EE211
PRINCIPLES OF MICROECONOMICS

Topic 4:

Consumer Surplus, Producer Surplus, and the Efficiency of Markets

Topics

- Consumer Surplus
- Producer Surplus
- Market Efficiency

Welfare Economics - Well-being

Basic questions: what, how, for whom?

- 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	$350 ✓
James	300 ✓
Mario	250 ✓
Ken	200 ✗

Suppose the price of an iPhone is $250.

Q: Who will buy an iPhone?

➔ N, J, M

Q: What is quantity demanded?

➔ 3

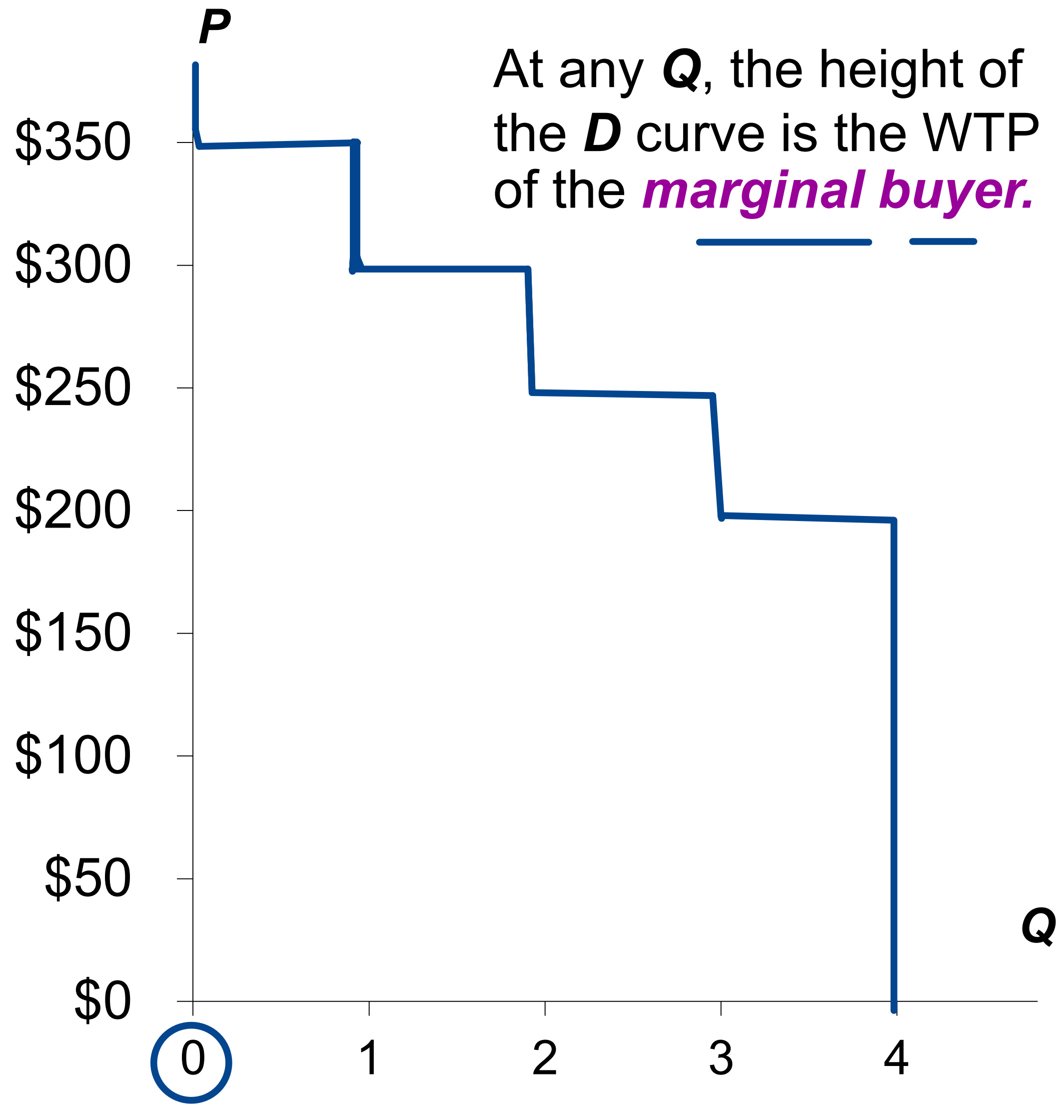
"revealed" preference

Deriving the Demand Curve

Buy if WTP ≥ P

Consumer	WTP
Nadech	$350
James	300
Mario	250
Ken	200

P	Q^d
$351+	0
301 – 350	1
251 – 300	2
201 – 250	3
0 – 200	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.

  P

- Mathematically, CS = WTP – P.
- Example:

CS

Consumer	WTP	P
Nadech	$350	250
James	300	250
Mario	250	250
Ken	200	250

Suppose P = $~~200~~ 250.

