

ECO2011 Basic Microeconomics

Mankiw Chapter 7 (Consumer and Producer Surplus)

2023

Motivation

- As a consumer, how would you feel if you find that the price of an iPhone 13 is at 1000RMB?
- Will Tim Cook be happy if Apple can only sell an iPhone 13 at 1000RMB?

Willingness to Pay (WTP)

- A buyer's willingness to pay for a good
 - Maximum amount the buyer will pay for that good
 - How much the buyer values the good
- Example: 4 buyers' WTP for a watch



Internet photo

name	WTP
Richard	\$250
David	175
Kenny	300
Eric	125

WTP and the Demand Curve

- Q: If price of a watch is \$200, who will buy a watch, and what is quantity demanded?
- A: Richard & Kenny will buy a watch, David & Eric will not.
- Hence, $Q^d = 2$ when $P = \$200$.

name	WTP
Richard	\$250
David	175
Kenny	300
Eric	125

WTP and the Demand Curve

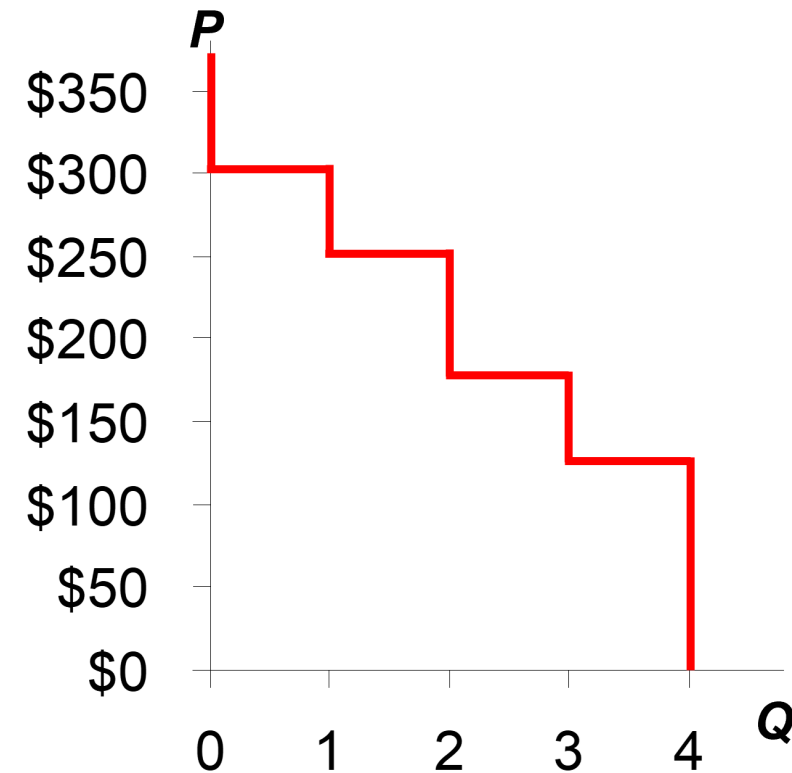
- Derive the demand schedule:

name	WTP
Richard	\$250
David	175
Kenny	300
Eric	125

P (price of watch)	who buys	Q^d
\$301 & up	nobody	0
251 – 300	Kenny	1
176 – 250	Richard, Kenny	2
126 – 175	David, Richard, Kenny	3
0 – 125	Eric, David, Richard, Kenny	4

WTP and the Demand Curve

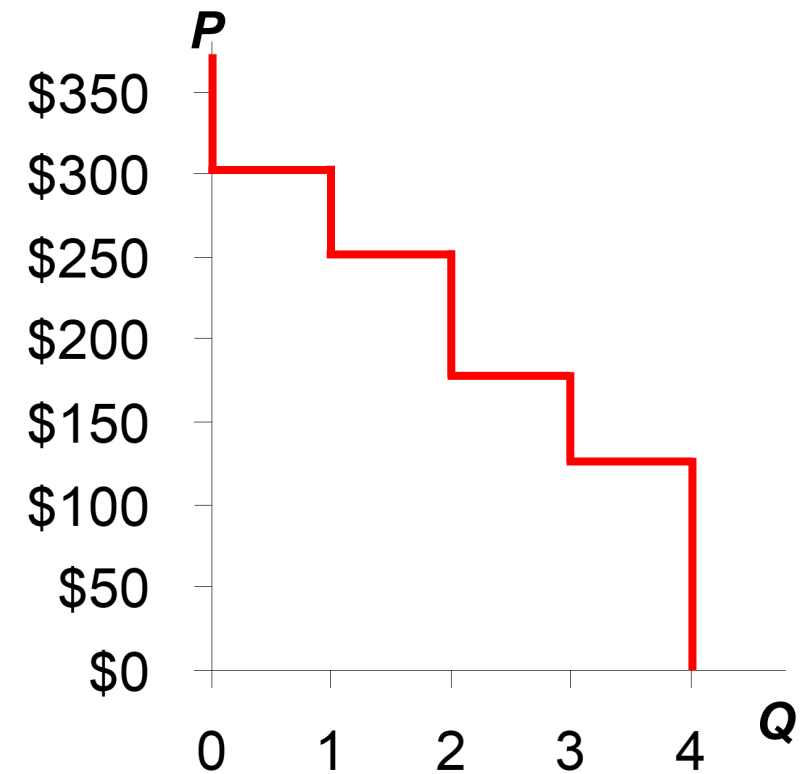
P (price of watch)	who buys	Q^d
\$301 & up	nobody	0
251 – 300	Kenny	1
176 – 250	Richard, Kenny	2
126 – 175	David, Richard, Kenny	3
0 – 125	Eric, David, Richard, Kenny	4



About the Staircase Shape...

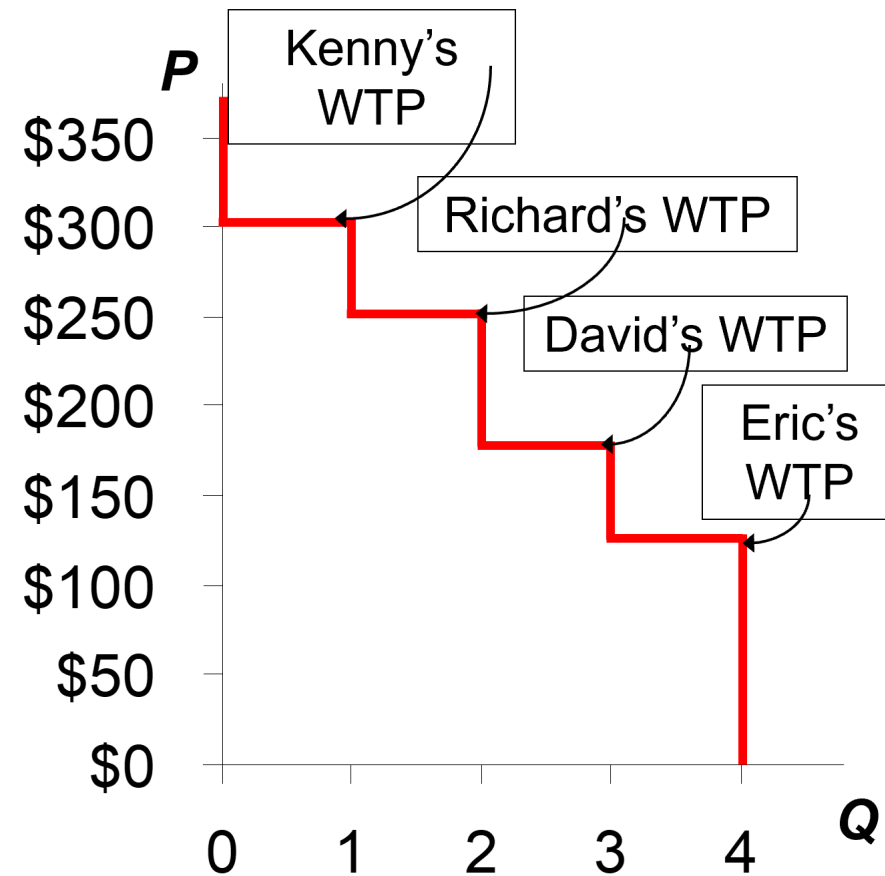
This D curve looks like a staircase with 4 steps – one per buyer.

