

ECON 101: INTRODUCTION TO ECONOMICS I

Lecture 1 – The Ten Principles of Economics

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2021/2022**

Course Overview

- The first two sessions of the course provides a broad overview of the subject of Economics. It outlines the building blocks of the Economics.
- An understanding of the first two sessions is crucial to making meaning of subsequent sessions in this semester and next semester.
- This lecture will be based on **Mankiw, G. (2012)**. Principles of Economics (6th Edition), South Western.
 - Chapter 1

Course Overview

- In this lecture, look out for the answers to these questions:
 - What kinds of questions does economics address?
 - What are the principles of how people make decisions?
 - What are the principles of how people interact?
 - What are the principles of how the economy as a whole works?

Learning Outcomes

- At the end of this lecture, you should be able to identify and explain the ten principles of economics.



Ten Principles of Economics

- **Resources are scarce**
- Scarcity: **the limited nature of society's resources**
 - Society has limited resources
 - Cannot produce all the goods and services people wish to have
- Economics
 - The study of how society manages its scarce resources

Ten Principles of Economics

- Economists study:
 - How people decide what to buy, how much to work, save, and spend
 - How firms decide how much to produce, how many workers to hire
 - How society decides how to divide its resources between national defense, consumer goods, protecting the environment, and other needs



Ten Principles of Economics

- How people make decisions: Principle 1 – 4
- How people interact: Principle 5 – 7
- How the economy as a whole works: Principle 8 -10

I: How People Make Decisions

- Principle 1: People face trade-offs
- Principle 2: The cost of something is what you give up to get it
- Principle 3: Rational people think at the margin
- Principle 4: People respond to incentives

Principle 1: People Face Trade-offs

- To get something that we like, we have to give up something else that we also like
 - Having more money to buy stuff
 - Working longer hours, less time for leisure
 - Protecting the environment
 - Resources could be used to produce consumer goods

Principle 1: People Face Trade-offs

- Society faces trade-offs:
 - The more it spends on national defense to protect its shores
 - The less it can spend on consumer goods to raise the standard of living at home
 - Pollution regulations: cleaner environment and improved health
 - But at the cost of reducing the incomes of the firms' owners, workers, and customers

Principle 1: People Face Trade-offs

- **Efficiency:** society gets the most from its scarce resources
- **Equality:** prosperity is distributed uniformly among society's members
- **Tradeoff:**
 - To achieve greater equality, could redistribute income from wealthy to poor
 - But this reduces incentive to work and produce, shrinks the size of economic “pie”

Principle 2: The Cost of Something Is What You Give Up to Get It

- Making decisions:
 - Compare costs with benefits of alternatives
 - Need to include opportunity costs
- Opportunity cost
 - Whatever must be given up to obtain some item

Principle 2: The Cost of Something Is What You Give Up to Get It

- The opportunity cost of:
 - What is the opportunity cost of a university education?
 - What is the opportunity cost of starting a poultry business?

Principle 3: Rational People Think at the Margin

- Rational people
 - Systematically and purposefully do the best they can to achieve their objectives
 - Make decisions by evaluating costs and benefits of marginal changes
 - Small incremental adjustments to a plan of action

Principle 3: Rational People Think at the Margin

- Example:
 - A manager considers whether to increase output
 - Compares the cost of the needed labor and materials to the extra revenue

Principle 4: People Respond to Incentives

- **Incentive**
 - Something that induces a person to act
- **Examples:**
 - When petrol prices rise, consumers buy more hybrid cars and fewer petrol guzzling SUVs
 - When cigarette taxes increase, teen smoking falls

II: How People Interact

- Principle 5: Trade can make everyone better off
- Principle 6: Markets are usually a good way to organize economic activity
- Principle 7: Governments can sometimes improve market outcomes

Principle 5: Trade Can Make Everyone Better Off

- People benefit from trade:
 - People can buy a greater variety of goods and services at lower cost
- Countries benefit from trade and specialization
 - Get a better price abroad for goods they produce
 - Buy other goods more cheaply from abroad than could be produced at home

Principle 6: Markets Are Usually a Good Way to Organize Economic Activity

- Market
 - A group of buyers and sellers (need not be in a single location)
- “Organize economic activity” means determining
 - What goods and services to produce
 - How much of each to produce
 - Who produces and consumes these goods and services

Principle 6: Markets Are Usually a Good Way to Organize Economic Activity

- A market economy allocates resources
 - Decentralized decisions of many firms and households – as they interact in markets
- Famous insight by Adam Smith in *The Wealth of Nations* (1776):
 - Each of these households and firms acts as if “led by an invisible hand” to promote general economic well-being

Principle 6: Markets Are Usually a Good Way to Organize Economic Activity

- Prices:
 - Determined: interaction of buyers and sellers
 - Reflect the good's value to buyers
 - Reflect the cost of producing the good
- Invisible hand:
 - Prices guide self-interested households and firms to make decisions that maximize society's economic well-being

Principle 7: Governments Can *Sometimes* Improve Market Outcomes

- Government - enforce property rights
 - Enforce rules and maintain institutions that are key to a market economy
 - People are less inclined to work, produce, invest, or purchase if large risk of their property being stolen

Principle 7: Governments Can *Sometimes* Improve Market Outcomes

- Government - promote efficiency
 - Avoid market failures: market left on its own fails to allocate resources efficiently
 - Externality – source of market failure
 - Production or consumption of a good affects bystanders (e.g. pollution)
 - Market power – source of market failure
 - A single buyer or seller has substantial influence on market price (e.g. monopoly)

Principle 7: Governments Can *Sometimes* Improve Market Outcomes

- Government - promote equality
 - Avoid disparities in economic wellbeing
 - Use tax or welfare policies to change how the economic “pie” is divided

III: How the economy as a whole works

- **Principle 8:** A country's standard of living depends on its ability to produce goods and services
- **Principle 9:** Prices rise when the government prints too much money
- **Principle 10:** Society faces a short-run trade-off between inflation and unemployment

Principle 8: Country's Standard of Living Depends on Its Ability to Produce Goods and Services

- Huge variation in living standards
 - Across countries and over time
 - Average income in rich countries
 - Is more than ten times average income in poor countries
 - Standard of living (average income) is improving in Ghana like other developed countries

Principle 8: Country's Standard of Living Depends on Its Ability to Produce Goods and Services

- Productivity: the most important determinant of living standards
 - Quantity of goods and services produced from each unit of labor input
 - Depends on the equipment, skills, and technology available to workers
 - Other factors (e.g., labor unions, competition from abroad) have far less impact on living standards

Principle 9: Prices Rise When the Government Prints Too Much Money

- Inflation
 - An increase in the overall level of prices in the economy
- In the long run
 - Inflation is almost always caused by excessive growth in the quantity of money, which causes the value of money to fall
 - The faster the government creates money, the greater the inflation rate

Principle 10: Society Faces a Short-run Trade-off between Inflation and Unemployment

- Short-run trade-off between unemployment and inflation
 - Over a period of a year or two, many economic policies push inflation and unemployment in opposite directions
 - Other factors can make this tradeoff more or less favorable, but the tradeoff is always present

Summary

- Fundamental lessons about individual decision making:
 - People face trade-offs among alternative goals
 - The cost of any action is measured in terms of forgone opportunities
 - Rational people make decisions by comparing marginal costs and marginal benefits
 - People change their behavior in response to the incentives they face

Summary

- Fundamental lessons about interactions among people:
 - Trade and interdependence can be mutually beneficial
 - Markets are usually a good way of coordinating economic activity among people
 - The government can potentially improve market outcomes by remedying a market failure or by promoting greater economic equality

Summary

- Fundamental lessons about the economy as a whole:
 - Productivity is the ultimate source of living standards
 - Growth in the quantity of money is the ultimate source of inflation
 - Society faces a short-run trade-off between inflation and unemployment

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Lecture 2 – Thinking Like an Economist

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Lecture Overview

- This session will introduce you to what it means to be and think like an economist - the economist's approach to problem solving.
- We will look at the economist as a **scientist**, where the use of **models** helps to simplify complex relations in order to draw conclusions.
- We will also look at the economist as a **policy maker**, where we will make the point that economists do not always agree because they may view things from different perspectives.



Lecture Overview

- The objective of this session is to teach you how an economist thinks.
- At the end of this lecture, you should be able to
 - Explain basic models in economics
 - Analyse statements from economics and identify the perspective from which they argue
- Main text: **Mankiw, G. (2012).** Principles of Economics (6th Edition), South Western.
 - Chapter Two

The Economist as Scientist

- Economists play two roles:
 1. Scientists - try to explain happenings in the world
 2. Policy advisors - try to improve economic outcomes
- In the first, economists employ the **scientific method** - the dispassionate development and testing of theories about how the world works.

Assumptions & Models

- Assumptions simplify the complex world, make it easier to understand.
 - Example: To study international trade, assume two countries and two goods. Seems unrealistic, but simple to learn and gives useful insights about the real world.
- **Model:** a highly simplified representation of a more complicated reality. Economists use models to study economic issues.

Our First Model: The Circular-Flow Diagram

- The **Circular-Flow Diagram**: a visual model of the economy, shows how money flows through markets between households and firms
- Two types of “actors”:
 - households
 - firms
- Two markets:
 - the market for goods and services
 - the market for “factors of production”

The Circular-Flow Diagram

- **Factors of production:** the resources the economy uses to produce goods & services, including
 - labor
 - land
 - capital (buildings & machines used in production)

The Circular-Flow Diagram

Firms

Households:

- Own the factors of production, sell/rent them to firms for income
- Buy and consume goods & services

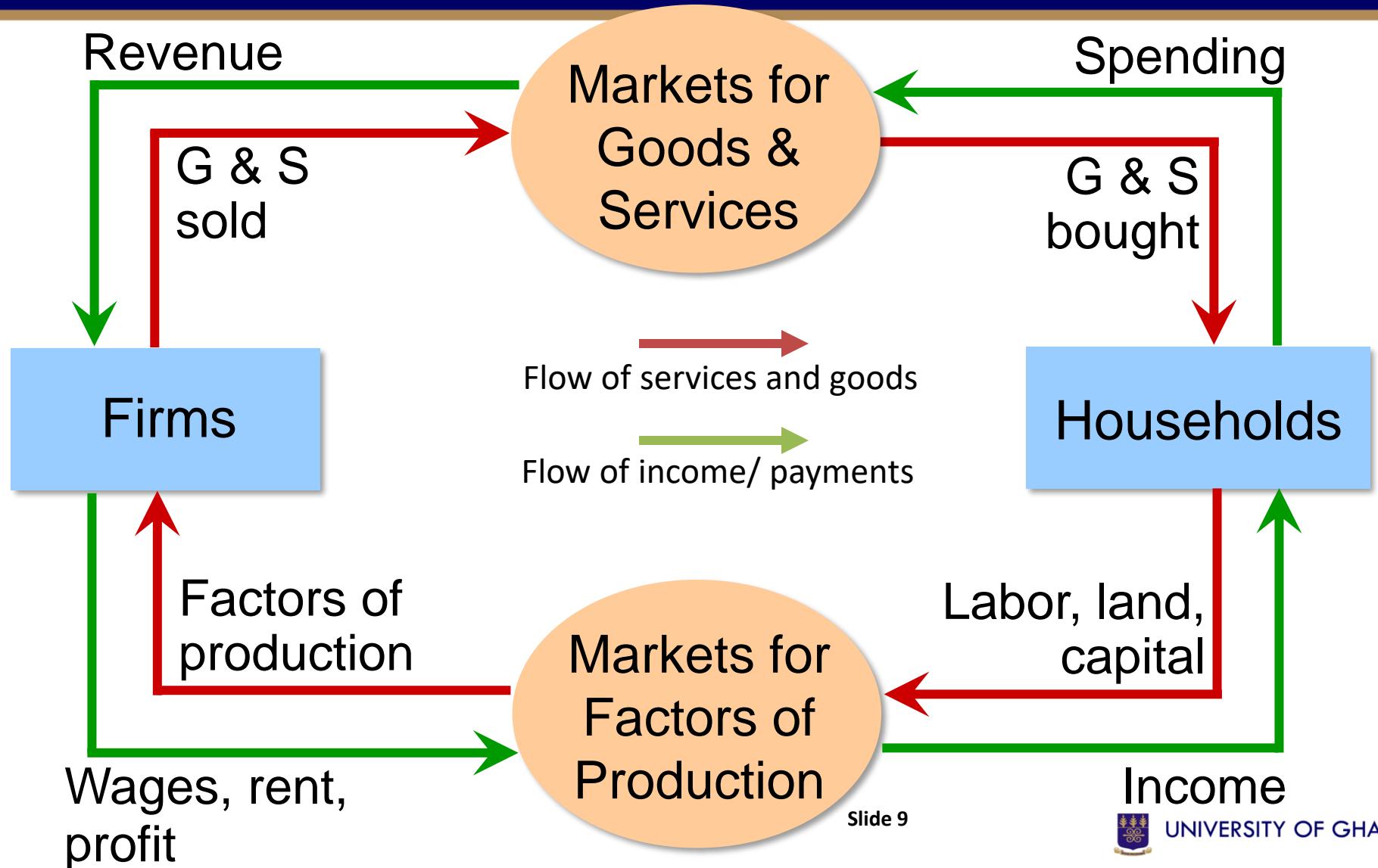
Households

Firms:

- Buy/hire factors of production, use them to produce goods and services
- Sell goods & services



FIGURE 1: The Circular-Flow Diagram



Our Second Model: The Production Possibilities Frontier

- The **Production Possibilities Frontier (PPF)**:
a graph that shows the combinations of two goods the economy can possibly produce given the available resources and the available technology
- Example:
 - Two goods: computers and wheat
 - One resource: labor (measured in hours)
 - Economy has 50,000 labor hours per month available for production.

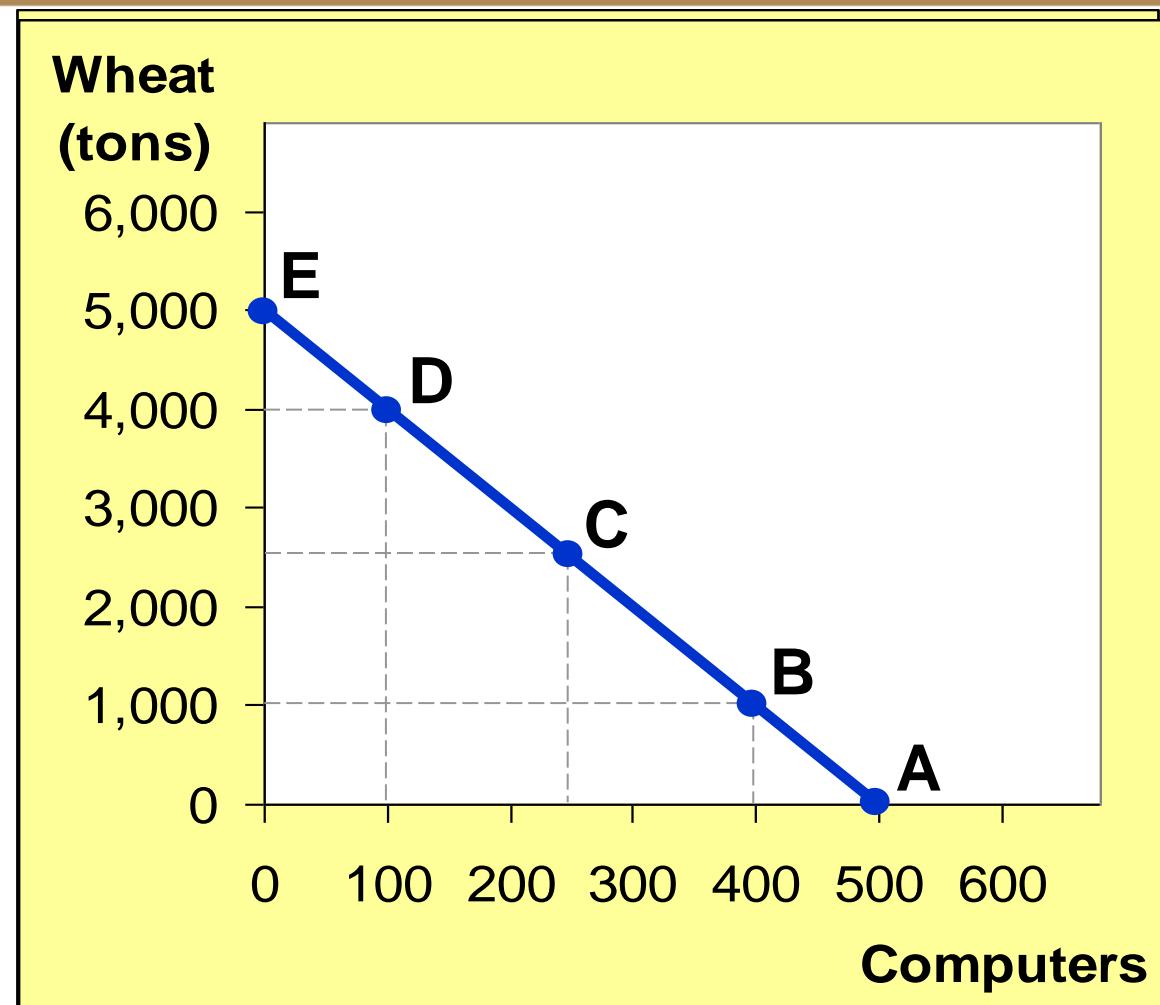
PPF Example

- Producing one computer requires 100 hours labor.
- Producing one ton of wheat requires 10 hours labor.

	Employment of labor hours		Production	
	Computers	Wheat	Computers	Wheat
A	50,000	0	500	0
B	40,000	10,000	400	1,000
C	25,000	25,000	250	2,500
D	10,000	40,000	100	4,000
E	0	50,000	0	5,000

PPF Example

Point on graph	Production	
	Com- puters	Wheat
A	500	0
B	400	1,000
C	250	2,500
D	100	4,000
E	0	5,000



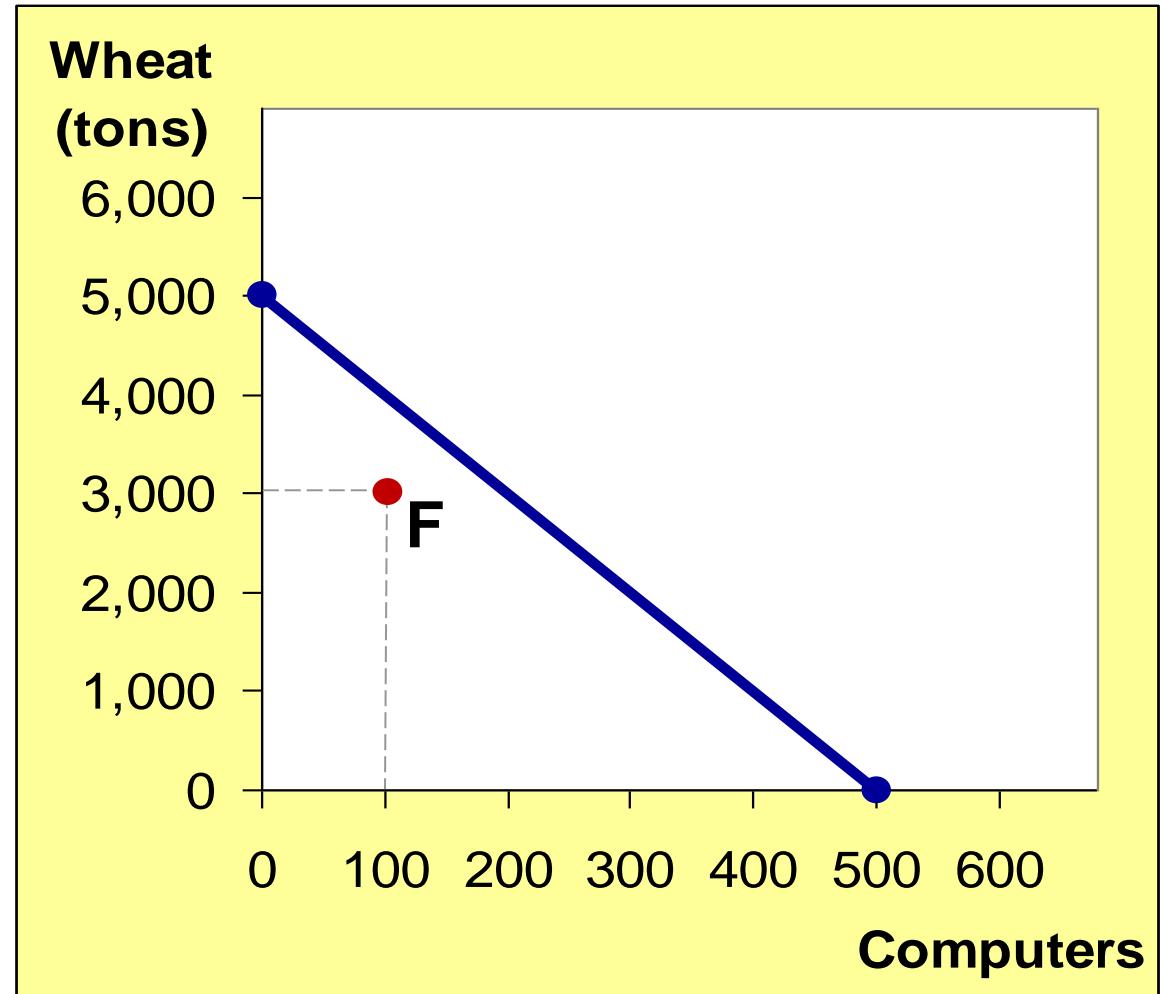
Points off the PPF

- A. On the graph, find the point that represents (100 computers, 3000 tons of wheat), label it **F**. Would it be possible for the economy to produce this combination of the two goods?
Why or why not?

- B. Next, find the point that represents (300 computers, 3500 tons of wheat), label it **G**. Would it be possible for the economy to produce this combination of the two goods?

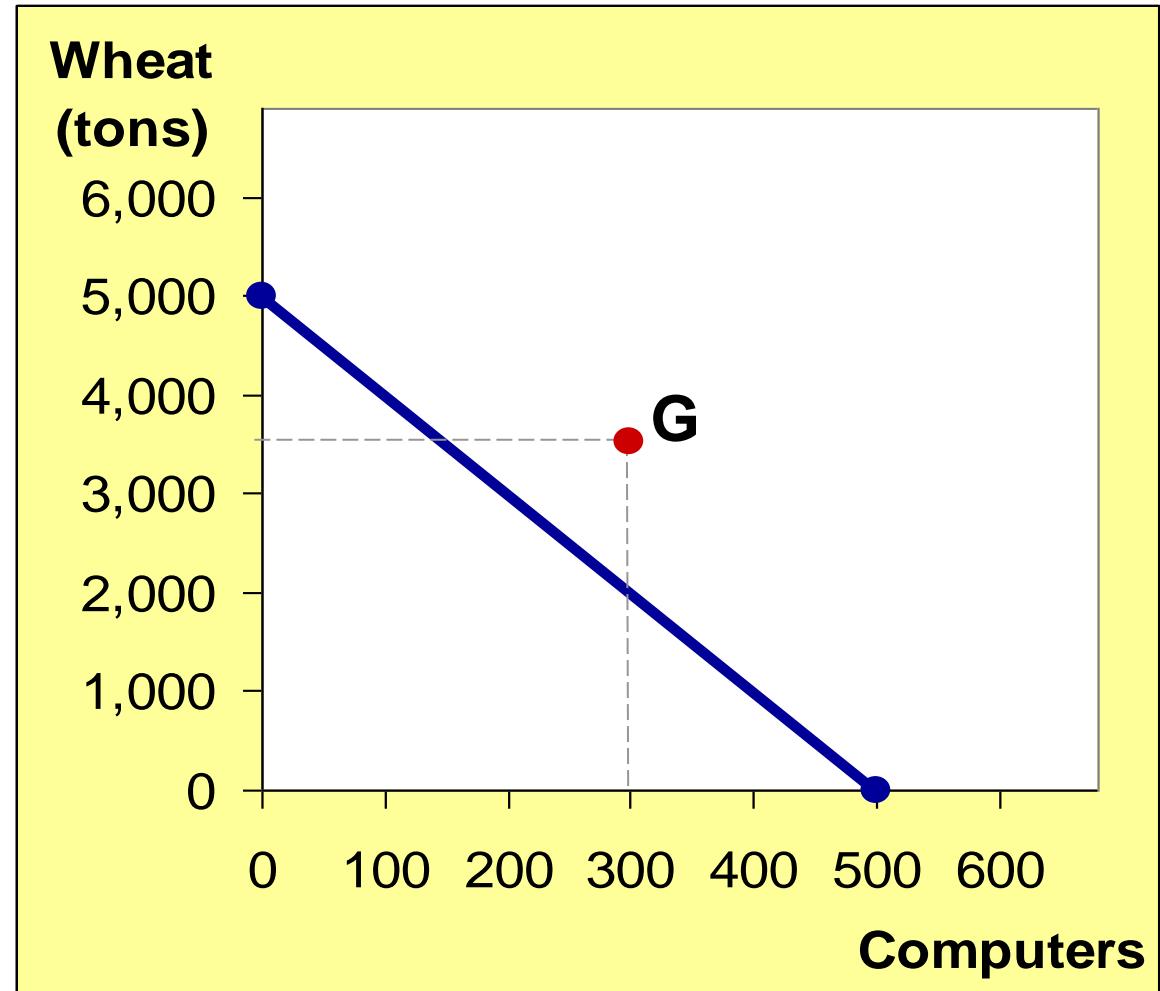
Answers

- Point F:
100 computers,
3000 tons wheat
- Point F requires
40,000 hours
of labor.
Possible but
not efficient:
could get more
of either good
w/o sacrificing
any of the other.



Answers

- Point **G**:
300 computers,
3500 tons wheat
- Point **G** requires
65,000 hours
of labor.
Not possible
because
economy
only has
50,000 hours.



The PPF: What We Know So Far

Points on the PPF (like A – E)

- possible
- efficient: all resources are fully utilized

Points under the PPF (like F)

- possible
- not efficient: some resources underutilized
(e.g., workers unemployed, factories idle)

Points above the PPF (like G)

- not possible

The PPF and Opportunity Cost

- Recall: The **opportunity cost** of an item is what must be given up to obtain that item.
- Moving **along** a PPF involves shifting resources (e.g., labor) from the production of one good to the other.
- Society faces a **tradeoff**: Getting more of one good requires sacrificing some of the other.
- The **slope** of the PPF tells you the opportunity cost of one good in terms of the other.

The PPF and Opportunity Cost

Wheat
(tons)

6,000
5,000
4,000
3,000
2,000
1,000
0

slope = $\frac{-1000}{100} = -10$

0 100 200 300 400 500 600

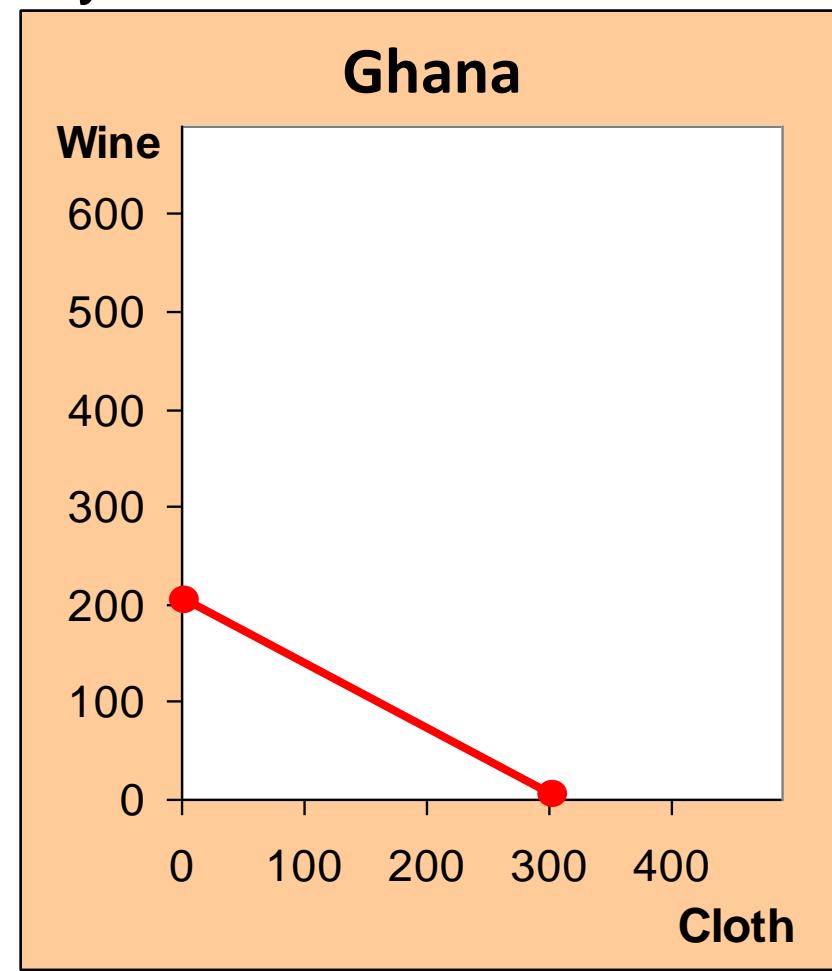
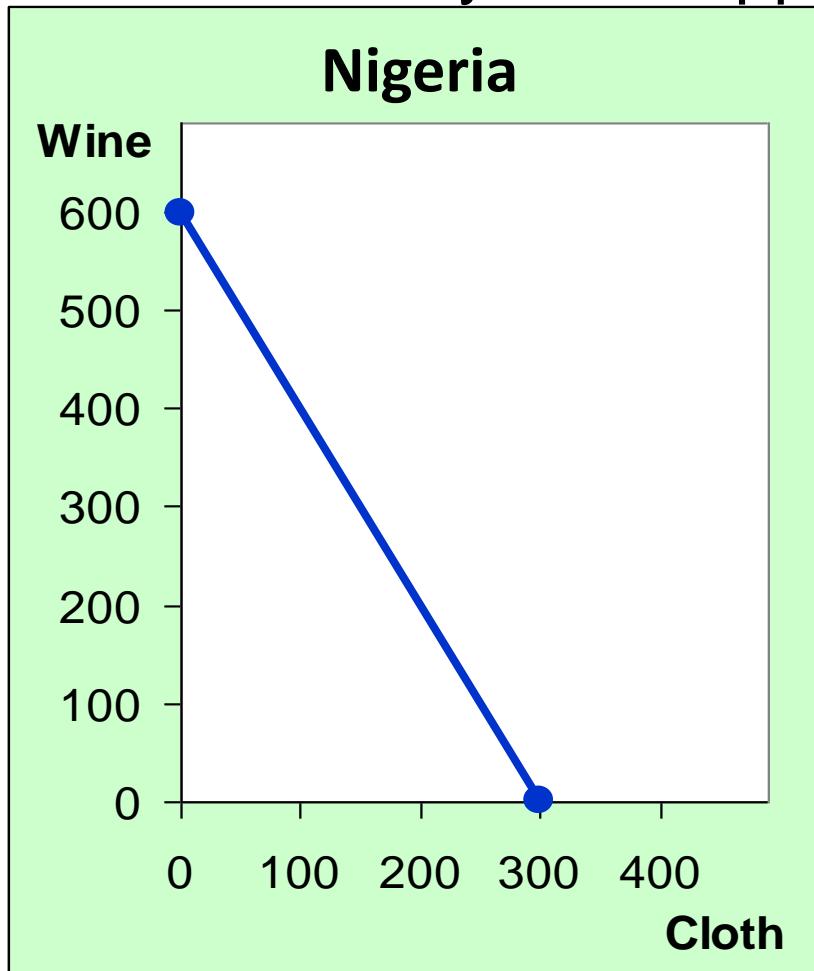
Computers

The slope of a line equals the “**rise** over the **run**,” the amount the line rises when you move to the right by one unit.

Here, the opportunity cost of a computer is 10 tons of wheat.

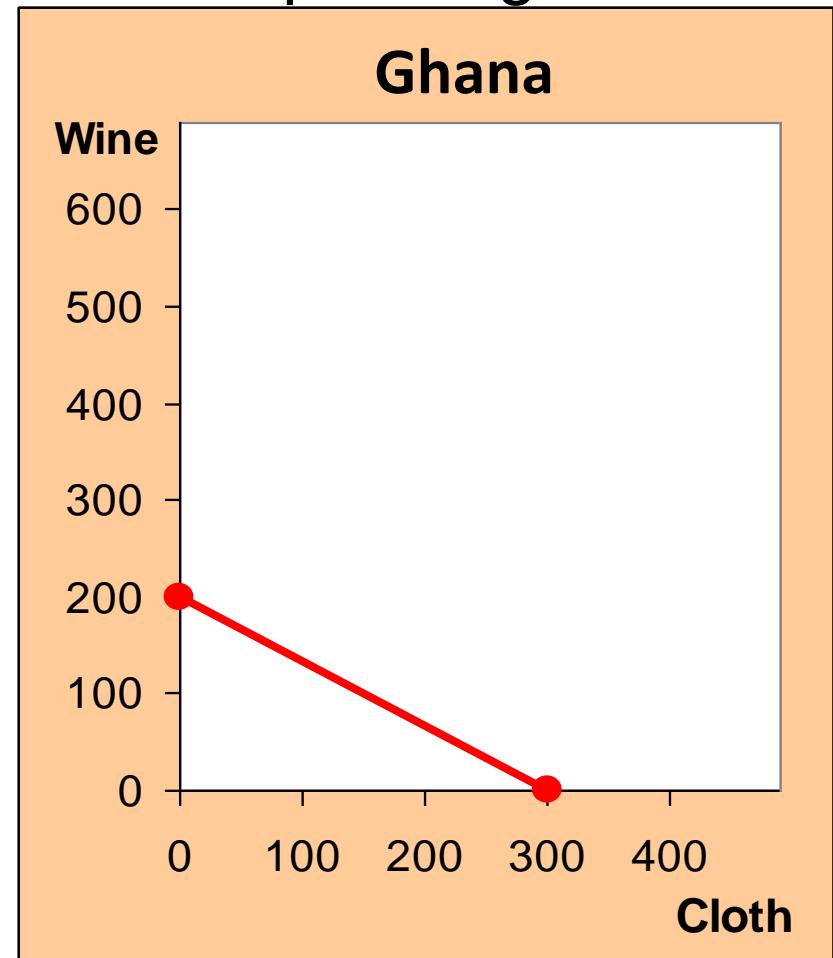
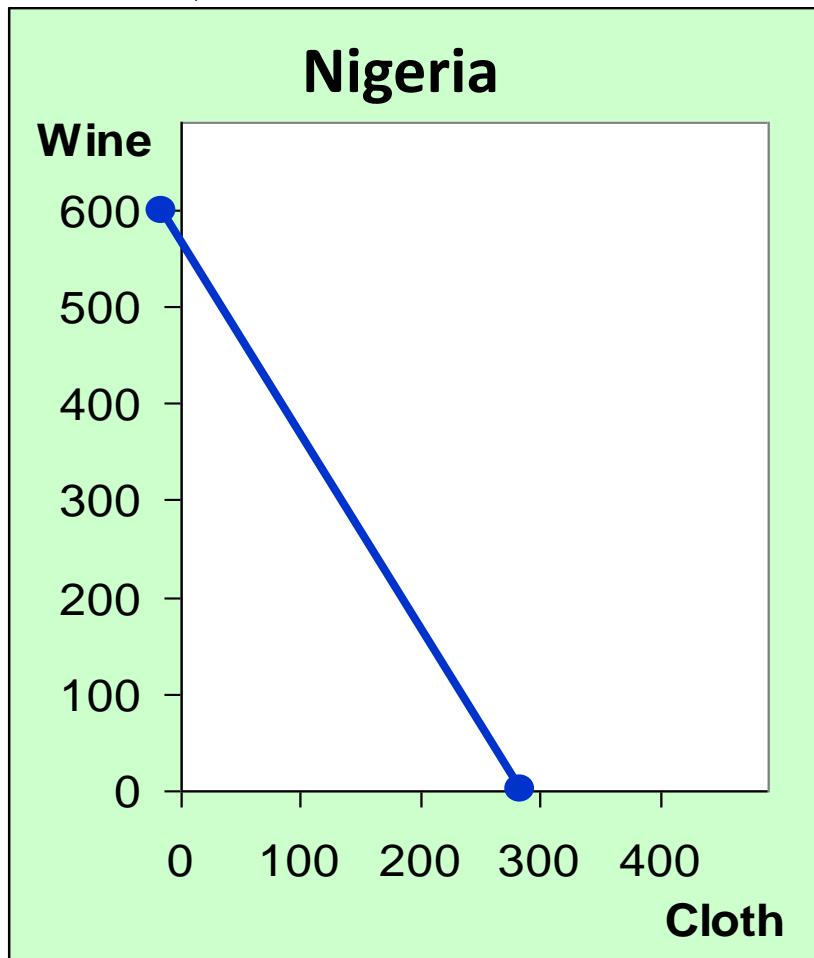
PPF and Opportunity Cost

In which country is the opportunity cost of cloth lower?



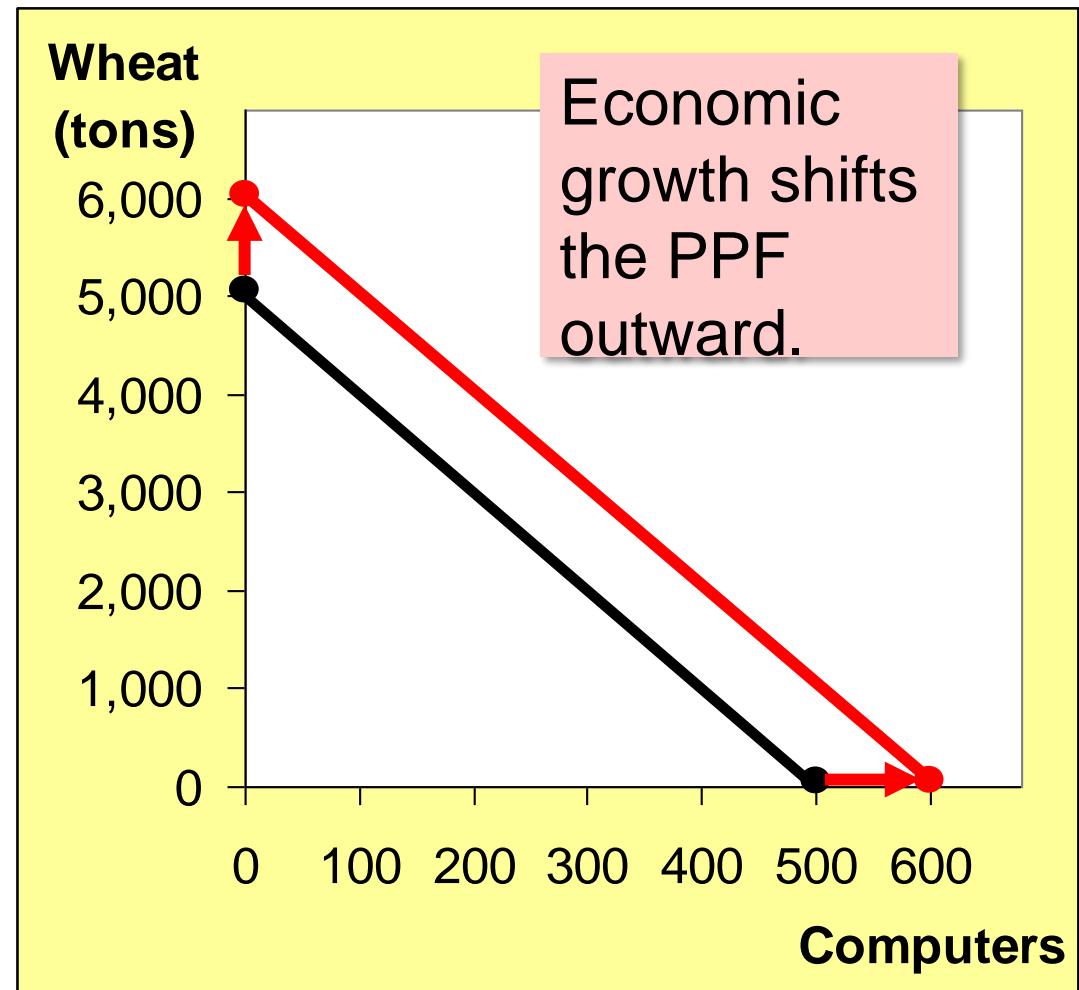
Answers

Ghana, because its PPF is not as steep as Nigeria's.



Economic Growth and the PPF

With additional resources or an improvement in technology, the economy can produce more computers, more wheat, or any combination in between.



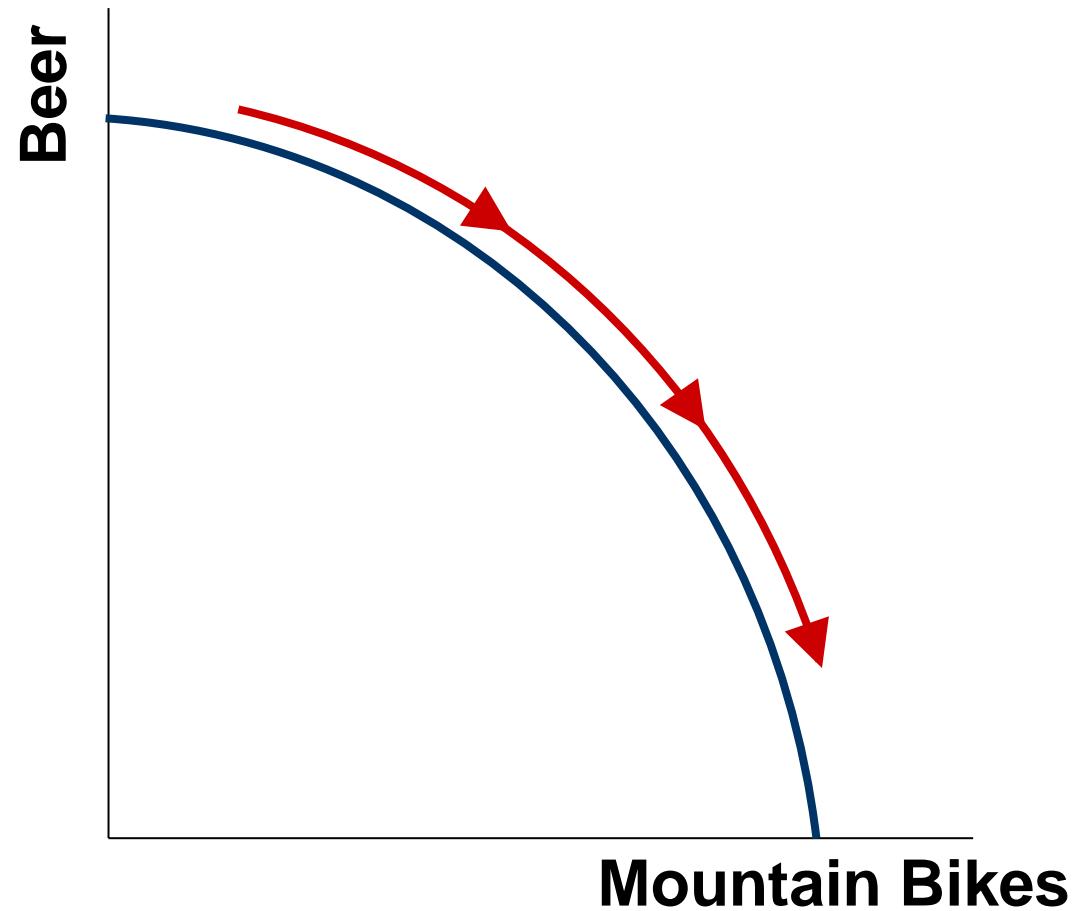
The Shape of the PPF

- The PPF could be a straight line or **bow-shaped**
- Depends on what happens to opportunity cost as economy shifts resources from one industry to the other.
 - If opp. cost remains **constant**, PPF is a **straight line**.
(In the previous example, opp. cost of a computer was always 10 tons of wheat.)
 - If opp. cost of a good **rises** as the economy produces more of the good, PPF is **bow-shaped**.

Why the PPF Might Be Bow-Shaped

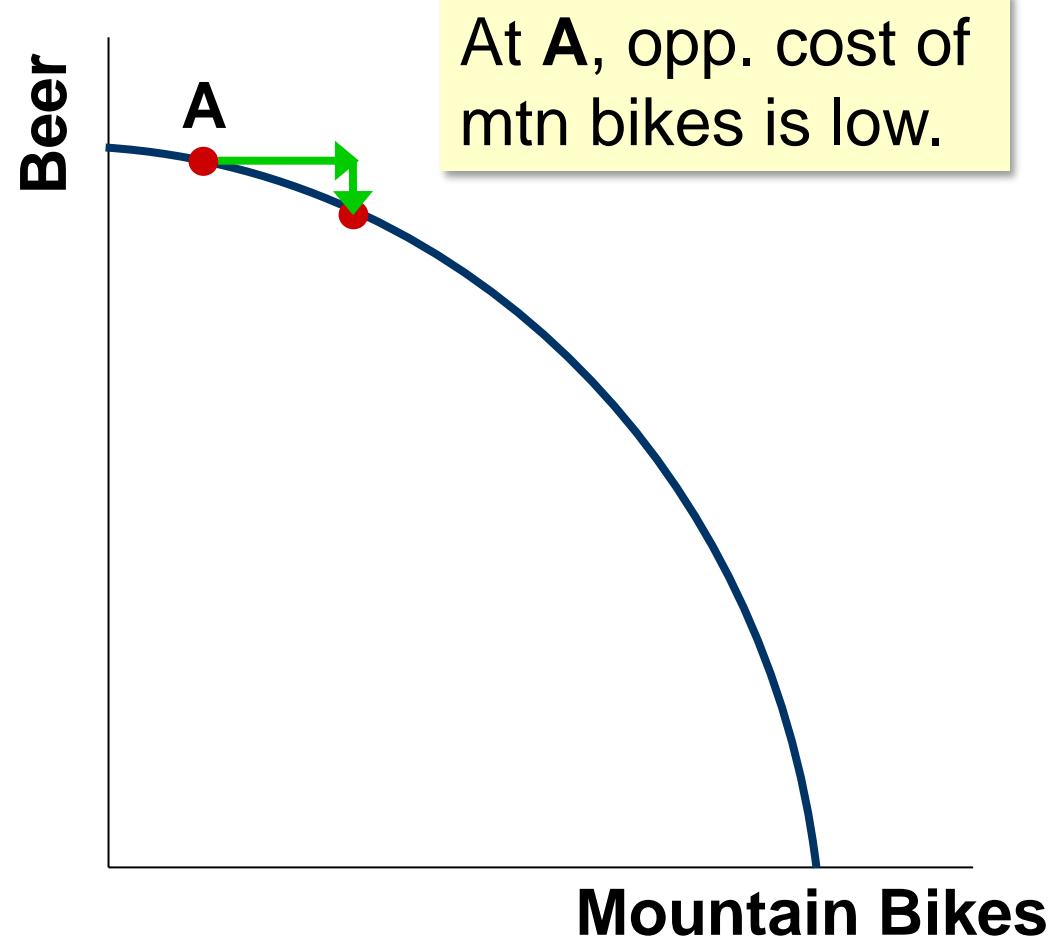
As the economy shifts resources from beer to mountain bikes:

- PPF becomes steeper
- opp. cost of mountain bikes increases



Why the PPF Might Be Bow-Shaped

At point A,
most workers are
producing beer,
even those who
are better suited
to building bikes.
So, do not have to
give up much beer
to get more bikes.

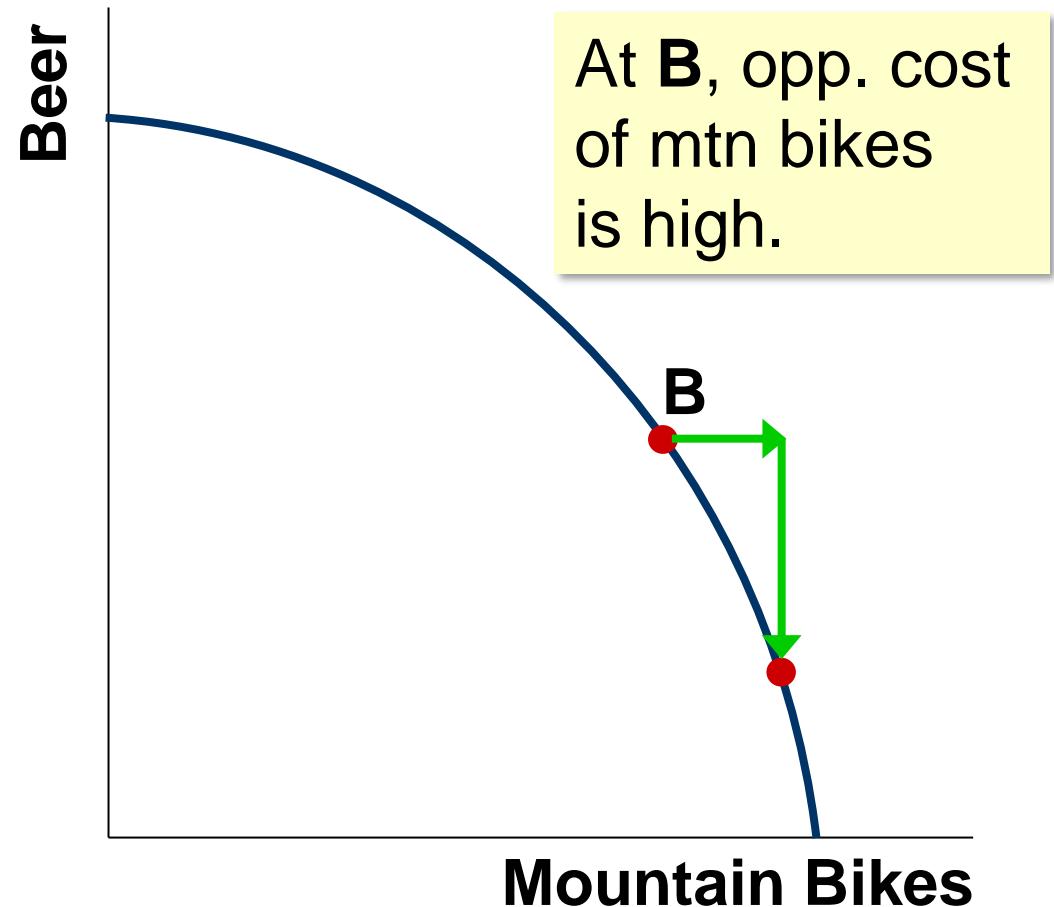


Why the PPF Might Be Bow-Shaped

At **B**, most workers are producing bikes.

The few left in beer are the best brewers.

Producing more bikes would require shifting some of the best brewers away from beer production, causing a big drop in beer output.



Why the PPF Might Be Bow-Shaped

- So, PPF is bow-shaped when different workers have different skills, different opportunity costs of producing one good in terms of the other.
- The PPF would also be bow-shaped when there is some other resource or mix of resources with varying opportunity costs (E.g., different types of land suited for different uses).

The PPF: A Summary

- The PPF shows all combinations of two goods that an economy can possibly produce, given its resources and technology.
- The PPF illustrates the concepts of **tradeoff** and **opportunity cost**, **efficiency** and **inefficiency**, unemployment, and economic growth.
- A bow-shaped PPF illustrates the concept of **increasing opportunity cost**.



The Economist as Policy Advisor

- As scientists, economists make **positive statements**, which attempt to describe the world **as it is**.
- As policy advisors, economists make **normative statements**, which attempt to prescribe how the world **should be**.
- Positive statements can be confirmed or refuted, normative statements cannot.

Identifying positive vs. normative

Which of these statements are “positive” and which are “normative”? How can you tell the difference?

- a. Prices rise when the government increases the quantity of money.
- b. The government should print less money.
- c. A tax cut is needed to stimulate the economy.
- d. An increase in the price of burritos will cause an increase in consumer demand for music downloads.

Answers

- a. Prices rise when the government increases the quantity of money.

Positive – describes a relationship, could use data to confirm or refute.

- b. The government should print less money.

Normative – this is a value judgment, cannot be confirmed or refuted.

Answers

- c. A tax cut is needed to stimulate the economy.

Normative – another value judgment.

- d. An increase in the price of burritos will cause an increase in consumer demand for music downloads.

Positive – describes a relationship.

Note that a statement need not be true to be positive.

Why Economists Disagree

- Economists often give conflicting policy advice.
- They sometimes disagree about the validity of alternative positive theories about the world.
- They may have different values and, therefore, different normative views about what policy should try to accomplish.
- Yet, there are many propositions about which most economists agree.

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Lecture 3 – The Market Forces of Demand and Supply

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Lecture Overview

- In this lecture, we introduce the concept of demand and supply – law of demand; law of supply; shifts in the demand and supply curves
- We subsequently combine demand and supply to look at the market equilibrium, where the equilibrium price and equilibrium quantity is determined.
- We answer the following questions during this lecture
 - What factors affect buyers' demand for goods?
 - What factors affect sellers' supply of goods?

Lecture Overview

- Questions continued:
 - How do supply and demand determine the price of a good and the quantity sold?
 - How do changes in the factors that affect demand or supply affect the market price and quantity of a good?
 - How do markets allocate resources?
- This lecture will be based on **Mankiw, G. (2012).** Principles of Economics (6th Edition), South Western.
 - Chapter 4

Learning Outcomes

- By the end of the lecture, you should be able to:
 - Differentiate between a change in demanded and a change in quantity demanded
 - Identify and explain the factors that influence a change in demand.
 - Differentiate between a change in quantity supplied and a change in supply
 - Identify and explain the factors that influence a change in supply
 - Determine the equilibrium price and quantity in a market.

Markets and Competition

- A **market** - group of buyers and sellers of a particular product.
- A **competitive market** - many buyers and sellers, each has an insignificant effect on price.
- In a **perfectly competitive** market:
 - Homogeneous goods
 - Many buyers & sellers such that no one can affect market price—each is a “**price taker**”
- We assume markets are perfectly competitive.



DEMAND



Demand

- The **quantity demanded** of any good is the amount of the good that buyers are *willing* and *able* to purchase.
- **Law of demand:** quantity demanded of a good falls when the price of the good rises, *other things equal*
- Demand may be expressed as a demand schedule, graph or in a functional form.



The Demand Schedule

- A table that shows the relationship between the price of a good and the quantity demanded
- *Example:*
Helen's demand for latte.

Price of latte (\$)	Quantity of latte demanded
0.00	16
1.00	14
2.00	12
3.00	10
4.00	8
5.00	6
6.00	4

Helen's Demand Schedule & Curve

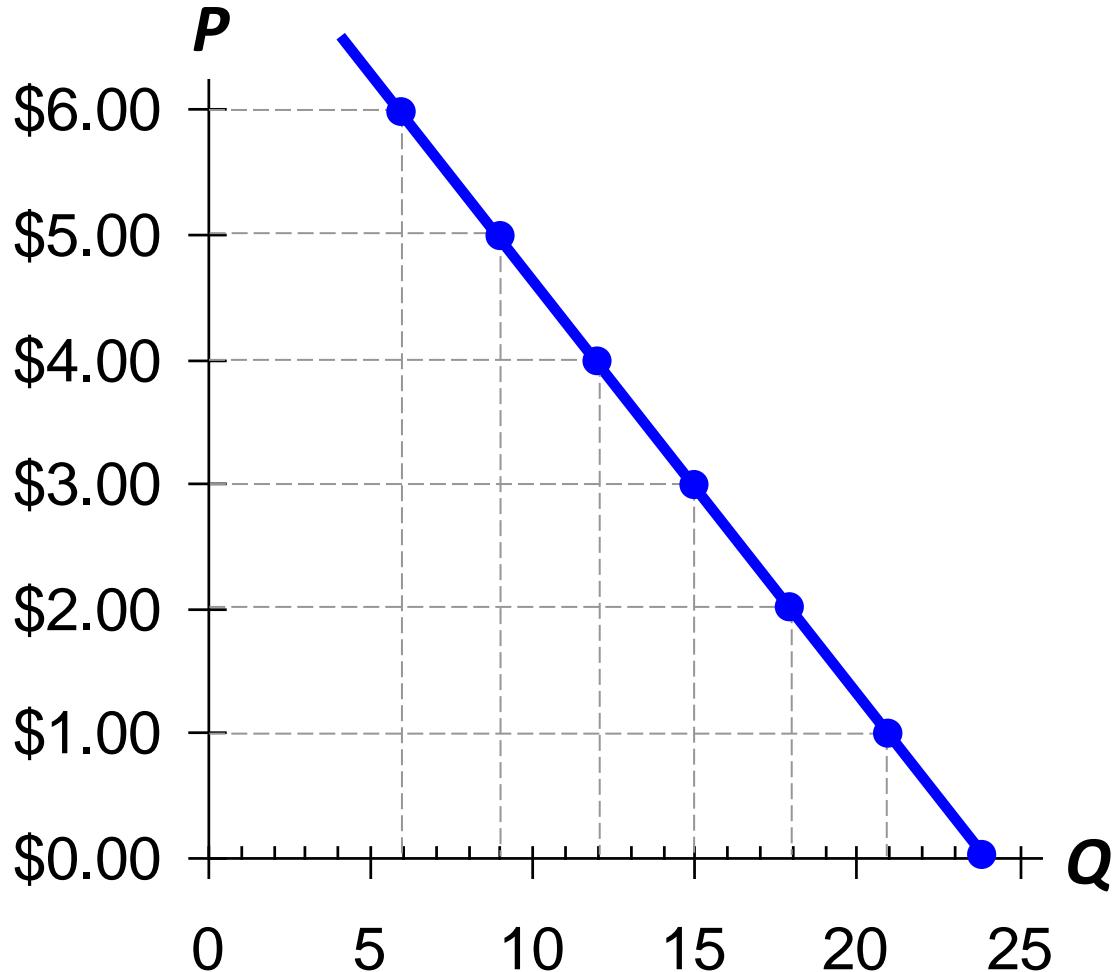


Market Demand versus Individual Demand

- Suppose Helen and Ken are the only two buyers in the latte market. (Q^d = quantity demanded)

Price	Helen's Q^d		Ken's Q^d	=	Market Q^d
\$0.00	16	+	8	=	24
1.00	14	+	7	=	21
2.00	12	+	6	=	18
3.00	10	+	5	=	15
4.00	8	+	4	=	12
5.00	6	+	3	=	9
6.00	4	+	2	=	6

The Market Demand Curve for latte



P	Q^d (Market)
\$0.00	24
1.00	21
2.00	18
3.00	15
4.00	12
5.00	9
6.00	6

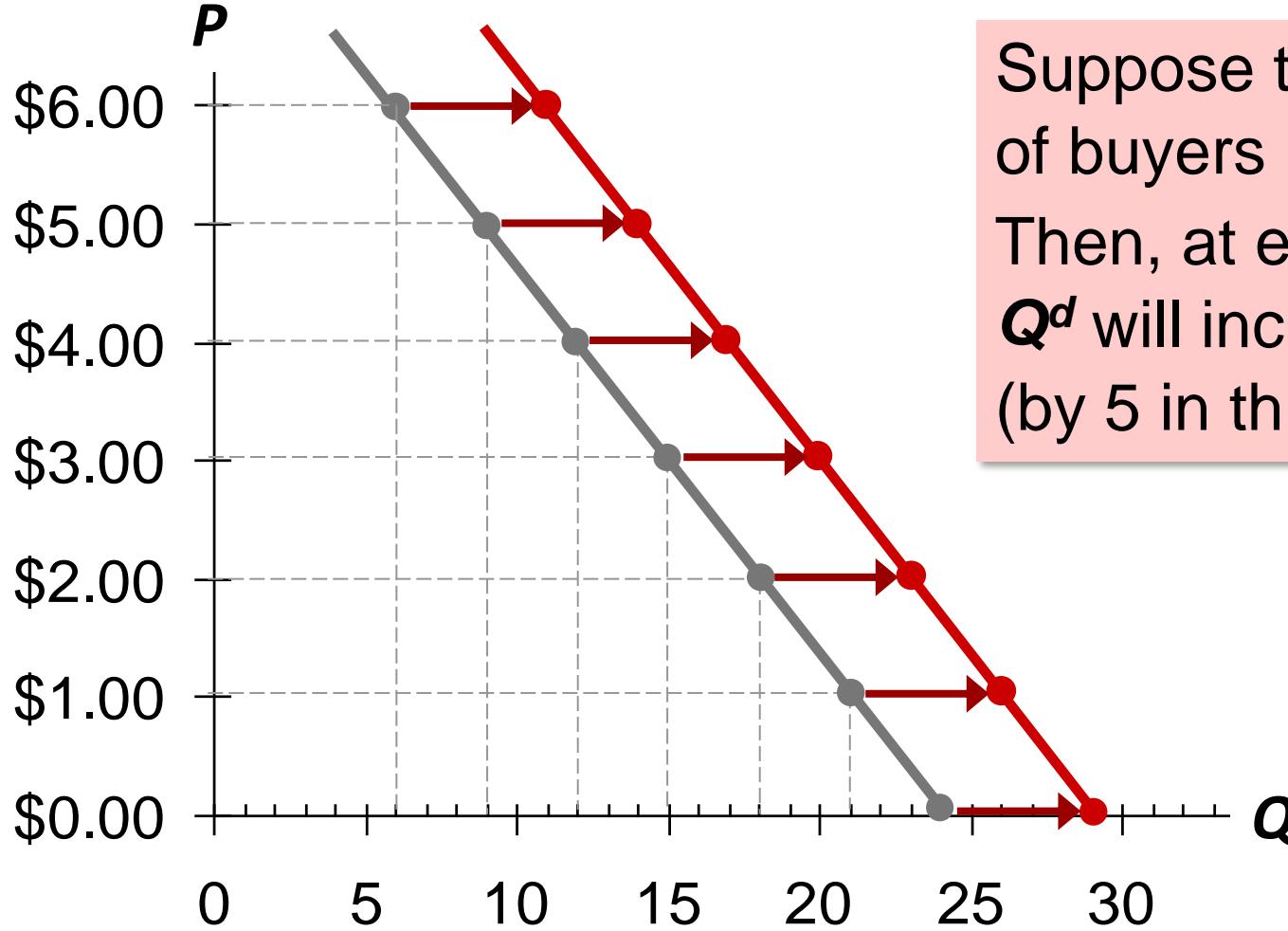
Shift in the Demand Curve

- The demand curve shows how price affects quantity demanded, *other things being equal.*
- These “other things” are non-price determinants of demand (i.e., things that determine buyers’ demand for a good, other than the good’s price).
- Changes in them shift the **D** curve...

Demand Curve Shifters: # of Buyers

- Increase in # of buyers
increases quantity demanded at each price,
shifts *D* curve to the right.

Demand Curve Shifters: # of Buyers



Suppose the number of buyers increases.
Then, at each P , Q^d will increase
(by 5 in this example).

Demand Curve Shifters: **Income**

- Demand for a **normal good** is positively related to income.
 - Increase in income causes increase in quantity demanded at each price, shifts **D** curve to the right.

(Demand for an **inferior good** is negatively related to income. An increase in income shifts **D** curves for inferior goods to the left.)

- Two goods are **substitutes** if an increase in the price of one causes an increase in demand for the other.
- Examples?

- Two goods are **complements** if an increase in the price of one causes a fall in demand for the other.
- Examples?

Demand Curve Shifters: **Tastes**

- Anything that causes a shift in tastes *toward* a good will increase demand for that good and shift its **D** curve to the right.

Demand Curve Shifters: **Expectations**

- Expectations affect consumers' buying decisions.
- Examples:
 - If people expect their incomes to rise, their demand for meals at expensive restaurants may increase now.
 - If the economy takes a downturn and people worry about their future job security, demand for new cars may fall now.

Summary: Variables That Influence Buyers

<i>Variable</i>	<i>A change in this variable...</i>
Price	...causes a movement along the D curve
# of buyers	...shifts the D curve
Income	...shifts the D curve
Price of related goods	...shifts the D curve
Tastes	...shifts the D curve
Expectations	...shifts the D curve

SUPPLY



Supply

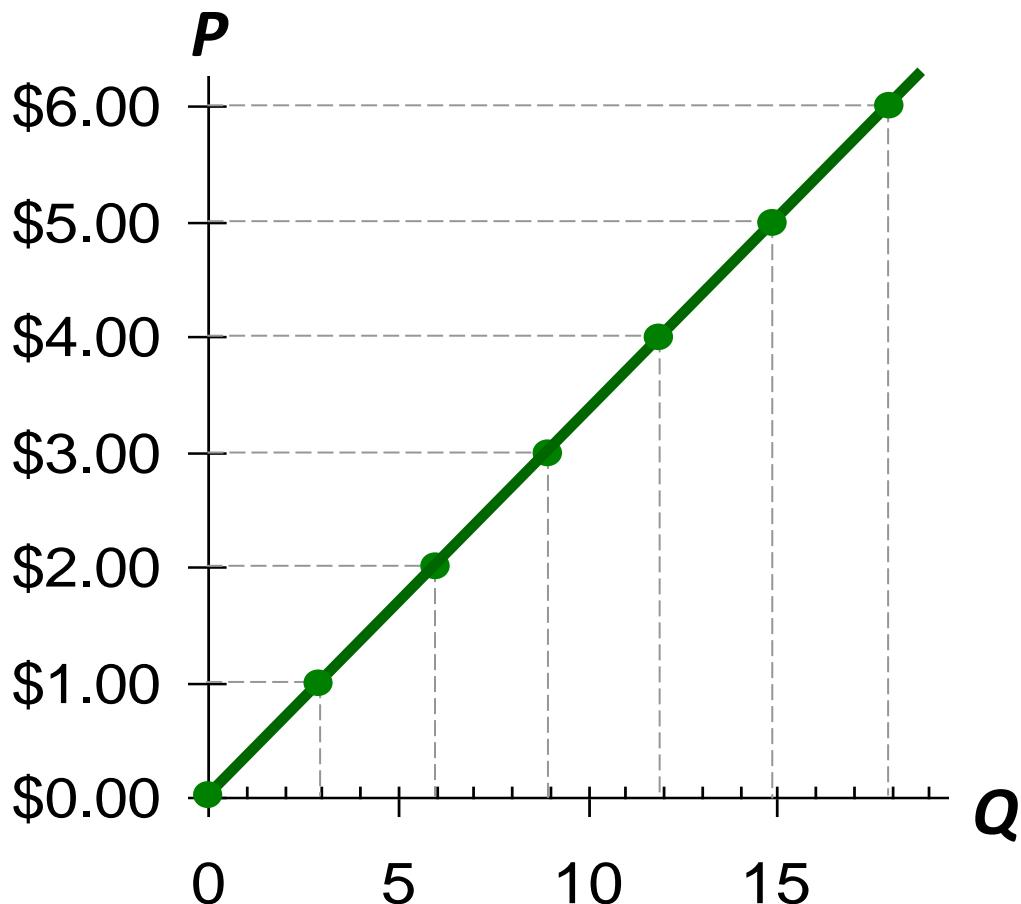
- The **quantity supplied** of any good is the amount that sellers are *willing* and able to *sell*.
- **Law of supply:** the quantity supplied of a good rises when the price of the good rises, *other things equal*

The Supply Schedule

- A table that shows the relationship between the price of a good and the quantity supplied.
- Example:
Vidaecaffe's supply of lattes.
- Notice that Vidaecaffe's supply schedule obeys the law of supply.