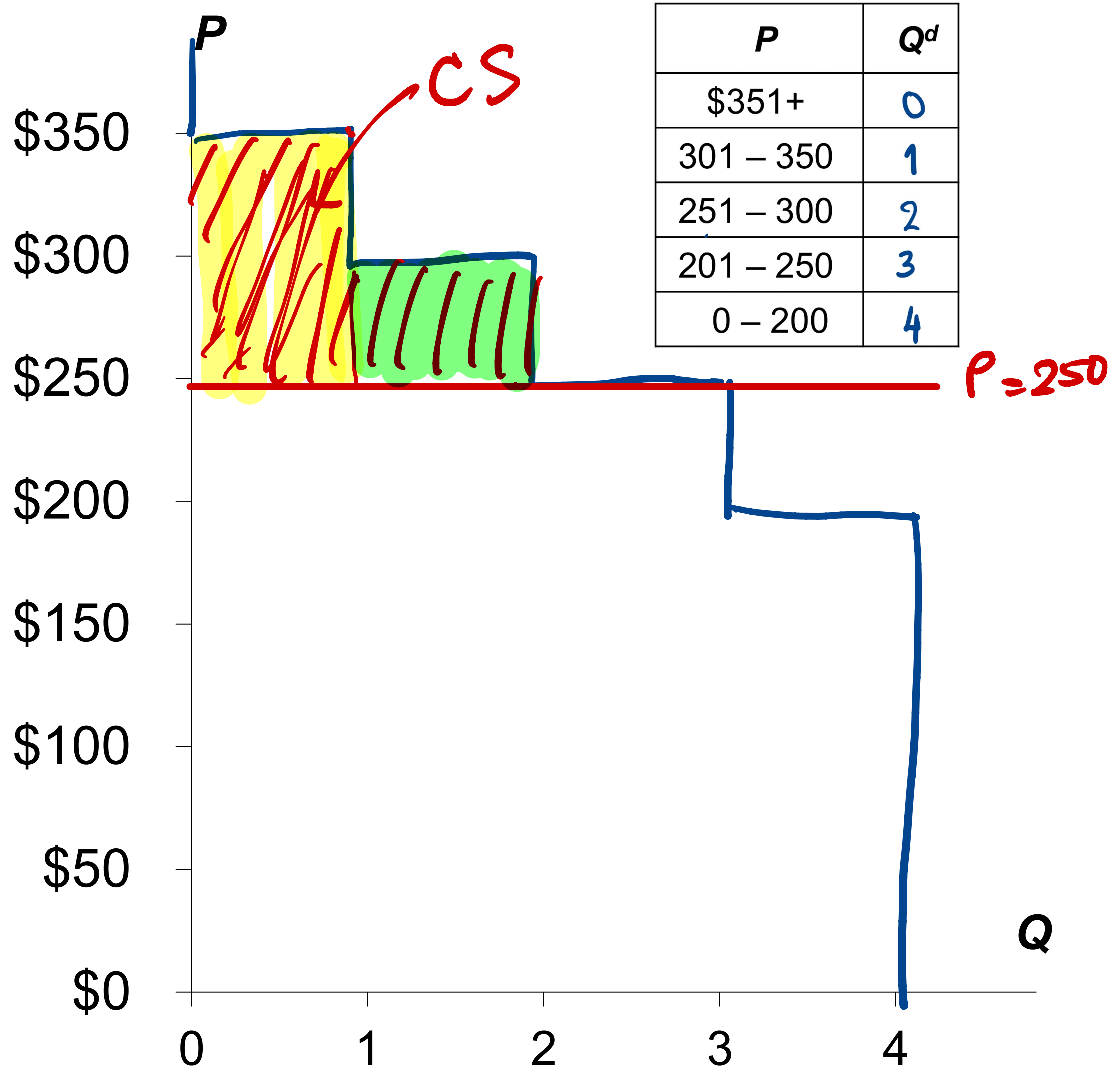
- Nadech's CS = $100
- James' CS= $50
- Mario's CS= 0
- Ken's CS= 0
- Total CS = $150

Consumer Surplus and WTP

P = $250

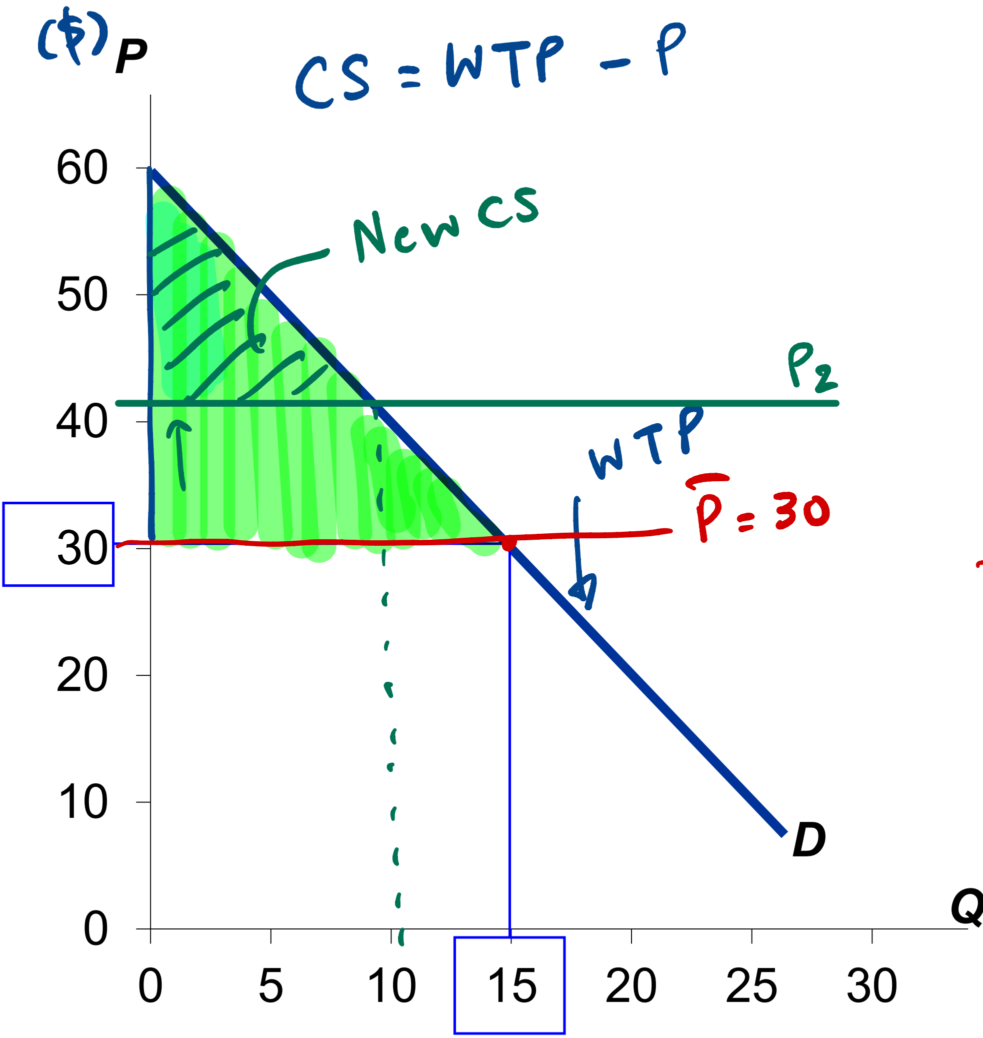
Total CS equals the area under the demand curve above the price, from 0 to Q.

