



1

## METHODOLOGY AND MARKET STRUCTURE

### Partial equilibrium analysis

Studies the determination of equilibrium price and output in a single market, taking as given the prices in all other markets.

*e.g. Examining the effect of rent controls on the market for housing.*

### General equilibrium analysis

Studies how a change in one market affects all markets simultaneously.



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## METHODOLOGY AND MARKET STRUCTURE

### Perfectly competitive markets

- Producers and consumers are price takers
- Consumers have perfect information about products and prices
- There are no **externalities**.



An **externality** occurs if the actions of either consumers or producers lead to costs or benefits that are not reflected in the price of the product in that market

**Consumer surplus** – measures the impacts of any government intervention on consumers.

**Producer surplus** – measures the impacts of any government intervention on producers.

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## PERFECTLY COMPETITIVE MARKETS

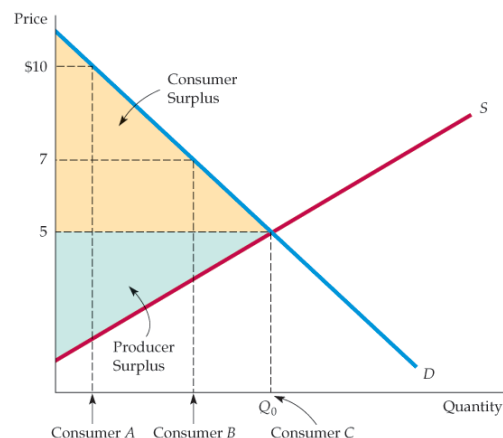
**Allocate resources efficiently without any government intervention.**

At the equilibrium price and quantity, the **net economic benefits** are maximized.



**Consumer surplus** + **Producer surplus**

(Also referred to as **total surplus**)



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## WHAT IS AN EXCISE TAX?

**A tax on a specific commodity** (also referred to as a specific tax)

Consider a tax of \$ $t$  per unit sold levied on **sellers**.

It creates a “wedge” between the price consumers pay and the price sellers receive.

$$p^s = p^d - t$$

At the same time, for the market to clear:

$$Q^d(p^d) = Q^s(p^s)$$

**What can we solve for from these two equations?**

1.  $p^d$  = the buyer price (market price).
2.  $p^s$  = the seller price.
3.  $Q_t$  = the quantity demanded at the buyer price ( $Q^d(p^d)$ )  
= the quantity supplied at the seller price ( $Q^s(p^s)$ ).

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## EXCISE TAXES IN ACTION

Consider the market for bananas, where  $Q$  is in bushels and  $P$  is in dollars.

**Demand:**  $Q^d = 360 - 10P^d$

**Supply:**  $Q^s = 10P^s - 40$

In the absence of any government intervention the equilibrium in this market is  $Q = 160$  and  $P = \$20$ .

Suppose the government decides to levy a tax of \$8 per bushel of bananas on sellers in this market.



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Find the equilibrium prices and quantity with the tax in place.

**What we know...**

**Tax wedge condition.**

(1)  $P^s = P^d - 8$

**Market clearing condition.**

(2)  $10P^s - 40 = 360 - 10P^d$

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Plug (1) into (2) and solve for  $P^d$

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Find the equilibrium prices and quantity with the tax in place.

(1)  $P^s = P^d - 8$

(2)  $10P^s - 40 = 360 - 10P^d$

(3)  $P^d = \$24$

Plug (3) into (1) and solve for  $P^s$

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(1)  $P^s = P^d - 8$

(2)  $10P^s - 40 = 360 - 10P^d$

(3)  $P^d = \$24$

(4)  $P^s = \$16$

Use either demand or supply to determine the quantity with the tax in place.

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## EXCISE TAXES IN ACTION

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**Demand:**  $Q^d = 360 - 10P^d$

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Find the equilibrium prices and quantity with the tax in place.

### Final Solution

Buyer Price

$$P^d = \$24$$

Seller Price

$$P^s = \$16$$

Quantity bought and sold with the \$8 per-unit tax in place.

$$Q_t = 120$$

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## EXCISE TAXES IN ACTION

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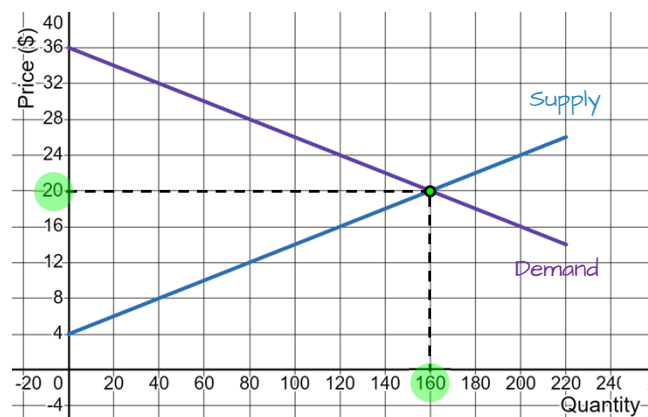
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## Graphical Representation (No Tax)



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## EXCISE TAXES IN ACTION

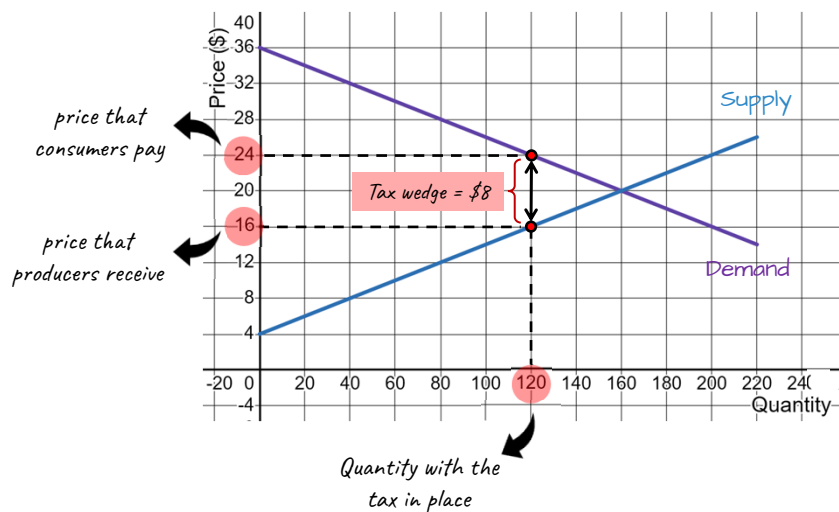
**Tax wedge condition.**

(1)  $P^s = P^d - 8$

**Market clearing condition.**

(2)  $10P^s - 40 = 360 - 10P^d$

## Graphical Representation (With the Tax)



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## EXCISE TAXES IN ACTION

Tax wedge condition.

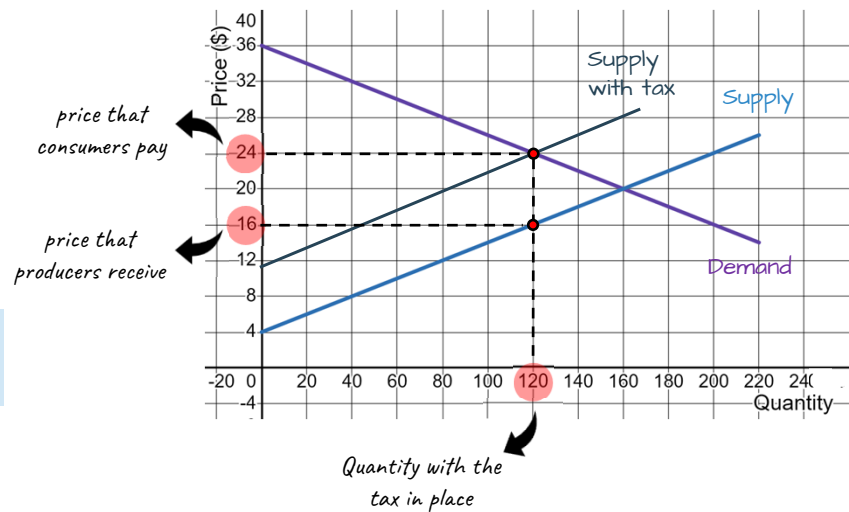
$$(1) P^s = P^d - 8$$

Market clearing condition.

$$(2) 10P^s - 40 = 360 - 10P^d$$

Graphically, we could also think of the tax as shifting the supply curve upward by  $t = \$8$ ...