Price of lattes	Quantity of lattes supplied
\$0.00	0
1.00	3
2.00	6
3.00	9
4.00	12
5.00	15
6.00	18

Vidaecaffe's Supply Schedule & Curve



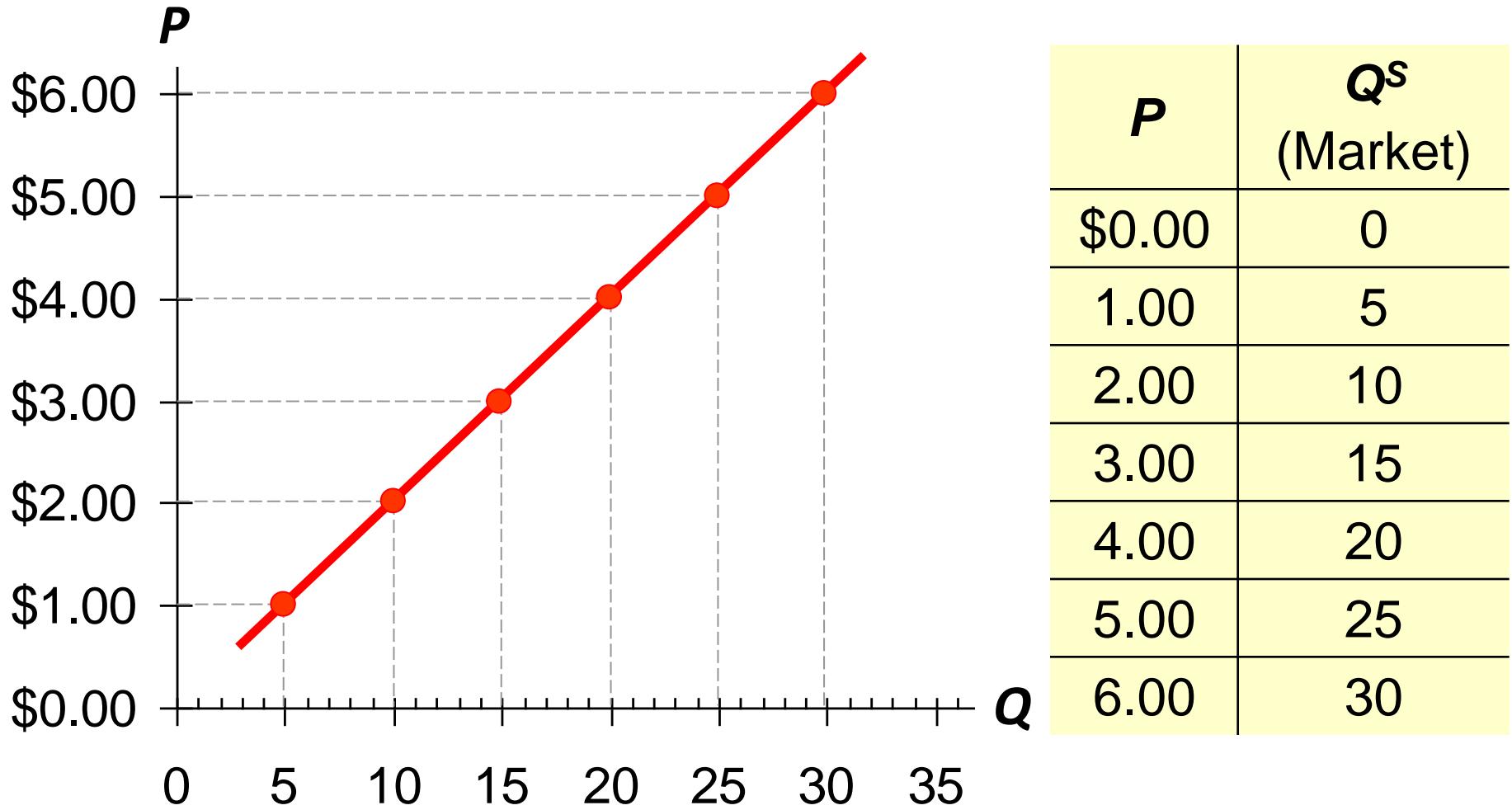
Price of lattes	Quantity of lattes supplied
\$0.00	0
1.00	3
2.00	6
3.00	9
4.00	12
5.00	15
6.00	18

Market Supply versus Individual Supply

- Suppose Vidaecaffe and Kukun's are the only two sellers in this market. (Q^s = quantity supplied)

Price	Vidaecaffe	+	Kukun's	=	Market Q^s
\$0.00	0	+	0	=	0
1.00	3	+	2	=	5
2.00	6	+	4	=	10
3.00	9	+	6	=	15
4.00	12	+	8	=	20
5.00	15	+	10	=	25
6.00	18	+	12	=	30

The Market Supply Curve



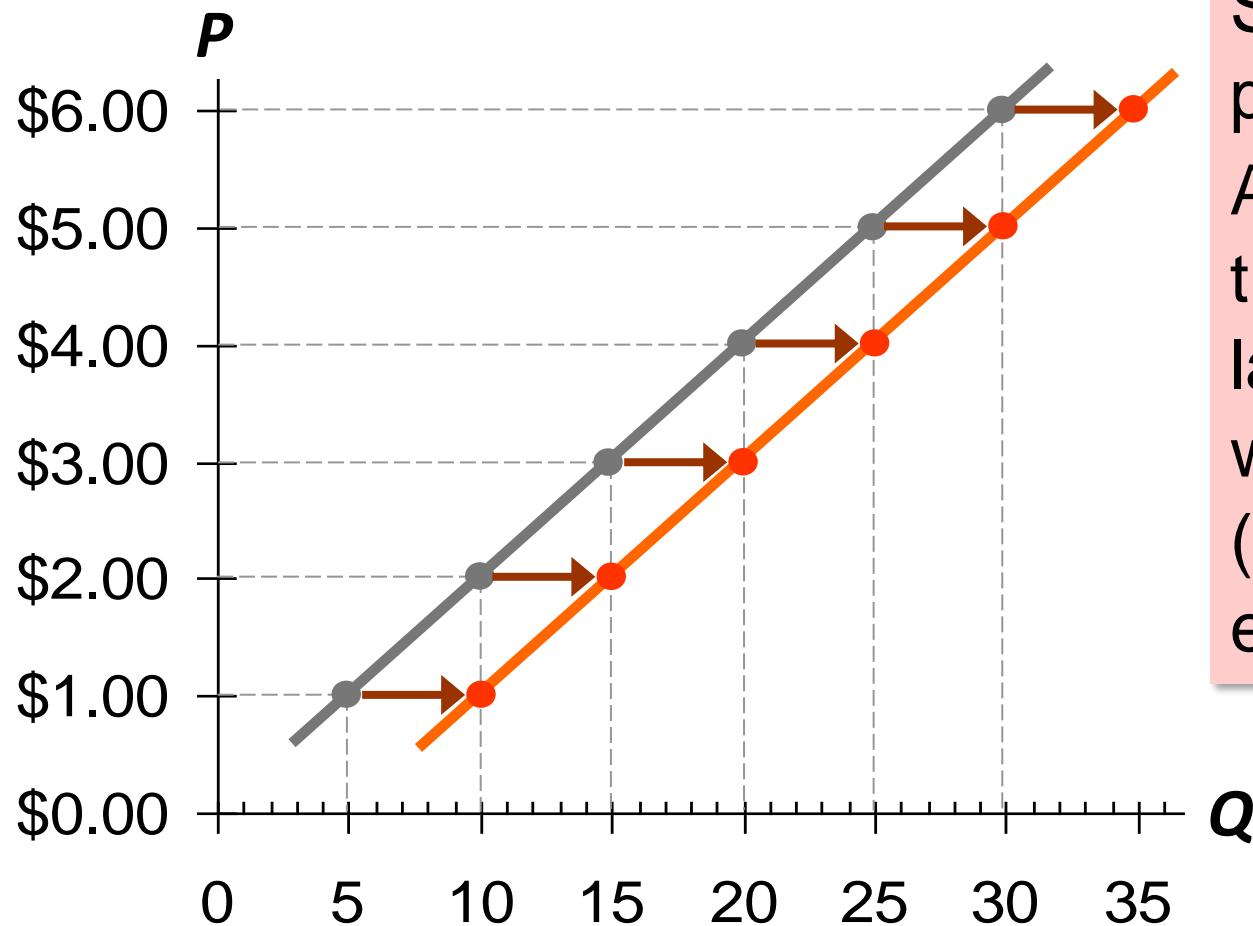
Supply Curve Shifters

- The supply curve shows how price affects quantity supplied, *other things being equal.*
- These “other things” are non-price determinants of supply.
- Changes in them shift the **S** curve...

Supply Curve Shifters: **Input Prices**

- Examples of input prices:
wages, prices of raw materials.
- A fall in input prices makes production more profitable at each output price, so firms supply a larger quantity at each price, and the **S** curve shifts to the right.

Supply Curve Shifters: **Input Prices**



Suppose the price of milk falls. At each price, the quantity of lattes supplied will increase (by 5 in this example).

Supply Curve Shifters: **Technology**

- Technology determines how much inputs are required to produce a unit of output.
- A cost-saving technological improvement has the same effect as a fall in input prices, shifts **S** curve to the right.

Supply Curve Shifters: # of Sellers

- An increase in the number of sellers increases the quantity supplied at each price, shifts **S** curve to the right.

Supply Curve Shifters: Expectations

- Example:
 - Events in the Middle East lead to expectations of higher oil prices.
 - In response, owners of Texas oilfields reduce supply now, save some inventory to sell later at the higher price.
 - **S** curve shifts left.
- In general, sellers may adjust supply* when their expectations of future prices change.
*(*If good not perishable)*

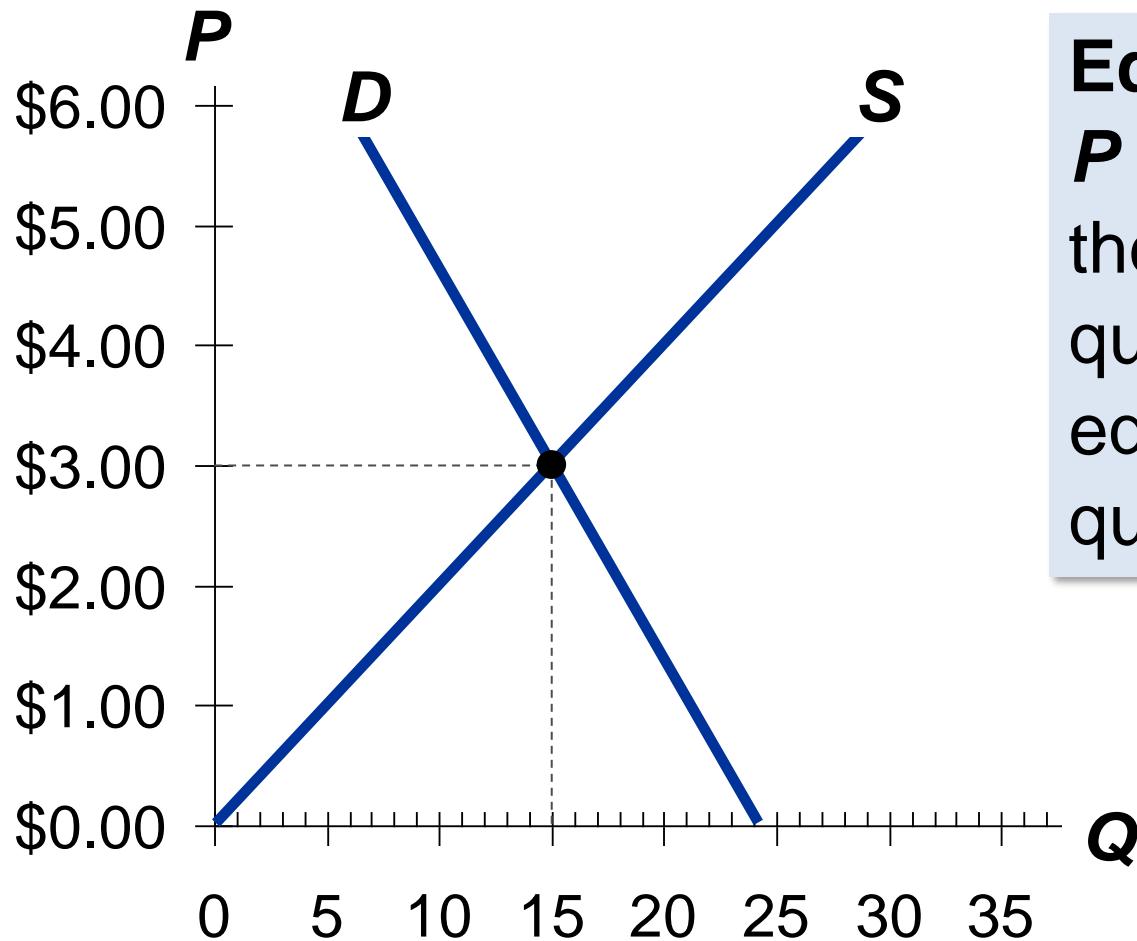
Summary: Variables that Influence Sellers

<i>Variable</i>	<i>A change in this variable...</i>
Price	...causes a movement along the S curve
Input Prices	...shifts the S curve
Technology	...shifts the S curve
# of Sellers	...shifts the S curve
Expectations	...shifts the S curve

MARKET EQUILIBRIUM



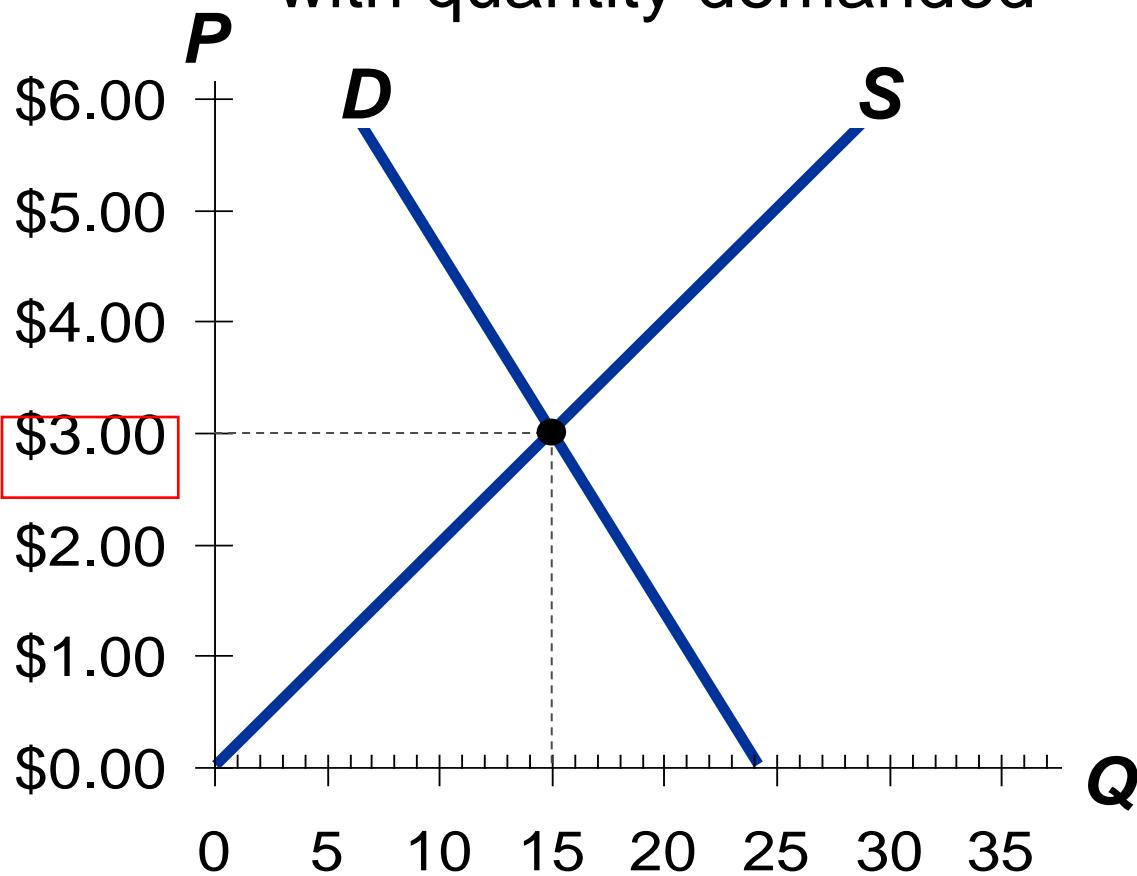
Supply and Demand



Equilibrium:
 P has reached
the level where
quantity supplied
equals
quantity demanded

Equilibrium price:

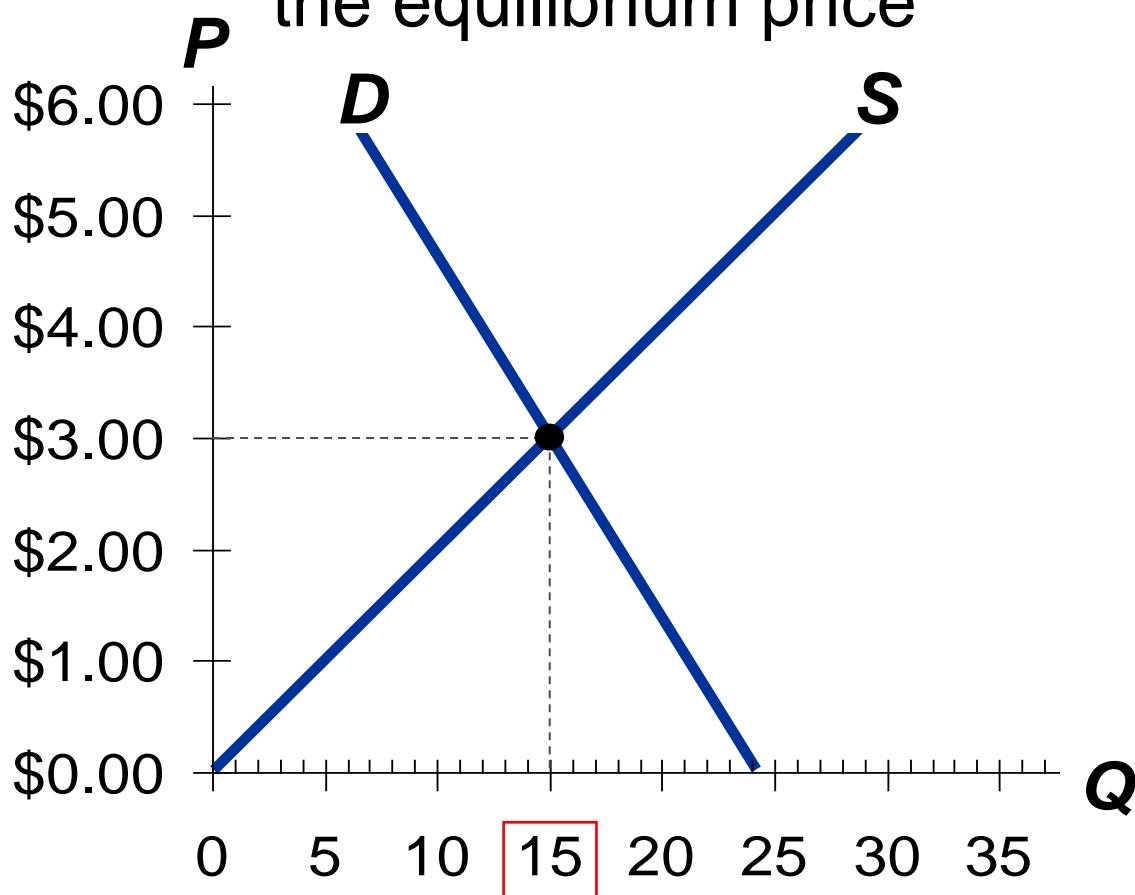
the price that equates quantity supplied with quantity demanded



P	Q^D	Q^S
\$0	24	0
1	21	5
2	18	10
3	15	15
4	12	20
5	9	25
6	6	30

Equilibrium quantity:

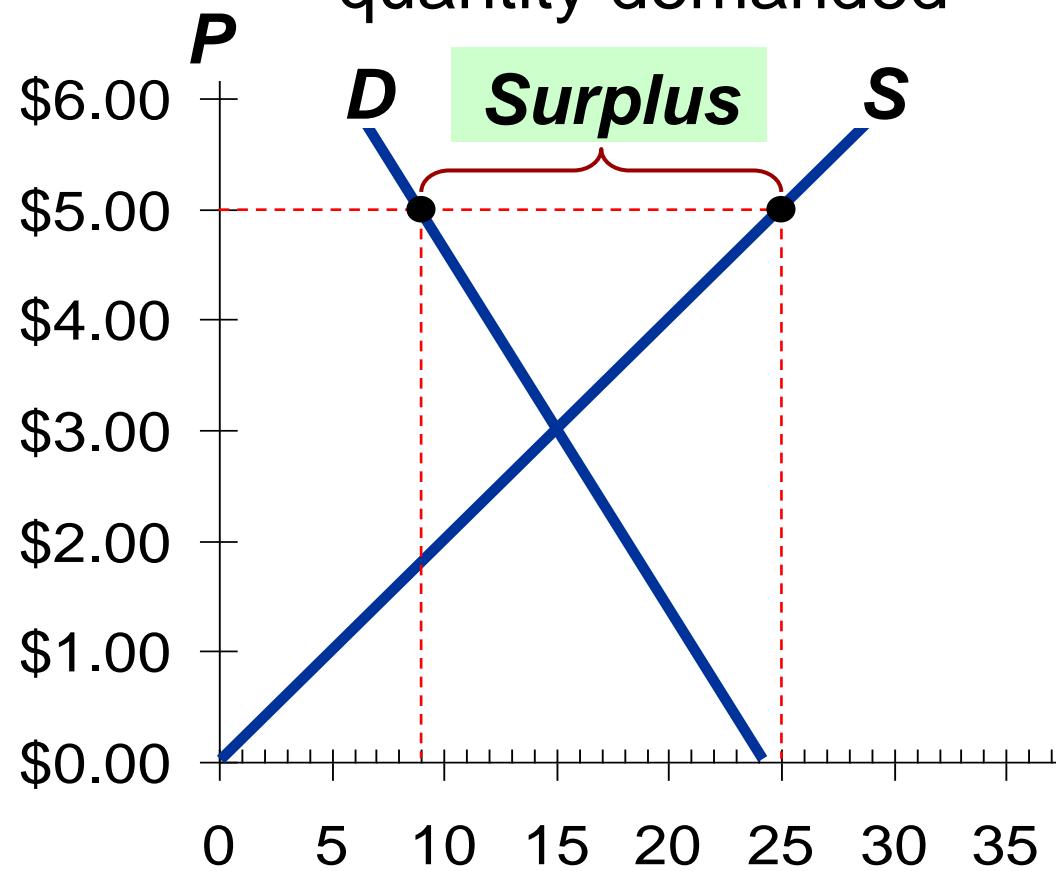
the quantity supplied and demanded at the equilibrium price



P	Q^D	Q^S
\$0	24	0
1	21	5
2	18	10
3	15	15
4	12	20
5	9	25
6	6	30

Surplus / excess supply:

when quantity supplied is greater than quantity demanded



Example:

If $P = \$5$,

then

$Q^D = 9$ lattes

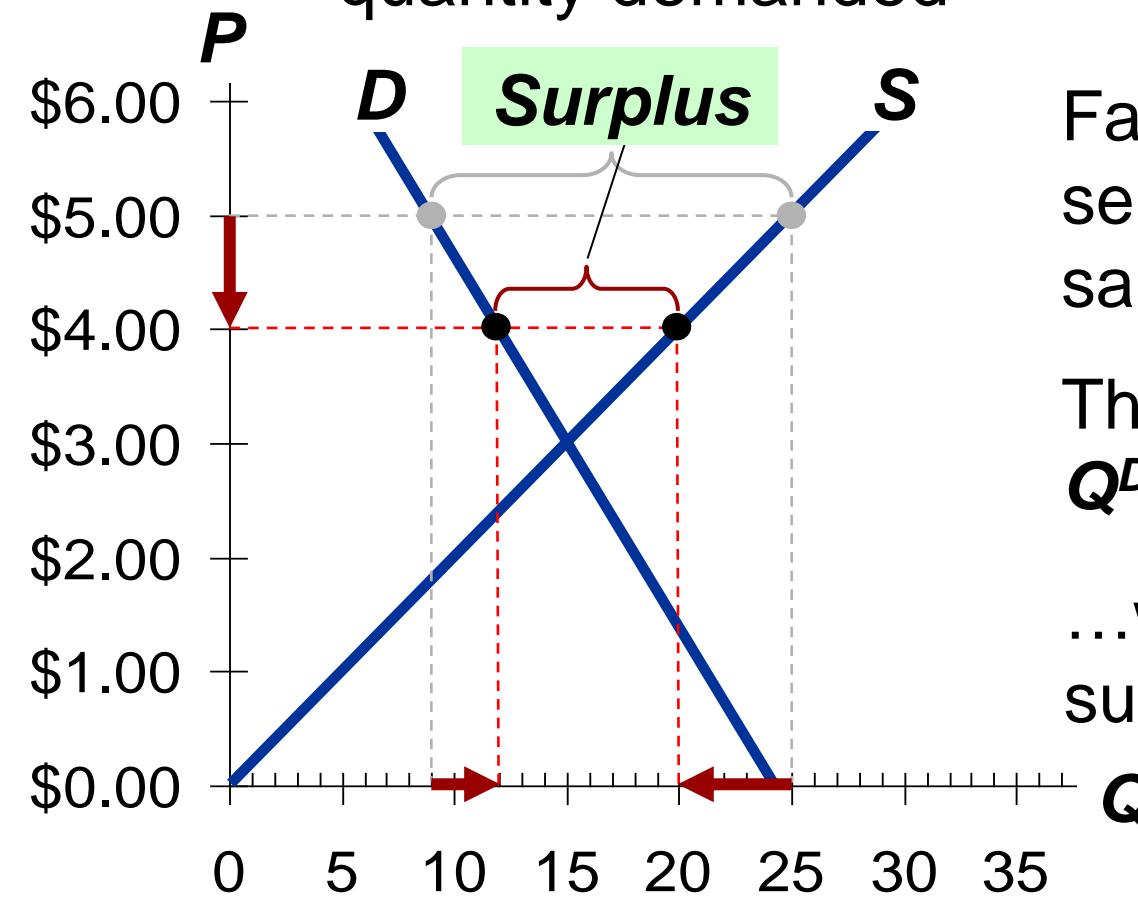
and

$Q^S = 25$ lattes

resulting in a
 Q surplus of 16 lattes

Surplus /excess supply:

when quantity supplied is greater than quantity demanded

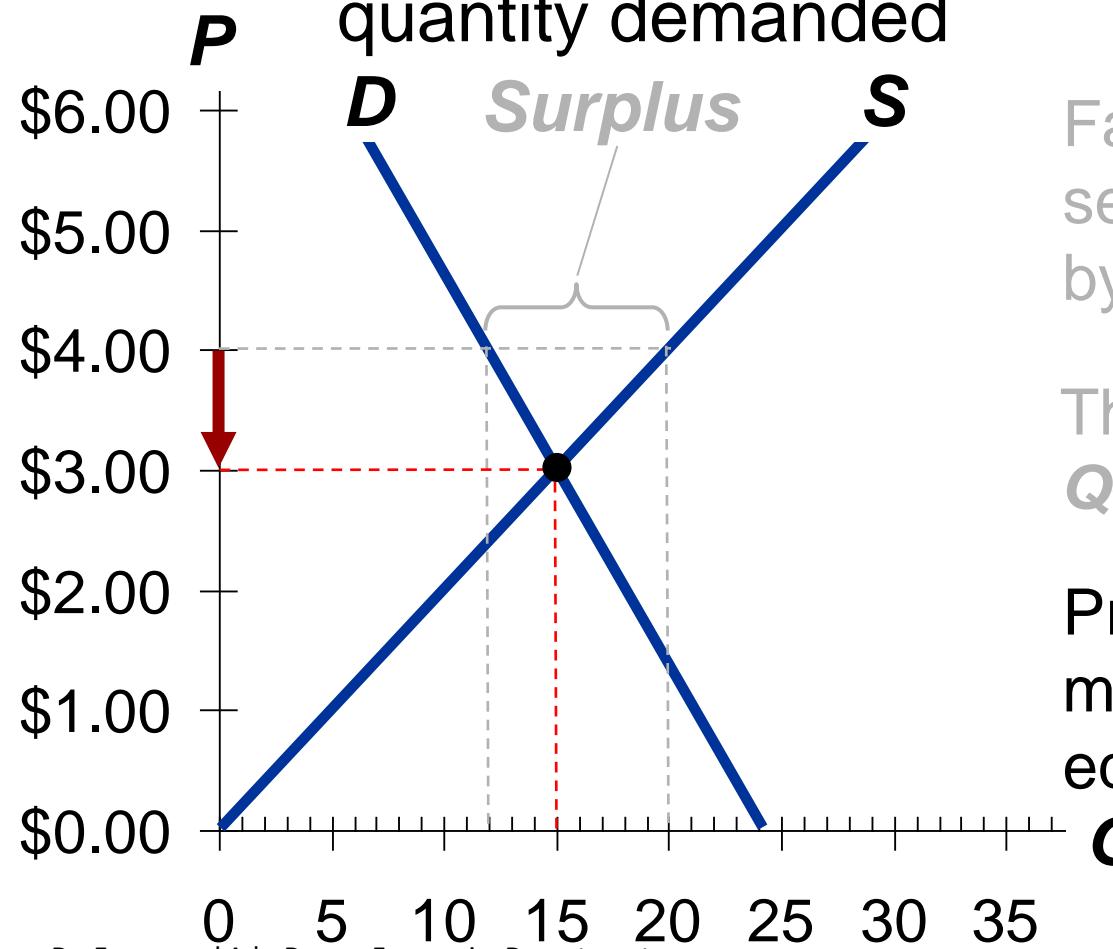


Facing a surplus, sellers try to increase sales by cutting price.

This causes Q^D to rise and Q^S to fall...
...which reduces the surplus.

Surplus /excess supply:

when quantity supplied is greater than quantity demanded



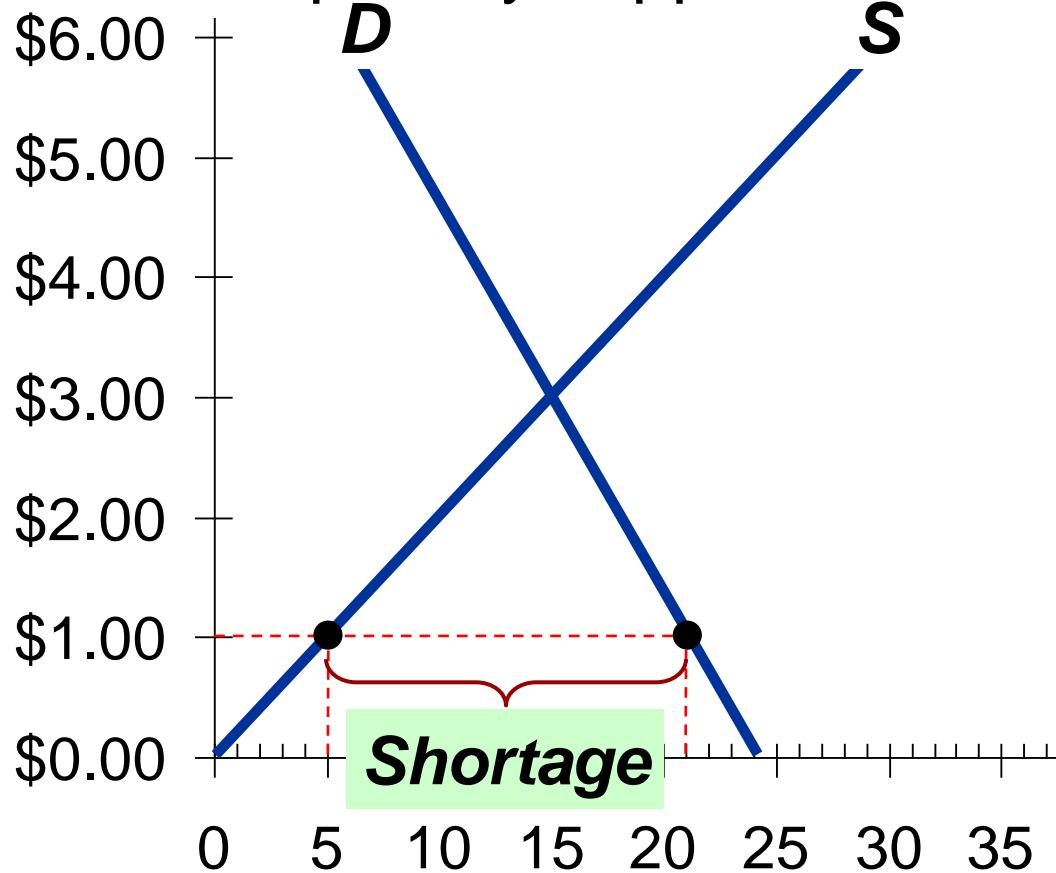
Facing a surplus, sellers try to increase sales by cutting price.

This causes Q^D to rise and Q^S to fall.

Prices continue to fall until market reaches equilibrium.

Shortage /excess demand:

when quantity demanded is greater than
 P quantity supplied



Example:

If $P = \$1$,

then

$Q^D = 21$ lattes

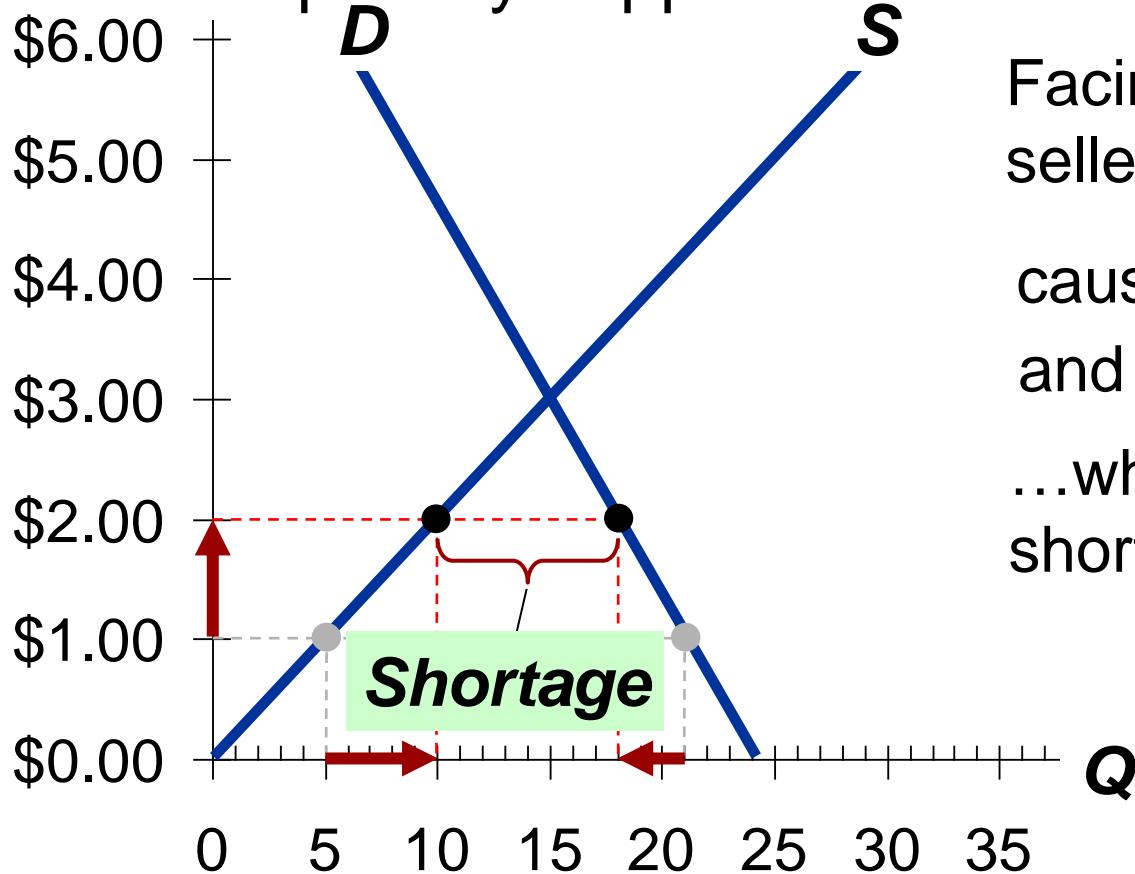
and

$Q^S = 5$ lattes

resulting in a
shortage of 16 lattes

Shortage /excess demand:

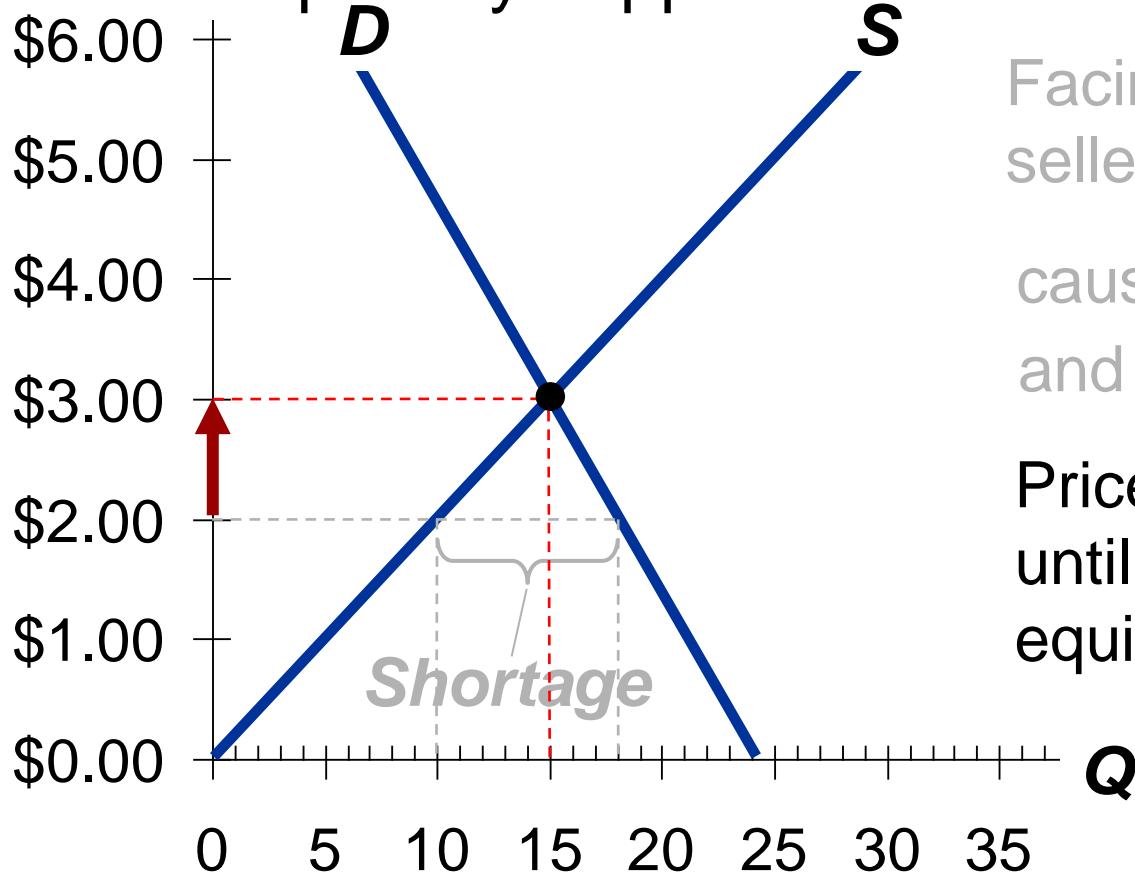
when quantity demanded is greater than quantity supplied



Facing a shortage,
sellers raise the price,
causing Q^D to fall
and Q^S to rise,
...which reduces the
shortage.

Shortage /excess demand:

when quantity demanded is greater than quantity supplied



Facing a shortage, sellers raise the price,

causing Q^D to fall
and Q^S to rise.

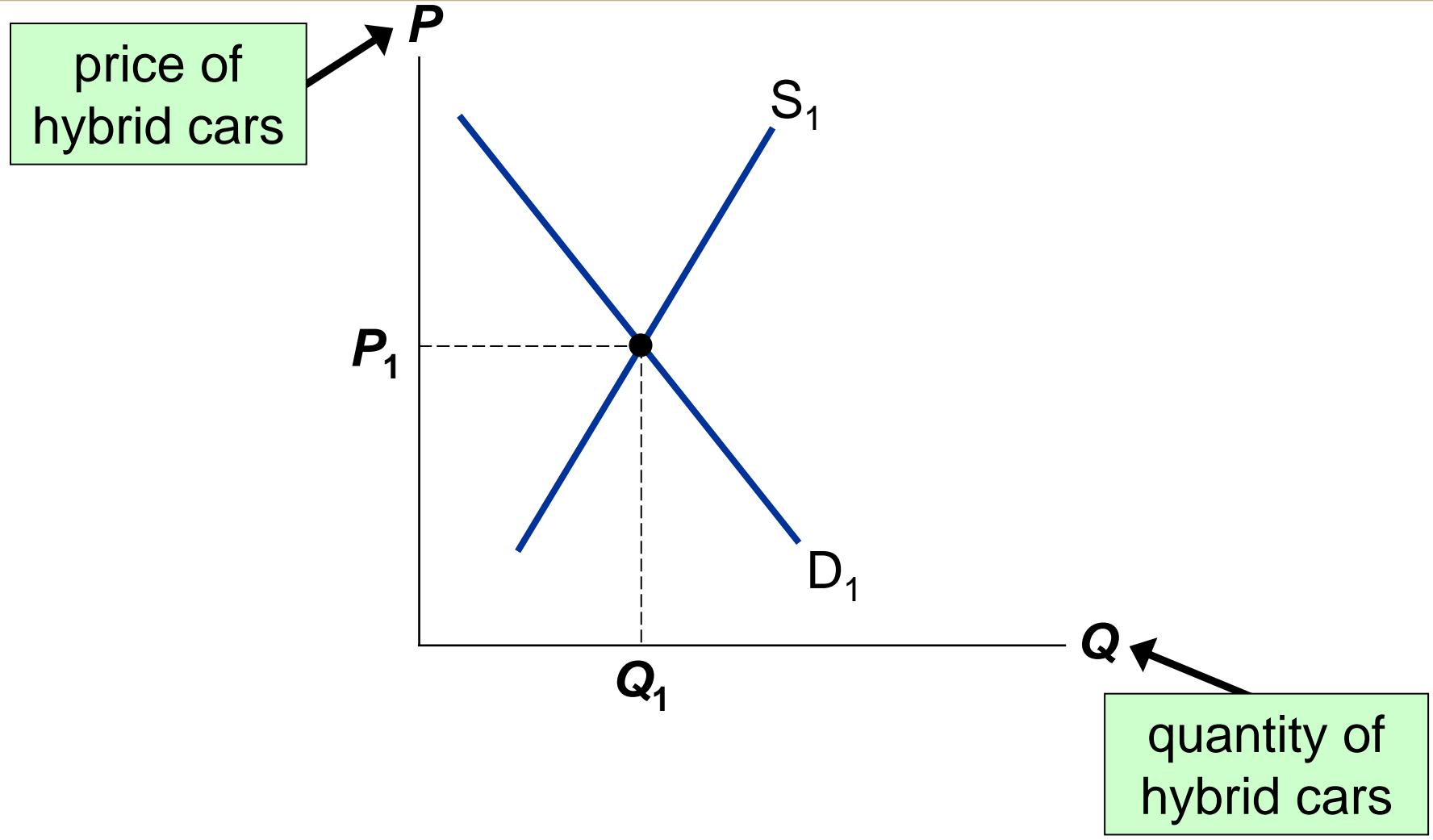
Prices continue to rise until market reaches equilibrium.

Three Steps to Analyzing Changes in Equilibrium

To determine the effects of any event,

1. Decide whether the event shifts S curve, D curve, or both.
2. Decide in which direction curve shifts.
3. Use supply—demand diagram to see how the shift changes equilibrium P and Q .

EXAMPLE: The Market for Hybrid Cars



EXAMPLE 1: A Shift in Demand

EVENT TO BE ANALYZED:

Increase in price of gas.

STEP 1:

D curve shifts because price of gas affects demand for hybrids.

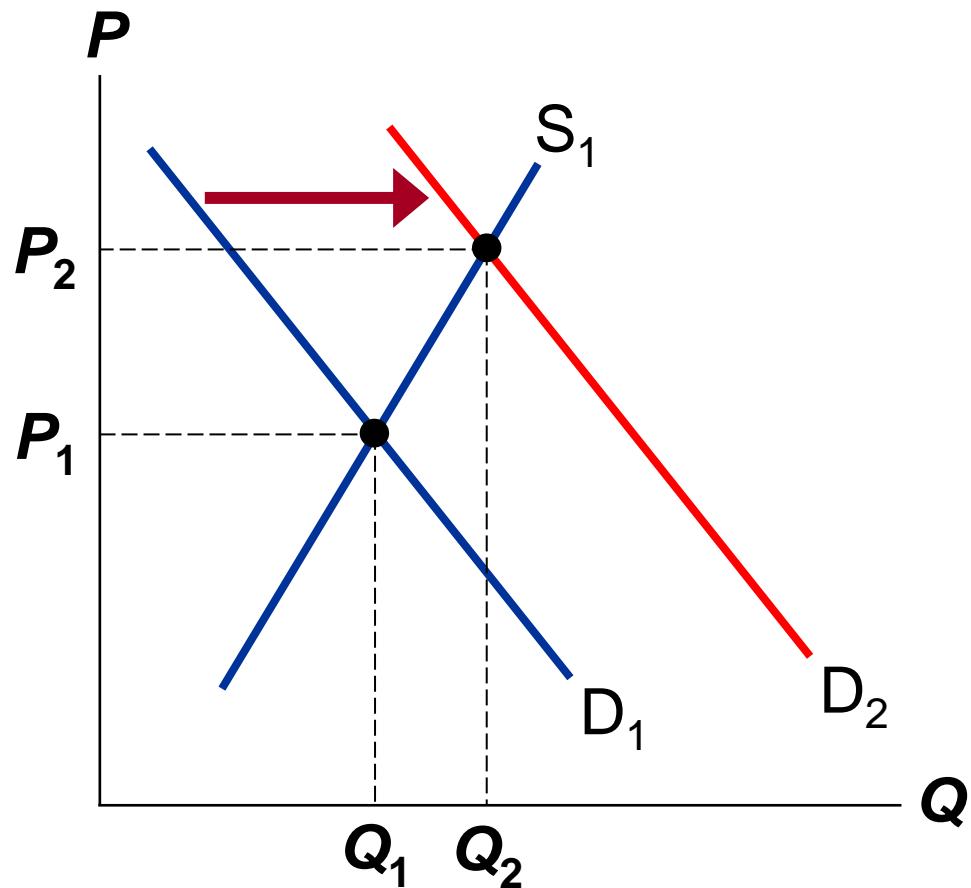
S curve does not shift, because price of gas does not affect cost of producing hybrids cars.

STEP 2:

D shifts right because high gas price makes hybrids more attractive relative to other

STEP 3:

The shift causes an increase in price and quantity of hybrid cars.

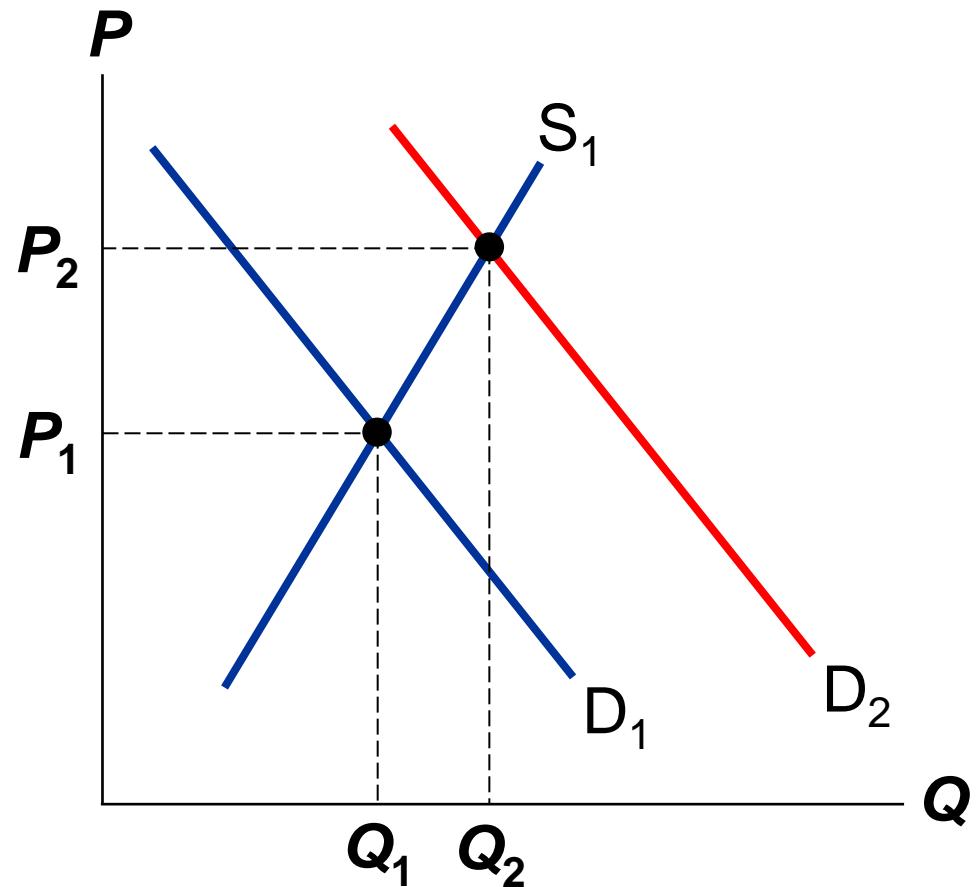


EXAMPLE 1: A Shift in Demand

Notice:

When **P** rises,
producers supply
a larger quantity
of hybrids, even
though the **S** curve
has not shifted.

*Always be careful to
distinguish b/w a
shift in a curve and a
movement along the
curve.*



Terms for Shift vs. Movement Along Curve

- **Change in supply:** a shift in the *S* curve occurs when a *non-price determinant* of supply changes (like technology or costs)
- **Change in the quantity supplied:** a movement along a fixed *S* curve occurs when *P* changes

Terms for Shift vs. Movement Along Curve

- **Change in demand:** a shift in the D curve
occurs when a *non-price determinant* of demand
changes (like income or # of buyers)
- **Change in the quantity demanded:**
a movement along a fixed D curve
occurs when P changes

EXAMPLE 2: A Shift in Supply

EVENT: New technology reduces cost of producing hybrid cars.

STEP 1:

S curve shifts because event affects cost of production.

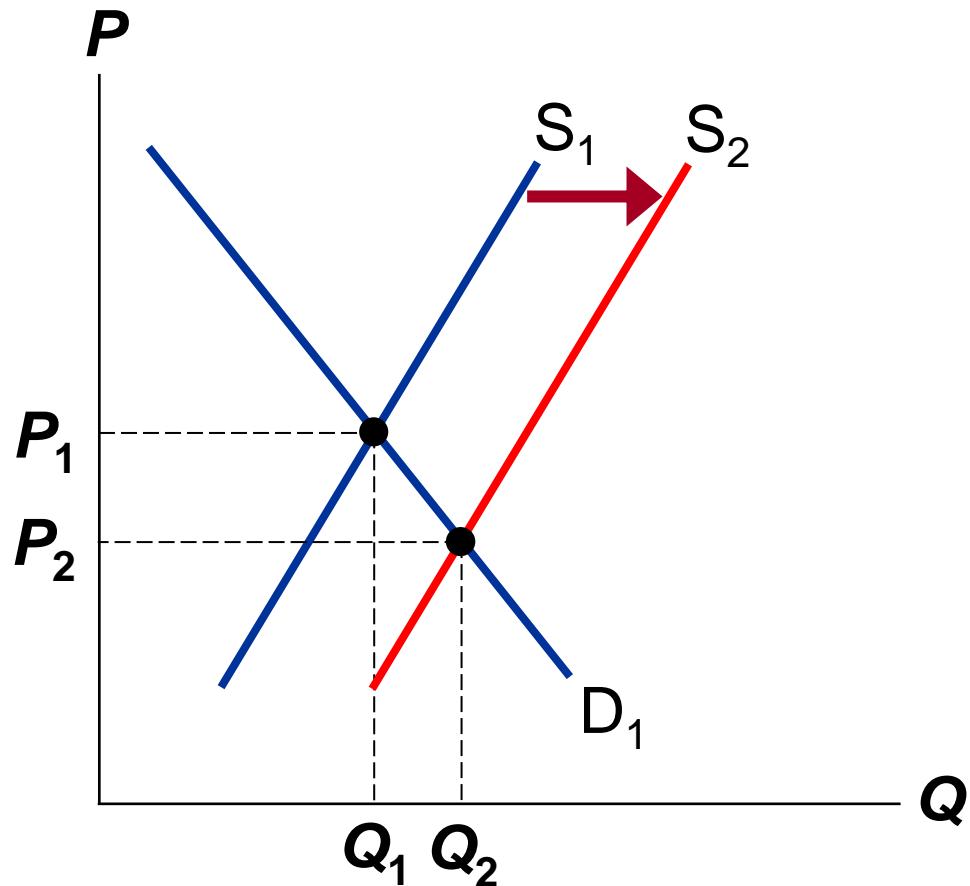
D curve does not shift, because production technology is not one of the factors that affect demand.

STEP 2:

S shifts right because event reduces cost, makes production more profitable at any given price.

STEP 3:

The shift causes price to fall and quantity to rise.



EXAMPLE 3: A Shift in Both Supply and Demand

EVENTS:

Price of gas rises AND new technology reduces production costs

STEP 1:

Both curves shift.

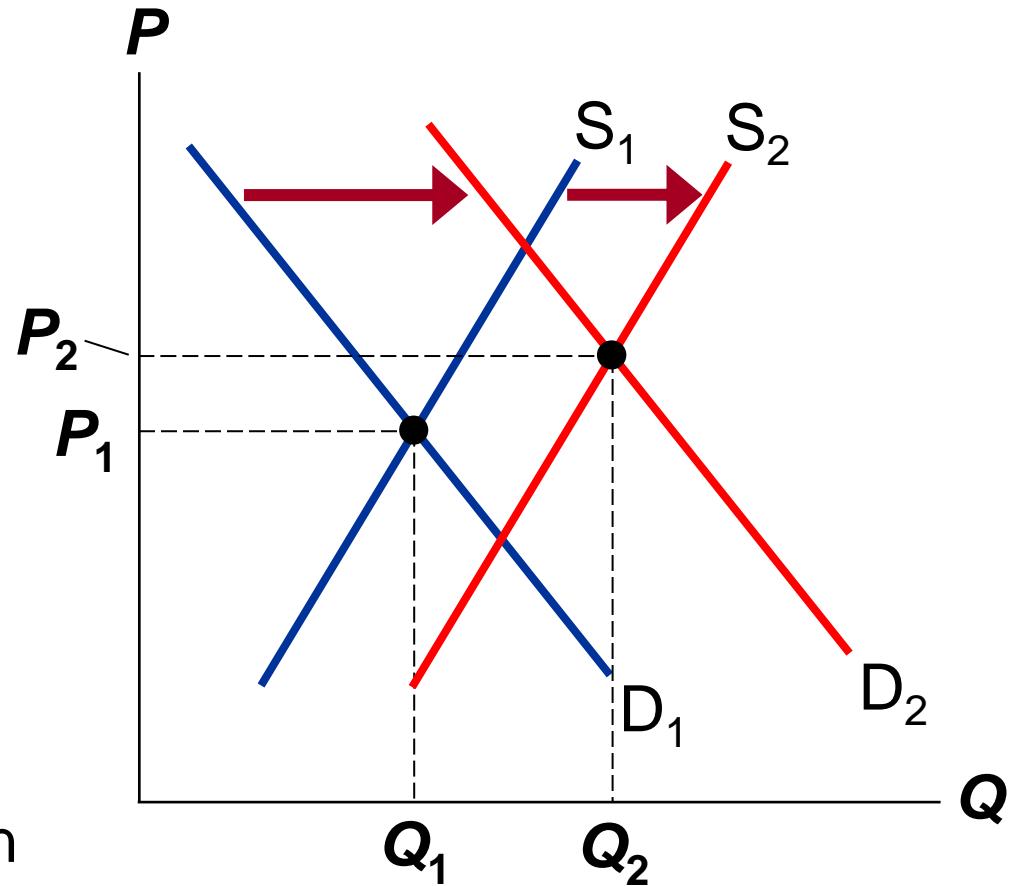
STEP 2:

Both shift to the right.

STEP 3:

Q rises, but effect on P is ambiguous:

If demand increases more than supply, P rises.



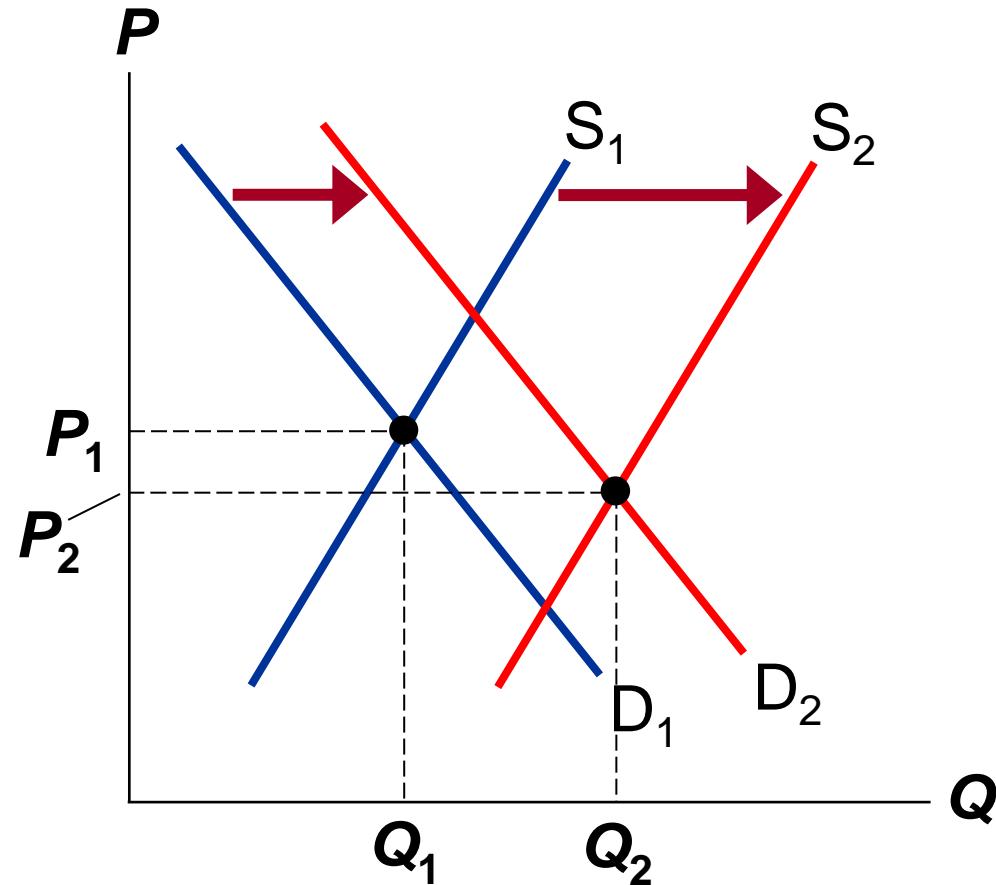
EXAMPLE 3: A Shift in Both Supply and Demand

EVENTS:

price of gas rises AND
new technology reduces
production costs

STEP 3, cont.

But if supply
increases more
than demand,
 P falls.



CONCLUSION:

How Prices Allocate Resources

- One of the Ten Principles from Lecture 1:
*Markets are usually a good way
to organize economic activity.*
- In market economies, prices adjust to balance supply and demand.
- These equilibrium prices are the signals that guide economic decisions and thereby allocate scarce resources.

Summary

- A competitive market has many buyers and sellers, each of whom has little or no influence on the market price.
- Economists use the supply and demand model to analyze competitive markets.
- The downward-sloping demand curve reflects the law of demand, which states that the quantity buyers demand of a good depends negatively on the good's price.

Summary

- Besides price, demand depends on buyers' incomes, tastes, expectations, the prices of substitutes and complements, and number of buyers.
 - If one of these factors changes, the D curve shifts.
- The upward-sloping supply curve reflects the Law of Supply, which states that the quantity sellers supply depends positively on the good's price.
 - Other determinants of supply include input prices, technology, expectations, and the # of sellers. Changes in these factors shift the S curve.

Summary

- The intersection of S and D curves determines the market equilibrium.
 - At the equilibrium price, quantity supplied equals quantity demanded.
- If the market price is above equilibrium, a surplus results, which causes the price to fall.
 - If the market price is below equilibrium, a shortage results, causing the price to rise.

Summary

- We can use the supply-demand diagram to analyze the effects of any event on a market:
 - First, determine whether the event shifts one or both curves.
 - Second, determine the direction of the shifts.
 - Third, compare the new equilibrium to the initial one.
- In market economies, prices are the signals that guide economic decisions and allocate scarce resources.

ECON 101: INTRODUCTION TO ECONOMICS I

Lecture 4a – Elasticity and its application

Dr. Emmanuel Adu-Danso (Group C)



UNIVERSITY OF GHANA

**Department of Economics
School of Social Studies
2021/2022**

Lecture Overview

- In this lecture we look at the concept of elasticity and how it is estimated
- We go on to explore how elasticity is related to the demand curve, revenue and expenditure, and to the supply curve
- We end with a look at the concepts of income and cross price elasticities of demand
- This lecture will be based on **Mankiw, G. (2012).** Principles of Economics (6th Edition), South Western.
 - Chapter 5

Learning Outcomes

- By the end of the lecture, you should be able to:
 - Identify the determinants of the price elasticity of demand and supply
 - Explain how price elasticity of demand and supply determine the slope of the demand and supply curves respectively
 - Calculate various elasticities

Elasticity

- Elasticity measures how much one variable responds to changes in another variable.
 - The cost of chemicals have risen, and you wish to increase the price of your liquid soap. By how much will the demand for your product fall if you increase your price?
 - One type of elasticity measures how much the demand for your liquid soap will fall if you raise your price.

Elasticity

- **Elasticity** is a numerical measure of the responsiveness of Q^d or Q^s to one of its determinants.

$$\text{Price elasticity of demand} = \frac{\text{Percentage change in } Q^d}{\text{Percentage change in } P}$$

- **Price elasticity of demand** measures how much Q^d responds to a change in P .
 - it measures the price-sensitivity of buyers' demand

Price Elasticity of Demand

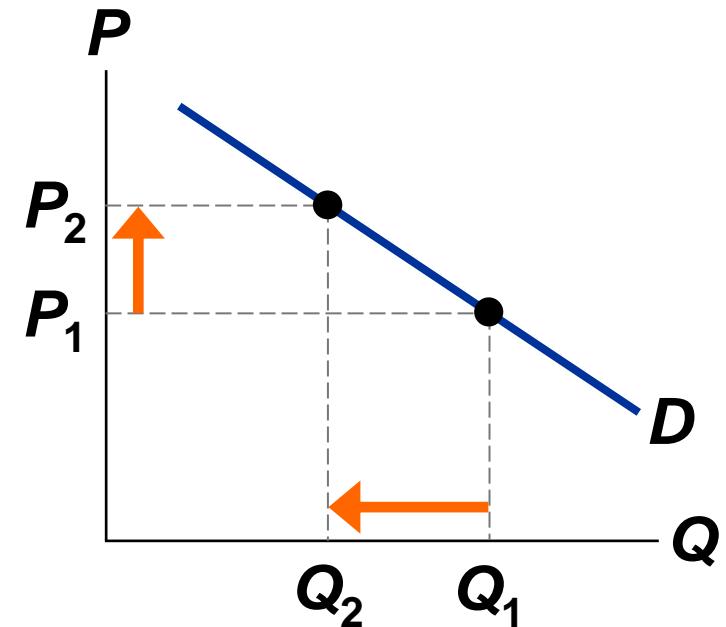
$$\text{Price elasticity of demand} = \frac{\text{Percentage change in } Q^d}{\text{Percentage change in } P}$$

Example:

Price elasticity of demand equals

$$\frac{15\%}{10\%} = 1.5$$

P rises by 10%



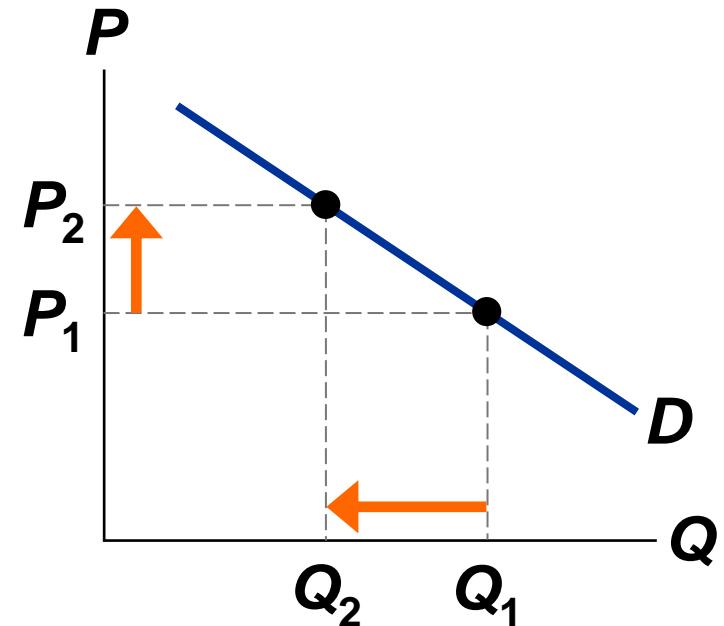
Q falls by 15%

Price Elasticity of Demand

$$\text{Price elasticity of demand} = \frac{\text{Percentage change in } Q^d}{\text{Percentage change in } P}$$

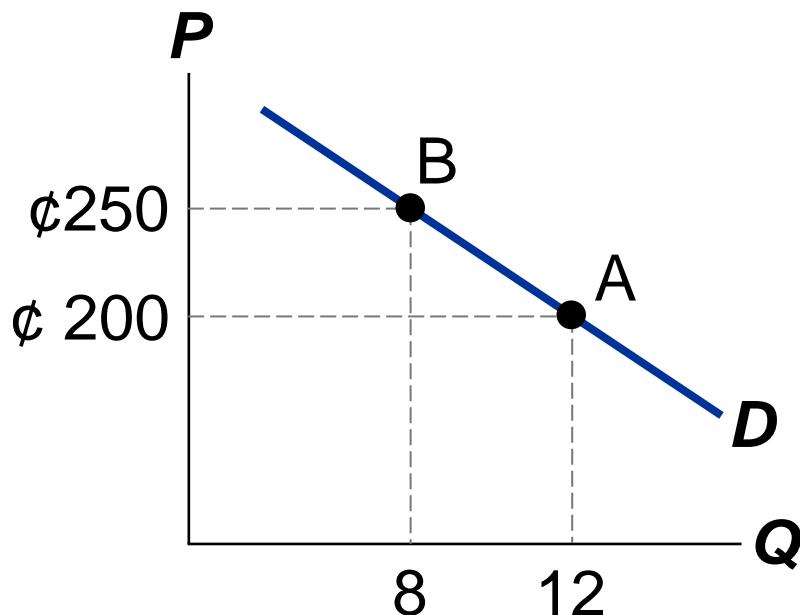
Along a D curve, P and Q move in opposite directions, which would make price elasticity negative.

We will drop the minus sign and report all price elasticities as positive numbers.



Calculating Percentage Changes

Demand for your liquid soap



Standard method
of computing the
percentage (%) change:

$$\frac{\text{end value} - \text{start value}}{\text{start value}} \times 100\%$$

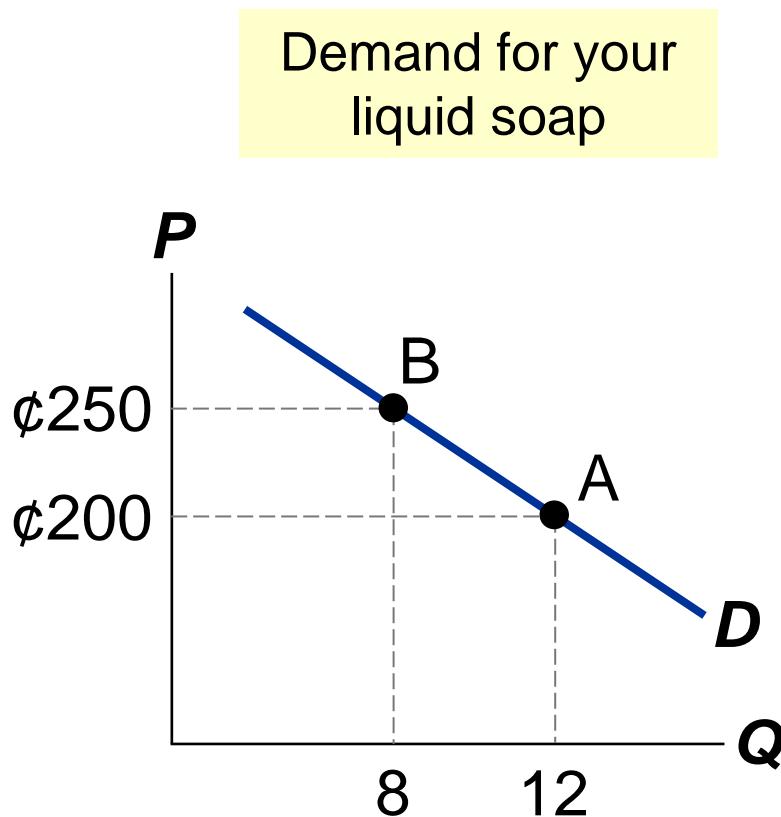
Going from A to B,
the % change in *P* equals

$$\frac{(\text{₦}250 - \text{₦}200)}{\text{₦}200} = 25\%$$

Calculating Percentage Changes

Problem:

The standard method gives different answers depending on where you start.



From A to B,

P rises 25%, Q falls 33%,
elasticity = $33/25 = 1.33$

From B to A,

P falls 20%, Q rises 50%,
elasticity = $50/20 = 2.50$

Calculating Percentage Changes

- So, we instead use the **midpoint method**:

$$\frac{\text{end value} - \text{start value}}{\text{midpoint}} \times 100\%$$

- The midpoint is the number halfway between the start and end values, the **average** of those values.
- It doesn't matter which value you use as the start and which as the end—you get the same answer either way!

Calculating Percentage Changes

- Using the midpoint method, the % change in **P** equals

$$\frac{\text{¢}250 - \text{¢}200}{\text{¢}225} \times 100\% = 22.2\%$$

- The % change in **Q** equals

$$\frac{12 - 8}{10} \times 100\% = 40.0\%$$

- The price elasticity of demand equals

$$40/22.2 = 1.8$$

What determines price elasticity?