CS = WTP − P



P	Q^d
$351+	0
301 – 350	1
251 – 300	2
201 – 250	3
0 – 200	4

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

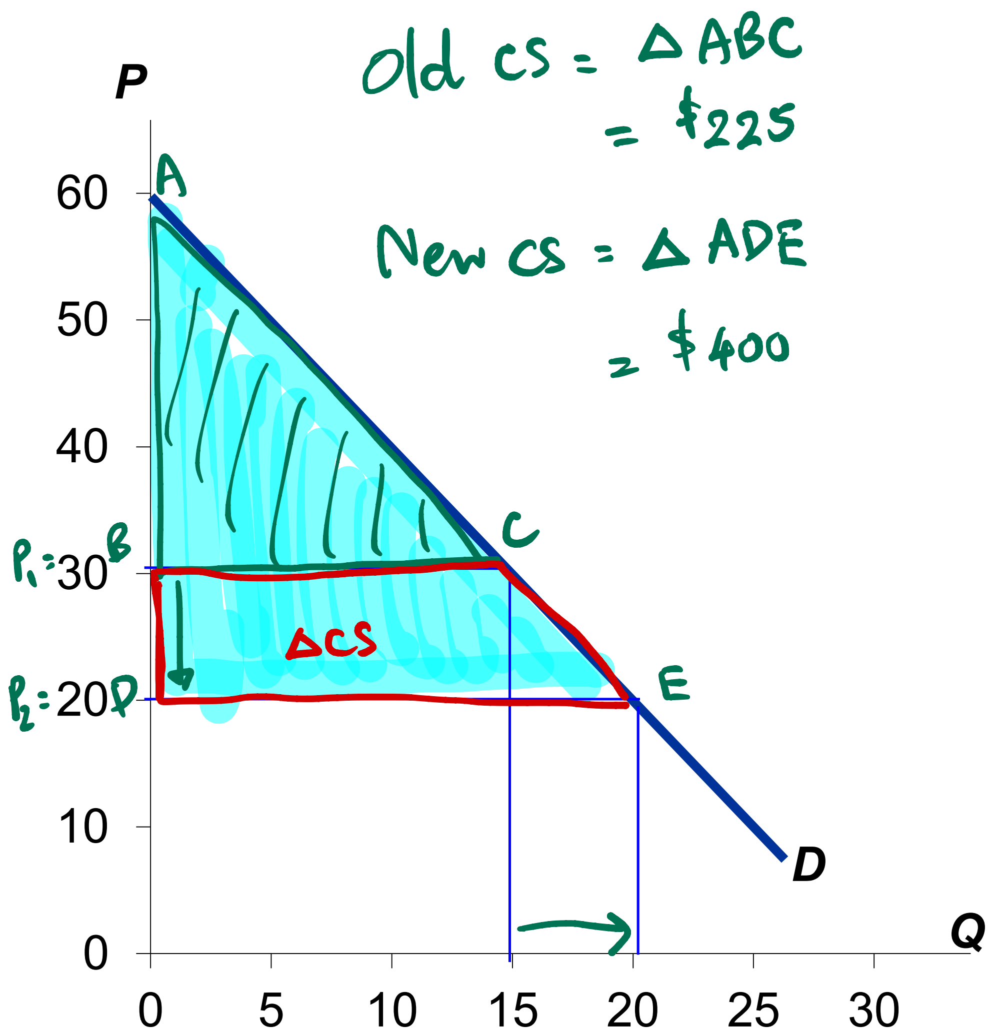
What if P ↑ to P_2 = \$40 ?

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

As P ↑, ΔCS = \$100 − \$225

= −\$125

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 = $\frac{1}{2} \times 20 \times (60-20)$ $= \$400$
  - ΔCS= \$400 − \$225
    $= \$175 = \square BCDE$

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 4 sellers of iPhones.

