

Lecture 3: Using Supply and Demand to Analyze Markets

September 9, 2025

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 - most oil prices shifts are [S or D] driven?
 - give me some other examples!

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 - most oil prices shifts are [S or D] driven?
 - give me some other examples!
- 4 Problem Set 3 posted
- 5 Use Numbers 2 of 2 is posted
 - don't start the night before!

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 - most oil prices shifts are [S or D] driven?
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- 4 Problem Set 3 posted
- 5 Use Numbers 2 of 2 is posted
 - don't start the night before!
- 6 Come see me in office hours!
- 7 Other administrative questions or issues?

Oil Prices Over Time



Ripped From the Headlines

As a reminder, next week

Afternoon

Finder	Presenters
Kibin	Ali

Evening

Finder	Presenters
Magaly	Damen

Today's Ripped From the Headlines

Afternoon

Finder	Presenters
Kibin	Ali

Evening

Finder	Presenters
Damen	Charlotte

Today: Using Supply and Demand to Analyze Markets

- ① (leftover) Elasticities
- ② Consumer and Producer Surplus
- ③ Price Regulations
- ④ Quantity Regulations
- ⑤ (skip in favor of later in depth coverage) Taxes
- ⑥ (skip) Subsidies

Many Types of Elasticity

Many Types of Elasticities

- (last class) Price elasticity of demand and supply
- (skip, time reasons) Income elasticity of demand
- Cross-price elasticity of demand

How do we define elasticity?

$E =$

How do we define elasticity?

$$E = \frac{\% \Delta Q}{\% \Delta P}$$

Cross-Price Elasticity of Demand

How much does your demand for pluots change when the price of apricots increases?

Cross-Price Elasticity of Demand

How much does your demand for pluots change when the price of apricots increases?

$$E_{XY}^D = \frac{\% \Delta Q_X^D}{\% \Delta P_Y}$$

- The responsiveness of quantity demanded of good X to price of good Y
- If E_{XY}^D is positive, are X and Y substitutes or complements?

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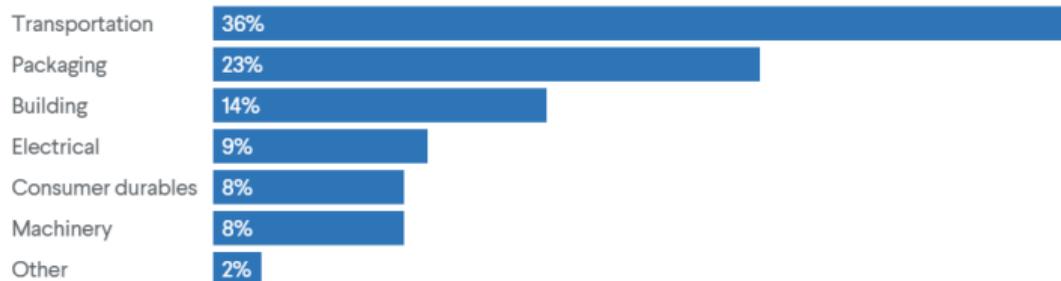
Policy examples, please!

How Does Cross-Price Elasticity Explain Tariff Impacts?

As of June 4, US charges 50% tariff on aluminum

Transportation, Packaging Lead U.S. Industries in Aluminum Consumption

Percent of domestic consumption, aluminum, 2024



Source: U.S. Geological Survey, Mineral Commodity Summaries.

COUNCIL^{on}.
FOREIGN
RELATIONS

From [Council on Foreign Relations](#)

If soda and aluminum are complements, do we expect to happen to the price of Coke?
How does this relate to cross-price elasticity?