- 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.



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 $CS = WTP - P$
 - Amount a buyer is willing to pay minus the amount the buyer actually pays

- Example: suppose $P = \$260$.

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

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

Total $CS = \$40$.

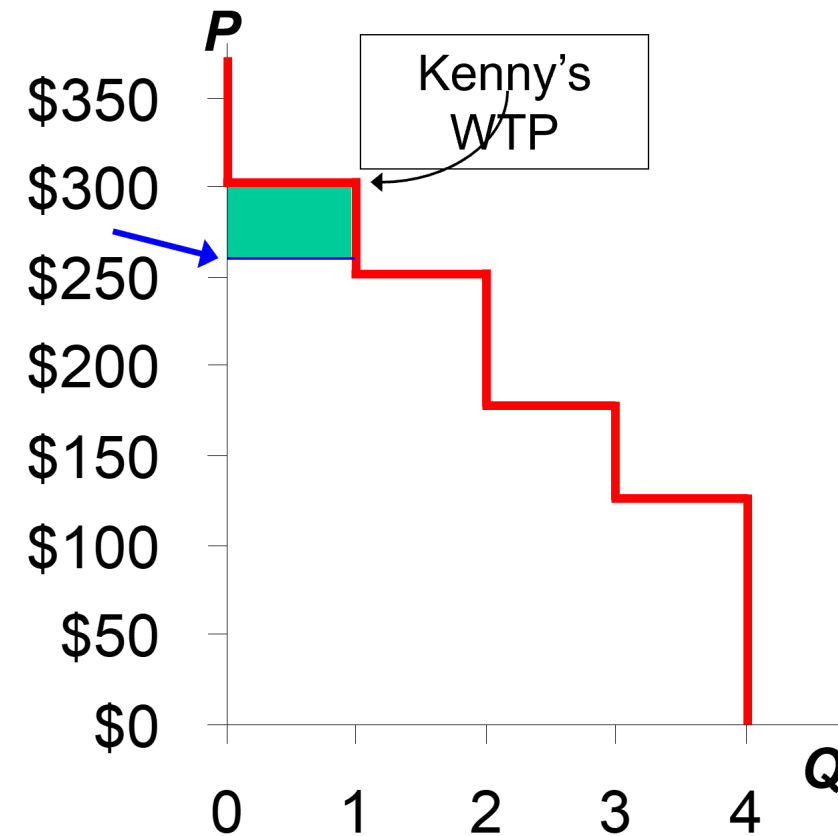
name	WTP
Richard	\$250
David	175
Kenny	300
Eric	125