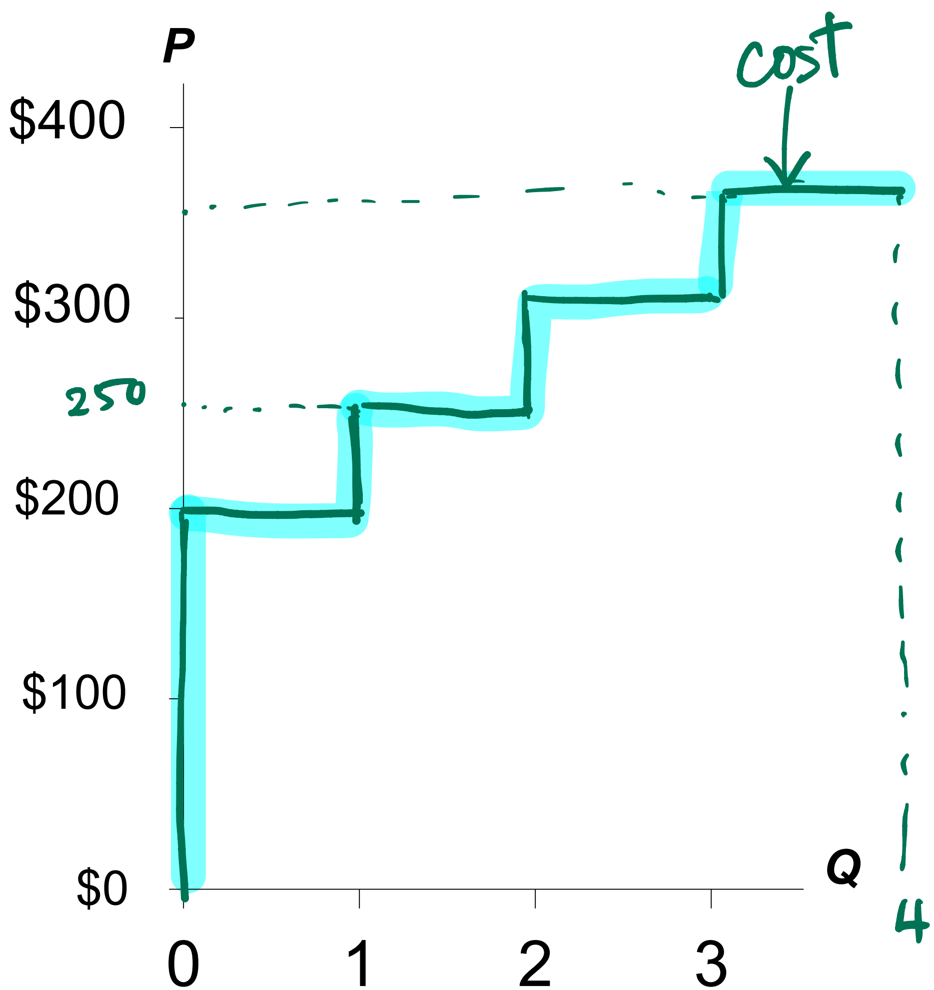
Seller	cost
I-store1	$200
I-store2	250
I-store3	300
I-store4	350

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.

Sell if $P \geq$ cost.

Cost and the Supply Curve



P	Q^s
$0 – 199	0
200 – 249	1
250 – ~~300~~ 299	2
30~~1~~0+	4

Seller	cost
I-store1	$200
I-store2	250
I-store3	300
I-store4	350

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

Producer Surplus

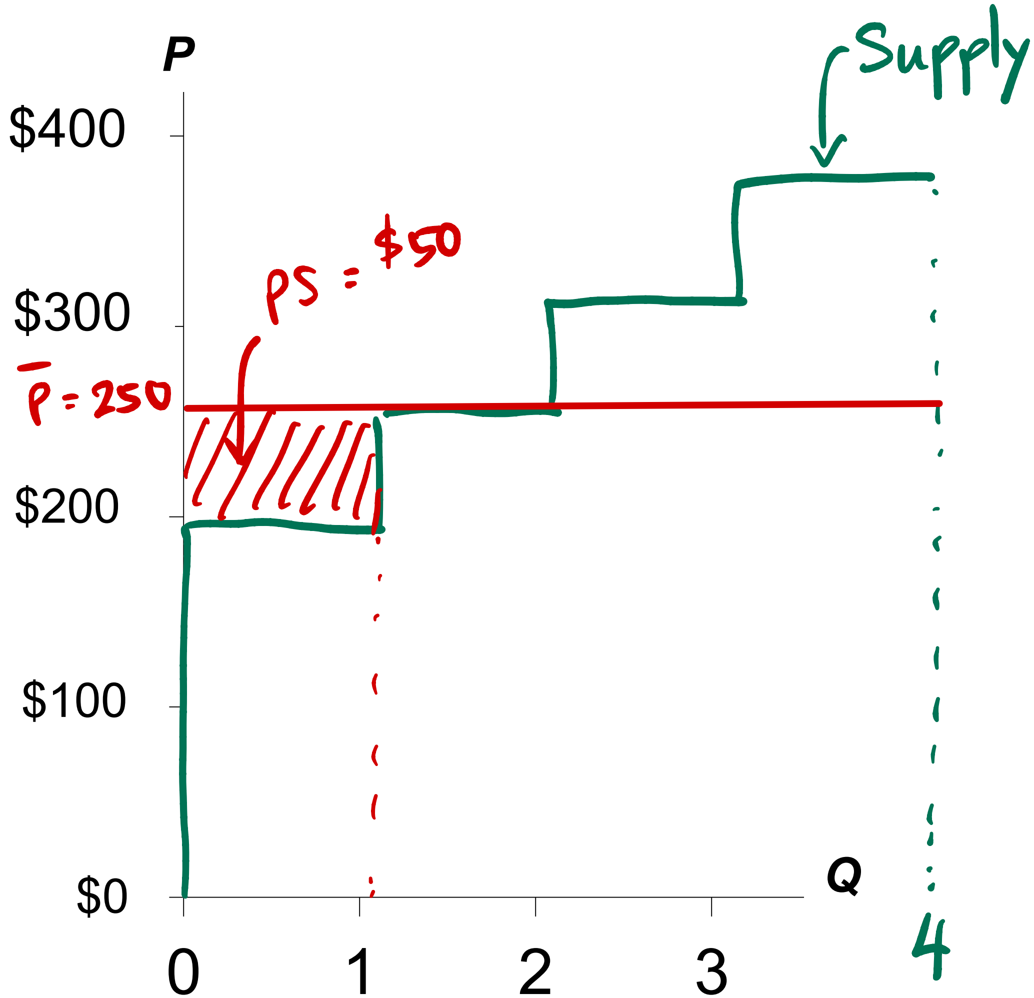
- Producer surplus (PS) is the difference between what a seller is willing to sell (i.e. cost) and the price at which s/he actually sells.
- Mathematically, PS = P - Cost.
- Example: 250 − cost = PS