- To learn the determinants of price elasticity, we look at a series of examples.
- Each compares two common goods.
- In each example:
 - Suppose the prices of both goods rise by 20%.
 - The good for which Q^d falls the most (in percent) has the highest price elasticity of demand.
Which good is it? Why?
 - What lesson does the example teach us about the determinants of the price elasticity of demand?

EXAMPLE 1

Spiced Millet Porridge (Huasa koko) vs. LPG gas for cooking

- The prices of both of these goods rise by 20%. For which good does Q^d drop the most? Why?
 - The porridge has close substitutes (*what are some examples?*), so buyers can easily switch if the price rises.
 - LPG gas for cooking has no close substitutes, so a price increase would not affect demand very much.
- Lesson: ***Price elasticity is higher when close substitutes are available***

EXAMPLE 2

“Blue Jeans” vs. “Clothing”

- The prices of both goods rise by 20%.
For which good does Q^d drop the most? Why?
 - For a *narrowly defined* good such as blue jeans, there are many substitutes (khakis, shorts).
 - There are fewer substitutes available for broadly defined goods.
(Are there any substitutes for clothing?)
- Lesson: ***Price elasticity is higher for narrowly defined goods than for broadly defined ones.***

EXAMPLE 3

Insulin vs. Caribbean Cruises

- The prices of both of these goods rise by 20%.
For which good does Q^d drop the most? Why?
 - To millions of diabetics, insulin is a necessity.
A rise in its price would cause little or no decrease in demand.
 - A cruise is a luxury. If the price rises,
some people will forego it.
- Lesson: ***Price elasticity is higher for luxuries than for necessities.***

EXAMPLE 4

LPG gas in the Short Run vs. LPG gas in the Long Run

- The price of gasoline rises 20%. Does Q^d drop more in the short run or the long run? Why?
 - There's not much people can do in the short run.
 - In the long run, people may switch to charcoal use or cook less at home
- Lesson: ***Price elasticity is higher in the long run than the short run.***

The Determinants of Price Elasticity: A Summary

The price elasticity of demand depends on:

- the extent to which close substitutes are available
- whether the good is a necessity or a luxury
- how broadly or narrowly the good is defined
- the time horizon—elasticity is higher in the long run than the short run

The Variety of Demand Curves

- The price elasticity of demand is closely related to the **slope** of the demand curve.
- Rule of thumb:
 - The flatter the curve, the bigger the elasticity
 - The steeper the curve, the smaller the elasticity
- Five different classifications of **D** curves....

“Perfectly inelastic demand” (one extreme case)

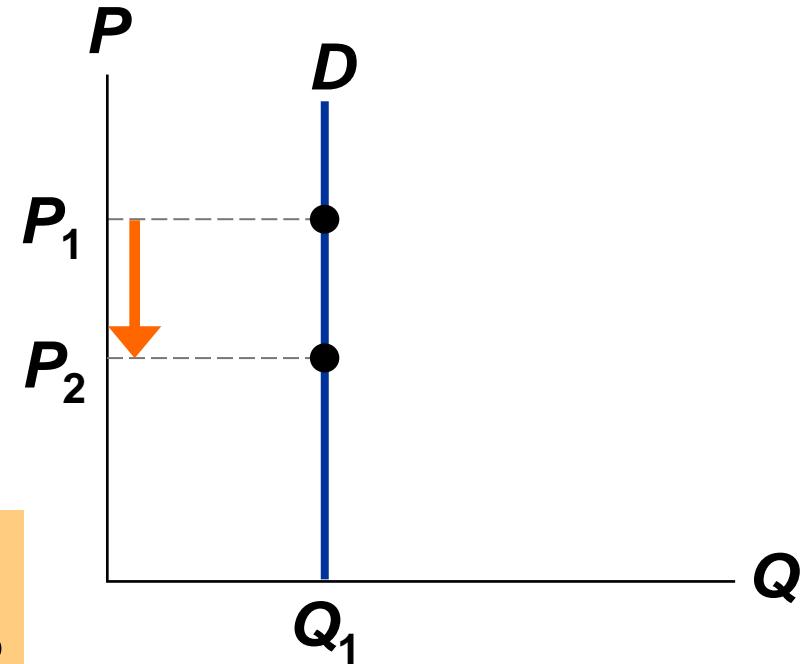
$$\text{Price elasticity of demand} = \frac{\% \text{ change in } Q}{\% \text{ change in } P} = \frac{0\%}{10\%} = 0$$

D curve:
vertical

Consumers' price sensitivity:
none

Elasticity:
0

P falls by 10%



Q changes by 0%

“Inelastic demand”

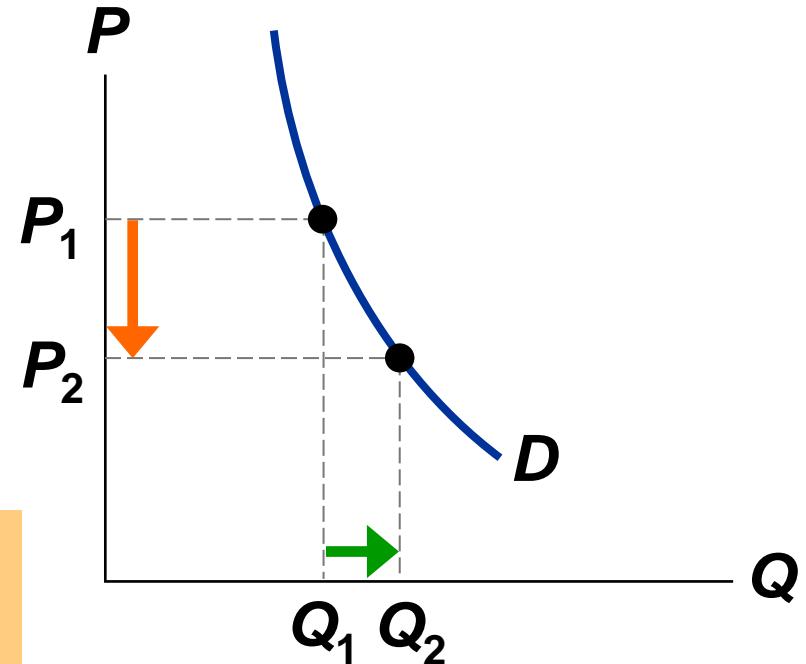
$$\text{Price elasticity of demand} = \frac{\% \text{ change in } Q}{\% \text{ change in } P} = \frac{< 10\%}{10\%} < 1$$

D curve:
relatively steep

Consumers' price sensitivity:
relatively low

Elasticity:
 < 1

P falls by 10%



Q rises less than 10%

“Unit elastic demand”

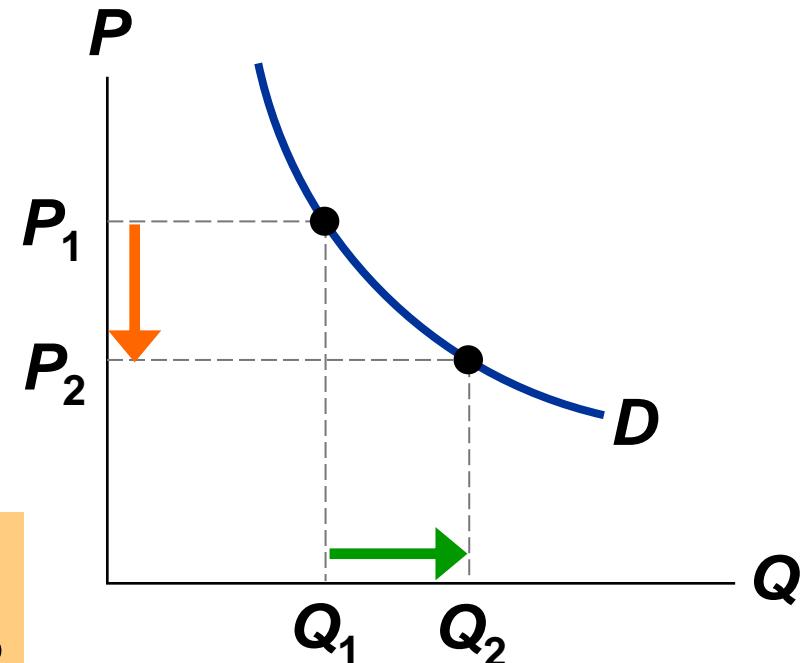
$$\text{Price elasticity of demand} = \frac{\% \text{ change in } Q}{\% \text{ change in } P} = \frac{10\%}{10\%} = 1$$

D curve:
intermediate slope

Consumers' price sensitivity:
intermediate

Elasticity:
1

P falls by 10%



Q rises by 10%

“Elastic demand”

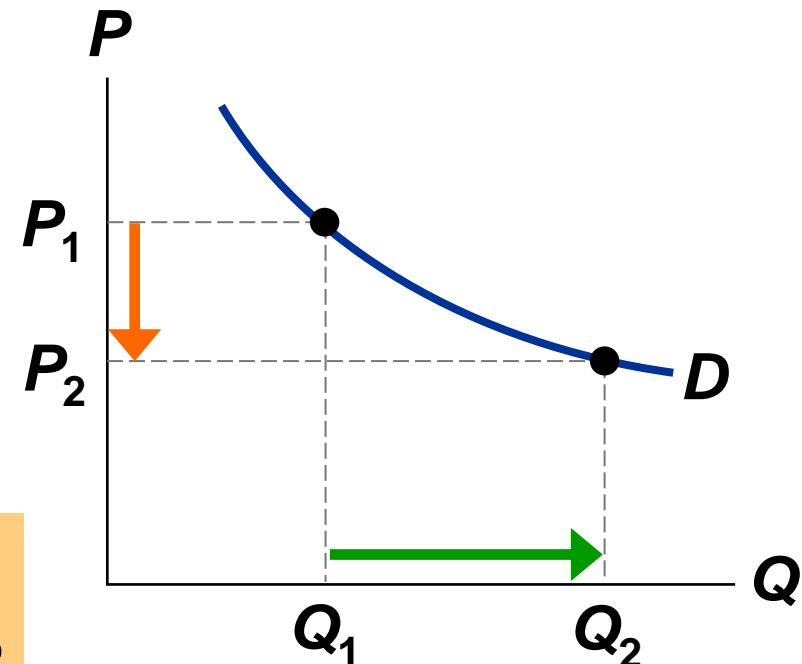
$$\text{Price elasticity of demand} = \frac{\% \text{ change in } Q}{\% \text{ change in } P} = \frac{> 10\%}{10\%} > 1$$

D curve:
relatively flat

Consumers'
price sensitivity:
relatively high

Elasticity:
 > 1

P falls
by 10%



Q rises more than 10%

“Perfectly elastic demand” (the other extreme)

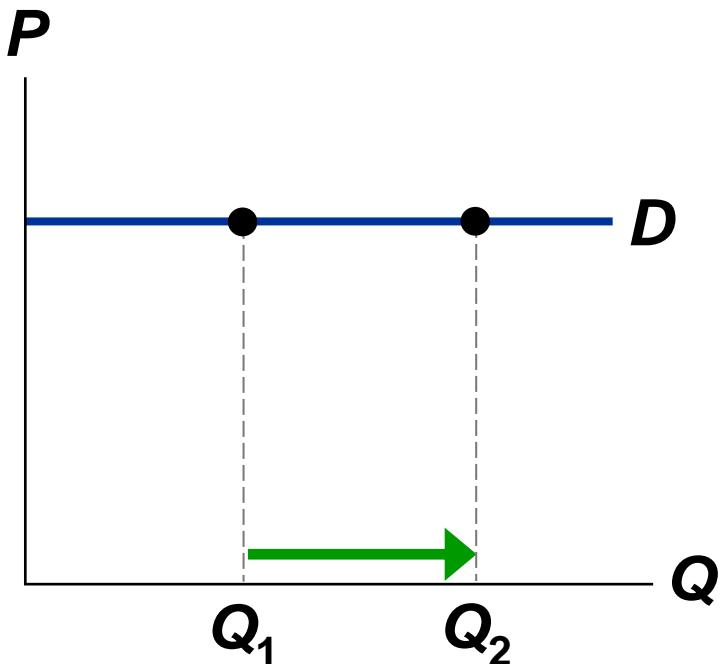
$$\text{Price elasticity of demand} = \frac{\% \text{ change in } Q}{\% \text{ change in } P} = \frac{\text{any \%}}{0\%} = \text{infinity}$$

D curve:
horizontal

Consumers' price sensitivity:
extreme

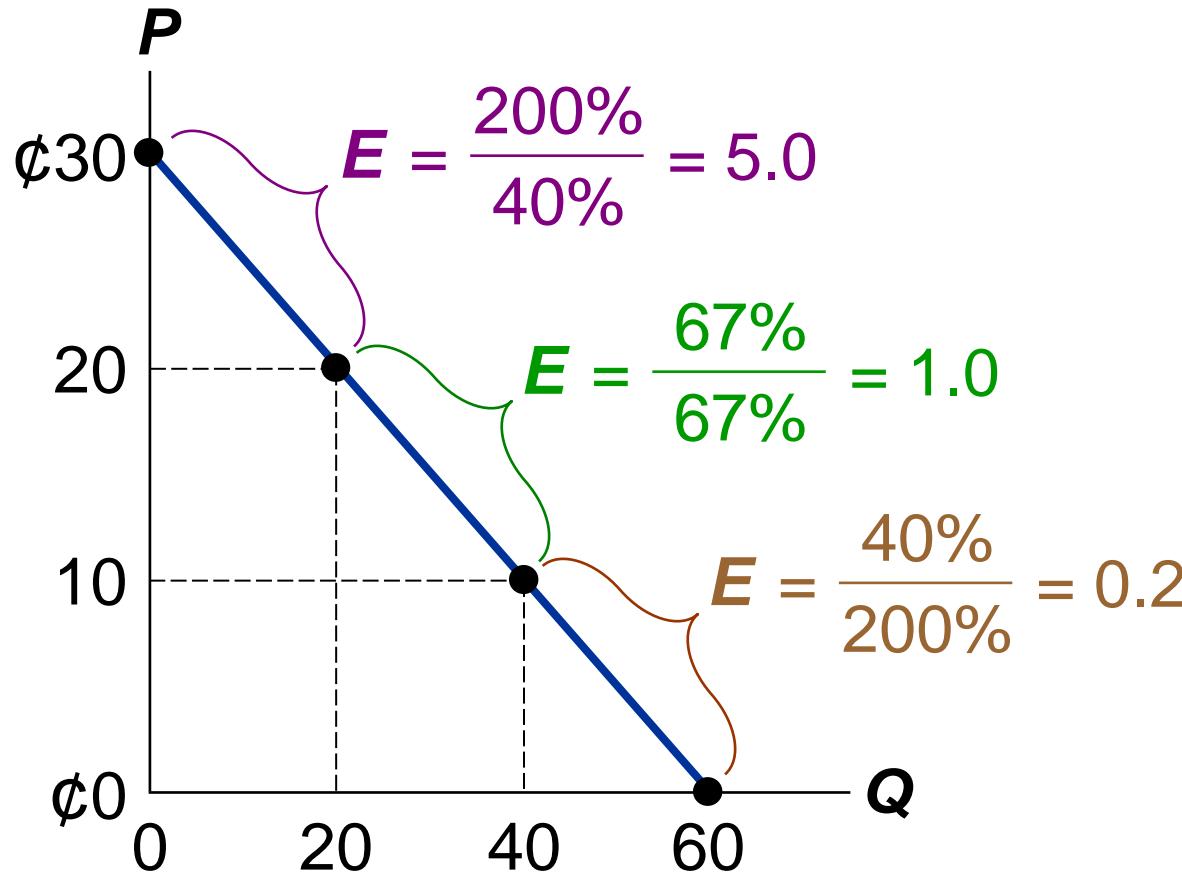
Elasticity:
infinity

P changes by 0%



Q changes by any %

Elasticity of a Linear Demand Curve



The slope of a linear demand curve is constant, but its elasticity is not.

Price Elasticity and Total Revenue

- Continuing our scenario of liquid soap business, if you raise your price from ₦200 to ₦250, would your revenue rise or fall?

$$\text{Revenue} = P \times Q$$

- A price increase has two effects on revenue:
 - Higher P means more revenue on each unit you sell.
 - But you sell fewer units (lower Q), due to law of demand.
- Which of these two effects is bigger?
It depends on the price elasticity of demand.

Price Elasticity and Total Revenue

$$\text{Price elasticity of demand} = \frac{\text{Percentage change in } Q}{\text{Percentage change in } P}$$

$$\text{Revenue} = P \times Q$$

- If demand is **elastic**, then
price elast. of demand > 1
 $\% \text{ change in } Q > \% \text{ change in } P$
- The fall in revenue from lower Q is greater than the increase in revenue from higher P , so **revenue falls**.

Price Elasticity and Total Revenue

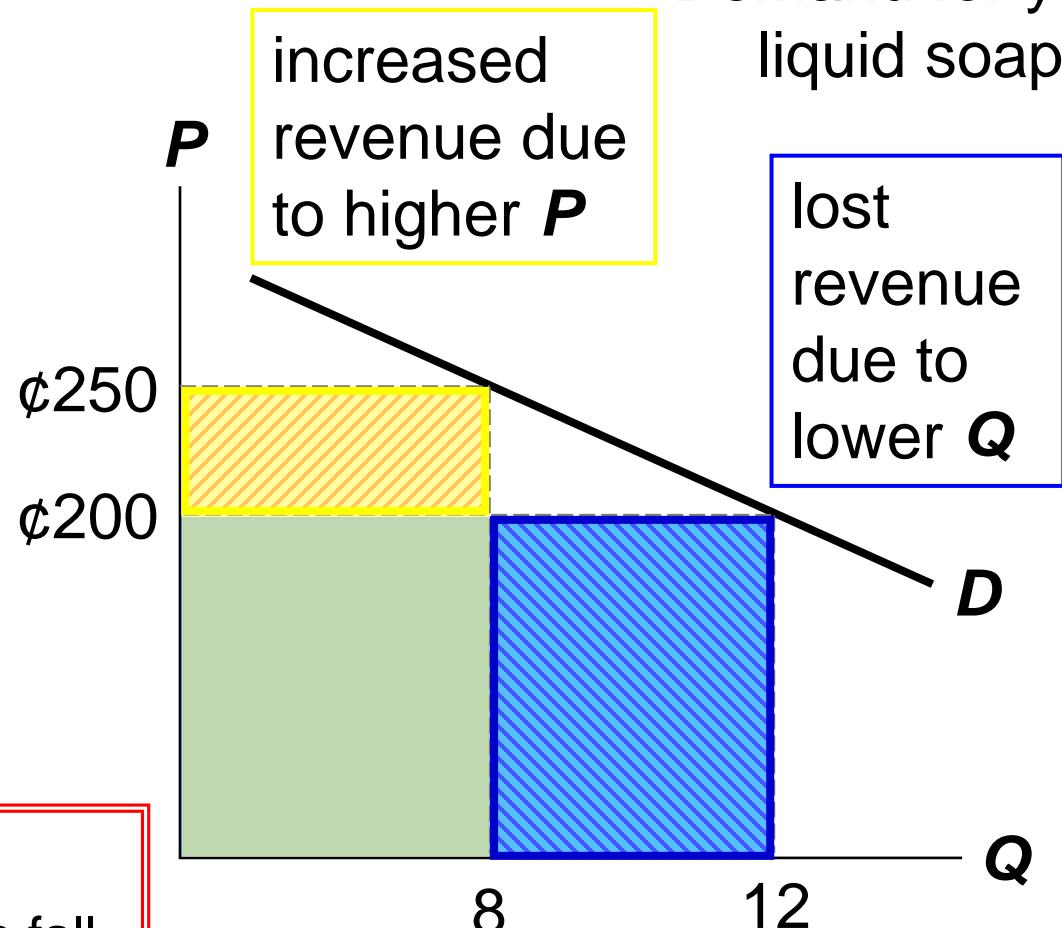
Elastic demand
(elasticity = 1.8)

If $P = \text{¢}200$,
 $Q = 12$ and
revenue = $\text{¢}2400$.

If $P = \text{¢}250$,
 $Q = 8$ and
revenue = $\text{¢}2000$.

When D is elastic, a price increase causes revenue to fall.

Demand for your liquid soap



Price Elasticity and Total Revenue

$$\text{Price elasticity of demand} = \frac{\text{Percentage change in } Q}{\text{Percentage change in } P}$$

- If demand is **inelastic**, then
price elast. of demand < 1
 $\% \text{ change in } Q < \% \text{ change in } P$
- The fall in revenue from lower Q is smaller than the increase in revenue from higher P , so **revenue rises**.
- In our example, assume that Q only falls to 10 (instead of 8) when you raise your price to ¢250.

$$\text{Revenue} = P \times Q$$



Price Elasticity and Total Revenue

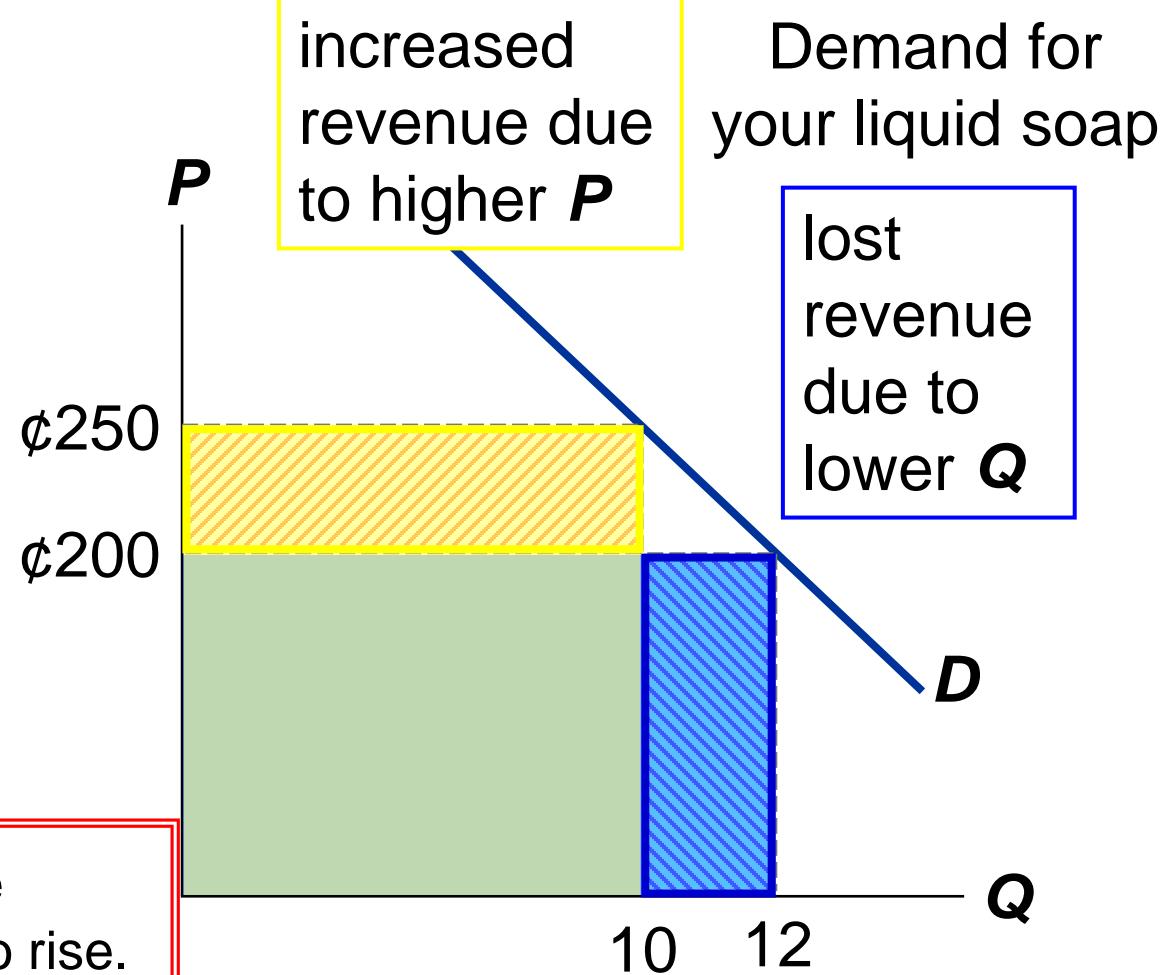
Now, demand is inelastic:

$$\text{elasticity} = 0.82$$

If $P = \text{¢}200$,
 $Q = 12$ and
revenue = $\text{¢}2400$.

If $P = \text{¢}250$,
 $Q = 10$ and
revenue = $\text{¢}2500$.

When D is inelastic, a price increase causes revenue to rise.



Price Elasticity of Supply

$$\text{Price elasticity of supply} = \frac{\text{Percentage change in } Q^s}{\text{Percentage change in } P}$$

- **Price elasticity of supply** measures how much Q^s responds to a change in P .
- Loosely speaking, it measures sellers' price-sensitivity.
- Again, use the midpoint method to compute the percentage changes.

Price Elasticity of Supply

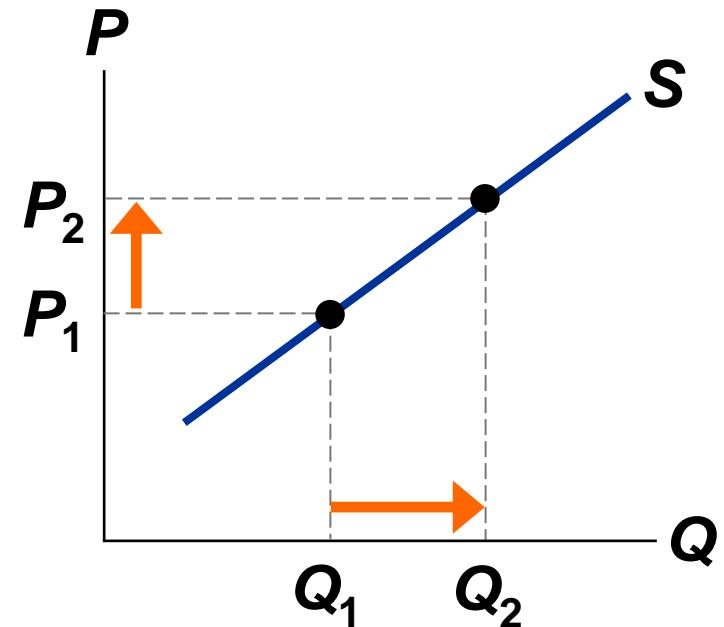
$$\text{Price elasticity of supply} = \frac{\text{Percentage change in } Q^s}{\text{Percentage change in } P}$$

Example:

Price elasticity of supply equals

$$\frac{16\%}{8\%} = 2.0$$

P rises by 8%



Q rises by 16%

The Variety of Supply Curves

- The slope of the supply curve is closely related to price elasticity of supply.
- Rule of thumb:
 - The flatter the curve, the bigger the elasticity.
 - The steeper the curve, the smaller the elasticity.
- Five different classifications...

“Perfectly inelastic” (one extreme)

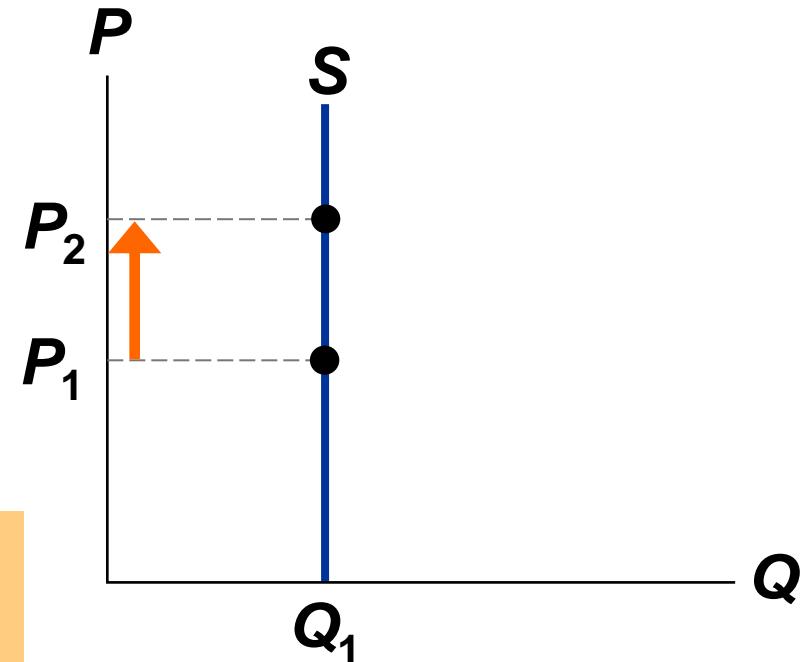
$$\text{Price elasticity of supply} = \frac{\% \text{ change in } Q}{\% \text{ change in } P} = \frac{0\%}{10\%} = 0$$

S curve:
vertical

Sellers'
price sensitivity:
none

Elasticity:
0

P rises
by 10%



Q changes by 0%

“Inelastic”

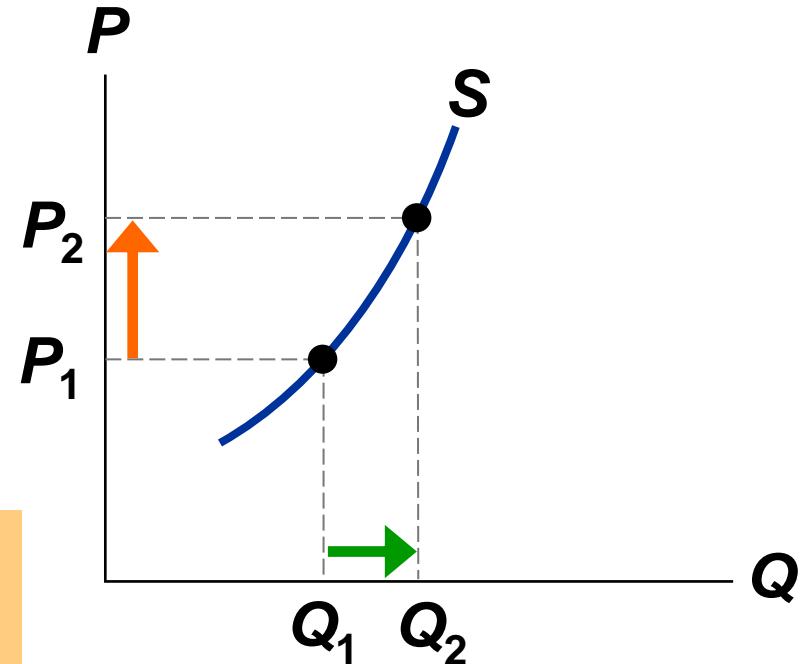
$$\text{Price elasticity of supply} = \frac{\% \text{ change in } Q}{\% \text{ change in } P} = \frac{\text{< 10\%}}{10\%} < 1$$

S curve:
relatively steep

Sellers'
price sensitivity:
relatively low

Elasticity:
 < 1

P rises
by 10%



Q rises less than 10%

“Unit elastic”

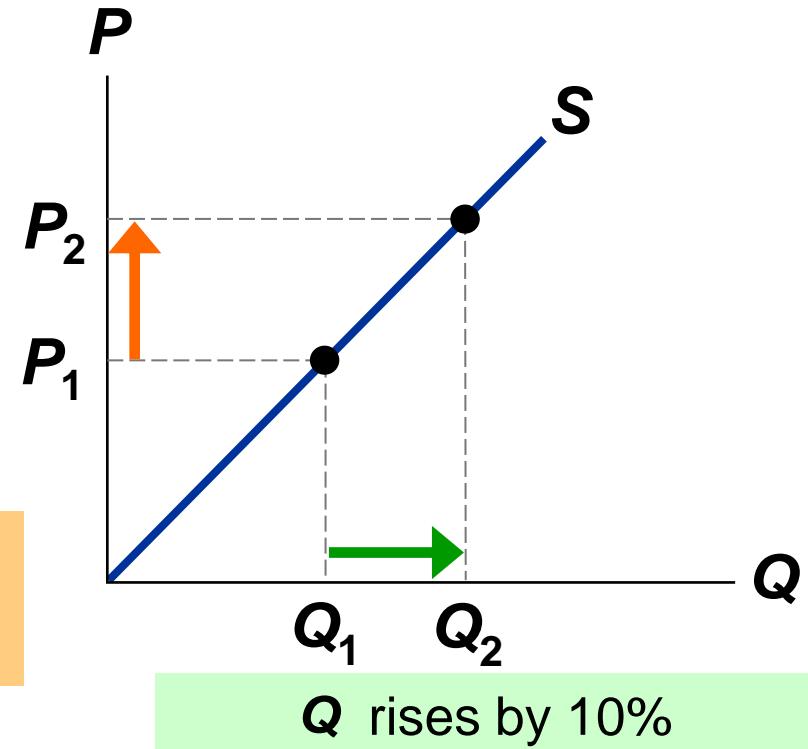
$$\text{Price elasticity of supply} = \frac{\% \text{ change in } Q}{\% \text{ change in } P} = \frac{10\%}{10\%} = 1$$

S curve:
intermediate slope

Sellers'
price sensitivity:
intermediate

Elasticity:
= 1

P rises by 10%



“Elastic”

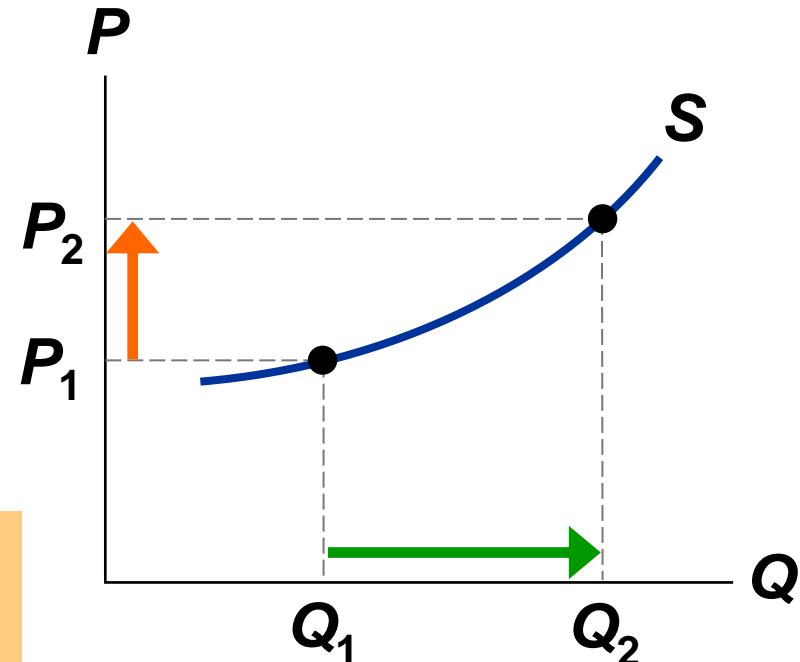
$$\text{Price elasticity of supply} = \frac{\% \text{ change in } Q}{\% \text{ change in } P} = \frac{\text{> } 10\%}{10\%} > 1$$

S curve:
relatively flat

Sellers'
price sensitivity:
relatively high

Elasticity:
 > 1

P rises
by 10%



Q rises more than 10%

“Perfectly elastic” (the other extreme)

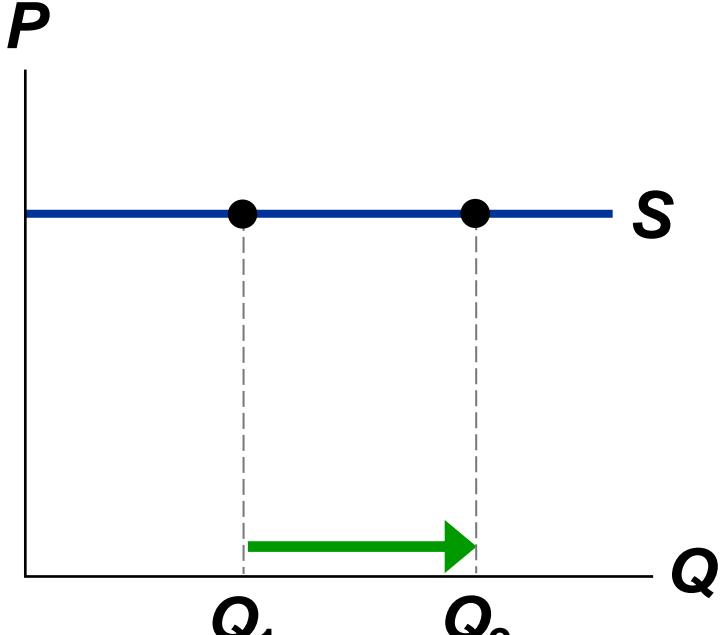
$$\text{Price elasticity of supply} = \frac{\% \text{ change in } Q}{\% \text{ change in } P} = \frac{\text{any \%}}{0\%} = \text{infinity}$$

S curve:
horizontal

Sellers'
price sensitivity:
extreme

Elasticity:
infinity

P changes
by 0%

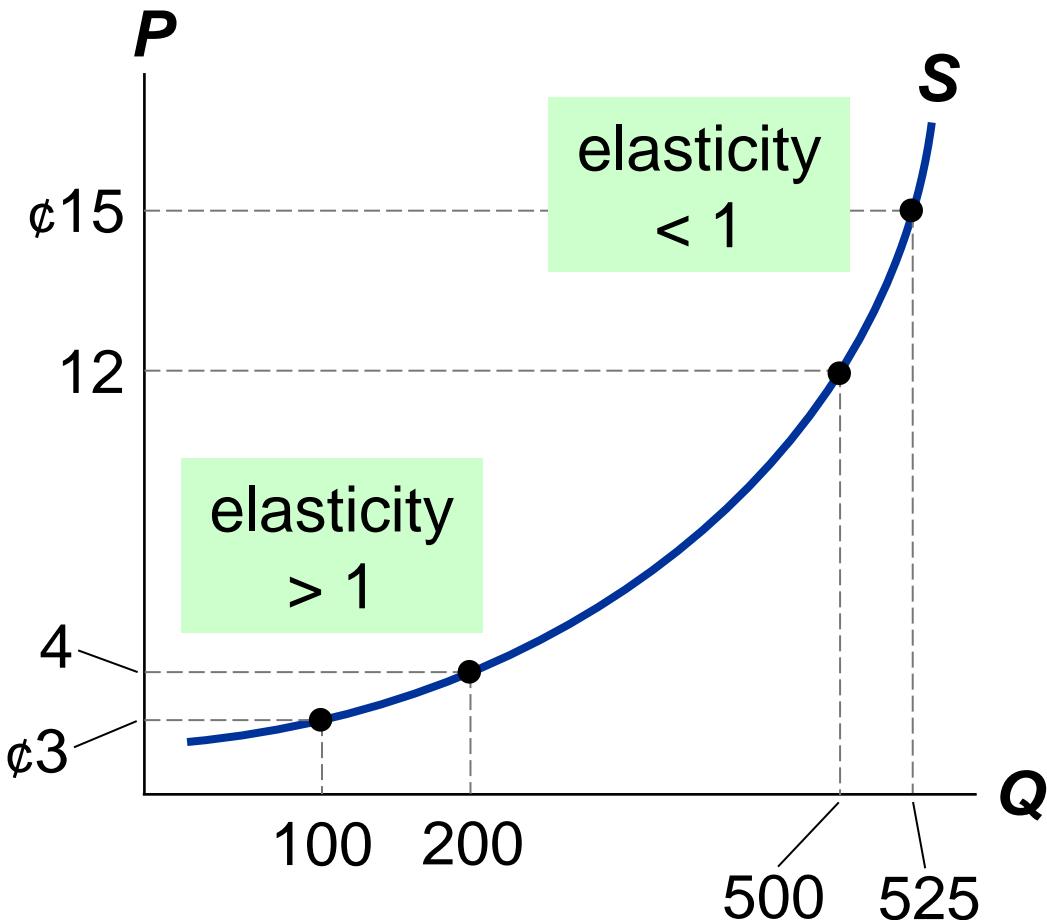


Q changes by any %

The Determinants of Supply Elasticity

- The more easily sellers can change the quantity they produce, the greater the price elasticity of supply.
 - Example: Supply of most agricultural produce is harder to vary and thus less elastic than supply of hausa koko.
- For many goods, price elasticity of supply is greater in the long run than in the short run, because firms can build new factories, or new firms may be able to enter the market.

How the Price Elasticity of Supply Can Vary



Supply often becomes less elastic as Q rises, due to capacity limits.

Other Elasticities

- **Income elasticity of demand:** measures the response of Q^d to a change in consumer income

$$\text{Income elasticity of demand} = \frac{\text{Percent change in } Q^d}{\text{Percent change in income}}$$

- Recall from lecture 3: An increase in income causes an increase in demand for a *normal* good.
- Hence, for normal goods, income elasticity > 0 .
- For *inferior* goods, income elasticity < 0 .

Other Elasticities

- **Cross-price elasticity of demand:**

measures the response of demand for one good to changes in the price of another good

$$\text{Cross-price elast. of demand} = \frac{\% \text{ change in } Q^d \text{ for good 1}}{\% \text{ change in price of good 2}}$$

- For substitutes, cross-price elasticity > 0 (e.g., an increase in price of beef causes an increase in demand for chicken)
- For complements, cross-price elasticity < 0 (e.g. An increase in the price of computers causes a decrease in demand for software)

Summary

- Elasticity measures the responsiveness of Q^d or Q^s to one of its determinants.
- Price elasticity of demand equals percentage change in Q^d divided by percentage change in P .
When it's less than one, demand is “inelastic.” When greater than one, demand is “elastic.”
- When demand is inelastic, total revenue rises when price rises. When demand is elastic, total revenue falls when price rises.

Summary

- Demand is less elastic in the short run, for necessities, for broadly defined goods, and for goods with few close substitutes.
- Price elasticity of supply equals percentage change in Q^s divided by percentage change in P . When it's less than one, supply is “inelastic.” When greater than one, supply is “elastic.”
- Price elasticity of supply is greater in the long run than in the short run.

Summary

- The income elasticity of demand measures how much quantity demanded responds to changes in buyers' incomes.
- The cross-price elasticity of demand measures how much demand for one good responds to changes in the price of another good.

ECON 101: INTRODUCTION TO ECONOMICS I

Lecture 4b – Supply, Demand, and Government Policies

Dr. Emmanuel Adu-Danso (Group C)



UNIVERSITY OF GHANA

**Department of Economics
School of Social Studies
2021/2022**

Lecture Overview

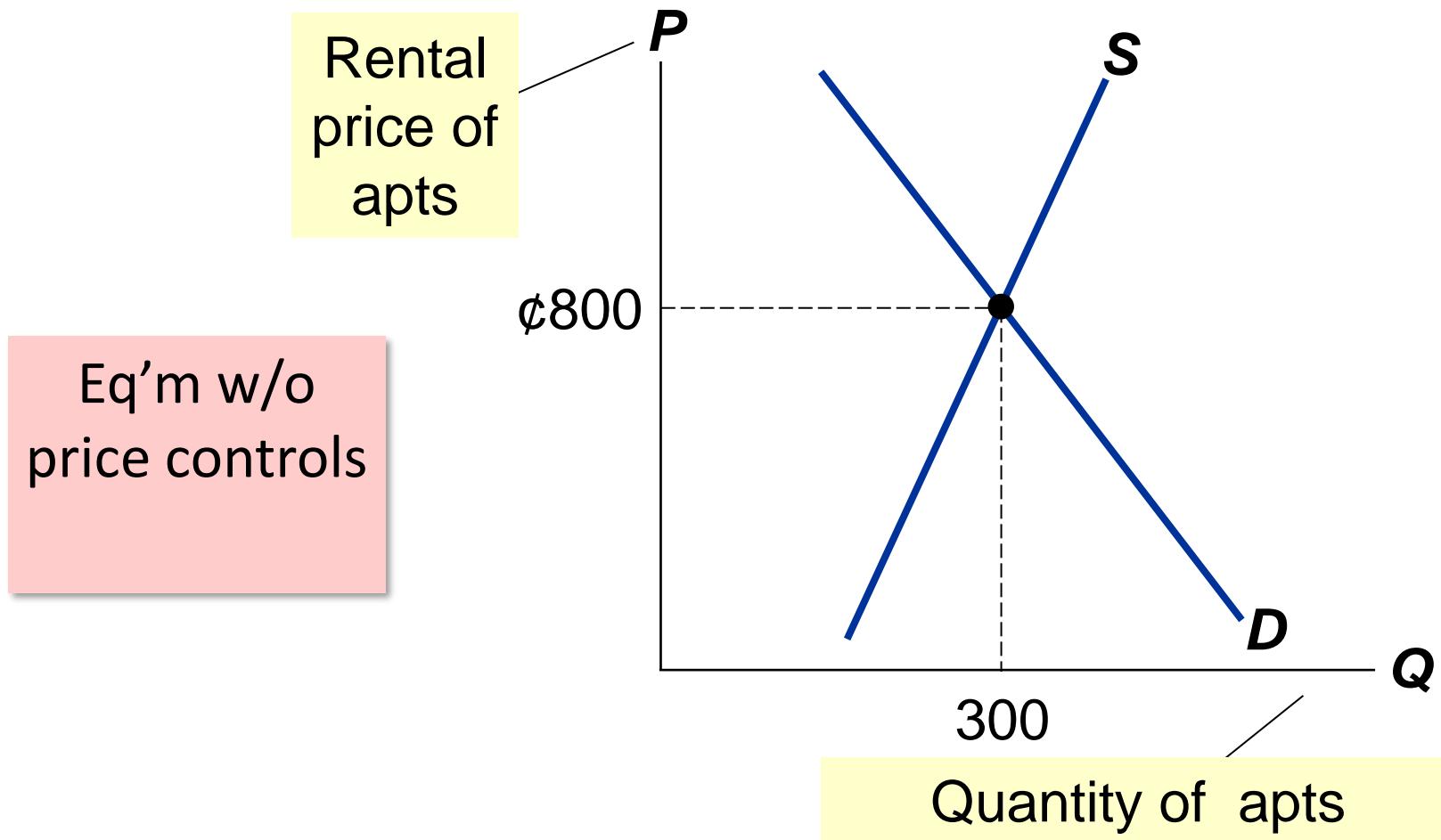
- In this lecture, we introduce the visible hand (government) into our market analysis and see how it affects the market.
- We start with the concepts of **price ceilings** and **price floors** and how they affect market outcomes
- We will also introduce government taxes and their observed effect on market outcomes.
- We end with a discussion on the incidence of taxes
- This lecture will be based on **Mankiw, G. (2012)**. Principles of Economics (6th Edition), South Western.
 - Chapter 6

Government Policies That Alter the Private Market Outcome

- Price controls
 - **Price ceiling:** a legal maximum on the price of a good or service *Example: rent control*
 - **Price floor:** a legal minimum on the price of a good or service *Example: minimum wage*
- Taxes
 - The govt can make buyers or sellers pay a specific amount on each unit.

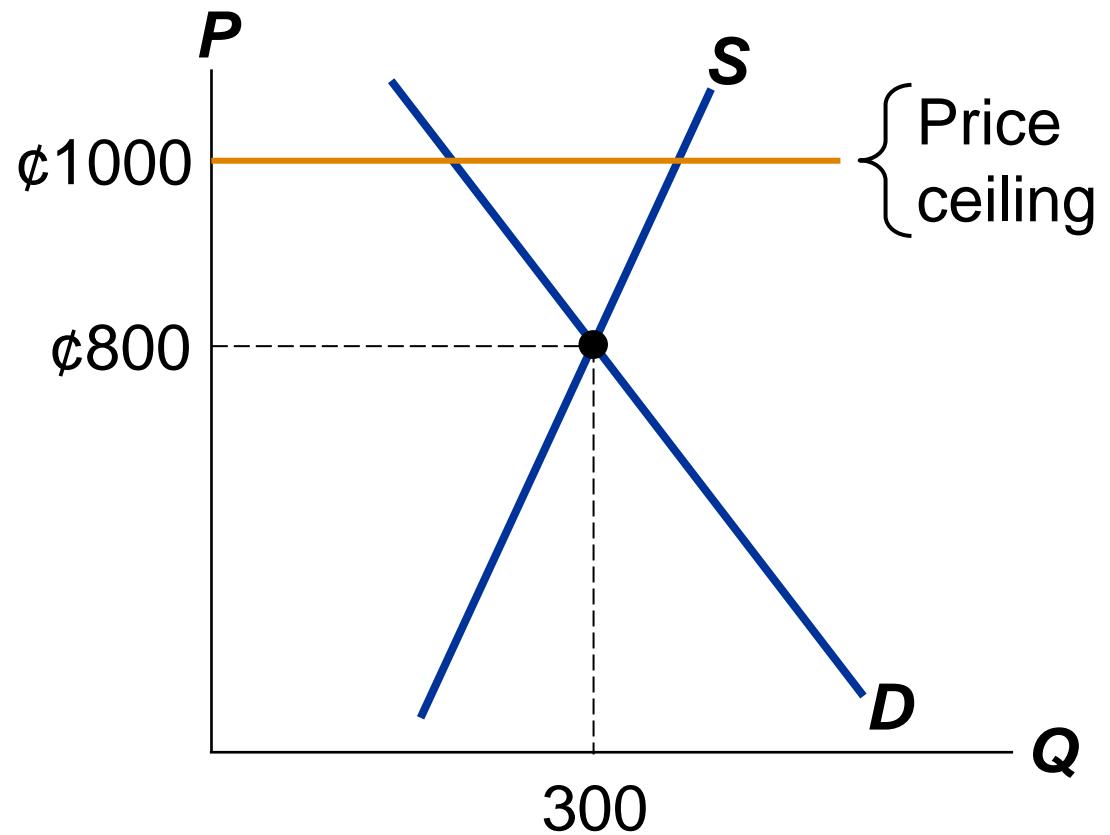
We will use the supply/demand model to see how each policy affects the market outcome (the price buyers pay, the price sellers receive, and eq'm quantity).

EXAMPLE 1: The Market for Apartments



How Price Ceilings Affect Market Outcomes

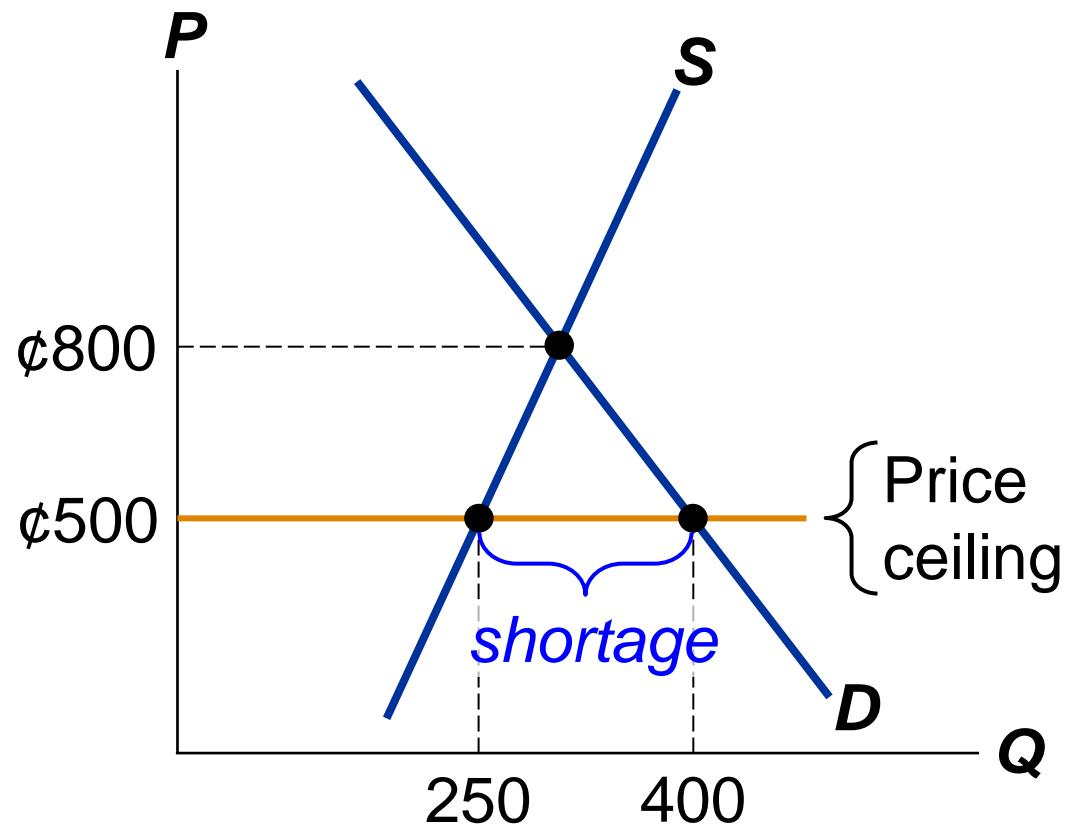
A price ceiling above the eq'm price is **not binding**— has no effect on the market outcome.



How Price Ceilings Affect Market Outcomes

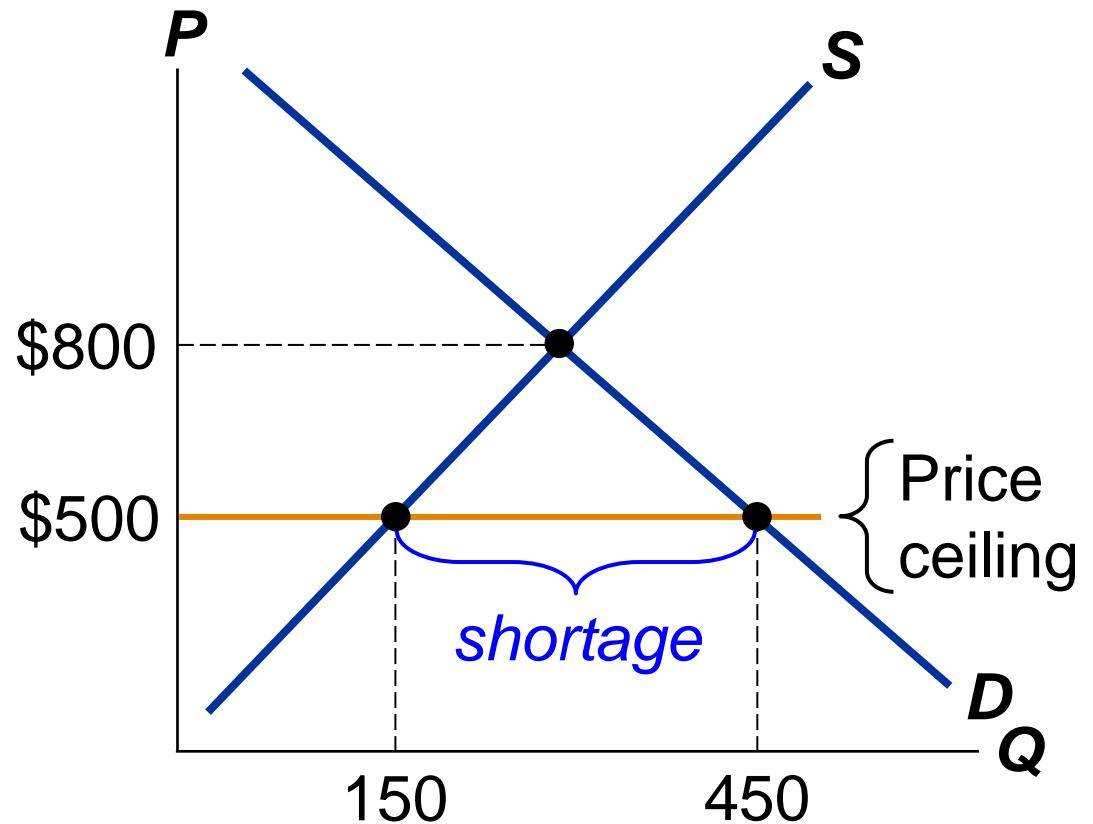
The eq'm price (¢800) is above the ceiling and therefore illegal.

The ceiling is a **binding constraint** on the price, causes a shortage.



How Price Ceilings Affect Market Outcomes

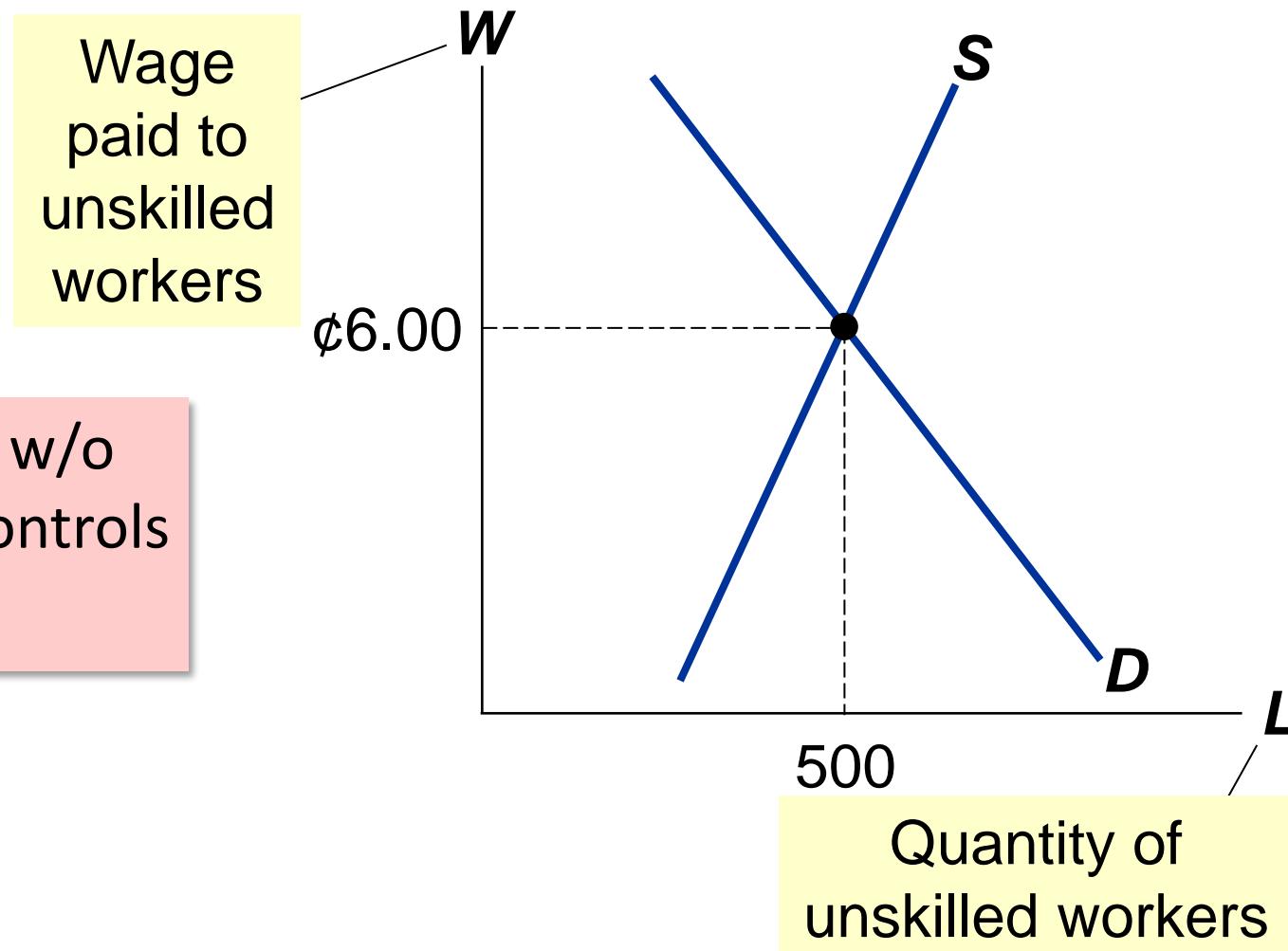
In the long run,
supply and
demand
are **more**
price-elastic.
So, the shortage
is larger.



Shortages and Rationing

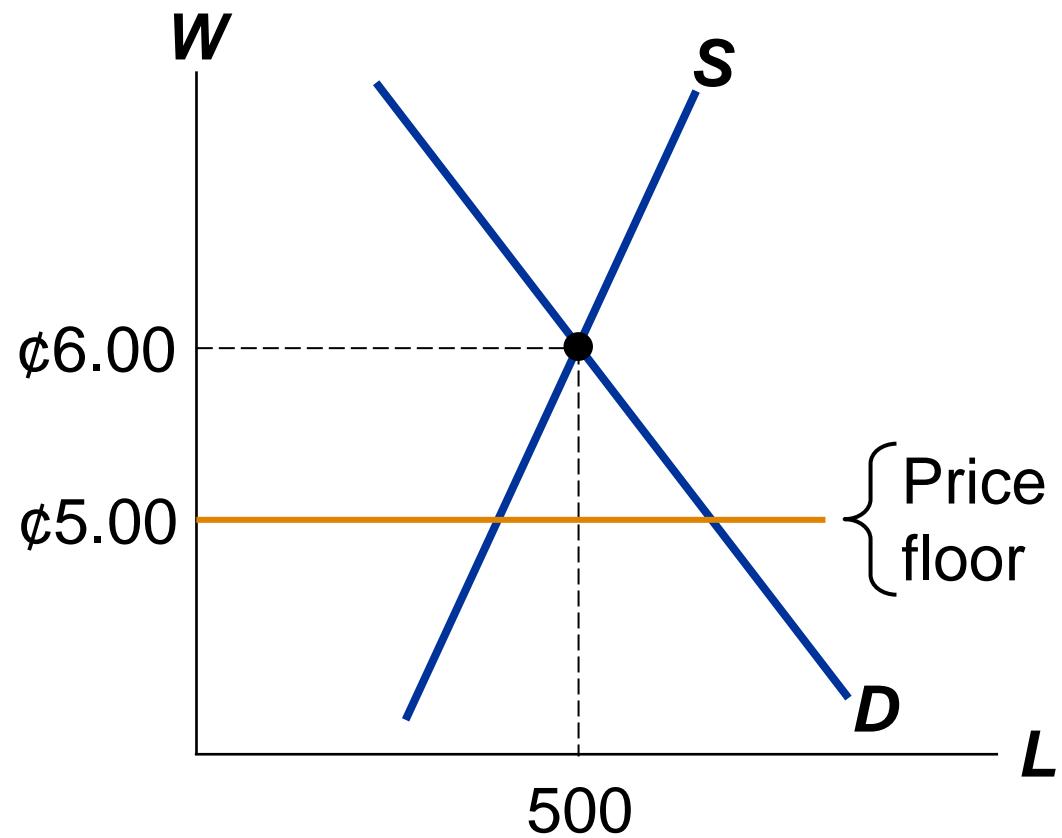
- With a shortage, sellers must ration the goods among buyers.
- Some rationing mechanisms: (1) Long lines
(2) Discrimination according to sellers' biases
- These mechanisms are often unfair, and inefficient: the goods do not necessarily go to the buyers who value them most highly.
- In contrast, when prices are not controlled, the rationing mechanism is efficient (the goods go to the buyers that value them most highly) and impersonal (and thus fair).

EXAMPLE 2: The Market for Unskilled Labor



How Price Floors Affect Market Outcomes

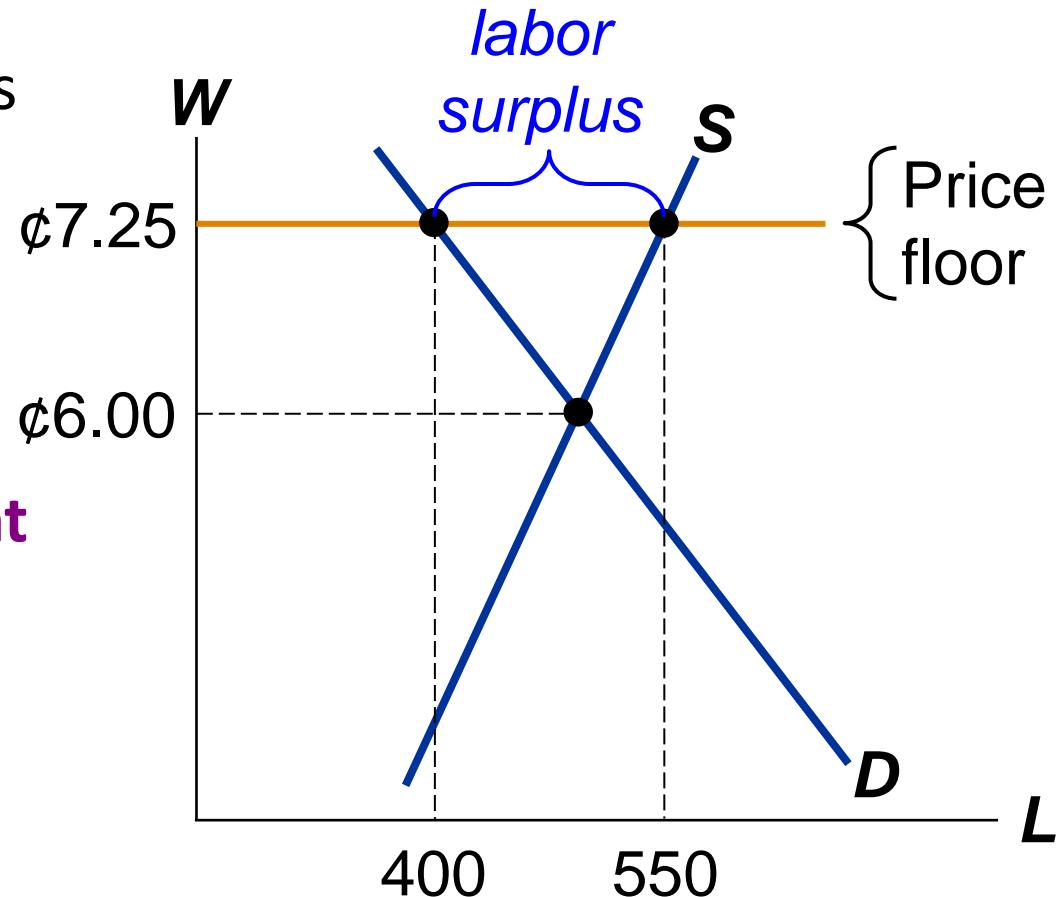
A price floor below the eq'm price is **not binding** – has no effect on the market outcome.



How Price Floors Affect Market Outcomes

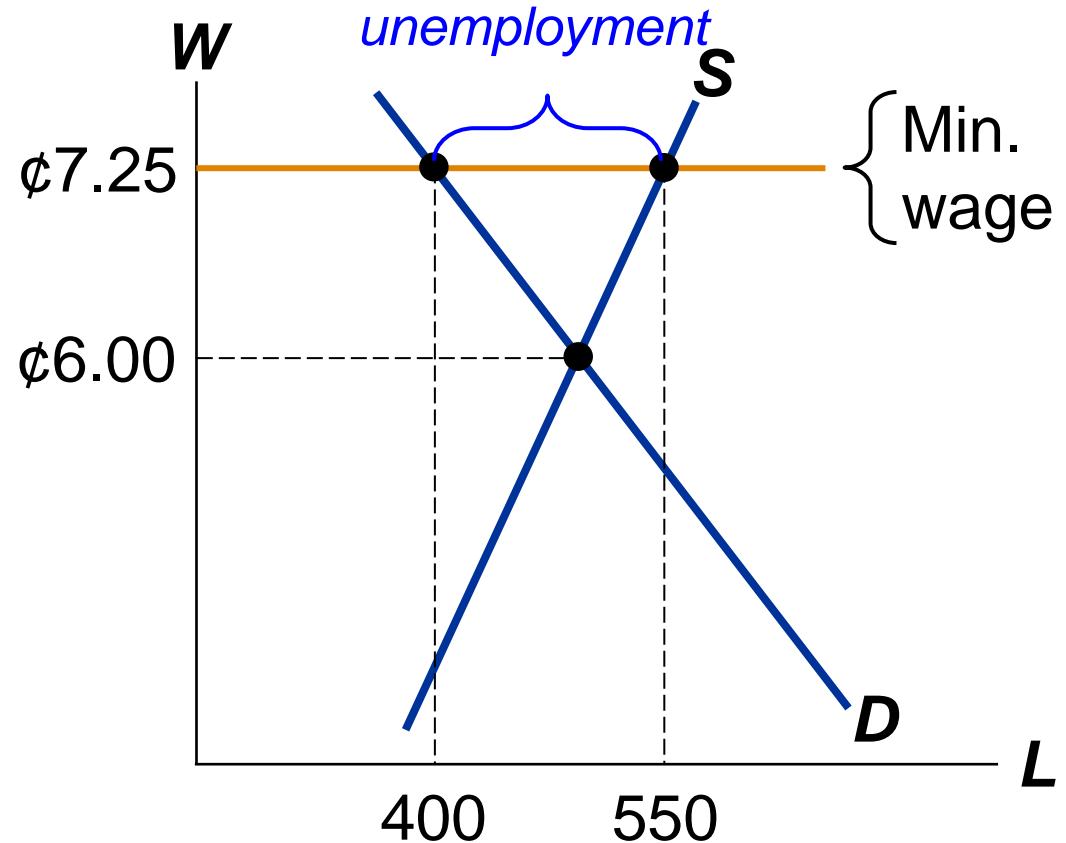
The eq'm wage (¢6) is below the floor and therefore illegal.