CS and the Demand Curve

$$P = \$260$$

$$\text{Kenny's CS} = \$300 - 260 = \underline{\$40}$$

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



CS and the Demand Curve

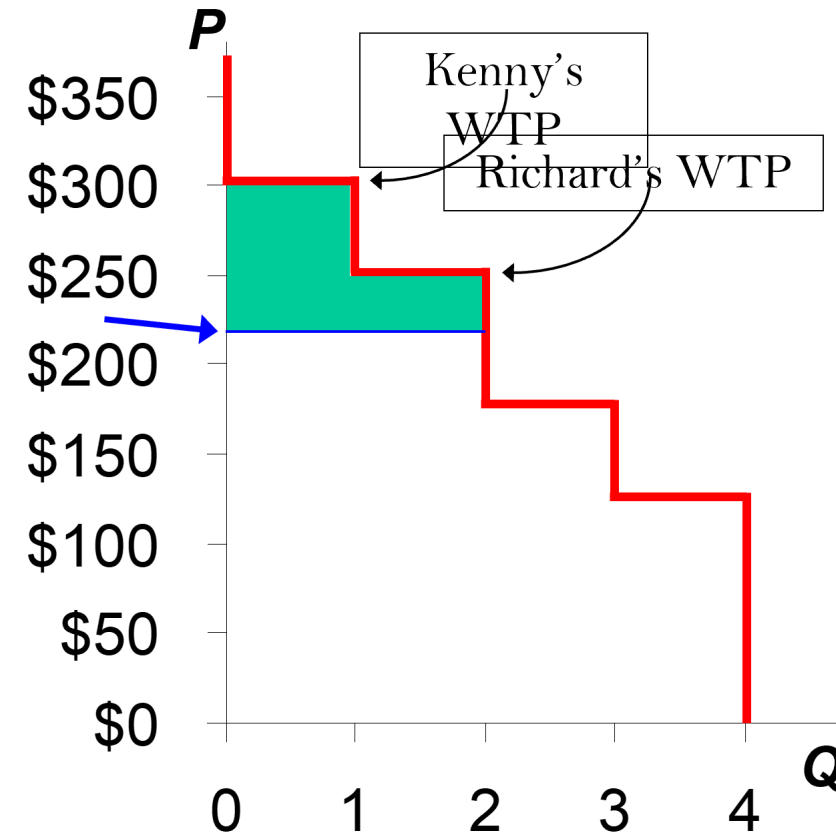
Instead, suppose $P = \$220$

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

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

Total CS = $\$110$

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

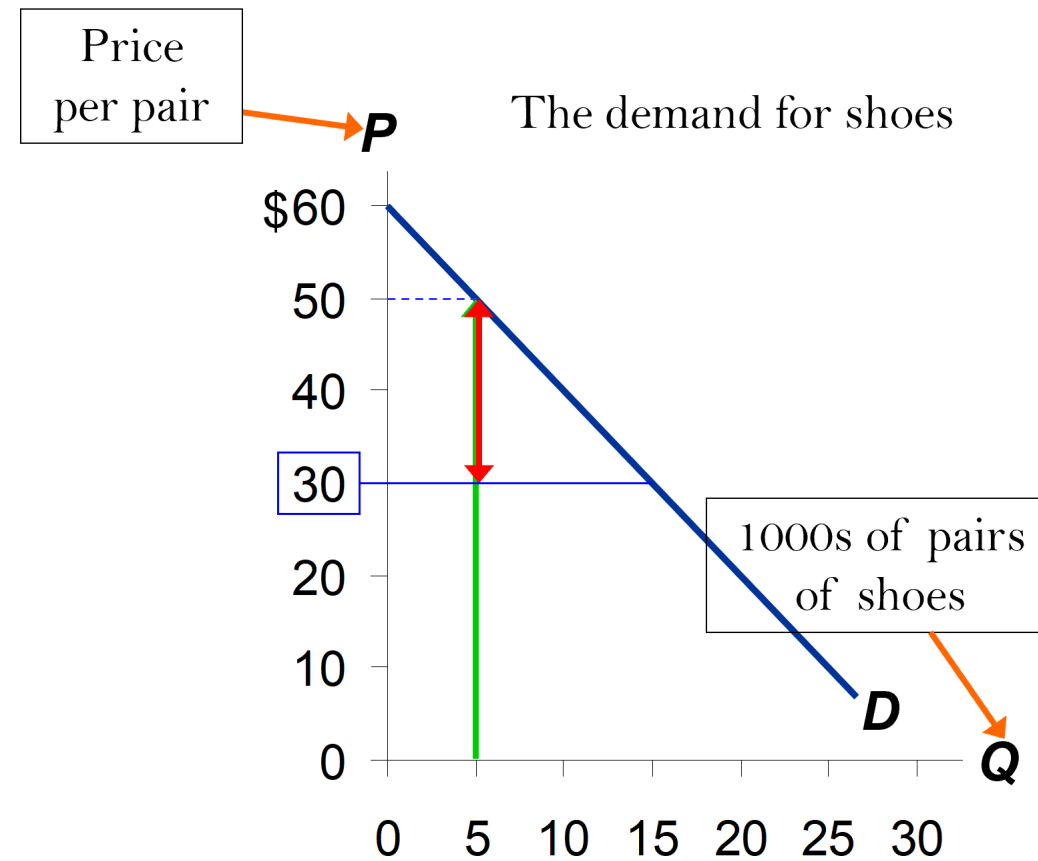


CS with Lots of Buyers & a Smooth D Curve

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

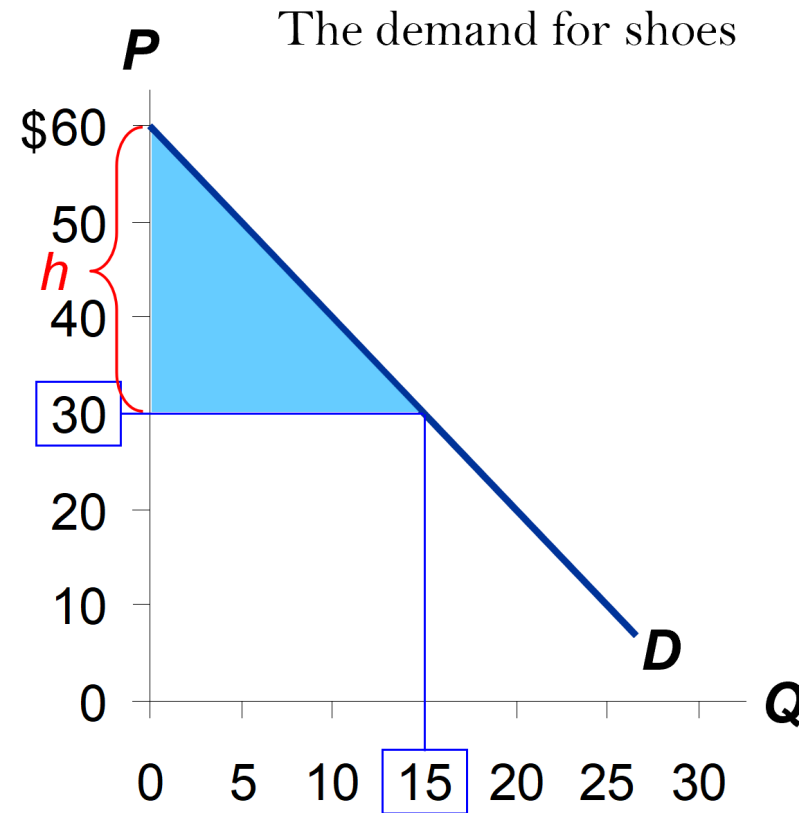
CS is the area between P and the D curve, from 0 to Q .

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

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

So,

$$\begin{aligned} \text{CS} &= \frac{1}{2} \times 15 \times \$30 \\ &= \underline{\underline{\$225}}. \end{aligned}$$

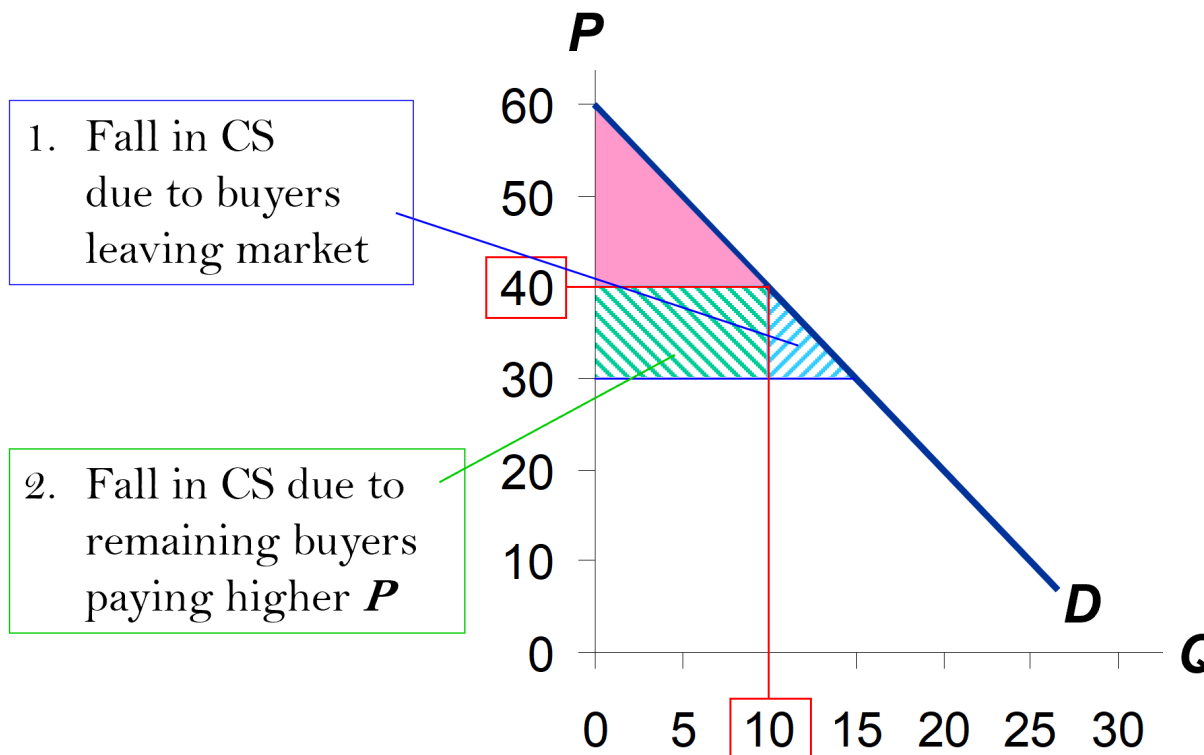


How a Higher Price Reduces CS

If P rises to \$40,

$$\begin{aligned} \text{CS} &= \frac{1}{2} \times 10 \times \$20 \\ &= \$100. \end{aligned}$$

Two reasons for the fall in CS.