Seller	cost	PS
I-store1	$200	50
I-store2	250	0
I-store3	300	0
I-store4	350	0

Suppose P = $250.

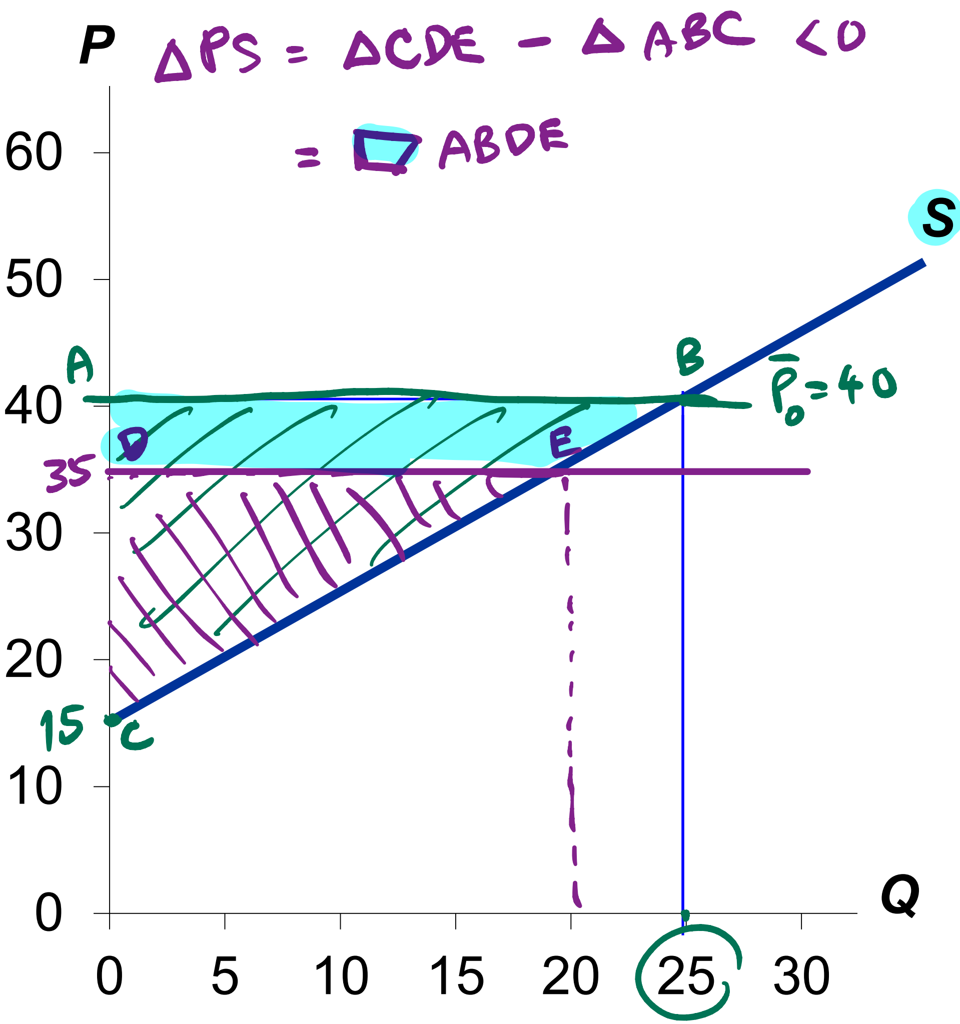
➢ Total PS = $50

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.

