EE211
PRINCIPLES OF MICROECONOMICS

Topic 4:

Consumer Surplus, Producer Surplus, and the Efficiency of Markets

Topics

- Consumer Surplus
- Producer Surplus
- Market Efficiency

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
  - Consumer's well-being is measured by consumer surplus.
  - Producer's well-being is measured by producer surplus.
  - Both contribute to *total surplus* (or *social welfare)*.

Willingness to Pay (WTP)

- A consumer's willingness to pay for a good is the maximum amount the buyer will pay for that good.
  - WTP measures how much s/he values the good.
- Example: 4 buyers' WTP for an iPhone

Consumer	WTP
Nadech	$250
James	175
Ken	300
Boy	125

Suppose the price of an iPhone is $200. ← determined by the market.

Q: Who will buy an iPhone?

➔ Nadech & Ken

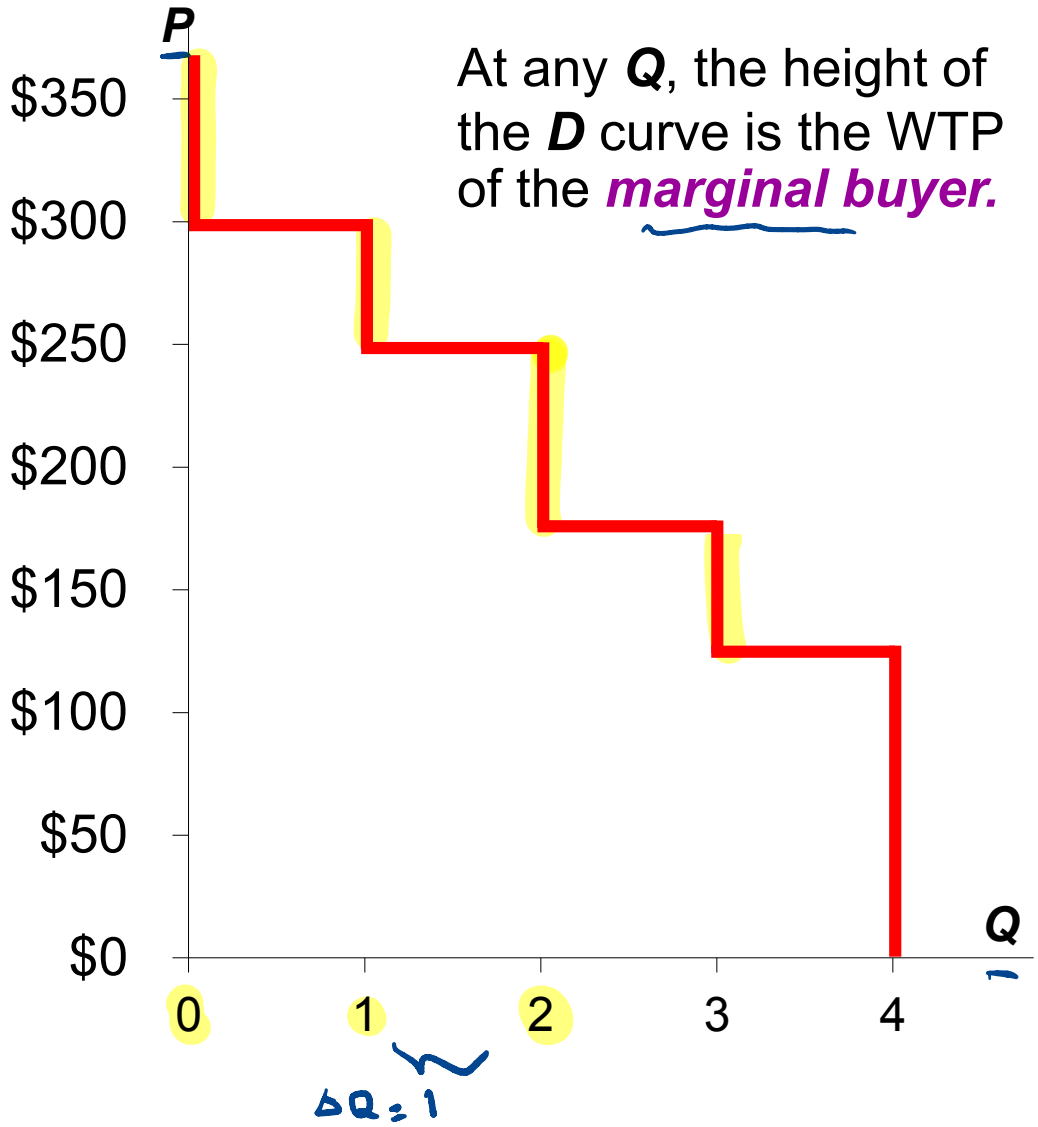
Q: What is quantity demanded?