The floor is a **binding constraint** on the wage, causes a surplus (i.e., unemployment).



The Minimum Wage

- Min wage laws do not affect highly skilled workers.
- They may affect youth unemployment.
- In advanced economies, studies show that a 10% rise in min wage increases youth/ teen unemployment by 1-3%



Evaluating Price Controls

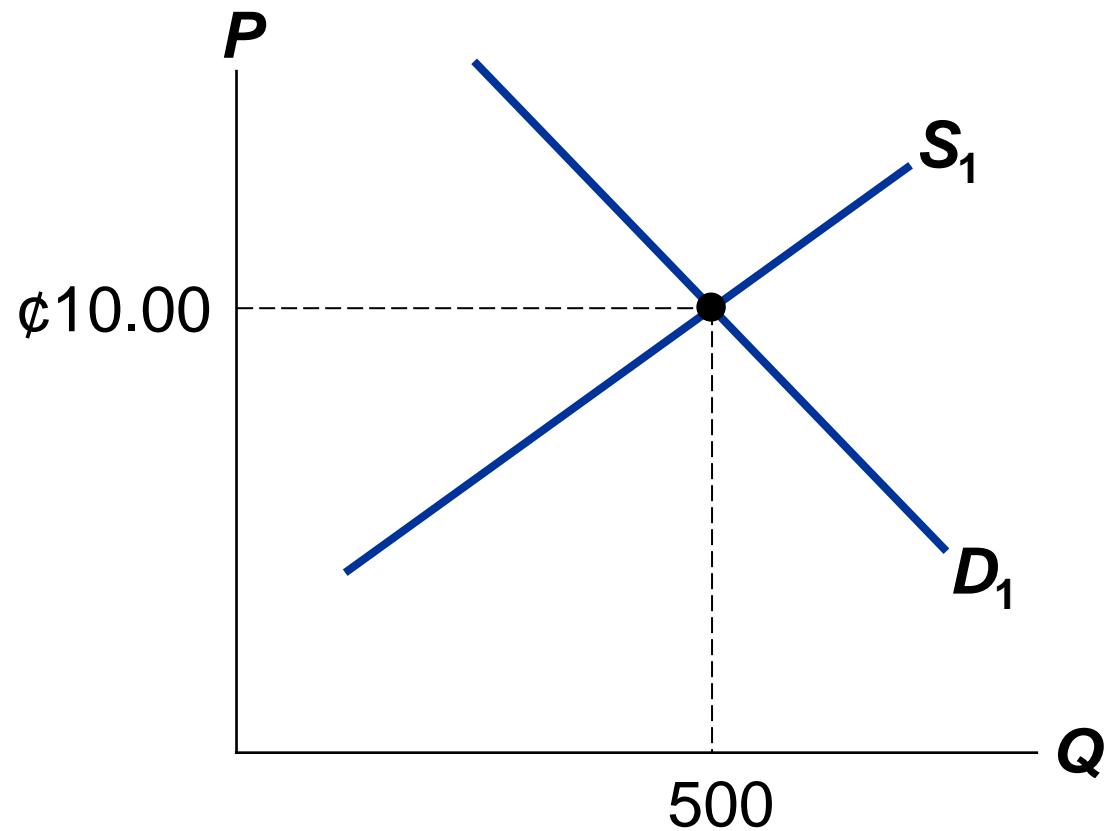
- Recall one of the Ten Principles from Chapter 1:
*Markets are usually a good way
to organize economic activity.*
- Prices are the signals that guide the allocation of society's resources. This allocation is altered when policymakers restrict prices.
- Price controls often intended to help the poor, but often hurt more than help.

Taxes

- The govt levies taxes on many goods & services to raise revenue to pay for national defense, public schools, etc.
- The govt can make buyers or sellers pay the tax.
- The tax can be a % of the good's price, or a specific amount for each unit sold.
 - For simplicity, we analyze per-unit taxes only.

EXAMPLE 3: The Market for LPG Gas

Eq'm
w/o tax



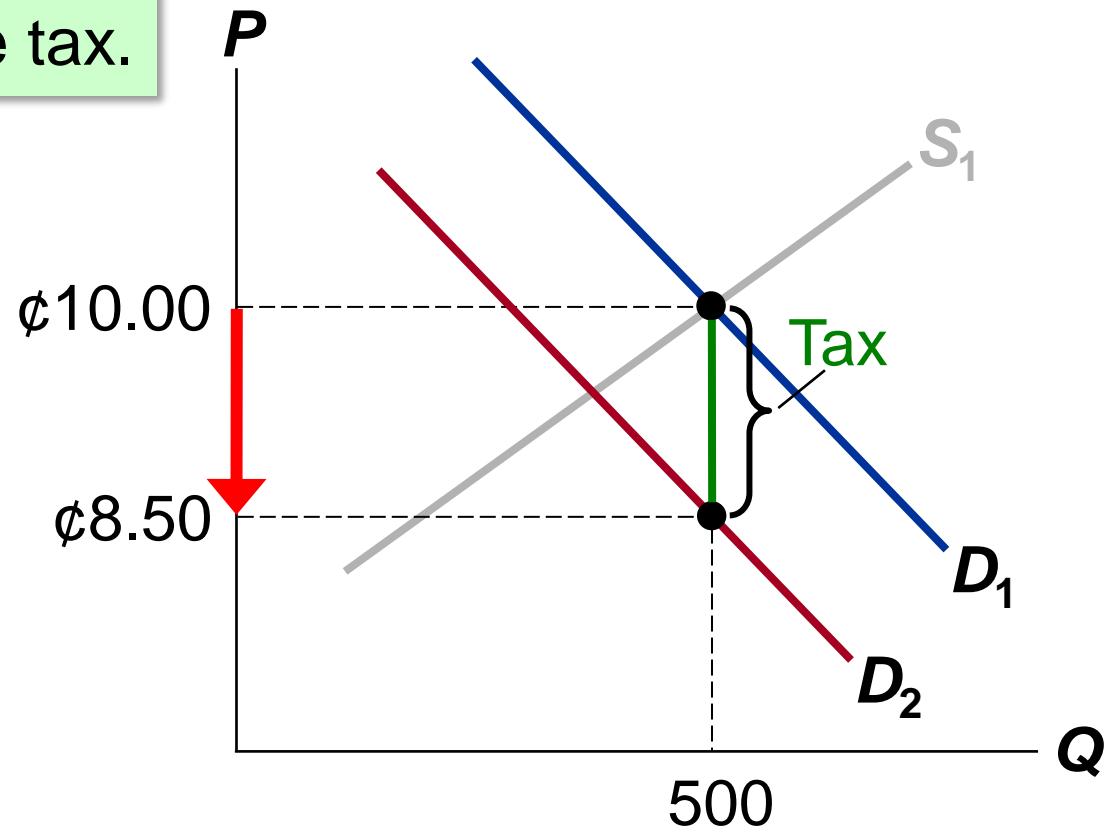
A Tax on Buyers e.g. LPG gas

Hence, a tax on buyers shifts the D curve down by the amount of the tax.

P would have to fall by ¢1.50 to make buyers willing to buy same Q as before.

E.g., if P falls from ¢10.00 to ¢8.50, buyers still willing to purchase 500 LPG gas.

Effects of a ¢1.50 per unit tax on buyers



A Tax on Buyers

New eq'm:

$$Q = 450$$

Sellers
receive

$$P_s = \text{¢}9.50$$

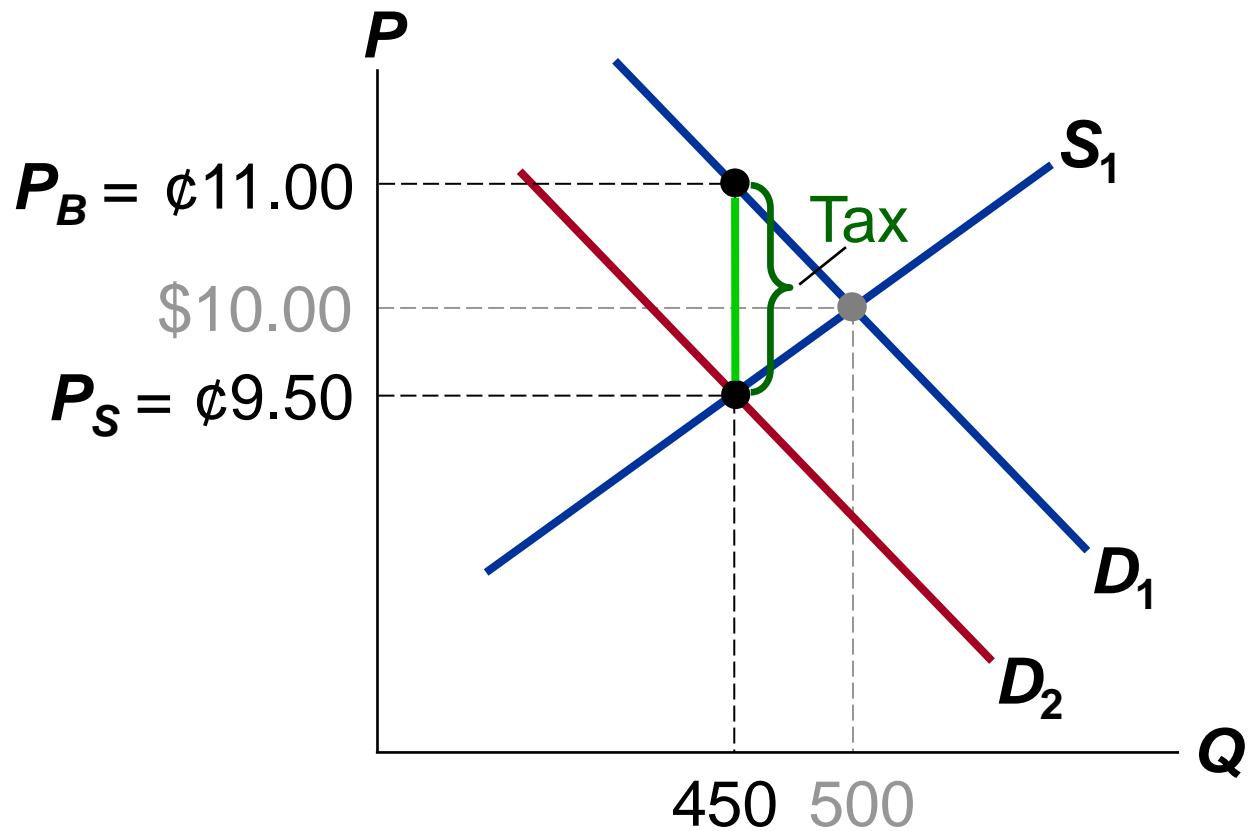
Buyers pay

$$P_B = \text{¢}11.00$$

Difference
between them

$$= \text{¢}1.50 = \text{tax}$$

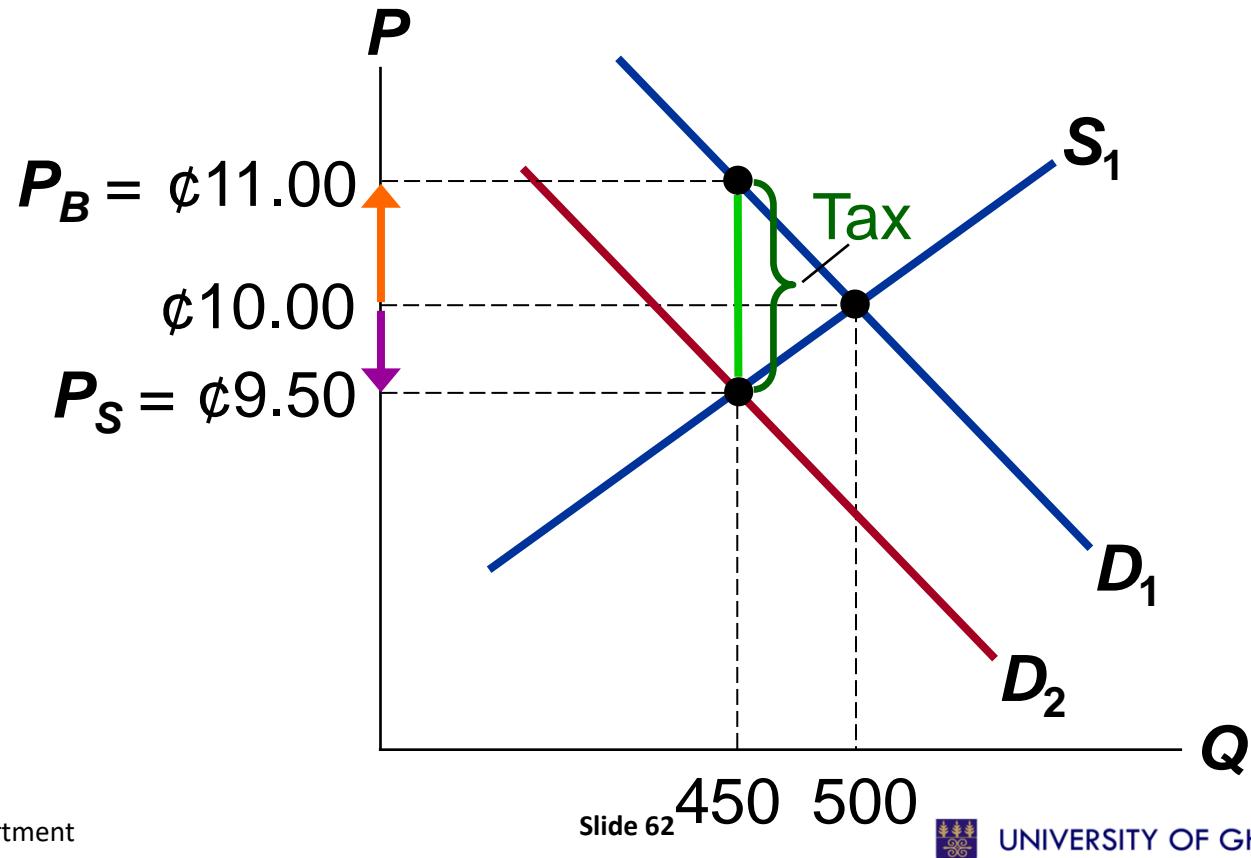
Effects of a ¢1.50 per
unit tax on buyers



The **Incidence** of a Tax:

how the burden of a tax is shared among market participants

In our example,
buyers pay
¢1.00 more,
sellers get
¢0.50 less.

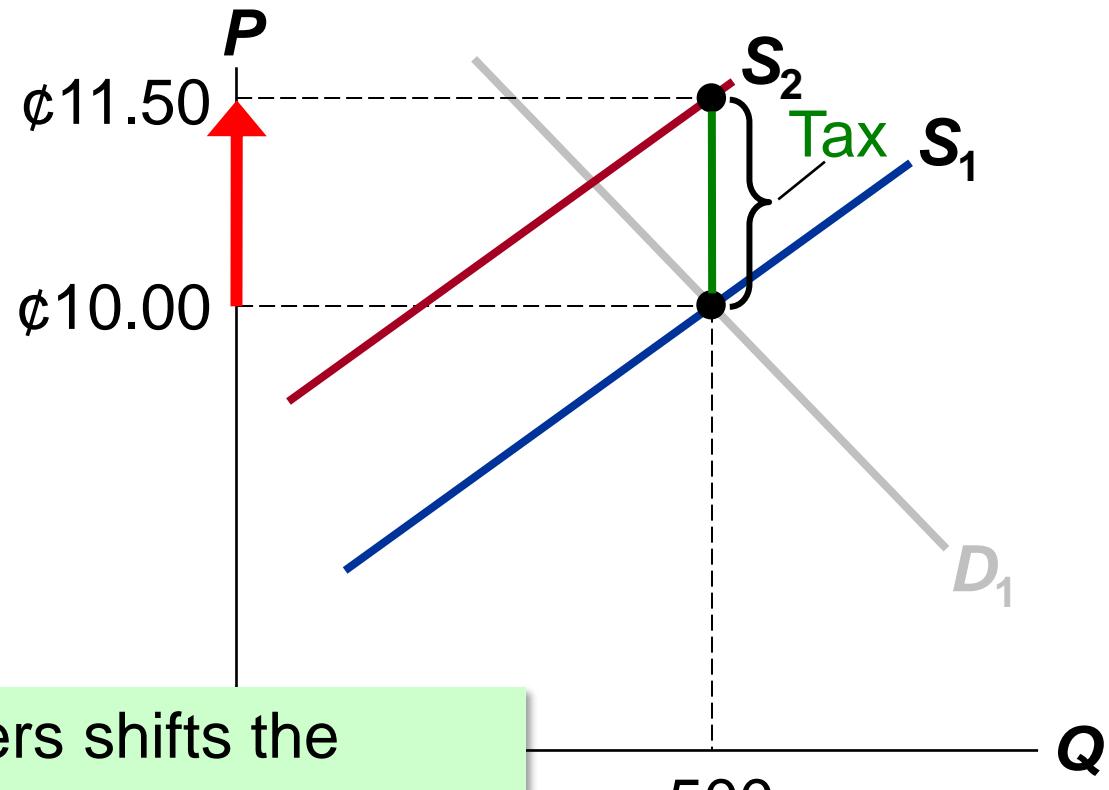


A Tax on Sellers

The tax effectively raises sellers' costs by ¢1.50 per liter.

Sellers will supply 500 liters only if P rises to ¢11.50, to compensate for this cost increase.

Effects of a ¢1.50 per unit tax on sellers



A Tax on Sellers

New eq'm:

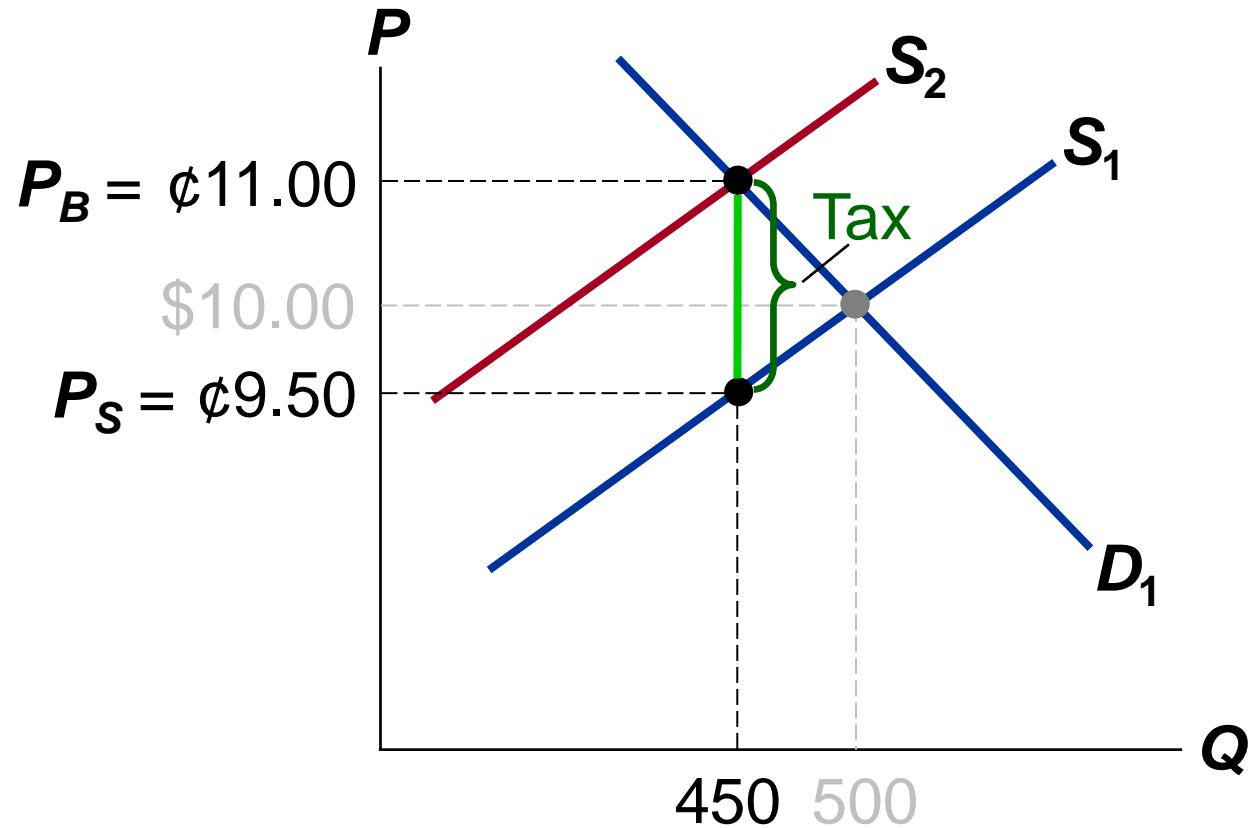
$$Q = 450$$

Buyers pay
 $P_B = \text{¢}11.00$

Sellers receive
 $P_s = \text{¢}9.50$

Difference
between them
 $= \text{¢}1.50 = \text{tax}$

Effects of a ¢1.50 per unit tax on sellers

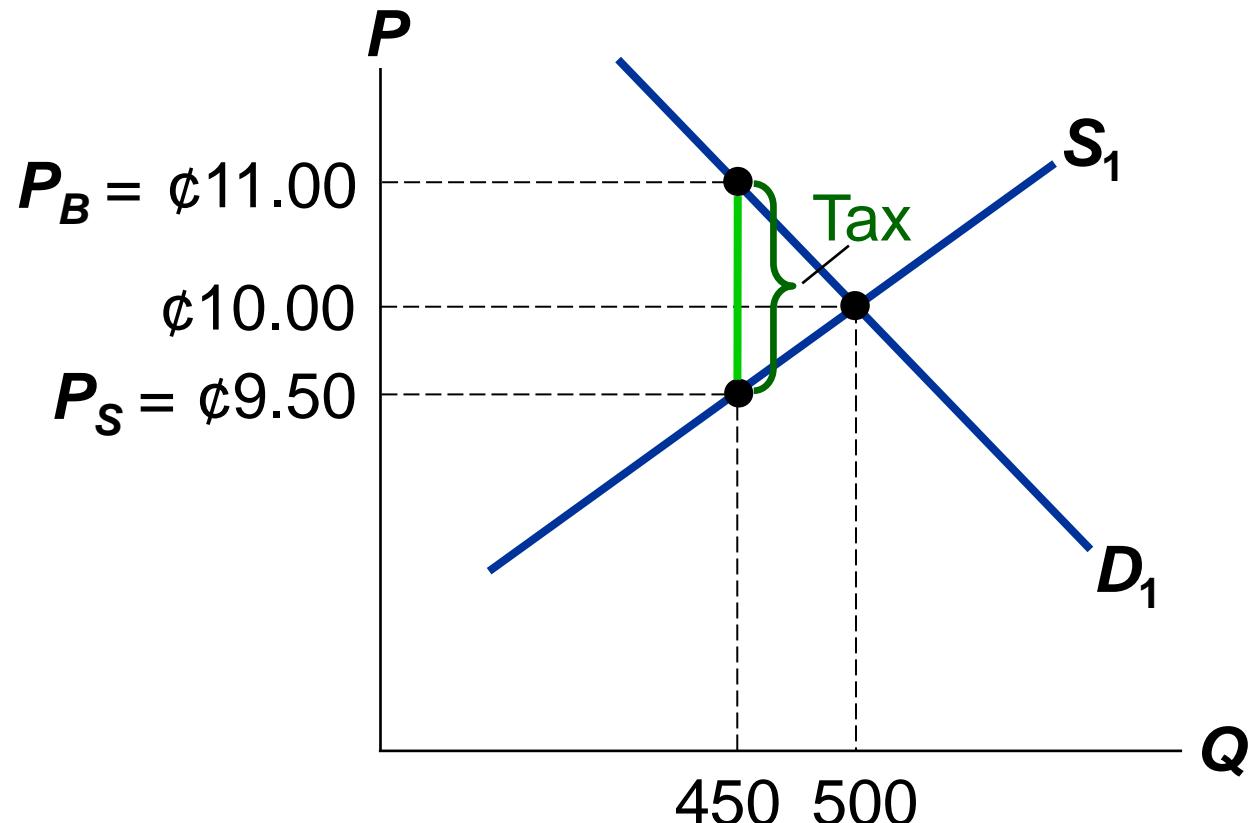


The Outcome Is the Same in Both Cases!

The effects on P and Q , and the tax incidence are the same whether the tax is imposed on buyers or sellers!

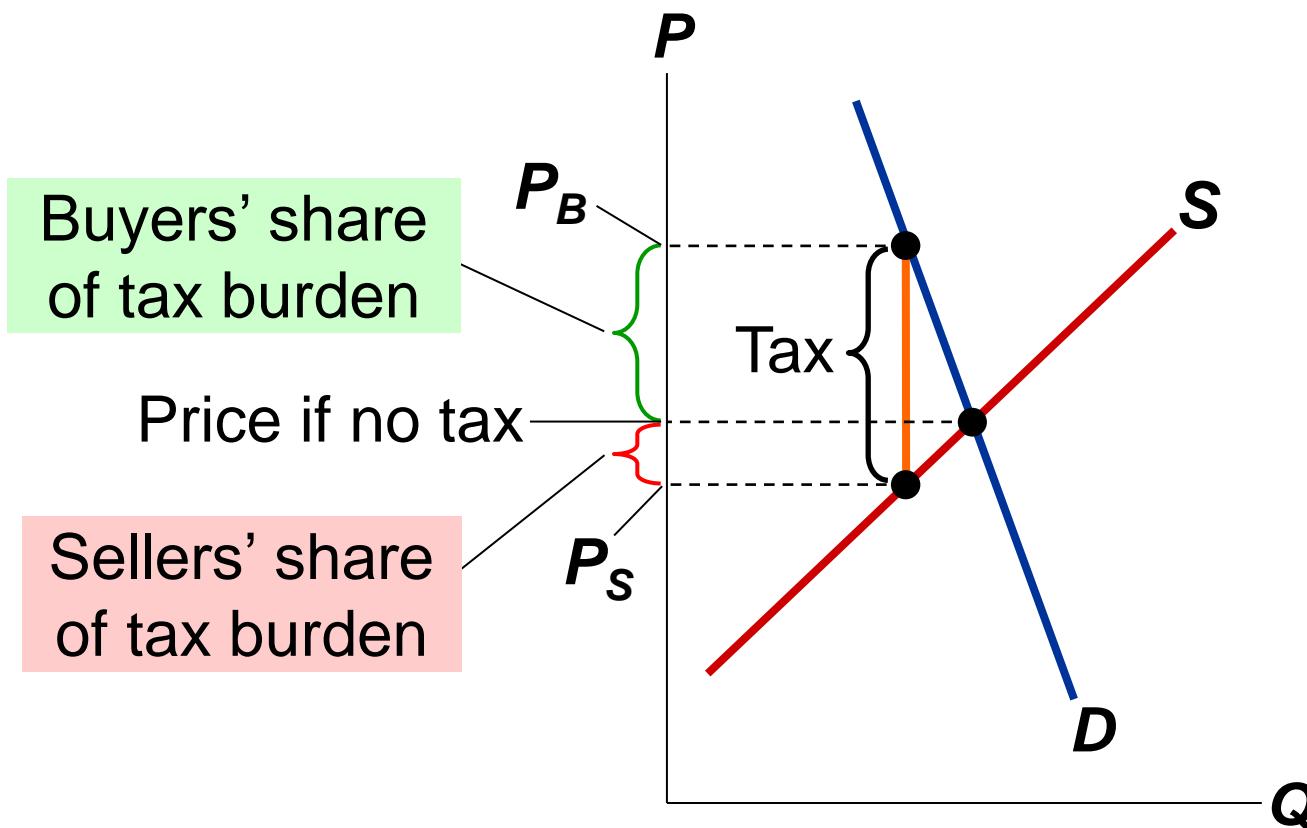
What matters
is this:

A tax drives
a wedge
between the
price buyers
pay and the
price sellers
receive.



Elasticity and Tax Incidence

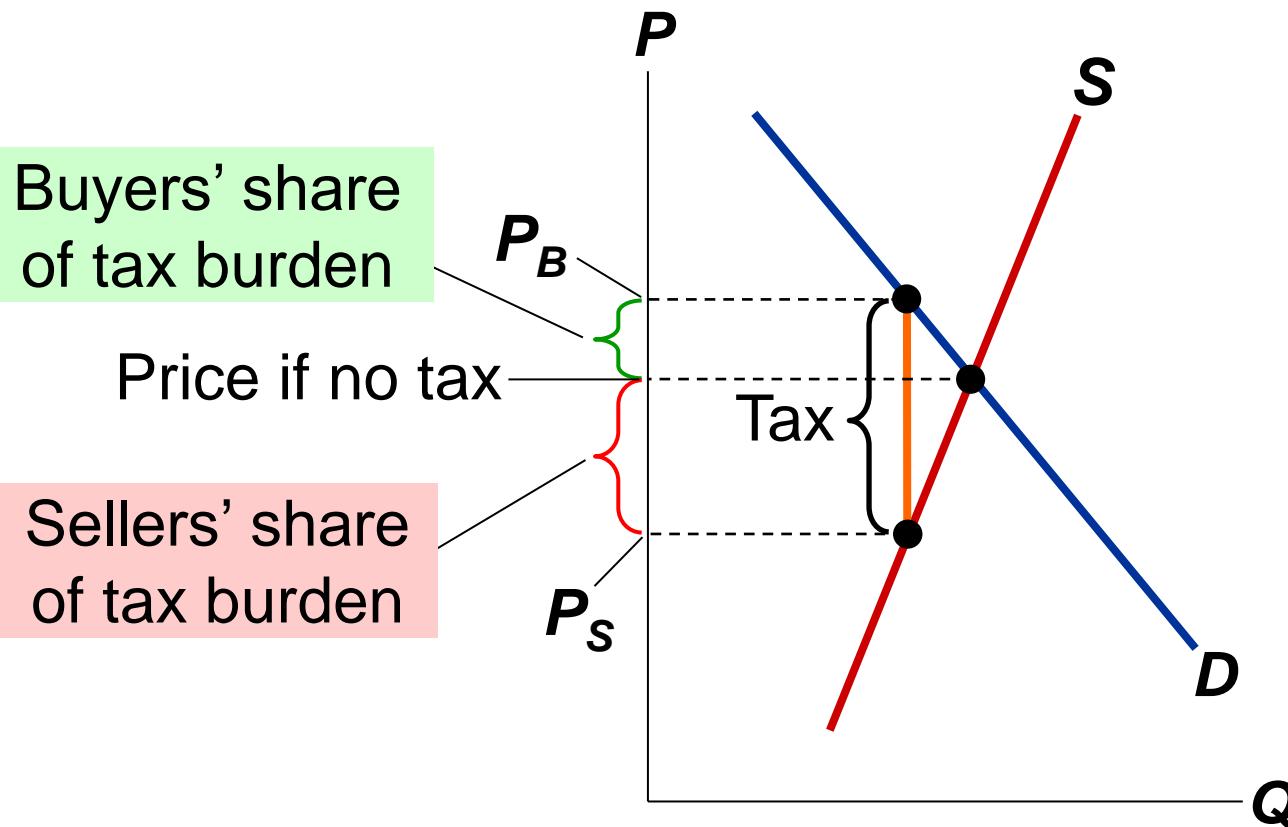
CASE 1: Supply is more elastic than demand



It's easier for sellers than buyers to leave the market.
So buyers bear most of the burden of the tax.

Elasticity and Tax Incidence

CASE 2: Demand is more elastic than supply



It's easier for buyers than sellers to leave the market.

Sellers bear most of the burden of the tax.

CONCLUSION: Government Policies and the Allocation of Resources

- Each of the policies looked at affects the allocation of society's resources.
 - *Example 1:* A tax on LPG gas reduces eq'm Q .
With less production of LPG gas, resources (workers, plants, trucks) will become available to other industries.
 - *Example 2:* A binding minimum wage causes a surplus of workers, a waste of resources.
- So, it's important for policymakers to apply such policies very carefully.

Summary

- A price ceiling is a legal maximum on the price of a good. An example is rent control. If the price ceiling is below the eq'm price, it is binding and causes a shortage.
- A price floor is a legal minimum on the price of a good. An example is the minimum wage. If the price floor is above the eq'm price, it is binding and causes a surplus. The labor surplus caused by the minimum wage is unemployment.



Summary

- A tax on a good places a wedge between the price buyers pay and the price sellers receive, and causes the eq'm quantity to fall, whether the tax is imposed on buyers or sellers.
- The incidence of a tax is the division of the burden of the tax between buyers and sellers, and does not depend on whether the tax is imposed on buyers or sellers.
- The incidence of the tax depends on the price elasticities of supply and demand.

ECON 101: INTRODUCTION TO ECONOMICS I

Lecture 5 – Consumers, Producers, and the Efficiency of Markets

Dr. Emmanuel Adu-Danso (Group C)



UNIVERSITY OF GHANA

**Department of Economics
School of Social Studies
2021/2022**

Lecture Overview

- We are introduced to welfare economics
- In this we look at the concept of the consumer surplus and how it is related to the demand curve
- We also look at the concept of producer surplus and how it relates to the supply curve
- Two important questions we attempt to answer is whether markets produce desirable outcomes, and whether these outcomes can be improved.
- This lecture will be based on **Mankiw, G. (2012)**. Principles of Economics (6th Edition), South Western.
 - Chapter 7

Learning Outcomes

- By the end of the lecture, you should be able to:
 - Explain and estimate the consumer surplus
 - Explain and estimate the producer surplus
 - Demonstrate that only the market equilibrium maximizes Society's wellbeing (Total Surplus)

Welfare economics

- Recall, the **allocation of resources** refers to:
 - how much of each good is produced
 - which producers produce it
 - which consumers consume it
- **Welfare economics:**
the study of how the allocation of resources affects
economic well-being
- First, we look at the well-being of consumers.

Willingness to Pay (WTP)

A buyer's **willingness to pay** for a good is the maximum amount the buyer will pay for that good.

WTP measures how much the buyer values the good.

name	WTP
Anthony	\$250
Chad	175
Flea	300
John	125

Example:
4 buyers' WTP
for a beats headset



WTP and the Demand Curve

Q: If price of headset is \$200, who will buy a headset, and what is quantity demanded?

A: Anthony & Flea will buy a headset, Chad & John will not.

Hence, $Q^d = 2$
when $P = \$200$.

name	WTP
Anthony	\$250
Chad	175
Flea	300
John	125

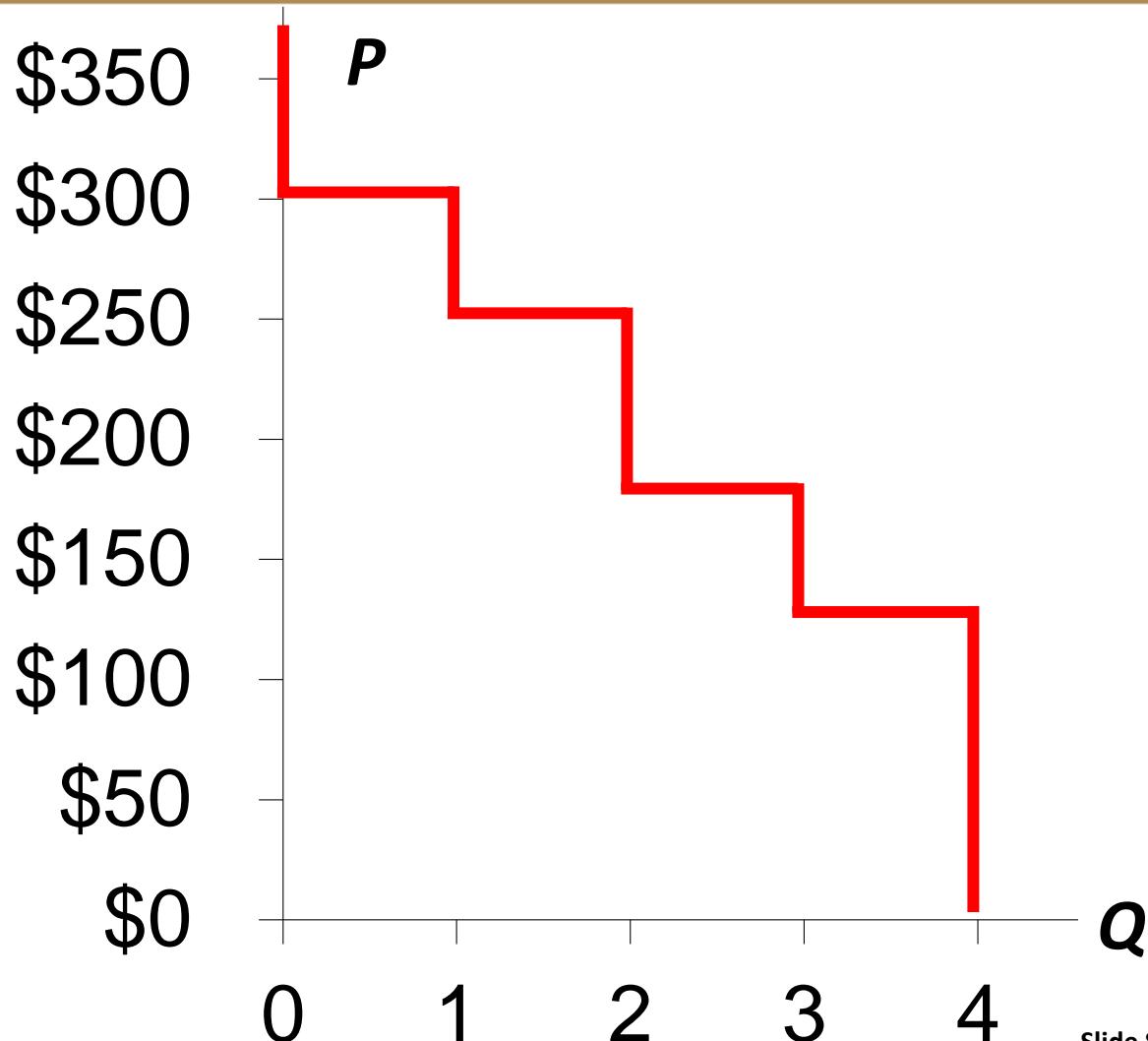
WTP and the Demand Curve

Derive the demand schedule:

name	WTP
Anthony	\$250
Chad	175
Flea	300
John	125

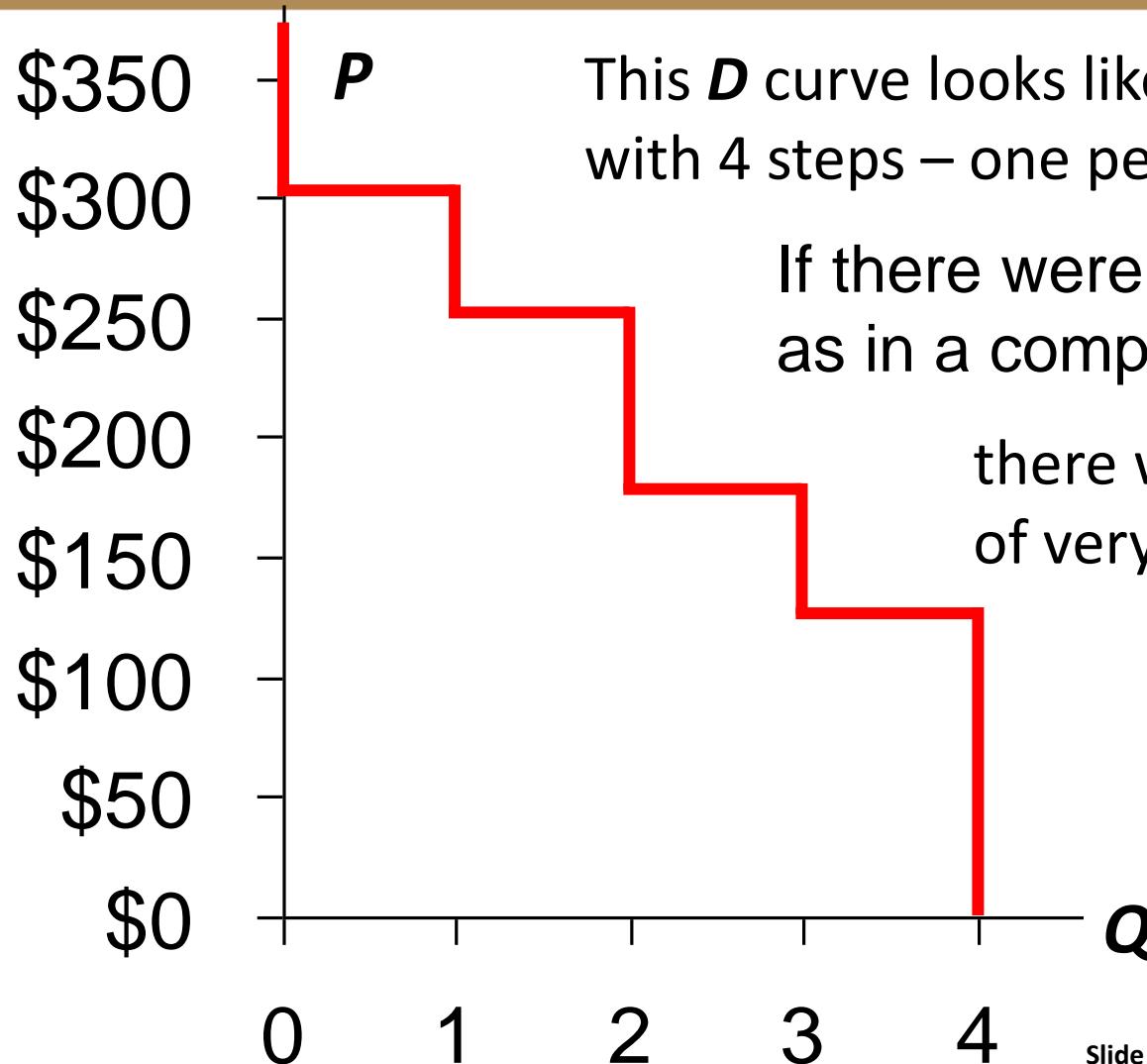
P (price of headset)	who buys	Q^d
\$301 & up	nobody	0
251 – 300	Flea	1
176 – 250	Anthony, Flea	2
126 – 175	Chad, Anthony, Flea	3
0 – 125	John, Chad, Anthony, Flea	4

WTP and the Demand Curve

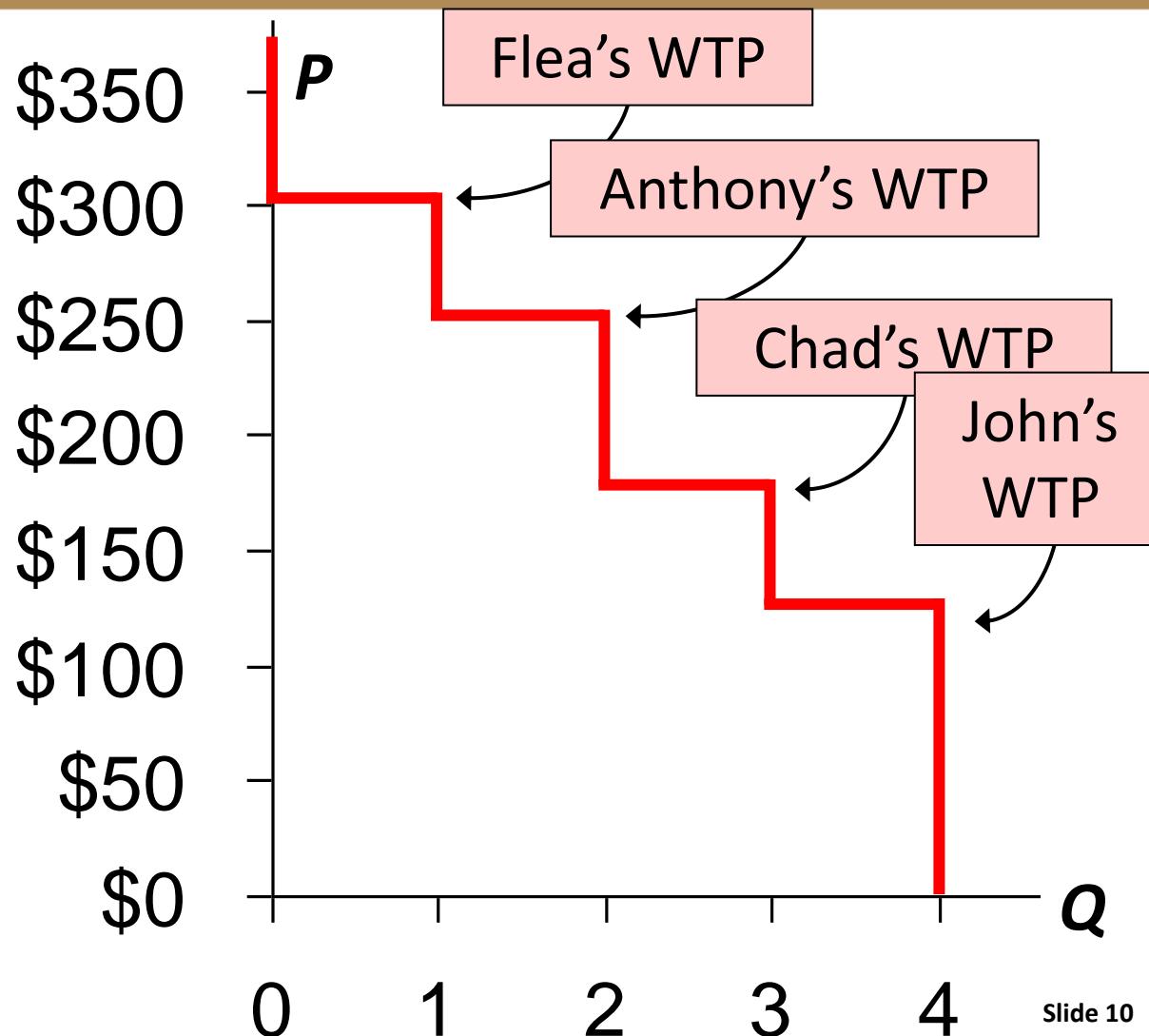


P	Q^d
\$301 & up	0
251 – 300	1
176 – 250	2
126 – 175	3
0 – 125	4

About the Staircase Shape...



WTP and the Demand Curve



At any Q , the height of the D curve is the WTP of the *marginal buyer*, the buyer who would leave the market if P were any higher.

Consumer Surplus (CS)

Consumer surplus is the amount a buyer is willing to pay minus the price the buyer actually pays:

$$CS = WTP - P$$

name	WTP
Anthony	\$250
Chad	175
Flea	300
John	125

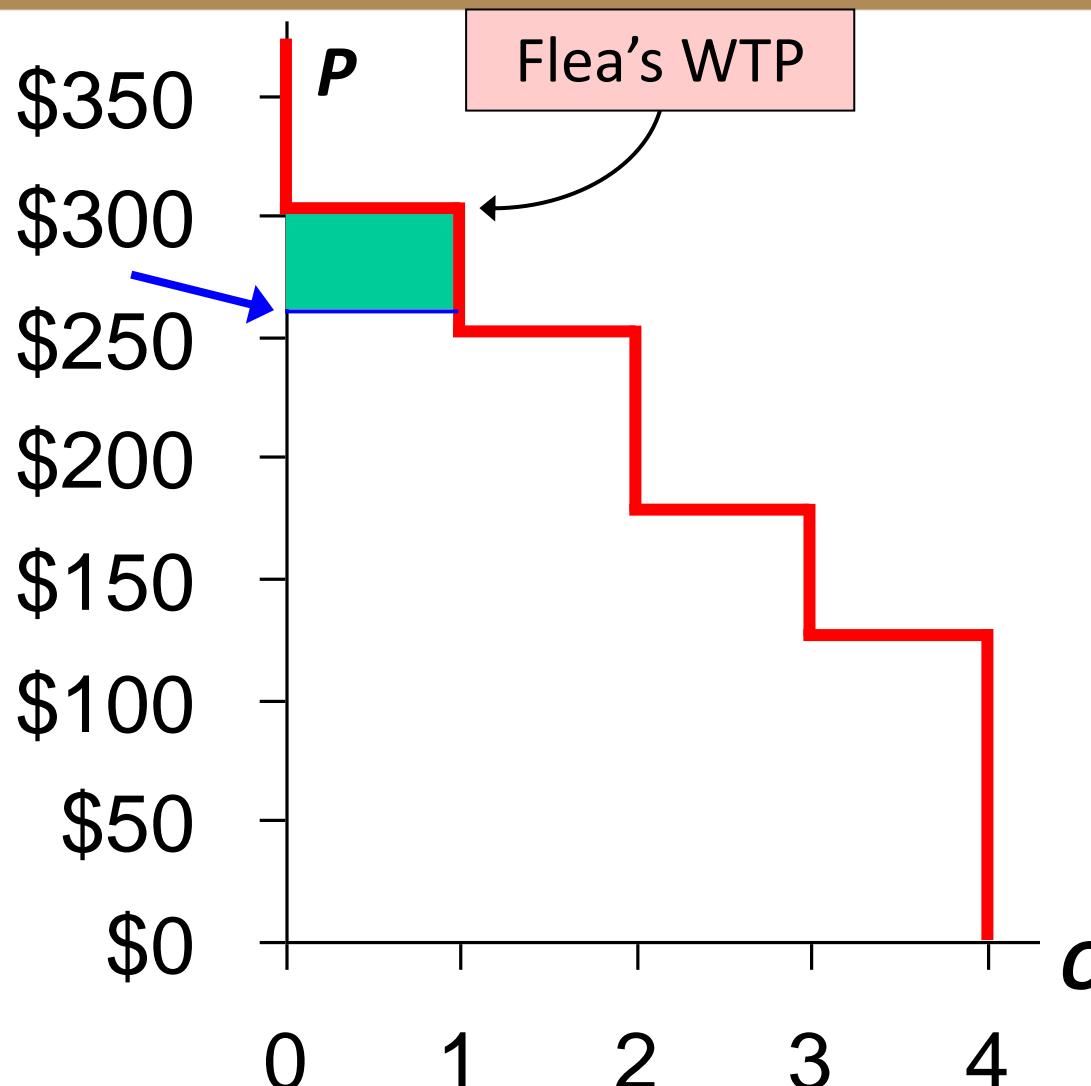
Suppose $P = \$260$.

Flea's CS = $\$300 - 260 = \40 .

The others get no CS because they do not buy an headset at this price.

Total CS = \$40.

CS and the Demand Curve

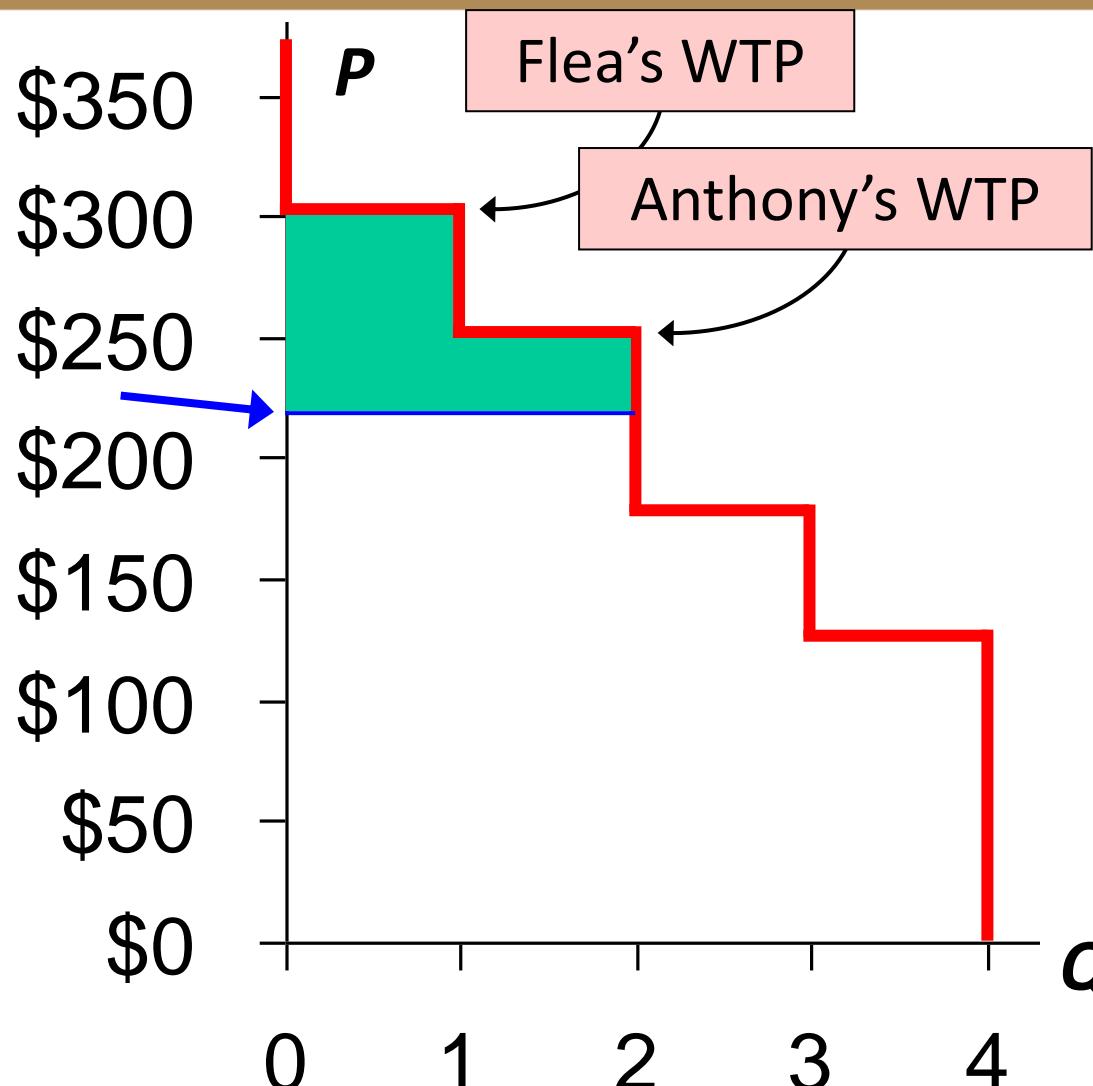


$$P = \$260$$

$$\begin{aligned} \text{Flea's CS} &= \\ \$300 - 260 &= \underline{\$40} \end{aligned}$$

$$\text{Total CS} = \underline{\$40}$$

CS and the Demand Curve



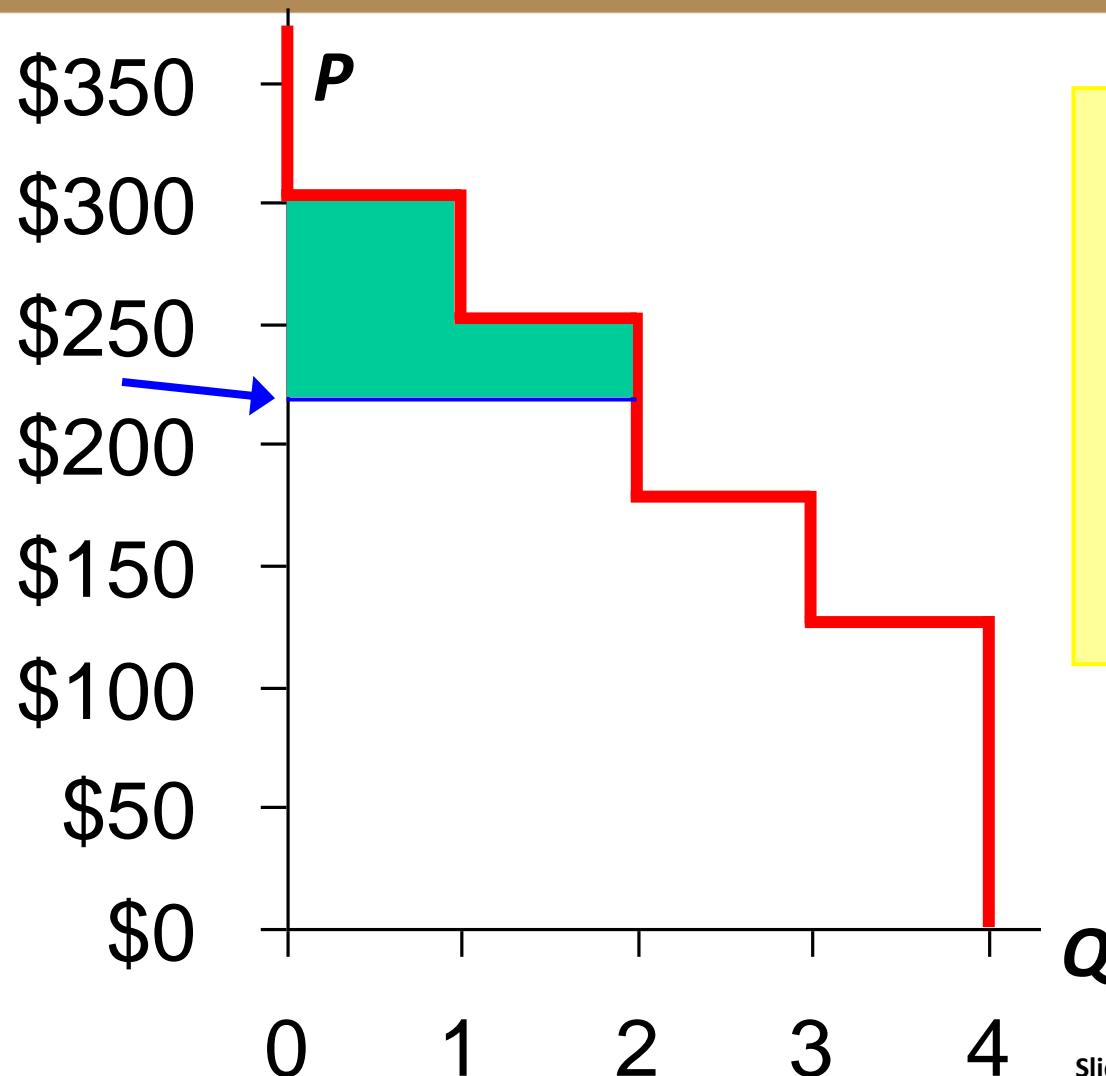
Instead, suppose
 $P = \$220$

Flea's CS =
 $\$300 - 220 = \underline{\$80}$

Anthony's CS =
 $\$250 - 220 = \underline{\$30}$

Total CS = $\$110$

CS and the Demand Curve

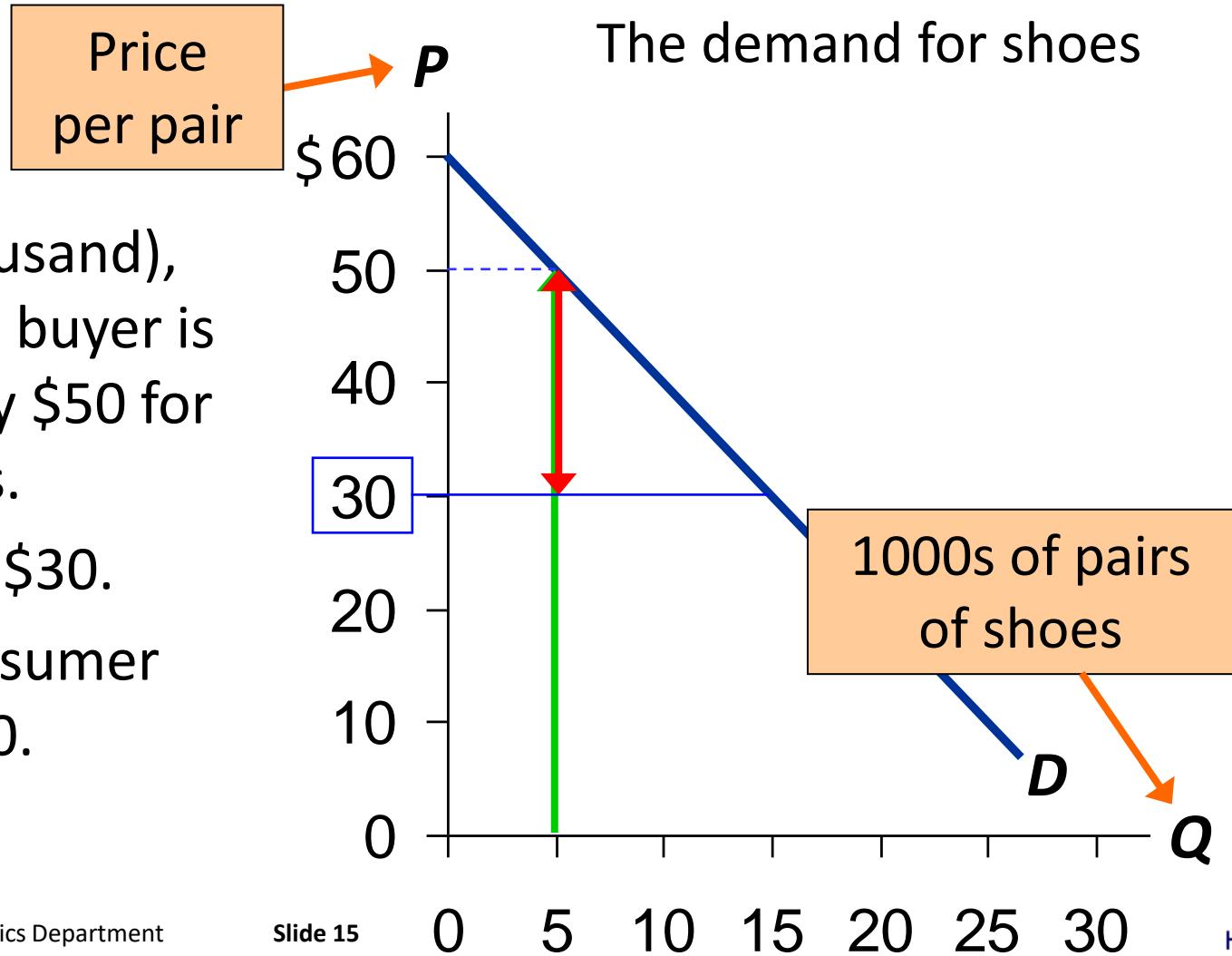


*The lesson:
Total CS equals the
area under
the demand curve
above the price,
from 0 to Q .*

CS with Lots of Buyers & a Smooth D Curve

At $Q = 5$ (thousand),
the marginal buyer is
willing to pay \$50 for
pair of shoes.

Suppose $P = \$30$.
Then his consumer
surplus = \$20.



CS with Lots of Buyers & a Smooth D Curve

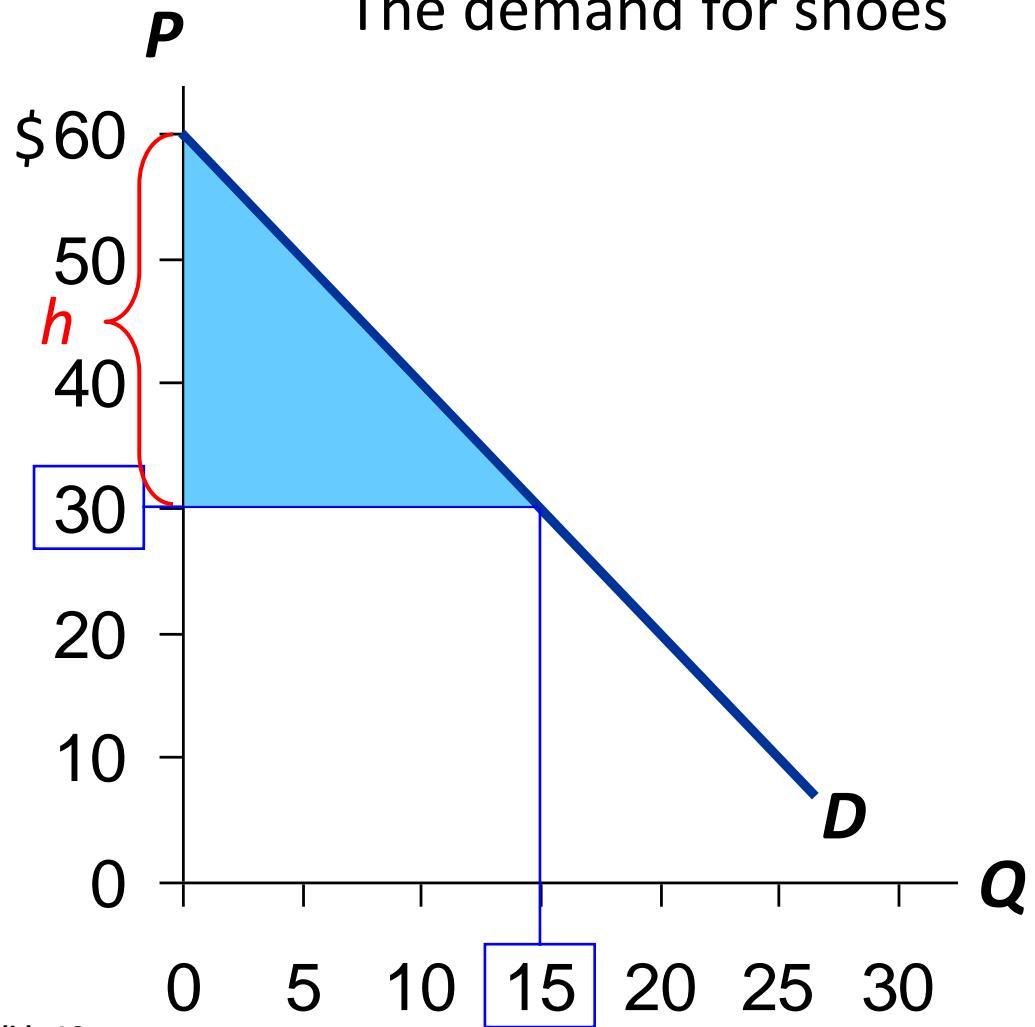
CS is the area b/w P and the D curve, from 0 to Q .

Recall: area of a triangle equals $\frac{1}{2} \times \text{base} \times \text{height}$

Height of this triangle is $\$60 - 30 = \30 .

So,
 $\text{CS} = \frac{1}{2} \times 15 \times \$30 = \$225$.

The demand for shoes



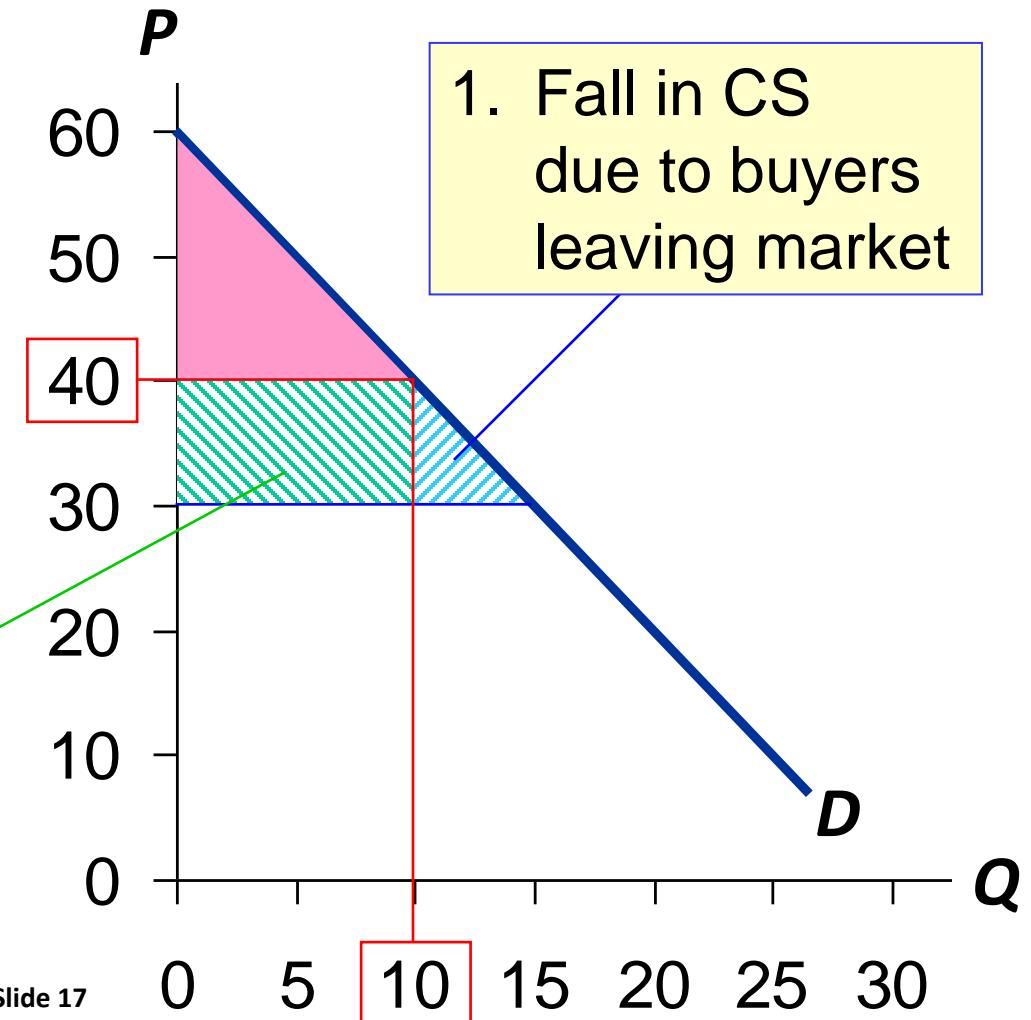
How a Higher Price Reduces CS

If P rises to \$40,

$$\text{CS} = \frac{1}{2} \times 10 \times \$20 \\ = \$100.$$

Two reasons for the fall in CS.

