

- Consumers, Producers, and the Efficiency of Markets

Welfare Economics

- **Welfare economics**
 - Studies how the allocation of resources affects economic well-being
- - The equilibrium of supply and demand maximizes the total benefits received by all buyers and sellers combined.

Consumer Surplus – 1

- Willingness to pay, **WTP**
 - The maximum amount that a buyer will pay for a good
 - How much the buyer values the good
- Consumer surplus, **$CS = WTP - P$**
 - Amount a buyer is willing to pay minus the amount the buyer actually pays
 - Benefits buyers receive from participating in a market.

EXAMPLE 1A: Willingness to pay (WTP)

You work at the local store that sells refurbished iPads. The store is running a sale on the refurbished iPad mini-5. Each of your roommates wants to buy an iPad mini-5. Their willingness to pay is given in the table below.

Name	WTP
Alexis	\$350
Cameron	275
Fatima	400
Jamir	225

Q: If the sale price is \$300, who will buy an iPad, and what is the quantity demanded?

A: Alexis & Fatima will buy an iPad mini. Cameron & Jamir will not.

- Hence, $Q^d = 2$ when $P = \$300$

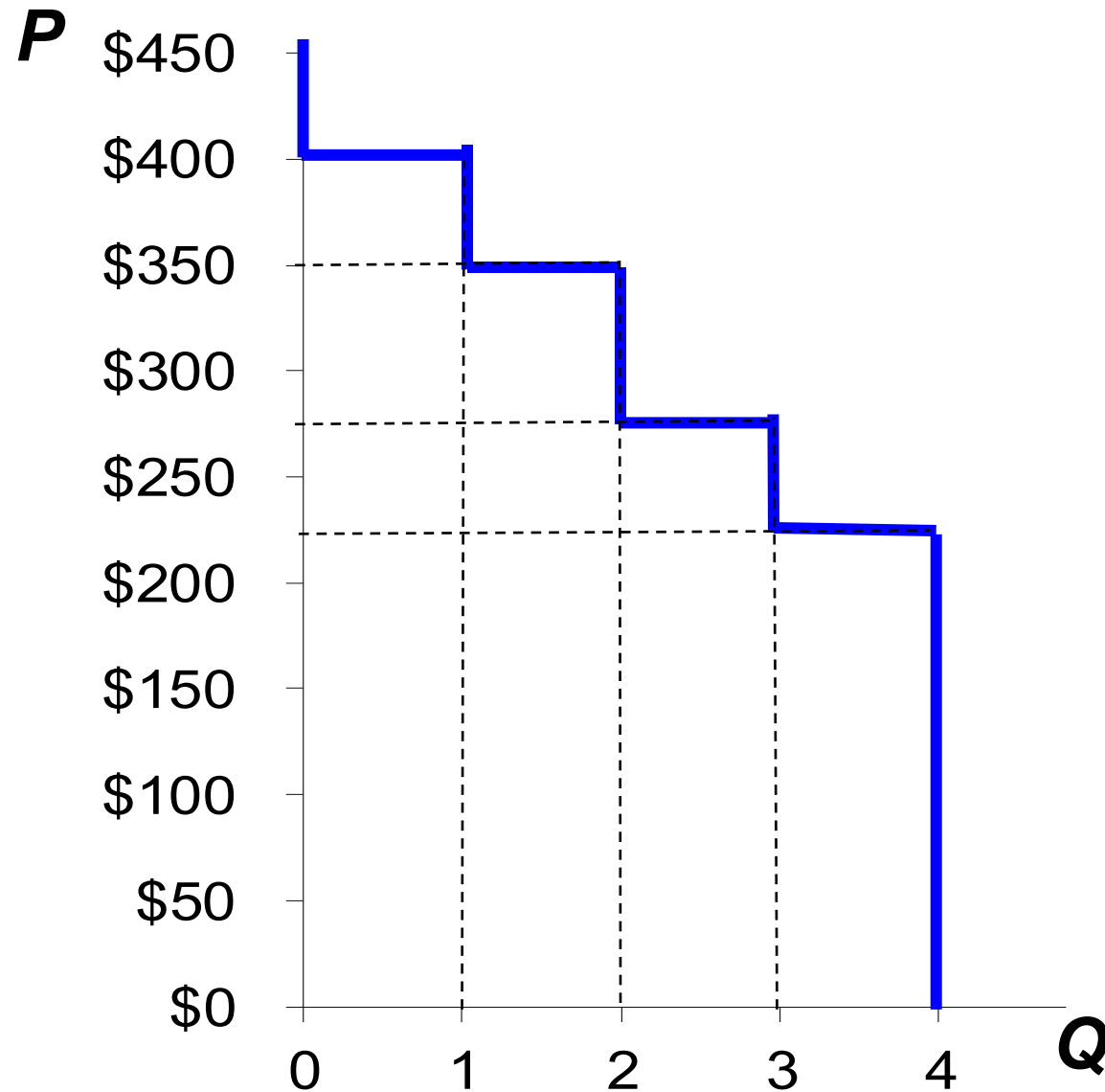
EXAMPLE 1B: **WTP** and the demand curve

Derive the demand schedule:

Name	WTP
Alexis	\$350
Cameron	275
Fatima	400
Jamir	225

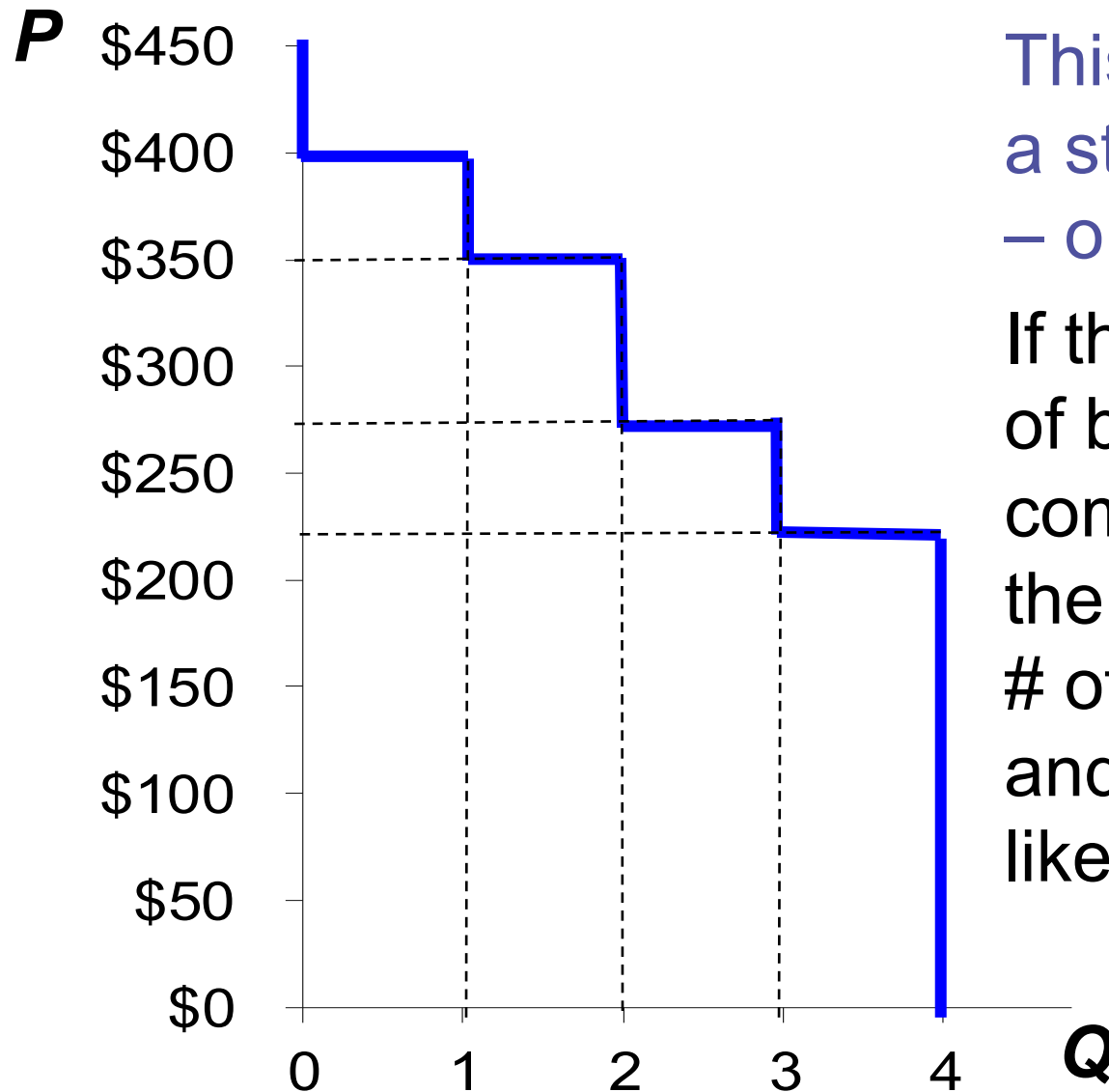
P (price of iPad)	who buys	Q^d
\$401 & up	nobody	0
351 – 400	Fatima	1
276 – 350	Alexis, Fatima	2
226 – 275	Cameron, Alexis, Fatima	3
0 – 225	Jamir, Cameron, Alexis, Fatima	4

EXAMPLE 1C: The demand curve – 1



P		Q^d
\$401 & up		0
351 – 400	400	1
276 – 350	350	2
226 – 275	275	3
0 – 225	225	4

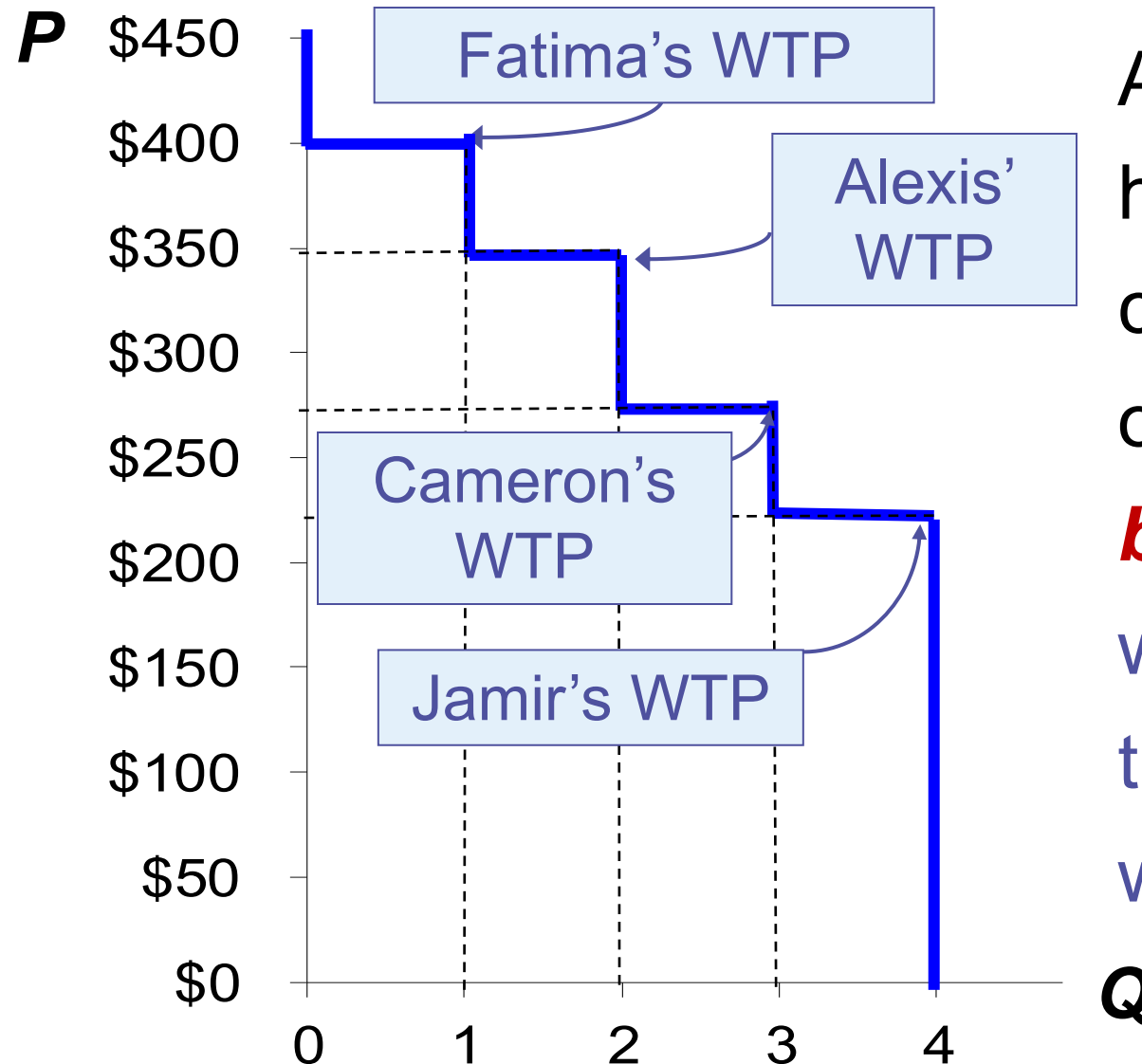
About the staircase shape...