➔ 2

Deriving the Demand Curve

Consumer	WTP
Nadech	$250
James	175
Ken	300
Boy	125

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



At any ***Q***, the height of the ***D*** curve is the WTP of the ***marginal buyer.***

Consumer Surplus

- Consumer surplus (CS) is the difference between what a consumer is willing to pay and what s/he actually pays.
- Mathematically, CS = WTP – P.
- Example:

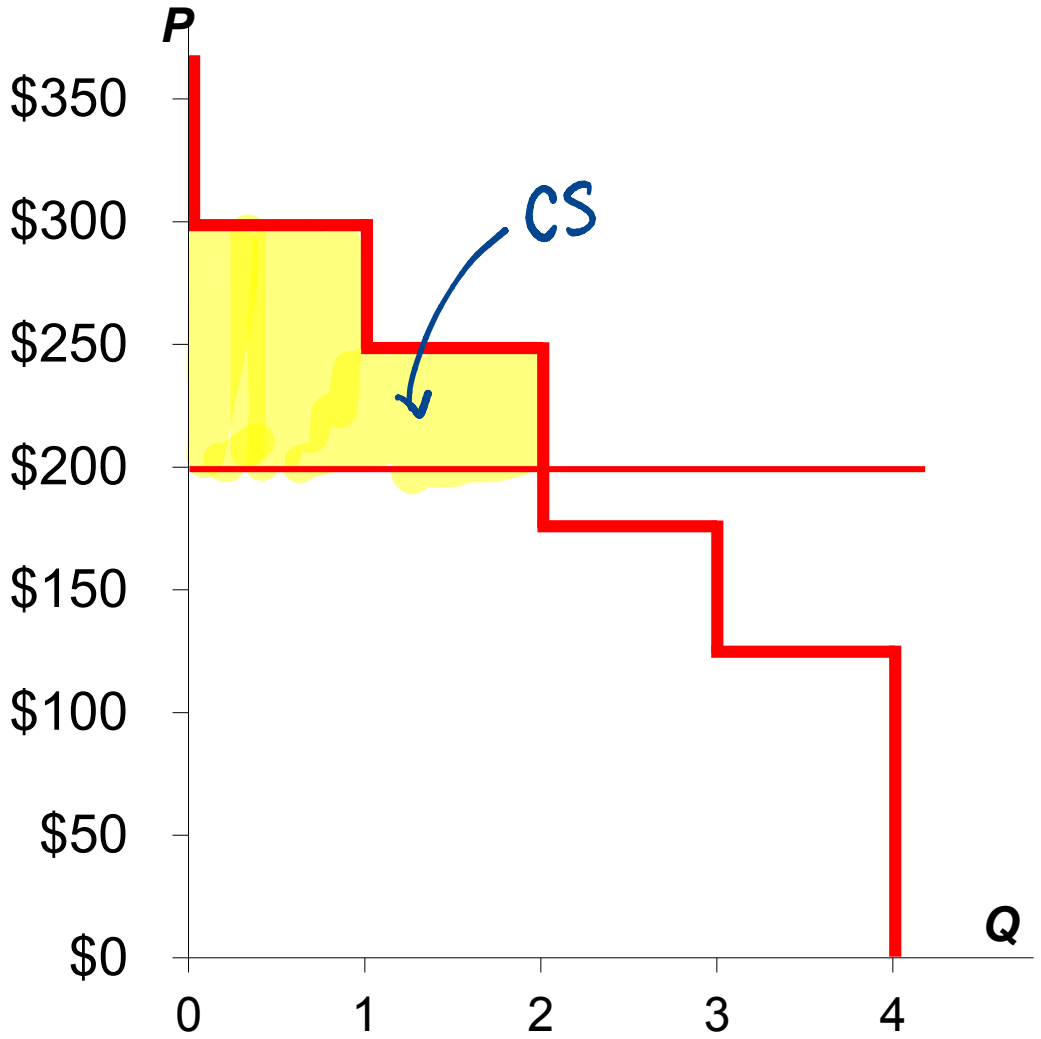
Consumer	WTP
Nadech	$250
James	175
Ken	300
Boy	125

Suppose P = $200.

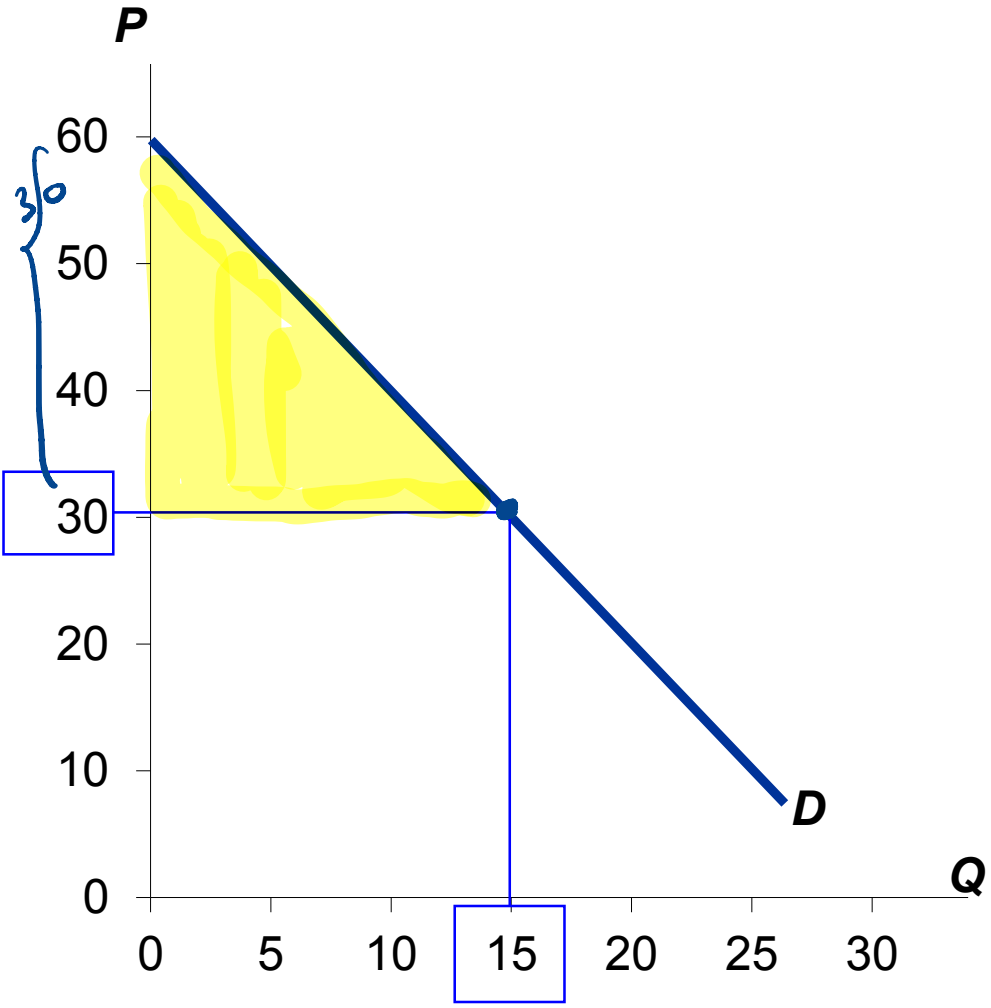
- Nadech's CS = $250 - $200 = $50
- James' CS= 0 (∵ WTP < P)
- Ken's CS= 300 - 200 = $100
- Boy's CS= 0
- Total CS = $150