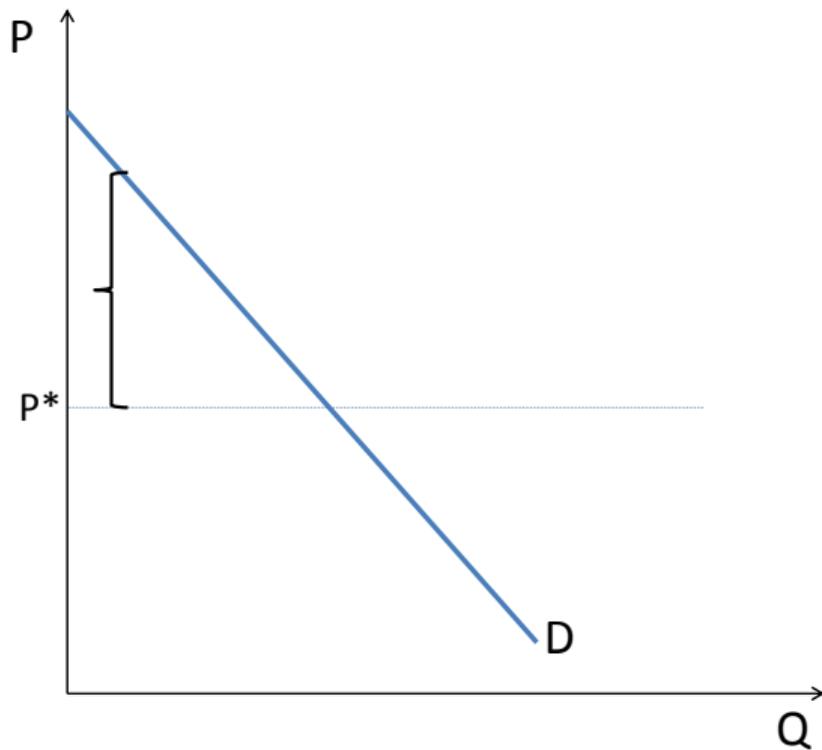
Consumer and Producer Surplus

Consumer Surplus

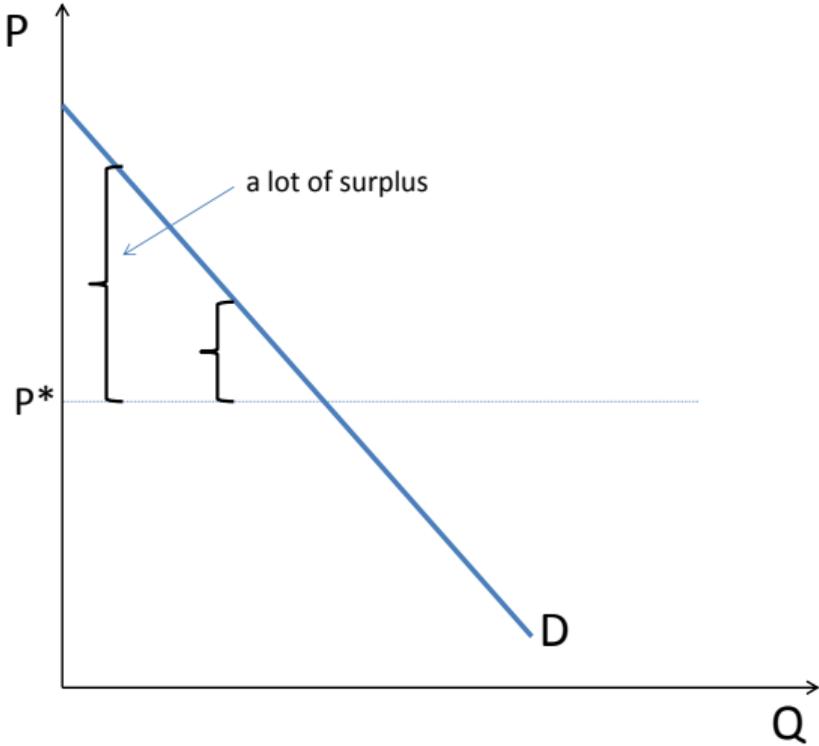
Consumer surplus \equiv “difference between the amount consumers would be willing to pay for a good and the amount they actually have to pay”