- Suppose $P_0 = 40$.
- $PS_0 = \frac{1}{2} \times 25 \times (40 - 15)$

  $= \frac{625}{2} = \$312.5$

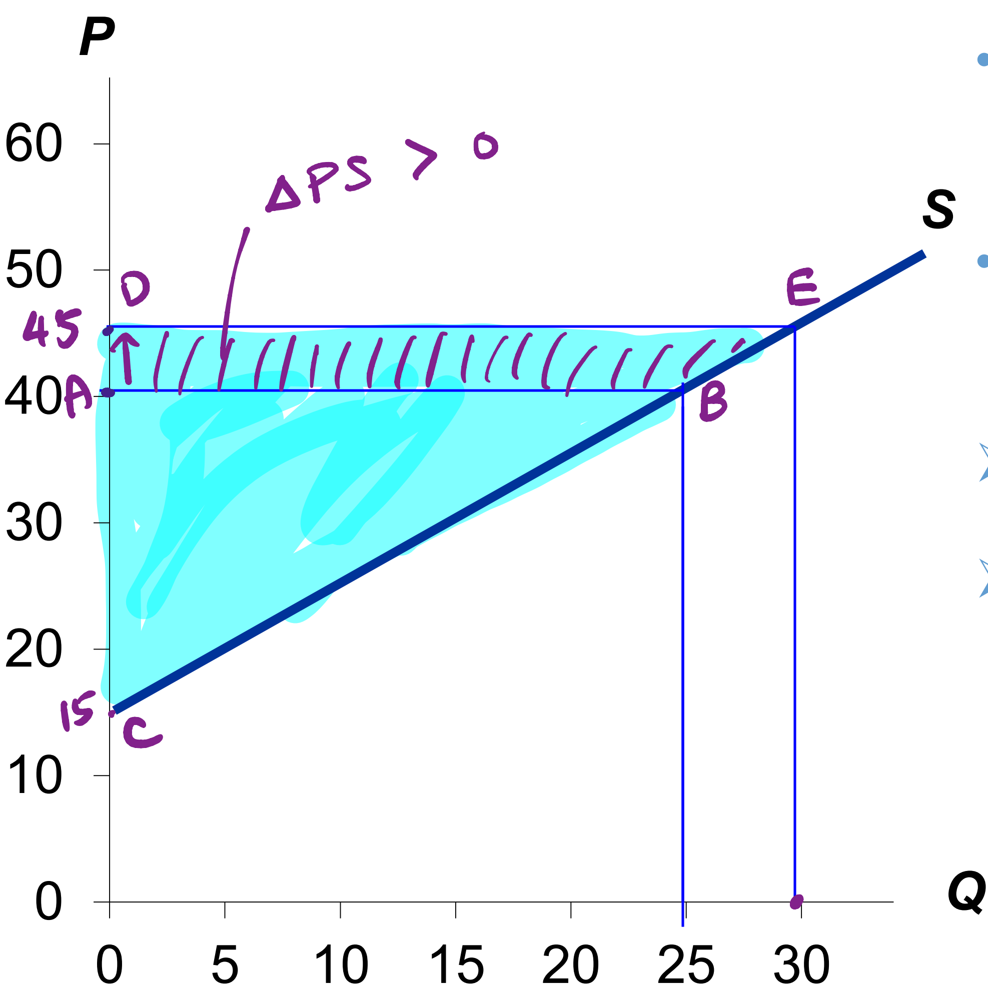
What if P↓ to $P_1 = 35$?

$PS_1 = \Delta CDE$

$= \frac{1}{2} \times 20 \times (35 - 15) = \$200$

$\Delta PS = \$200 - \$312.5 = -112.5$

Producer Surplus When Price is Higher



- When the price is higher, the PS will be higher.
- Suppose price increases from 40 to 45.
  - New PS = $\frac{1}{2} \times 30 \times (45-15)$ $= \$450$
  - ΔPS= ΔDCE − ΔABC
    $= \$450 - \$312.5$
    $= \$137.5$

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

CS = WTP − P

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

PS = P − Cost

- PS = (amount received by sellers) – (cost to sellers)
  - PS measures the benefit sellers receive from participating in the market.

= Social surplus = Social welfare

- Total surplus = CS + PS = $(WTP - \cancel{P}) - (\cancel{P} - cost) = WTP - cost$
  - TS measures the total gains from trade in a market.
  - We use total surplus as a measure of society's well-being.

Efficiency

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

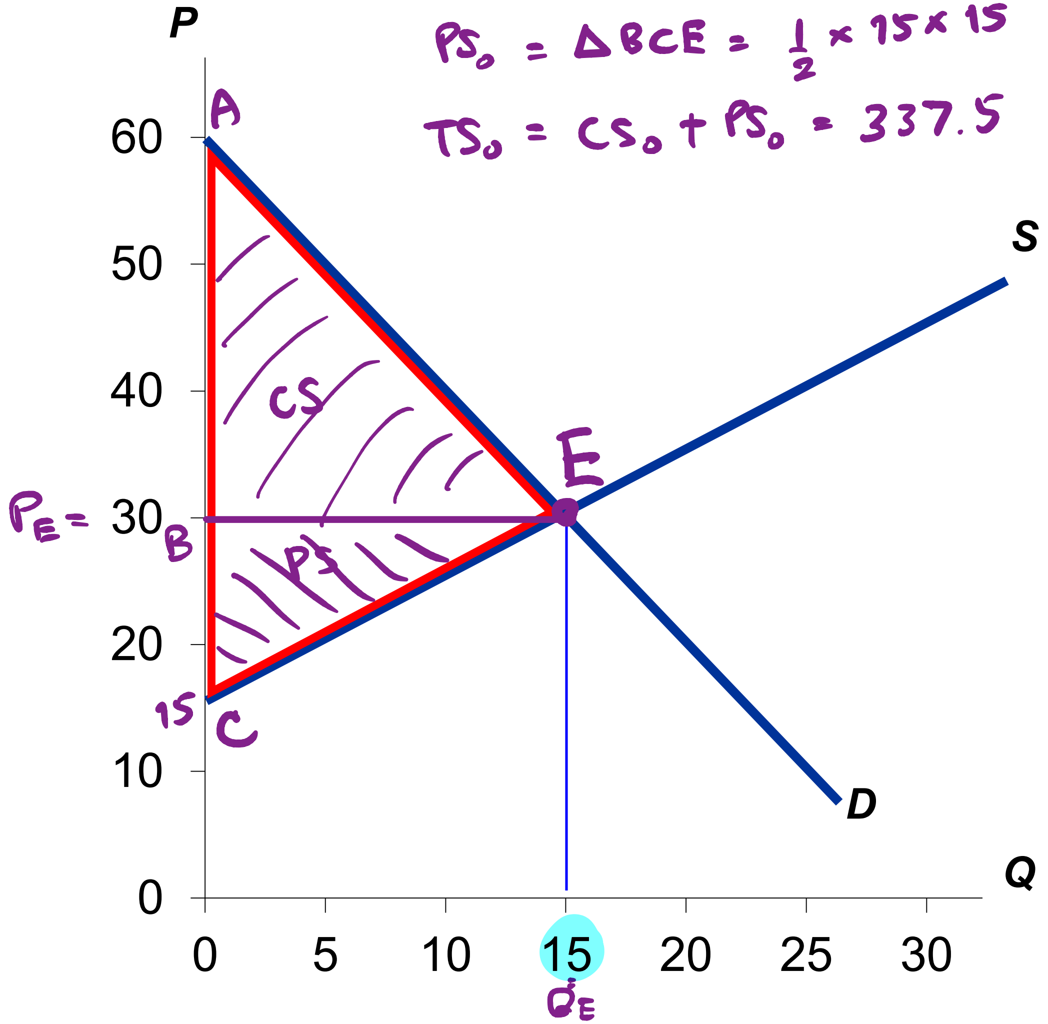
- An allocation of resources is efficient if it maximizes total surplus. Efficiency means:
  - Raising or lowering the quantity of a good would not increase total surplus.
  - The goods are being produced by the producers with lowest cost.
  - The goods are being consumed by the buyers who value them most highly.