Consumer Surplus and WTP

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



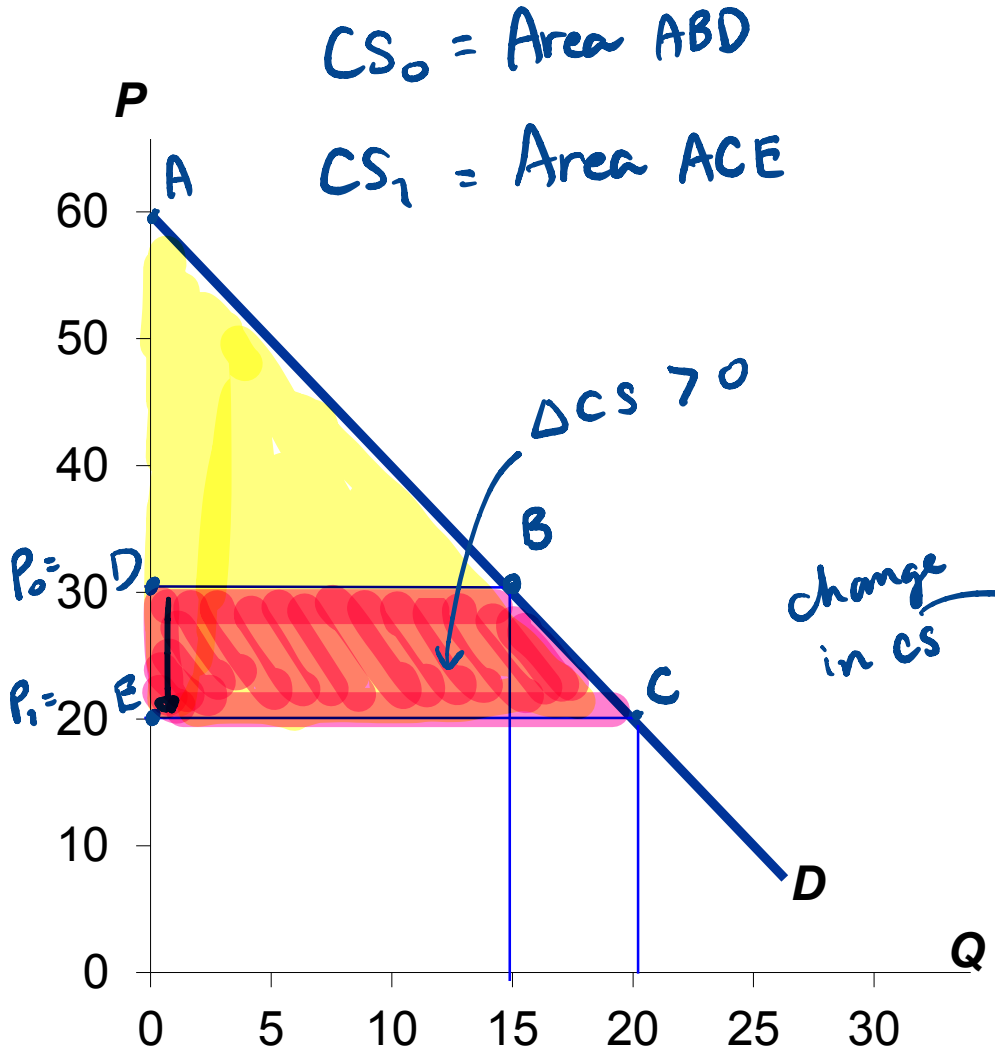
Consumer Surplus:
Many Buyers and Smooth Demand Curve



- Consumer surplus is the area under the demand curve above the price line.
- Suppose P = 30.
  - CS= $\frac{1}{2} \times 15 \times 30$
  - = $225

(Given price determined by the market)

Consumer Surplus When Price is lower.