2. Fall in CS due to remaining buyers paying higher P



Cost and the Supply Curve

- **Cost** is the value of everything a seller must give up to produce a good (*i.e.*, opportunity cost).
- Includes cost of all resources used to produce good, including value of the seller's time.
- Example: Costs of 3 sellers in the lawn-cutting business.

name	cost
Angelo	\$10
Hunter	20
Kitty	35

A seller will only produce and sell the good if the price exceeds his or her cost.

Hence, cost is a measure of willingness to sell.

Cost and the Supply Curve

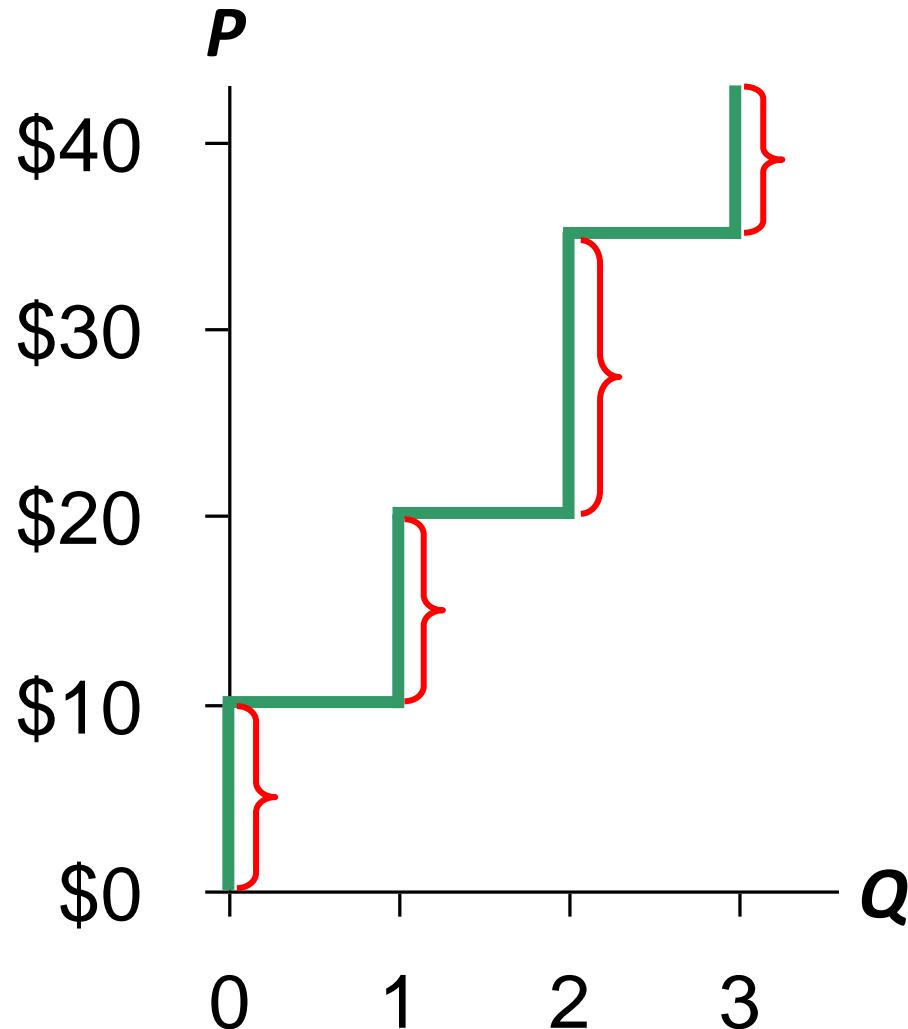
Derive the supply schedule from the cost data:

name	cost
Angelo	\$10
Hunter	20
Kitty	35

P	Q^s
\$0 – 9	0
10 – 19	1
20 – 34	2
35 & up	3

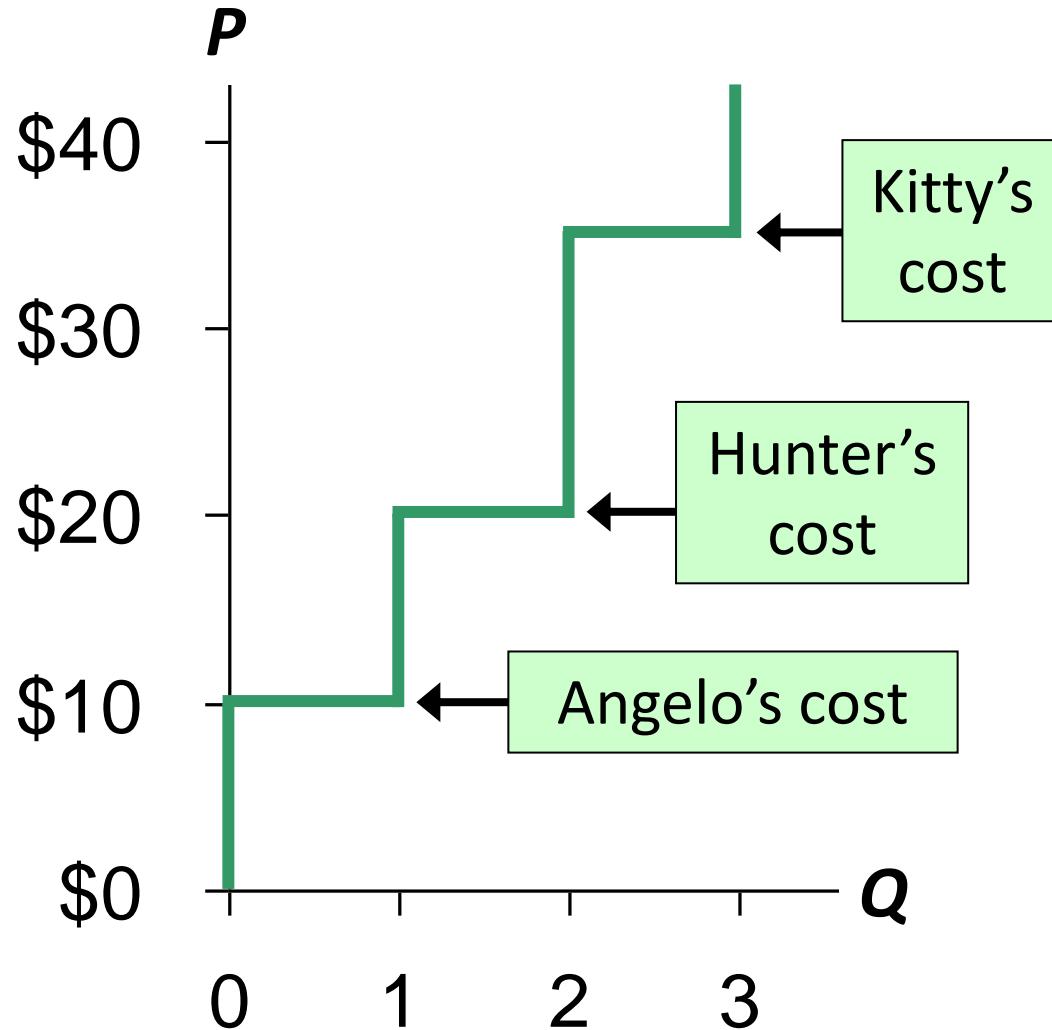


Cost and the Supply Curve



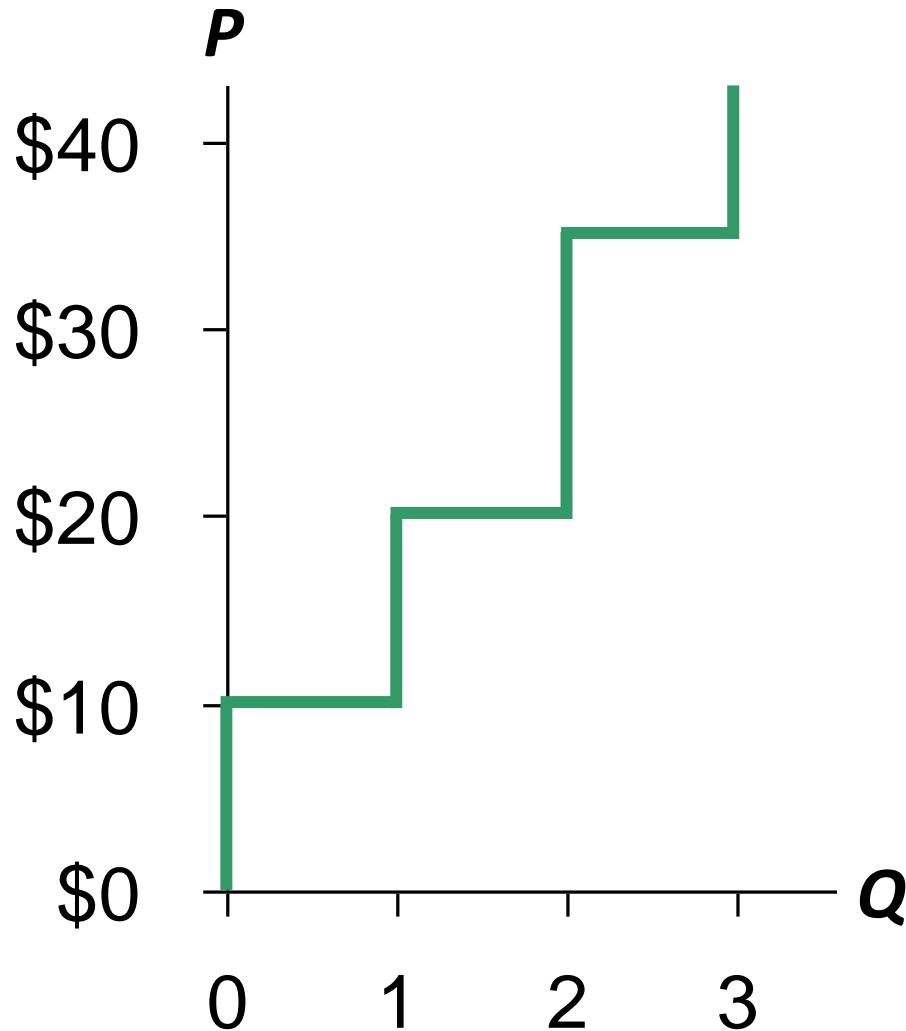
P	Q^s
\$0 – 9	0
10 – 19	1
20 – 34	2
35 & up	3

Cost and the Supply Curve



At each Q , the height of the S curve is the cost of the *marginal seller*, the seller who would leave the market if the price were any lower.

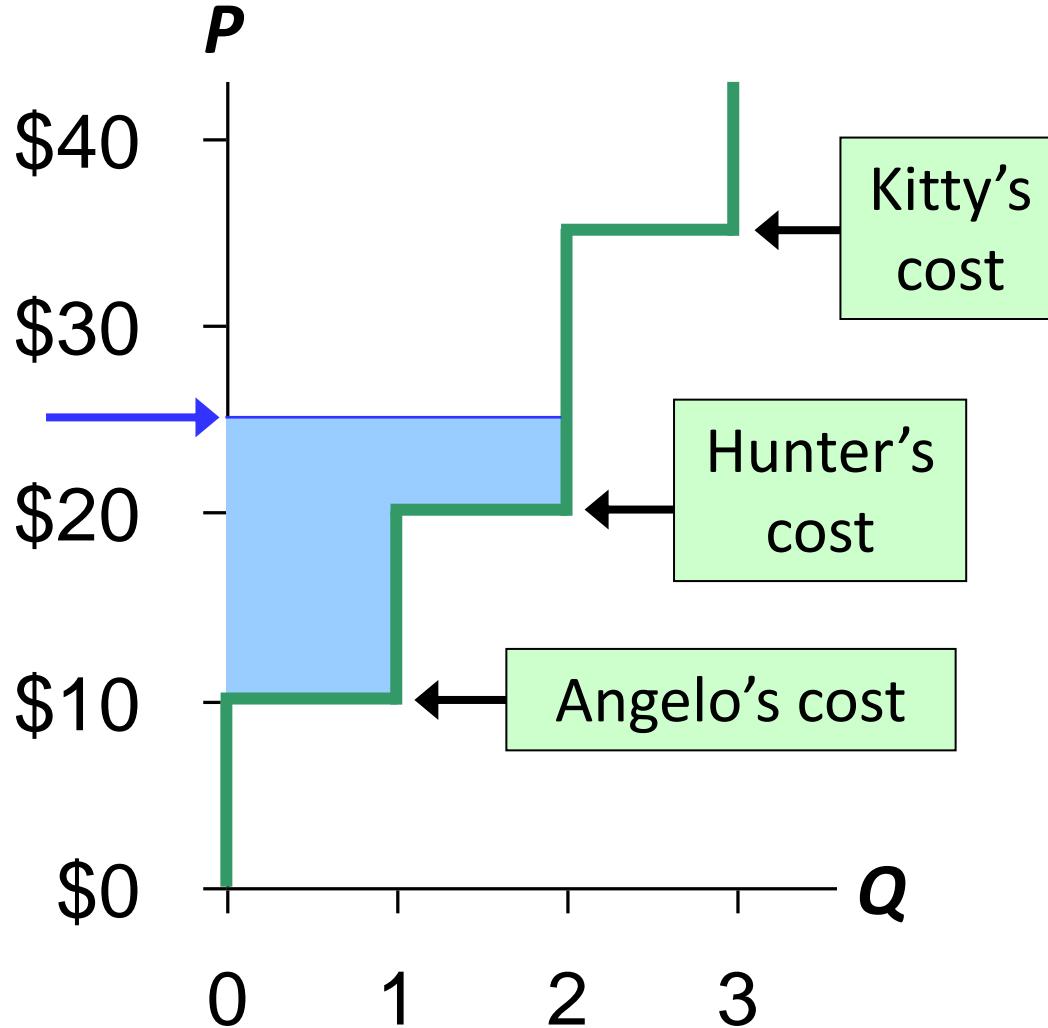
Producer Surplus



$$PS = P - \text{cost}$$

Producer surplus (PS): the amount a seller is paid for a good minus the seller's cost.

Producer Surplus and the S Curve



$$PS = P - \text{cost}$$

Suppose $P = \$25$.

Angelo's PS = \$15

Hunter's PS = \$5

Kitty's PS = \$0

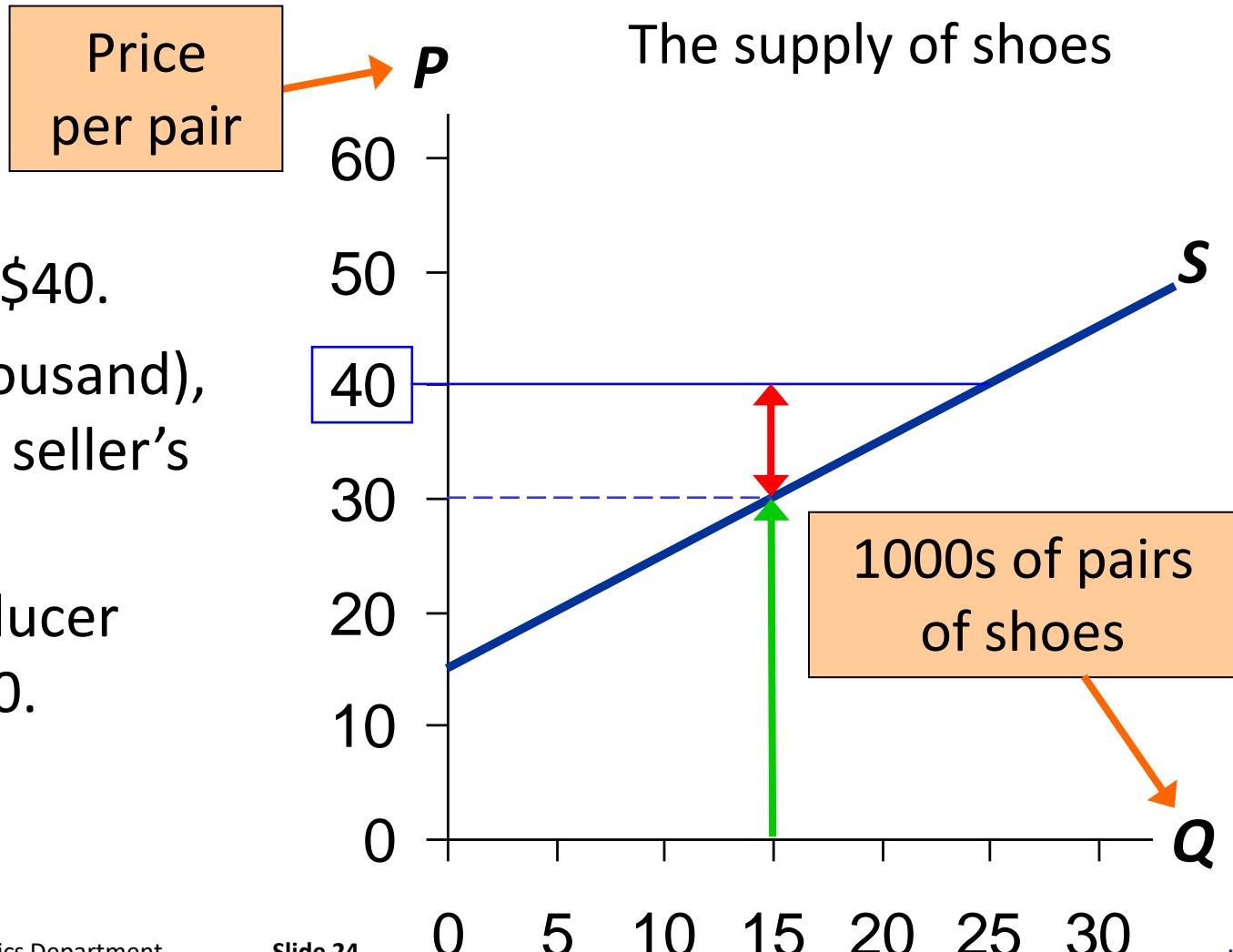
Total PS = \$20

Total PS equals the area above the supply curve under the price, from 0 to Q .

PS with Lots of Sellers & a Smooth S Curve

Suppose $P = \$40$.

At $Q = 15$ (thousand),
the marginal seller's
cost is $\$30$,
and her producer
surplus is $\$10$.



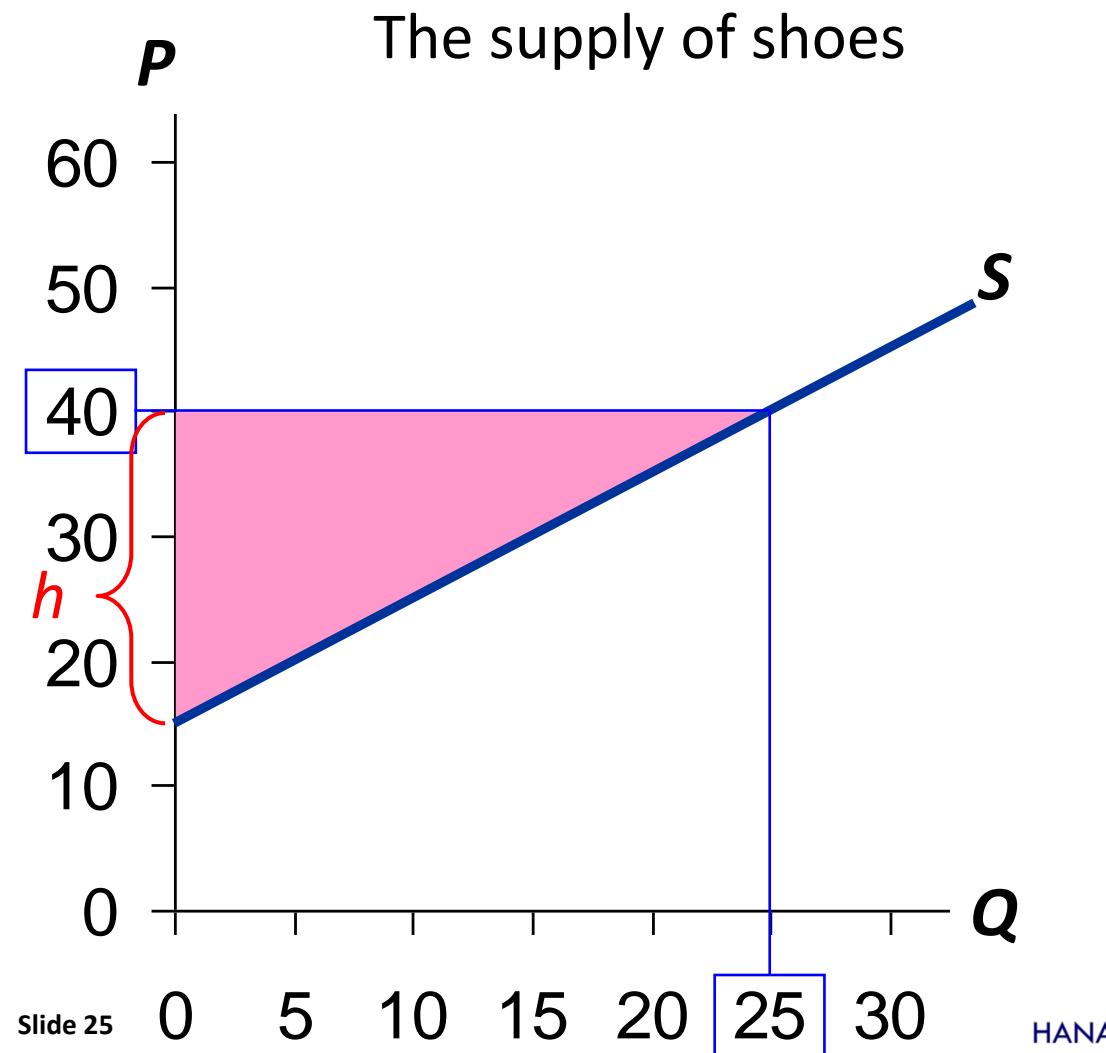
PS with Lots of Sellers & a Smooth S Curve

PS is the area b/w P and the S curve, from 0 to Q .

The height of this triangle is
 $\$40 - 15 = \25 .

So,

$$\begin{aligned} \text{PS} &= \frac{1}{2} \times b \times h \\ &= \frac{1}{2} \times 25 \times \$25 \\ &= \$312.5 \end{aligned}$$



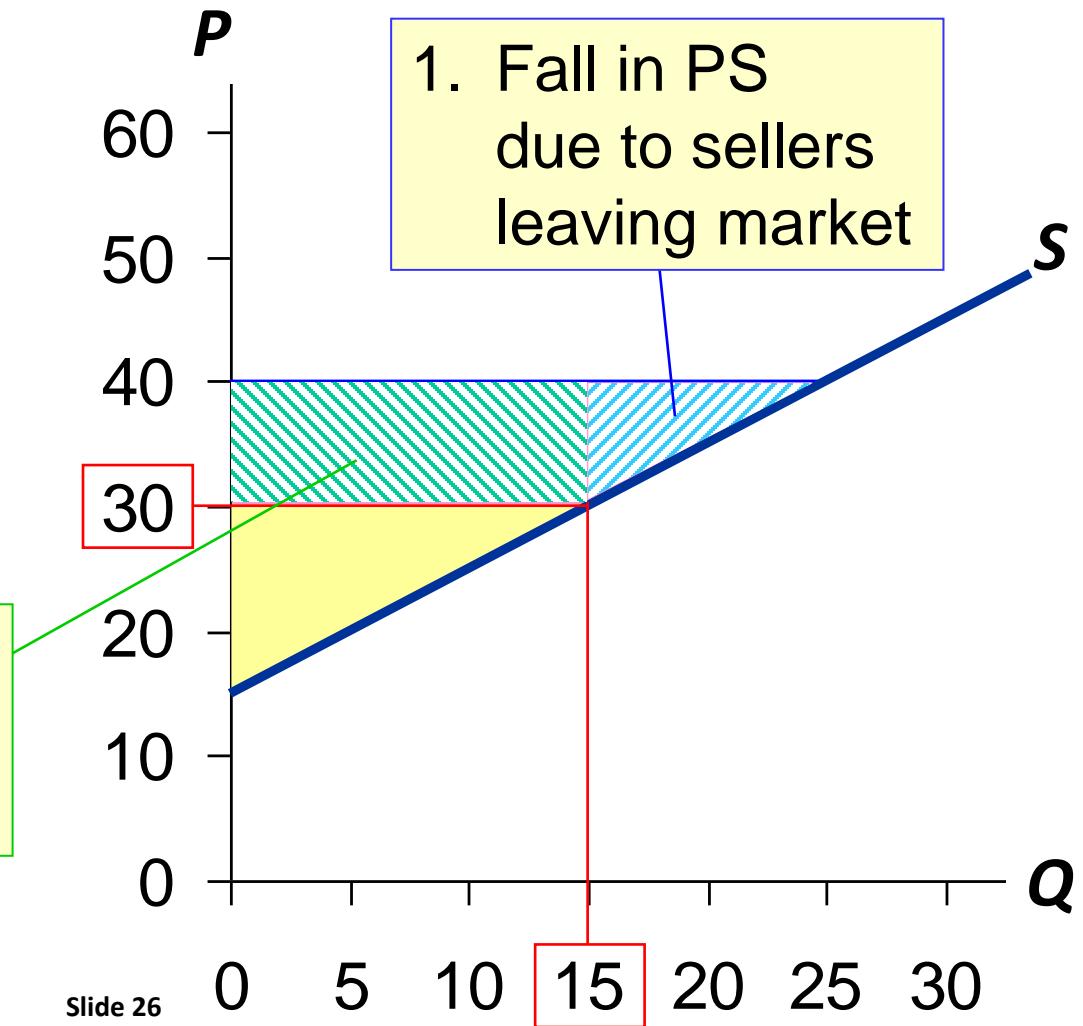
How a Lower Price Reduces PS

If P falls to \$30,

$$\begin{aligned} \text{PS} &= \frac{1}{2} \times 15 \times \$15 \\ &= \$112.5 \end{aligned}$$

Two reasons for the fall in PS.

2. Fall in PS due to remaining sellers getting lower P



What Do CS, PS, and Total Surplus Measure?

CS = (value to buyers) – (amount paid by buyers)

CS measures the benefit buyers receive from participating in the market.

PS = (amount received by sellers) – (cost to sellers)

PS measures the benefit sellers receive from participating in the market.

Total surplus = CS + PS

TS measures the total gains from trade in a market.

The Market's Allocation of Resources

- In a market economy, the allocation of resources is decentralized, determined by the interactions of many self-interested buyers and sellers.
- Is the market's allocation of resources desirable? Or would a different allocation of resources make society better off?
- To answer this, we use total surplus as a measure of society's well-being.

Measuring Society's Well-Being

Total surplus

$$= CS + PS$$

$$\begin{aligned} &= (\text{value to buyers}) - \cancel{(\text{amount paid by buyers})} \\ &\quad + \cancel{(\text{amount received by sellers})} - (\text{cost to sellers}) \end{aligned}$$

$$= (\text{value to buyers}) - (\text{cost to sellers})$$

Efficiency

$$\text{Total surplus} = (\text{value to buyers}) - (\text{cost to sellers})$$

An allocation of resources is **efficient** if it maximizes total surplus. Efficiency means:

- Raising or lowering the quantity of a good would not increase total surplus.
- The goods are being produced by the producers with lowest cost.
- The goods are being consumed by the buyers who value them most highly.



Efficiency

Total surplus = (value to buyers) – (cost to sellers)

- Efficiency means making the pie as big as possible.
- In contrast, **equity** refers to whether the pie is divided fairly.
- What's "fair" is subjective, harder to evaluate.
- Hence, we focus on efficiency as the goal, even though policymakers in the real world usually care about equity, too.

Evaluating the Market Equilibrium

Market eq'm:

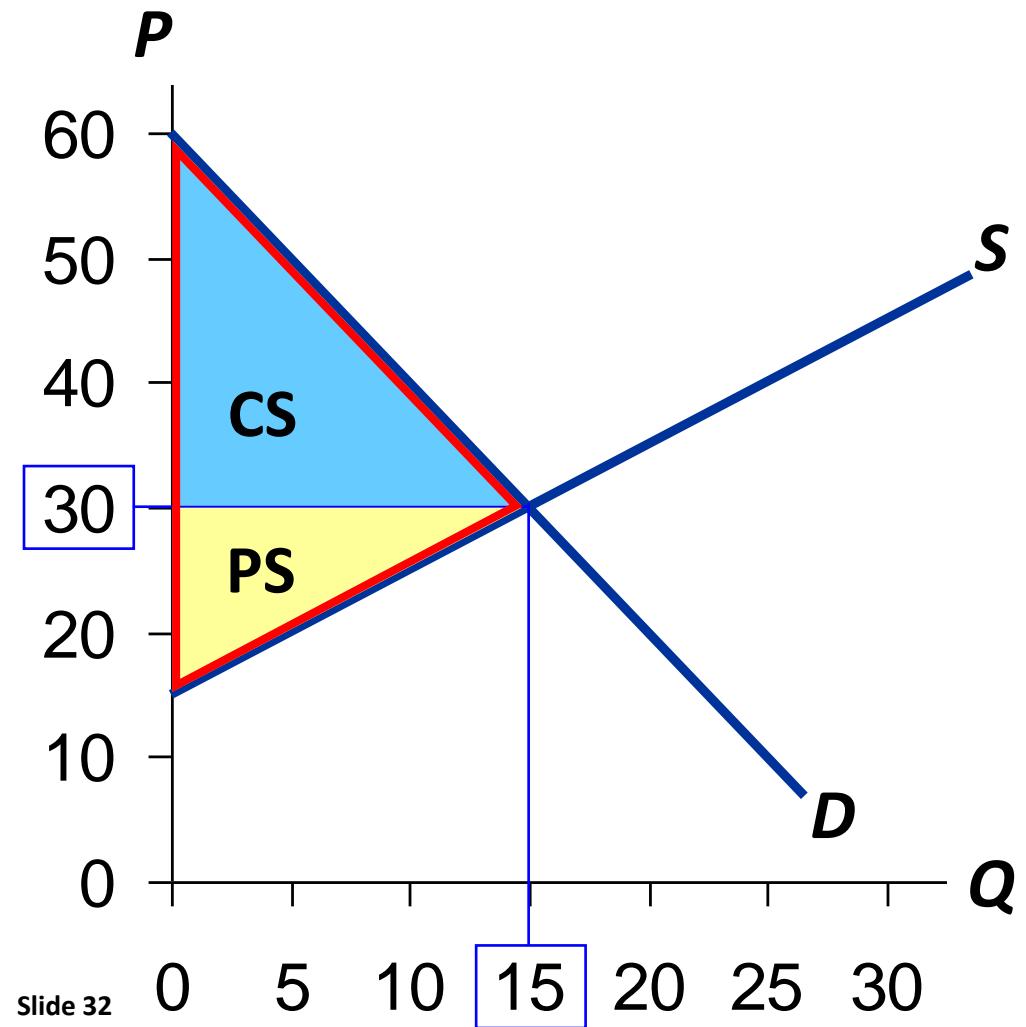
$$P = \$30$$

$$Q = 15,000$$

Total surplus

$$= CS + PS$$

Is the market eq'm
efficient?

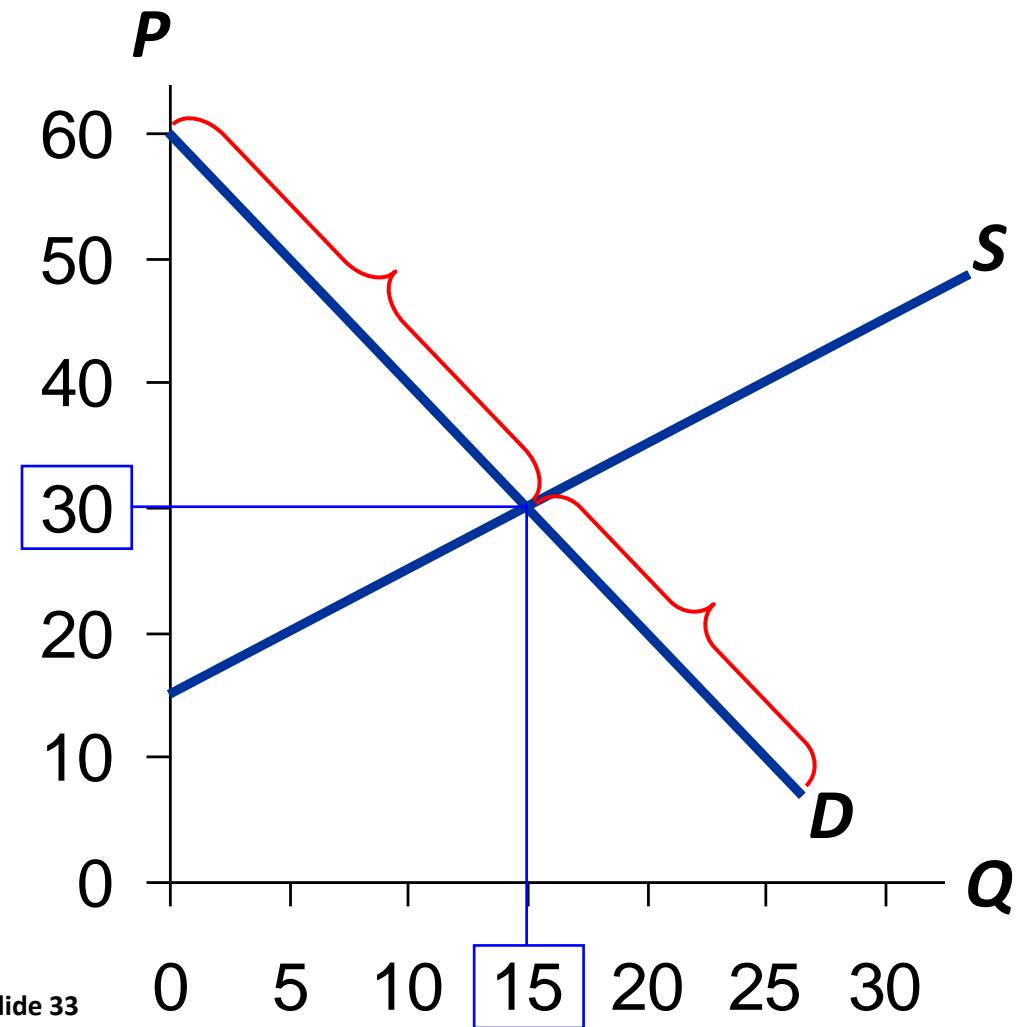


Which Buyers Get to Consume the Good?

Every buyer
whose WTP is
 $\geq \$30$ will buy.

Every buyer
whose WTP is
 $< \$30$ will not.

So, the buyers who
value the good most
highly are the ones
who consume it.

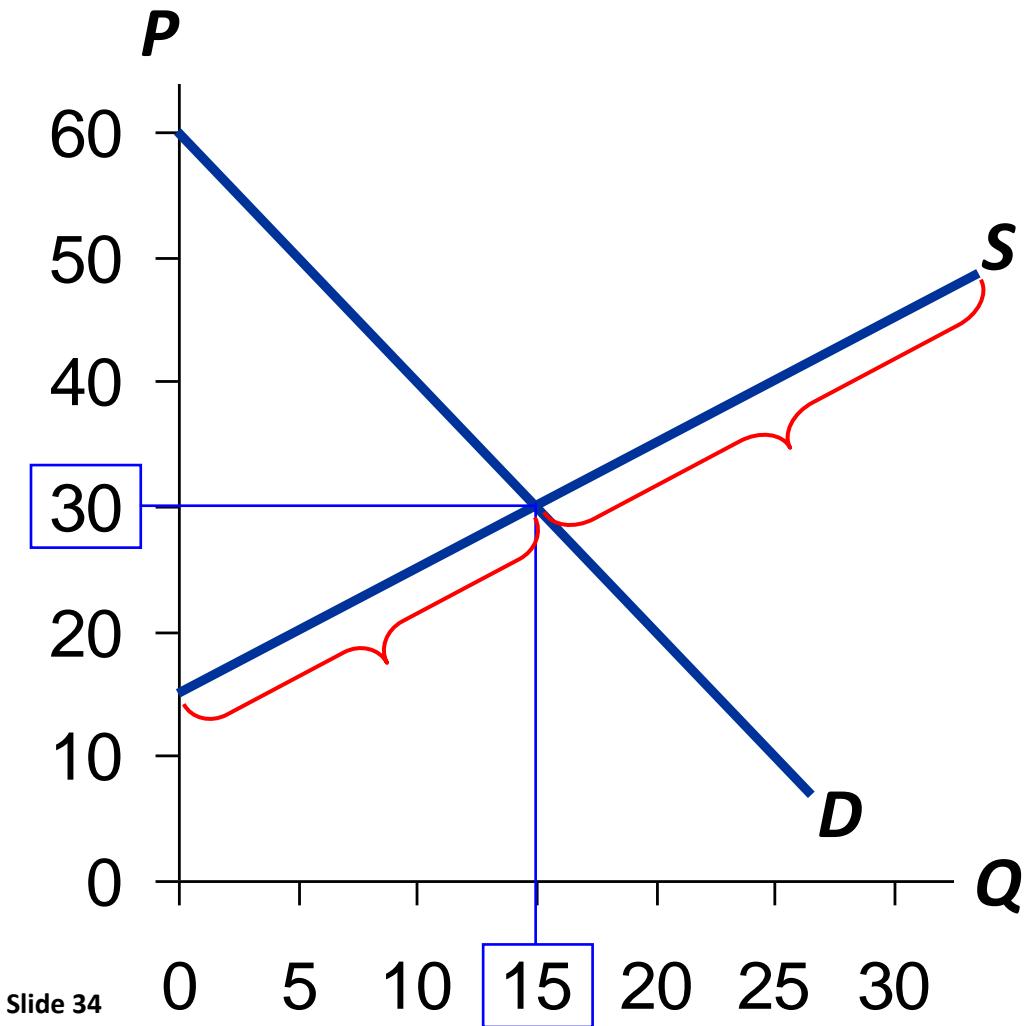


Which Sellers Produce the Good?

Every seller whose cost is $\leq \$30$ will produce the good.

Every seller whose cost is $> \$30$ will not.

Hence, the sellers with the lowest cost produce the good.



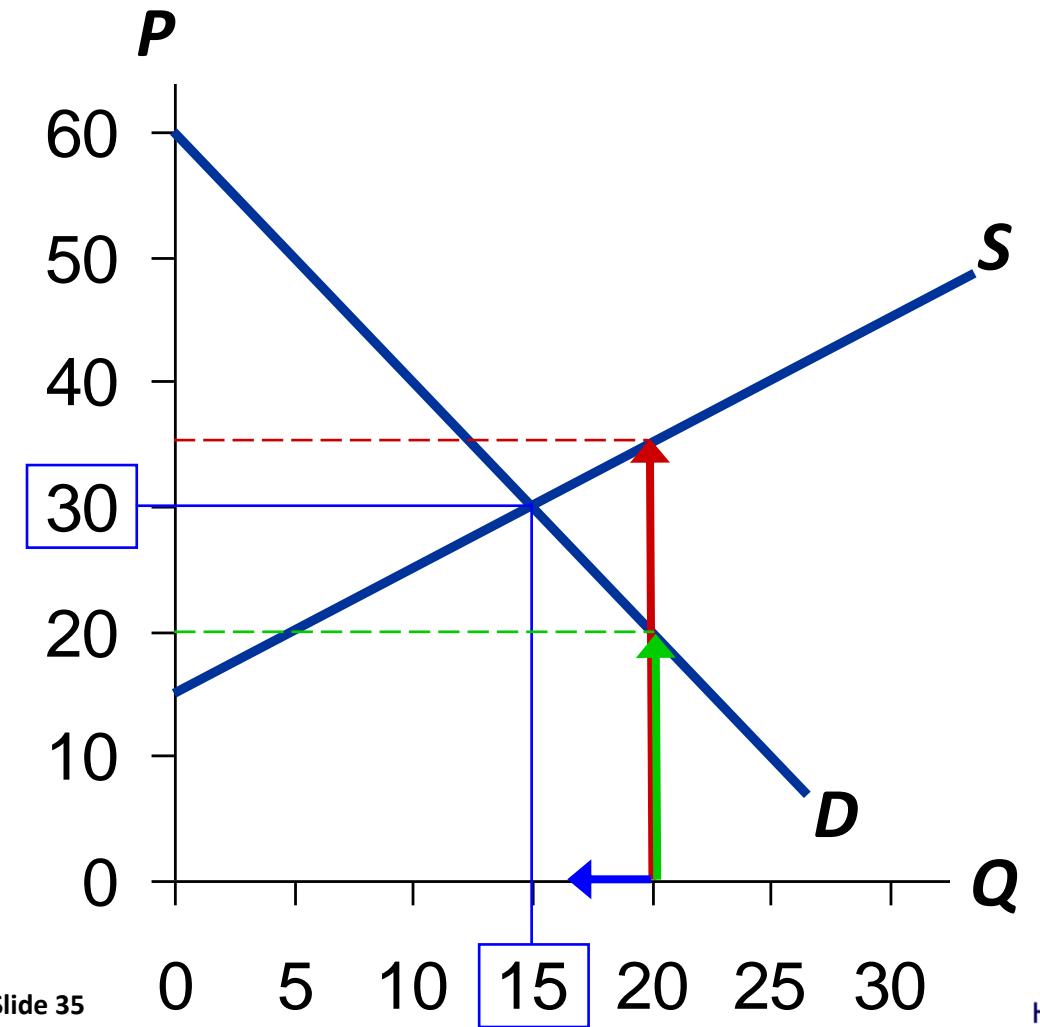
Does Eq'm Q Maximize Total Surplus?

At $Q = 20$,
cost of producing
the marginal unit
is \$35.

Value to consumers
of the marginal unit
is only \$20.

Hence, can increase
total surplus
by reducing Q .

*This is true at any Q
greater than 15.*



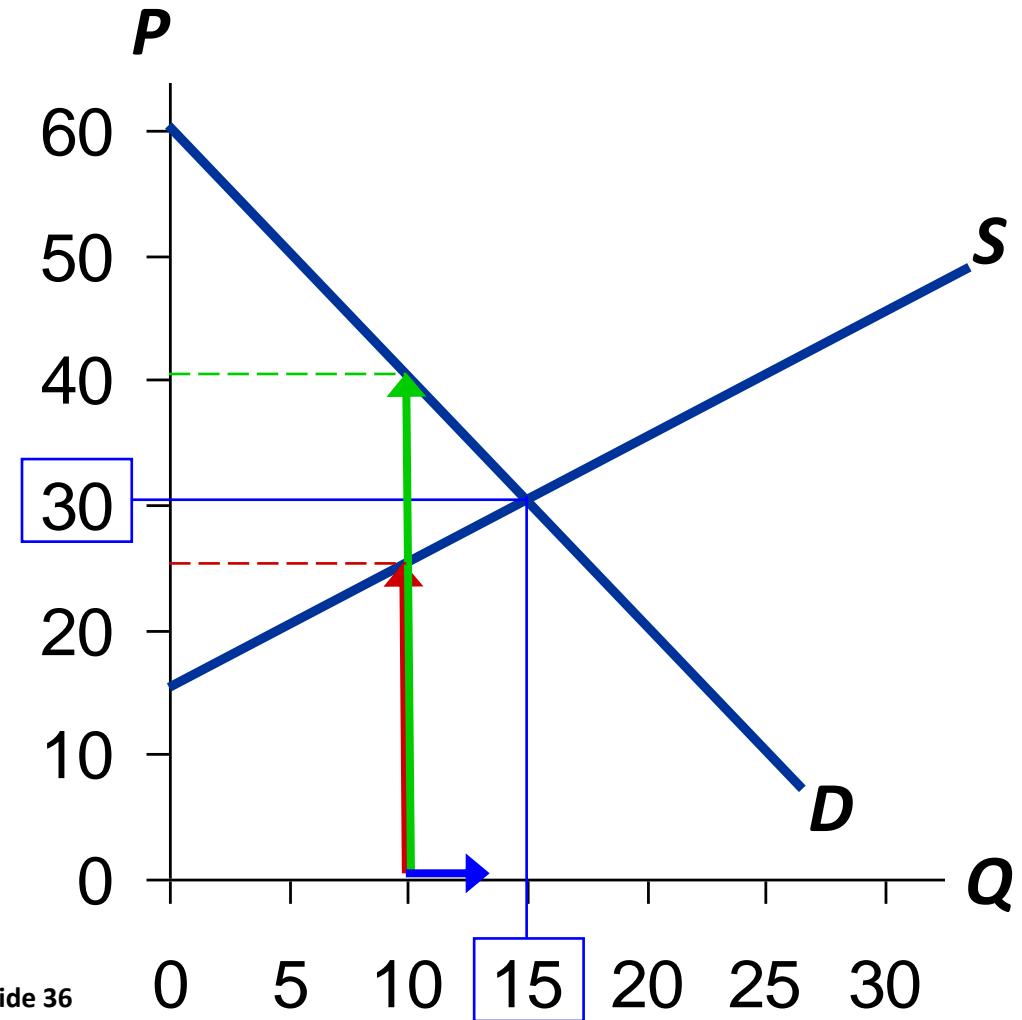
Does Eq'm Q Maximize Total Surplus?

At $Q = 10$,
cost of producing
the marginal unit
is \$25

Value to consumers
of the marginal unit
is \$40

Hence, can increase
total surplus
by increasing Q .

This is true at any Q less than 15.



Evaluating the Market Eq'm: Summary

The market eq'm is efficient:

- The eq'm Q maximizes total surplus.
- The goods are produced by the producers with lowest cost,
- and consumed by the buyers who value them most highly.

The govt cannot improve on the market outcome.

Laissez faire (French for “allow them to do”):

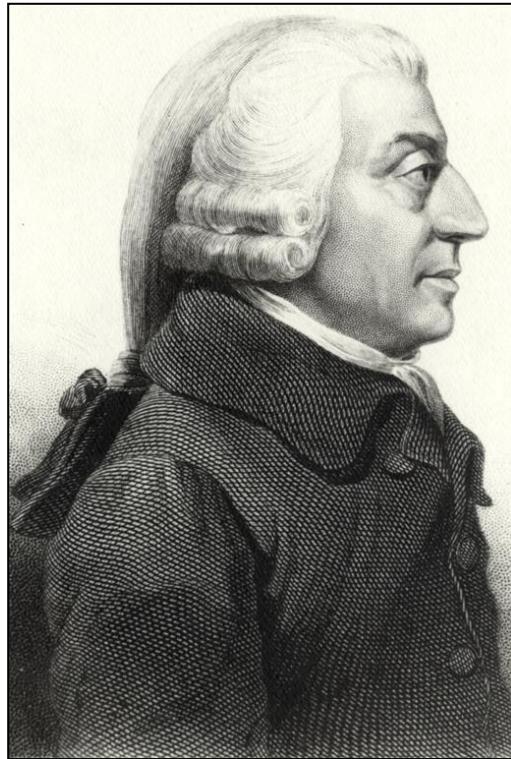
the govt should not interfere with the market.

Why Non-Market Allocations Are Usually Bad

- Suppose the allocation of resources were instead determined by a central planner (e.g., the Communist leaders of the former Soviet Union.)
- To choose an efficient allocation, the planner would need to know every seller's cost and every buyer's WTP, for each of the thousands of goods produced in the economy.
- This is practically impossible, so centrally planned economies are never very efficient.

Adam Smith and the Invisible Hand

Passages from *The Wealth of Nations*, 1776



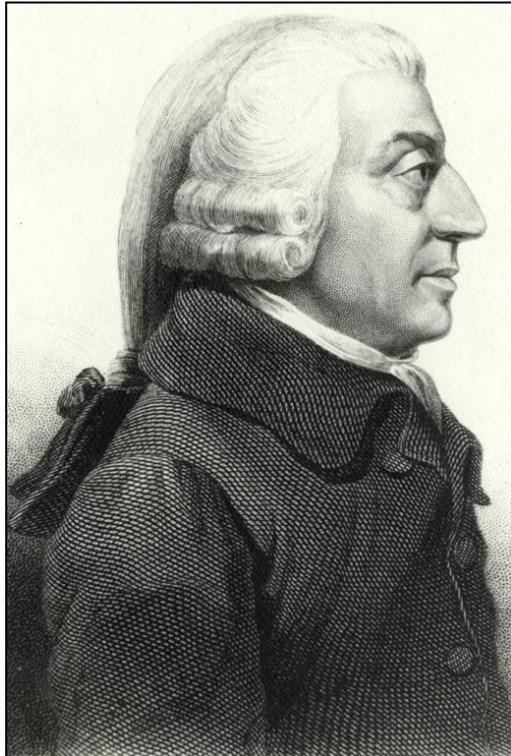
Adam Smith,
1723-1790

“Man has almost constant occasion for the help of his brethren, and it is vain for him to expect it from their benevolence only.

He will be more likely to prevail if he can interest their self-love in his favor, and show them that it is for their own advantage to do for him what he requires of them... It is not from the benevolence of the butcher, the brewer, or the baker that we expect our dinner, but from their regard to their own interest....

Adam Smith and the Invisible Hand

Passages from *The Wealth of Nations*, 1776



Adam Smith,
1723-1790

“Every individual...neither intends to promote the public interest, nor knows how much he is promoting it.... He intends only his own gain, and he is in this, as in many other cases, led by **an invisible hand** to promote an end which was no part of his intention. Nor is it always the worse for the society that it was no part of it. By pursuing his own interest he frequently promotes that of the society more effectually than when he really intends to promote it.”

CONCLUSION

- This chapter used welfare economics to demonstrate one of the Ten Principles:
Markets are usually a good way to organize economic activity.
- But we assumed markets are perfectly competitive.
- In the real world, sometimes there are **market failures**, when unregulated markets fail to allocate resources efficiently. Causes:
 - **market power** – a single buyer or seller can influence the market price, e.g. monopoly
 - **externalities** – side effects of transactions, e.g. pollution

CONCLUSION

- When markets fail, public policy may remedy the problem and increase efficiency.
- Welfare economics sheds light on market failures and govt policies.
- Despite the possibility of market failure, the assumptions in this chapter work well in many markets, and the invisible hand remains extremely important.

CHAPTER SUMMARY

- The height of the **D** curve reflects the value of the good to buyers—their willingness to pay for it.
- Consumer surplus is the difference between what buyers are willing to pay for a good and what they actually pay.
- On the graph, consumer surplus is the area between **P** and the **D** curve.

CHAPTER SUMMARY

- The height of the **S** curve is sellers' cost of producing the good. Sellers are willing to sell if the price they get is at least as high as their cost.
- Producer surplus is the difference between what sellers receive for a good and their cost of producing it.
- On the graph, producer surplus is the area between **P** and the **S** curve.

CHAPTER SUMMARY

- To measure of society's well-being, we use total surplus, the sum of consumer and producer surplus.
- Efficiency means that total surplus is maximized, that the goods are produced by sellers with lowest cost, and that they are consumed by buyers who most value them.
- Under perfect competition, the market outcome is efficient. Altering it would reduce total surplus.

ECON 101: INTRODUCTION TO ECONOMICS I

Lecture 6 – The Theory of Consumer Choice

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UNIVERSITY OF GHANA

**Department of Economics
School of Social Studies
2021/2022**

Lecture Overview

- We are in this lecture introduced to a number of concepts that relate to the decisions that we take on a daily basis in demanding products and services
- These include a budget constraint (how much you have to spend) , preferences (what you want), optimization (what you actually choose to consume)
- We will consider the effect of an income increase and then the effect of a price increase on what you actually consume. This introduces us to the concepts of income and substitution effect



Learning Outcomes

- By the end of the lecture, you should be able to:
 - Demonstrate the income and substitution effects of a price change for various types of goods
 - Derive the demand curve for a consumer based on optimization behavior
 - Use the theory of consumer choice to explain decisions such as how much a consumer saves, or how much labor she supplies?
- The lecture will be based on **Mankiw, G. (2012)**. Principles of Economics (6th Edition), South Western.
 - **Chapter 21**



Introduction

- Recall one of the Ten Principles from Lecture 1:
People face tradeoffs.
 - Buying more of one good leaves less income to buy other goods.
 - Working more hours means more income and more consumption, but less leisure time.
 - Reducing saving allows more consumption today but reduces future consumption.
- Today's lecture explores how consumers make choices like these.



The Budget Constraint: What the Consumer Can Afford

- Example:
Yaa divides her income between two goods: fish and mangos.
- A “consumption bundle” is a particular combination of the goods, e.g., 40 fish & 300 mangos.
- **Budget constraint:** the limit on the consumption bundles that a consumer can afford

Activity 1

The budget constraint

Yaa's income: ₦1200

Prices: $P_F = ₦4$ per fish, $P_M = ₦1$ per mango

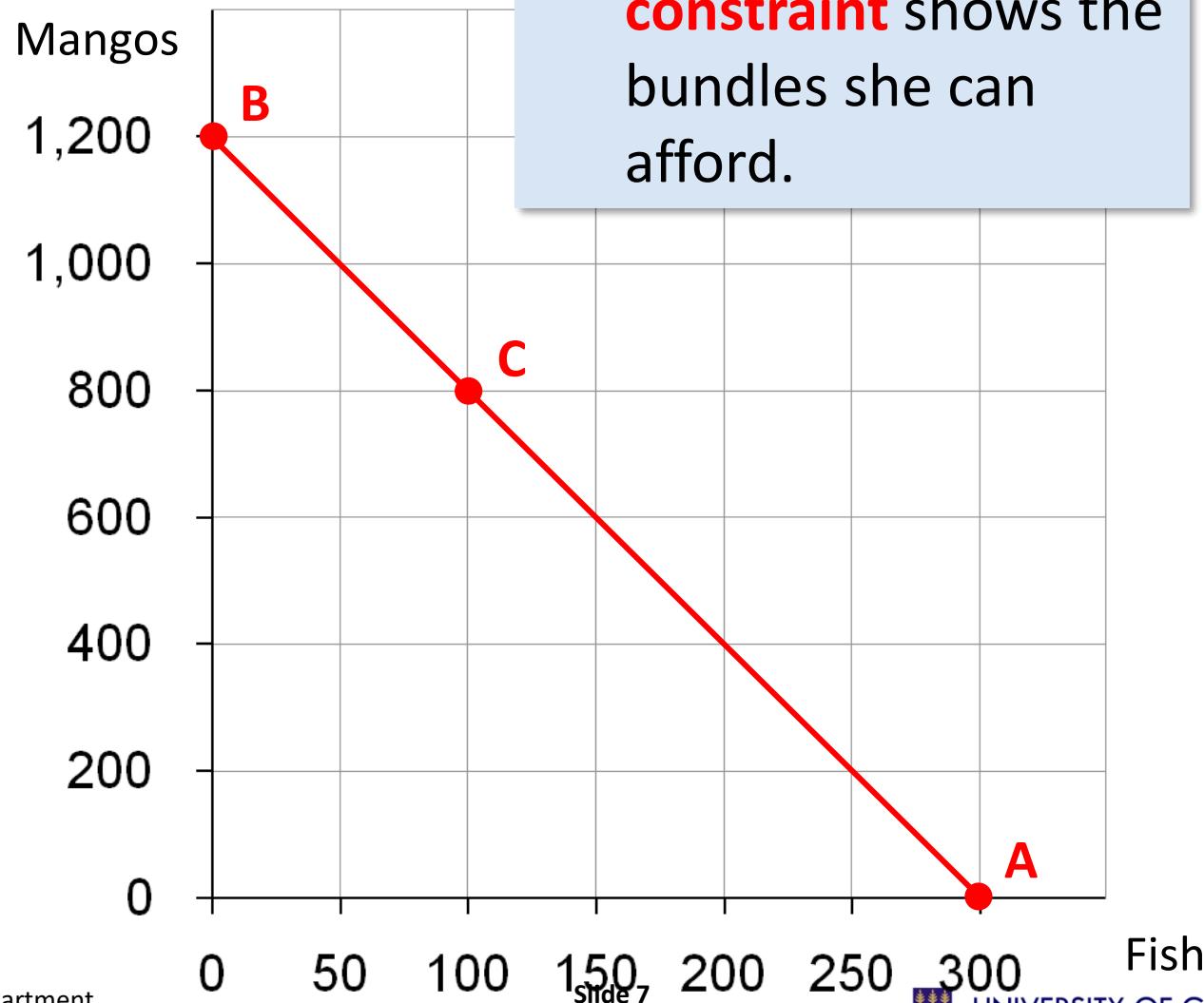
- A.** If Yaa spends all her income on fish,
how many fish does she buy?
- B.** If Yaa spends all her income on mangos,
how many mangos does she buy?
- C.** If Yaa buys 100 fish, how many mangos can she buy?
- D.** Plot each of the bundles from parts A – C on a graph that
measures fish on the horizontal axis and mangos on the
vertical, connect the dots.



Answers

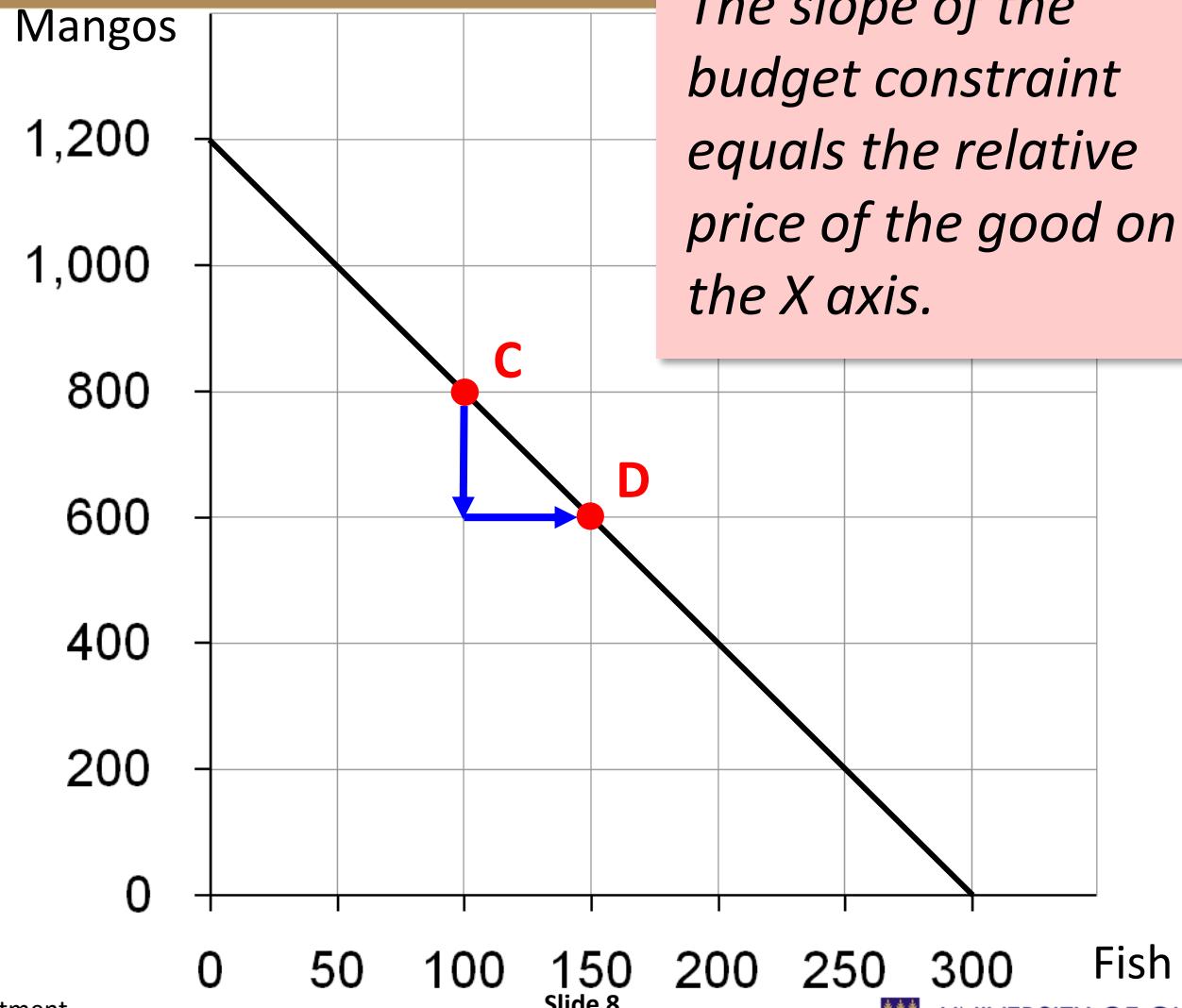
- A. $\text{¢}1200/\text{¢}4$
= 300 fish
- B. $\text{¢}1200/\text{¢}1$
= 1200
mangos
- C. 100 fish
cost ¢400,
¢800 left
buys 800
mangos

D. Yaa's **budget constraint** shows the bundles she can afford.



The Slope of the Budget Constraint

From **C** to **D**,
“rise” =
-200 mangos
“run” =
+50 fish
Slope = -4
Yaa must
give up
4 mangos
to get one fish.



Activity 2

Budget constraint, *continued*

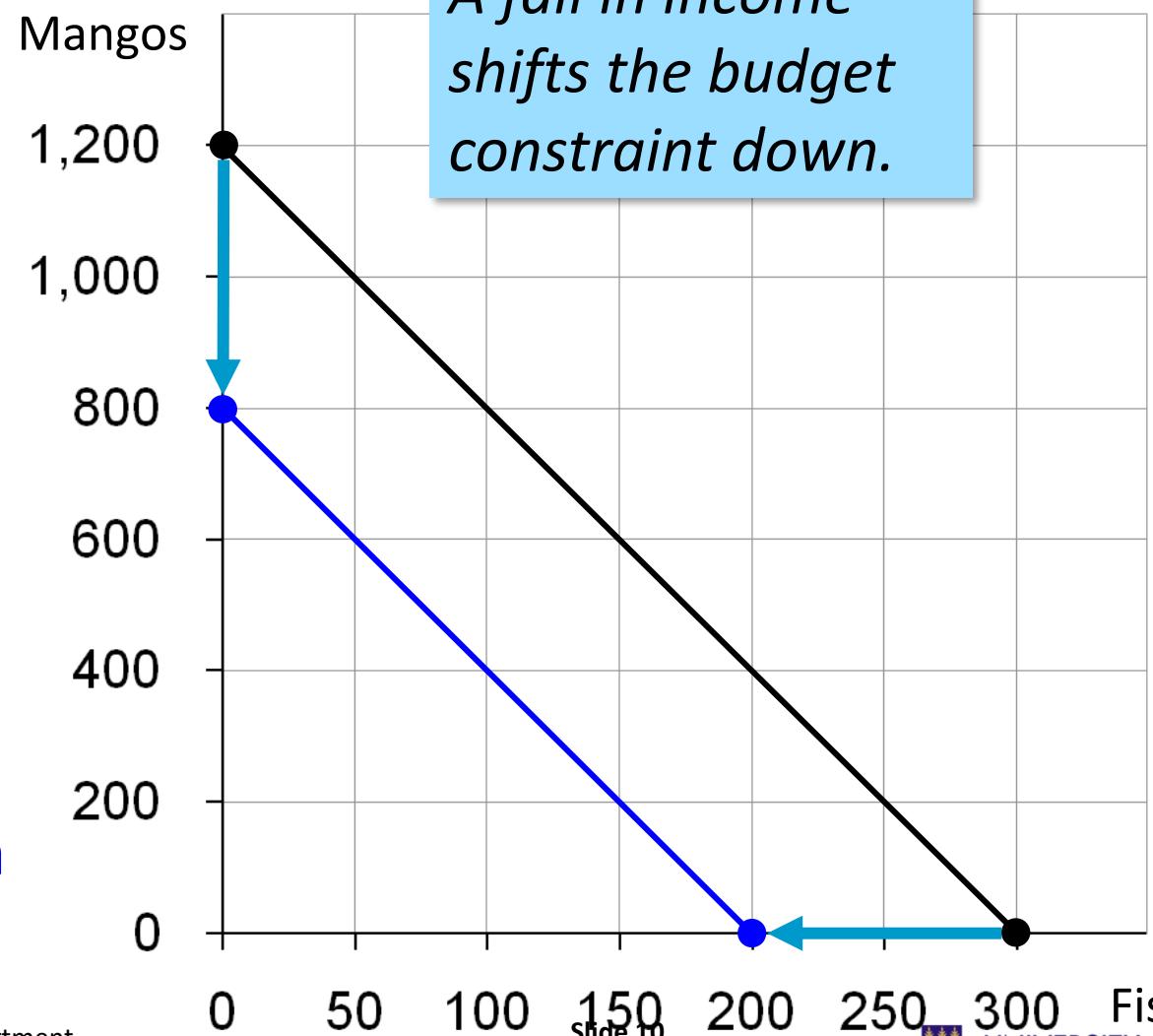
Show what happens to Yaa's budget constraint if:

- A. her income falls to ₦800.
- B. The price of mangos rises to
 $P_M = ₦2$ per mango

Activity 3

Answers, part A

Now,
Yaa
can buy
¢800/¢4
= 200 fish
or
¢800/¢1
= 800 mangos
or any
combination in
between.

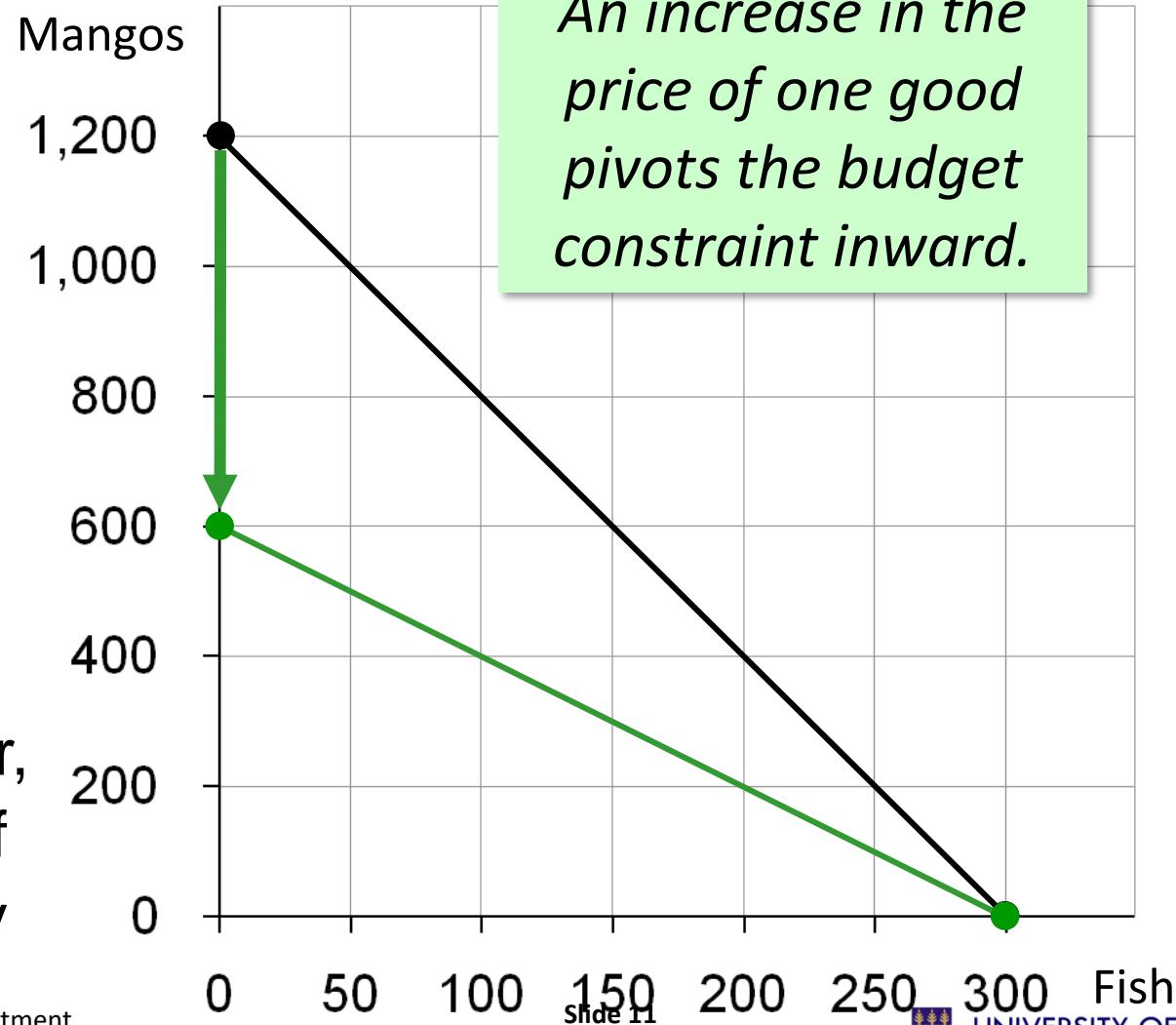


Activity 3 Answers, part B

Yaa
can still buy
300 fish.

But now she
can only buy
 $\text{₵}1200/\text{₵}2 =$
600 mangos.

Notice:
slope is smaller,
relative price of
fish is now only
2 mangos.