This **D** curve looks like a staircase with 4 steps – one per buyer.

If there were a huge # of buyers, as in a competitive market, there would be a huge # of very tiny steps, and it would look more like a smooth curve.

EXAMPLE 1C: The demand curve – 2



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.

EXAMPLE 1D: Calculating consumer surplus (CS)

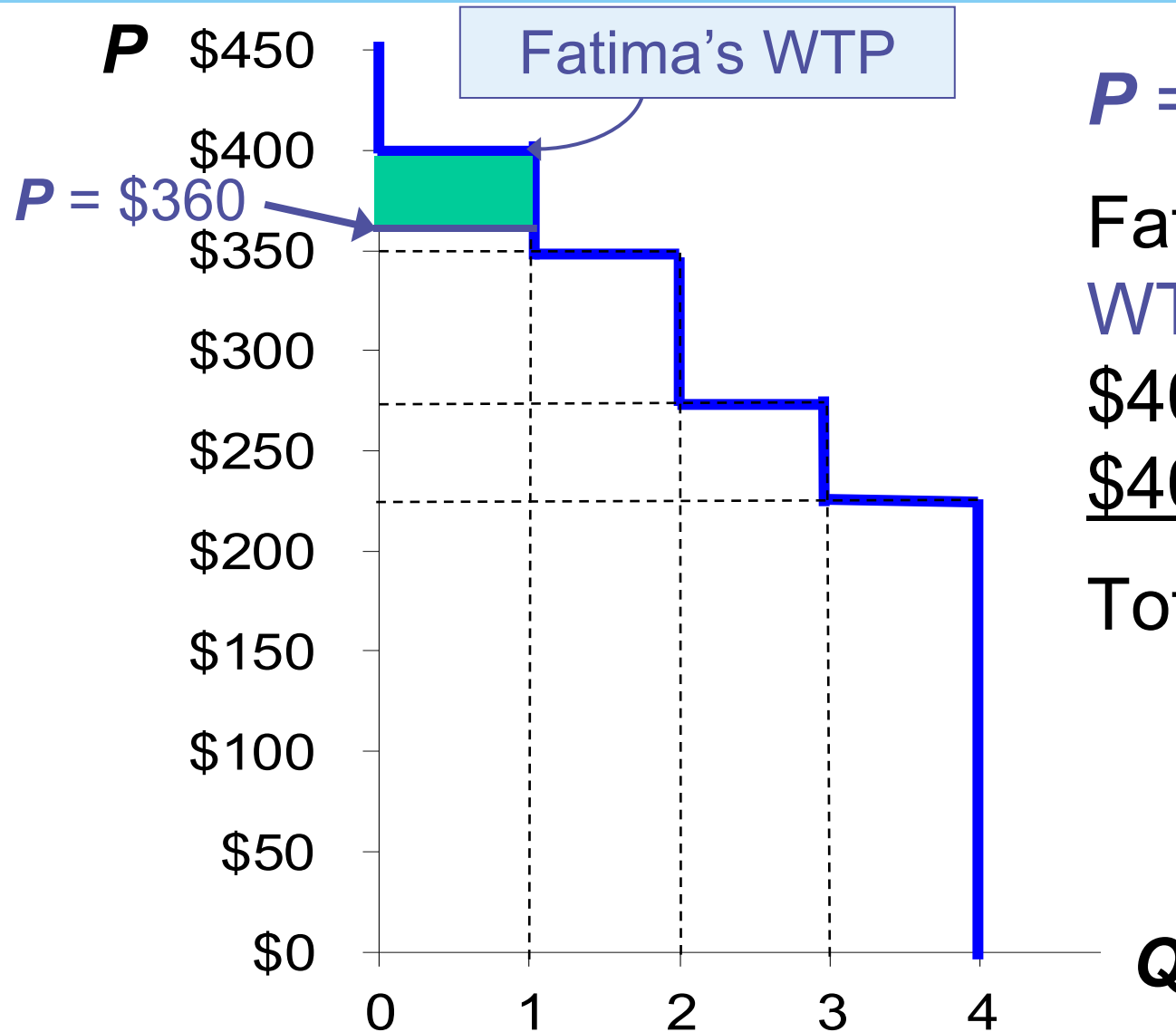
$$CS = WTP - P$$

Name	WTP
Alexis	\$350
Cameron	275
Fatima	400
Jamir	225

Suppose $P = \$360$.

- Fatima's **CS** = $\$400 - 360 = \40 .
- The others get no **CS** because they do not buy an iPad mini at this price.
- Total **CS** = $\$40$.