- When the price is lower, the CS will be higher.
- Suppose price decreases from 30 to 20.
  - New CS = $\frac{1}{2} \times 20 \times 40 = 400$
  - change in CS → $\Delta CS = CS_1 - CS_0$
    $= 400 - 225$
    $= \$175$

Cost and the Supply Curve

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

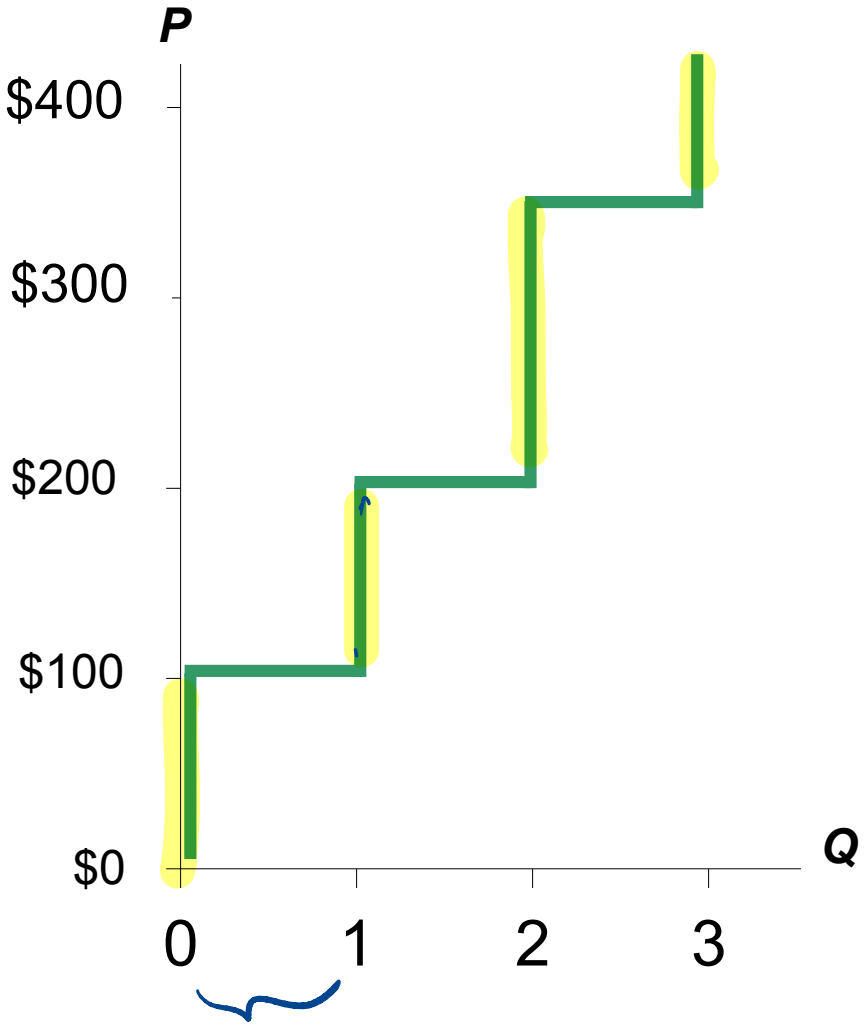
Seller	cost
I-store1	$100
I-store2	200
I-store3	350

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

Seller	cost
I-store1	$100
I-store2	200
I-store3	350



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

- At each ***Q***, the height of the ***S*** curve is the cost of the ***marginal seller.***

Producer Surplus

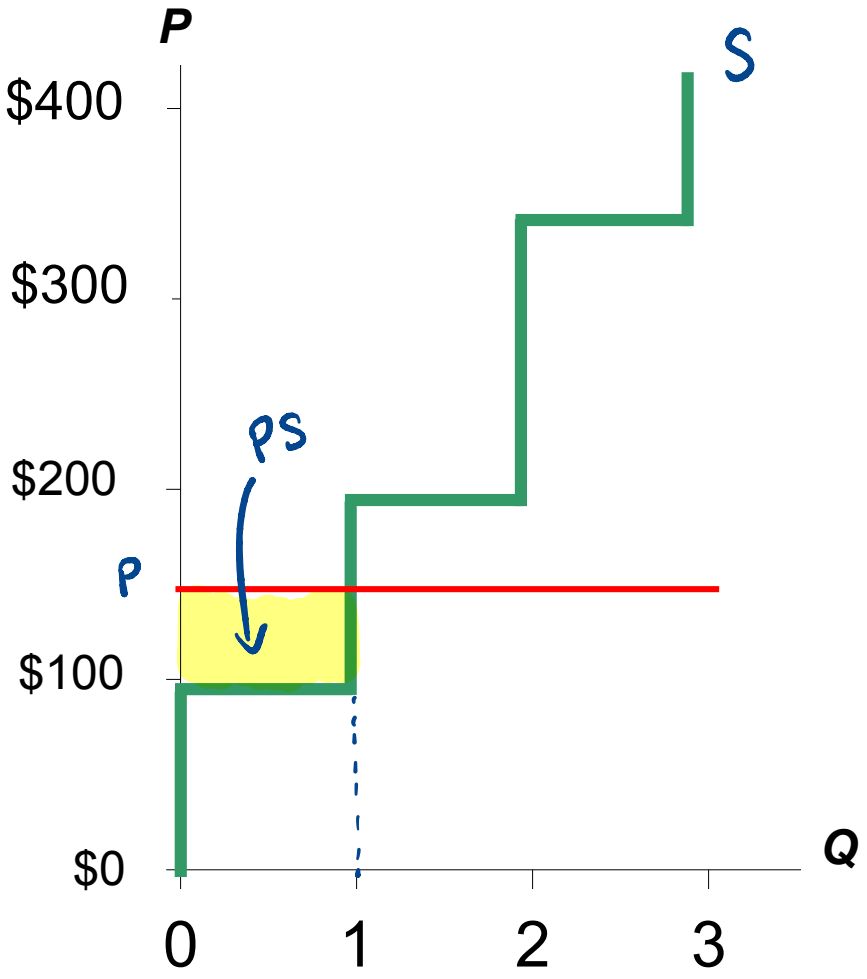
- Producer surplus (PS) is the difference between what a seller is willing to sell (i.e. cost) and the price at which s/he actually sells.
- Mathematically, PS = P - Cost.
- Example:

Seller	cost	PS
I-store1	$100	50
I-store2	200	0
I-store3	350	0

Suppose P = $150.

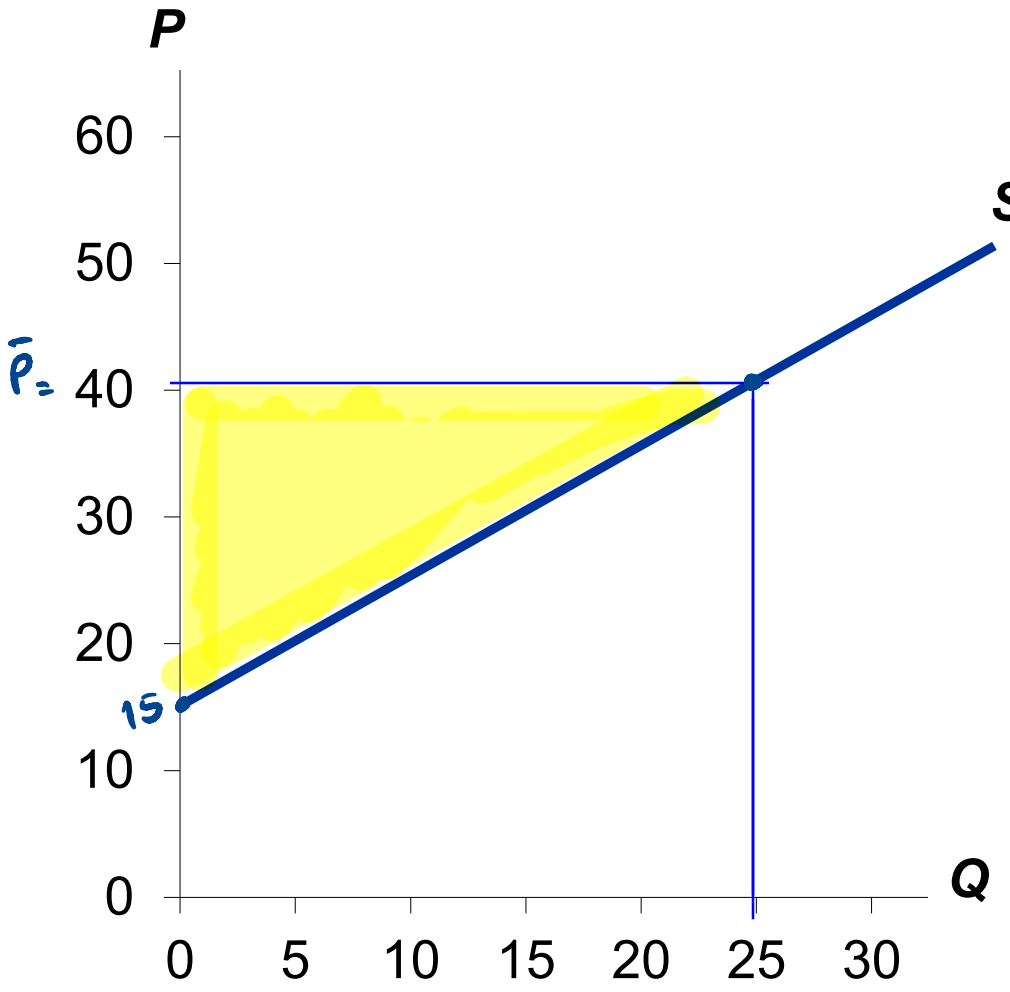
➢ Total PS = 50

Producer Surplus and the Supply Curve



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

Producer Surplus: Many Sellers and Smooth Supply Curve



- Producer surplus is the area above the supply curve and under the price line.