Getting to Consumer Surplus

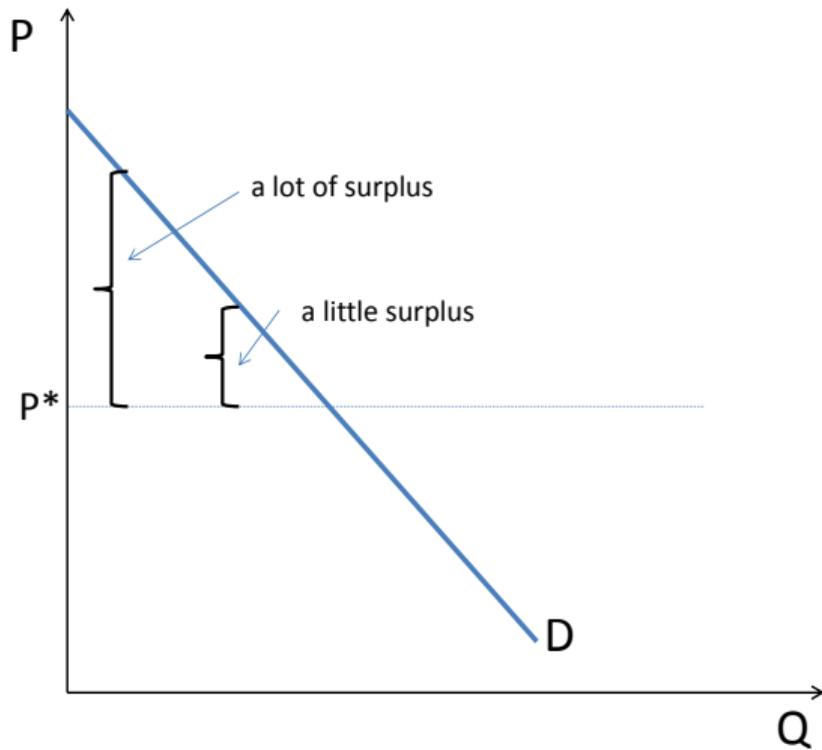
Is this a person with a little or a lot?



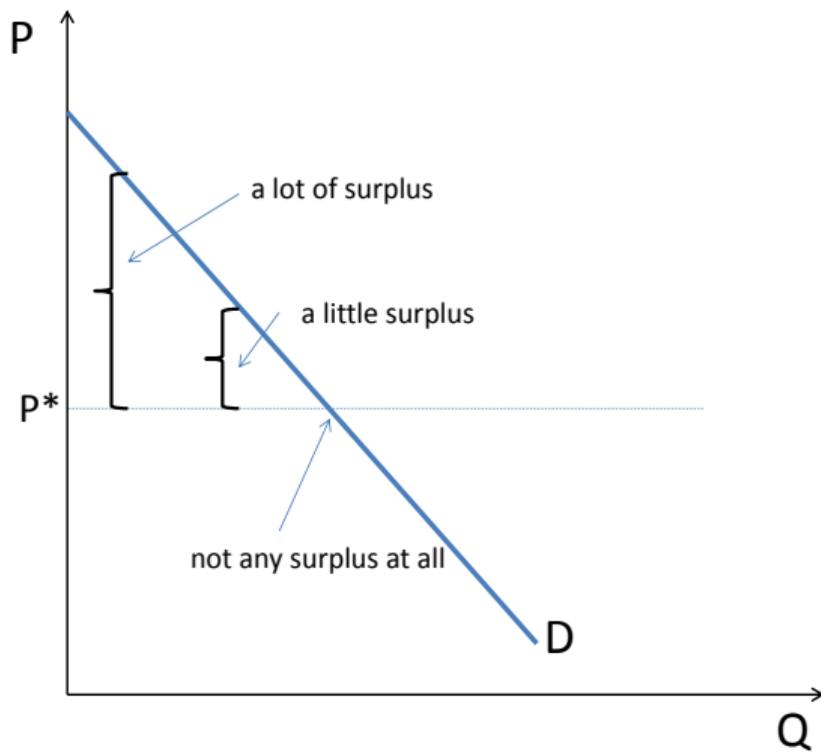
And this person?