EXAMPLE 1E: CS and the demand curve



$$P = \$360$$

Fatima's **CS** =

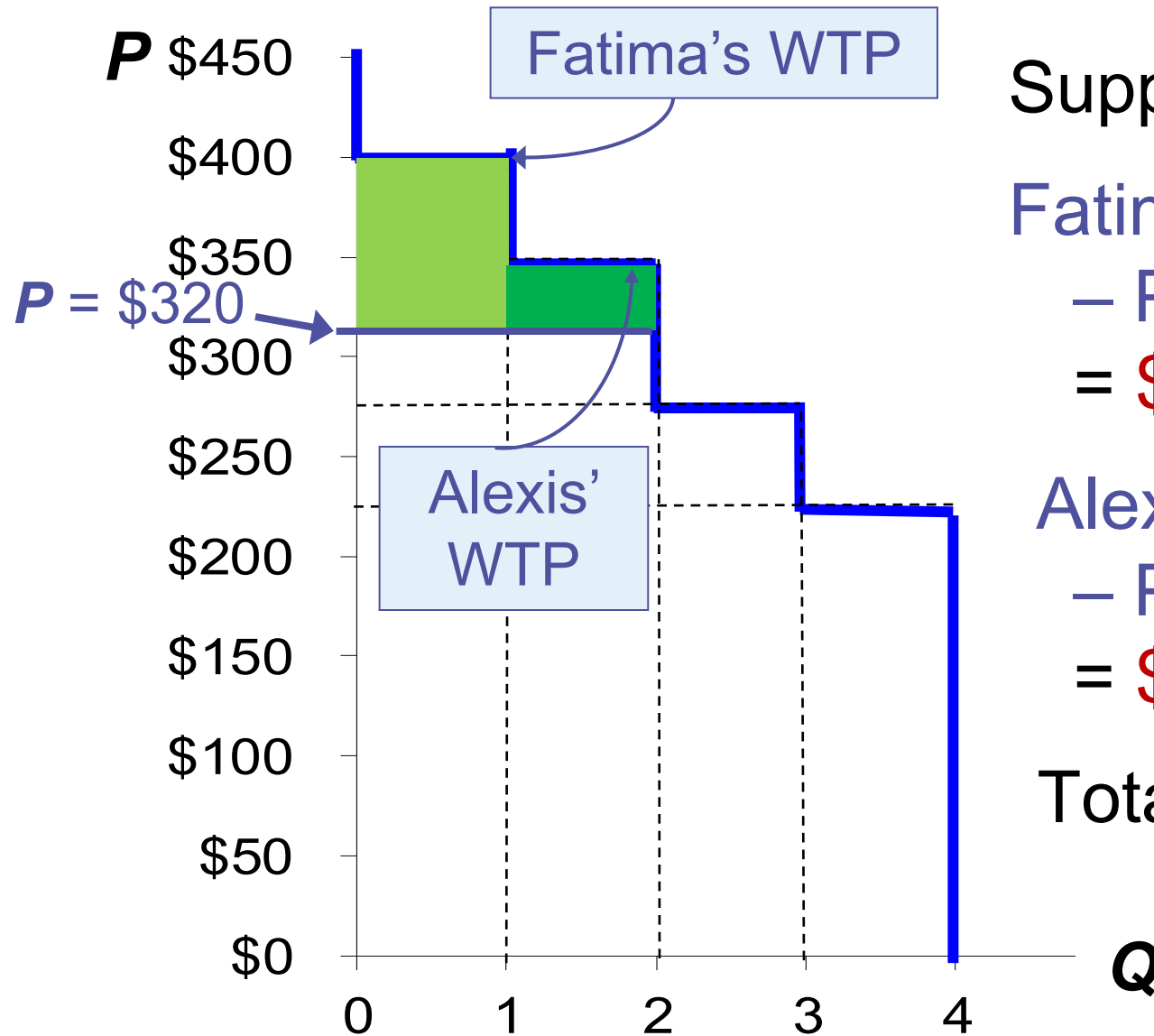
$$WTP - P =$$

$$\$400 - 360 =$$

$$\underline{\$40}$$

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

EXAMPLE 1E: A lower price increases **CS**



Suppose $P = \$320$

Fatima's **CS** = WTP

$$\begin{aligned} - P &= \$400 - 320 \\ &= \$80 \end{aligned}$$

Alexis' **CS** = WTP

$$\begin{aligned} - P &= \$350 - 320 \\ &= \$30 \end{aligned}$$

Total **CS** = \$110

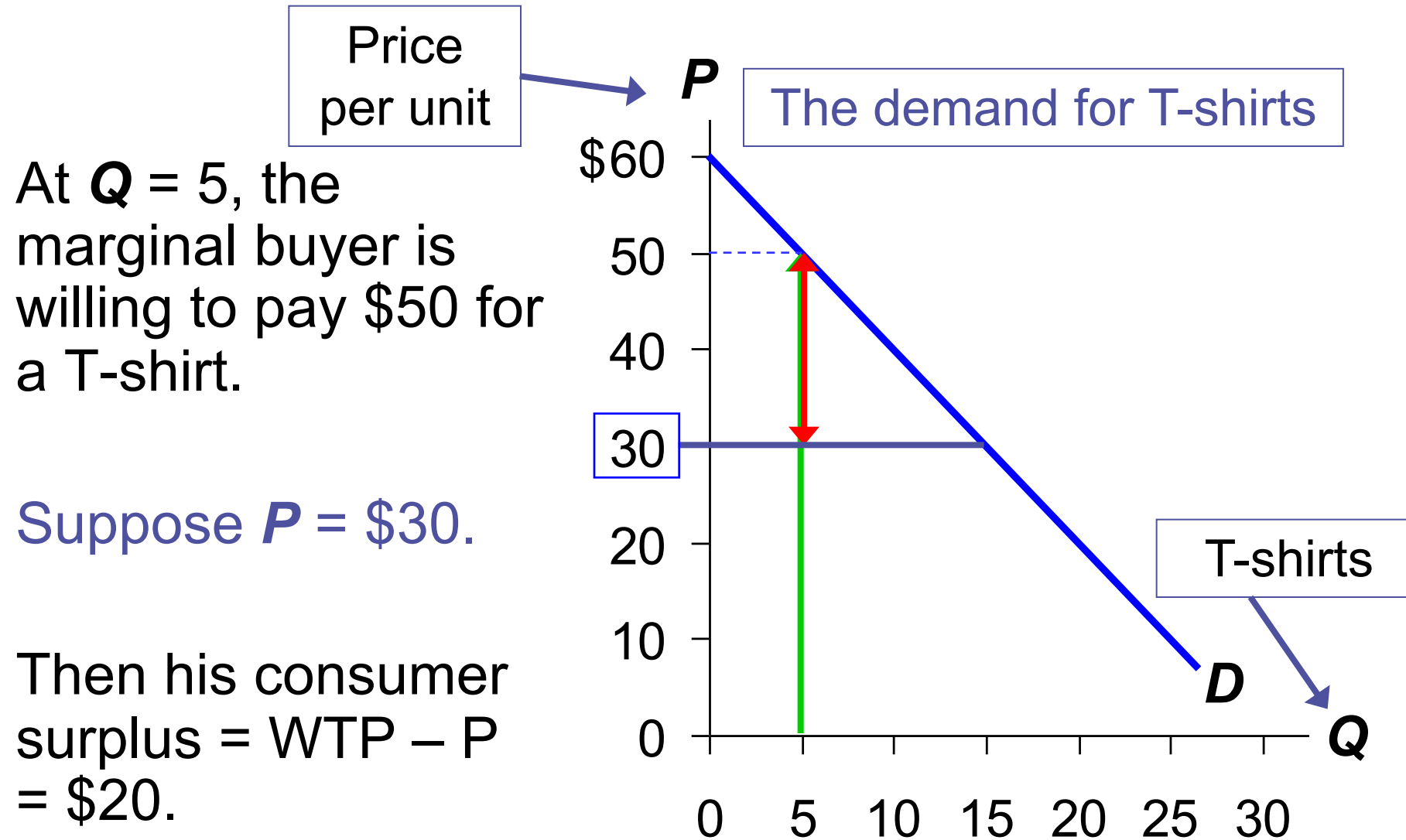
Consumer Surplus – 2

- Total consumer surplus

- The area below the demand curve and above the price

- The height of the demand curve = the value buyers place on the good (***WTP***)
- Each buyer's **$CS = WTP - P$**
- The sum of the consumer surplus of all buyers in the market
- The benefit that buyers derive from a market as the buyers themselves perceive it.

EXAMPLE 2: Consumer surplus for one buyer



EXAMPLE 2A: Total consumer surplus

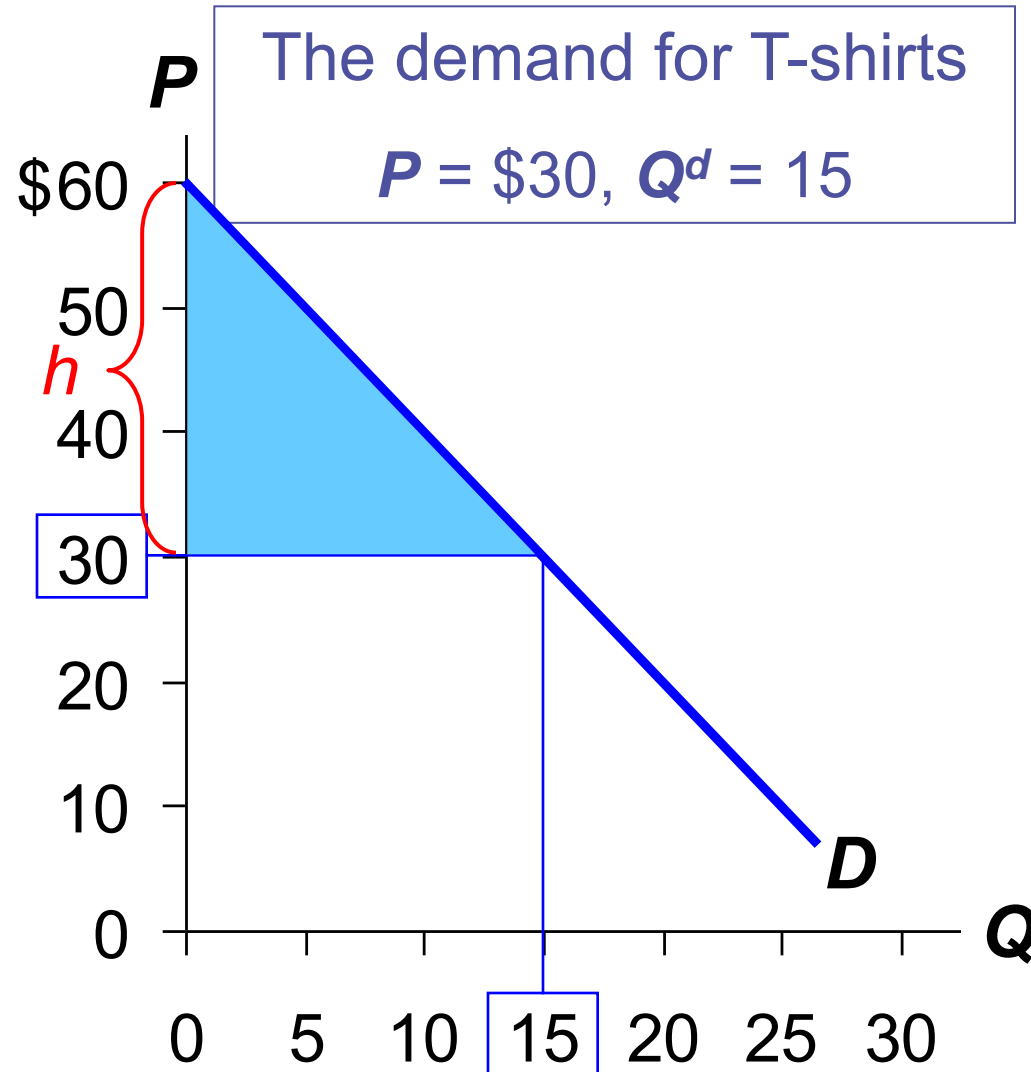
CS is the area between **P** and the **D** curve, from 0 to **Q**.

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

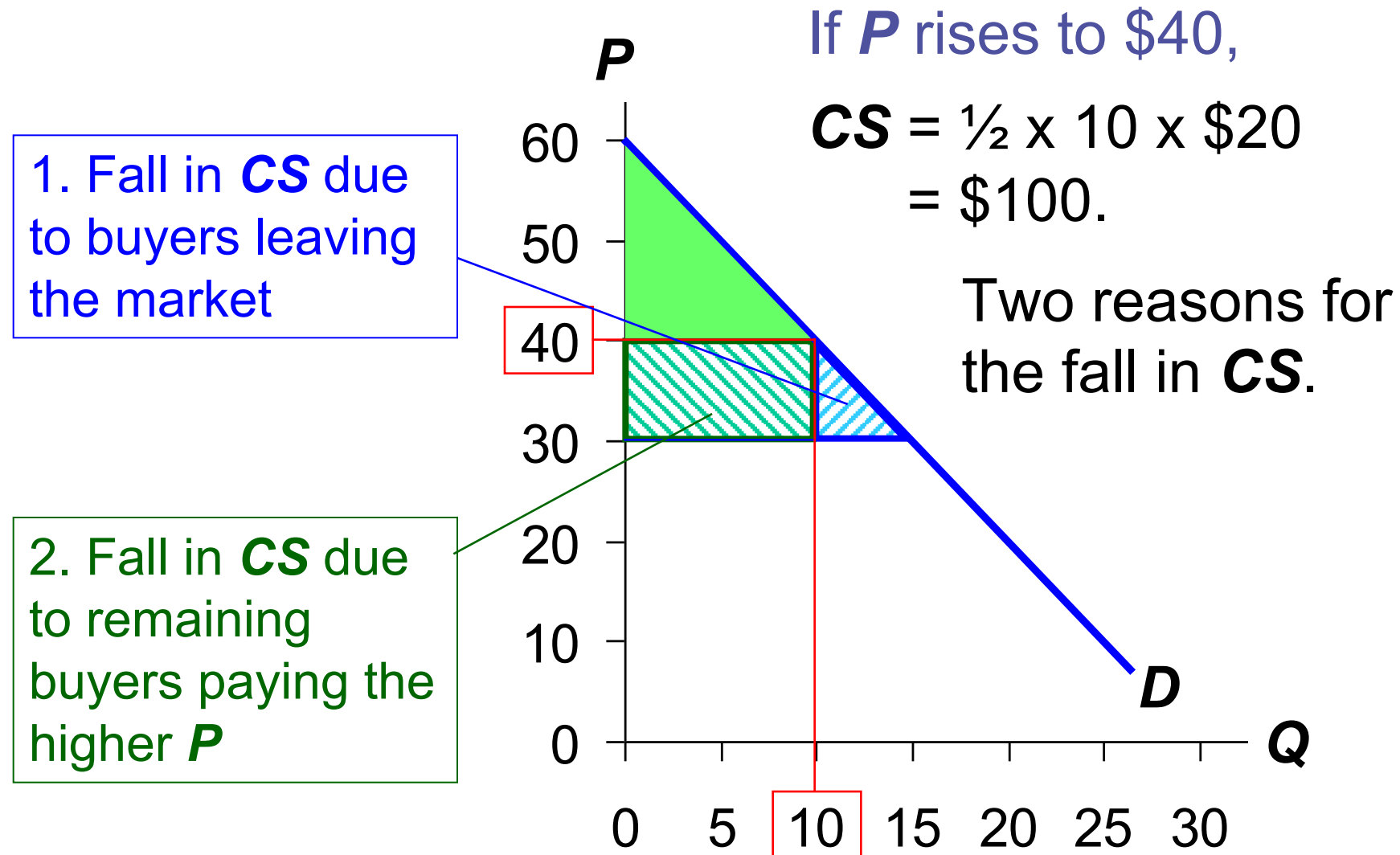
Height =
 $\$60 - 30 = \underline{\$30}$.

So,

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

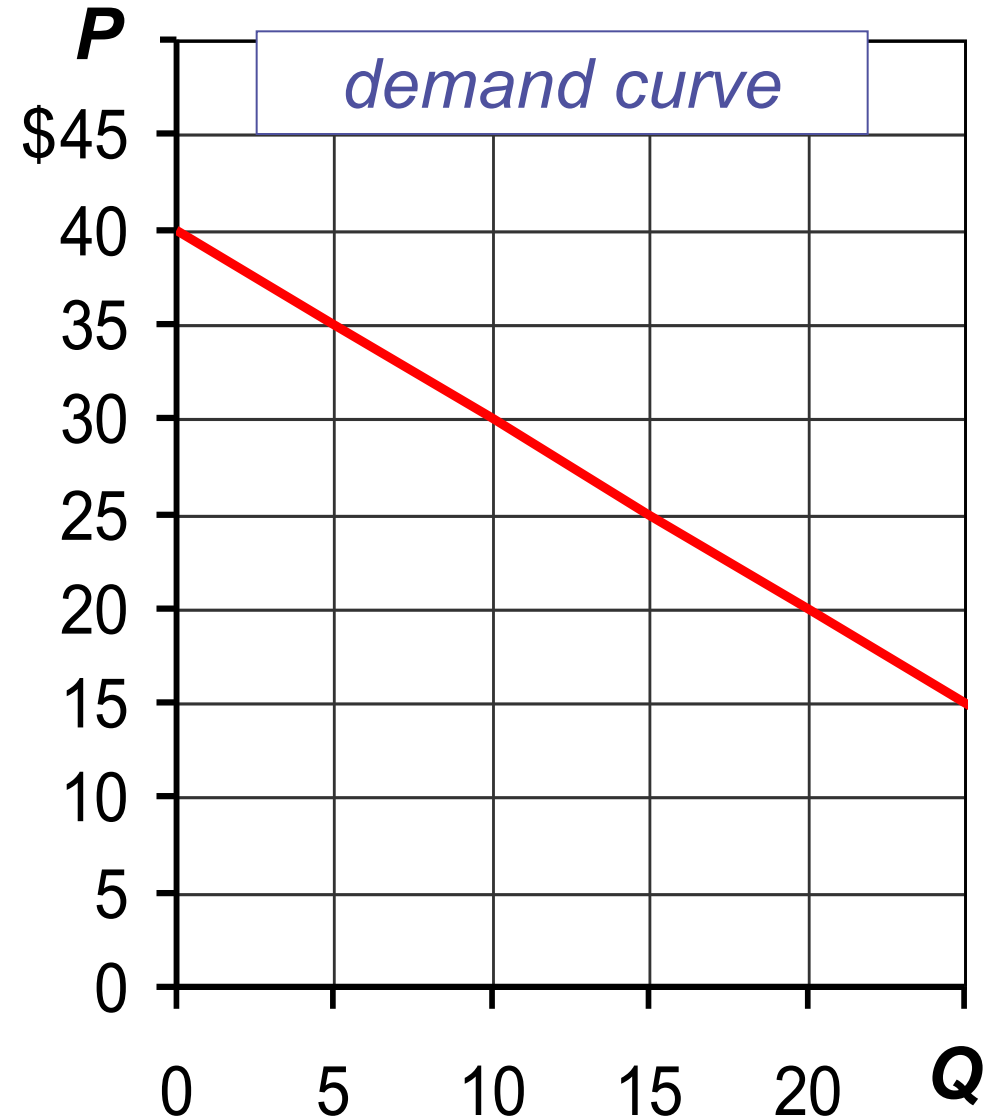


EXAMPLE 2B: A higher price reduces CS



Active Learning 1: Consumer surplus

- A. Find marginal buyer's **WTP** at $Q = 10$.
- B. Find **CS** for $P = \$30$
Suppose P falls to \$20.
How much will **CS** increase due to...
- C. buyers entering the market
- D. existing buyers paying lower price