## Graphical Representation (With the Tax)



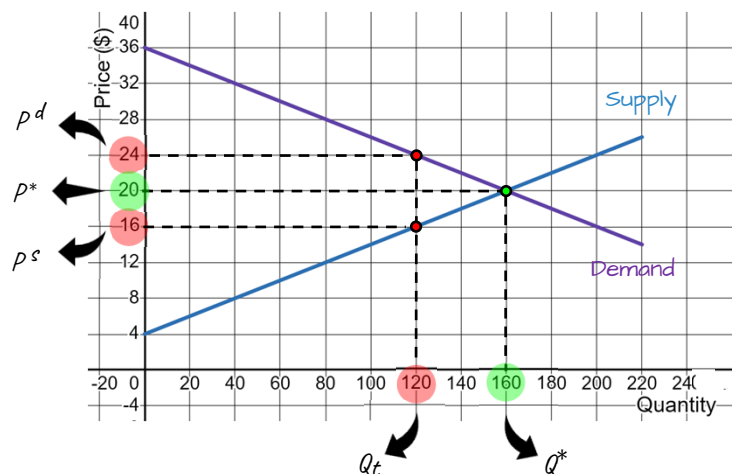
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## EXCISE TAXES IN ACTION

### Impacts of Note...

1. Market will underproduce relative to what is efficient

$$Q_t < Q^*$$



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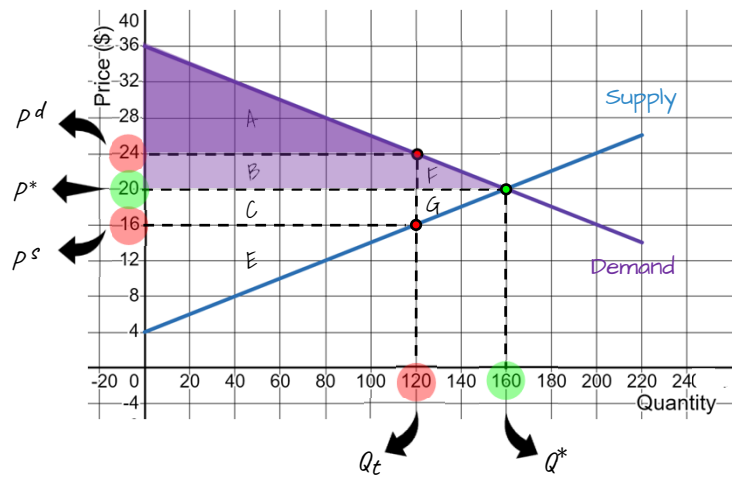
## EXCISE TAXES IN ACTION

### Impacts of Note...

- Consumer surplus will...  
decrease by **B + F**

$$CS(\text{no tax}) = A + B + F$$

$$CS(\text{with tax}) = A$$



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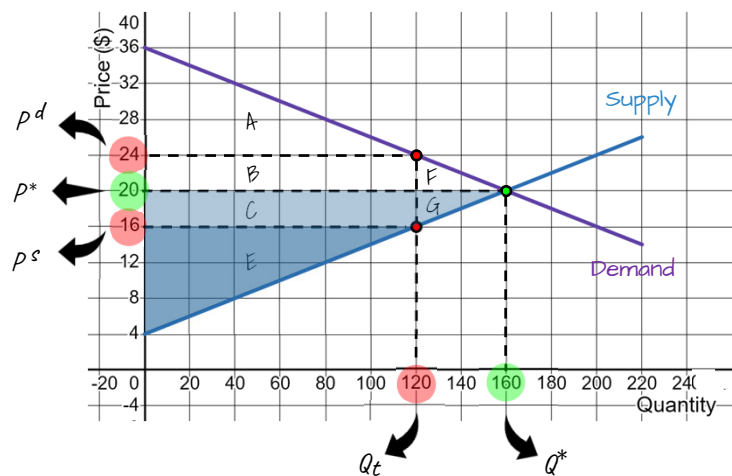
## EXCISE TAXES IN ACTION

### Impacts of Note...

- Producer surplus will...  
decrease by **C + G**

$$PS(\text{no tax}) = C + G + E$$

$$PS(\text{with tax}) = E$$



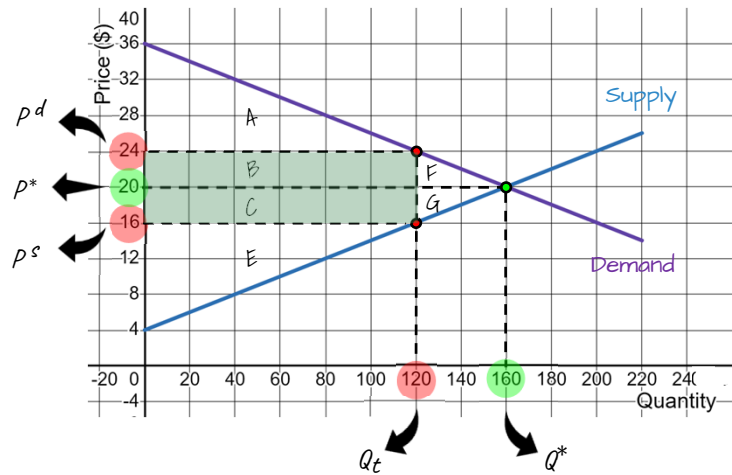
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## EXCISE TAXES IN ACTION

### Impacts of Note...

4. Tax revenues of **B + C** will be collected

$$\text{Tax revenue} = t \times Q_t$$



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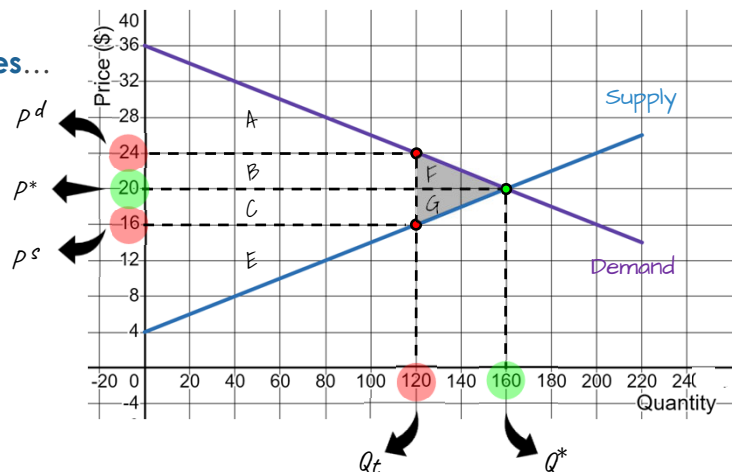
## EXCISE TAXES IN ACTION

### Impacts of Note...

5. There will be **deadweight losses**... equal to **F + G**

A reduction in net economic benefits resulting from an inefficient allocation of resources

$$DWL = \frac{1}{2}(P^d - P^s)(Q^* - Q_t)$$



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## EXCISE TAXES IN ACTION

### Impacts of Note...

5. There will be **deadweight losses...**  
equal to **F + G**

Net economic benefit (no tax)

$$= A + B + C + E + F + G$$

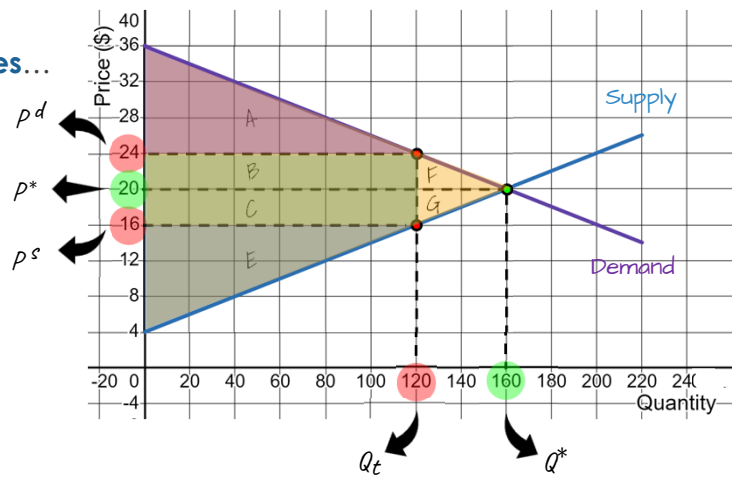
Net economic benefit (tax)

$$= A$$

$$+ E$$

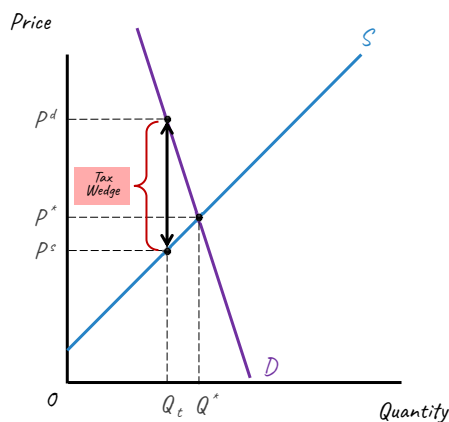
$$+ (B + C)$$

$$= A + B + C + E$$



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## TAX INCIDENCE DEPENDS ON ELASTICITIES

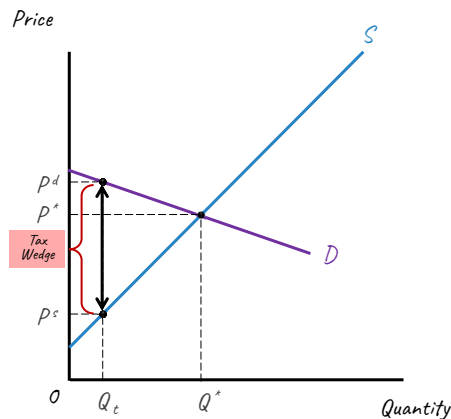


(a)

- a) If demand is **very inelastic** relative to supply, the burden of the tax falls mostly on buyers.