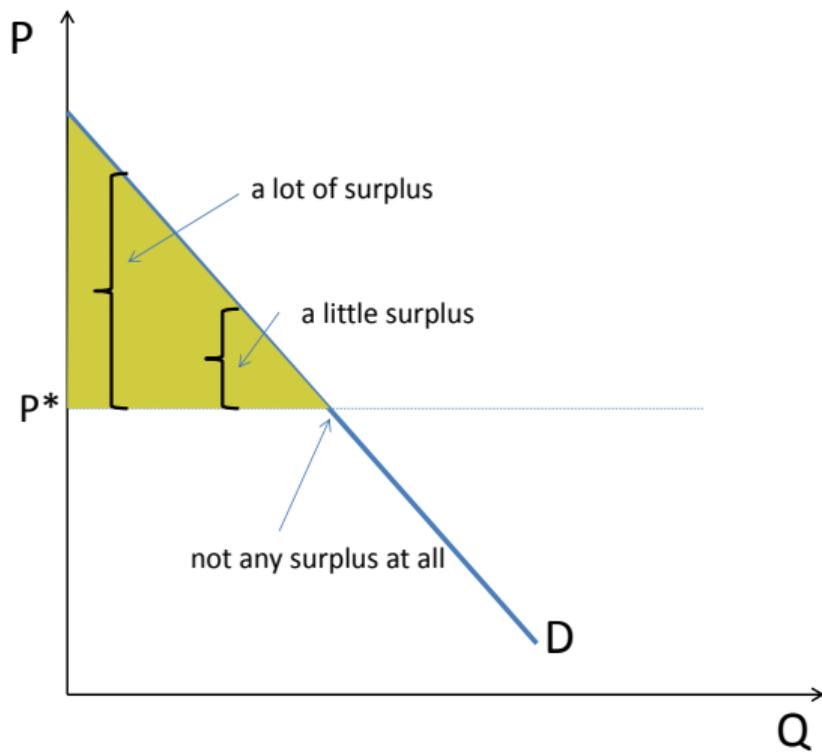
Where is Someone Without Surplus?



And Total Consumer Surplus?



The Whole Shebang of Consumer Surplus

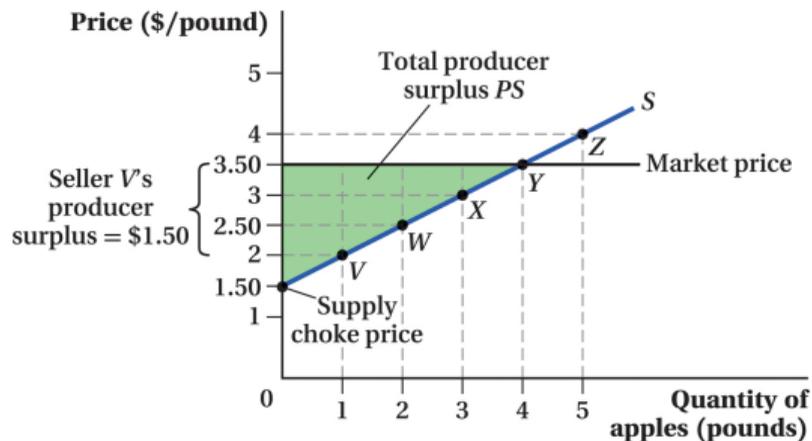


Identifying Consumer Surplus

- For which goods do you have a positive consumer surplus?
- For which goods do you have a consumer surplus of zero?
- Give an example when your consumer surplus increased

Producer Surplus

- Producer surplus \equiv “difference between price at which producers are willing to sell their good or service and the price they actually receive”
- Above the supply curve, and below price, this is surplus
- You are a producer of labor. Have you ever received surplus?