Active Learning 1: Answers

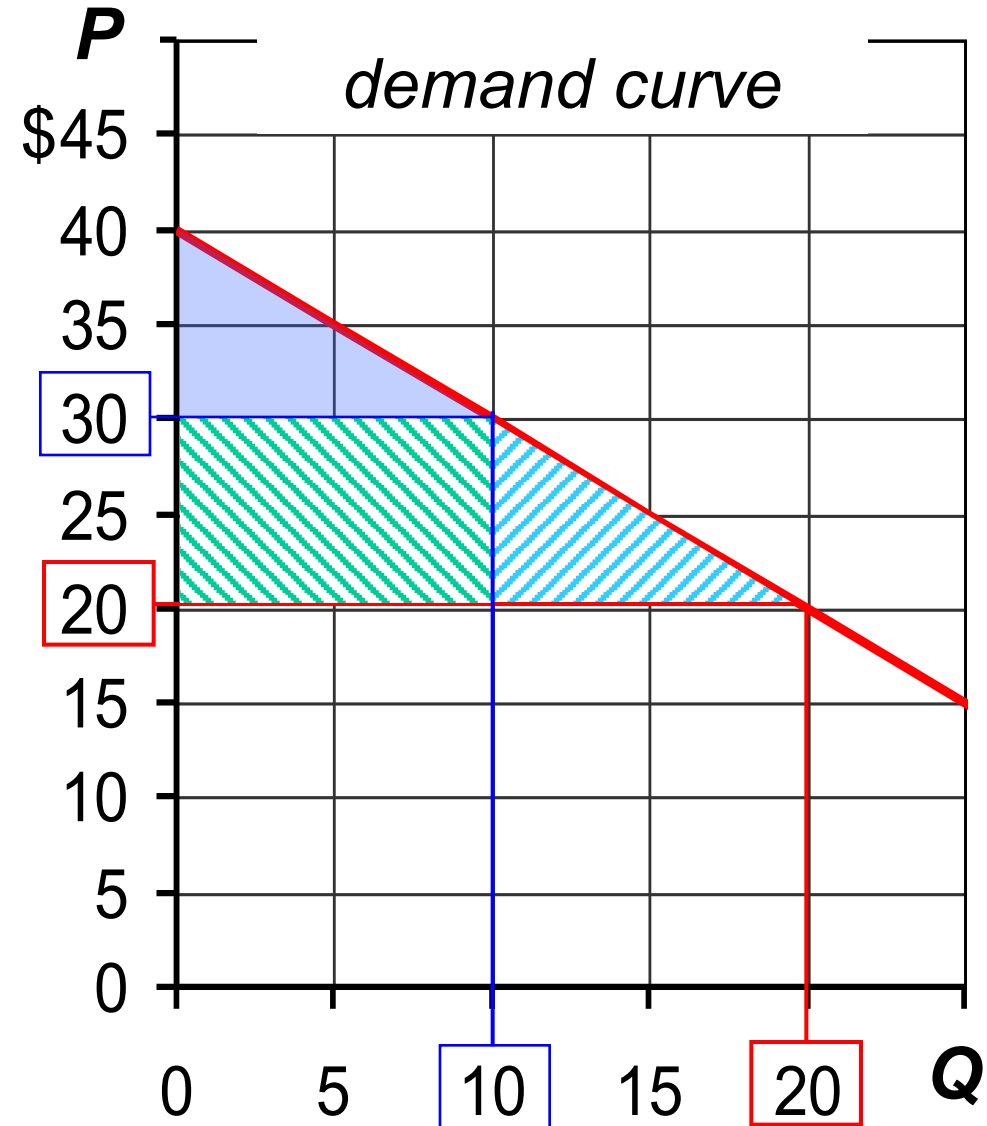
A. At $Q = 10$, marginal buyer's **WTP** is \$30.

B. If $P = \$30$, **CS** = $\frac{1}{2} \times 10 \times \$10 = \$50$

P falls to \$20.

C. **CS** for the additional buyers = $\frac{1}{2} \times 10 \times \$10 = \$50$

D. Increase in **CS** on initial 10 units = $10 \times \$10 = \100



Producer Surplus – 1

- **Cost**
 - The value of everything a seller must give up to produce a good
 - Including opportunity cost
- **Willingness to sell, $WTS = Cost$**
 - The lowest price accepted by a seller for one unit of a good or service
 - The cost is a measure of WTS: produce and sell the good/service only if the price $>$ cost

Producer Surplus – 2

- Producer surplus, $PS = P - \text{cost}$
 - Amount a seller is paid for a good minus the seller's cost of providing it
 - Price received minus willingness to sell
 - Measures the benefit sellers receive from participating in a market

EXAMPLE 3A: Cost and willingness to sell (WTS)

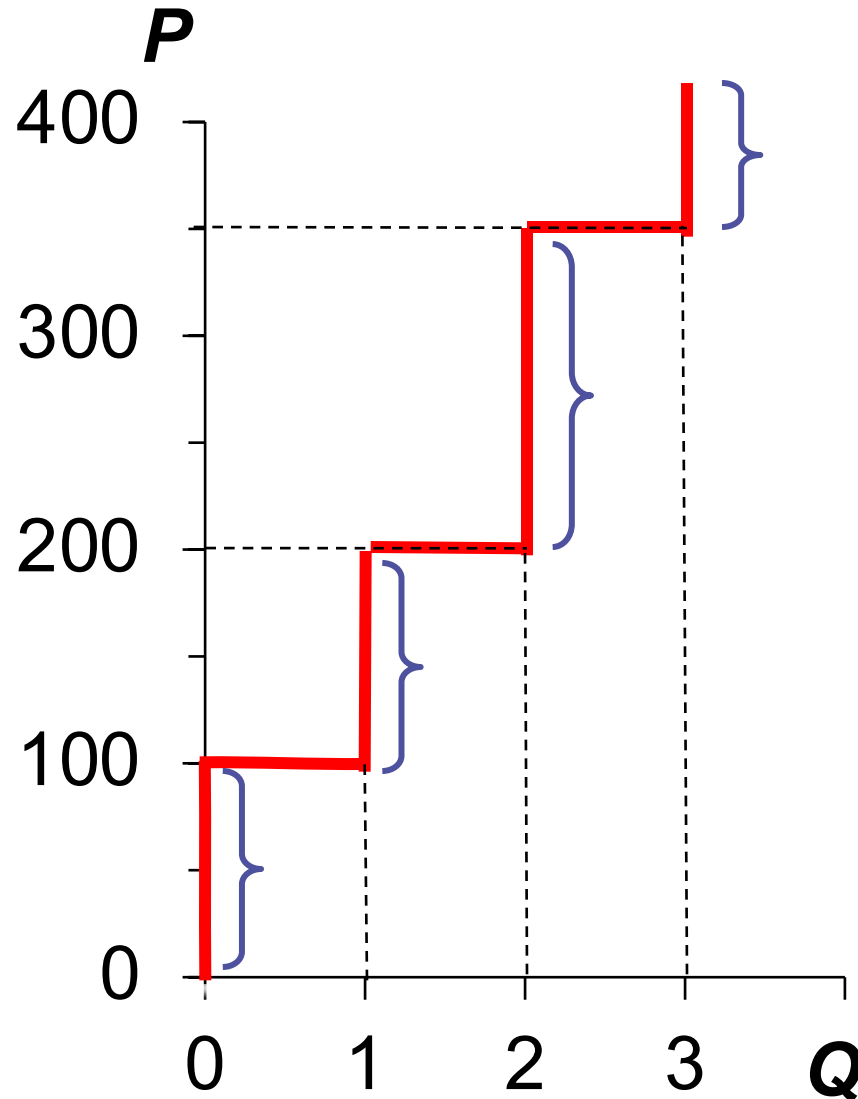
You are the lucky owner of 3 properties with identical lawns that need mowing. There are 3 lawn-mowing business in town that you can hire. The table below shows their willingness to sell:

Q: Derive the supply schedule from the cost data.

<i>Name</i>	<i>cost</i>
Jin	\$100
Jada	200
Chris	350

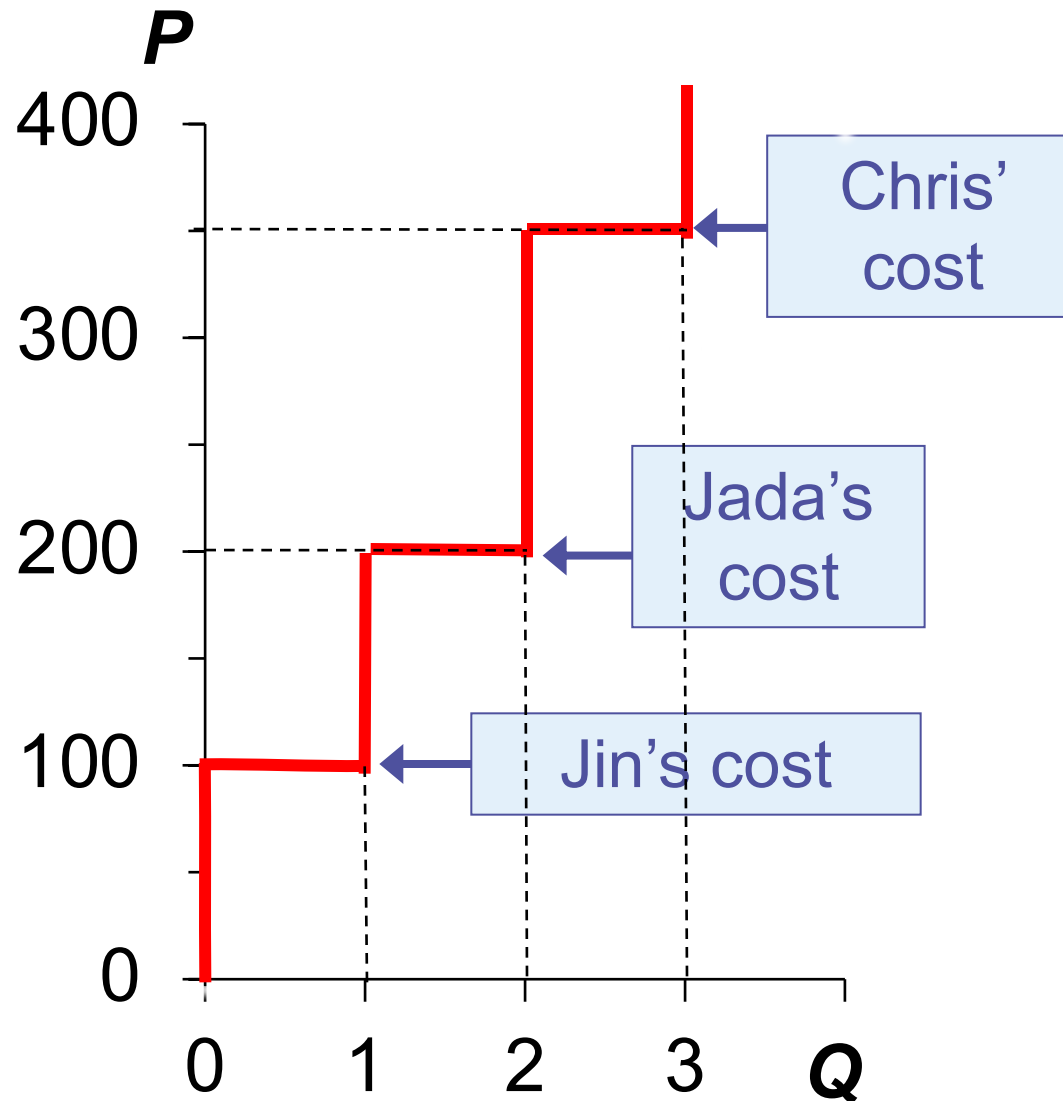
<i>P</i>	<i>Q^s</i>
\$0 – 99	0
100 – 199	1
200 – 349	2
350 & up	3