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## TAX INCIDENCE DEPENDS ON ELASTICITIES



(b)

- a) If demand is **very inelastic** relative to supply, the burden of the tax falls mostly on buyers.
- b) If demand is **very elastic** relative to supply, the burden of the tax falls mostly on sellers.

**Pass-through fraction** – reveals the fraction of the tax that is “passed through” to consumers in the form of higher prices.

$$= \frac{E_s}{E_s - E_d}$$

Fraction of tax that producers bear is given by:

$$= \frac{-E_d}{E_s - E_d}$$

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## WHAT ABOUT OUR EXAMPLE?

**Burden of the tax on consumers**

$$= p^d - p^*$$

$$= 24 - 20 = \$4$$

**Burden of the tax on sellers**

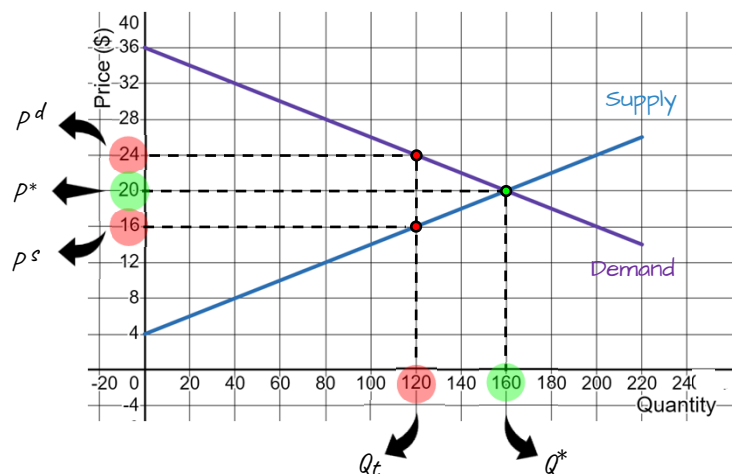
$$= p^* - p^s$$

$$= 20 - 16 = \$4$$

**Draw a conclusion about relative elasticities...**

Each side of the market “pays” \$4 of the \$8 per unit tax.

Demand and supply must be **equally price elastic**.



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## WHAT IS A SUBSIDY?

### A negative tax on a specific commodity

Consider a subsidy of \$ $b$  per unit sold awarded to **sellers**.

It creates a “wedge” between the price consumers pay and the price sellers receive.

$$P^s = P^d + b$$

At the same time, for the market to clear:

$$Q^d(P^d) = Q^s(P^s)$$

### What can we solve for from these two equations?

1.  $P^d$  = the buyer price (market price).
2.  $P^s$  = the seller price.
3.  $Q_b$  = the quantity demanded at the buyer price ( $Q^d(P^d)$ )  
= the quantity supplied at the seller price ( $Q^s(P^s)$ ).

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Suppose the government decides apply a **subsidy of \$8 per bushel** of bananas on sellers in this market.



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Find the equilibrium prices and quantity with the subsidy in place.

**What we know...**

*Subsidy wedge condition.*

(1)  $P^s = P^d + 8$

*Market clearing condition.*

(2)  $10P^s - 40 = 360 - 10P^d$

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*Use either demand or supply to determine the quantity with the subsidy in place.*

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Find the equilibrium prices and quantity with the subsidy in place.

### Final Solution

Buyer Price

$$P^d = \$16$$

Seller Price

$$P^s = \$24$$

Quantity bought and sold with the \$8 per-unit subsidy in place.

$$Q_b = 200$$

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## SUBSIDIES IN ACTION

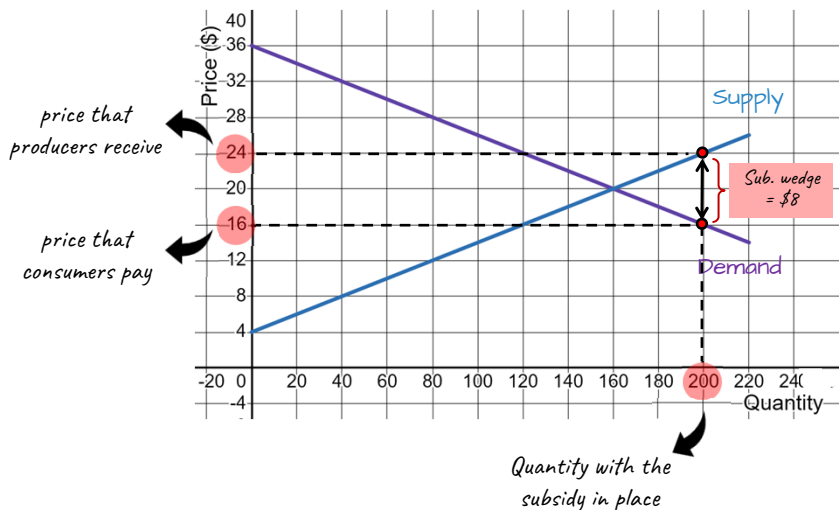
Subsidy wedge condition.

$$(1) P^s = P^d + 8$$

Market clearing condition.

$$(2) 10P^s - 40 = 360 - 10P^d$$

## Graphical Representation (With the Subsidy)



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## SUBSIDIES IN ACTION

Subsidy wedge condition.

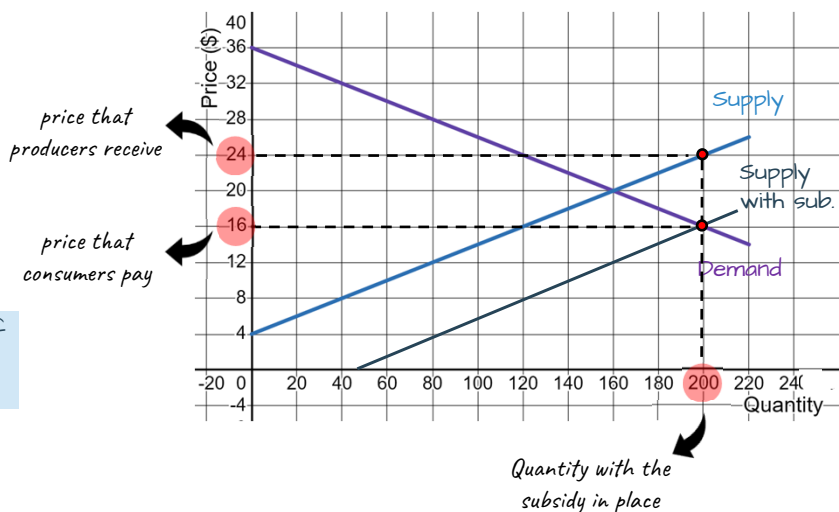
$$(1) P^s = P^d + 8$$

Market clearing condition.

$$(2) 10P^s - 40 = 360 - 10P^d$$

Graphically, we could also think of the subsidy as shifting the supply curve downward by  $b = \$8$ ...