Active Learning 1

Consumer surplus

A. Find marginal buyer's WTP at $Q = 10$.

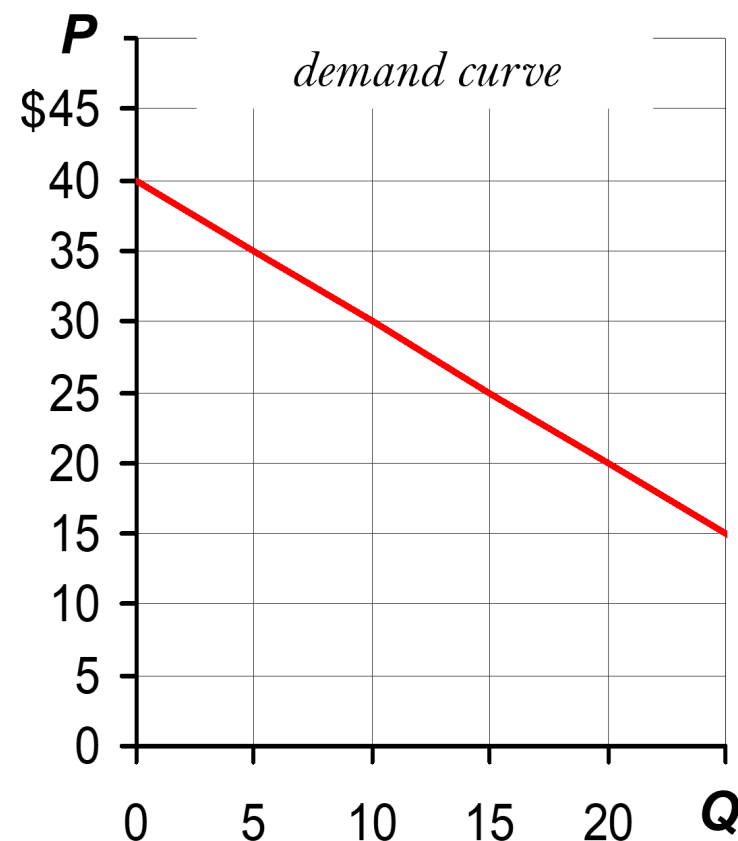
B. Find CS for $P = \$30$

Suppose P falls to \$20.

How much will CS increase due to...

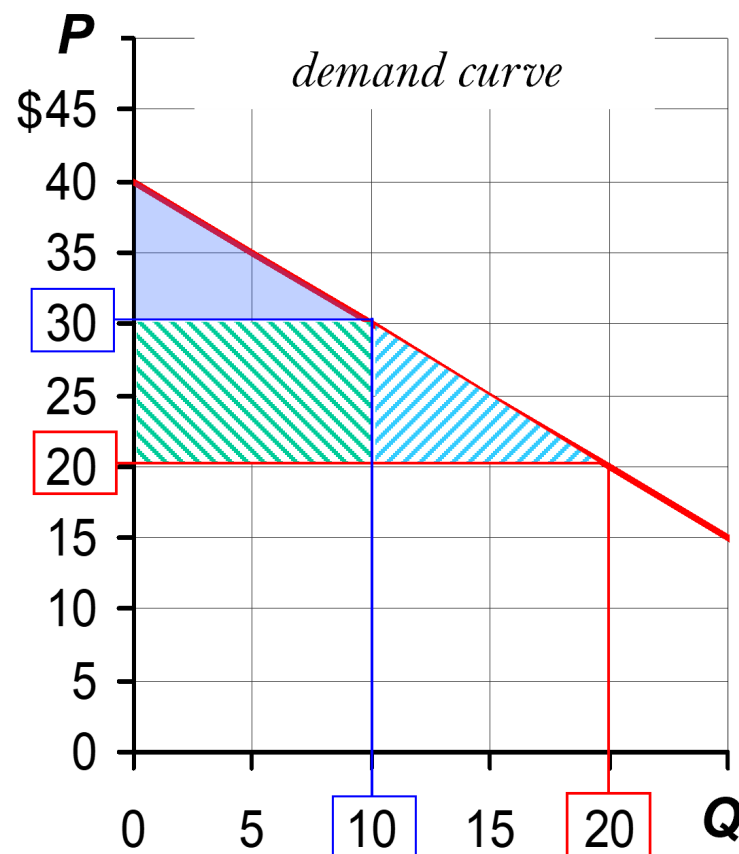
C. buyers entering the market

D. existing buyers paying lower price



Answers

- A. At $Q = 10$, marginal buyer's WTP is \$30.
- B. $CS = \frac{1}{2} \times 10 \times \$10 = \$50$
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

- Cost

- Value of everything a seller must give up to produce a good

- Measure of willingness to sell: produce and sell the good/service only if the price $>$ cost

- Example: Costs of 3 sellers in the lawn-cutting business.

<i>name</i>	<i>cost</i>
Emily	\$10
Janet	20
Helen	35



Internet photo

Producer Surplus

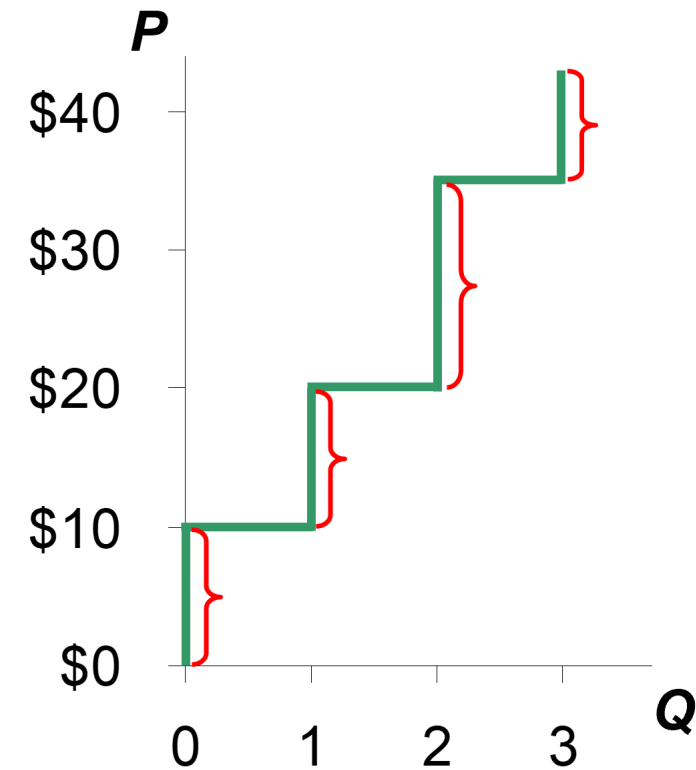
- Derive the supply schedule from the cost data:

<i>name</i>	<i>cost</i>
Emily	\$10
Janet	20
Helen	35

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

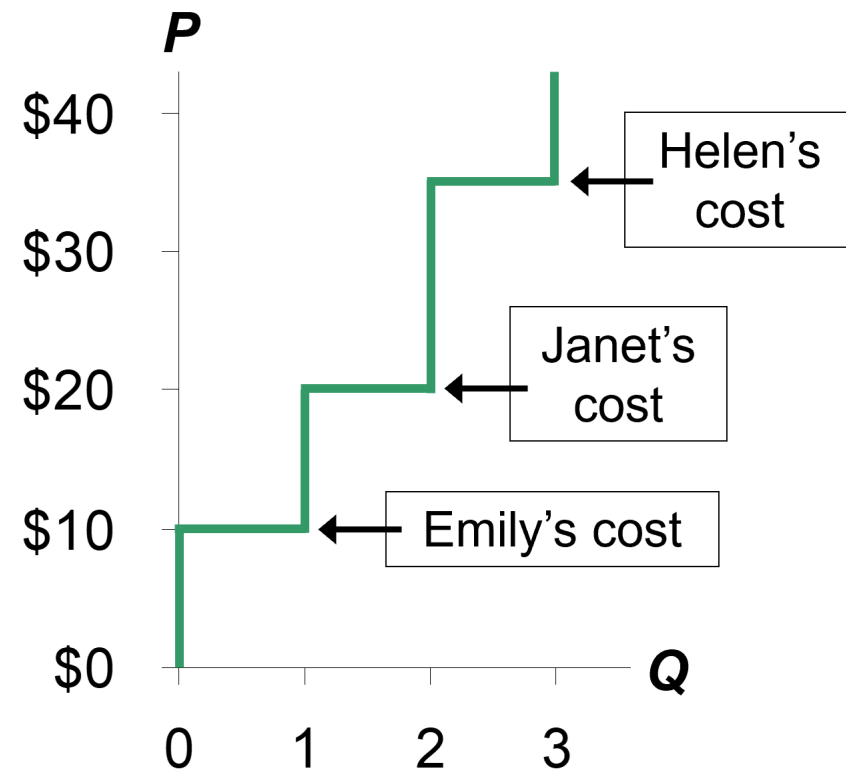
Cost and the Supply Curve

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

- 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

Producer Surplus and the S Curve

$PS = P - \text{cost}$. Suppose $P = \$25$:

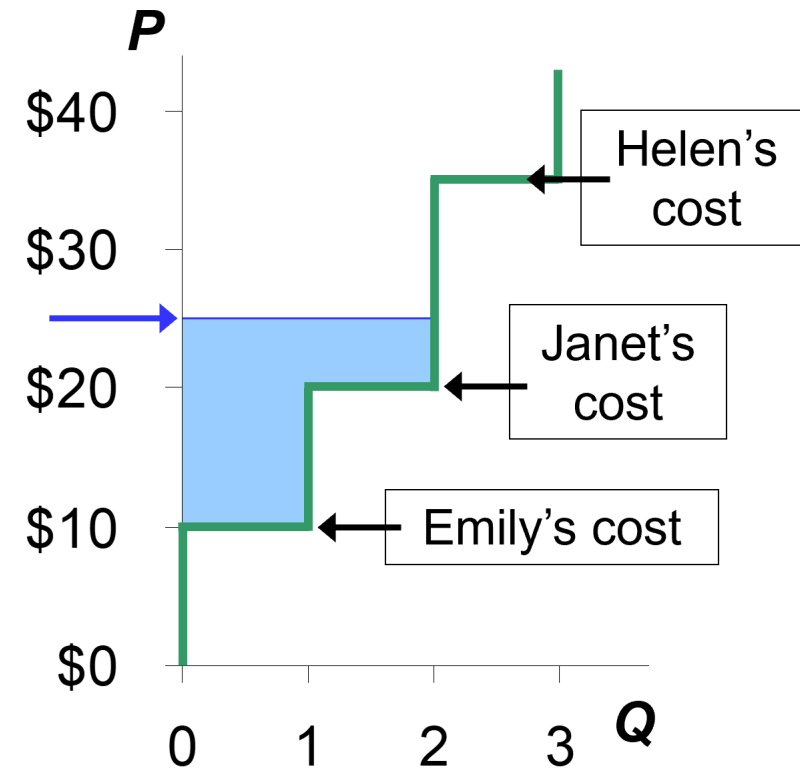
Emily's PS = \$15

Janet's PS = \$5

Helen's PS = \$0

Total PS = \$20

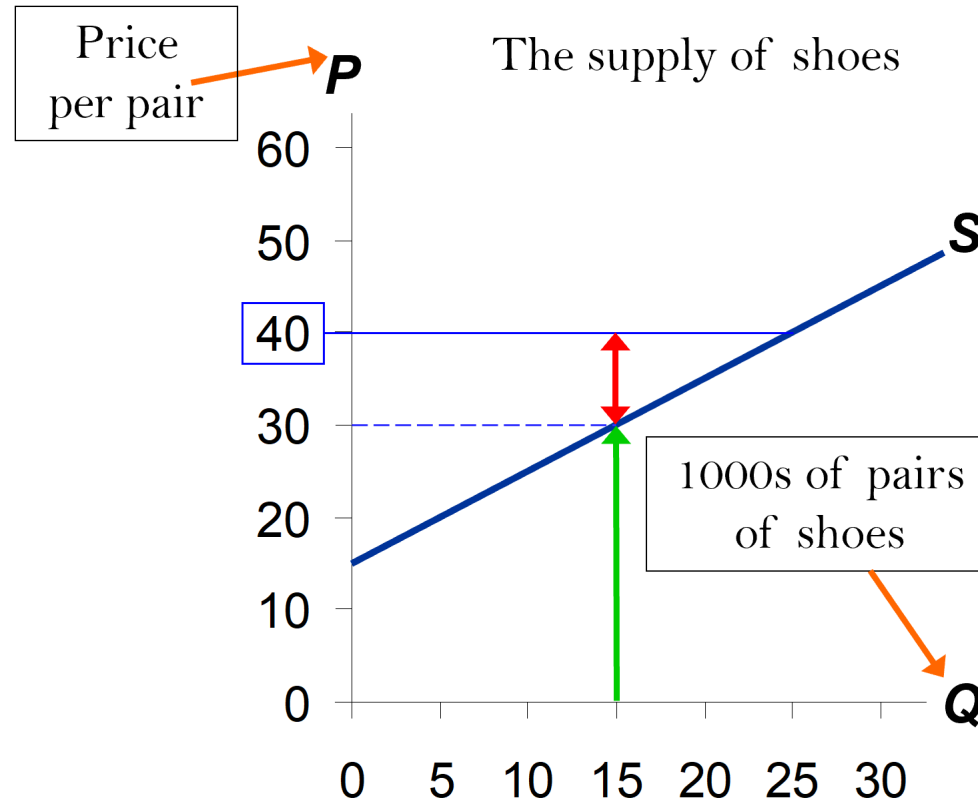
Total PS equals the area above the supply curve under the price, from 0 to Q .



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.



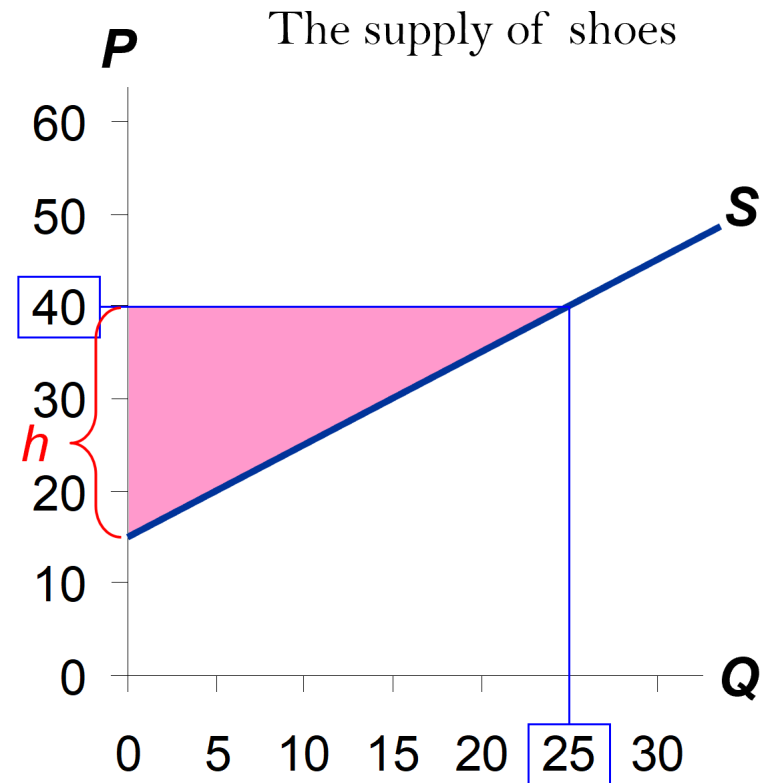
PS with Lots of Sellers & a Smooth S Curve