EXAMPLE 3B: The supply curve – 1



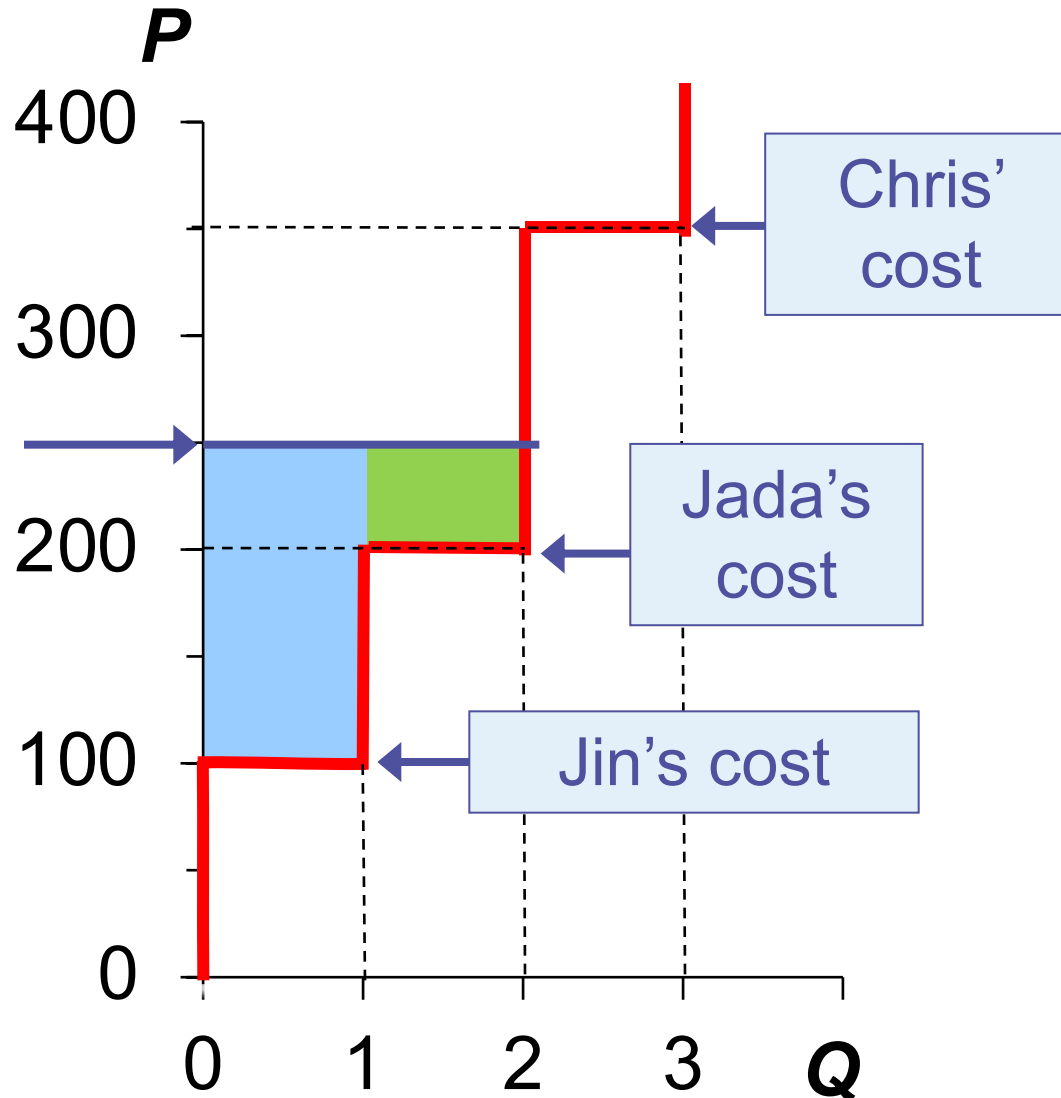
P	Q^s
\$0 – 99	0
100 – 199	1
200 – 349	2
350 & up	3

EXAMPLE 3B: The supply curve – 2



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.

EXAMPLE 3C: Producer surplus & the **S** curve



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

Suppose $P = \$250$.

$$\text{Jin's } PS = 250 - 100 = \$150$$

$$\text{Jada's } PS = 250 - 200 = \$50$$

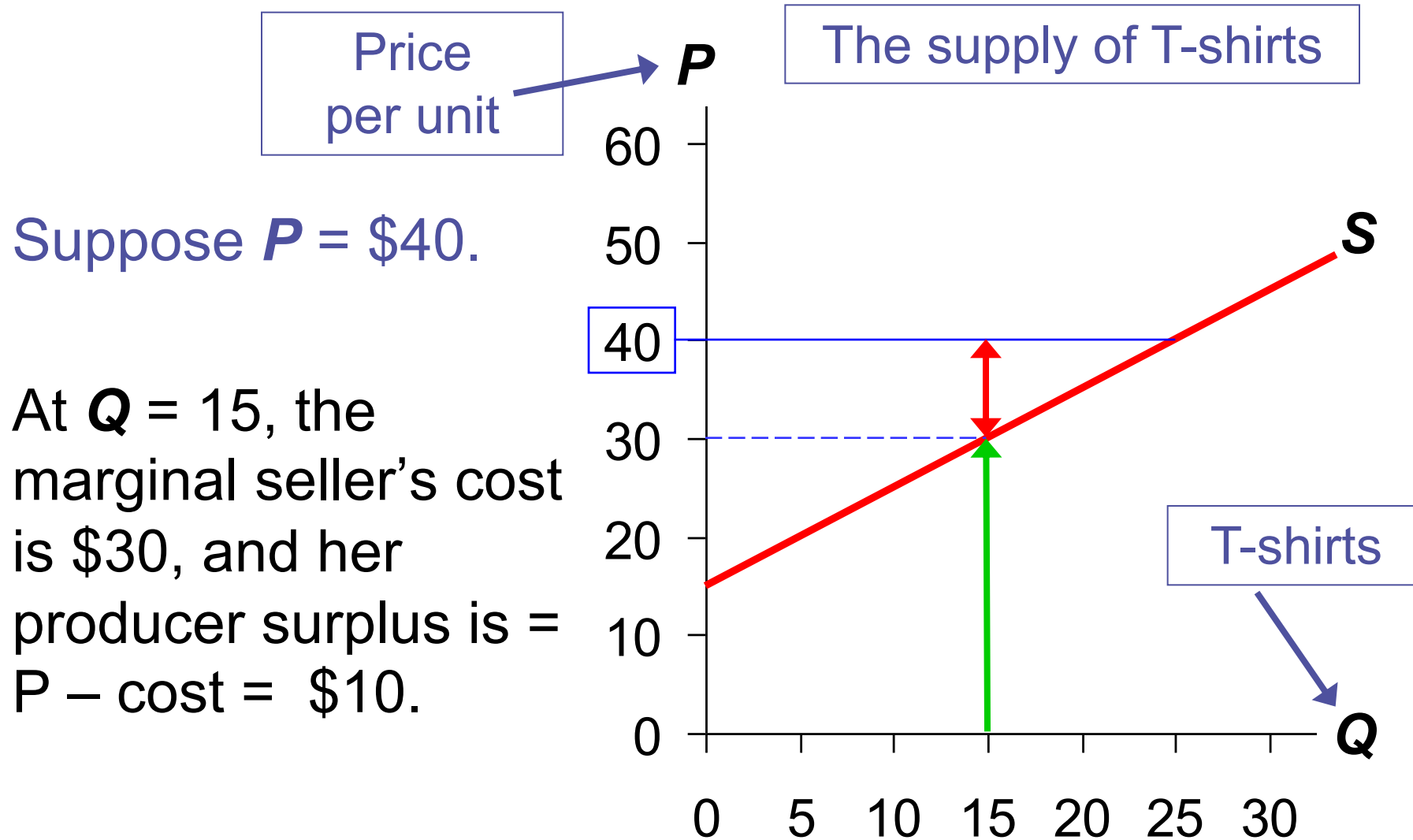
$$\text{Chris's } PS = \$0$$

$$\text{Total } PS = \$200$$

Producer Surplus – 3

- Producer surplus, **$PS = P - \text{cost}$**
 - The area below the price and above the supply curve
 - The height of the supply curve measures sellers' costs
 - Each seller's **$PS = P - \text{cost}$**
 - Total area is the sum of the producer surplus of all sellers

EXAMPLE 4A: Producer surplus for one sellers



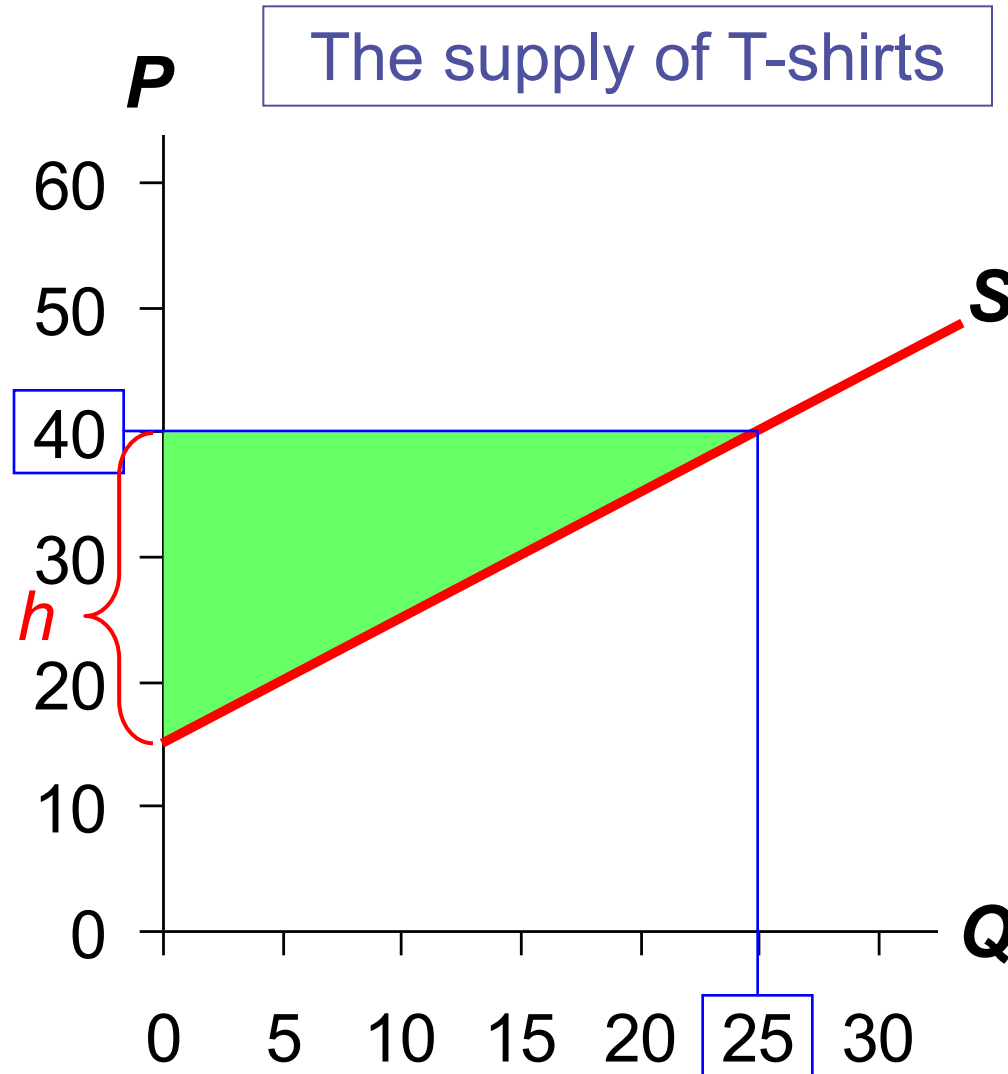
EXAMPLE 4B: Total producer surplus

PS is the area between **P** and the **S** curve, from 0 to **Q**.