## Graphical Representation (With the Subsidy)



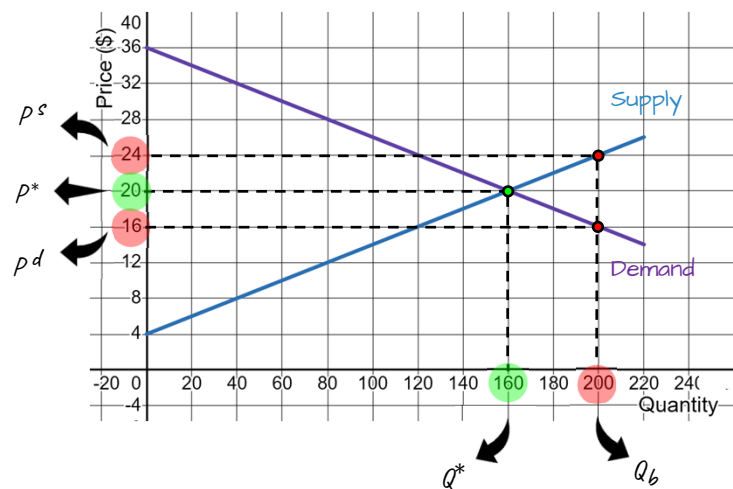
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## SUBSIDIES IN ACTION

### Impacts of Note...

1. Market will over produce relative to what is efficient

$$Q_b > Q^*$$



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## SUBSIDIES IN ACTION

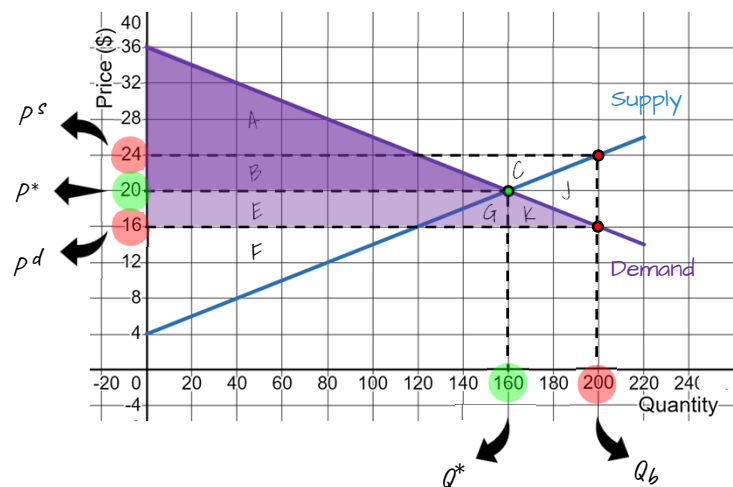
### Impacts of Note...

2. Consumer surplus will...

increase by  $E + G + K$

$$CS(\text{no sub}) = A + B$$

$$CS(\text{with sub}) = A + B + E + G + K$$



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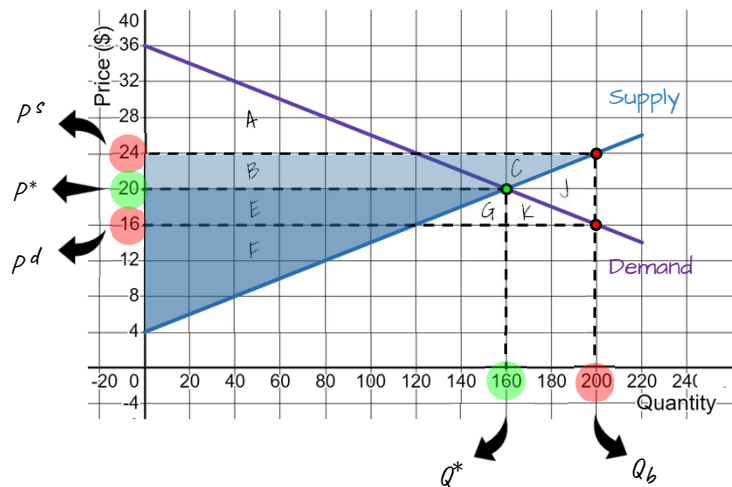
## SUBSIDIES IN ACTION

### Impacts of Note...

3. Producer surplus will...  
increase by **B + C**

$$PS(\text{no sub}) = E + F$$

$$PS(\text{with sub}) = E + F + B + C$$



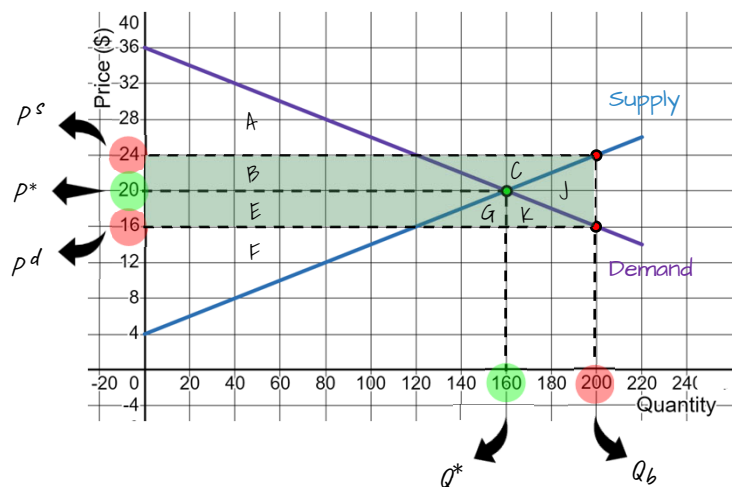
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## SUBSIDIES IN ACTION

### Impacts of Note...

4. Government will spend...  
**B + C + E + G + K + J**

$$\text{spending} = \text{sub} \times Q_{\text{sub}}$$



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## SUBSIDIES IN ACTION

### Impacts of Note...

5. There will be **deadweight losses** equal to J

Net economic benefit (no sub)

$$= A + B + E + F$$

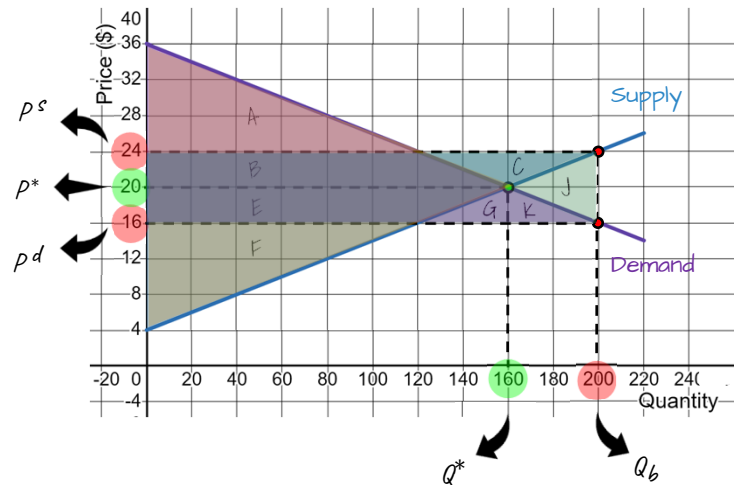
Net economic benefit (subsidy)

$$= (A + B + E + G + K)$$

$$+ (F + E + B + C)$$

$$- (B + C + E + G + K + J)$$

$$= A + B + E + F - J$$



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## SUBSIDIES IN ACTION

### Impacts of Note...

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Net economic benefit (no sub)

$$= A + B + E + F$$

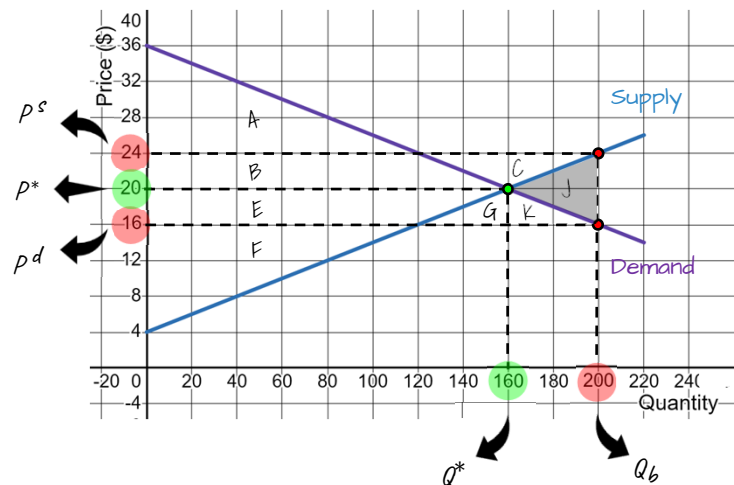
Net economic benefit (subsidy)