$P_1 = 50 \rightarrow PS \uparrow$

$P_2 = 30 \rightarrow PS \downarrow$

- Suppose $P_o = 40$.
- PS = $\frac{1}{2} \times 25 \times \$(40-15)$

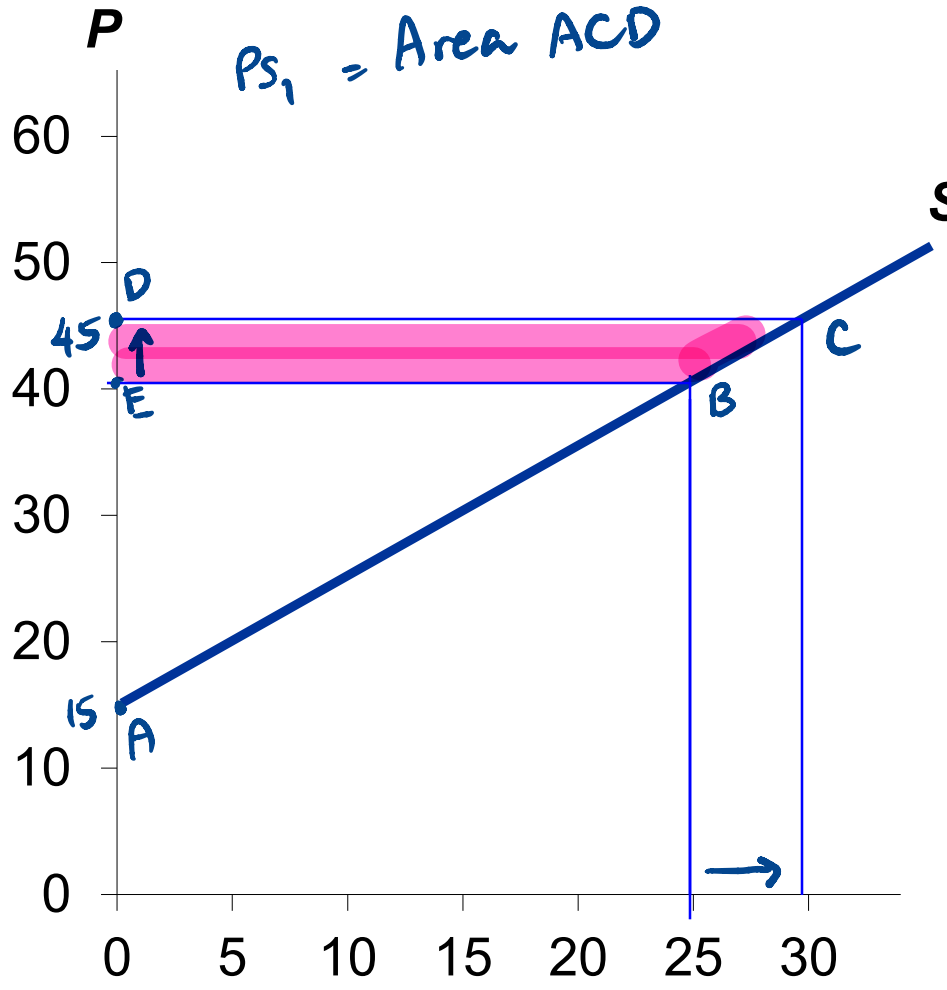
$= \frac{\$625}{2}$

$= \$312.5$

Producer Surplus When Price is Higher

PS_0 = Area ABE

PS_1 = Area ACD



- When the price is higher, the PS will be higher.
- Suppose price increases from 40 to 45.
  - New PS = $\frac{1}{2} \times 30 \times (45-15) = \$450$
  - $\Delta PS = PS_1 - PS_0$
    $= 450 - 312.5$
    $= \$137.5$ (Area DCBE)

Total Surplus (a.k.a. Social Welfare)

$CS = WTP - \bar{P}$

- CS = (value to buyers) – (amount paid by buyers)
  - CS measures the benefit buyers receive from participating in the market.

$PS = \bar{P} - cost$

- 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.
  - We use total surplus as a measure of society's well-being.

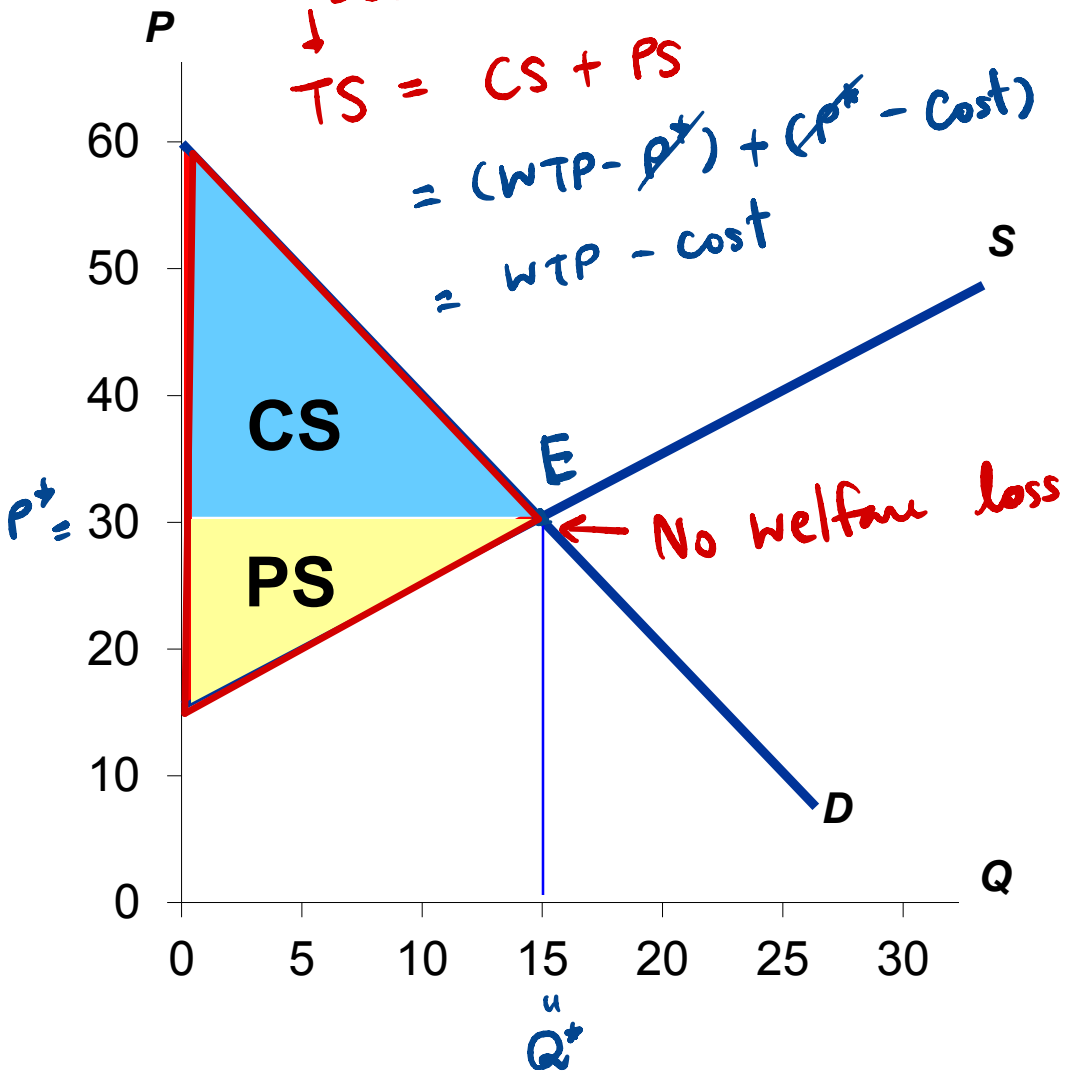
Efficiency (Allocative efficiency)