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

So,

$$\begin{aligned}\mathbf{PS} &= \frac{1}{2} \times b \times h \\ &= \frac{1}{2} \times 25 \times \$25 \\ &= \underline{\underline{\$312.50}}\end{aligned}$$



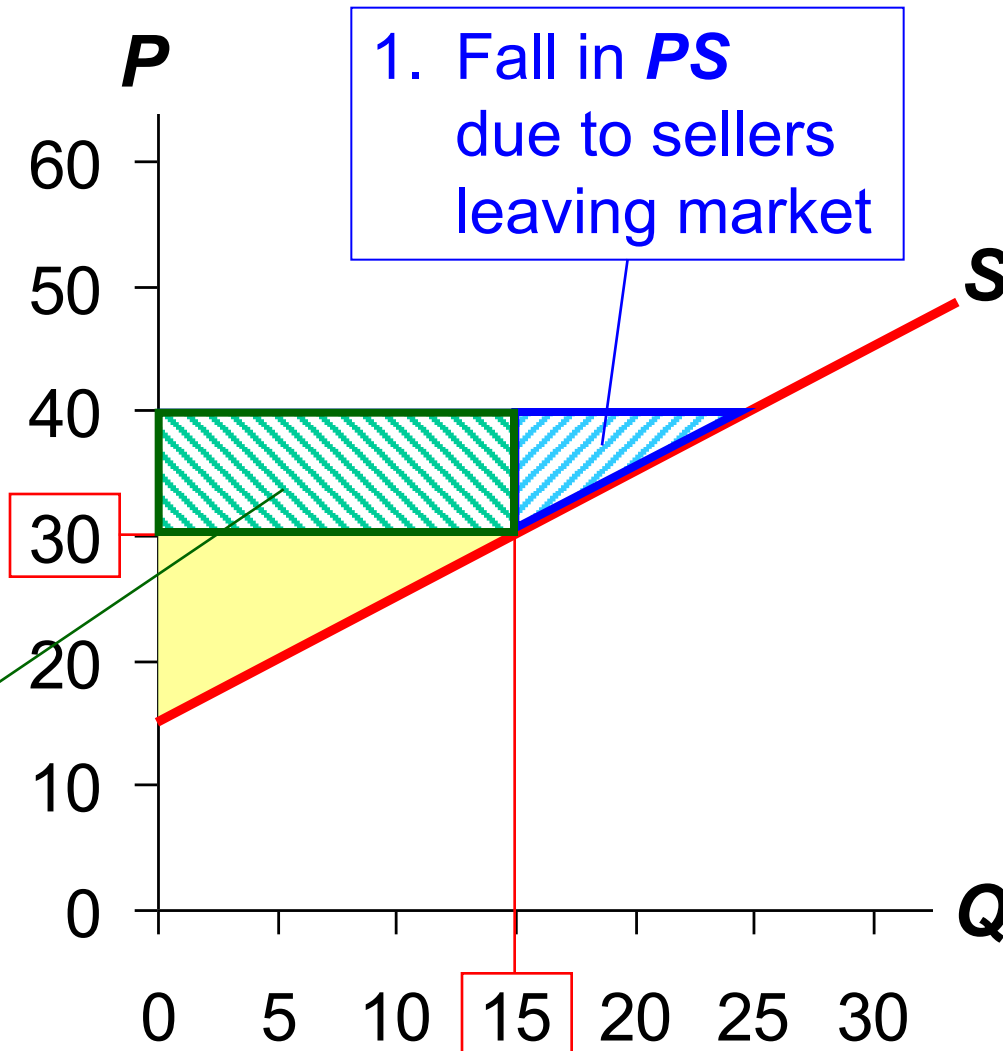
EXAMPLE 4C: A lower price reduces PS

If P falls to \$30,

$$PS = \frac{1}{2} \times 15 \times \$15 \\ = \underline{\$112.50}$$

Two reasons for the fall in PS .

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



Active Learning 2: Producer surplus

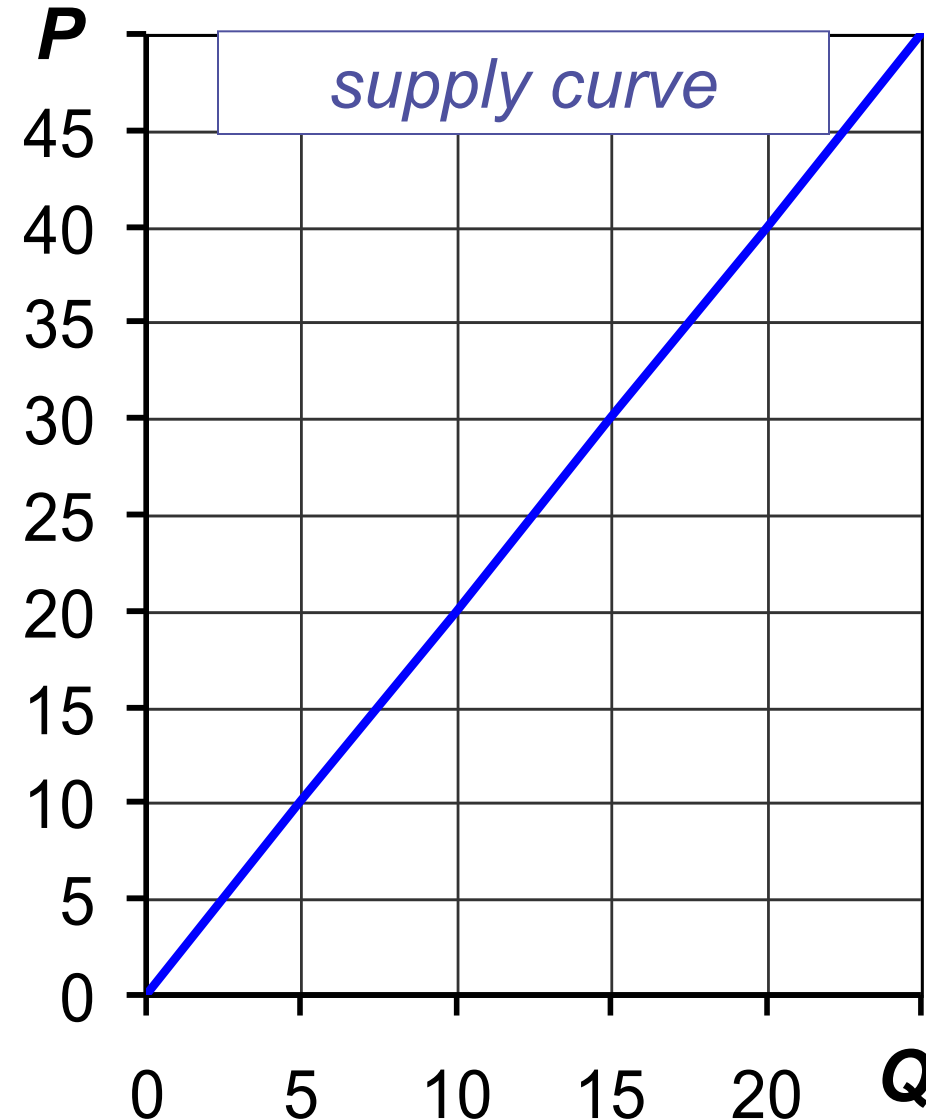
A. Find marginal seller's cost at $Q = 10$.

B. Find total **PS** for $P = \$20$.

Suppose P rises to \$30.
Find the increase in **PS**
due to:

C. selling 5 additional units

D. getting a higher price on the initial 10 units



Active Learning 2: Answers

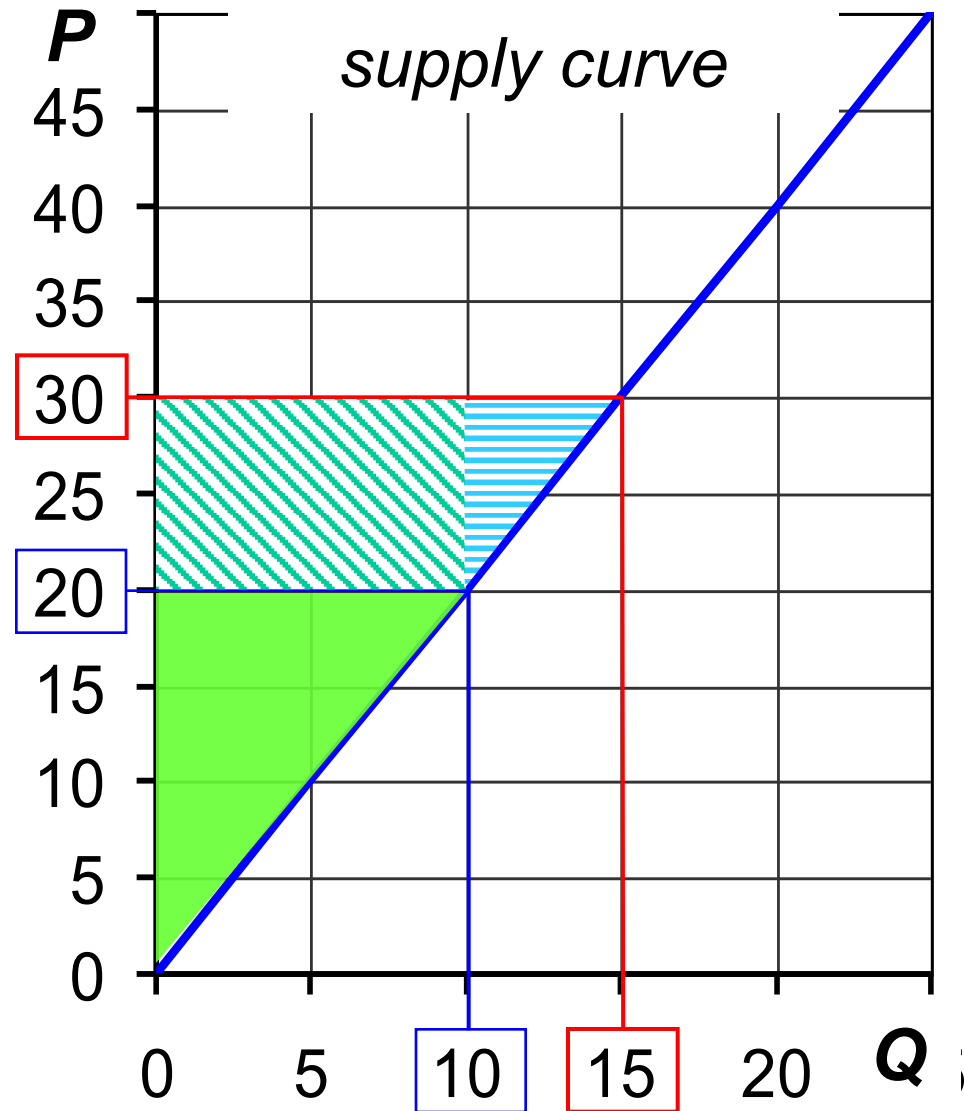
A. At $Q = 10$,
marginal cost = \$20

B. If $P = \$20$,
 $PS = \frac{1}{2} \times 10 \times \20
 $= \$100$

P rises to \$30.