*An increase in the
price of one good
pivots the budget
constraint inward.*

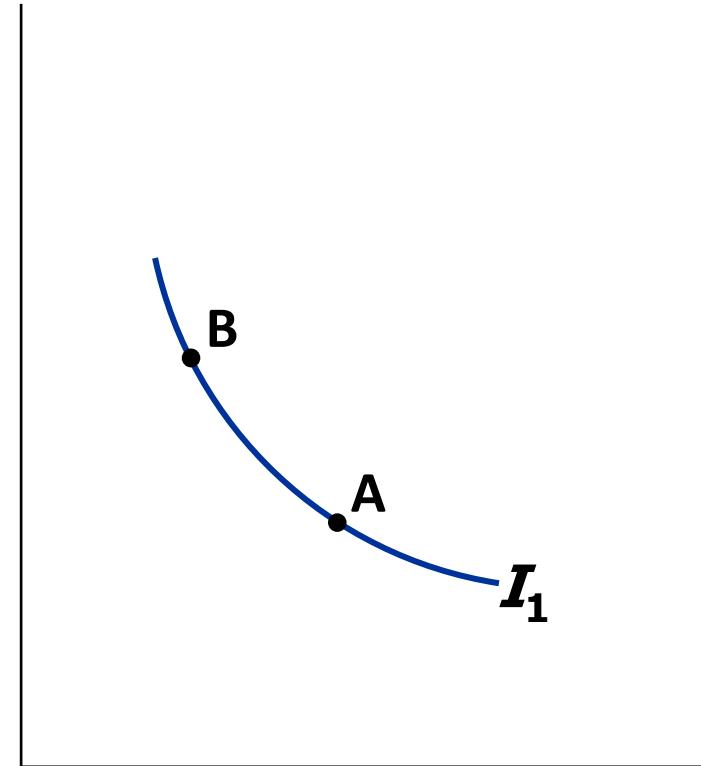
Preferences: What the Consumer Wants

Indifference curve:
shows consumption
bundles that give the
consumer the same
level of satisfaction

A, B, and all other
bundles on I_1 make Yaa
equally happy: she is
indifferent between
them.

Quantity
of Mangos

One of Yaa's
indifference curves



Quantity
of Fish

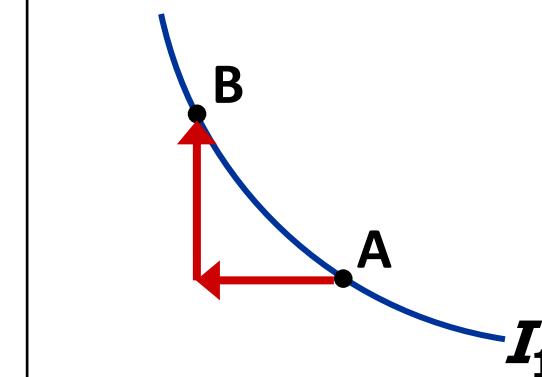
Four Properties of Indifference Curves

1. Indifference curves are downward-sloping.

If the quantity of fish is reduced, the quantity of mangos must be increased to keep Yaa equally happy.

Quantity
of Mangos

One of Yaa's
indifference curves



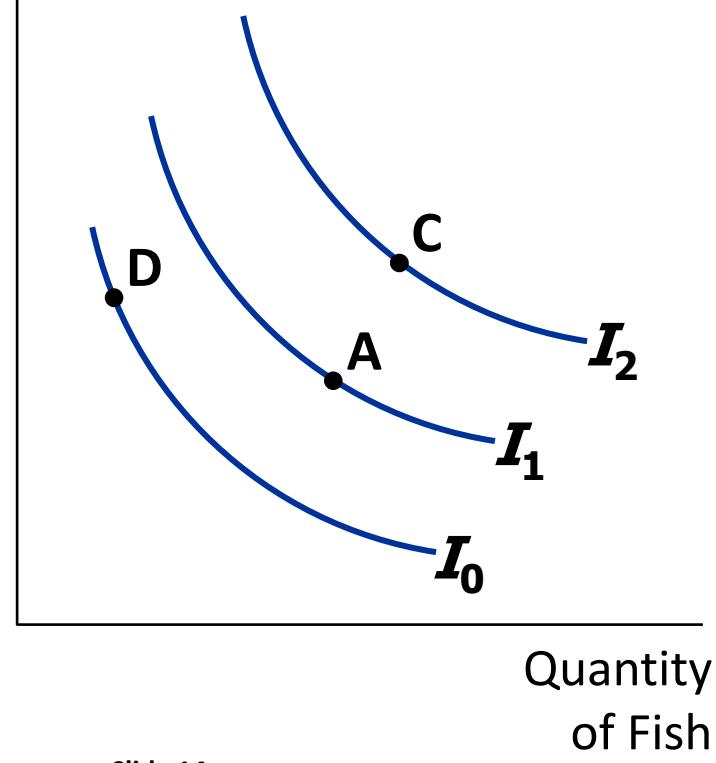
Four Properties of Indifference Curves

- Higher indifference curves are preferred to lower ones.

Yaa prefers every bundle on I_2 (like C) to every bundle on I_1 (like A). She prefers every bundle on I_1 (like A) to every bundle on I_0 (like D).

Quantity
of Mangos

A few of Yaa's
indifference curves



Four Properties of Indifference Curves

3. Indifference curves cannot cross.

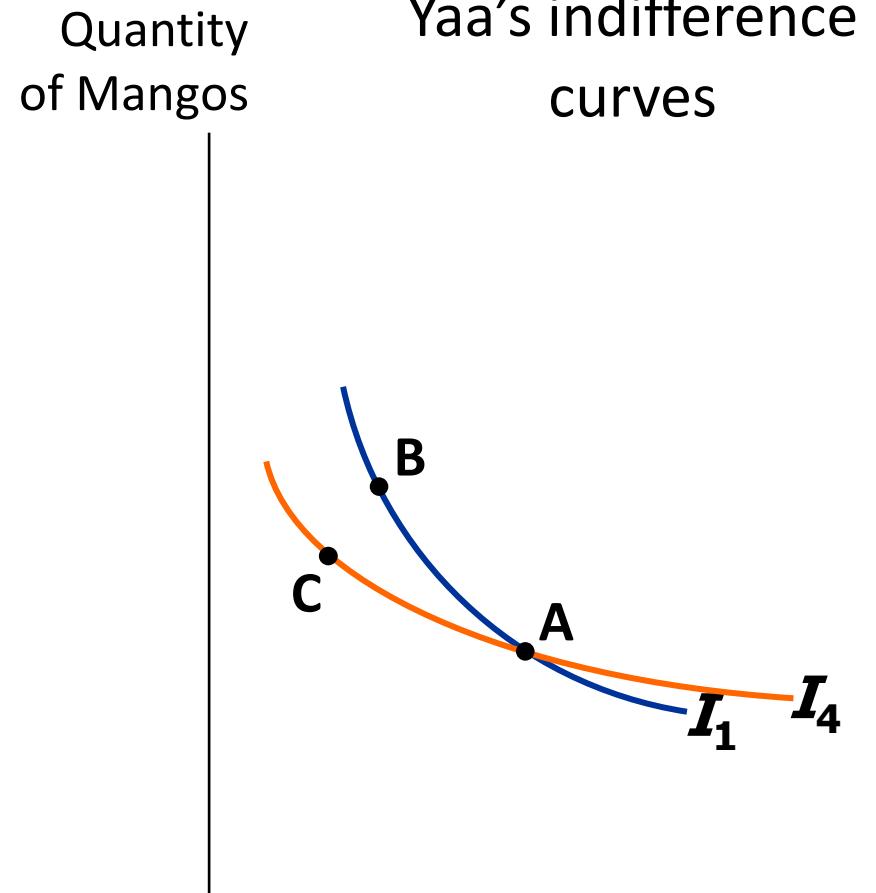
Suppose they did.

Yaa should prefer **B** to **C**, since **B** has more of both goods.

Yet, Yaa is indifferent between **B** and **C**:

she likes **C** as much as **A** (both are on I_4).

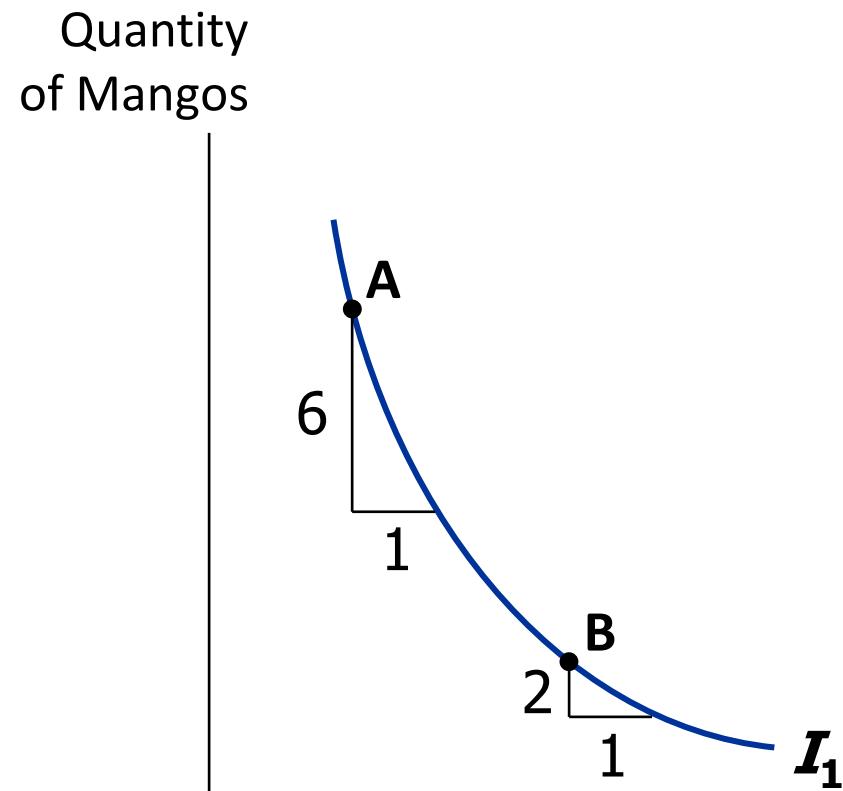
she likes **A** as much as **B** (both are on I_1).



Four Properties of Indifference Curves

- Indifference curves are bowed inward.

Yaa is willing to give up more mangos for a fish if she has few fish (A) than if she has many (B).



The Marginal Rate of Substitution

Marginal rate of substitution (MRS):

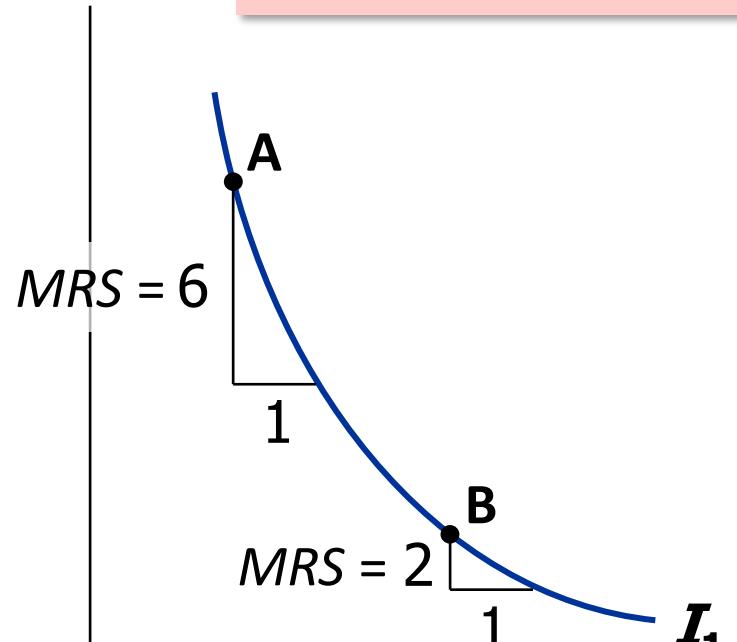
the rate at which a consumer is willing to trade one good for another.

Yaa's MRS is the amount of mangos she would substitute for another fish.

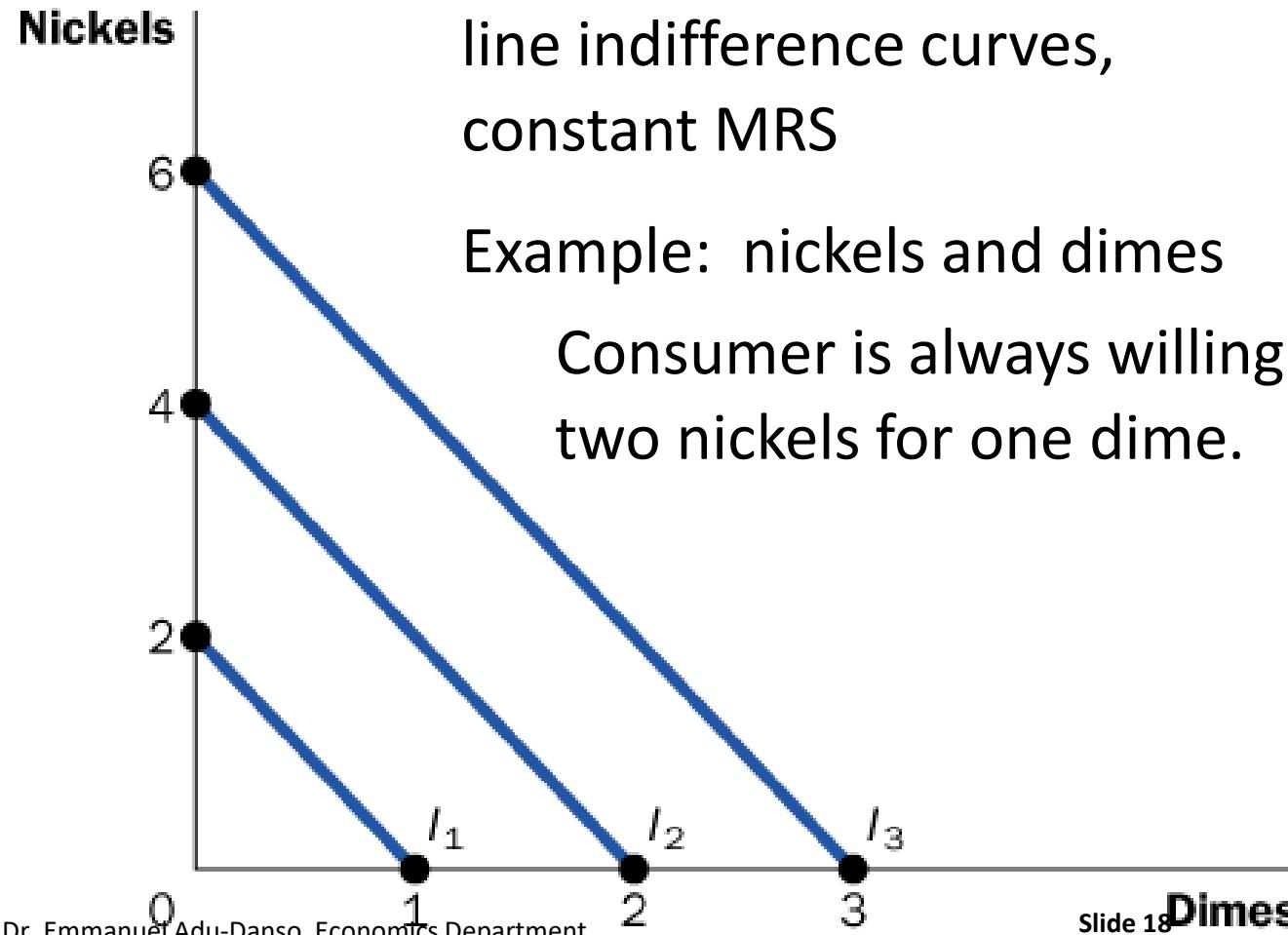
MRS falls as you move down along an indifference curve.

Quantity
of Mangos

MRS = slope of indifference curve



One Extreme Case: Perfect Substitutes



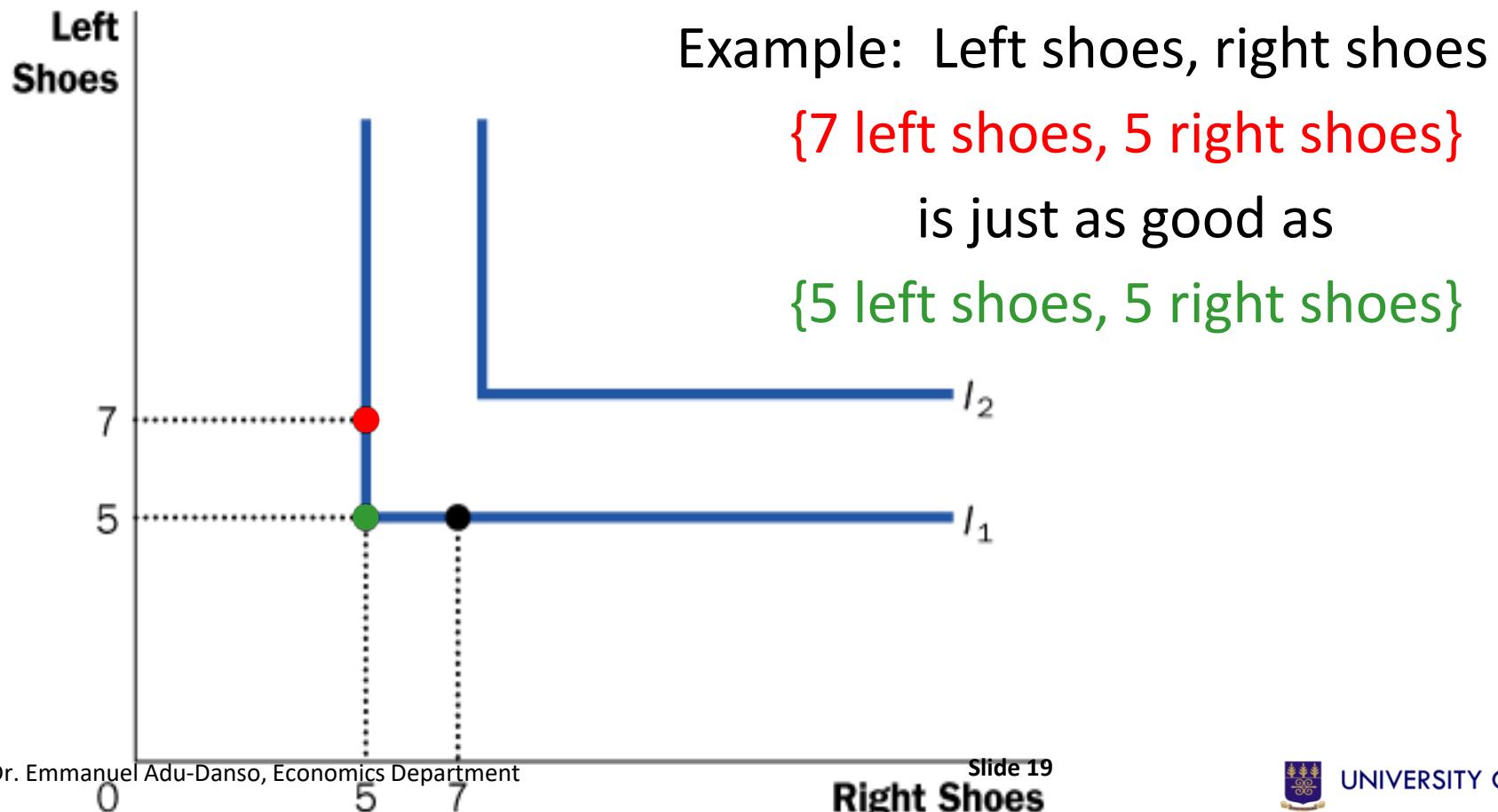
Perfect substitutes: two goods with straight-line indifference curves,
constant MRS

Example: nickels and dimes

Consumer is always willing to trade
two nickels for one dime.

Another Extreme Case: Perfect Complements

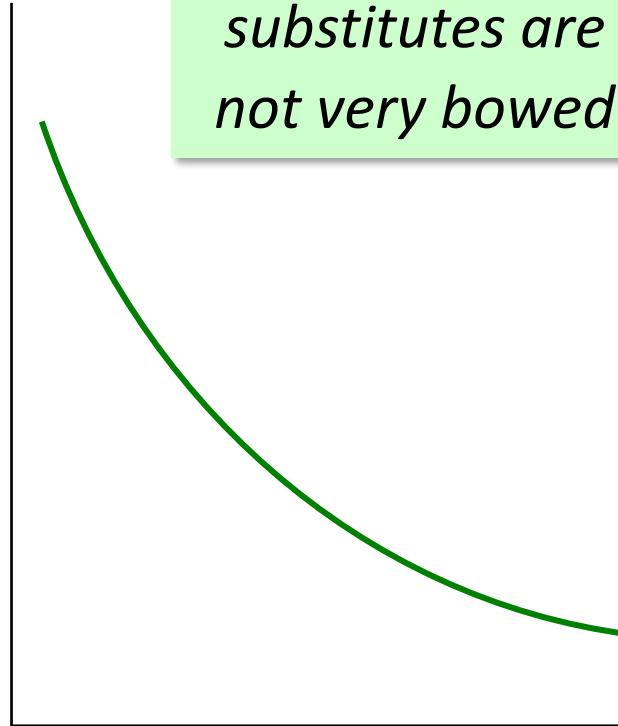
Perfect complements: two goods with right-angle indifference curves



Less Extreme Cases: Close Substitutes and Close Complements

Quantity
of Pepsi

*Indifference
curves for close
substitutes are
not very bowed*



Quantity
of hot dog
buns

*Indifference
curves for
close
complements
are very bowed*

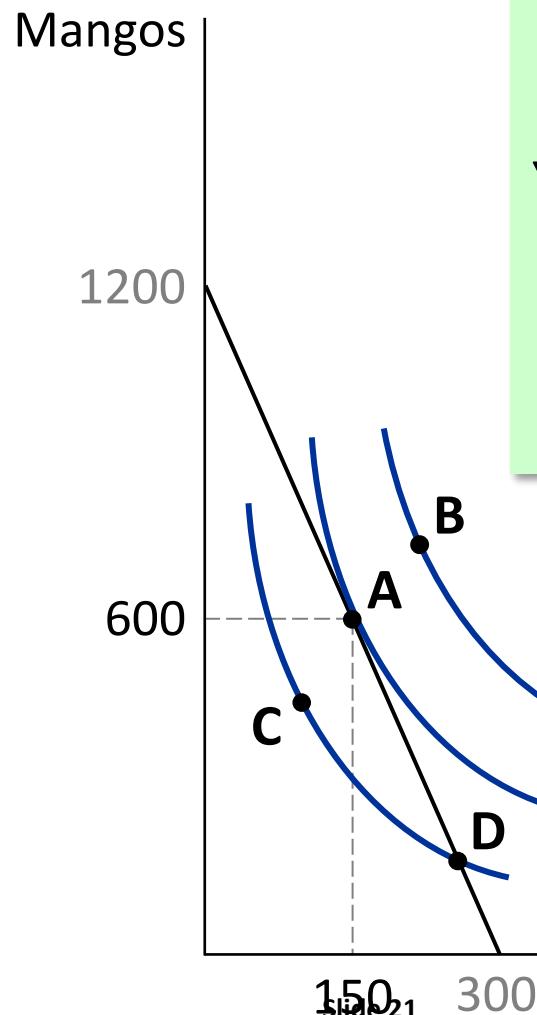


Optimization: What the Consumer Chooses

A is the *optimum*:
the point on the
budget constraint
that touches the
highest possible
indifference curve.

Yaa prefers **B** to **A**, but
she cannot afford **B**.

Yaa can afford **C** and
D,
but **A** is on a higher
indifference curve.



The optimum
is the bundle
Yaa most prefers
out of all the
bundles she can
afford.

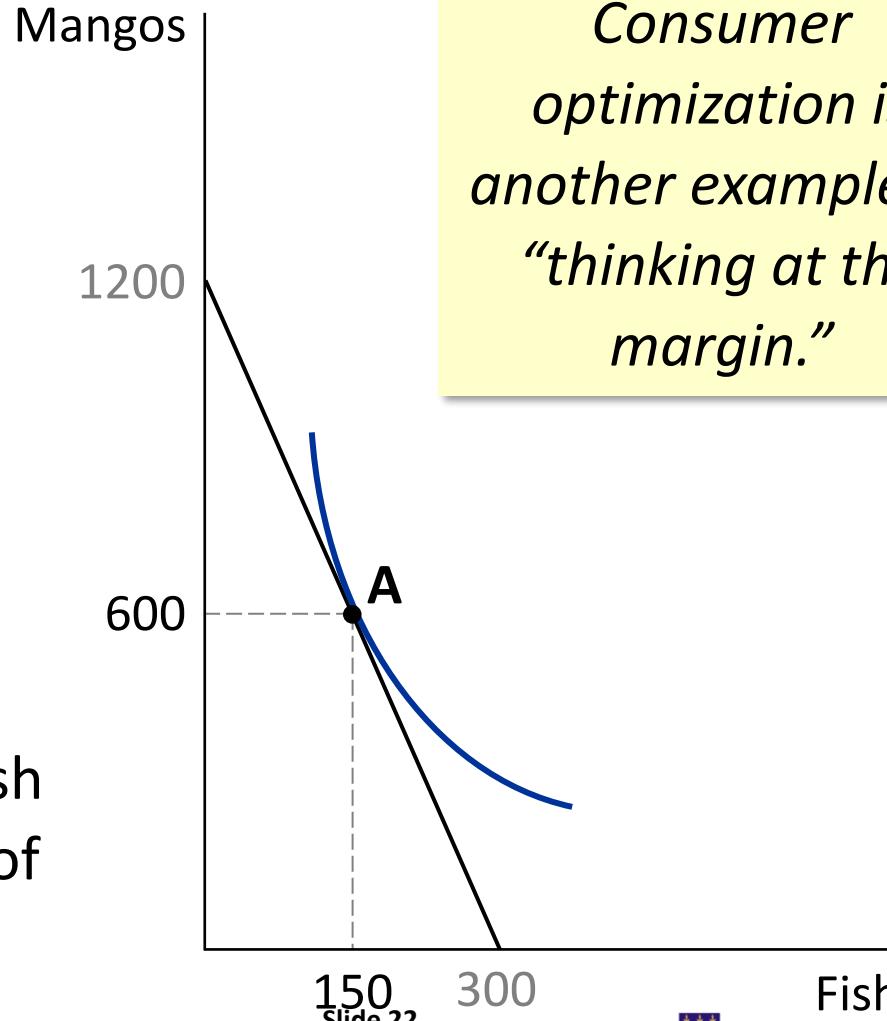
Optimization: What the Consumer Chooses

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

$$MRS = P_F/P_M$$

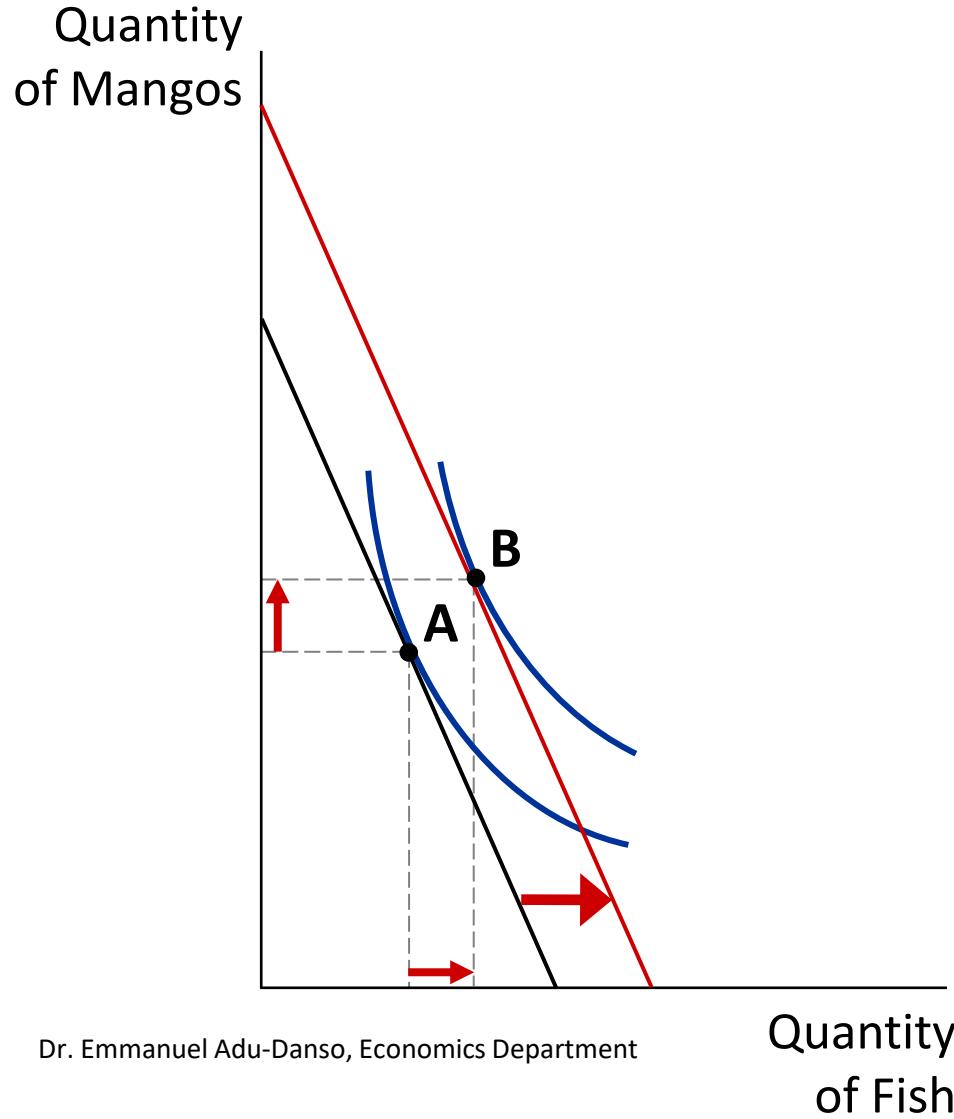
/
marginal
value of fish
(in terms of
mangos)

price of fish
(in terms of
mangos)



*Consumer
optimization is
another example of
“thinking at the
margin.”*

The Effects of an Increase in Income



An increase in income shifts the budget constraint outward.

If both goods are “normal,” Yaa buys more of each.

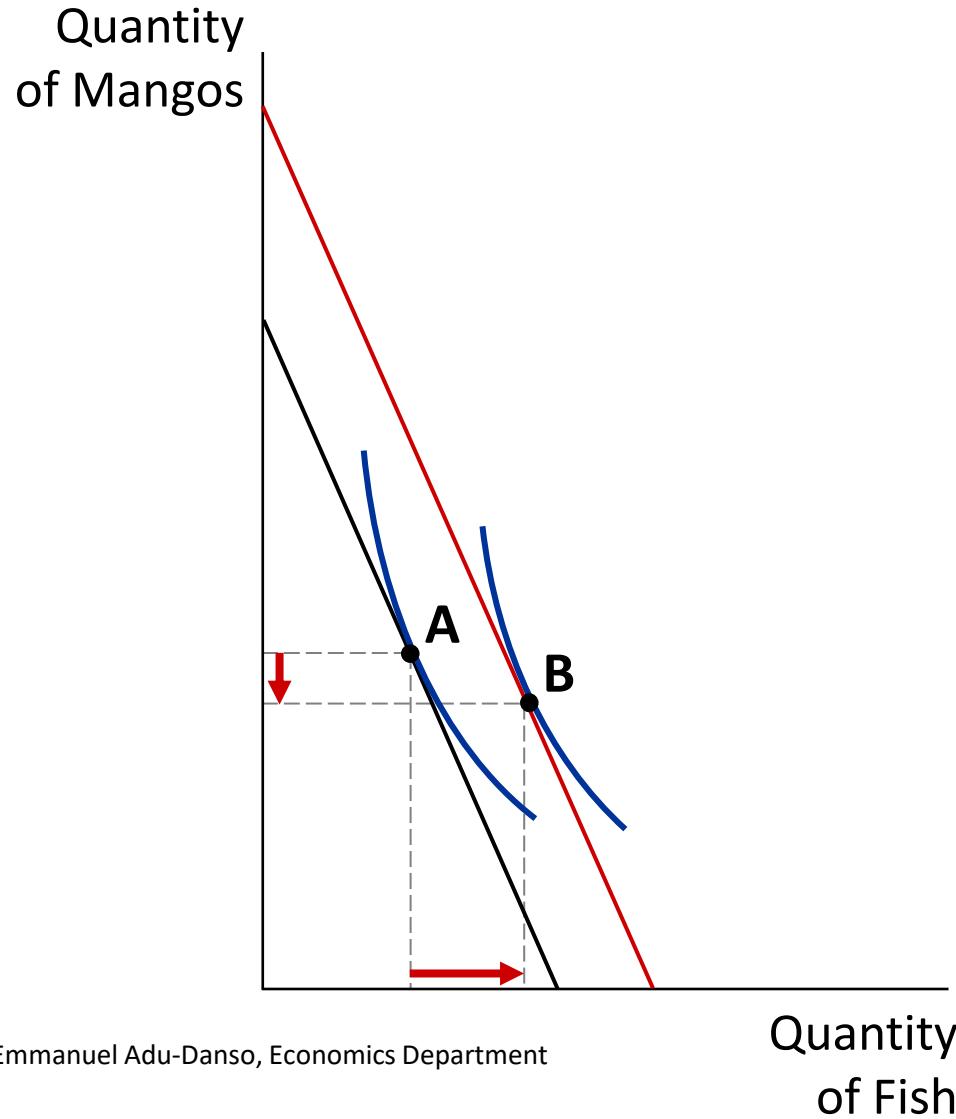
Activity 4

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 Yaa's optimal bundle of fish and mangos.

Activity 4

Answers



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

The Effects of a Price Change

Initially,

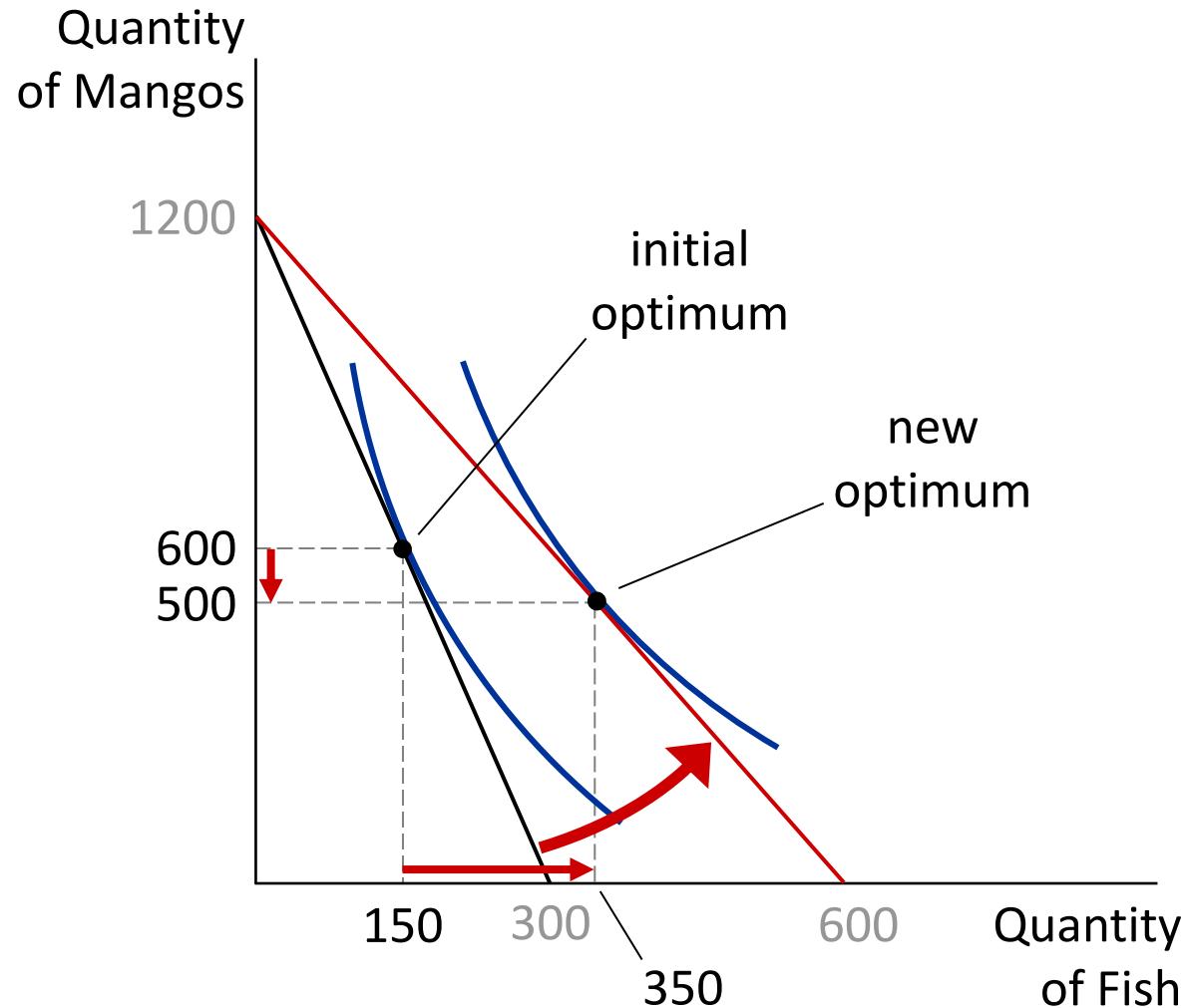
$$P_F = \text{¢}4$$

$$P_M = \text{¢}1$$

P_F falls to ¢2

budget constraint
rotates outward,

Yaa buys
more fish and
fewer mangos.



The Income and Substitution Effects

A fall in the price of fish has two effects on Yaa's optimal consumption of both goods.

- **Income effect**

A fall in P_F boosts the purchasing power of Yaa's income, allows him to buy more mangos and more fish.

- **Substitution effect**

A fall in P_F makes mangos more expensive relative to fish, causes Yaa to buy fewer mangos and more fish.

Notice: *The net effect on mangos is ambiguous.*

The Income and Substitution Effects

Initial optimum at A.

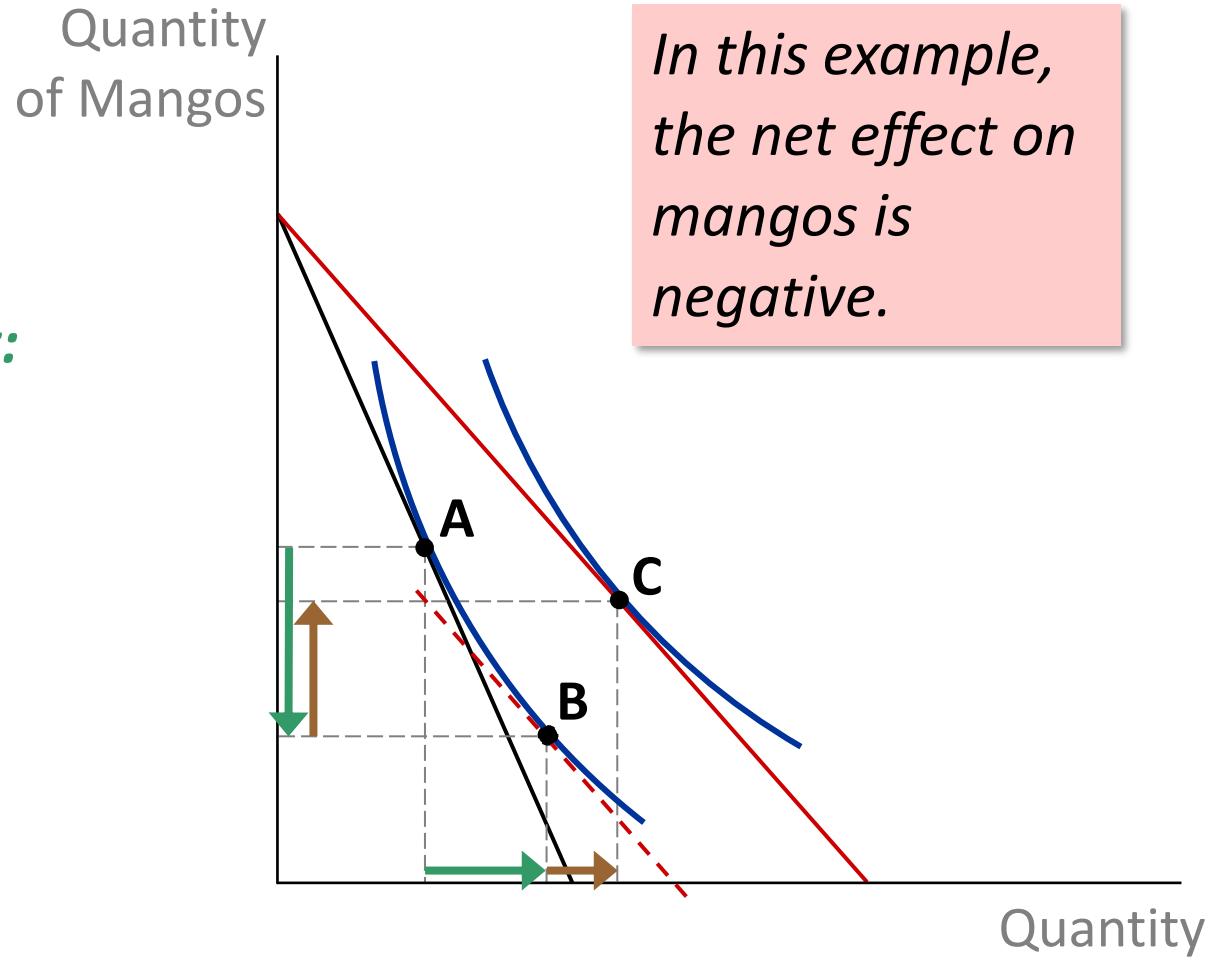
P_F falls.

Substitution effect:

from A to B,
buy more fish and
fewer mangos.

Income effect:

from B to C,
buy more of both
goods.



Activity 5

The substitution effect in two cases

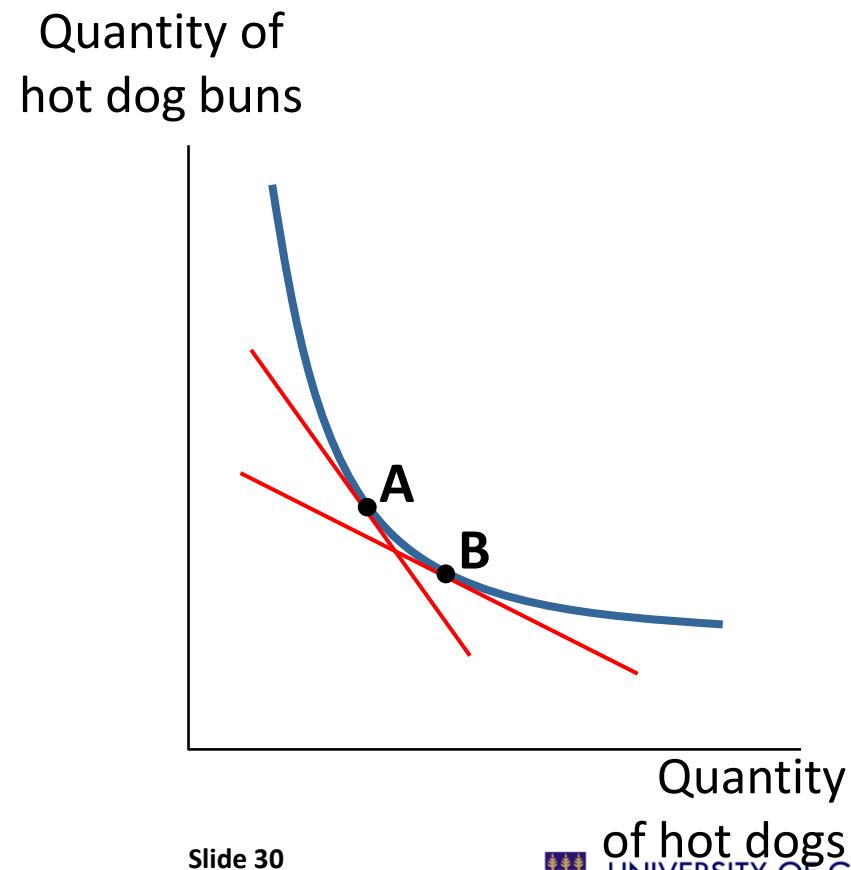
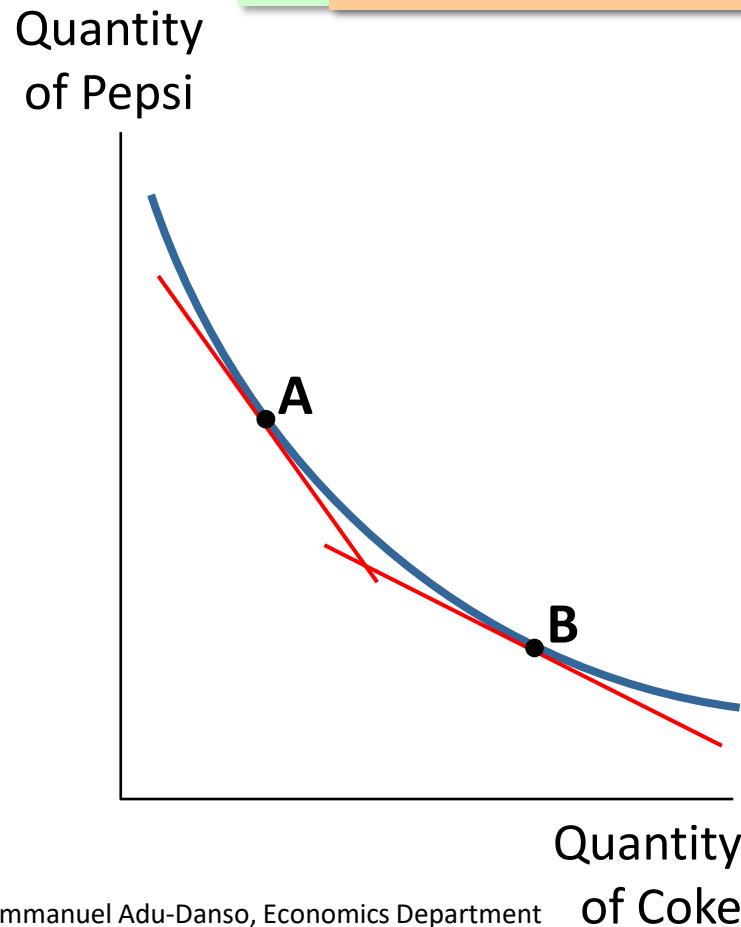
Do you think the substitution effect would be bigger for substitutes or complements?

- Draw an indifference curve for Coke and Pepsi, and, on a separate graph, one for hot dogs and hot dog buns.
- On each graph, show the effects of a relative price change (keeping the consumer on the initial indifference curve).

Activity 5

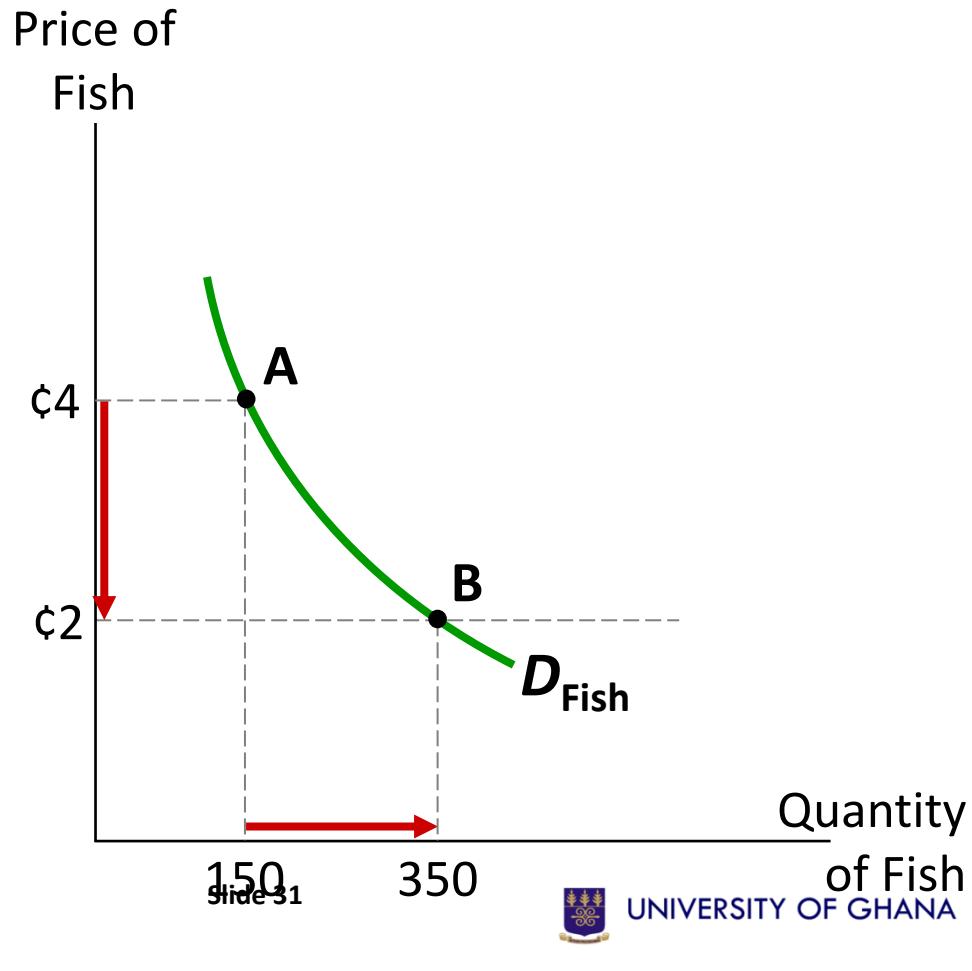
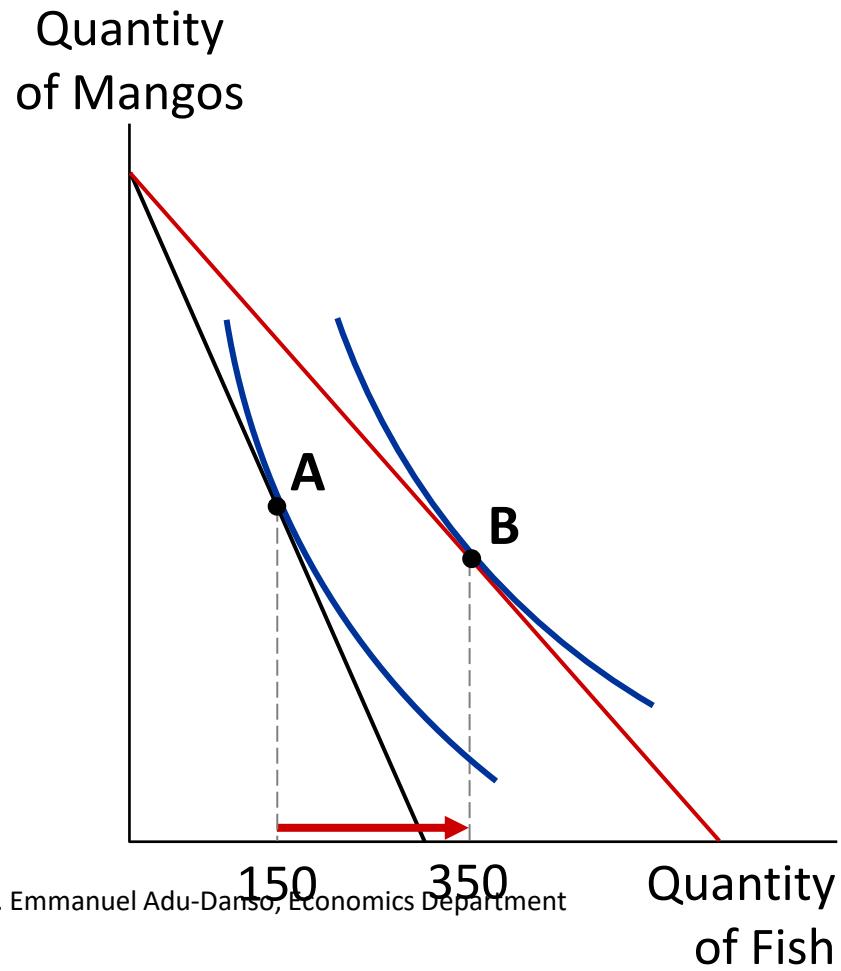
Answers

4 In both graphs, the relative price changes by less than the same amount.



Deriving Yaa's Demand Curve for Fish

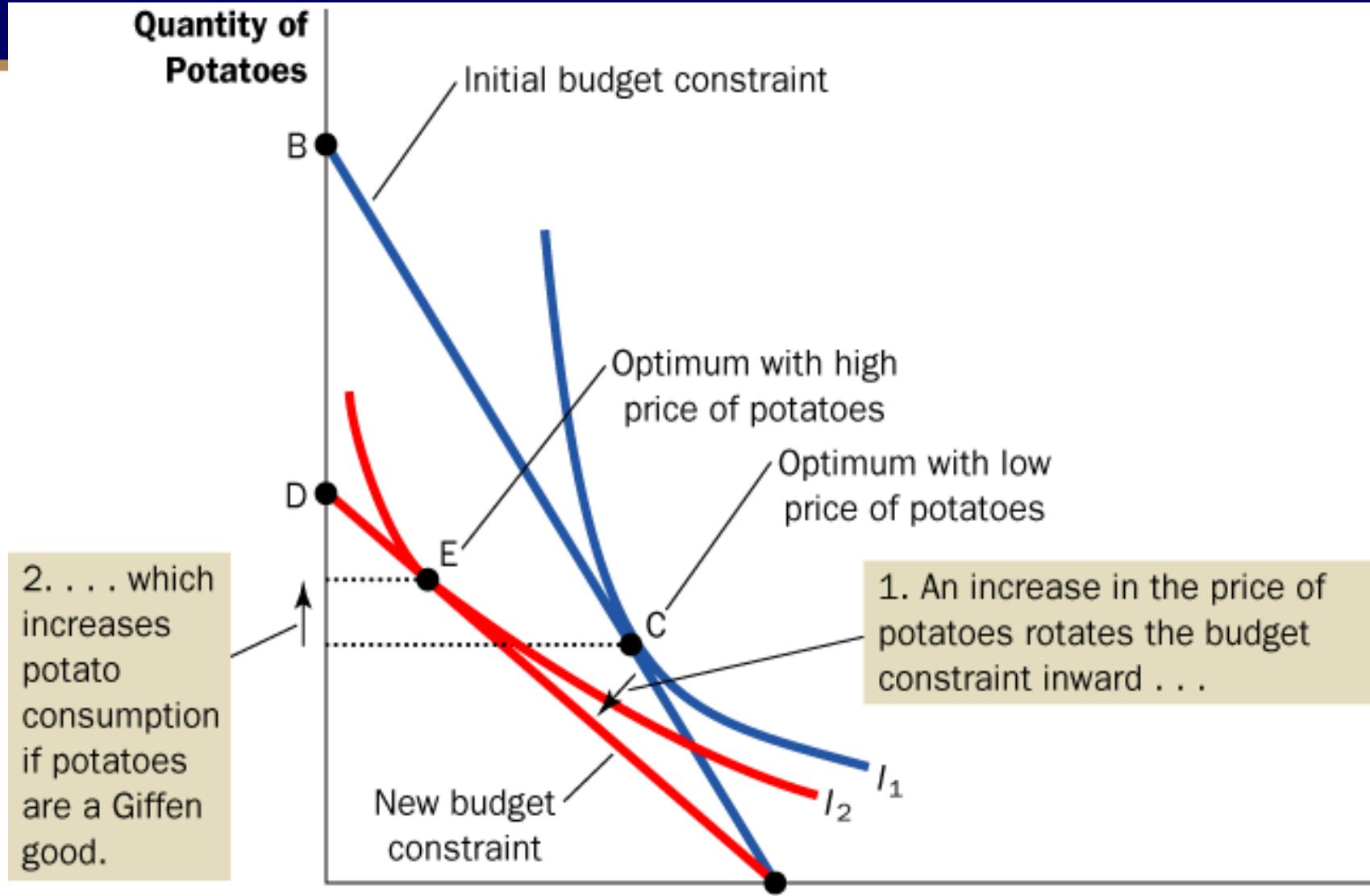
B: When $P_f = \text{¢}2$, Yaa demands 350 fish.



Application 1: Giffen Goods

- Do all goods obey the *Law of Demand*?
- Suppose the goods are potatoes and meat, and potatoes are an inferior good.
- If price of potatoes rises,
 - substitution effect: buy less potatoes
 - income effect: buy more potatoes
- If income effect > substitution effect, then potatoes are a **Giffen good**, a good for which an increase in price raises the quantity demanded.

Application 1: Giffen Goods



Application 2: Wages and Labor Supply

Budget constraint

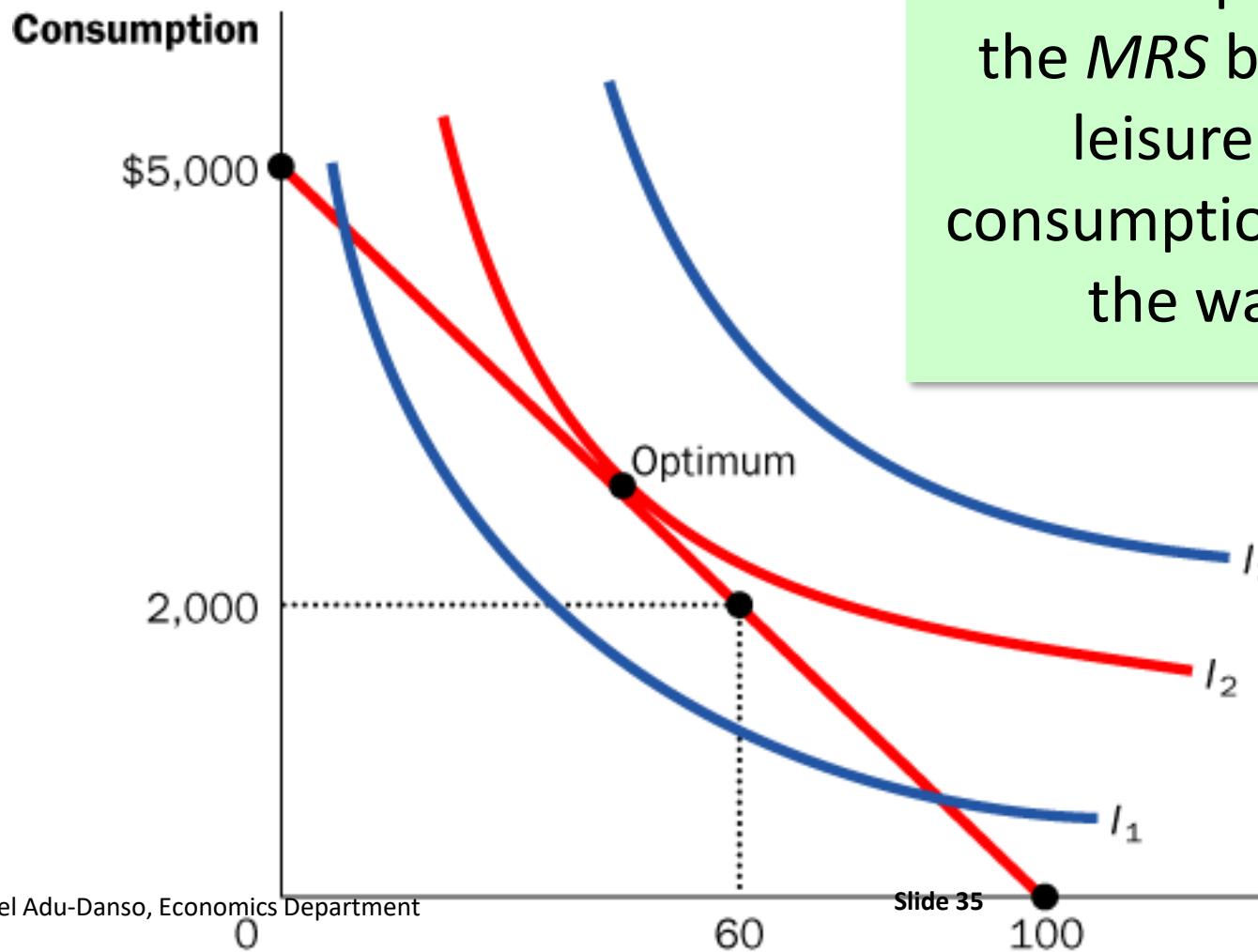
- Shows a person's tradeoff between consumption and leisure.
- Depends on how much time she has to divide between leisure and working.
- The relative price of an hour of leisure is the amount of consumption she could buy with an hour's wages.

Indifference curve

- Shows “bundles” of consumption and leisure that give her the same level of satisfaction.



Application 2: Wages and Labor Supply



At the optimum,
the *MRS* between
leisure and
consumption equals
the wage.

Application 2: Wages and Labor Supply

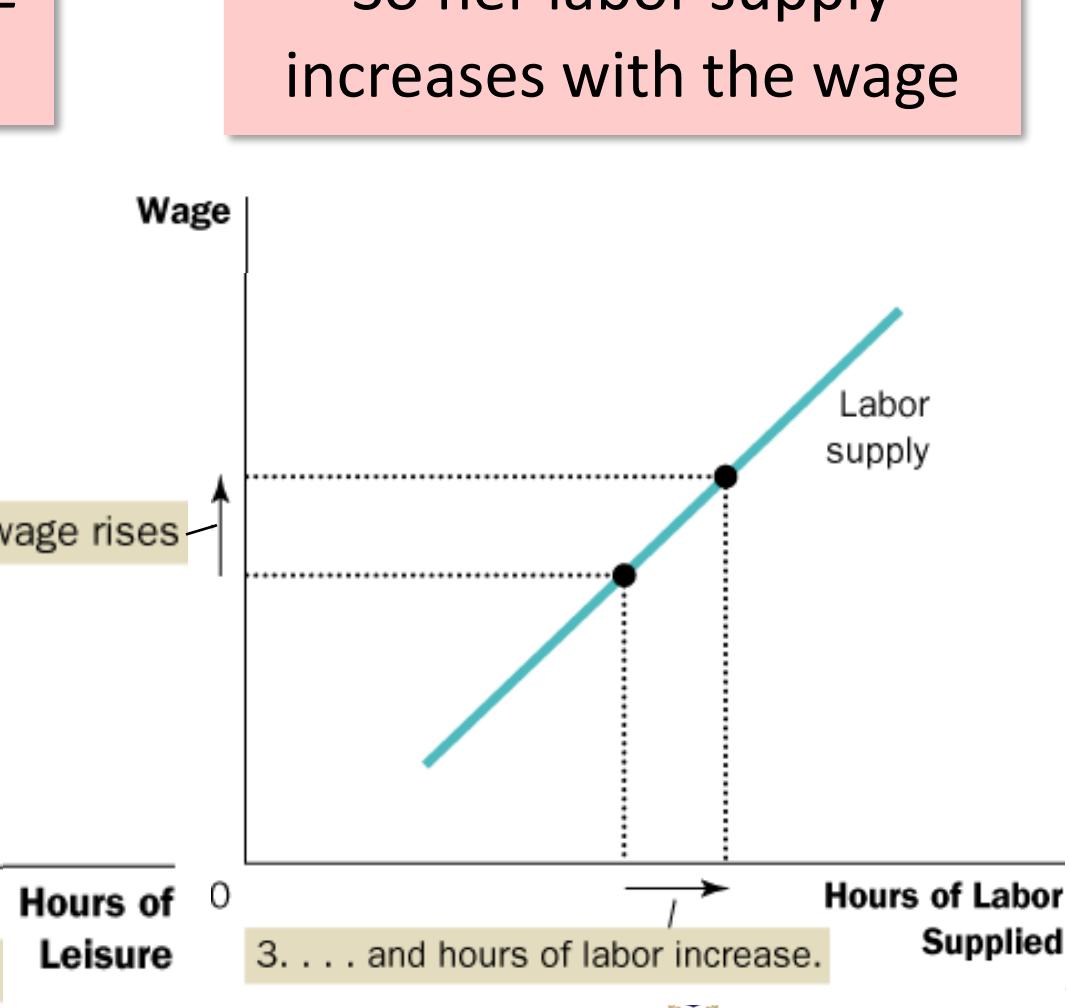
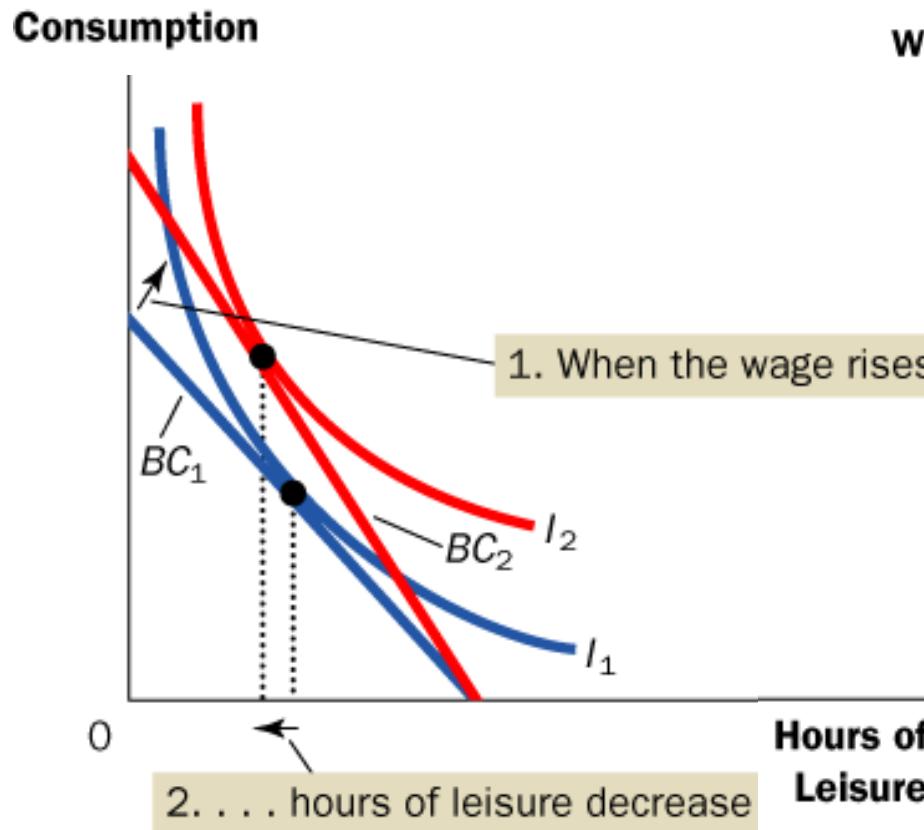
An increase in the wage has two effects on the optimal quantity of labor supplied.

- *Substitution effect (SE)*: A higher wage makes leisure more expensive relative to consumption.
The person chooses less leisure,
i.e., increases quantity of labor supplied.
- *Income effect (IE)*: With a higher wage,
she can afford more of both “goods.”
She chooses more leisure,
i.e., reduces quantity of labor supplied.