$$= (A + B + E + G + K)$$

$$+ (F + E + B + C)$$

$$- (B + C + E + G + K + J)$$

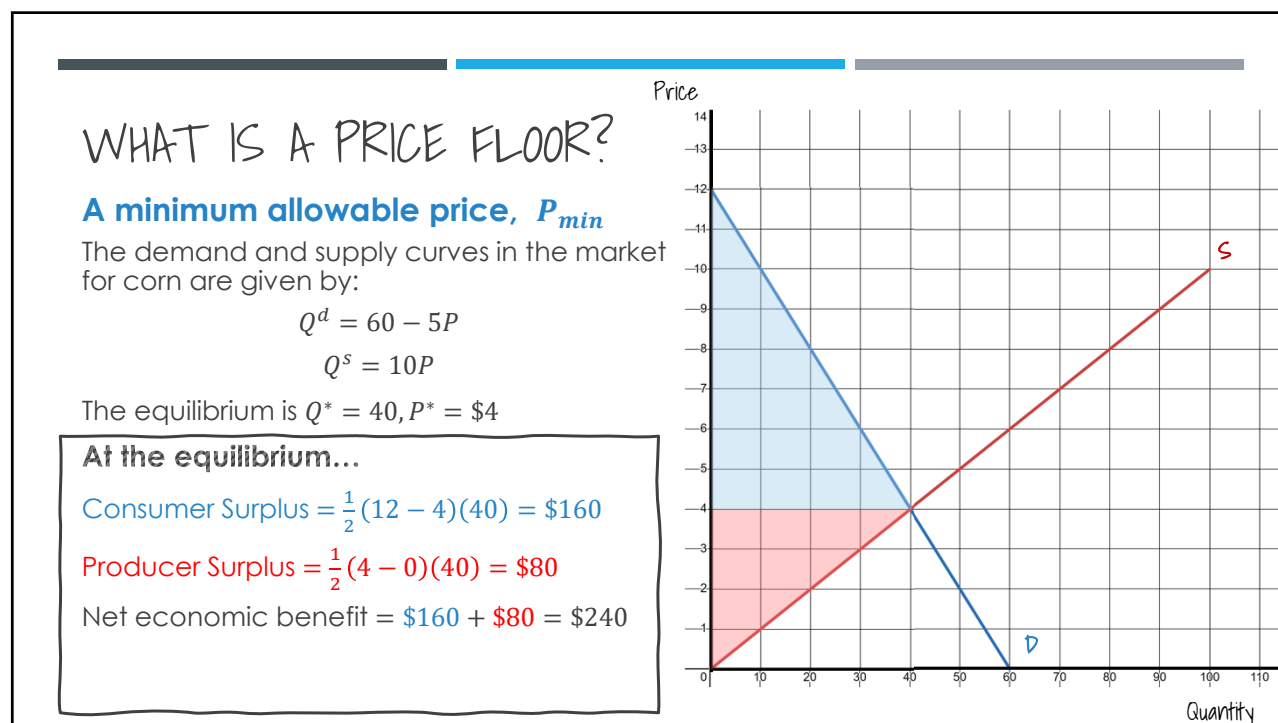
$$= A + B + E + F - J$$



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## WHAT IS A PRICE FLOOR?

### A minimum allowable price, $P_{min}$

The demand and supply curves in the market for corn are given by:

$$Q^d = 60 - 5P$$

$$Q^s = 10P$$

Suppose the government institutes a price floor of \$9.

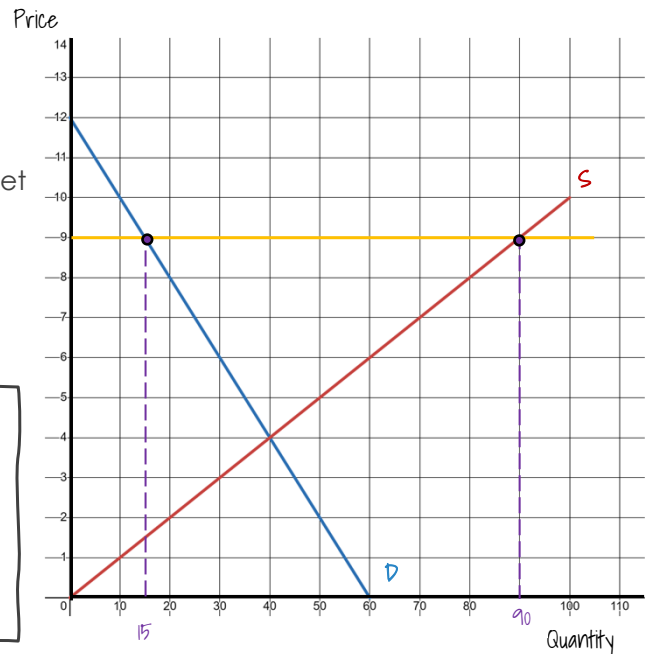
#### Impacts of Note...

##### 1. There is excess supply

$$Q^d = 60 - 5(9) = 15$$

$$Q^s = 10(9) = 90$$

$$\text{Excess supply} = 90 - 15 = 75$$



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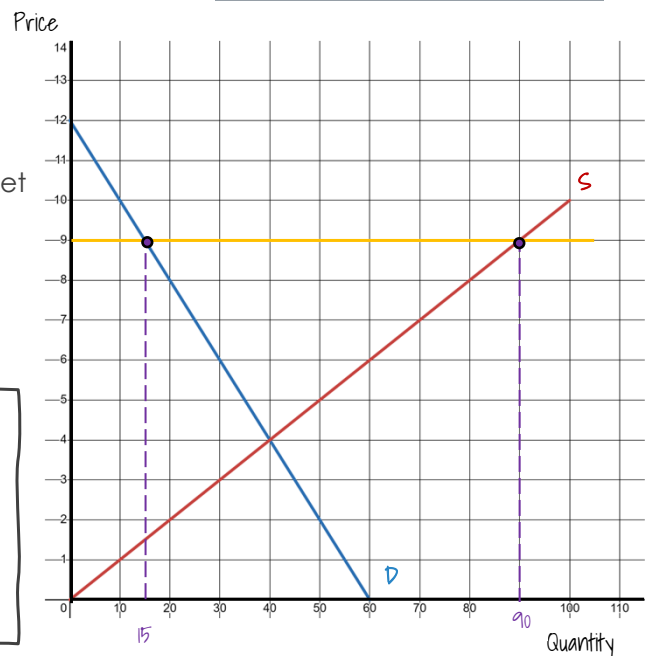
$$Q^s = 10P$$

Suppose the government institutes a price floor of \$9.

#### Impacts of Note...

##### 2. Consumers buy less of the good

$$Q^d = 60 - 5(9) = 15 < 40 = Q^*$$



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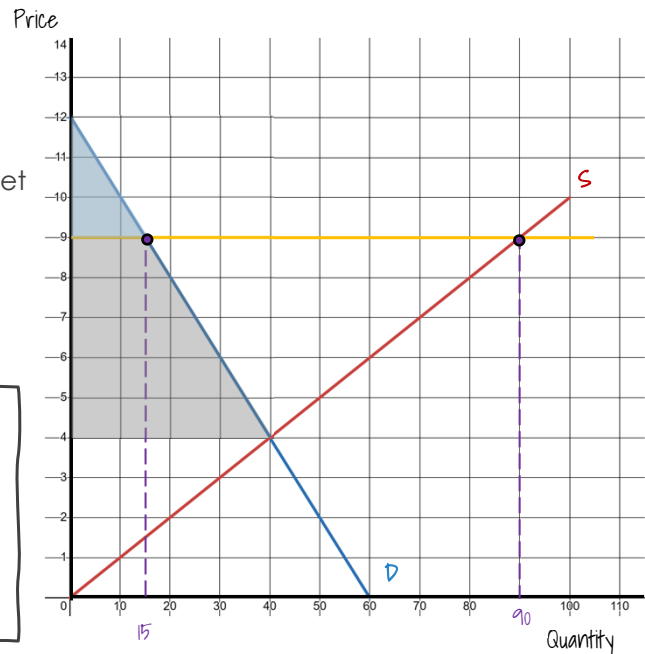
$$Q^s = 10P$$

Suppose the government institutes a price floor of \$9.

#### Impacts of Note...

#### 3. Consumer surplus decreases

$$CS_f = \frac{1}{2}(12 - 9)(15) = \$22.5$$



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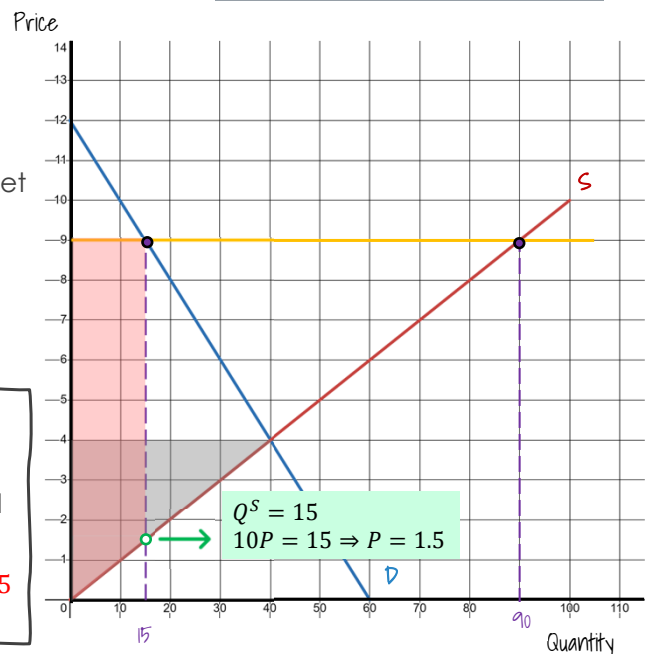
Suppose the government institutes a price floor of \$9.