C. PS on
additional units sold
 $= \frac{1}{2} \times 5 \times \$10 = \$25$

D. Increase in PS
on initial 10 units
 $= 10 \times \$10 = \100



Benevolent Social Planners – 1

- Benevolent social planners (BSP)
 - Hypothetical committee: all-knowing, all-powerful, well-intentioned
 - Want to maximize the economic well-being of everyone in society
 - Total surplus = Consumer surplus + Producer surplus
 - Evaluate market outcomes
 - Care about efficiency and equality

Benevolent Social Planners – 2

- Allocation of resources – desirable?
 - Competitive markets
 - Determined by interactions of many self-interested buyers and sellers
 - Total surplus – measure of society's well-being
 - To consider whether the market's allocation is efficient

Market Efficiency – 1

- Total surplus = **CS + PS**

- Consumer surplus = Value to buyers – Amount paid by buyers

- Buyers' gains from participating in the market

- Producer surplus = Amount received by sellers – Cost to sellers

- Sellers' gains from participating in the market

Total surplus = Value to buyers – Cost to sellers

Market Efficiency – 2

- Efficiency

- The allocation of resources maximizes total surplus
- Is the pie as big as possible?

- Equality

- Distribute economic prosperity uniformly among the members of society
- Every member of society gets an equal slice of the pie?

Evaluating the Market Equilibrium

Competitive Markets:

1. Allocate the supply of goods to the buyers who value them most, as measured by their WTP
2. Allocate the demand for goods to the sellers who can produce them at the lowest cost
3. At equilibrium, produce the quantity of goods that maximizes the sum of consumer and producer surplus
 - Raising or lowering the quantity of a good would not increase total surplus

EXAMPLE 5: Evaluating the market equilibrium

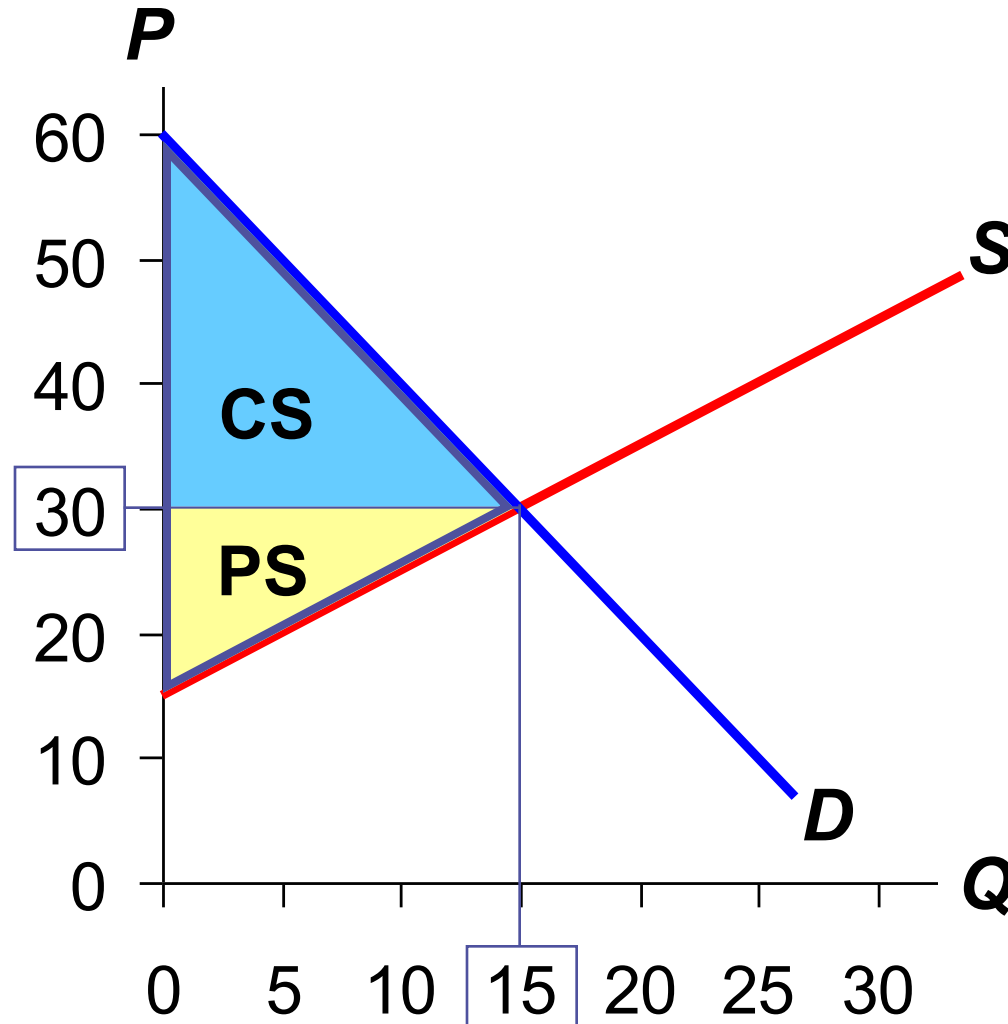
Market equilibrium:

$$P = \$30$$

$$Q = 15$$

$$\begin{aligned}\text{Total surplus } TS \\ = CS + PS\end{aligned}$$

Is the market
equilibrium
efficient?

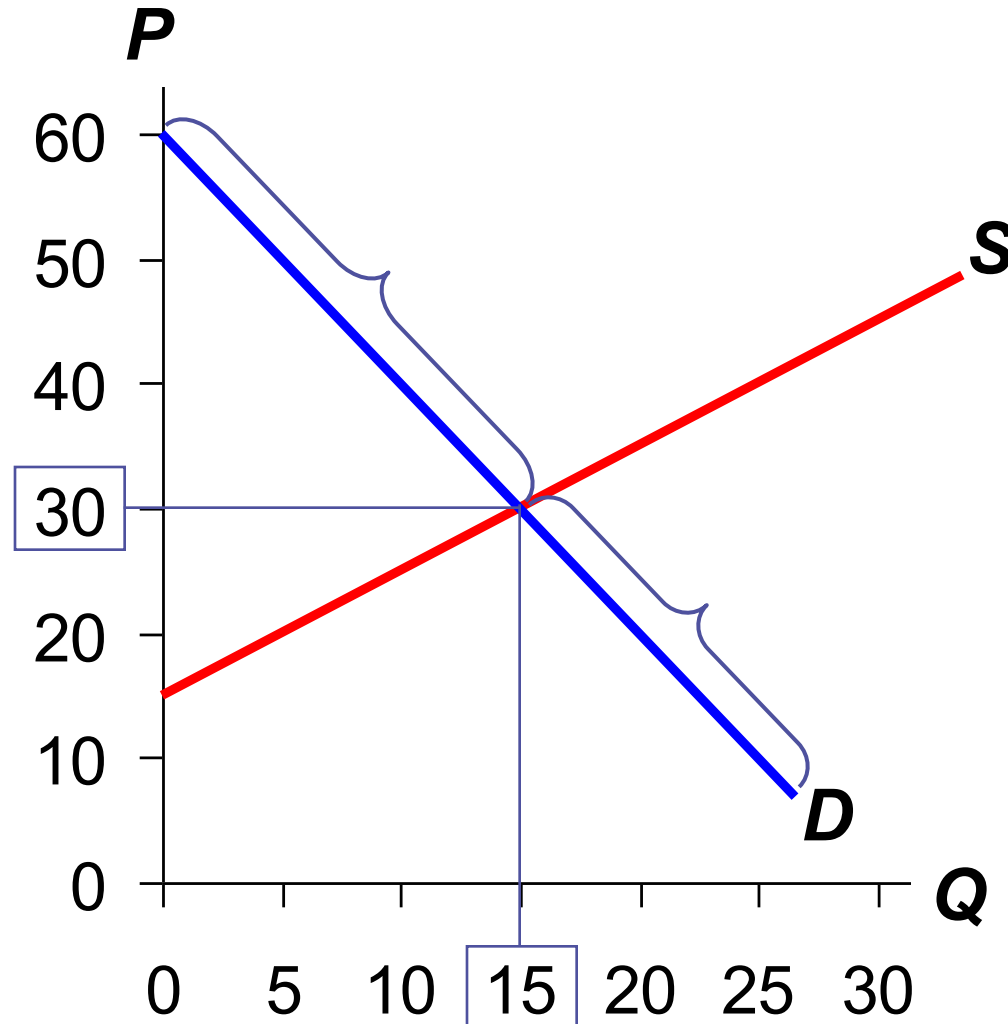


EXAMPLE 5A: Which buyers consume the good?

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

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

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

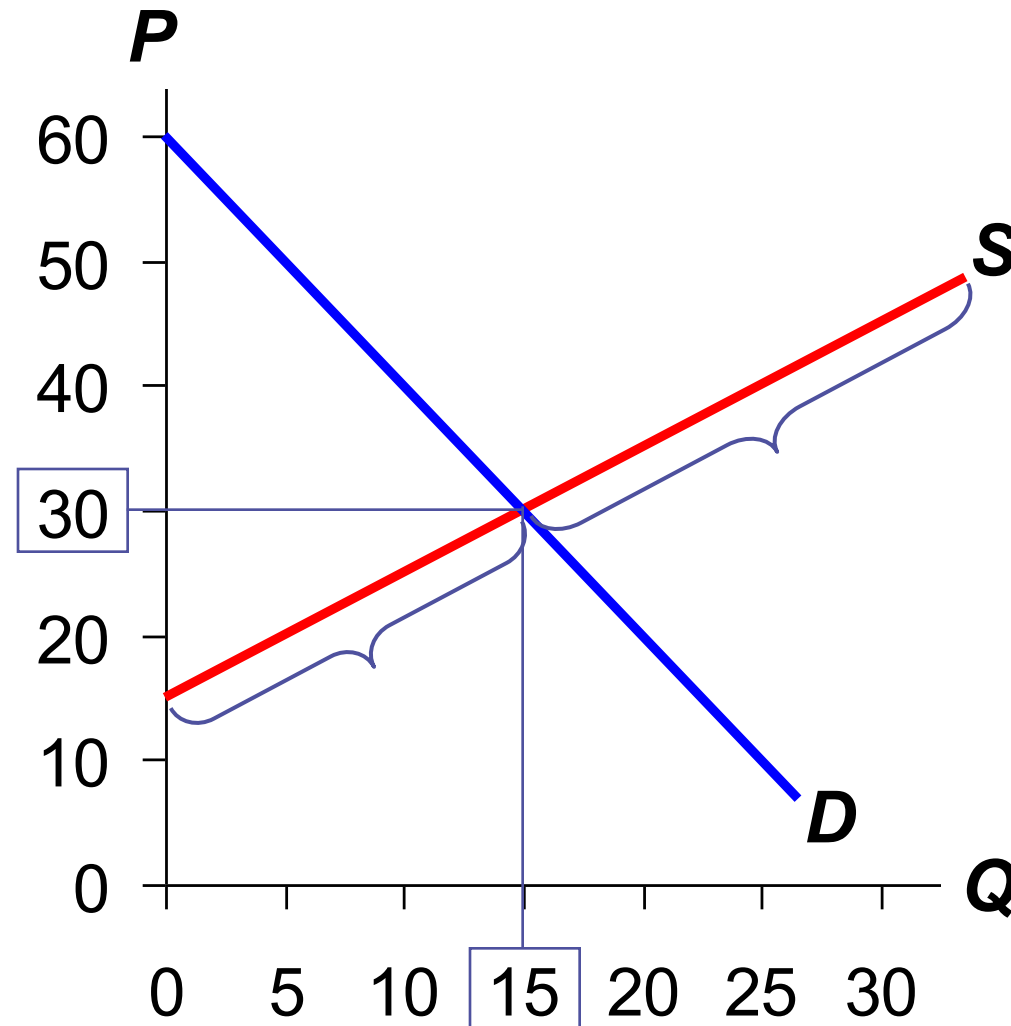


EXAMPLE 5B: Which sellers produce the good?

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

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

The sellers with the lowest cost produce the good.