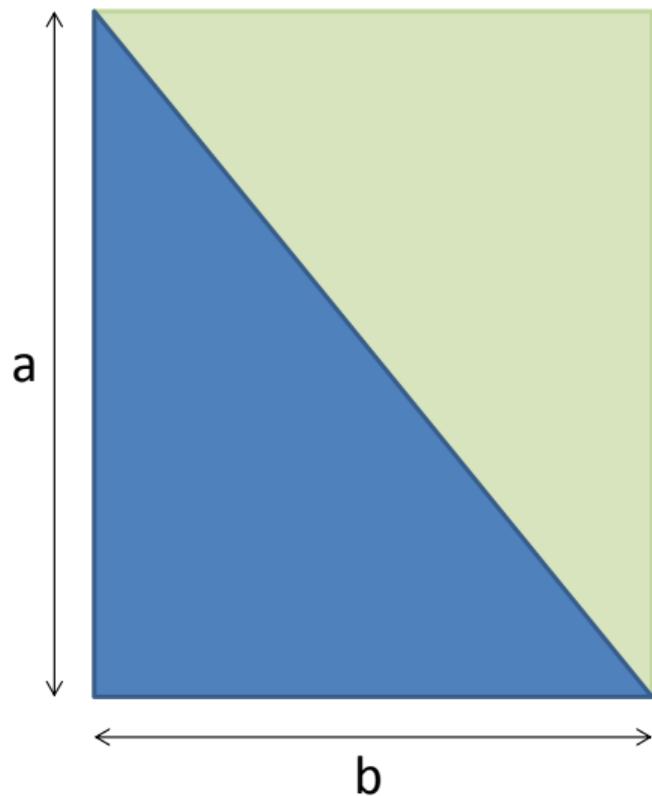
Why Should You Care About Surplus?

- Want to understand overall welfare implications of a policy change
- Welfare is not just $P * Q$
- It is also consumer benefits above the purchase price
- And supplier benefits below the purchase price

Distribution of Gains and Losses from Changes in Market Conditions: Measuring Consumer and Producer Surplus

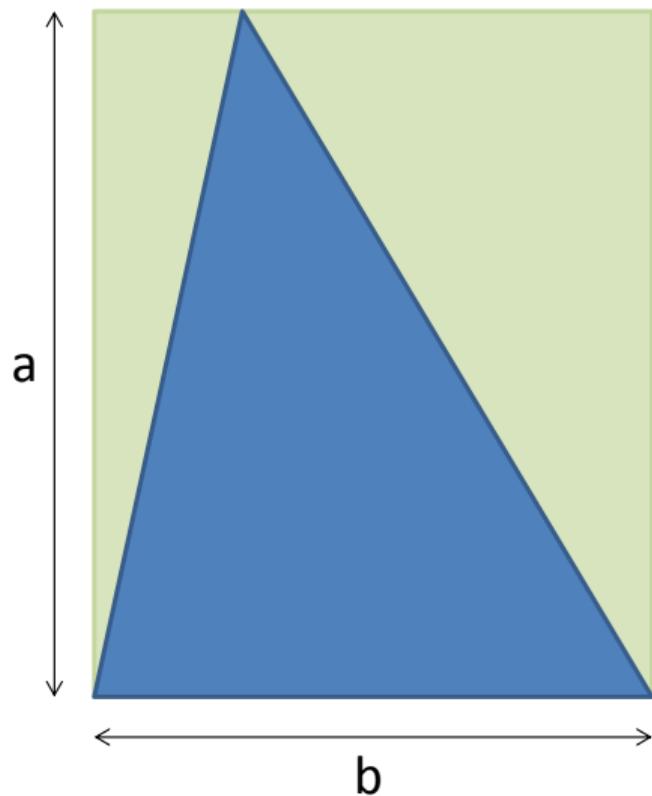
- How do shocks to supply or demand – which might be a function of policy choices – affect consumers and producers?
- We will analyze impact of decrease in supply
- You should be able to reason out an impact of an increase in supply, or changes in demand

Math Reminder: Area of a Triangle



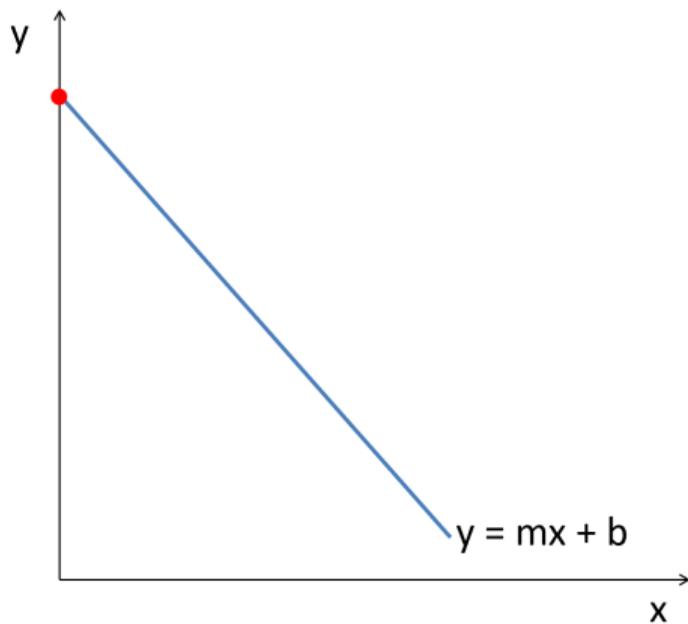
- Area of the triangle is $\frac{1}{2} * a * b$
- With linear supply and demand curves, you can find all the points on a triangle.
- We will always be working with linear demand and supply curves