#### Impacts of Note...

#### 4. Producer surplus will change

**Best-case scenario:** the 15 units demanded are supplied by the lowest cost producers

$$PS_f = (9 - 1.5)(15) + \frac{1}{2}(1.5 - 0)(15) = \$123.75$$



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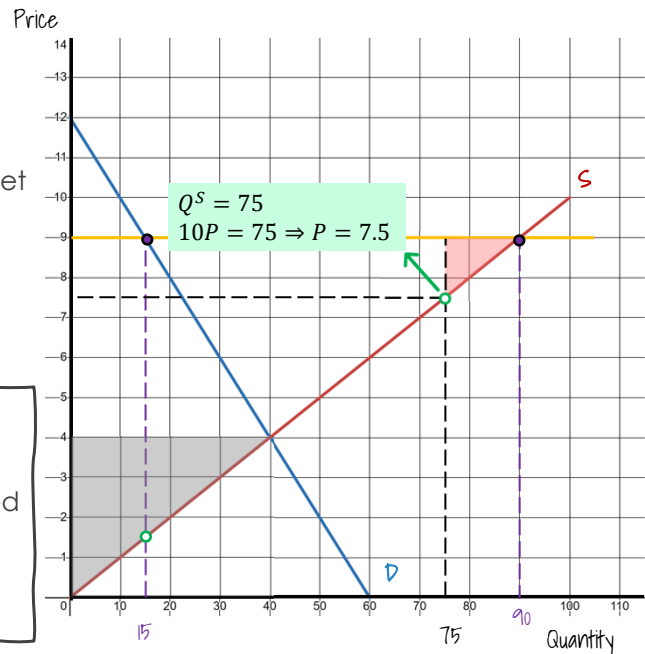
Suppose the government institutes a price floor of \$9.

#### Impacts of Note...

#### 4. Producer surplus will change

**Worst-case scenario:** the 15 units demanded are supplied by the highest cost producers

$$PS_f = \frac{1}{2}(9 - 7.5)(90 - 75) = \$11.25$$



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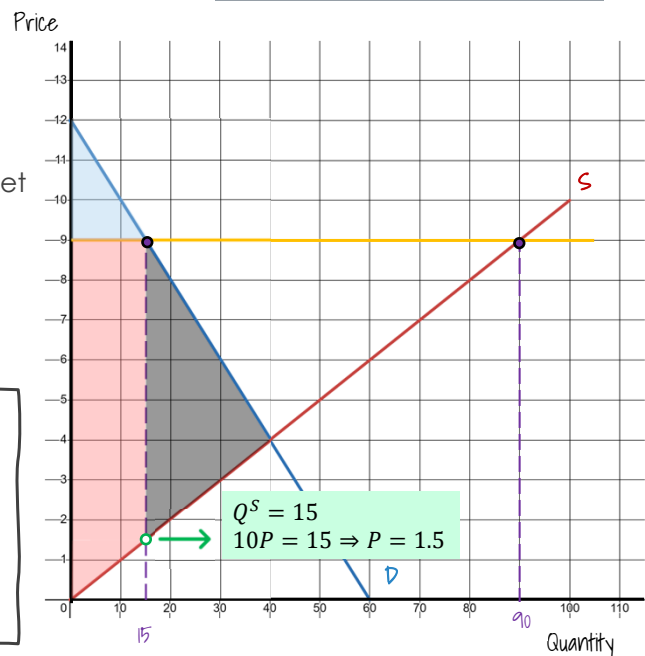
#### Impacts of Note...

#### 5. There will be deadweight loss

#### Best-case scenario:

$$\text{Total Surplus} = \$22.5 + \$123.75 = \$146.25$$

$$DWL_f = \frac{1}{2}(9 - 1.5)(40 - 15) = \$93.75$$



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## WHAT IS A PRICE FLOOR?

### A minimum allowable price, $P_{min}$

The demand and supply curves in the market for corn are given by:

$$Q^d = 60 - 5P$$

$$Q^s = 10P$$

Suppose the government institutes a price floor of \$9.

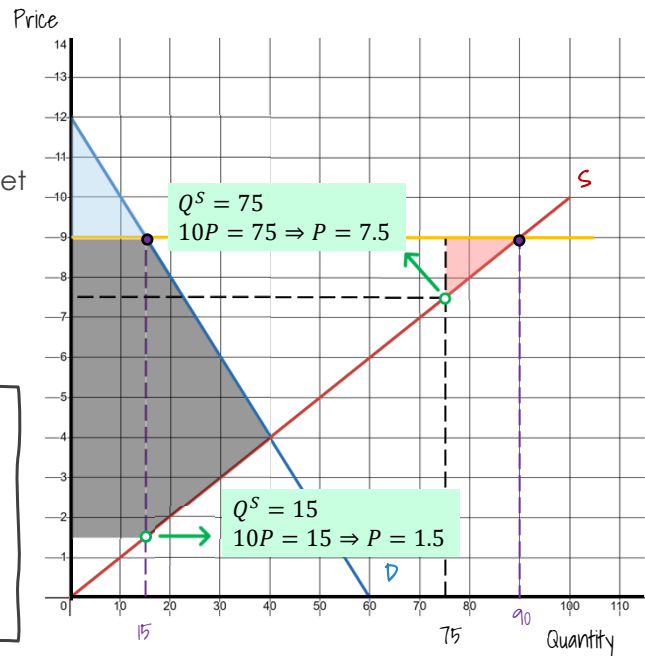
#### Impacts of Note...

5. There will be deadweight loss

#### Worst-case scenario:

$$\text{Total Surplus} = \$22.5 + \$11.25 = \$33.75$$

$$DWL_f = \$240 - 33.75 = \$206.25$$



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## WHAT IS A PRICE CEILING?

### A maximum allowable price, $P_{max}$

The demand and supply curves in the market for corn are given by:

$$Q^d = 60 - 5P$$

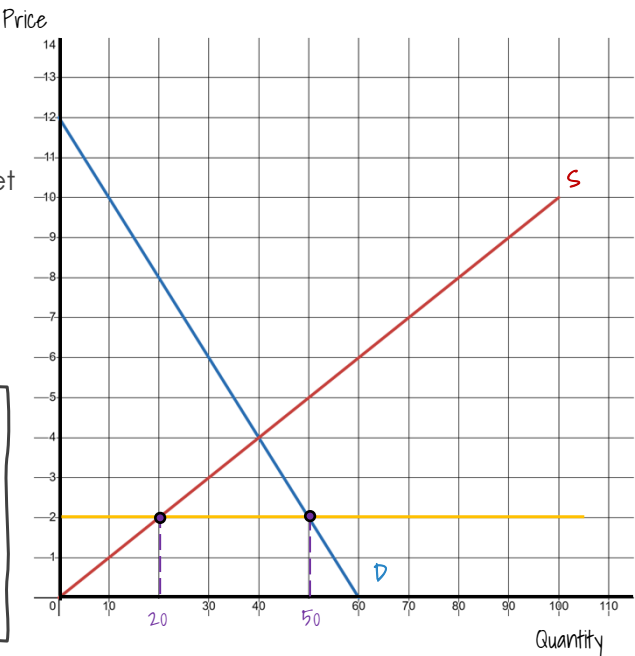
$$Q^s = 10P$$

Suppose the government institutes a price ceiling of \$2.