Market Equilibrium

At E, $CS_0 = \Delta ABE = \frac{1}{2} \times 15 \times 30 = \$225$

$PS_0 = \Delta BCE = \frac{1}{2} \times 15 \times 15 = \$112.5$

$TS_0 = CS_0 + PS_0 = 337.5$



- The equilibrium quantity maximizes total surplus. $= \Delta ACE$
- Why?
  - No excess supply nor excess demand

Market Equilibrium:

Welfare Loss When P > P_E

At P_E, $CS_0 = \Delta ABE = \frac{1}{2} \times 30 \times 15 = 225$

$PS_0 = \Delta BEC = \frac{1}{2} \times 15 \times 15 = 112.5$

$TS_0 = 337.5$

→ What is CS and PS?

$CS_1 = \Delta ADH$

$PS_1 = \square HDCG$

$TS_1 = CS_1 + PS_1 = \square ADGC$

P > P_E

$CS_1 = \frac{1}{2} \times 10 \times (60-40) = \$100$

$PS_1 = \frac{1}{2} \times 10 \times (\underline{15+25}) = ?\ \$200$ (40)

$TS_1 = \$300$

$PS_1 = \square HDBF + \square BFGC$

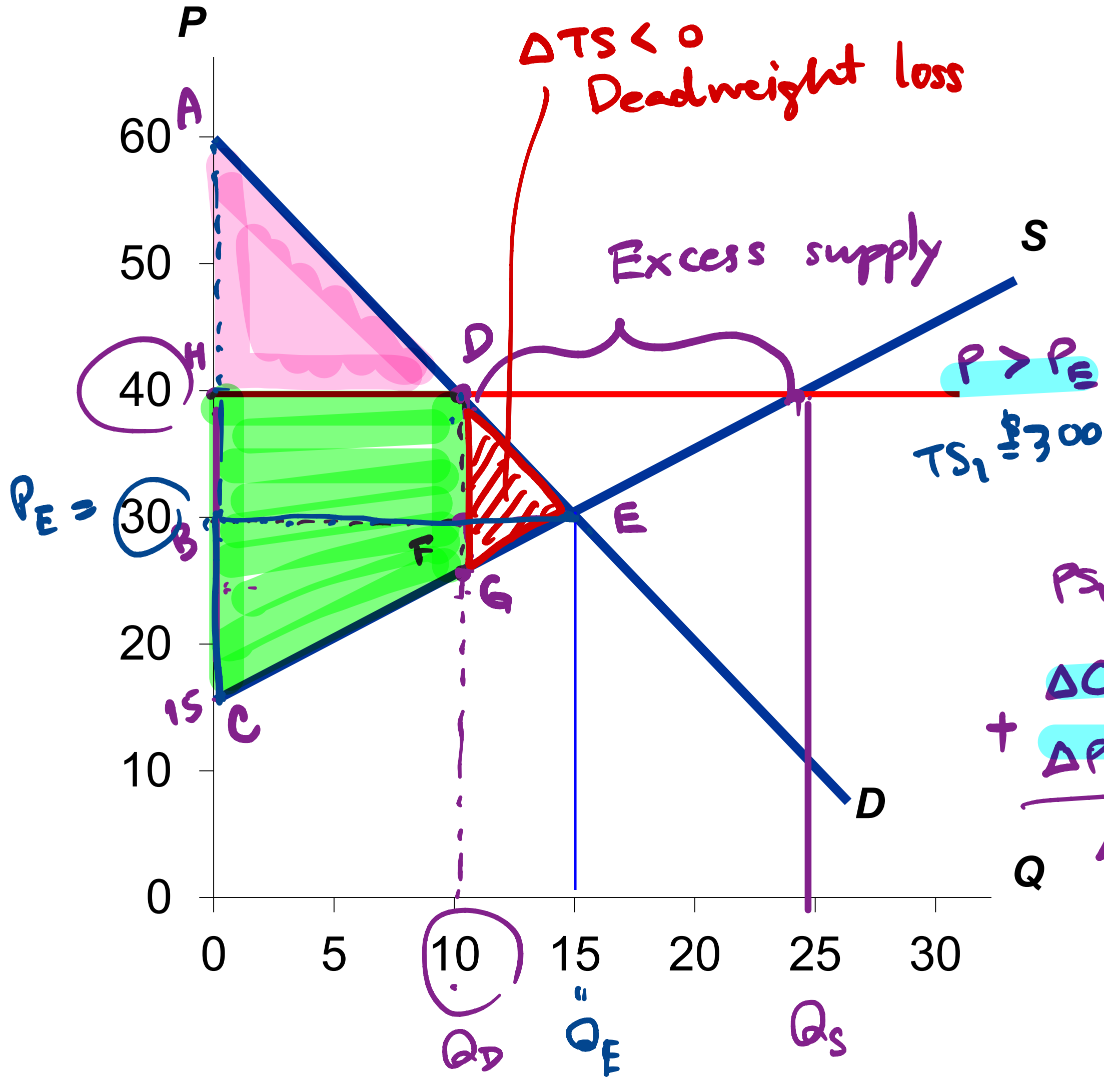
$\Delta CS = \Delta ADH - \Delta ABE = -(\square HDBF + \Delta DFE)$