- Total Surplus = CS + PS
- Total Surplus = (value to buyers) – (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.

Market equilibrium → efficiency

Market Equilibrium

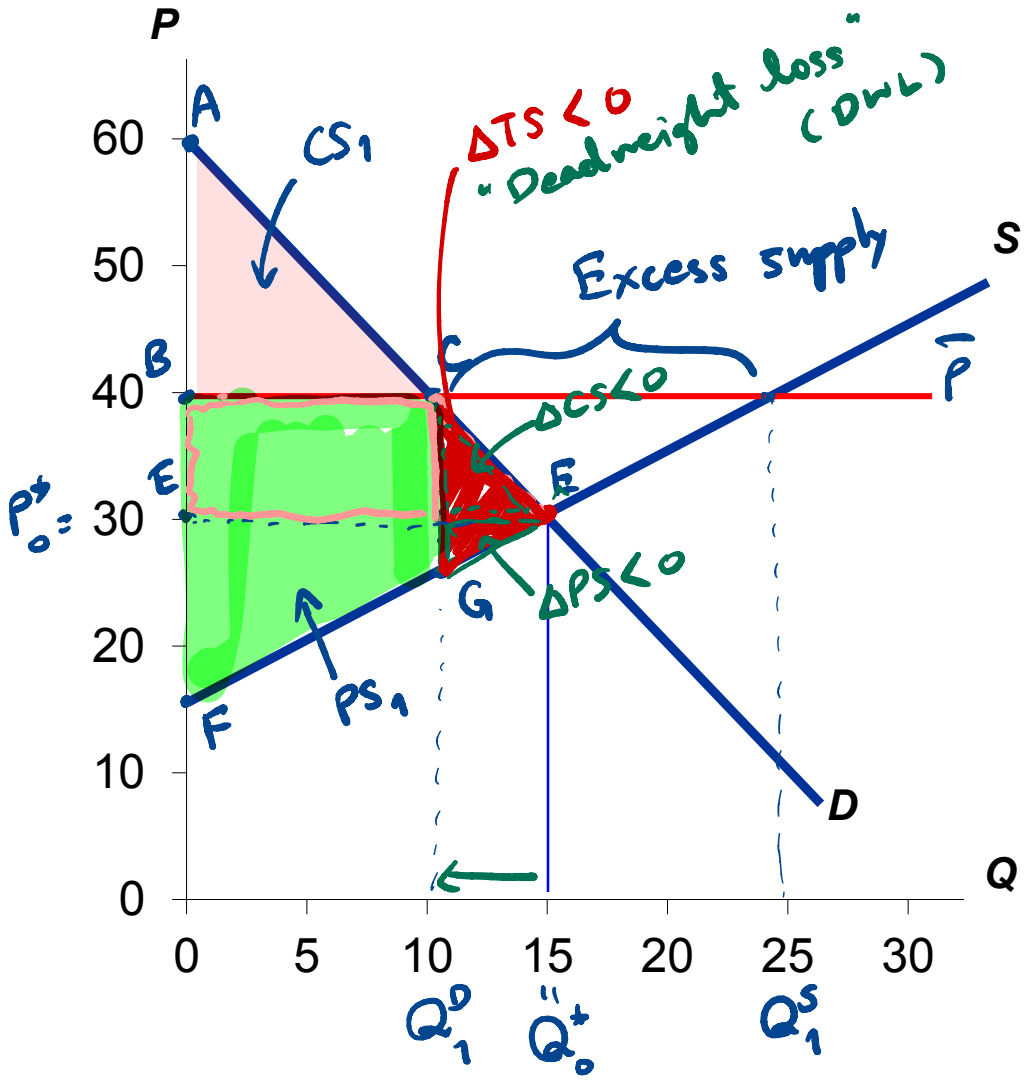


- The equilibrium quantity maximizes total surplus.
- Why?
  - Because there is neither excess demand nor excess supply. → At the eqm.
    - The value of the last unit consumed by the consumer equals to the cost of producing the last unit.
    - No welfare loss!