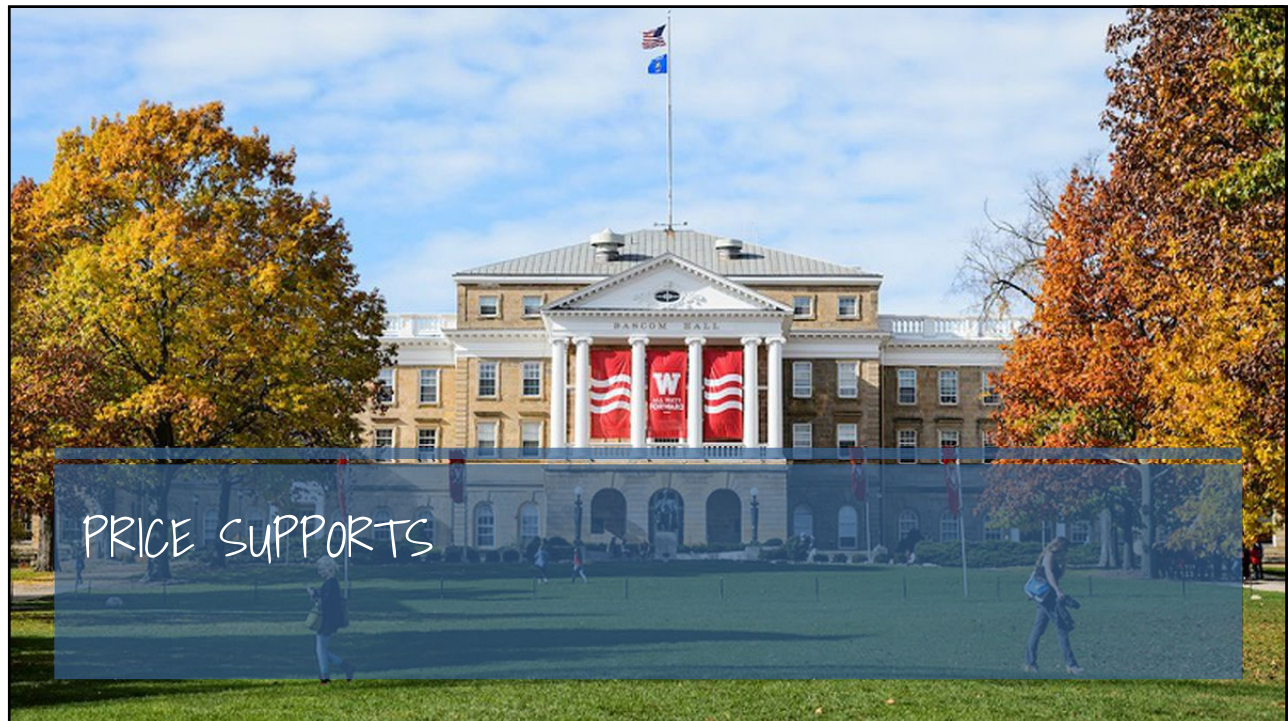
#### Impacts of Note...

**You will investigate this during discussion sections this week!**

You can also see LBD 10.3 for a worked-out example.



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## TWO TYPES OF PRICE SUPPORTS

**Policies designed to keep the price of a particular good above the equilibrium price.**

### Acreage Limitation Program

The government gives farmers an incentive to keep production below some level by paying them not to plant.

**How does this support prices?**

When quantity supplied is low, price will rise until the market clears.

The U.S. had such a program, but it was eliminated in the 1990s.

### Government Purchase Program

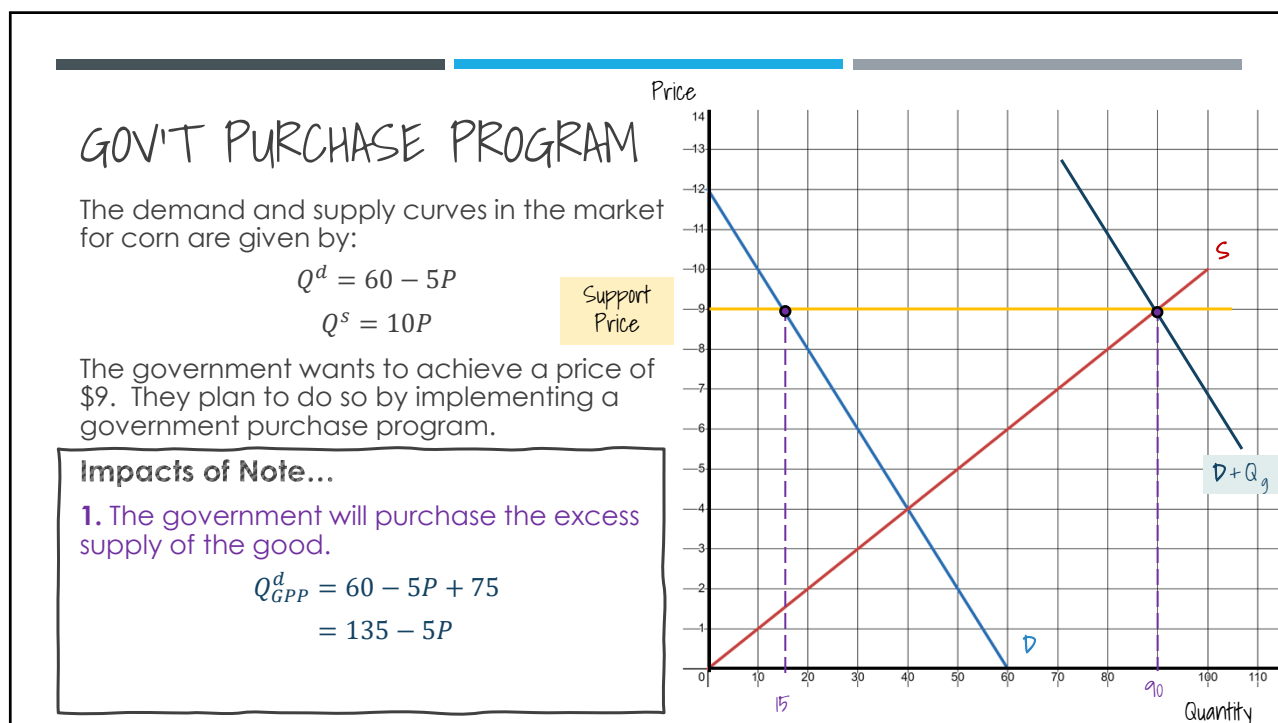
Prices are set by government above free-market level and maintained by governmental purchases of excess supply.

**What does the government do with the excess?**

Store it!

In 2019 and 2020, it was used to supply food pantries.

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## GOV'T PURCHASE PROGRAM

The demand and supply curves in the market for corn are given by:

$$Q^d = 60 - 5P$$

$$Q^s = 10P$$

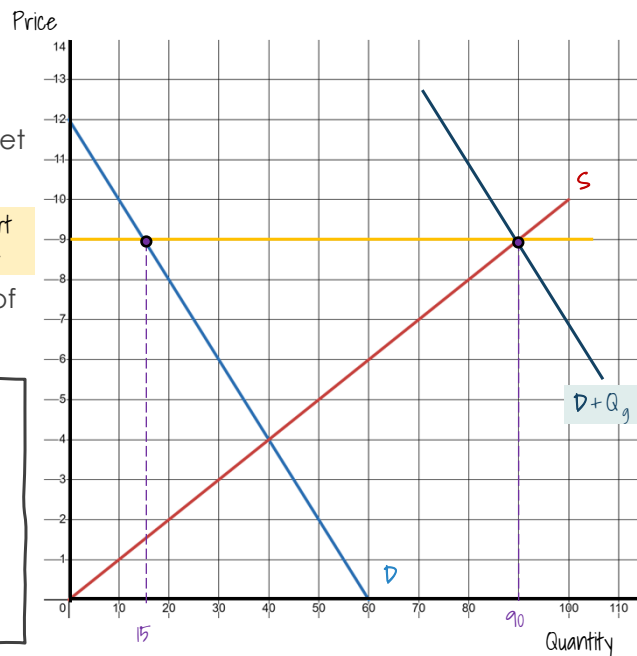
Support  
Price

The government wants to achieve a price of \$9. They plan to do so by implementing a government purchase program.

### Impacts of Note...

#### 2. Consumers buy less of the good

$$Q^d = 60 - 5(9) = 15 < 40 = Q^*$$



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## GOV'T PURCHASE PROGRAM

The demand and supply curves in the market for corn are given by:

$$Q^d = 60 - 5P$$

$$Q^s = 10P$$

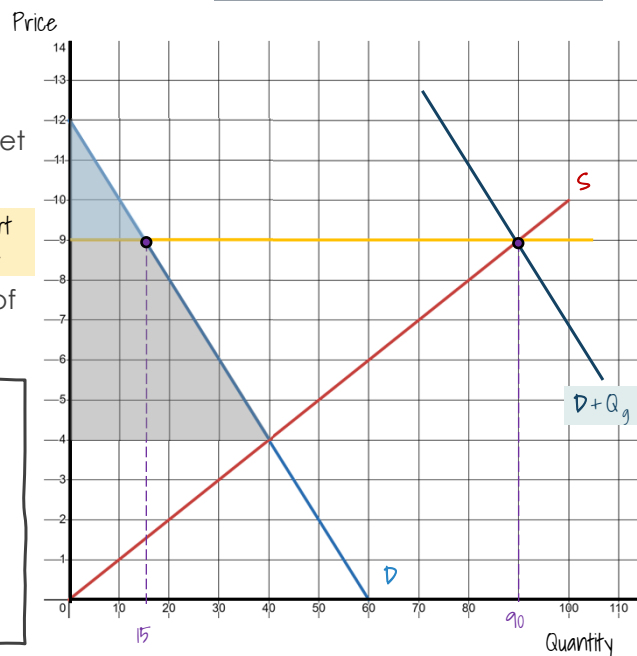
Support  
Price

The government wants to achieve a price of \$9. They plan to do so by implementing a government purchase program.