+ $\Delta PS = \square \cancel{HDBF} + \square \cancel{BFGC} - (\square \cancel{BFGC} + FGE)$

$\Delta TS = -\Delta DFE - \Delta FGE = 300 - 337.5$

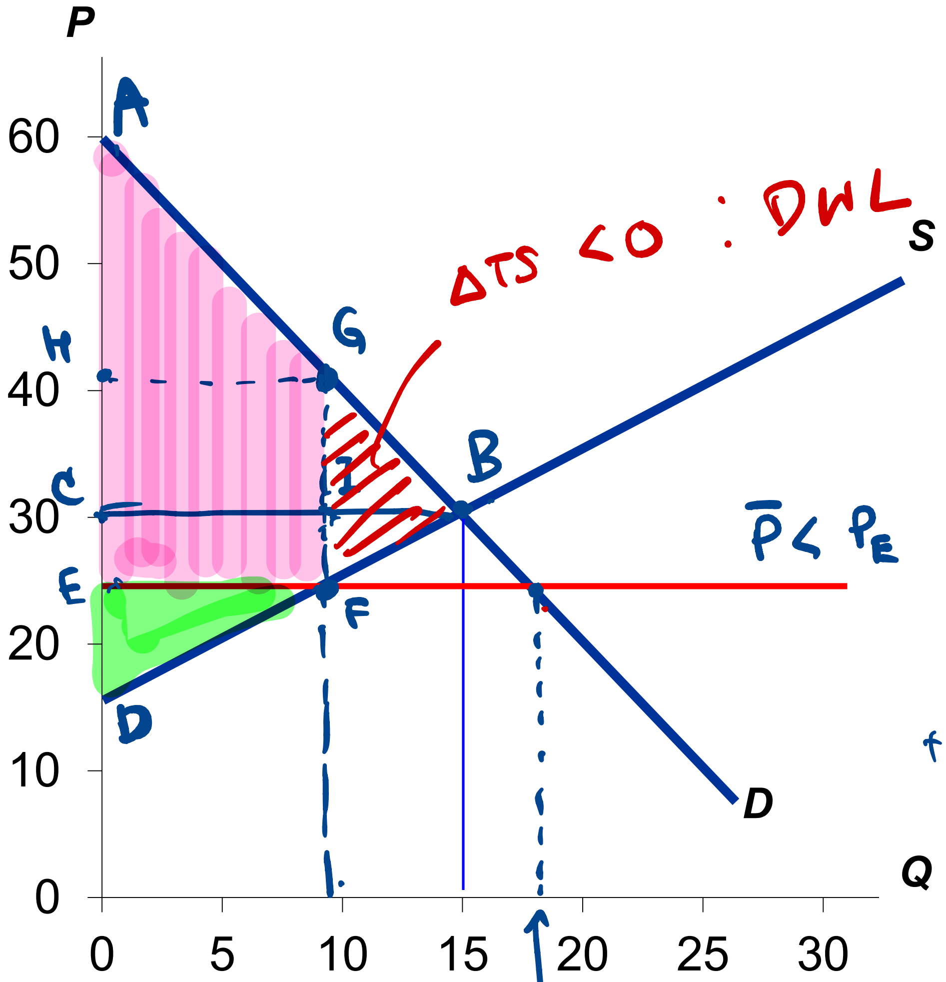
$\Delta TS = -\Delta DGE$

$= -37.5$



Market Equilibrium:

Welfare Loss When $\bar{P} < P_E$



$Q_S < Q_D$: Excess demand.

At P_E, $CS_0 = \Delta ABC$

$PS_0 = \Delta BCD$.

At $\bar{P}$, $\bar{P} < P_E$, $Q = Q_S$

$PS_1 = \Delta EDF$

$CS_1 = \square AGEF$

$\Delta CS = CS_1 - CS_0$

$= \square AGCI + CIEF - (\square AGCI + GIB)$

$\Delta CS = CIEF - \Delta GIB$

$\Delta PS = PS_1 - PS_0$

$= \Delta EDF - (EDF + CIEF + IBF)$

$\Delta PS = - CIEF - \Delta IBF$

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

$= \Delta GBF < 0$