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

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

So,

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

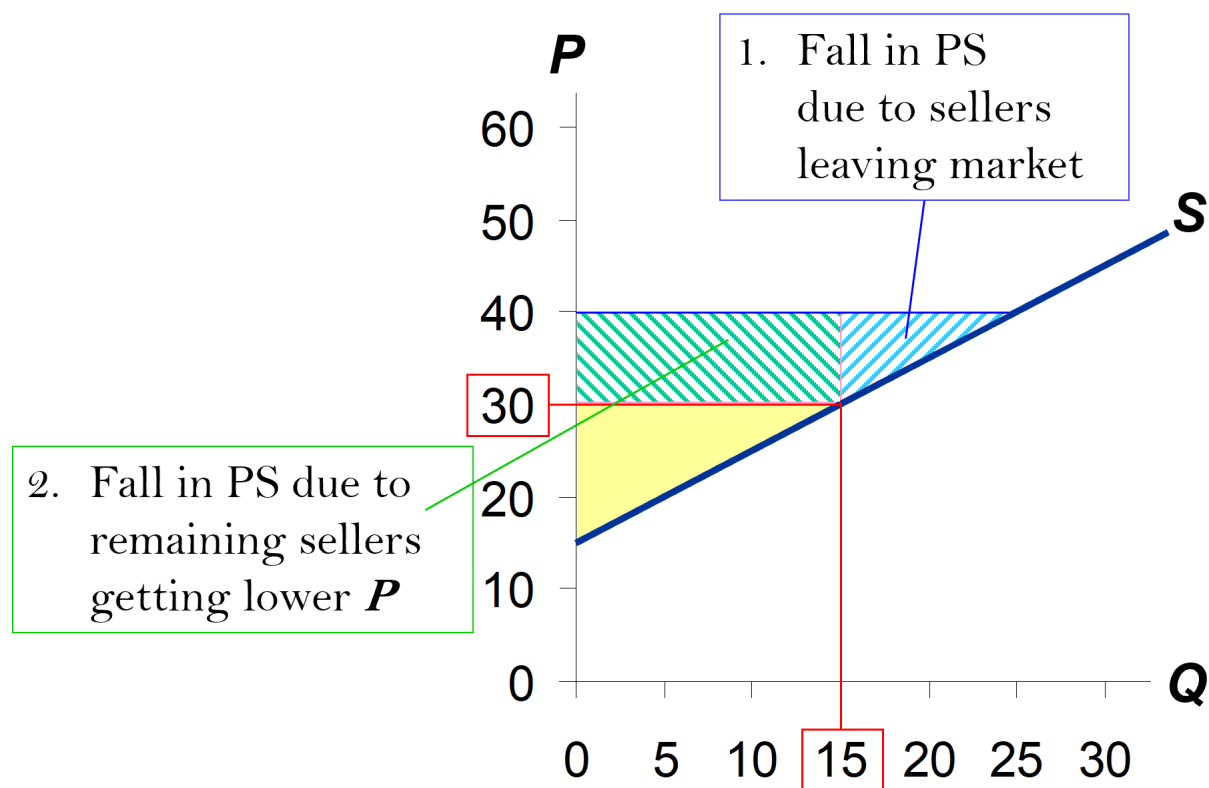


How a Lower Price Reduces PS

If P falls to \$30,

$$\begin{aligned} PS &= \frac{1}{2} \times 15 \times \$15 \\ &= \underline{\underline{\$112.50}} \end{aligned}$$

Two reasons for the fall in PS.



Active Learning 1

Producer surplus

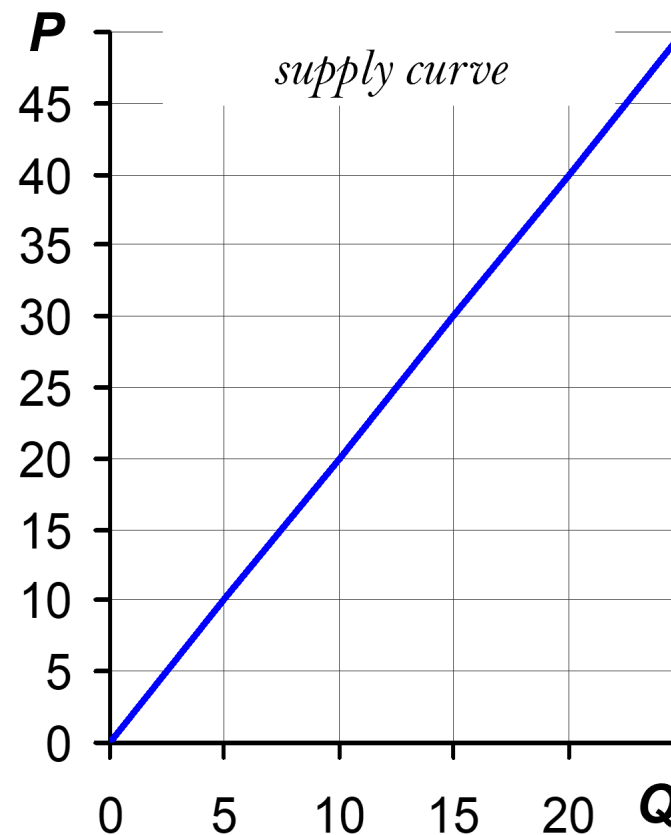
A. Find marginal seller's cost at $Q = 10$.

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

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

C. selling 5 additional units

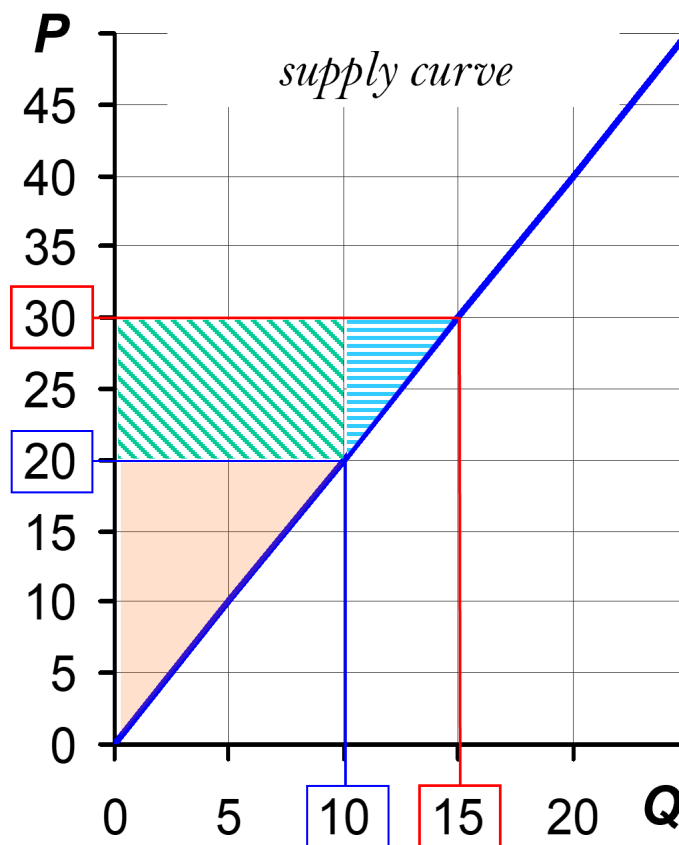
D. getting a higher price on the initial 10 units