### Impacts of Note...

#### 3. Consumer surplus will decrease

$$CS_{GPP} = \frac{1}{2}(12 - 9)(15) = \$22.5$$



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## GOV'T PURCHASE PROGRAM

The demand and supply curves in the market for corn are given by:

$$Q^d = 60 - 5P$$

$$Q^s = 10P$$

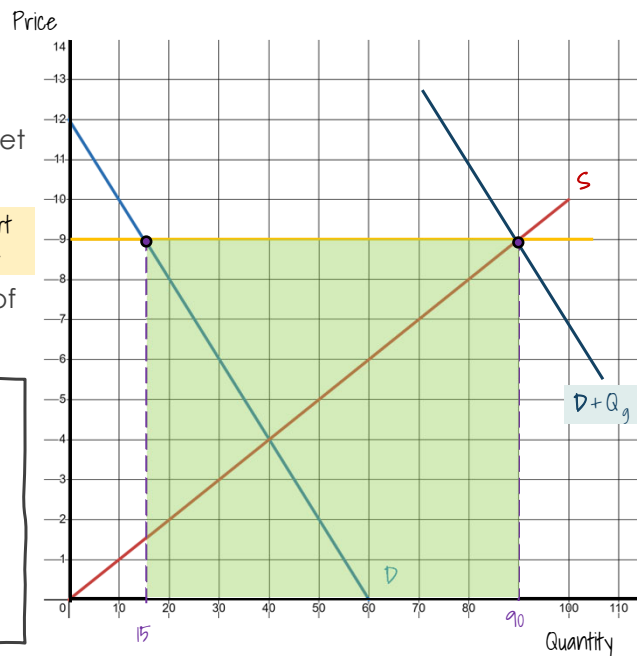
Support  
Price

The government wants to achieve a price of \$9. They plan to do so by implementing a government purchase program.

### Impacts of Note...

4. The government will spend a lot!

$$\begin{aligned} \text{Government Spending} &= \$P \times \text{Purchases} \\ &= \$9 \times 75 = \$675 \end{aligned}$$



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## GOV'T PURCHASE PROGRAM

The demand and supply curves in the market for corn are given by:

$$Q^d = 60 - 5P$$

$$Q^s = 10P$$

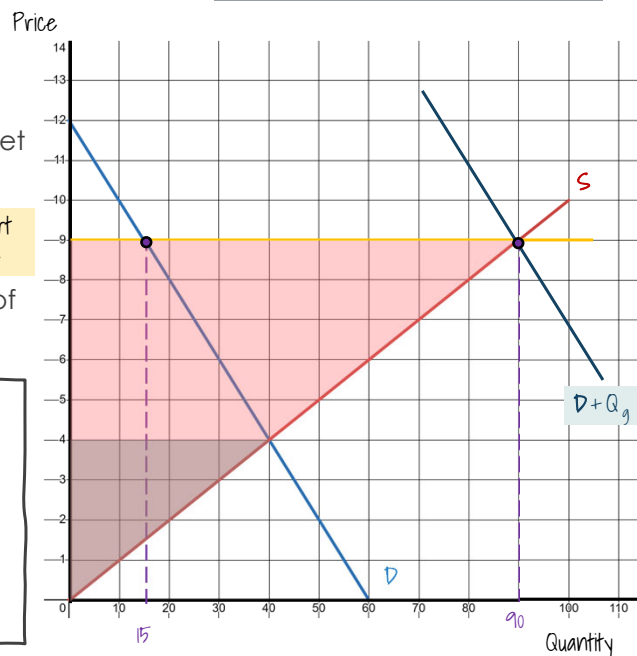
Support  
Price

The government wants to achieve a price of \$9. They plan to do so by implementing a government purchase program.

### Impacts of Note...

5. Producer surplus will increase

$$PS_{GPP} = \frac{1}{2}(9 - 0)(90) = \$405$$



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## GOV'T PURCHASE PROGRAM

The demand and supply curves in the market for corn are given by:

$$Q^d = 60 - 5P$$

$$Q^s = 10P$$

Support  
Price

The government wants to achieve a price of \$9. They plan to do so by implementing a government purchase program.

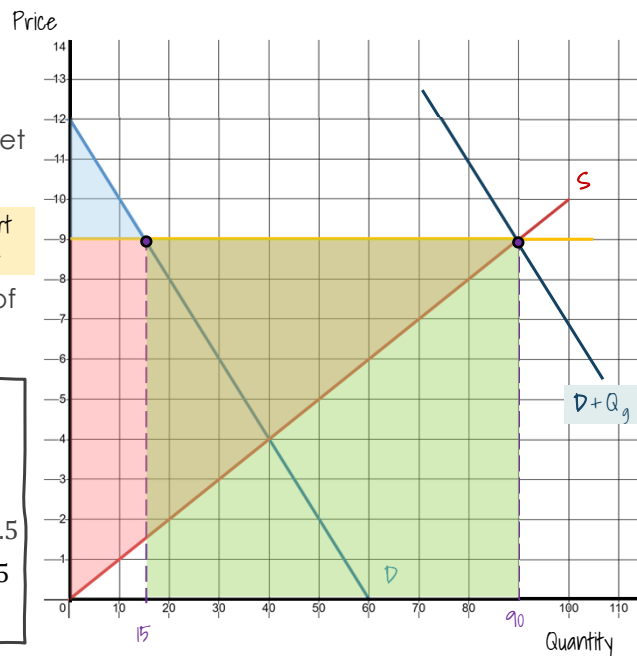
### Impacts of Note...

5. There will be deadweight loss

$$\text{Net benefit} = CS + PS - \text{Gov't Spending}$$

$$\text{Net benefit} = \$22.5 + \$405 - \$675 = -\$247.5$$

$$\text{Deadweight loss} = 240 - (-\$247.5) = \$487.5$$



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## GOV'T PURCHASE PROGRAM

The demand and supply curves in the market for corn are given by:

$$Q^d = 60 - 5P$$

$$Q^s = 10P$$

Support  
Price

The government wants to achieve a price of \$9. They plan to do so by implementing a government purchase program.

### Impacts of Note...

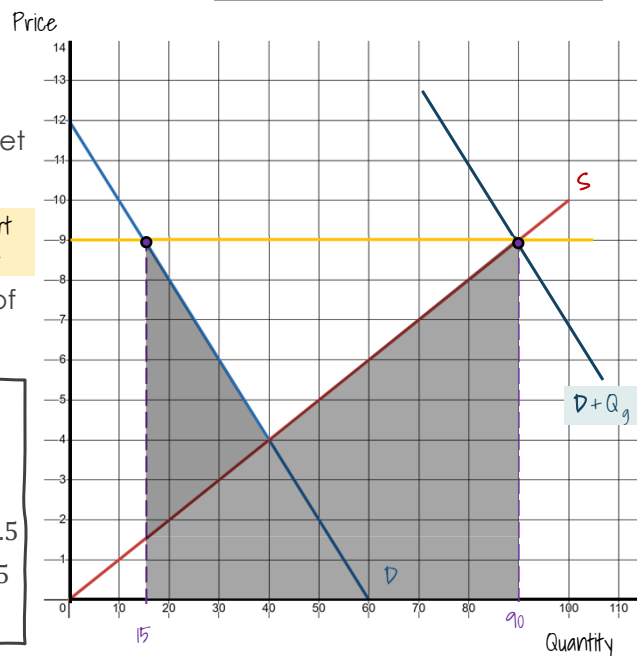
5. There will be deadweight loss

$$\text{Net benefit} = CS + PS - \text{Gov't Spending}$$

$$\text{Net benefit} = \$22.5 + \$405 - \$675 = -\$247.5$$

$$\text{Deadweight loss} = 240 - (-\$247.5) = \$487.5$$

What does this look like graphically?



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