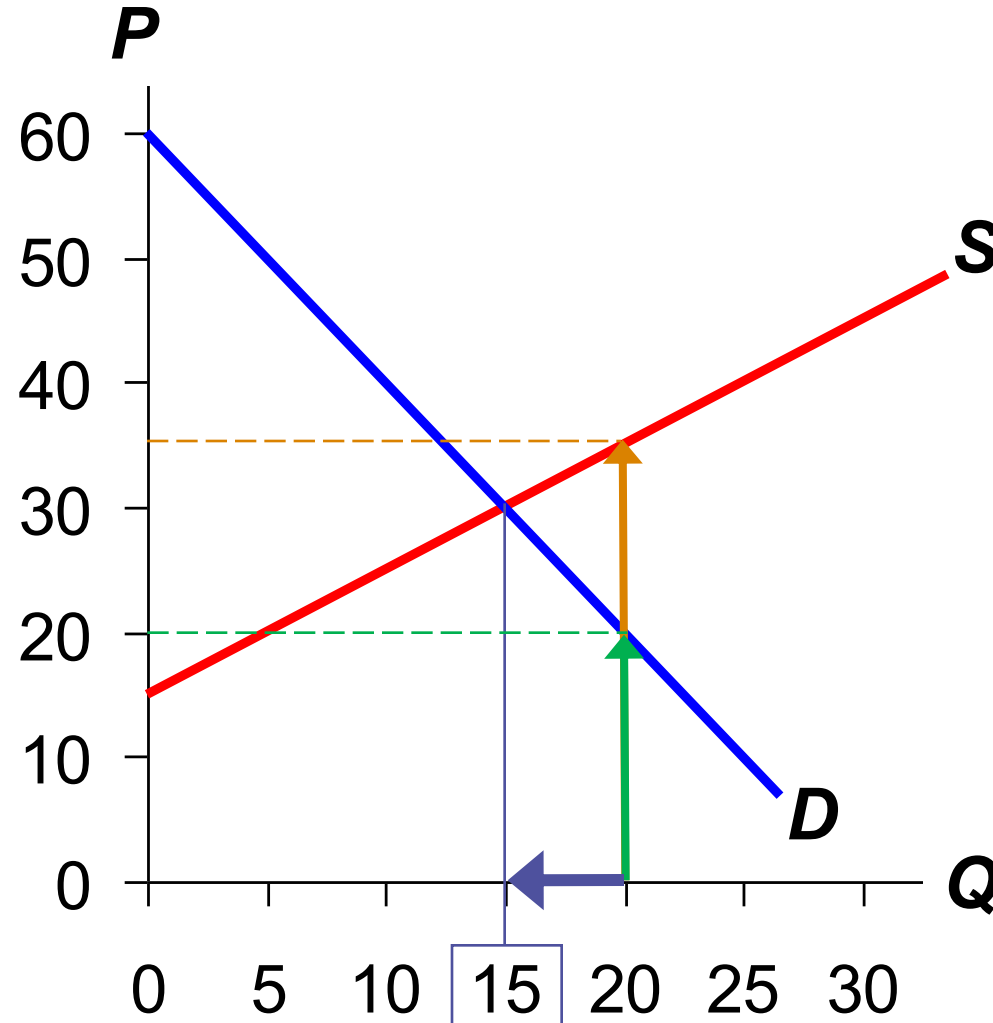


EXAMPLE 5C: Does eq'm Q maximize TS ? – 1

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

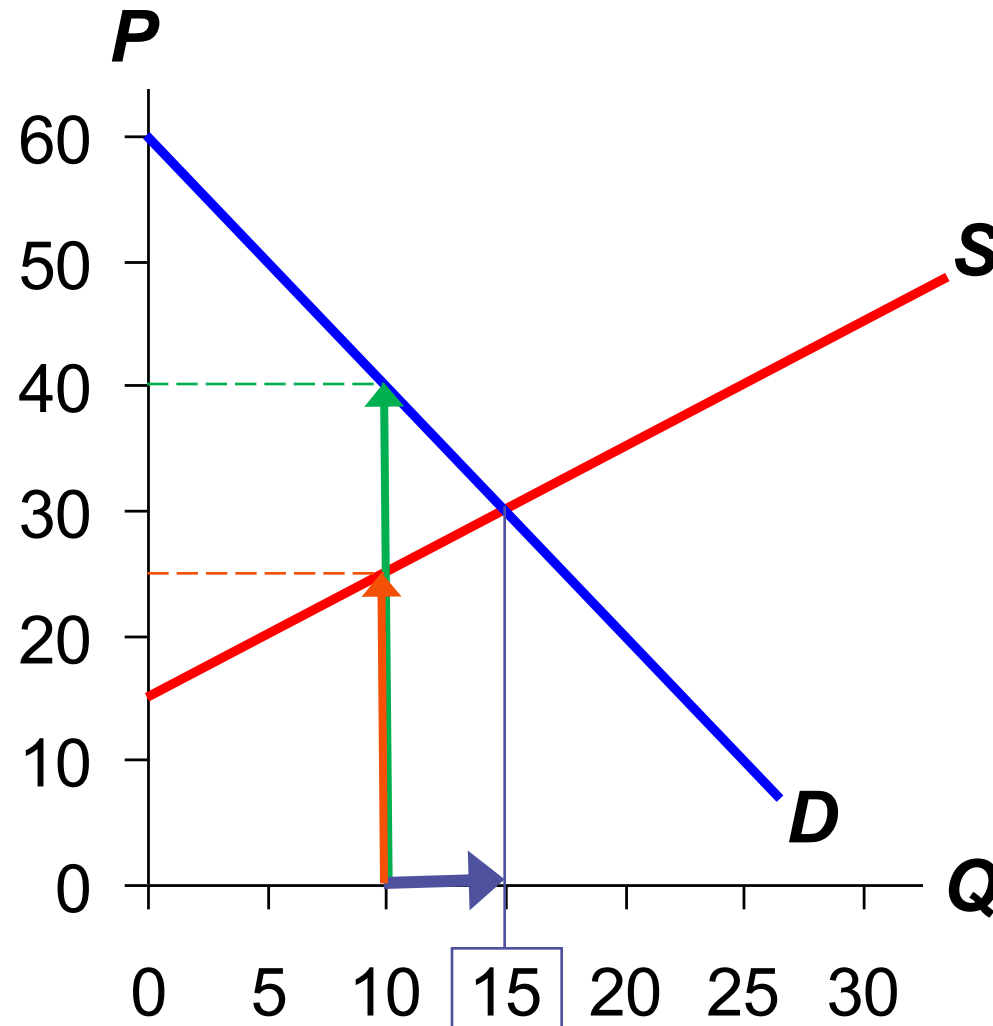


EXAMPLE 5C: Does eq'm Q maximize TS ? – 2

At $Q = 10$, cost of producing the marginal unit is \$25; the value to consumers of the marginal unit is \$40

Hence, can increase total surplus by increasing Q .

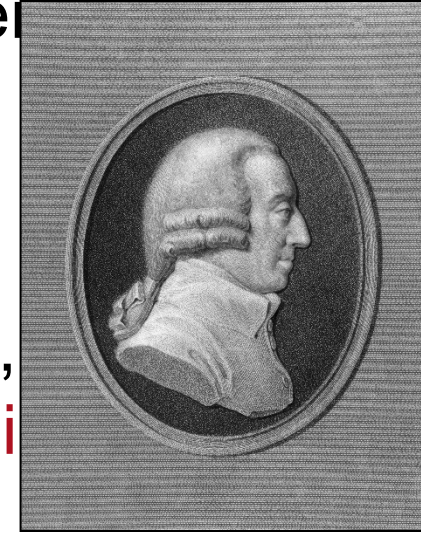
This is true at any Q less than 15.



Adam Smith and the Invisible Hand

Passage from The Wealth of Nations, 1776

“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. 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.... By pursuing his own interest, he frequently promotes that of the society more effectually than when he really intends to promote it.”



©Georgios Kollidas/Shutterstock.com

*Adam Smith,
1723-1790*

Market Efficiency & Market Failure – 1

- Forces of supply and demand
 - Allocate resources efficiently
- Assumptions about how markets work
 1. Markets are perfectly competitive
 2. Market outcome matters only to the buyers and sellers in that market
- When these assumptions do not hold
 - “Market equilibrium is efficient” may no longer be true

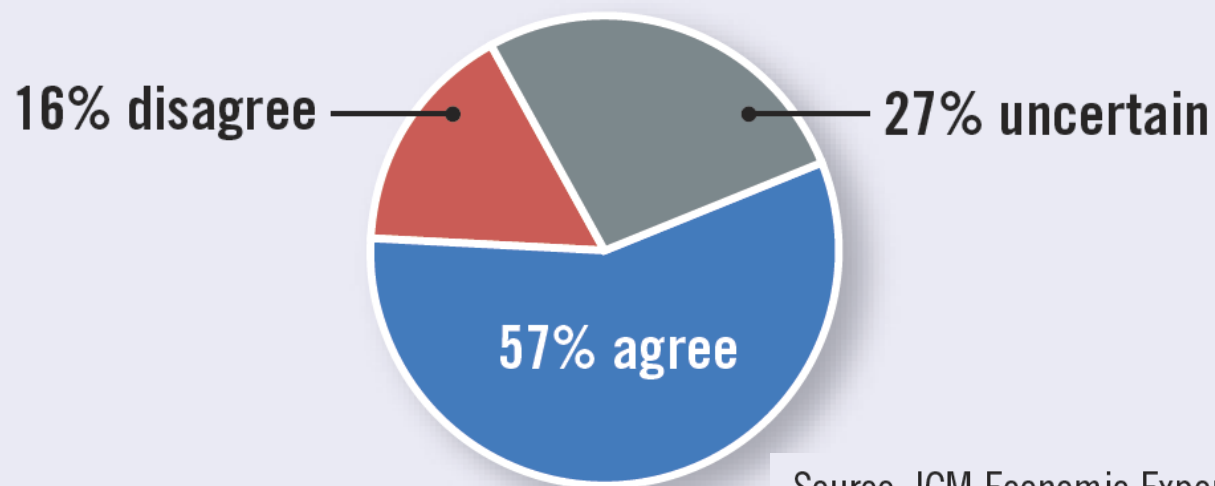
Market Efficiency & Market Failure – 2

- **Market failures:** the inability of some unregulated markets to allocate resources efficiently
 - *Market power:* a single buyer or seller (small group) control market prices
 - *Externalities:* decisions of buyers and sellers affect people who are not participants in the market at all
 - Inefficient equilibrium - from the standpoint of society as a whole

Supplying Kidneys

“A market that allows payment for human kidneys should be established on a trial basis to help extend the lives of patients with kidney disease.”

What do economists say?



Source: IGM Economic Experts Panel, March 11, 2014.



THINK-PAIR-SHARE

Some years ago, the front page of The Boston Globe ran the headline “How a Mother’s Love Helped Save Two Lives.” The mom couldn’t donate a kidney to her son (not compatible). Hospital’s solution: the mom donates one of her kidneys to a stranger, her son moves to the top of the kidney waiting list.

- A. What do you know about the market for kidneys?
- B. Is the current situation efficient? Is it fair?
- C. What would happen with the efficiency of the market if people were allowed to sell/buy kidneys?

CHAPTER IN A NUTSHELL

- **Consumer surplus:** buyers' willingness to pay for a good minus the amount they actually pay
 - Measures the benefit buyers get from participating in a market
 - Area below the ***D*** curve and above ***P***
- **Producer surplus:** amount sellers receive for their goods minus their costs of production
 - Measures the benefit sellers get from participating in a market
 - Area below ***P*** and above the ***S*** curve

CHAPTER IN A NUTSHELL

- An allocation of resources that maximizes total surplus is said to be efficient
 - Policymakers are concerned with the efficiency, as well as the equality, of economic outcomes.
- Equilibrium of **S** and **D** maximizes total surplus
 - The invisible hand of the marketplace leads buyers and sellers in competitive markets to allocate resources efficiently.
- Markets do not allocate resources efficiently in the presence of market failures (market power or externalities)