Active Learning 1

Answers

- A. At $Q = 10$,
marginal cost = \$20
- B. $PS = \frac{1}{2} \times 10 \times \$20 = \$100$
 P rises to \$30.
- C. PS on additional units
 $= \frac{1}{2} \times 5 \times \$10 = \$25$
- D. Increase in PS on initial 10
units = $10 \times \$10 = \100



Market Efficiency

- $\text{Total surplus} = \text{CS} + \text{PS}$
 - $\text{Consumer surplus} = \text{Value to buyers} - \text{Amount paid by buyers}$
 - Buyers' gains from participating in the market
 - $\text{Producer surplus} = \text{Amount received by sellers} - \text{Cost to sellers}$
 - Sellers' gains from participating in the market

$\text{Total surplus} = \text{Value to buyers} - \text{Cost to sellers}$

Market's Allocation of Resources

- Allocation of resources – desirable?
 - Decentralized (in a market economy)
 - 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
- Efficient allocation of resources maximizes total surplus
 1. The goods are consumed by the buyers who value them most highly
 2. The goods are produced by the producers with the lowest costs
 3. Raising or lowering the quantity of a good would not increase total surplus

Evaluating the Market Equilibrium

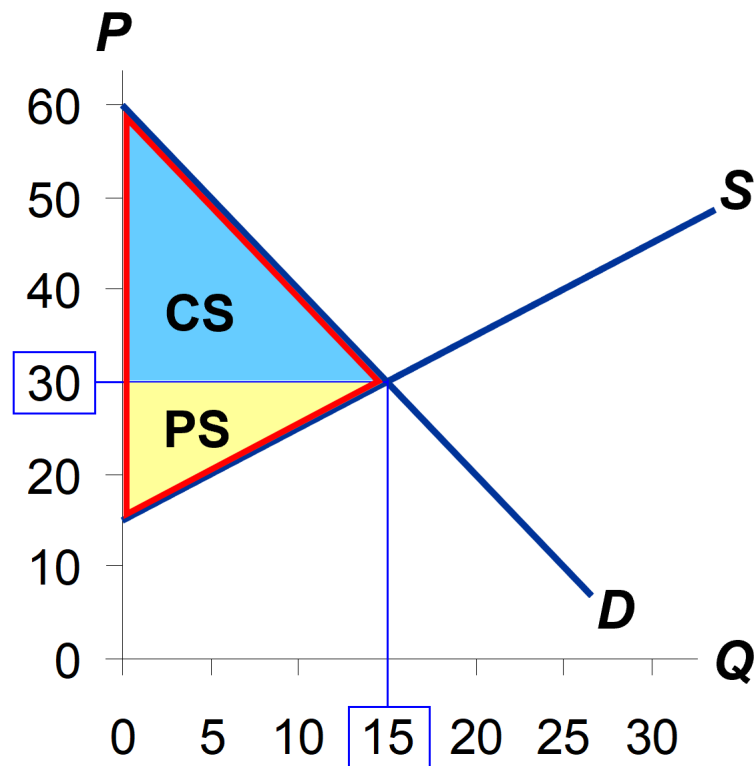
Market equilibrium:

$$P = \$30$$

$$Q = 15 \text{ (thousand)}$$

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

Is the market equilibrium efficient?

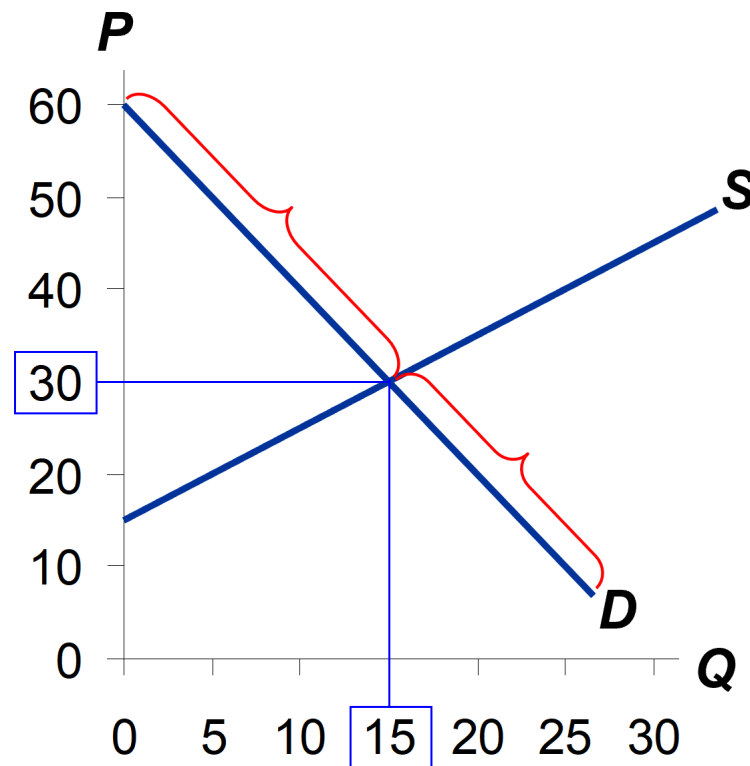


Which Buyers Consume the Good?

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.

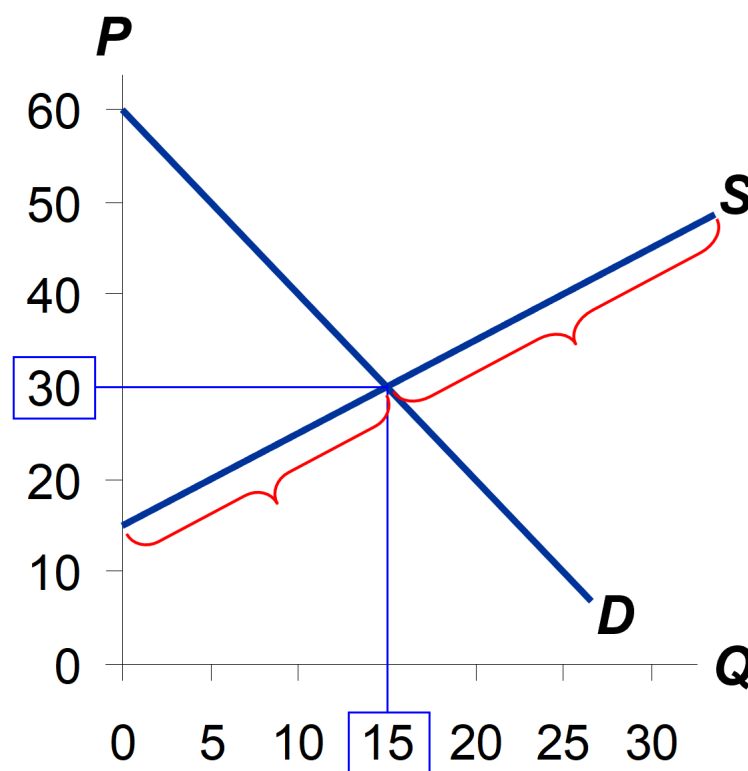


Which Sellers Produce the Good?