Application 2: Wages and Labor Supply

For this person, $SE > IE$

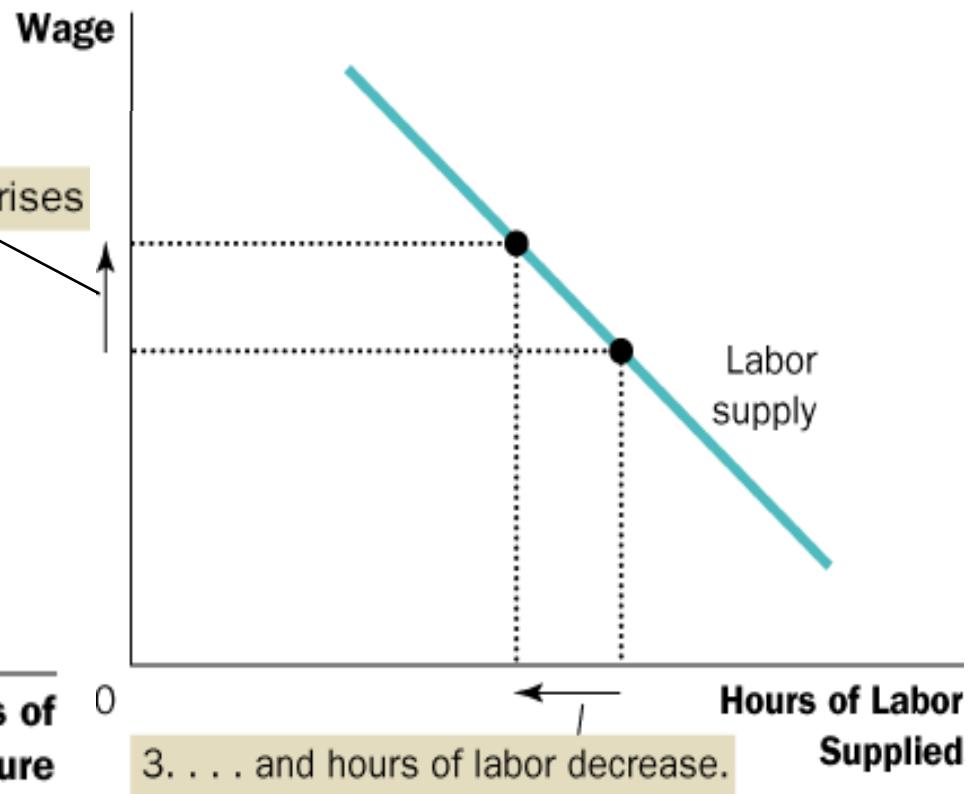
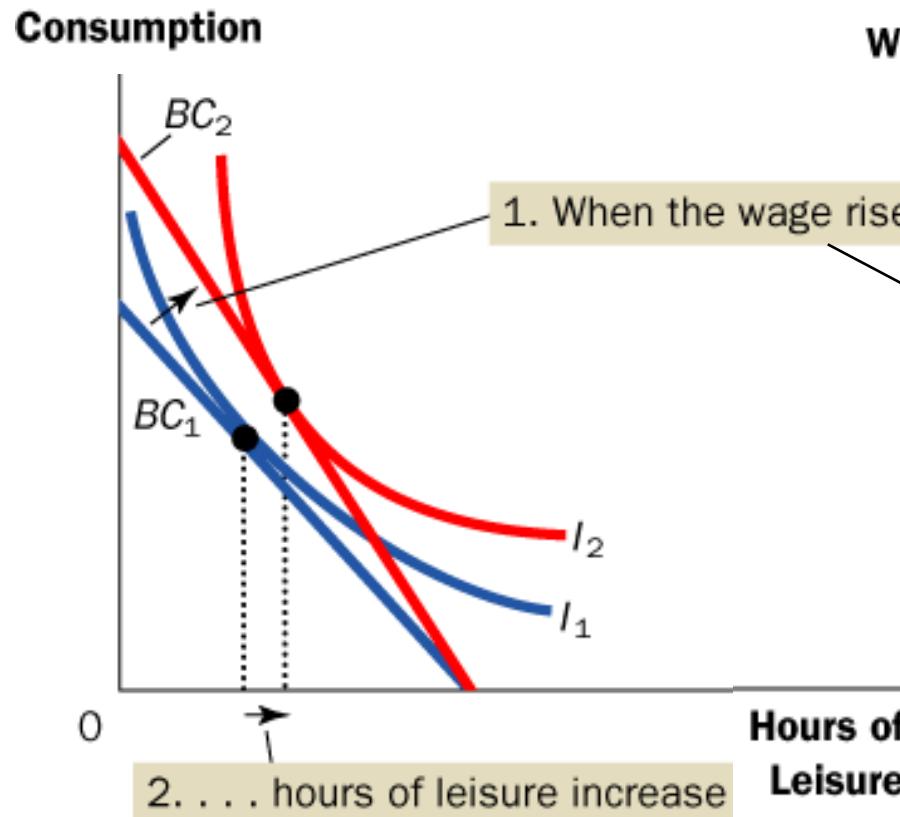
So her labor supply increases with the wage



Application 2: Wages and Labor Supply

For this person, $SE < IE$

So her labor supply falls when the wage rises



Could This Happen in the Real World???

Cases where the income effect on labor supply is very strong:

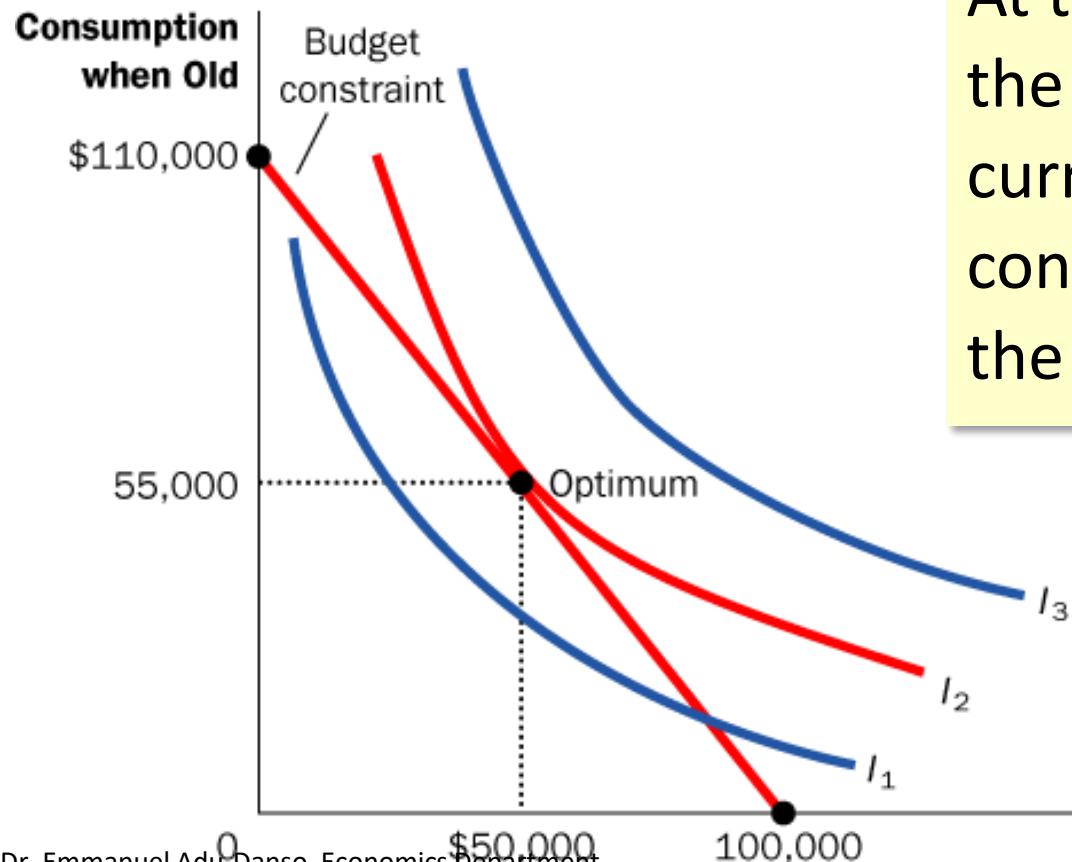
- Over last 100 years, technological progress has increased labor demand and real wages.
The average workweek fell from 6 to 5 days.
- When a person wins the lottery or receives an inheritance, her wage is unchanged—hence no substitution effect.
But such persons are more likely to work fewer hours, indicating a strong income effect.

Application 3: Interest Rates and Saving

- A person lives for two periods.
 - Period 1: young, works, earns ₦100,000
consumption = ₦100,000 minus amount saved
 - Period 2: old, retired
consumption = saving from Period 1
plus interest earned on saving
- The interest rate determines
the relative price of consumption when young
in terms of consumption when old.

Application 3: Interest Rates and Saving

Budget constraint shown is for 10% interest rate.



At the optimum,
the *MRS* between
current and future
consumption equals
the interest rate.

Activity 6

A change in the interest rate

- Suppose the interest rate rises.
- Describe the income and substitution effects on current and future consumption, and on saving.

Activity 6

Answers

The interest rate rises.

Substitution effect

- Current consumption becomes more expensive relative to future consumption.
- Current consumption falls, saving rises, future consumption rises.

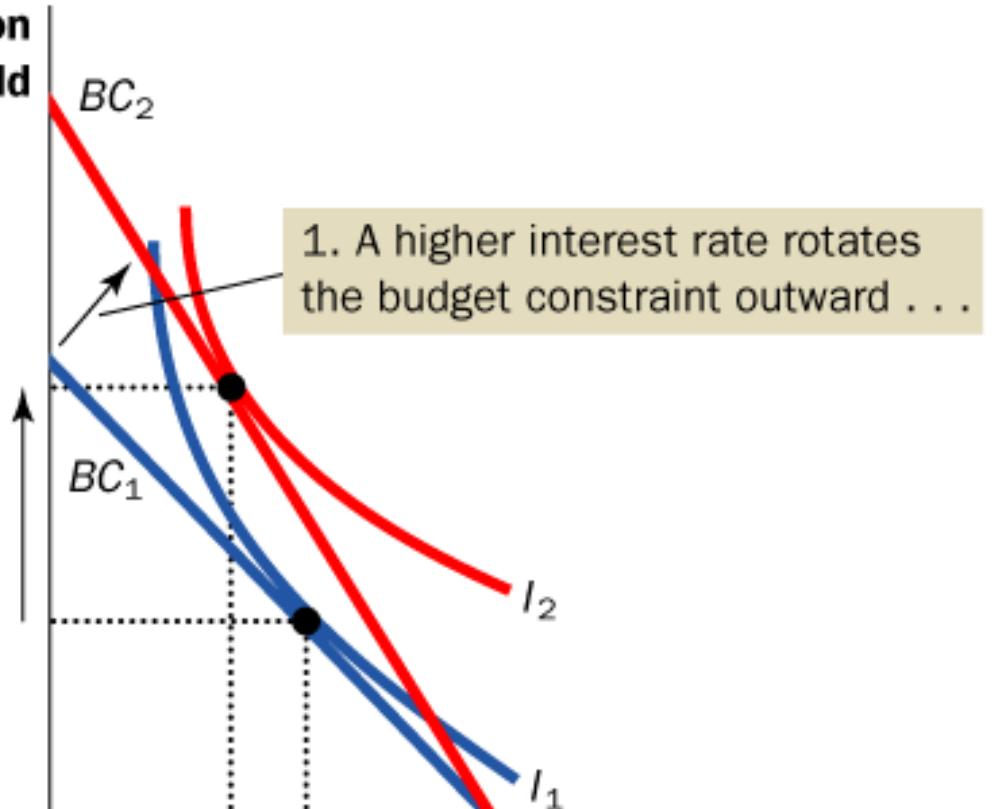
Income effect

- Can afford more consumption in both the present and the future. Saving falls.



Application 3: Interest Rates and Saving

**Consumption
when Old**



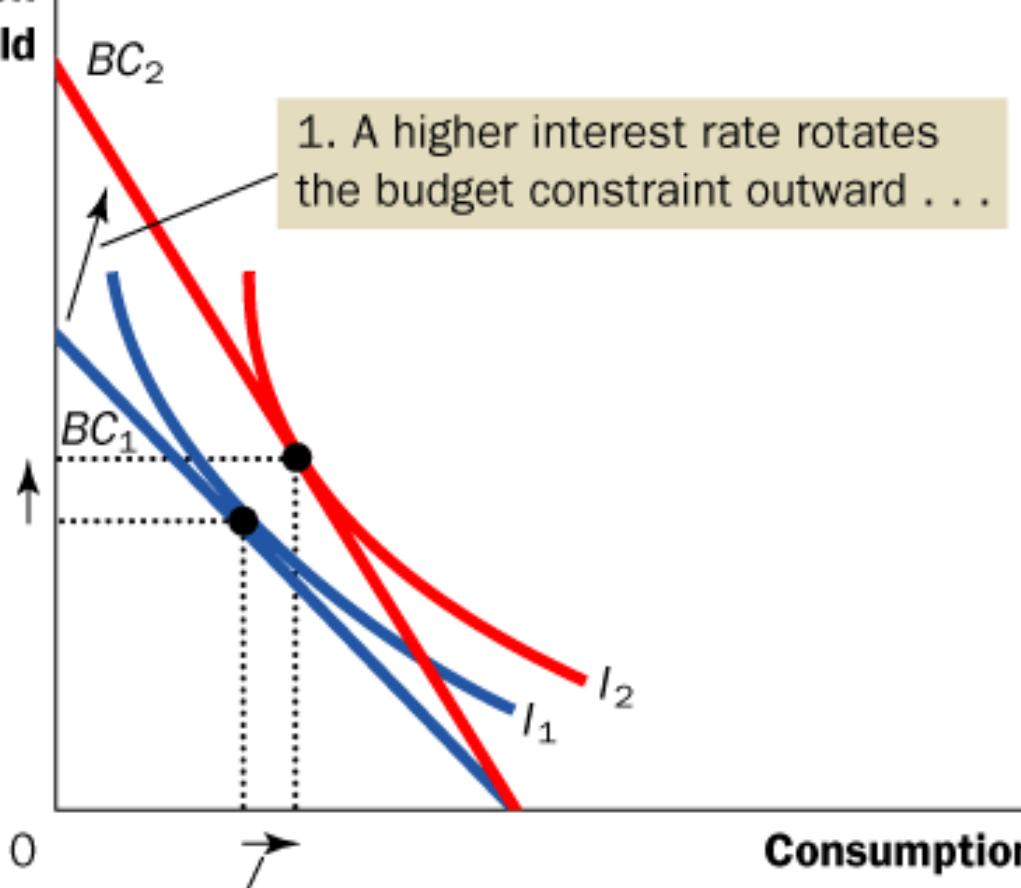
**Consumption
when Young**

2 . . . resulting in lower
consumption when young
and, thus, higher saving.

In this case, $SE > IE$ and saving rises

Application 3: Interest Rates and Saving

**Consumption
when Old**



In this case, $SE < IE$ and saving falls

2. . . . resulting in higher consumption when young and, thus, lower saving.

**Consumption
when Young**

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 this chapter 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.



SUMMARY

- A consumer's budget constraint shows the possible combinations of different goods she can buy given her income and the prices of the goods. The slope of the budget constraint equals the relative price of the goods.
- An increase in income shifts the budget constraint outward. A change in the price of one of the goods pivots the budget constraint.

SUMMARY

- A consumer's indifference curves represent her preferences. An indifference curve shows all the bundles that give the consumer a certain level of happiness. The consumer prefers points on higher indifference curves to points on lower ones.
- The slope of an indifference curve at any point is the marginal rate of substitution—the rate at which the consumer is willing to trade one good for the other.

SUMMARY

- The consumer optimizes by choosing the point on her budget constraint that lies on the highest indifference curve. At this point, the marginal rate of substitution equals the relative price of the two goods.
- When the price of a good falls, the impact on the consumer's choices can be broken down into two effects, an income effect and a substitution effect.

SUMMARY

- The income effect is the change in consumption that arises because a lower price makes the consumer better off. It is represented by a movement from a lower indifference curve to a higher one.
- The substitution effect is the change that arises because a price change encourages greater consumption of the good that has become relatively cheaper. It is represented by a movement along an indifference curve.

SUMMARY

- The theory of consumer choice can be applied in many situations. It can explain why demand curves can potentially slope upward, why higher wages could either increase or decrease labor supply, and why higher interest rates could either increase or decrease saving.

ECON 101: INTRODUCTION TO ECONOMICS I

Lecture 7 – The Theory of Production

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UNIVERSITY OF GHANA

**Department of Economics
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2021/2022**

Lecture Overview

- In this lecture, we will look at what we mean by production, and about some important concepts related to production – TP, AP and MP.
- We will also see how interrelated these concepts are and their implications for the stages of production.
- We conclude the discussion on theory of production by discussing what is referred to as the rational stage of production and its economic significance.

Learning Outcomes

- By the end of the lecture, you should be able to:
 - Explain how TP, AP and MP are related
 - Identify the various stages of production
 - Explain why the rational stage of production makes economic sense.
- The lecture will be based on **Mankiw, G. (2012)**. Principles of Economics (6th Edition), South Western.
 - **Chapter 13**

The Production Function

- A **production function** shows the relationship between the **quantity of inputs** used to produce a good and the **quantity of output** of that good.
- **technological or functional relationship** between the **quantity of inputs** used and the **maximum outputs** produced per unit of time
- Specifies the **maximum output** that can be produced **from a given amount / combination of inputs**
 - i.e. summary of *technically efficient* ways of combining inputs to produce output



The Production Function

- May be expressed in a table, equation, or graph.

e.g.

- $Y = f(a, b, c, \dots, z)$
 - $Y = f(K, L)$
-
- Firms' **main** objective
 - Profit maximization

The Production Function

Definitions

- *Technique* – a particular method of combining inputs to make output
- *Technology* – list of all known techniques

Hence;

- *Production function is the list of all techniques that are technically efficient*

How does the firm discover its production function – i.e. complete set of technically efficient production techniques?

- Ask its engineers, designers, other experts
- Experiment with different techniques and observe the results, etc.



The Production Function

e.g. technically efficient production function

Technique	Output	K	L
A	100	4	4
B	100	2	6
C	106	2	7
D	200	4	12

- *Firms can change the output by changing the amount of inputs used*



Concept of Time

- Given firms' main objective - must make decisions to achieve it

But

- ***Time constrained*** depending on
 - **Decision** making period
 - **Nature** of business/commodity produced
- **To maximize profit**, it must be able to ***decide correctly the time frame to operate in***

A decision time frame is;

- Specific period of time needed by the firm to take productive decision
- 3 major decision time frames; SR, LR, Very LR



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Concept of Time

Short Run (SR)

- Ability to vary all inputs is limited
- Period may differ across different firms
- Depends on the nature of products produced
- Fixed inputs
 - firms can produce only up to a certain level (capacity)

Long Run (LR)

- All inputs (except technology) are variable
- Firms decide to expand scale of operations by
 - producing new products; **or**
 - replacing obsolete machinery; **or**
 - close down in order to reduce its operations



Concept of Time

Very Long Run

- All inputs including technology are variable

Fixed vs Variable Inputs:

- Fixed inputs/factors
 - Levels are held constant in the SR
- Variable inputs/factors
 - Levels can be freely changed in the SR
 - Direct relationship with the firm's output



Production in the SR

- *Important for:*
 - *the law of supply*
 - *Theory of cost*
- *Analysis is based on the law of DMR*
- **Simplifying Assumptions**
 - 2 inputs (Land (**or K**), Labour)
 - Labour is variable
 - Land or “K” is fixed
 - $Q=f(K, L)$ or $Q=f(\text{Land}, L)$



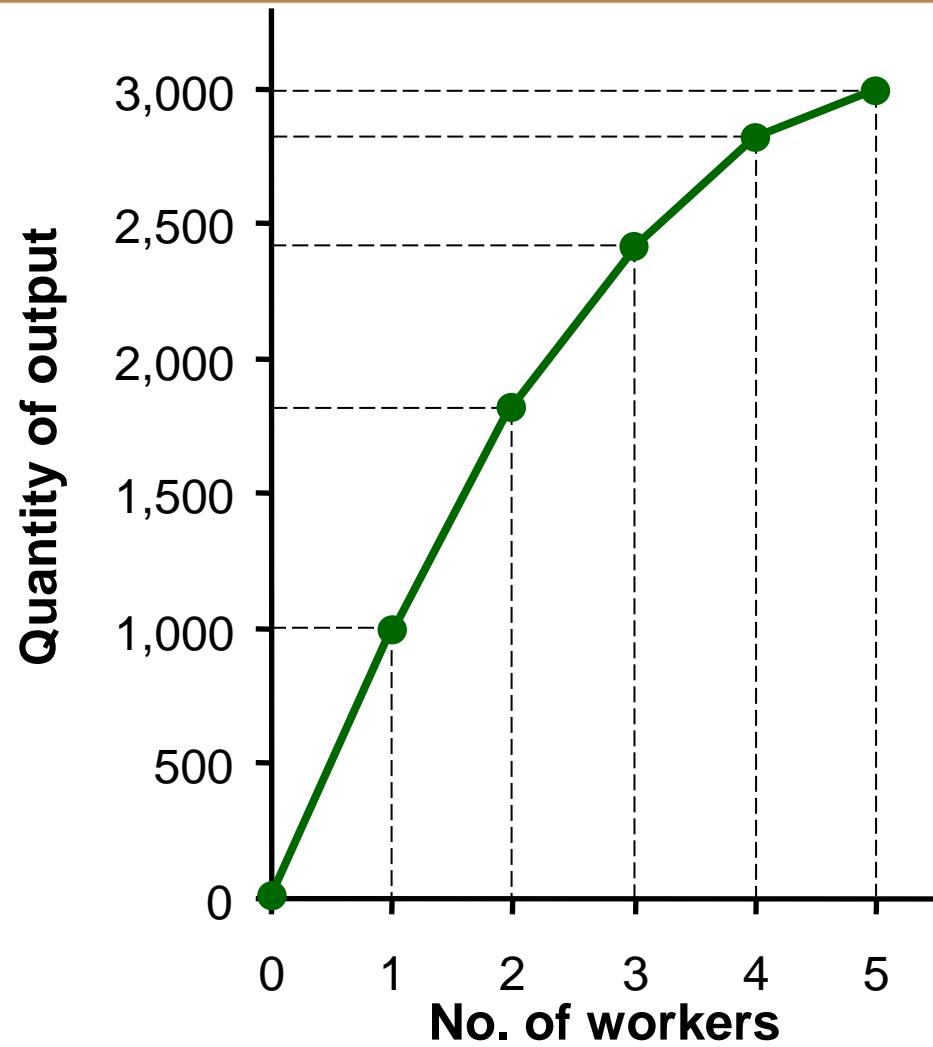
Production in the SR

Illustrating the Production function:

- Farmer Jack grows wheat.
- He has 5 acres of land.
 - *assumed fixed*
- He can hire as many workers as he wants.
 - *assumed variable*

EXAMPLE 1: Farmer Jack's Production Function

<i>L</i> (no. of workers)	<i>Q</i> (bushels of wheat)
0	0
1	1000
2	1800
3	2400
4	2800
5	3000



Total Product(TP)/Output (Q)

- Total volume (quantity) of a good produced
- Foundation of the SR production analysis
- Jack combines **Land** and **Labour** to produce a given volume/ output



Marginal Product (MP)

- If Jack hires one more worker, his output (TP) rises by the ***marginal product of labor***.
- The **marginal product** of any input is the increase in output arising from an additional unit of that input, holding all other inputs constant.
- **Notation:**
 Δ (delta) = “change in...”
- *Therefore;*
 ΔQ = change in output,
 ΔL = change in labor
- ***Marginal product of labor (MPL)*** =
$$\frac{\Delta Q}{\Delta L}$$



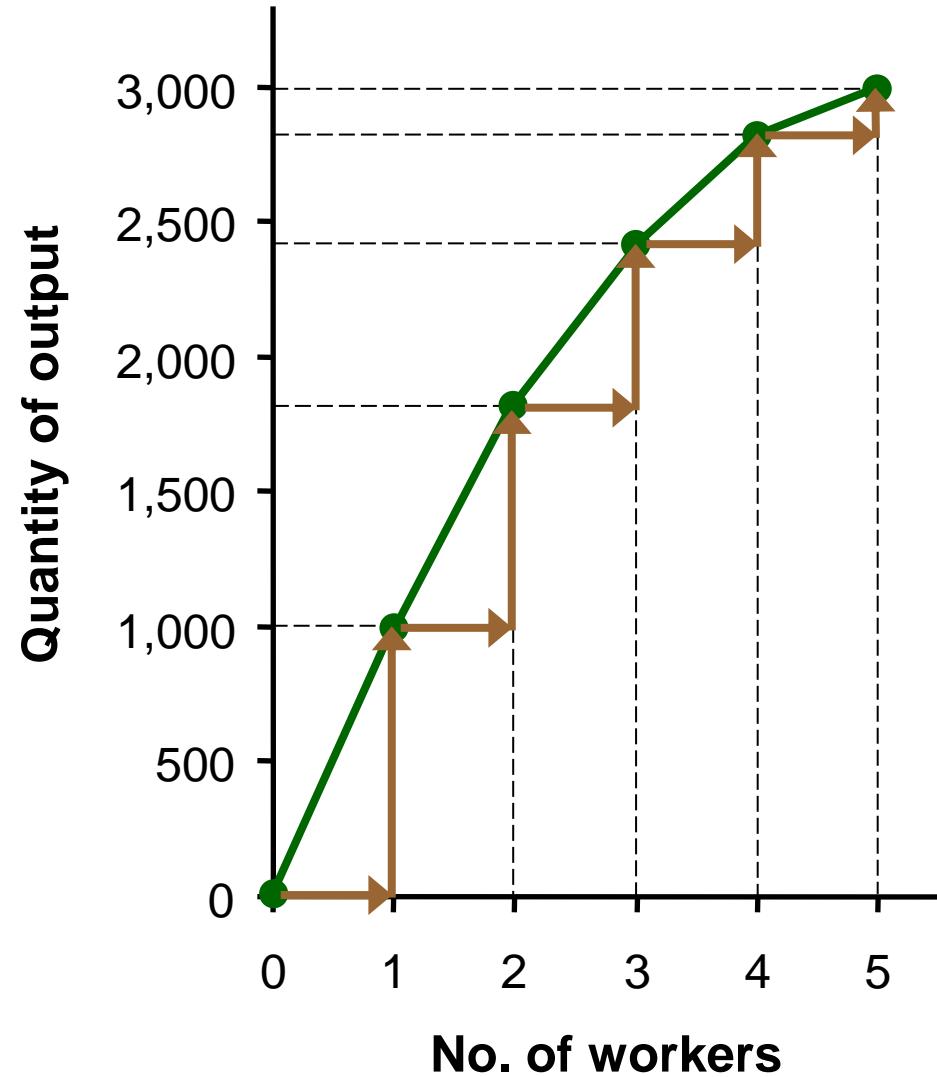
Marginal Product

L (no. of workers)	Q (bushels of wheat)	MPL
$\Delta L = 1$	0	
$\Delta L = 1$	1	
$\Delta L = 1$	2	
$\Delta L = 1$	3	
$\Delta L = 1$	4	
$\Delta L = 1$	5	
	0	
	1000	$\Delta Q = 1000$
	1800	$\Delta Q = 800$
	2400	$\Delta Q = 600$
	2800	$\Delta Q = 400$
	3000	$\Delta Q = 200$



$MPL = \text{Slope of Prod Function}$

L (no. of workers)	Q (bushels of wheat)	MPL
0	0	1000
1	1000	800
2	1800	600
3	2400	400
4	2800	200
5	3000	



Example 2: TP & MP

Capital	Labour	TP	MP
10	0	0	-
10	1	1	1
10	2	4	3
10	3	9	5
10	4	16	7
10	5	25	9
10	6	32	7
10	7	35	3
10	8	35	0
10	9	32	-3

- What do we observe about TP & MP?
- Is it logical to expand output beyond 9 employees? Interpretation?



Why MPL Is Important

Rational people think at the margin [Ten economic principles].

- When Farmer Jack hires an extra worker,
 - Output rises by the MPL
 - The MPL eventually declines with each extra worker



Why MPL Diminishes

- Farmer Jack's output (**Q or TP**) eventually rises by a smaller and smaller amount for each additional worker. Why?
 - As Jack adds workers, the average worker has less land to work with and will be less productive.
- *In general, MPL diminishes as L rises and is combined with a fixed input (land, capital, equipment, machines, etc.).*
- ***Diminishing marginal product:***
The marginal product of an input eventually declines as the quantity of the input increases (other things being equal).



The Law of DMR

- Linked to the DMPL
 - *“as successive amount of a variable input is added to a fixed input, the MP of the variable input increases, reaches a maximum and eventually falls”*
- Successive increases in the variable input to a fixed input causes TP/ output to **increase at an increasing rate**, then TP **increases at a decreasing rate, reaches a maximum and then falls**



The Law of DMR

- DMR is fundamental in explaining the law of supply
 - As the variable input is increased against a fixed input, output eventually declines – **more variable inputs required to produce higher output level**
 - *This implies increased cost of production*
 - Hence firms will demand higher price to supply more to compensate higher cost of production
 - *Thus, the direct relationship between the price and quantity produced*

Average Product (AP)

- TP (output) **per unit** of the variable input
- Gives the average amount of the good each variable input produces

$$AP_L = \frac{TP}{L}$$

- Can be measured as the slope of a line from the origin to any point on the TP curve

Task:

- From Example 2, compute the AP
- What is the shape of the the AP curve?

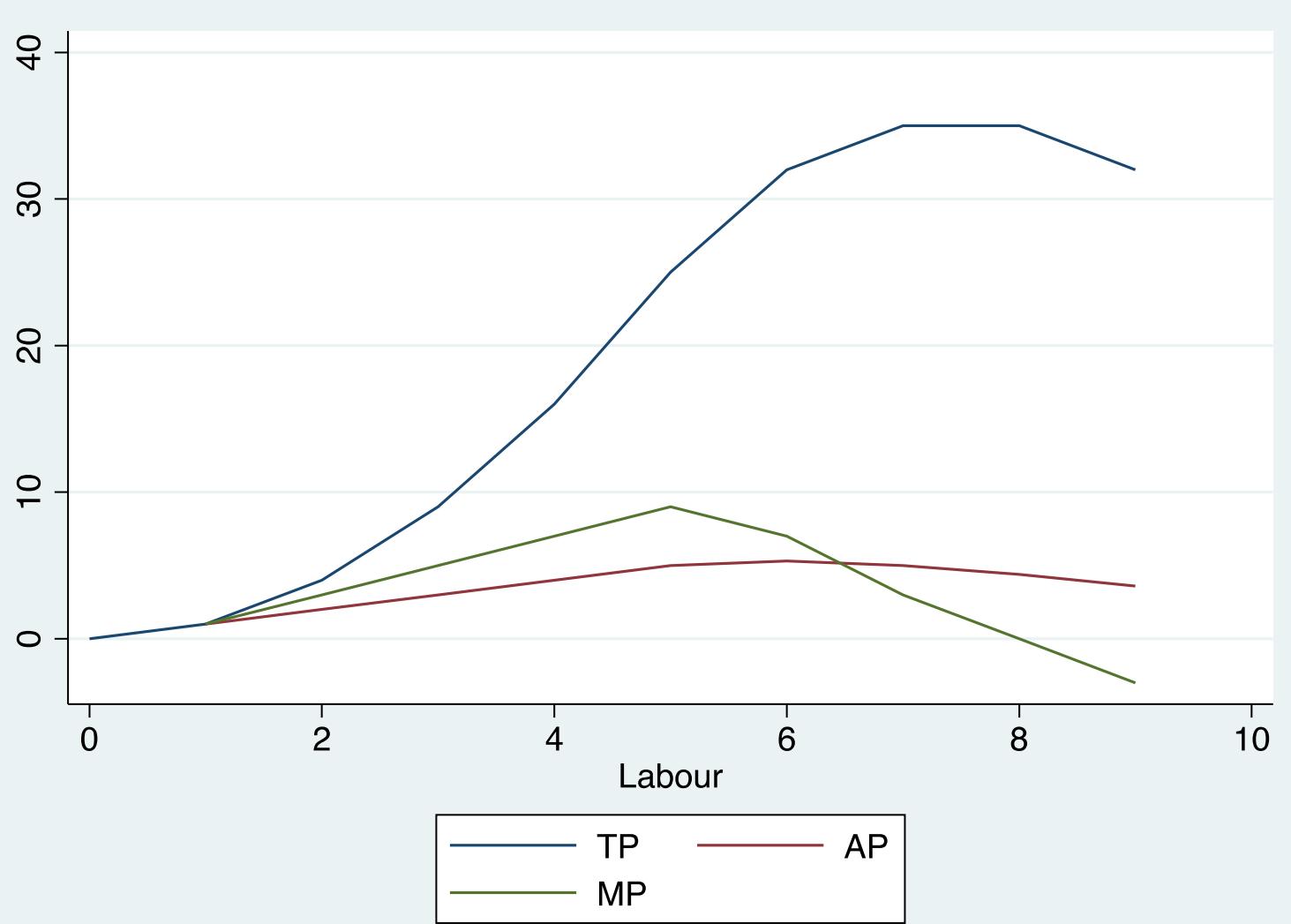


AP of the variable input

Land	Labour	TP	MP	AP
10	0	0	-	-
10	1	1	1	1
10	2	4	3	2
10	3	9	5	3
10	4	16	7	4
10	5	25	9	5
10	6	32	7	5.3
10	7	35	3	5
10	8	35	0	4.4
10	9	32	-3	3.6



MP, TP & AP of the variable input



Relationship between MP, TP & AP of the variable input

MP & AP

- both increase, reach a maximum and decline
 - *Inverted “u-shaped”*
- MP increases faster
- AP continue increasing so long as $MP > AP$
- MP decreases faster
 - $AP > MP$ – last worker's contribution < average of the existing workers
- $MP = AP$ when AP is at its max
 - Last unit of the variable input employed contributes an output level = average product of all existing variable inputs



Relationship between MP, TP & AP of the variable input

MP & TP

- both increase, maximum and fall
 - *Inverted “u-shaped”*

Recall

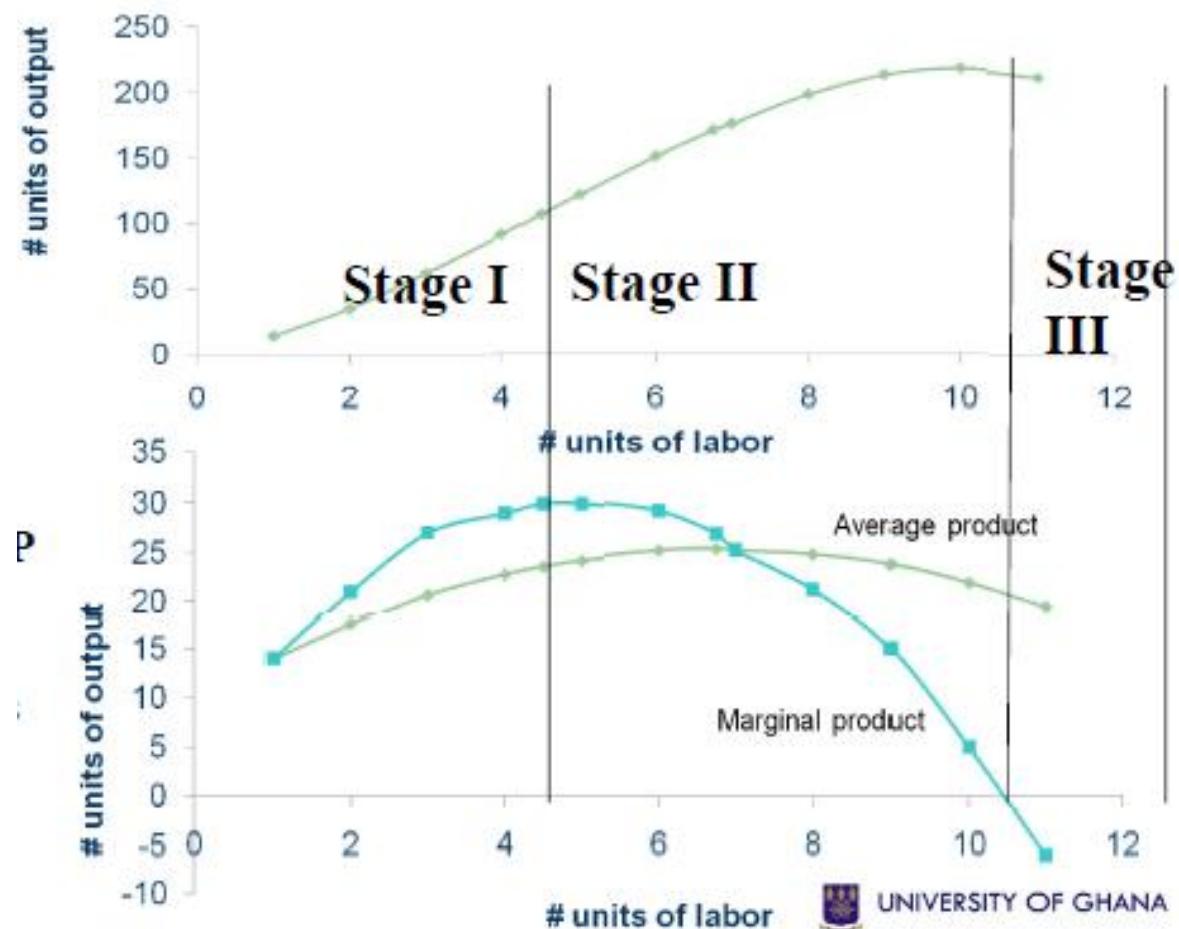
- MP measures the rate of change of TP (slope of TP)
- MP is the additions to TP - when:
 - $MP>0$, TP increasing;
 - $MP<0$, TP decreasing
 - $MP=0$, TP maximum
- Increasing MP – TP increases at an *increasing rate*
- Decreasing MP – TP increases at a *decreasing rate*
- When $MP<0$ – TP *falls*



Stages of Production

3 stages in the SR

- *Depend on the slope and shape of TP, MP & AP*



Stages of Production

Stage 1:

- Increasing positive slopes for TP, AP & MP
- From origin to AP_{max} ($AP=MP$)
- Also known as *increasing average returns*
- Productivity is rising

Stage 2

- Decreasing slope for AP, MP
- From AP_{max} to $MP=0$
- Also called *decreasing average & marginal returns*



Stages of Production

Stage 3

- Negative slope of TP
- From $MP=0$ and beyond
- TP begins to fall – *negative marginal returns*



Economic Significance of the Stages

- *Where should the firm produce?*

Stage 1 (**irrational stage**)

- AP is increasing – on average the returns on labour is increasing as firm employs additional unit of labour
 - Implies increasing returns to labour
 - i.e. fixed input > variable input; **or**
 - Ratio of fixed to variable input is high
- Therefore, variable input should be increased
 - Because firm enjoys positive returns on its variable input, it must not stop production



Economic Significance of the stages

Stage 3 (irrational stage)

- TP is decreasing, $MP < 0$
- **Ratio of fixed to variable input is low**
 - i.e. fixed input < variable input
 - *congestion or overcrowding of the variable input*
- Firm should **decrease** variable input; so that ratio increases, and TP will then increase



Economic Significance of the stages

Stage 2 (rational stage)

- AP_L reaches its maximum and begins to fall but remains positive
- MP is also decreasing but positive
- TP also increasing up till it reaches maximum
- There is a fair amount of the variable input to be added to the fixed input



ECON 101: INTRODUCTION TO ECONOMICS I

Lecture 8 – Firms in Competitive Markets

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**Department of Economics
School of Social Studies
2021/2022**

Lecture Overview

- An understanding of the structure of a market is key to appreciating decisions of firms and their implications in a market.
- One of the market structures we consider in this lecture is the perfectly competitive market (PCM).
- While a perfectly competitive market may not exist in the real world, some markets in the real world share similar characteristics with the PCM.
- Understanding what a PCM is, its features and characteristics, therefore, helps us to better appreciate some firm decisions and outcomes in the real world.

Learning Outcomes

- By the end of the lecture, you should be able to:
 - Identify a market that exhibits behaviour close to a PCM based on its characteristics
 - Explain profit maximization under PCM
 - Explain the shut down decision of the PCM
 - Show the nature of the supply curve in the SR and LR for the PCM
- The lecture will be based on **Mankiw, G. (2012)**. Principles of Economics (6th Edition), South Western.
 - **Chapter 14**

Characteristics of Perfect Competition

1. Many buyers and many sellers
 2. The goods offered for sale are largely the same (homogenous goods).
 3. Firms can freely enter or exit the market.
-
- Because of 1 & 2, each buyer and seller is a **“price taker”** – takes the price as given.

The Revenue of a Competitive Firm

- Total revenue (TR)

$$TR = P \times Q$$

- **Average revenue (AR)**

$$AR = \frac{TR}{Q} = P$$

- **Marginal Revenue (MR):**

The change in TR from selling one more unit.

$$MR = \frac{\Delta TR}{\Delta Q}$$

The Revenue of a Competitive Firm

<i>Q</i>	<i>P</i>	<i>TR</i>	<i>AR</i>	<i>MR</i>
0	¢10		n.a.	
1	¢10		¢10	
2	¢10			
3	¢10			
4	¢10	¢40		¢10
5	¢10	¢50		

The Revenue of a Competitive Firm

Q	P	$TR = P \times Q$	$AR = \frac{TR}{Q}$	$MR = \frac{\Delta TR}{\Delta Q}$
0	¢10	¢0	n.a.	
1	¢10	¢10	¢10	
2	¢10	¢20	Notice that $MR = P$	
3	¢10	¢30	¢10	
4	¢10	¢40	¢10	
5	¢10	¢50	¢10	

$MR = P$ for a Competitive Firm

- A competitive firm can keep increasing its output without affecting the market price.
- So, each one-unit increase in Q causes revenue to rise by P , i.e., $MR = P$.

$MR = P$ is only true for firms in competitive markets.

But how does a competitive firm maximize profit then?

Profit Maximization

- What Q maximizes the firm's profit?
- To find the answer,
“Think at the margin.”

If increase Q by one unit,
revenue rises by MR ,
cost rises by MC .
- If $MR > MC$, then increase Q to raise profit.
- If $MR < MC$, then reduce Q to raise profit.



Profit Maximization

At any Q with $MR > MC$, increasing Q raises profit.

At any Q with $MR < MC$, reducing Q raises profit.

Q	TR	TC	Profit	MR	MC	$\Delta\text{Profit} = MR - MC$
0	0	5	-5			
1	10	9	1	10	4	6
2	20	15	5	10	6	4
3	30	23	7	10	8	2
4	40	33	7	10	10	0
5	50	45	5	10	12	-2

MC and the Firm's Supply Decision

Rule: $MR = MC$ at the profit-maximizing Q .

At Q_a , $MC < MR$.

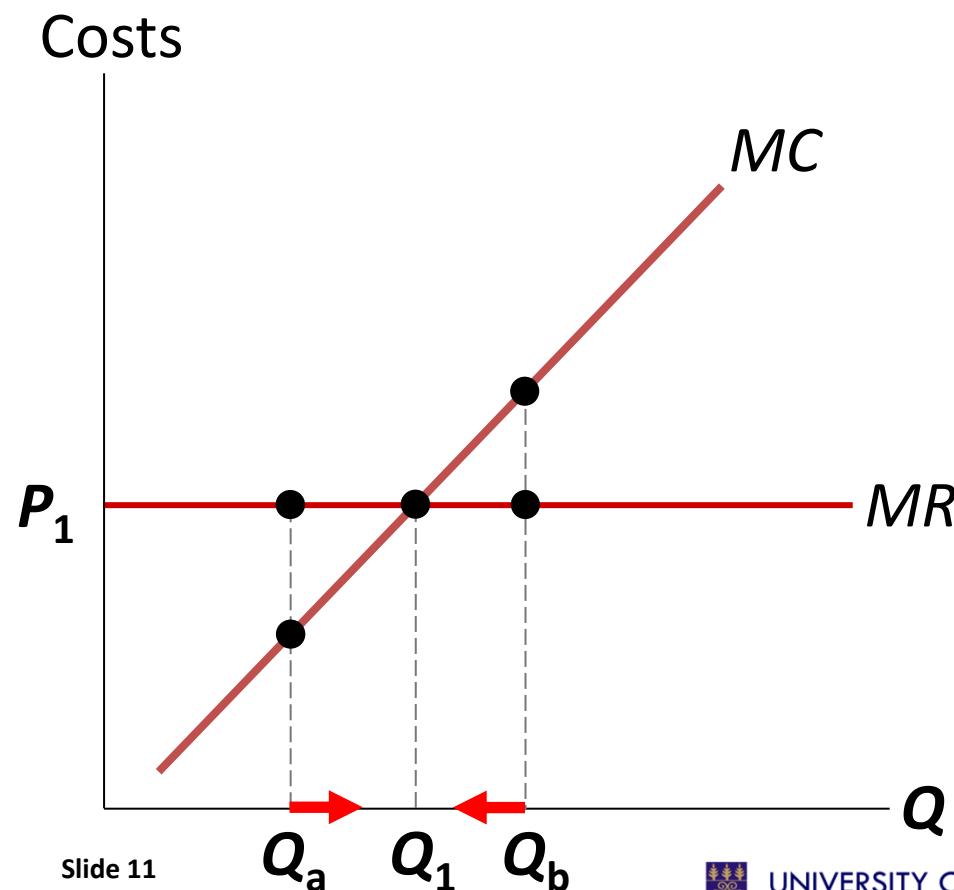
So, increase Q
to raise profit.

At Q_b , $MC > MR$.

So, reduce Q
to raise profit.

At Q_1 , $MC = MR$.

Changing Q
would lower profit.



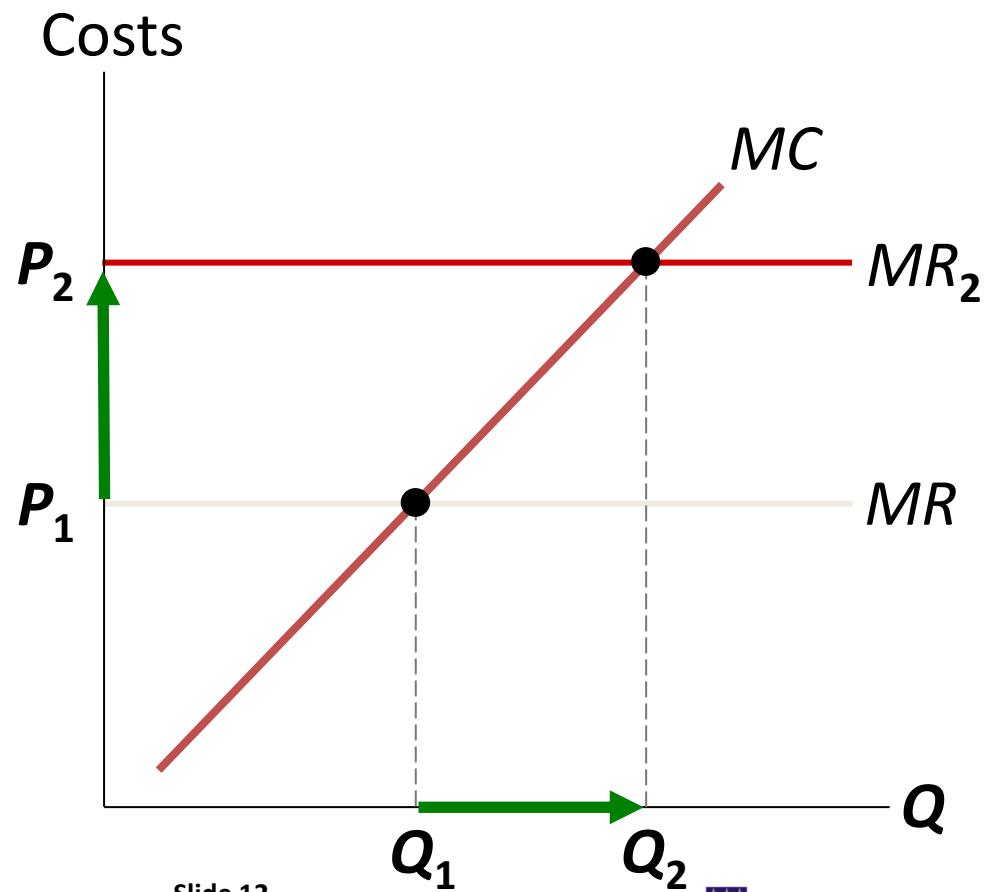
MC and the Firm's Supply Decision

If price rises to P_2 ,
then the profit-
maximizing quantity
rises to Q_2 .

The MC curve
determines the
firm's Q at any price.

Hence,

the MC curve is the
firm's supply curve.



Shutdown vs. Exit

- **Shutdown:**
A short-run decision not to produce anything because of market conditions.
- **Exit:**
A long-run decision to leave the market.
- A firm that shuts down temporarily must still pay its fixed costs.
- A firm that exits the market does not have to pay any costs at all, fixed or variable.



A Firm's Short-run Decision to Shut Down

- If firm shuts down temporarily,
 - revenue falls by TR (*the “cost” of a shutdown*)
 - costs fall by VC (*the “benefit” of a shutdown*)
- So when should the firm shut down?
 - if $TR < VC$ (*i.e. cost < benefit*)
- Divide both sides by Q : $TR/Q < VC/Q$
- So we can write the firm's decision as:

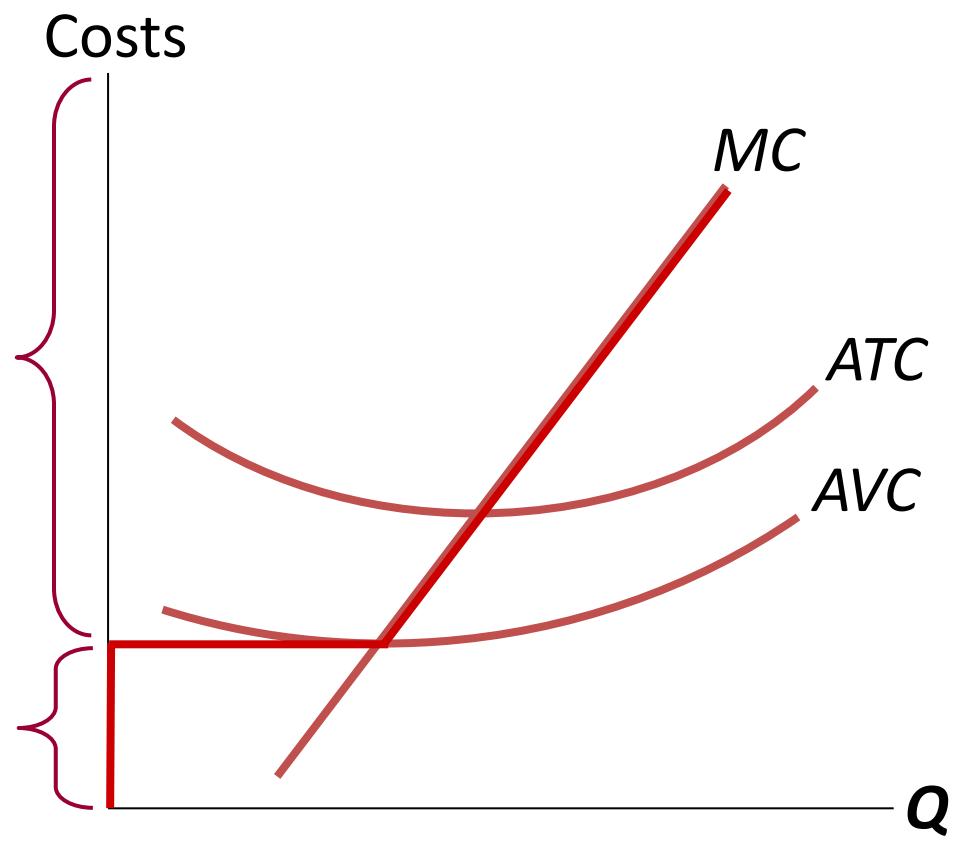
Shut down if $P < AVC$

A Competitive Firm's SR Supply Curve

The firm's SR supply curve is the portion of its MC curve above AVC .

If $P > AVC$, then firm produces Q where $P = MC$.

If $P < AVC$, then firm shuts down (produces $Q = 0$).



The Irrelevance of Sunk Costs

- **Sunk cost:** a cost that has already been committed and cannot be recovered
- Sunk costs should be irrelevant to decisions; you must pay them regardless of your choice.
- FC is a sunk cost: The firm must pay its fixed costs whether it produces or shuts down.
- So, FC should not matter in the decision to shut down.

A Firm's Long-Run Decision to Exit

- If firm exits the market,
 - revenue falls by TR (i.e. the “cost”)
 - costs fall by TC (i.e. the “benefit”)
- So, the firm should exit if $TR < TC$.
- Divide both sides by Q to rewrite the firm's decision as:

Exit if $P < ATC$

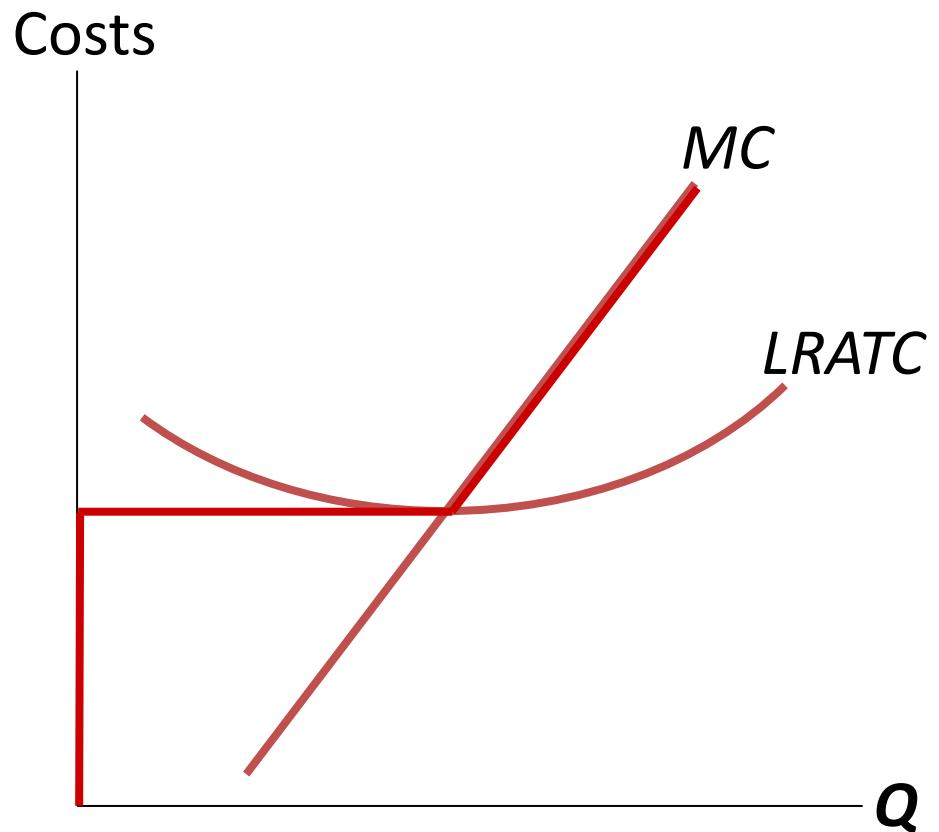
A New Firm's Decision to Enter Market

- In the long run, a new firm will enter the market if it is profitable to do so: if $TR > TC$.
- Divide both sides by Q to express the firm's entry decision as:

Enter if $P > ATC$

The Competitive Firm's Supply Curve

The firm's LR supply curve is the portion of its MC curve above $LRATC$.

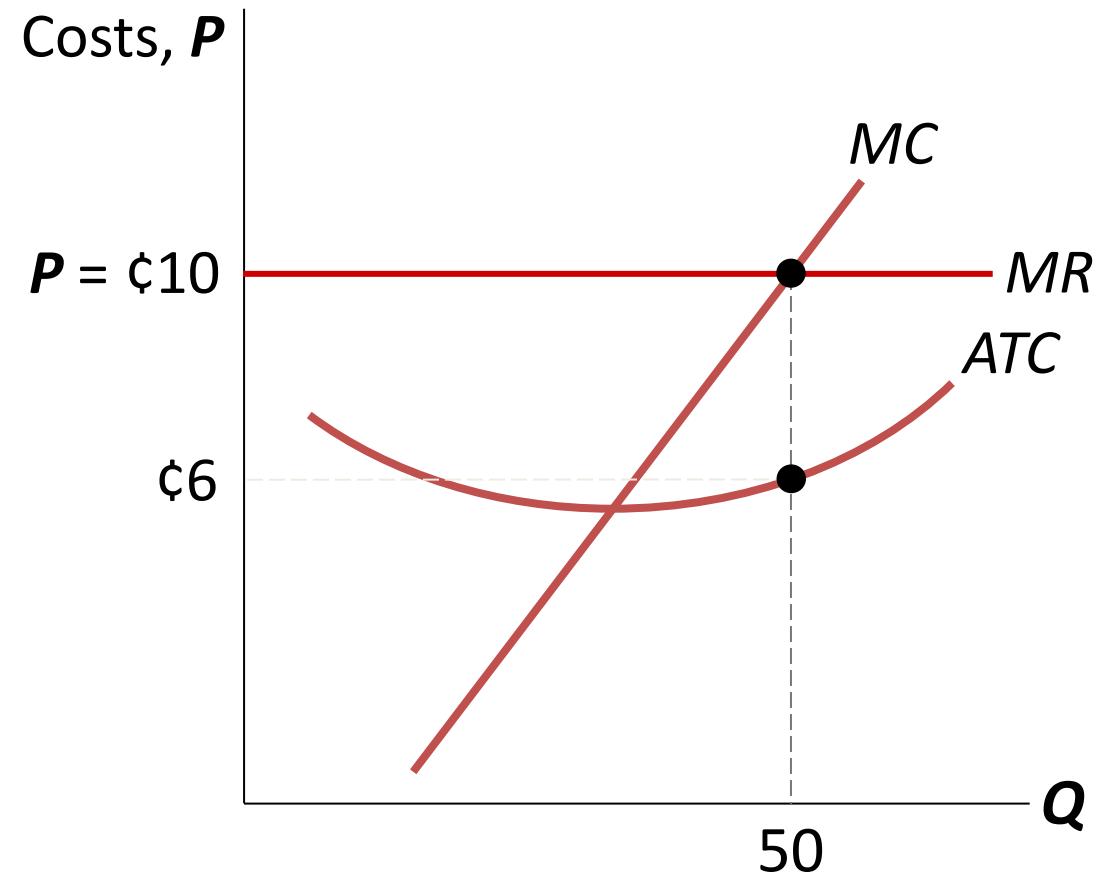


Identifying a firm's profit

Determine this firm's total profit.

Identify the area on the graph that represents the firm's profit.

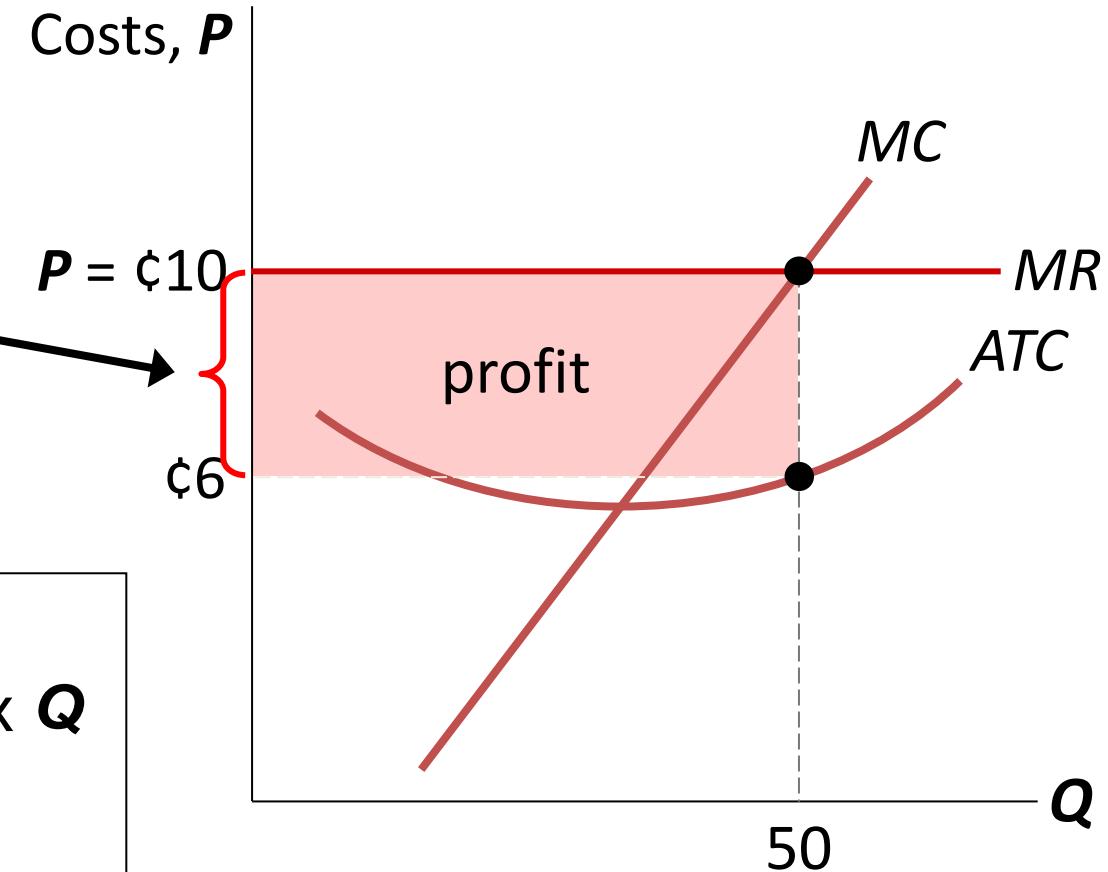
A competitive firm



Identifying a firm's profit

A competitive firm

$$\begin{aligned}\text{profit per unit} &= P - ATC \\ &= \text{¢}10 - 6 \\ &= \text{¢}4\end{aligned}$$



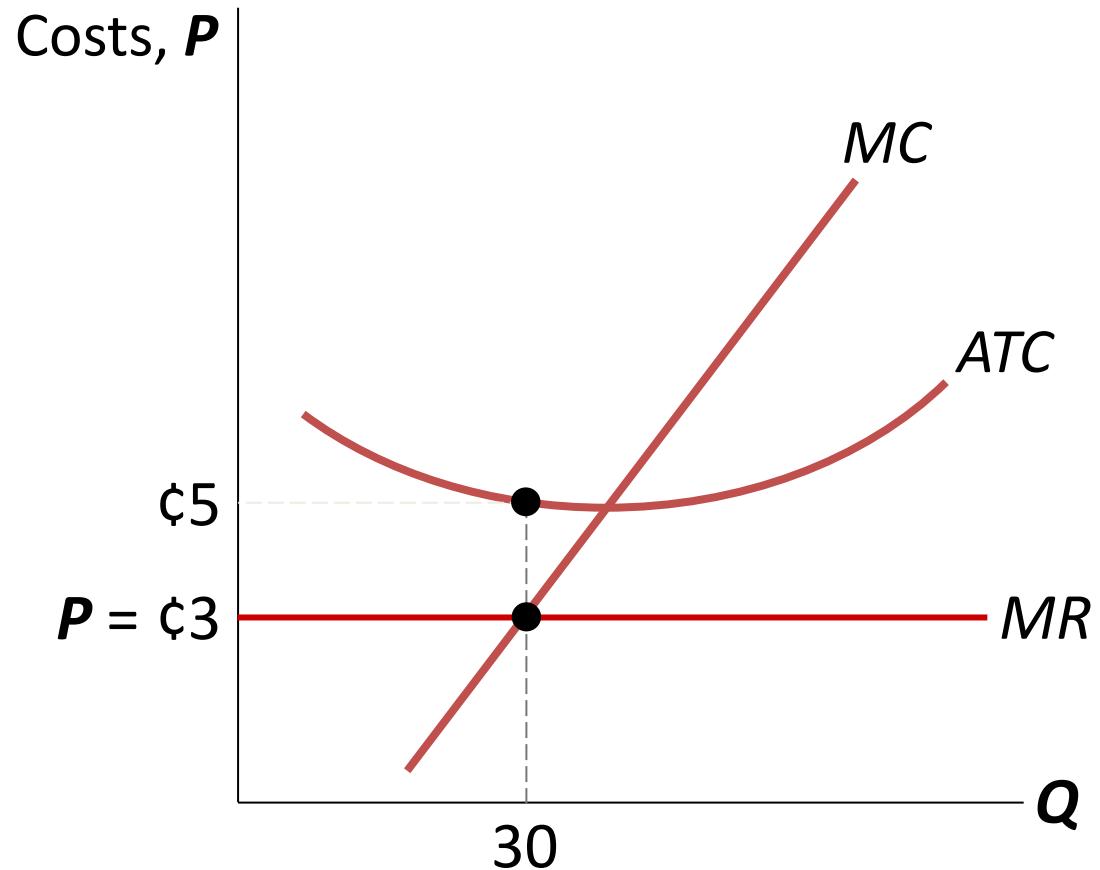
$$\begin{aligned}\text{Total profit} &= (P - ATC) \times Q \\ &= \text{¢}4 \times 50 \\ &= \text{¢}200\end{aligned}$$

Identifying a firm's loss

Determine this firm's total loss.

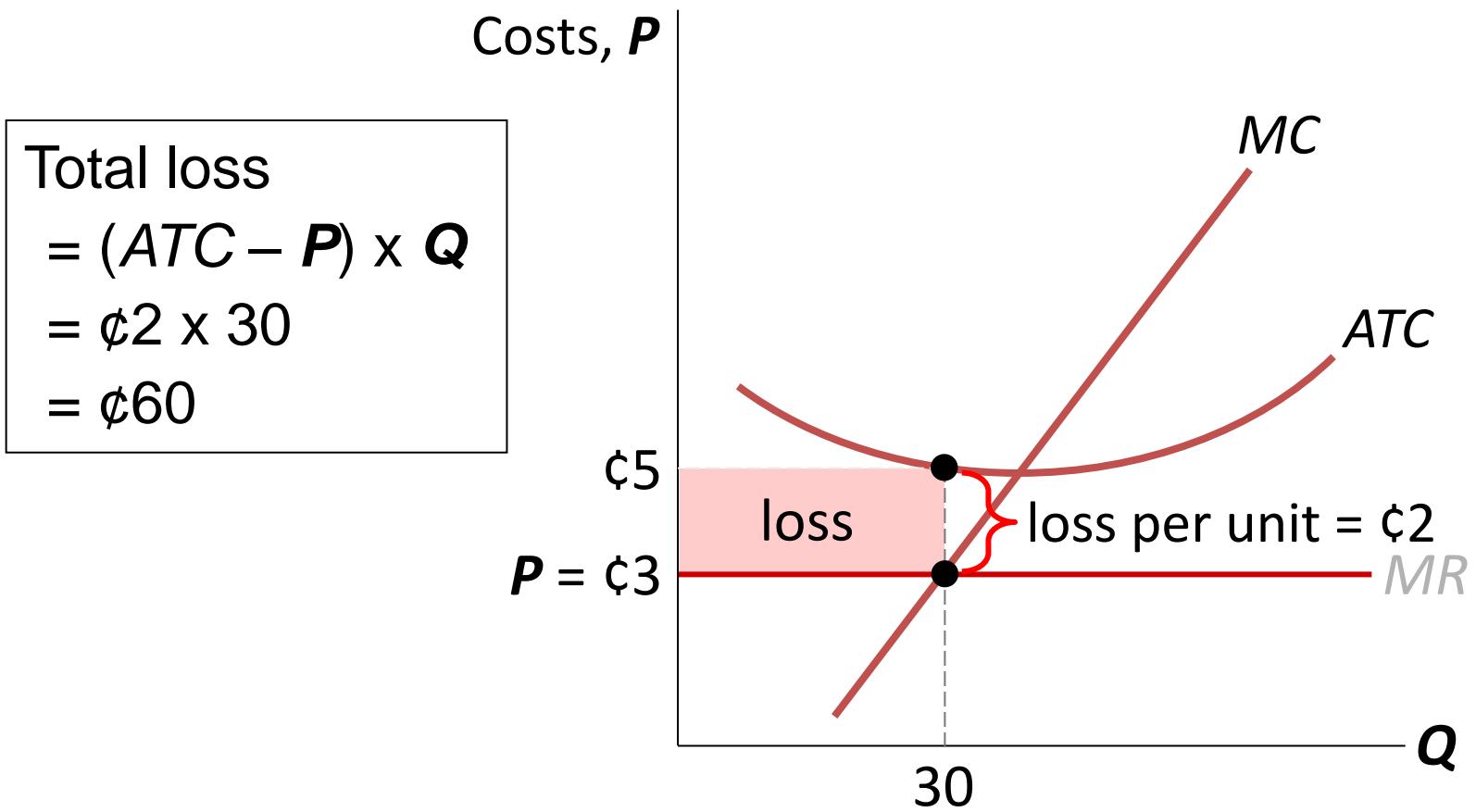
Identify the area on the graph that represents the firm's loss.