↗ Part of CS or PS (or both) that no one receives it.

Market Equilibrium:

Welfare Loss When $P > P_E$



Initial Situation

At eqm, $P^* = 30$, $Q^* = 15$

CS_0 = Area(ADE)

PS_0 = Area(DEF)

With change ($\bar{P} > P_0^*$)

(ES)? or ED?

CS_1 = Area(ABC) = \$100

PS_1 = Area(BCGF)

ΔCS = ABC − ADE = −BCDE = −(□BCDH + ΔCEH)

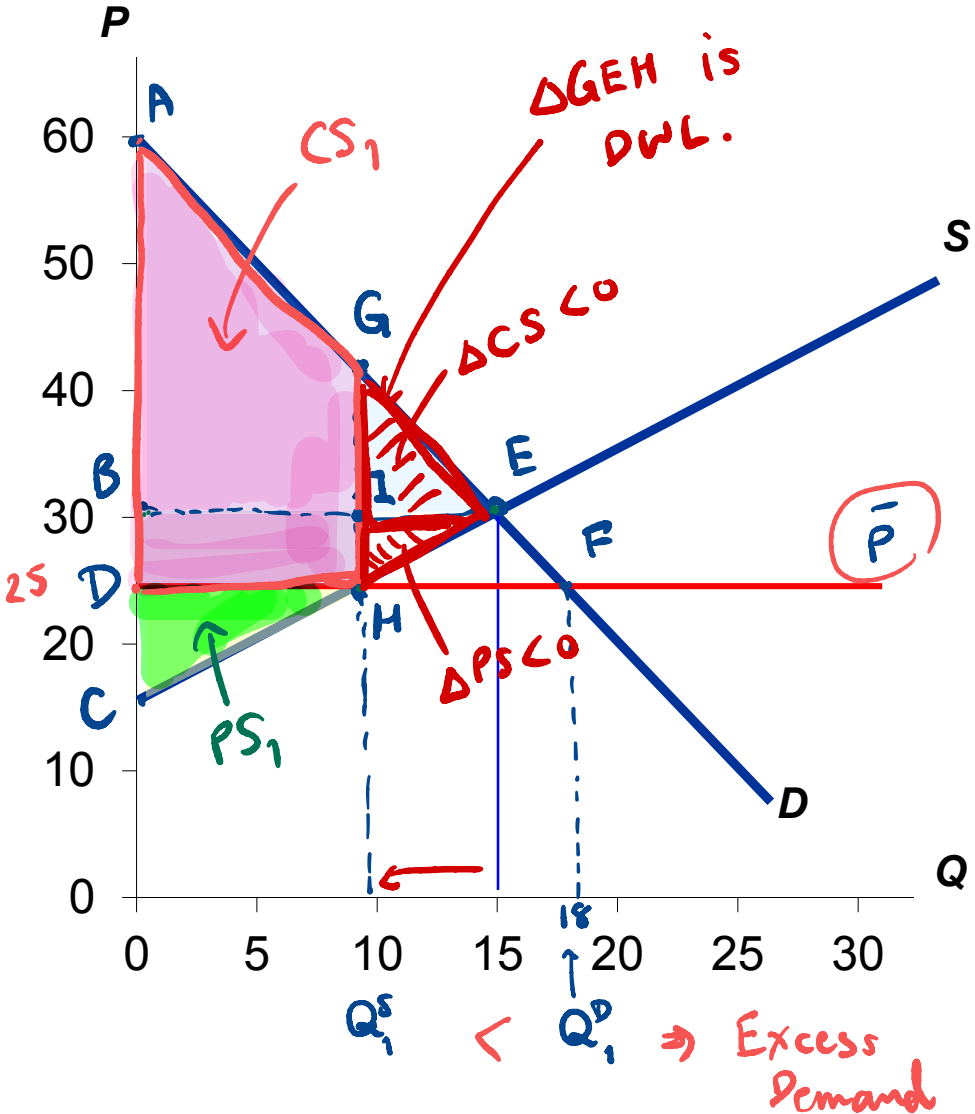
ΔPS = BCGF − DEF = □BCDH − ΔEHG

ΔTS = −□BCDH − ΔCEH + □BCDH − ΔEHG

ΔTS = −ΔCEH − ΔEHG = −ΔCEG

Market Equilibrium:

Welfare Loss When $P < P_E$



Initial Situation

CS_0 = Area (ABE)

PS_0 = Area (BEC)

After the change, $\bar{P} < P_0^*$

ES? ED?

CS_1 = Area (AGHD)

PS_1 = Area (DCH)

ΔCS = AGDH − ABE > 0

= □BDHI − △GIE

ΔPS = DCH − BEC = − BEHD

= − (□BDHI + △IEH) < 0

$\Delta TS = \Delta CS + \Delta PS$

$= \Delta GEH < 0$

= DWL

Applications (Next Topics)

- Price floors
- Price ceilings
- Tax/subsidy