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

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

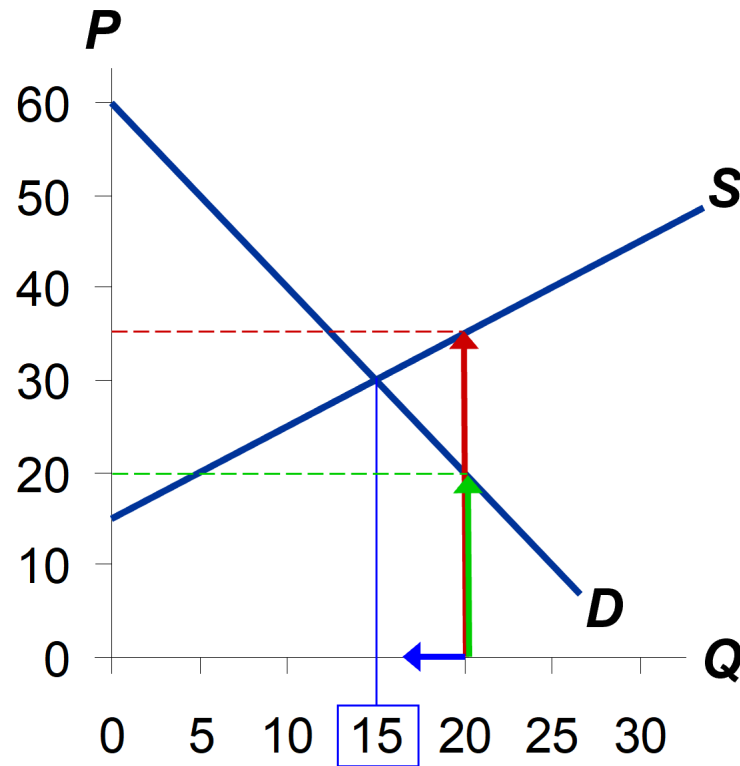
The sellers with the lowest cost produce the good.



Does Equilibrium 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.



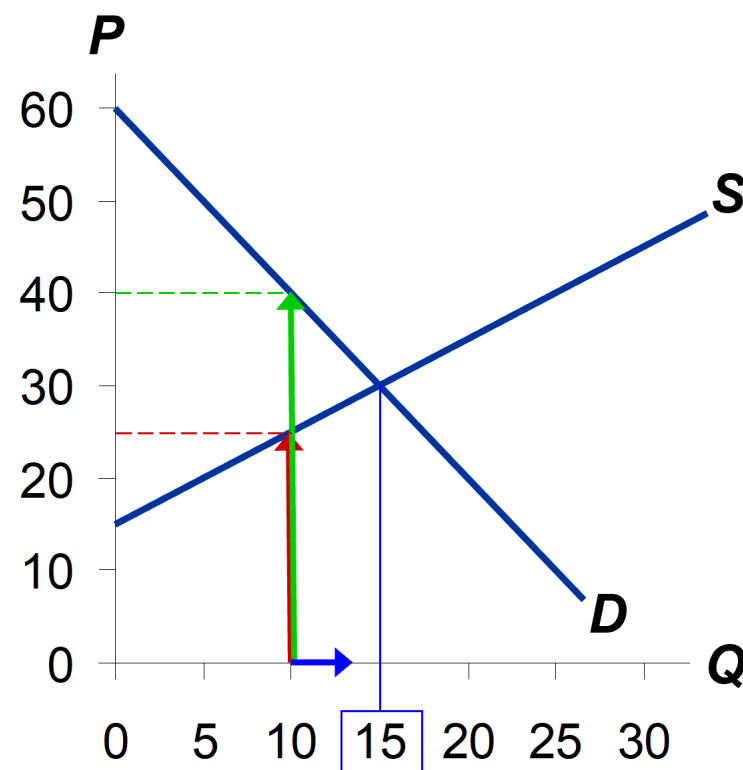
Does Equilibrium Q Maximize Total Surplus?

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.

Welfare Economics

- Allocation of resources refers to:
 - How much of each good is produced
 - Which producers produce it
 - Which consumers consume it
- Welfare economics
 - Studies how the allocation of resources affects economic well-being



Internet photo

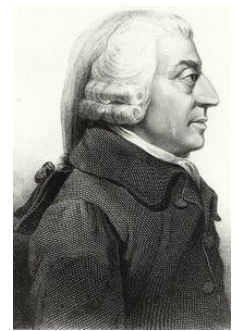
Adam Smith and the Invisible Hand

Passages from The Wealth of Nations, 1776

“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....



Internet photo

Adam Smith and the Invisible Hand

Passages from The Wealth of Nations, 1776

“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.”

Market Efficiency & Market Failure

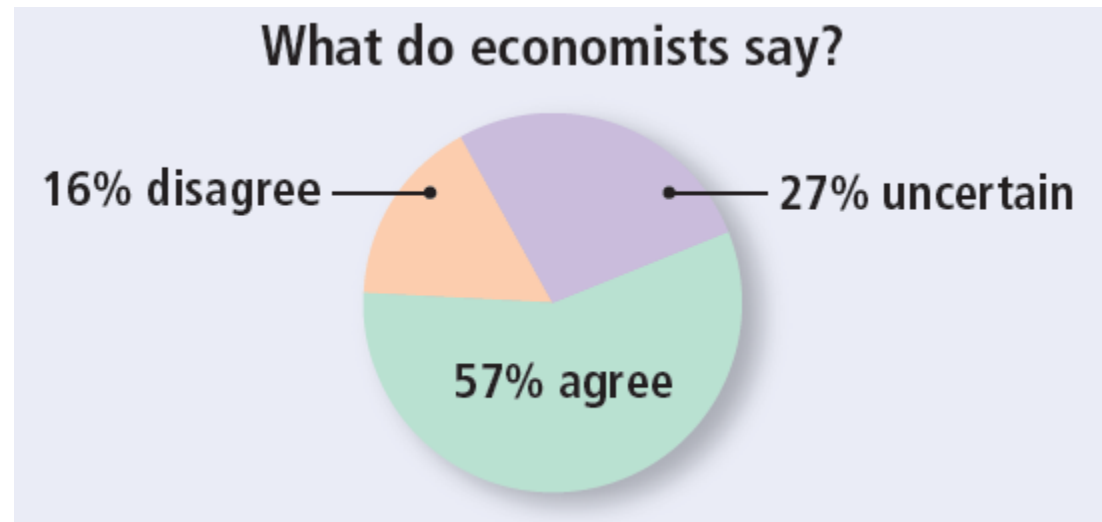
- This chapter used welfare economics to demonstrate one of the Ten Principles: Markets are usually a good way to organize economic activity.
- But we assumed markets are perfectly competitive.
- In the real world, sometimes there are market failures, when unregulated markets fail to allocate resources 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

Market Efficiency & Market Failure

- 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.

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.”



Can You Answer the Following Questions?

- What is consumer surplus? How is it related to the demand curve?
- What is producer surplus? How is it related to the supply curve?
- Do markets produce a desirable allocation of resources? Or could the market outcome be improved upon?

End