A competitive firm



Identifying a firm's loss

A competitive firm



Market Supply: Assumptions for a PCM

- 1) All existing firms and potential entrants have identical costs.
- 2) Each firm's costs do not change as other firms enter or exit the market.
- 3) The number of firms in the market is
 - fixed in the short run
(due to fixed costs)
 - variable in the long run
(due to free entry and exit)

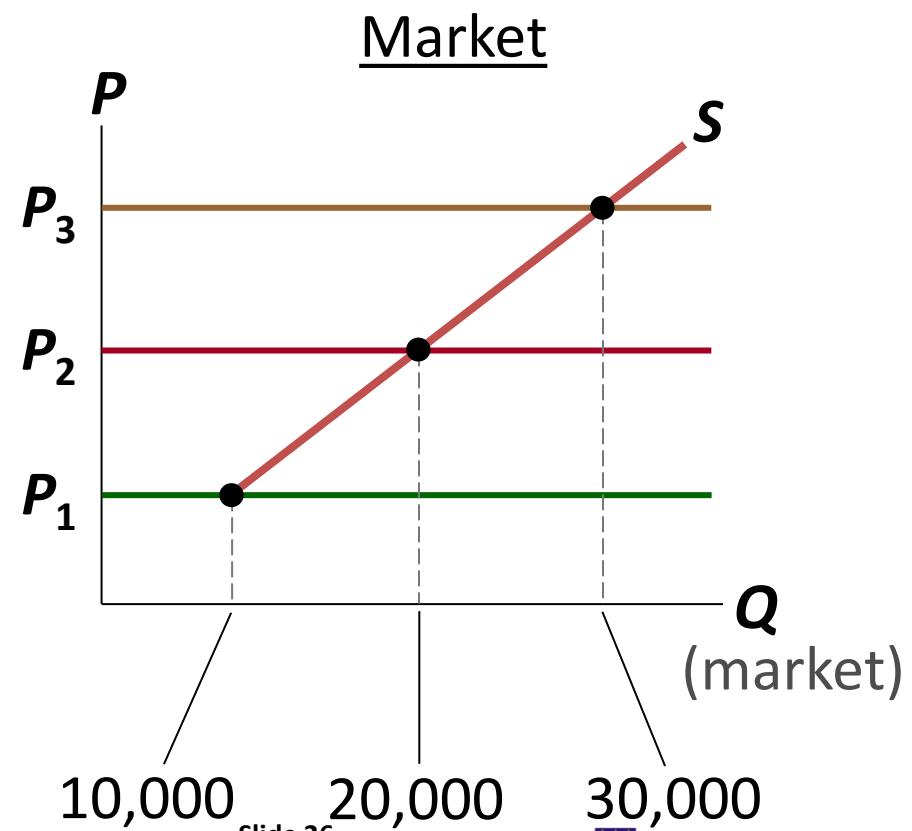
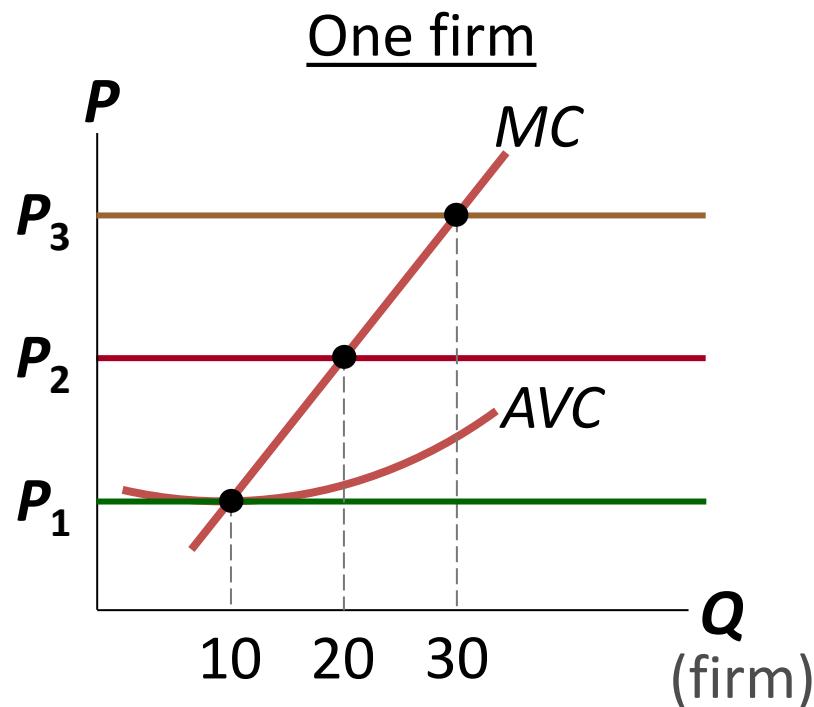
The SR Market Supply Curve

- As long as $P \geq AVC$, each firm will produce its profit-maximizing quantity, where $MR = MC$.
- Recall from Chapter 4:
At each price, the market quantity supplied is the sum of quantity supplied by each firm.

The SR Market Supply Curve

Example: 1000 identical firms.

At each P , market $Q^s = 1000 \times (\text{one firm's } Q^s)$



Entry & Exit in the Long Run

- In the LR, the number of firms can change due to entry & exit.
- If existing firms earn positive economic profit,
 - New firms enter.
 - SR market supply curve shifts right.
 - P falls, reducing firms' profits.
 - Entry stops when firms' economic profits have been driven to zero.

Entry & Exit in the Long Run

- In the LR, the number of firms can change due to entry & exit.
- If existing firms incur losses,
 - Some will exit the market.
 - SR market supply curve shifts left.
 - P rises, reducing remaining firms' losses.
 - Exit stops when firms' economic losses have been driven to zero.

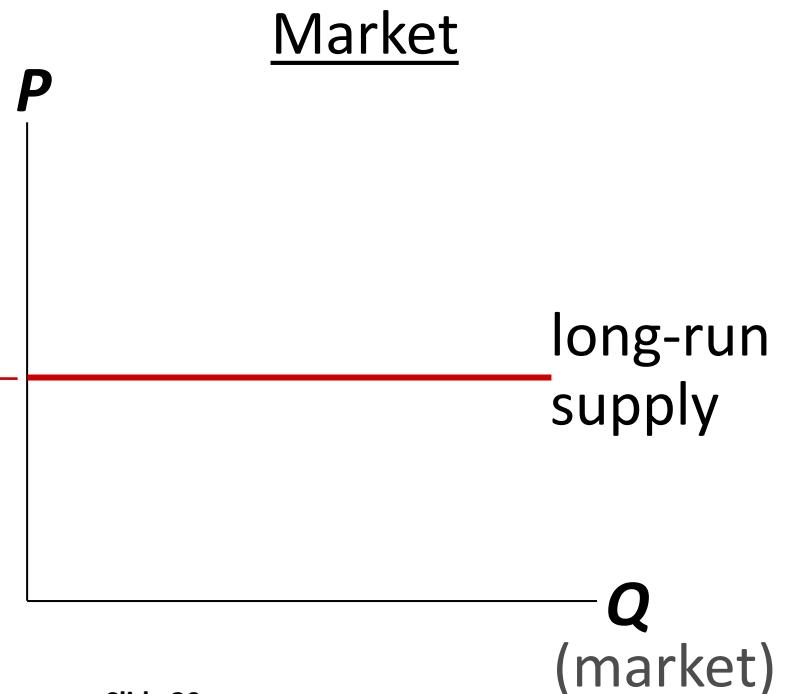
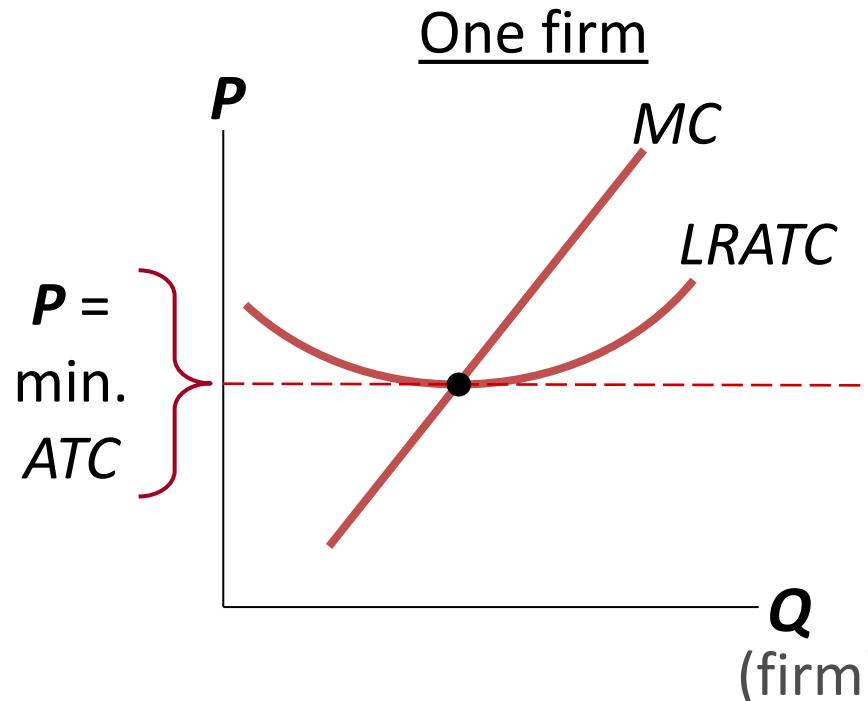
The Zero-Profit Condition

- **Long-run equilibrium:**
The process of entry or exit is complete – remaining firms earn zero economic profit.
- Zero economic profit occurs when $P = ATC$.
- Since firms produce where $P = MR = MC$,
the zero-profit condition is $P = MC = ATC$.
- Recall that MC intersects ATC at minimum ATC .
- Hence, in the long run, $P = \text{minimum } ATC$.

The LR Market Supply Curve

In the long run,
the typical firm
earns zero profit.

The LR market supply
curve is horizontal at
 $P = \text{minimum } ATC$.



Why Do Firms Stay in Business if Profit = 0?

- Recall, economic profit is revenue minus all costs – including implicit costs, like the opportunity cost of the owner's time and money.
- In the zero-profit equilibrium, firms earn enough revenue to cover these costs.

SR & LR Effects of an Increase in Demand

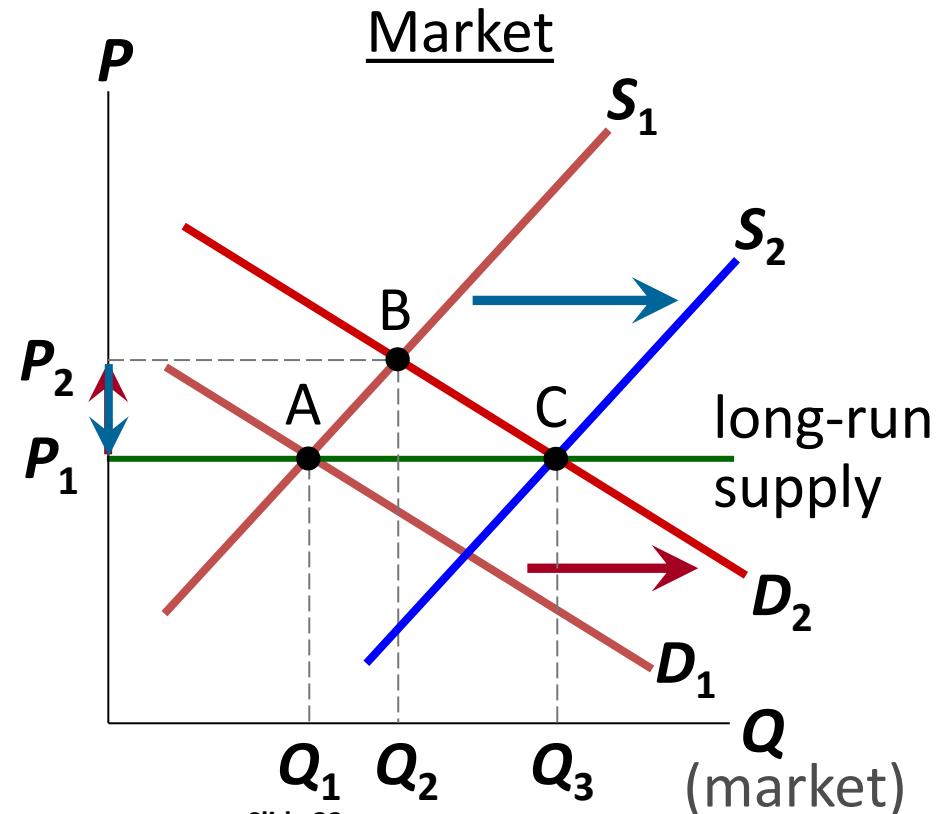
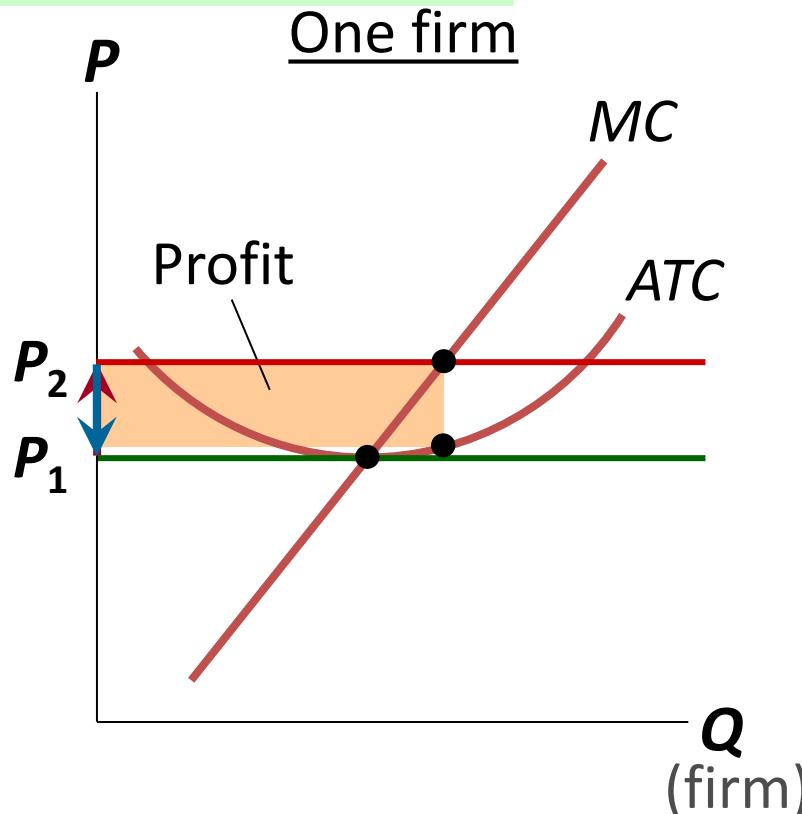
A firm begins in long-run eq'm...

...leading to SR profits for the firm.

...driving profits to zero and restoring long-run eq'm.

...but then an increase in demand raises P ...

Over time, profits induce entry, shifting S to the right, reducing P ...



Why the LR Supply Curve Might Slope Upward

- The LR market supply curve is horizontal if
 - 1) all firms have **identical costs**, and
 - 2) **costs do not change** as other firms enter or exit the market.
- If either of these assumptions is not true, then LR supply curve slopes upward.

1) Firms Have Different Costs

- As P rises, firms with **lower costs** enter the market before those with higher costs.
- Further increases in P make it worthwhile for **higher-cost** firms to enter the market, which increases market quantity supplied.
- Hence, LR market supply curve slopes upward.
- At any P ,
 - For the marginal firm,
 $P = \text{minimum } ATC$ and profit = 0.
 - For lower-cost firms, profit > 0.

2) Costs Rise as Firms Enter the Market

- In some industries, the supply of a **key input is limited** (e.g., there's a fixed amount of land suitable for farming).
- The entry of new firms increases demand for this input, causing its price to rise.
- This increases **all** firms' costs.
- Hence, an increase in P is required to increase the market quantity supplied, so the supply curve is upward-sloping.

CONCLUSION: The Efficiency of a Competitive Market

- Profit-maximization: $MC = MR$
- Perfect competition: $P = MR$
- So, in the competitive eq'm: $P = MC$
- Recall, MC is cost of producing the marginal unit.
 P is value to buyers of the marginal unit.
- So, the competitive eq'm is efficient, maximizes total surplus.
- In the next chapter, monopoly: pricing & production decisions, deadweight loss, regulation.

CHAPTER SUMMARY

- For a firm in a perfectly competitive market, price = marginal revenue = average revenue.
- If $P > AVC$, a firm maximizes profit by producing the quantity where $MR = MC$. If $P < AVC$, a firm will shut down in the short run.
- If $P < ATC$, a firm will exit in the long run.
- In the short run, entry is not possible, and an increase in demand increases firms' profits.
- With free entry and exit, profits = 0 in the long run, and $P = \text{minimum } ATC$.



ECON 101: INTRODUCTION TO ECONOMICS I

Lecture 9 – Monopoly

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Lecture Overview

- In this lecture, we learn what monopolies are and how they arise in an economy.
- We will also study the characteristics of the monopoly, including unlike the perfectly competitive market, $P > MR$ for the monopoly.
- Furthermore, how monopolies choose their Q and P and the effect that monopolies have on society's welfare will be looked at.
- We conclude the discussion on monopoly with what government can do about it and introduce the concept of price discrimination.

Learning Outcomes

- By the end of the lecture, you should be able to:
 - Explain how monopolies arise
 - Explain why $MR < P$ for the monopolist
 - Explain how monopolists choose P and Q and how this affects society's welfare.
 - Provide some options on how government can deal with monopolies
- The lecture will be based on **Mankiw, G. (2012)**. Principles of Economics (6th Edition), South Western.
 - **Chapter 15**

Introduction

- A **monopoly** is a firm that is the sole seller of a product without close substitutes.
- The key difference b/n a monopoly and a competitive firm:
 - A monopoly firm has **market power** - the ability to influence the market price of the product it sells.
 - A competitive firm has no market power.

Why Monopolies Arise

The main cause of monopolies is **barriers to entry** – other firms cannot enter the market.

Three sources of barriers to entry:

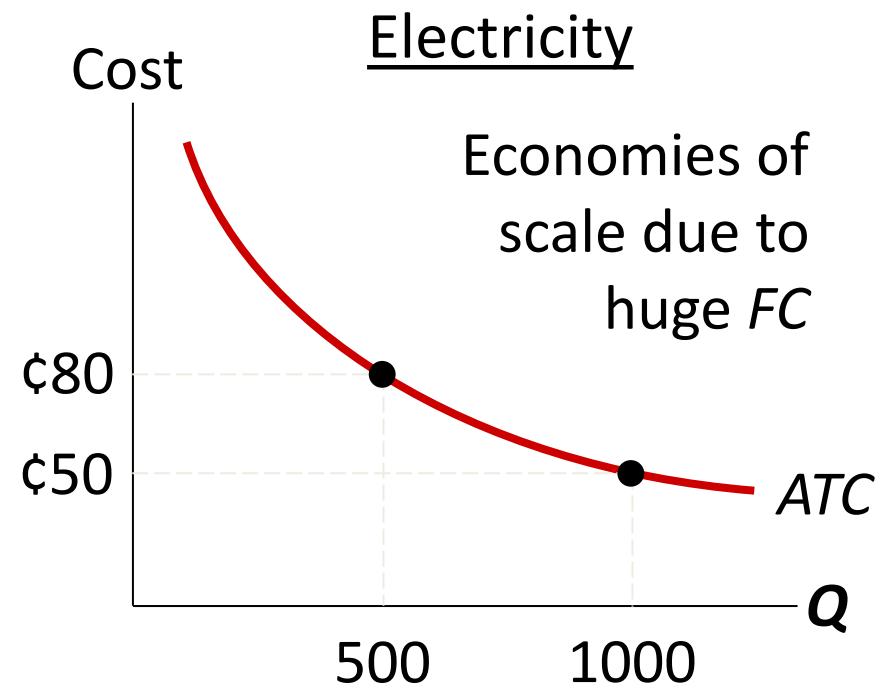
1. A single firm owns a key resource.
E.g., The VRA has control over the Volta river for hydro-electric power generation (Akosombo & Kpong)
2. The govt gives a single firm the exclusive right to produce the good.
E.g., patents, copyright laws

Why Monopolies Arise

3. **Natural monopoly**: a single firm can produce the entire market Q at lower ATC than could several firms.

Example: 1000 homes need electricity.

ATC is lower if one firm services all 1000 homes than if two firms each service 500 homes.



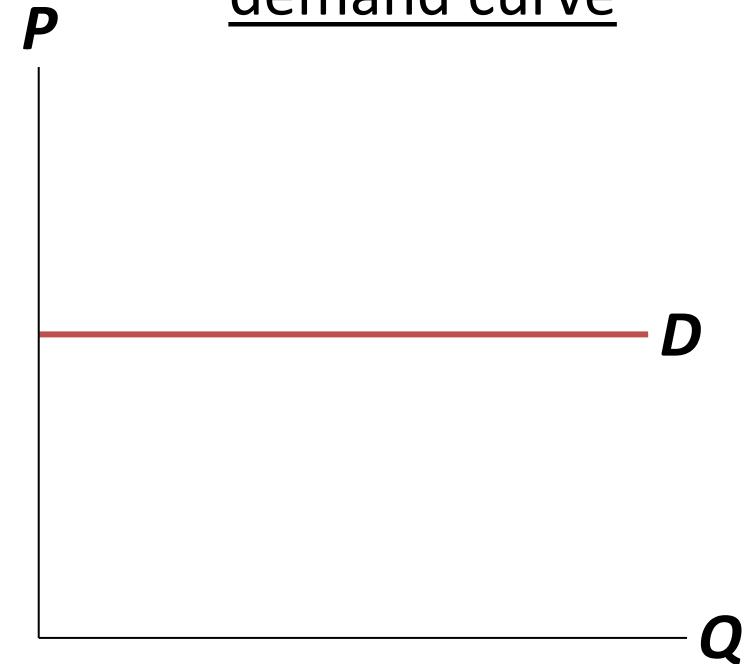
Monopoly vs. Competition: Demand Curves

In a competitive market, the market demand curve slopes downward.

but the demand curve for any **individual** firm's product is **horizontal** at the market price.

The firm can increase **Q** without lowering **P** , so $MR = P$ for the competitive firm.

A competitive firm's demand curve



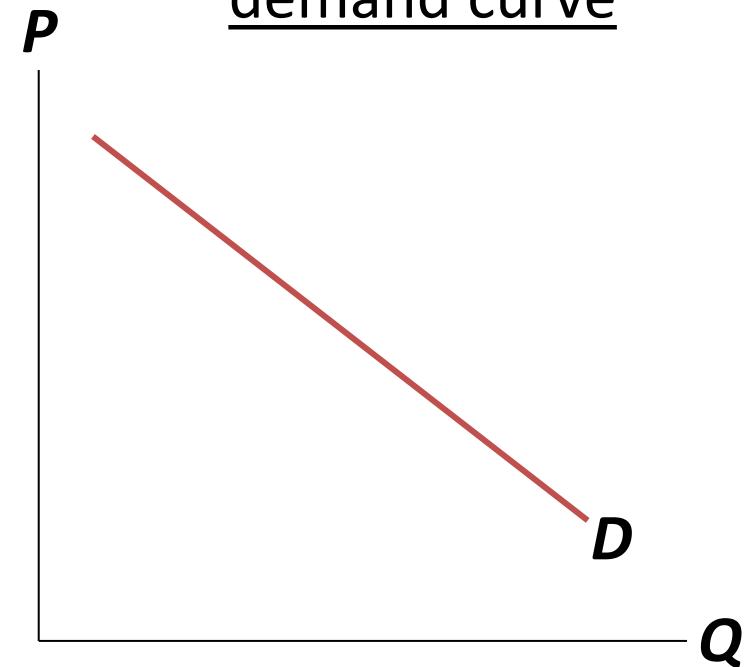
Monopoly vs. Competition: Demand Curves

A monopolist is the only seller, so it faces the **market demand curve**.

To sell a larger Q , the firm must reduce P .

Thus, $MR \neq P$.

A monopolist's demand curve



ACTIVE LEARNING 1:

A monopoly's revenue

University Farms is the only seller of guinea fowl eggs in town.

The table shows the market demand for cappuccinos.

Fill in the missing spaces of the table.

What is the relation between P and AR ?

Between P and MR ?

Q	P	TR	AR	MR
0	¢4.50		n.a.	
1	4.00			
2	3.50			
3	3.00			
4	2.50			
5	2.00			
6	1.50			



ACTIVE LEARNING 1:

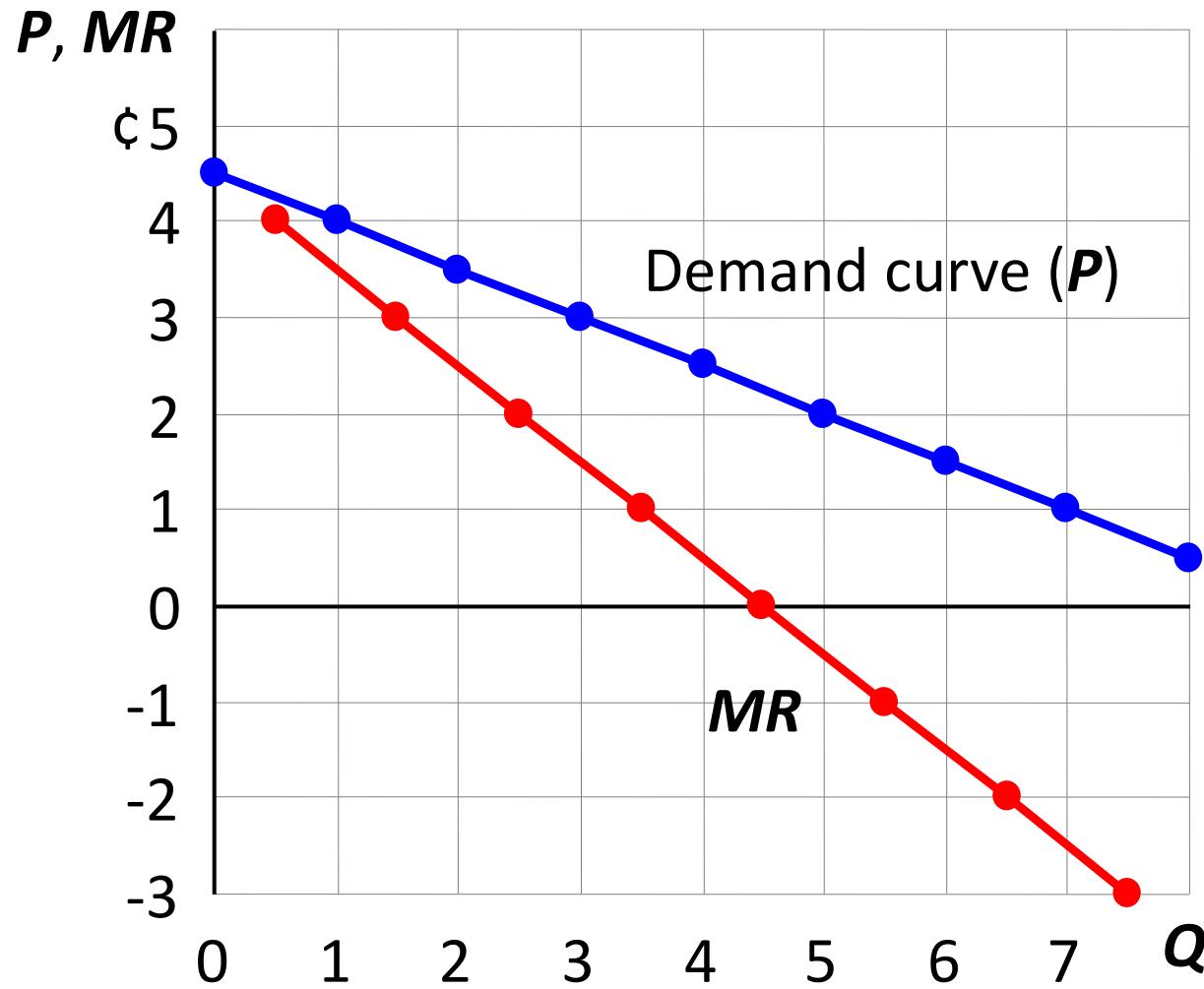
Answers

Here, $P = AR$, same as for a competitive firm.

Here, $MR < P$, whereas $MR = P$ for a competitive firm.

Q	P	TR	AR	MR
0	¢4.50	¢ 0	n.a.	
1	4.00	4	¢4.00	¢4
2	3.50	7	3.50	3
3	3.00	9	3.00	2
4	2.50	10	2.50	1
5	2.00	10	2.00	0
6	1.50	9	1.50	-1

University Farm's D and MR Curves



Understanding the Monopolist's MR

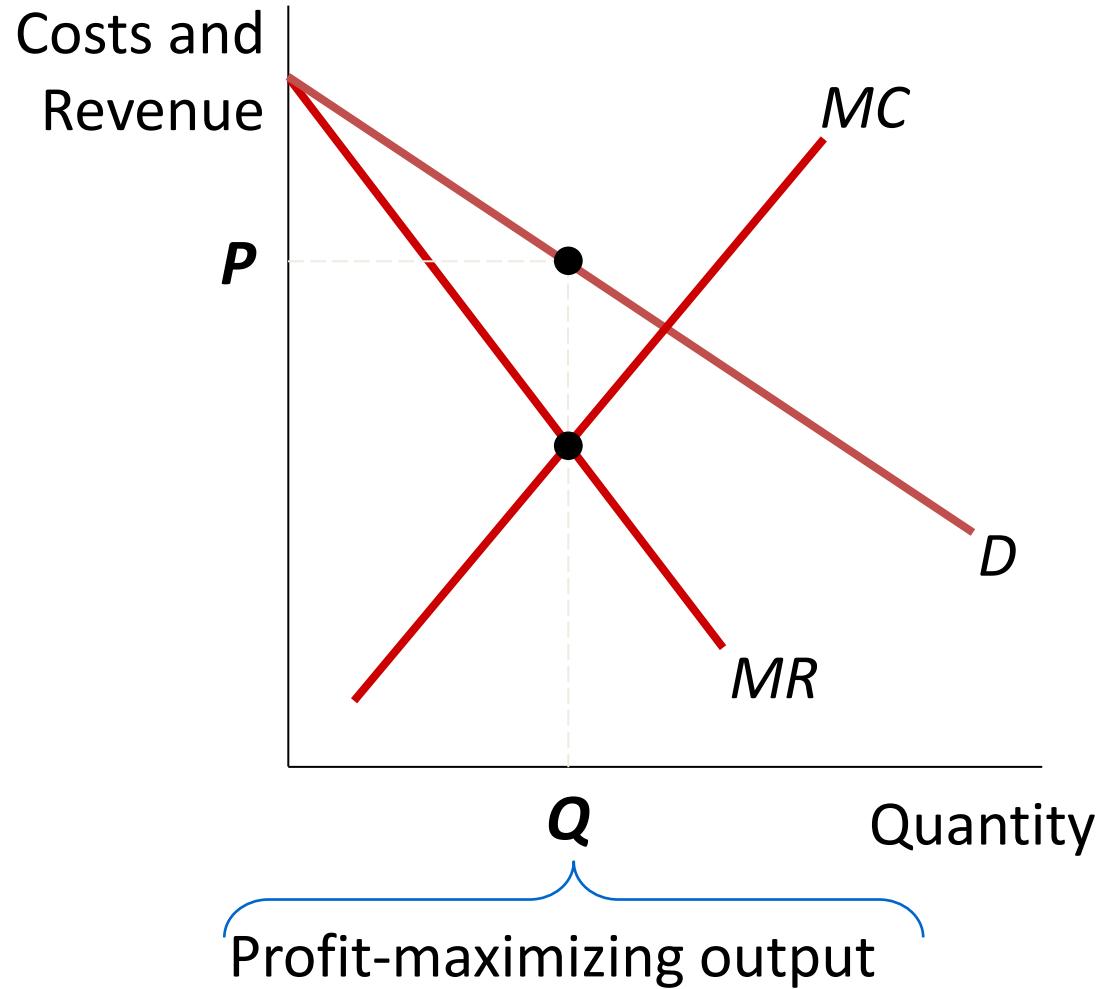
- Increasing Q has two effects on revenue:
 - The ***output effect***:
More output is sold, which raises revenue
 - The ***price effect***:
The price falls, which lowers revenue
- To sell a larger Q , the monopolist must reduce the price on all the units it sells.
- Hence, $MR < P$
- MR could even be negative if the price effect exceeds the output effect
(e.g., when University farms increases Q from 5 to 6).

Profit-Maximization

- Like a competitive firm, a monopolist maximizes profit by producing the quantity where $MR = MC$.
- Once the monopolist identifies this quantity, it sets the highest price consumers are willing to pay for that quantity.
- It finds this price from the D curve.

Profit-Maximization

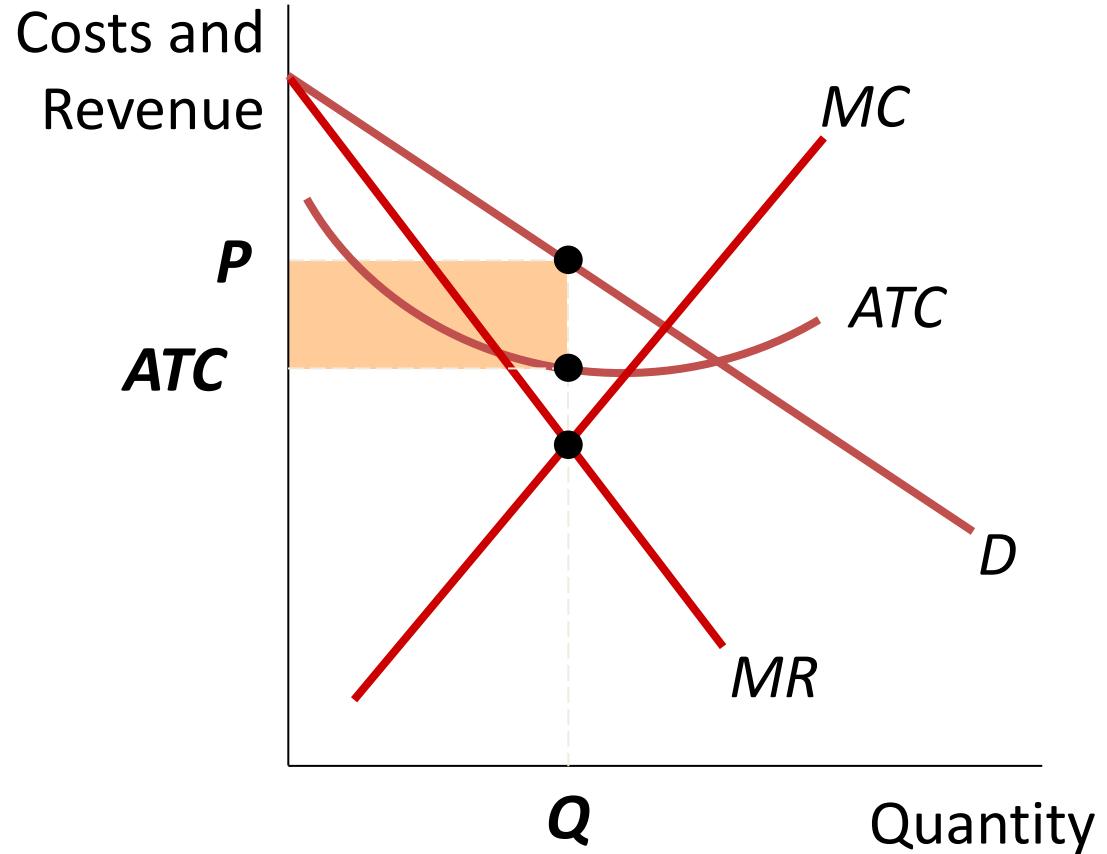
1. The profit-maximizing Q is where $MR = MC$.
2. Find P from the demand curve at this Q .



The Monopolist's Profit

As with a competitive firm, the monopolist's profit equals

$$(P - ATC) \times Q$$



A Monopoly Does Not Have an S Curve

A competitive firm

- takes P as given
- has a supply curve that shows how its Q depends on P

A monopoly firm

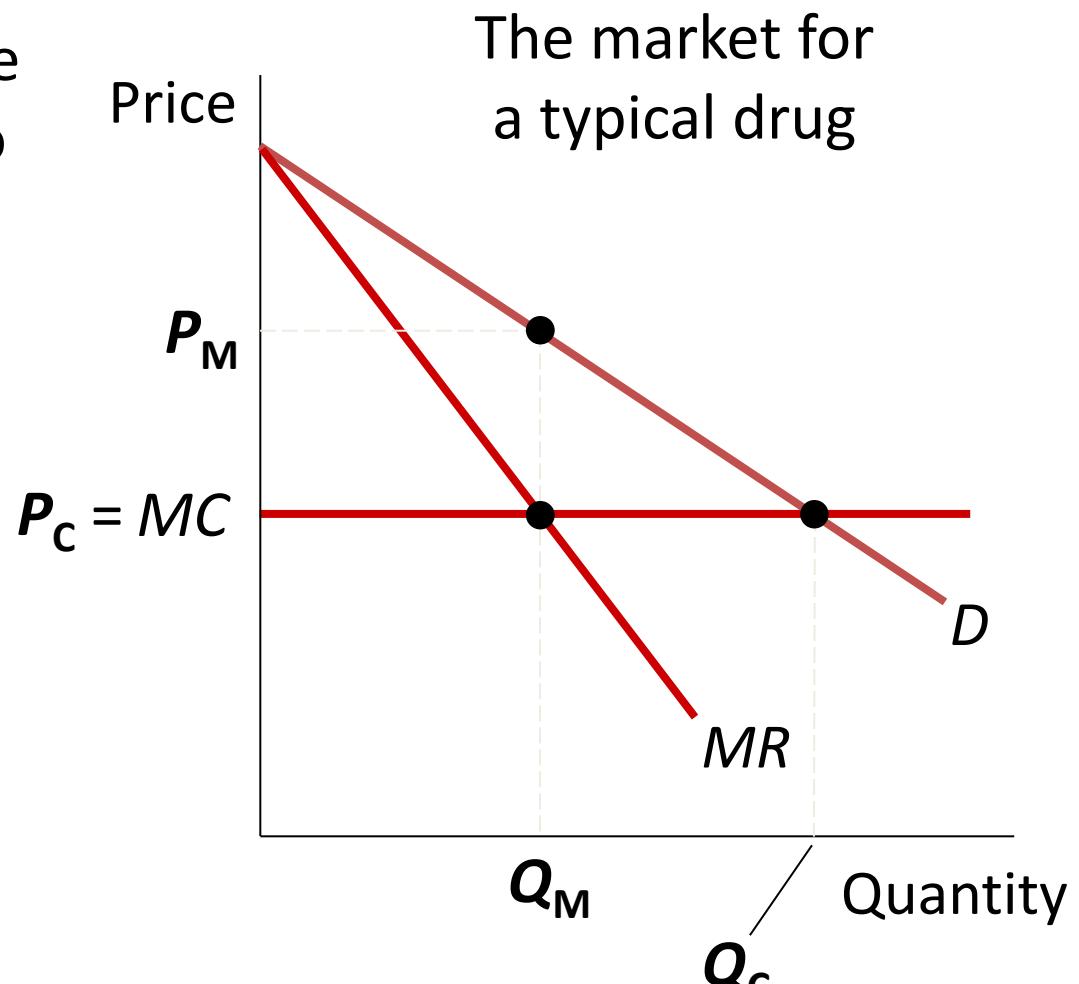
- is a “price-maker,” **not** a “price-taker”
- Q does not depend on P ;
rather, Q and P are jointly determined by
 MC , MR , and the demand curve.

So there is no supply curve for monopoly.

Case Study: Monopoly vs. Generic Drugs

Patents on new drugs give a temporary monopoly to the seller.

When the patent expires, the market becomes competitive, generic drugs appear.



The Welfare Cost of Monopoly

- Recall: In a competitive market equilibrium, $P = MC$ and total surplus is maximized.
- In the monopoly eq'm, $P > MR = MC$
 - The value to buyers of an additional unit (P) exceeds the cost of the resources needed to produce that unit (MC).
 - The monopoly Q is too low – could increase total surplus with a larger Q .
 - Thus, monopoly results in a deadweight loss.

The Welfare Cost of Monopoly

Competitive eq'm:

quantity = Q_E

$P = MC$

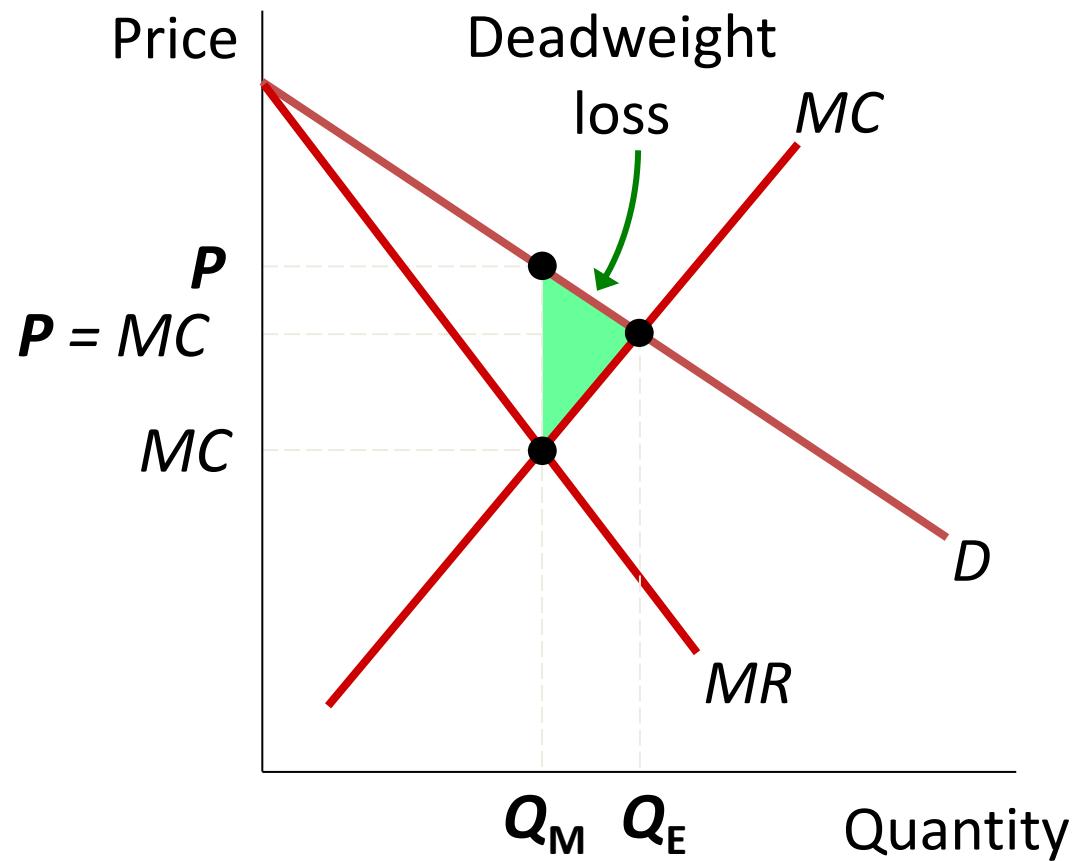
total surplus is
maximized

Monopoly eq'm:

quantity = Q_M

$P > MC$

deadweight loss



Public Policy Toward Monopolies

- Increasing competition with antitrust laws
 - Antitrust laws ban certain **anticompetitive** practices, and allow govt to break up monopolies (practices include takeovers that make firms too big, anticompetitive pricing, etc.)
- Regulation
 - Govt agencies set the monopolist's price
 - For natural monopolies, $MC < ATC$ at all Q , so marginal cost pricing would result in losses.
 - If so, regulators might subsidize the monopolist or set $P = ATC$ for zero economic profit.

Public Policy Toward Monopolies

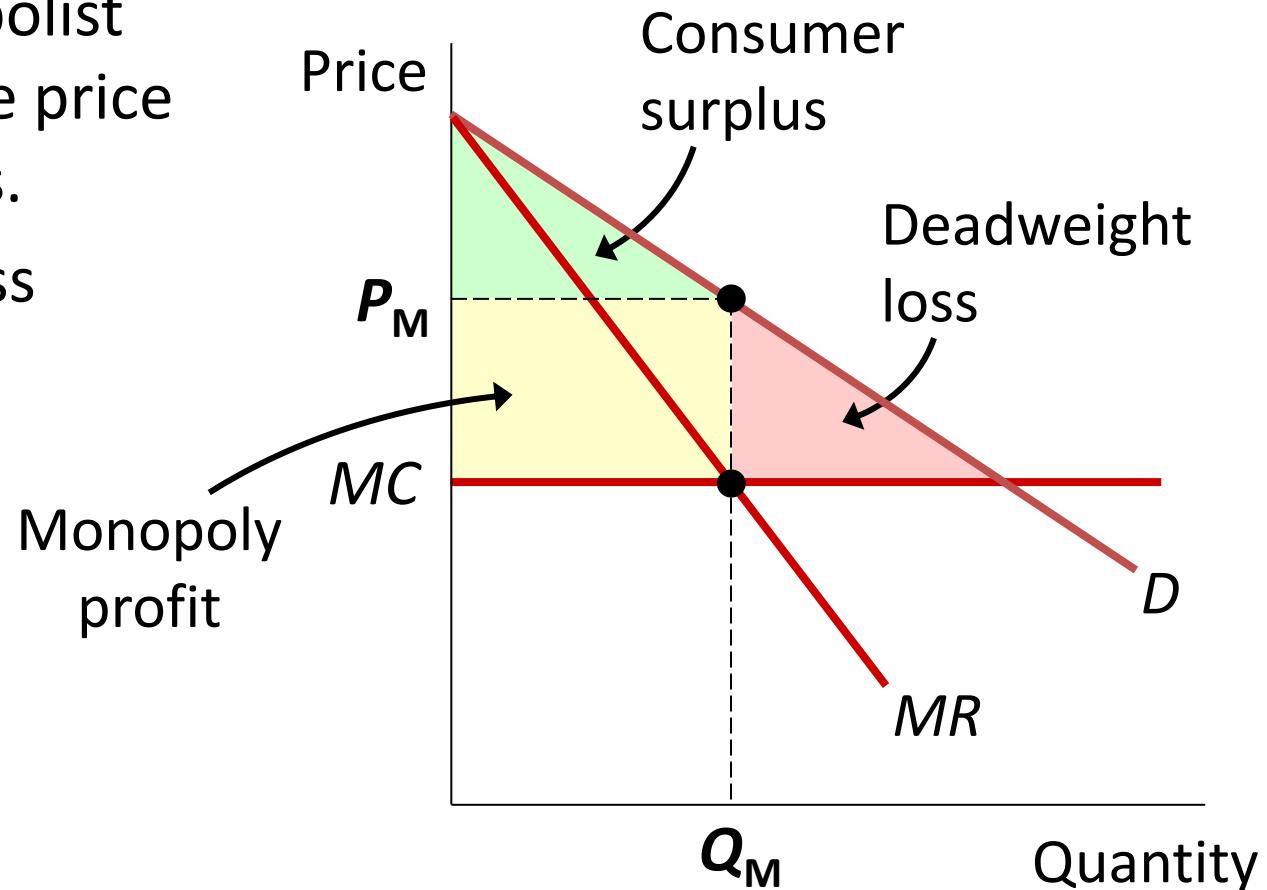
- Public ownership
 - Example: ECG, GWCL
 - Problem: Public ownership is usually less efficient since no profit motive to minimize costs
- Doing nothing
 - The foregoing policies all have drawbacks, so the best policy may be **no policy**.

Price Discrimination

- **Price discrimination** is the business practice of selling the **same good** at different prices to different buyers.
- The characteristic used in price discrimination is willingness to pay (WTP):
 - A firm can increase profit by charging a higher price to buyers with higher WTP.

Perfect Price Discrimination vs. Single Price Monopoly

Here, the monopolist charges the same price (P_M) to all buyers. A deadweight loss results.



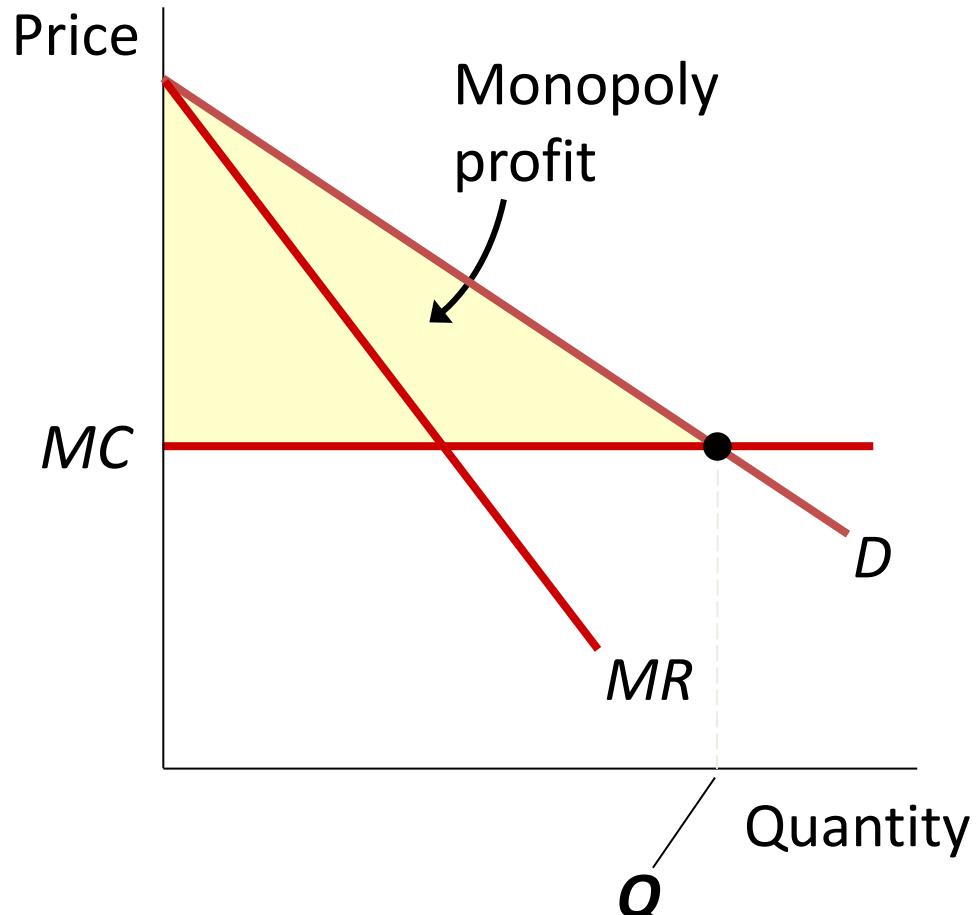
Perfect Price Discrimination vs. Single Price Monopoly

Here, the monopolist produces the competitive quantity, but charges each buyer his or her WTP.

This is called **perfect price discrimination**.

The monopolist captures all CS as profit.

But there's no DWL.



Price Discrimination in the Real World

- In the real world, perfect price discrimination is not possible:
 - no firm knows every buyer's WTP
 - buyers do not announce it to sellers
- So, firms divide customers into groups based on some observable trait that is likely related to WTP, such as age.

Examples of Price Discrimination

Movie tickets

Discounts for seniors, students, and people who can attend during weekday afternoons. They are all more likely to have lower WTP than people who pay full price on Friday night.

Airline prices

Discounts for Saturday-night stayovers help distinguish business travelers, who usually have higher WTP, from more price-sensitive leisure travelers.

Examples of Price Discrimination

Discount coupons

People who have time to clip and organize coupons are more likely to have lower income and lower WTP than others.

Need-based financial aid

Low income families have lower WTP for their children's college education.

Schools price-discriminate by offering need-based aid to low income families.

Examples of Price Discrimination

Quantity discounts

A buyer's WTP often declines with additional units, so firms charge less per unit for large quantities than small ones.

Example: A movie theater charges ¢4 for a small popcorn and ¢5 for a large one that's twice as big.

CONCLUSION: The Prevalence of Monopoly

- In the real world, pure monopoly is rare.
- Yet, many firms have market power, due to
 - selling a unique variety of a product
 - having a large market share and few significant competitors
- In many such cases, most of the results from this chapter apply, including
 - markup of price over marginal cost
 - deadweight loss

CHAPTER SUMMARY

- A monopoly firm is the sole seller in its market. Monopolies arise due to barriers to entry, including: government-granted monopolies, the control of a key resource, or economies of scale over the entire range of output.
- A monopoly firm faces a downward-sloping demand curve for its product. As a result, it must reduce price to sell a larger quantity, which causes marginal revenue to fall below price.

CHAPTER SUMMARY

- Monopoly firms maximize profits by producing the quantity where marginal revenue equals marginal cost. But since marginal revenue is less than price, the monopoly price will be greater than marginal cost, leading to a deadweight loss.
- Policymakers may respond by regulating monopolies, using antitrust laws to promote competition, or by taking over the monopoly and running it. Due to problems with each of these options, the best option may be to take no action.

CHAPTER SUMMARY

- Monopoly firms (and others with market power) try to raise their profits by charging higher prices to consumers with higher willingness to pay. This practice is called price discrimination.

ECON 101: INTRODUCTION TO ECONOMICS I

Lecture 10 – Oligopoly and Monopolistic Competition

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Lecture Overview

- Perfectly competitive markets and monopoly markets lie at the two extreme ends of market structures. In between these two are other market structures.
- In this lecture, we learn about two of such market structures; monopolistic competition, which is closer in characteristics to perfect competition, and oligopoly, which is closer in characteristic to monopolies.
- In looking at oligopoly, we will consider the possible outcomes that flow from their characteristics, why it is difficult for them to cooperate and how laws can be used to encourage competition.
- With monopolistic competition, we consider its characteristics, how price and quantity is chosen, welfare under monopolistic competition and why firms advertise

Learning Outcomes

- By the end of the lecture, you should be able to:
 - Identify the key characteristics of oligopoly and monopolistic competition
 - Identify their similarities and differences with the monopoly and perfectly competitive market structures
- The lecture will be based on **Mankiw, G. (2012)**. Principles of Economics (6th Edition), South Western.
 - **Chapters 16 & 17**

Introduction: Between Monopoly and Competition

Two extremes

- Competitive markets: many firms, identical products
- Monopoly: one firm

In between these extremes

- **Oligopoly**: only a few sellers offer similar or identical products.
- **Monopolistic competition**: many firms sell similar but not identical products.

Measuring Market Concentration

- **Concentration ratio:** the percentage of the market's total output supplied by its four largest firms.
- The higher the concentration ratio, the less competition.
- This session focuses on oligopoly, a market structure with **high** concentration ratios.
- **Duopoly** – a market structure in which there are only two sellers

Concentration Ratios in Selected U.S. Industries

Industry	Concentration ratio
Video game consoles	100%
Tennis balls	100%
Credit cards	99%
Batteries	94%
Soft drinks	93%
Web search engines	92%
Breakfast cereal	92%
Cigarettes	89%
Greeting cards	88%
Beer	85%
Cell phone service	82%
Autos	79%

EXAMPLE: Cell Phone Duopoly in Smalltown

P	Q
¢0	140
5	130
10	120
15	110
20	100
25	90
30	80
35	70
40	60
45	50

- Anum has 140 residents
- The “good”: cell phone service with unlimited anytime minutes and free phone
- Anum’s demand schedule
- Two firms: Vodafone, MTN
(duopoly): an oligopoly with two firms)
- Each firm’s costs: $FC = \text{¢}0$, $MC = \text{¢}10$

EXAMPLE: Cell Phone Duopoly in Anum

P	Q	Revenue	Cost	Profit
¢0	140	¢0	¢1,400	-1,400
5	130	650	1,300	-650
10	120	1,200	1,200	0
15	110	1,650	1,100	550
20	100	2,000	1,000	1,000
25	90	2,250	900	1,350
30	80	2,400	800	1,600
35	70	2,450	700	1,750
40	60	2,400	600	1,800
45	50	2,250	500	1,750

Competitive outcome (many sellers):

$$P = MC = \text{¢}10$$

$$Q = 120$$

$$\text{Profit} = \text{¢}0$$

Monopoly outcome (one seller):

$$P = \text{¢}40$$

$$Q = 60$$

$$\text{Profit} = \text{¢}1,800$$



EXAMPLE: Cell Phone Duopoly in Anum

- One possible duopoly outcome: collusion
- **Collusion:** an agreement among firms in a market about quantities to produce or prices to charge
- Vodafone and MTN could agree to each produce half of the monopoly output:
 - For each firm: $Q = 30$, $P = \text{¢}40$, profits = $\text{¢}900$
- **Cartel:** a group of firms acting in unison,
e.g., Vodafone and MTN in the outcome with collusion

Collusion vs. Self-Interest

- Both firms would be better off if both stick to the cartel agreement.
- But each firm has incentive to renege on the agreement (*any firm that produces more than the agreed [cartel] quantity to sell at the monopoly price can earn a higher profit. This eventually causes the cartel to collapse because the increase in quantity beyond monopoly output will eventually lead to a fall in market price*).
- **Lesson:**
It is difficult for oligopoly firms to form cartels and honor their agreements (*there is always an incentive for someone to “cheat”*).

The Equilibrium for an Oligopoly

- **Nash equilibrium:** a situation in which economic participants interacting with one another each *choose their best strategy given the strategies that all the others have chosen*

A Comparison of Market Outcomes

When firms in an oligopoly individually choose production to maximize profit,

- Q is greater than monopoly Q
but smaller than competitive market Q
- P is greater than competitive market P
but less than monopoly P

The Output & Price Effects

- Increasing output has two effects on a firm's profits:
 - **output effect:**
If $P > MC$, selling more output raises profits.
 - **price effect:**
Raising production increases market quantity, which reduces market price and reduces profit on all units sold.
- If output effect > price effect,
the firm increases production.
- If price effect > output effect,
the firm reduces production.

The Size of the Oligopoly

- As the number of firms in the market increases,
 - the price effect becomes smaller
 - the oligopoly looks more and more like a competitive market
 - P approaches MC
 - the market quantity approaches the socially efficient quantity

Another benefit of international trade:
Trade increases the number of firms competing,
increases Q , keeps P closer to marginal cost

Public Policy Toward Oligopolies

- Recall one of the Ten Principles:
Governments can sometimes improve market outcomes.
- In oligopolies, production is too low and prices are too high, relative to the social optimum.
- Role for policymakers:
promote competition, prevent cooperation to move the oligopoly outcome closer to the efficient outcome.

MONOPOLISTIC COMPETITION



Introduction to Monopolistic Competition

- **Monopolistic competition:**
a market structure in which many firms sell products that are **similar** but not **identical**.
- Examples:
 - apartments
 - books
 - bottled water
 - clothing
 - fast food
 - night clubs

Comparing Perfect & Monop. Competition

	perfect competition	monopolistic competition
number of sellers	many	many
free entry/exit	yes	yes
long-run econ. profits	zero	zero
the products firms sell	identical	differentiated
firm has market power?	none, price-taker	yes
<i>D</i> curve facing firm	horizontal	downward-sloping

Comparing Monopoly & Monop. Competition

	monopoly	monopolistic competition
number of sellers	one	many
free entry/exit	no	yes
long-run econ. profits	positive	zero
firm has market power?	yes	yes
D curve facing firm	downward-sloping (market demand)	downward-sloping
close substitutes	none	many

Comparing Oligopoly & Monop. Competition

	oligopoly	monopolistic competition
number of sellers	few	many
importance of strategic interactions between firms	high	low
likelihood of fierce competition	low	high

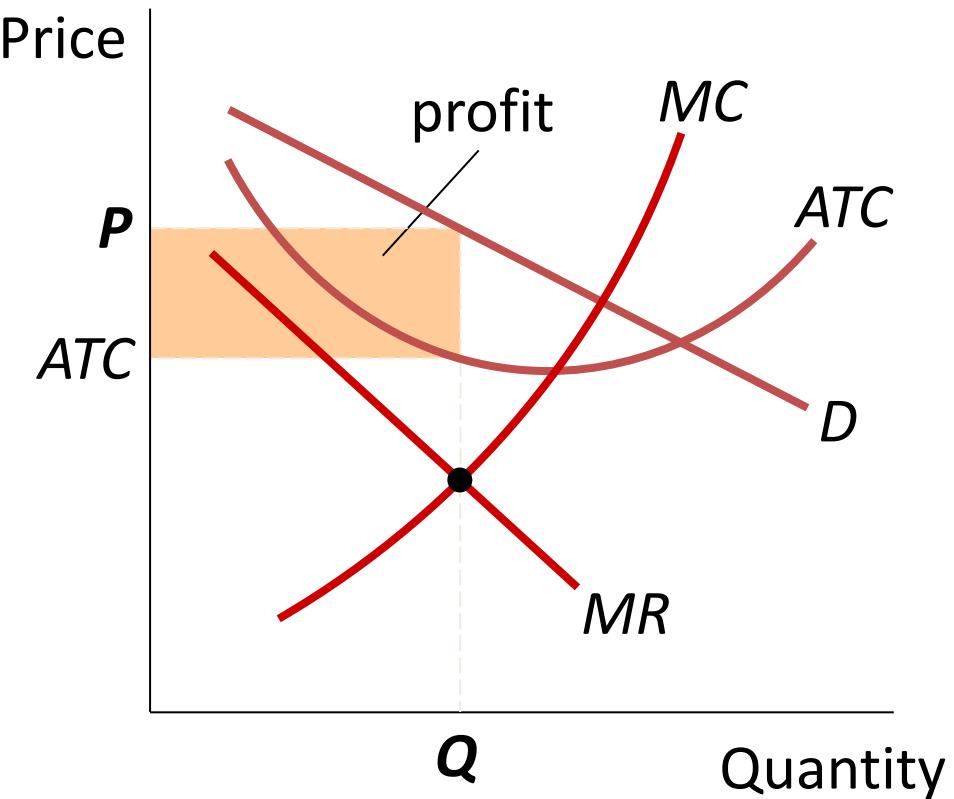
A Monopolistically Competitive Firm Earning Profits in the Short Run

The firm faces a downward-sloping D curve.

At each Q , $MR < P$.

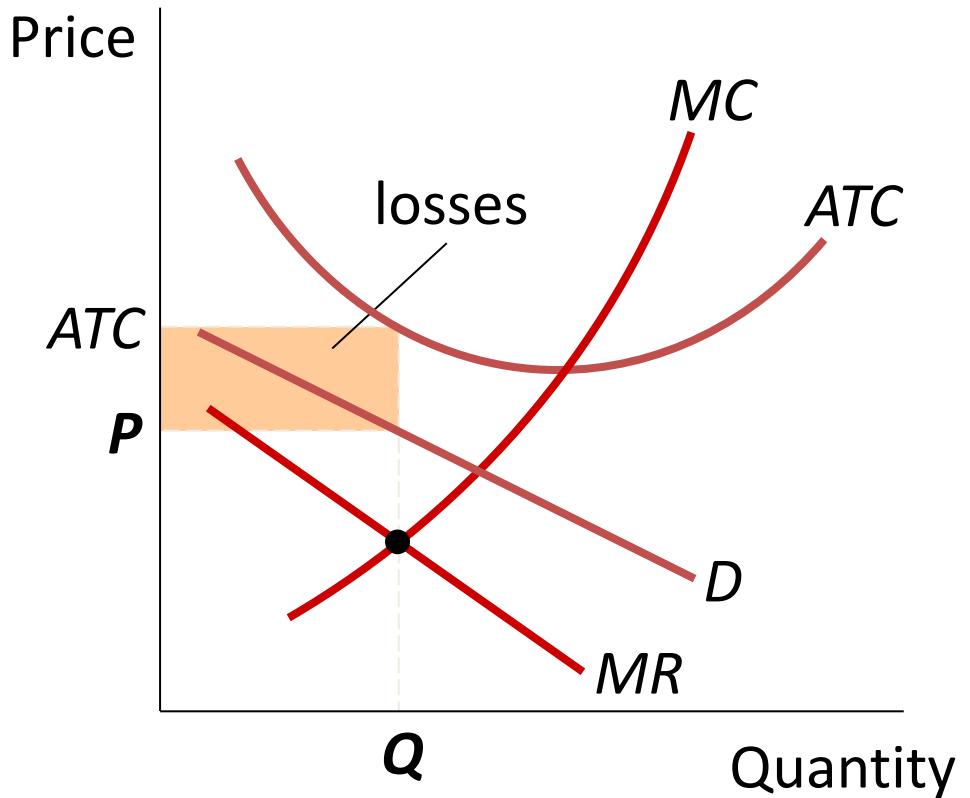
To maximize profit, firm produces Q where $MR = MC$.

The firm uses the D curve to set P .



A Monopolistically Competitive Firm With Losses in the Short Run

For this firm,
 $P < ATC$
at the output where
 $MR = MC$.
The best this firm can
do is to minimize its
losses.



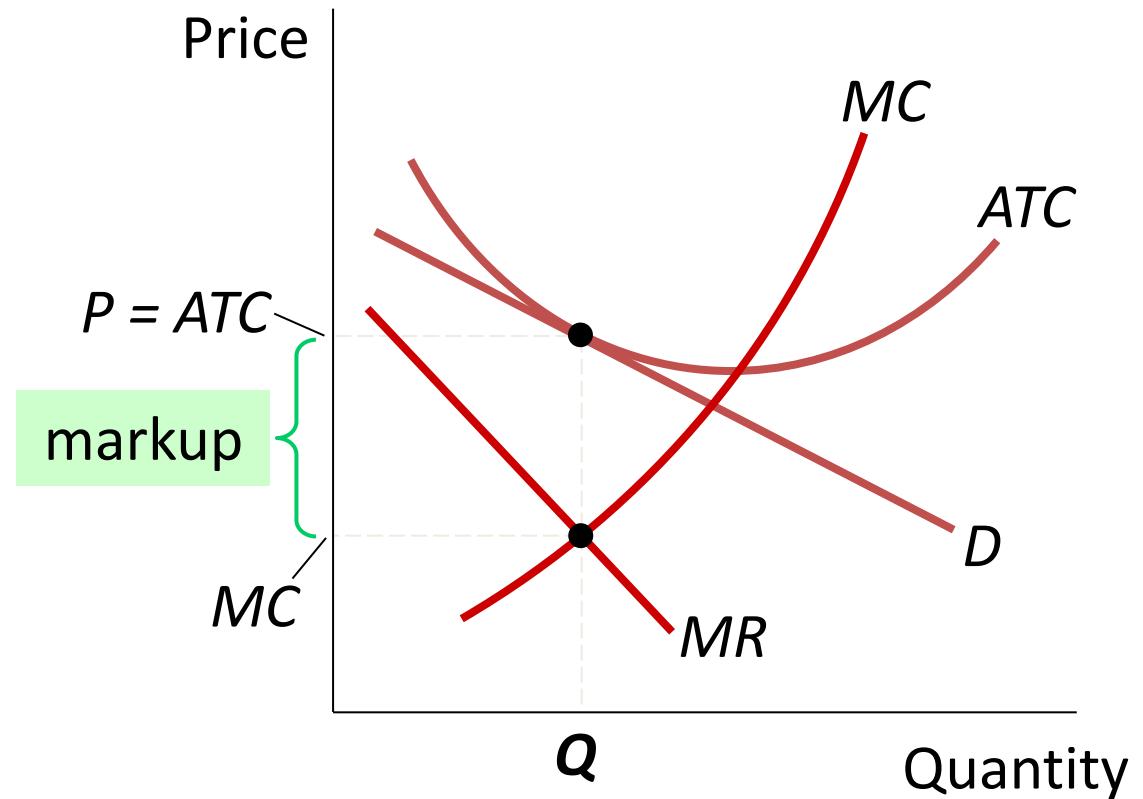
Monopolistic Competition and Monopoly

- *Short run:* Under monopolistic competition, firm behavior is very similar to monopoly.
- *Long run:* In monopolistic competition, entry and exit drive economic profit to zero.
 - If profits in the short run:
New firms enter market,
taking some demand away from existing firms,
prices and profits fall.
 - If losses in the short run:
Some firms exit the market,
remaining firms enjoy higher demand and prices.

A Monopolistic Competitor in the Long Run

Entry and exit occurs until $P = ATC$ and profit = zero.

Notice that the firm charges a markup of price over marginal cost, and does not produce at minimum ATC .



Why Monopolistic Competition Is Less Efficient than Perfect Competition

1. *Excess capacity*

- The monopolistic competitor operates on the downward-sloping part of its ATC curve, produces less than the cost-minimizing output.
- Under perfect competition, firms produce the quantity that minimizes ATC .

2. *Markup over marginal cost*

- Under monopolistic competition, $P > MC$.
- Under perfect competition, $P = MC$.

Monopolistic Competition and Welfare

- Monopolistically competitive markets do not have all the desirable welfare properties of perfectly competitive markets.
- Because $P > MC$, the market quantity is below the socially efficient quantity.
- Yet, not easy for policymakers to fix this problem: Firms earn zero profits, so cannot require them to reduce prices.

Monopolistic Competition and Welfare

- Number of firms in the market may not be optimal, due to external effects from the entry of new firms:
 - **the product-variety externality:**
surplus consumers get from the introduction of new products
 - **the business-stealing externality:**
losses incurred by existing firms when new firms enter market
- The inefficiencies of monopolistic competition are subtle and hard to measure. No easy way for policymakers to improve the market outcome.

Advertising

- In monopolistically competitive industries, product differentiation and markup pricing lead naturally to the use of advertising.
- In general, the more differentiated the products, the more advertising firms buy.
- Economists disagree about the social value of advertising.

The Critique of Advertising

- Critics of advertising believe:
 - Society is wasting the resources it devotes to advertising.
 - Firms advertise to manipulate people's tastes.
 - Advertising impedes competition –
it creates the perception that products are
more differentiated than they really are,
allowing higher markups.

The Defense of Advertising

- Defenders of advertising believe:
 - It provides useful information to buyers.
 - Informed buyers can more easily find and exploit price differences.
 - Thus, advertising promotes competition and reduces market power.
- Results of a prominent study:
Eyeglasses were more expensive in states that prohibited advertising by eyeglass makers than in states that did not restrict such advertising.

Advertising as a Signal of Quality

A firm's willingness to spend huge amounts on advertising may signal the quality of its product to consumers, *regardless of the content of ads.*

- Ads may convince buyers to try a product once, but the product must be of high quality for people to become repeat buyers.
- The most expensive ads are not worthwhile unless they lead to repeat buyers.
- When consumers see expensive ads, they think the product must be good if the company is willing to spend so much on advertising.

Brand Names

- In many markets, brand name products coexist with generic ones.
- Firms with brand names usually spend more on advertising, charge higher prices for the products.
- As with advertising, there is disagreement about the economics of brand names...

The Critique of Brand Names

- Critics of brand names believe:
 - Brand names cause consumers to perceive differences that do not really exist.
 - Consumers' willingness to pay more for brand names is irrational, fostered by advertising.
 - Eliminating govt protection of trademarks would reduce influence of brand names, result in lower prices.

The Defense of Brand Names

- Defenders of brand names believe:
 - Brand names provide information about quality to consumers.
 - Companies with brand names have incentive to maintain quality, to protect the reputation of their brand names.