What if it's Not a Right Triangle?



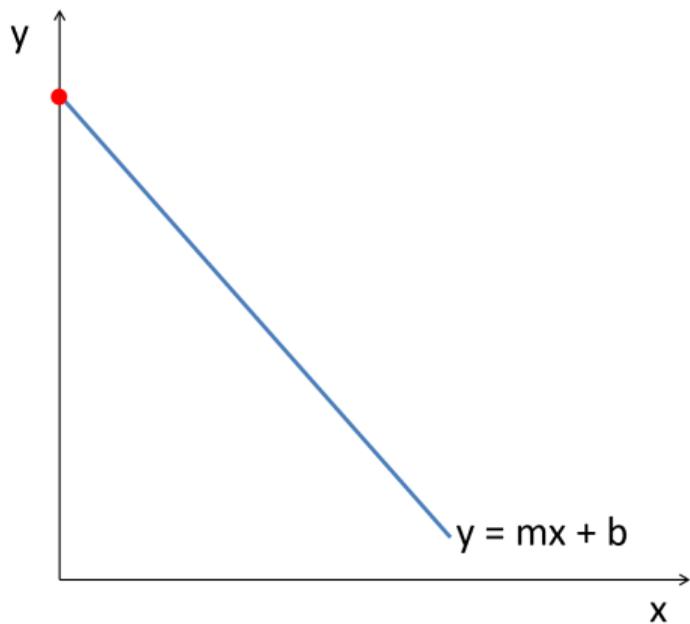
- What do you do?
- Still $\frac{1}{2} * a * b$

How to Find the Coordinates of the Intercept



- We know the equation of the line $y = mx + b$
- We want to find the coordinates (x, y) of the red point
- We know one already – which one?

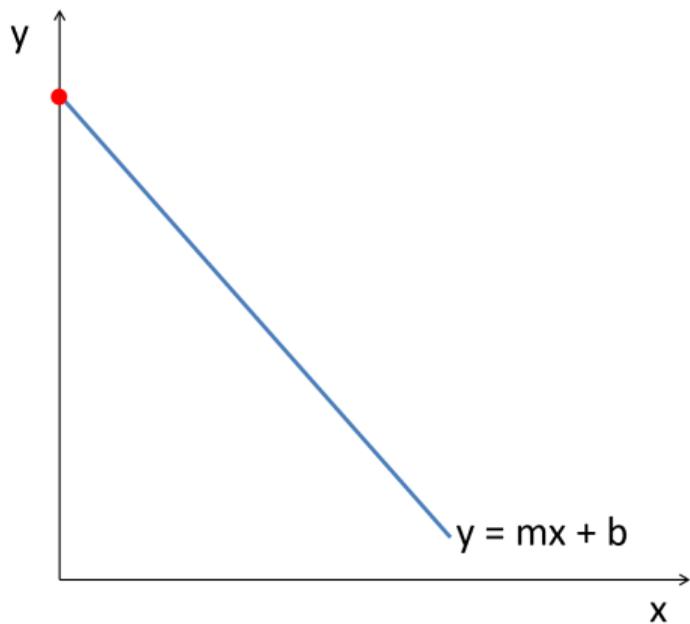
How to Find the Coordinates of the Intercept



- We know the equation of the line $y = mx + b$
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- How do we find y ?

$$y = mx + b$$

How to Find the Coordinates of the Intercept

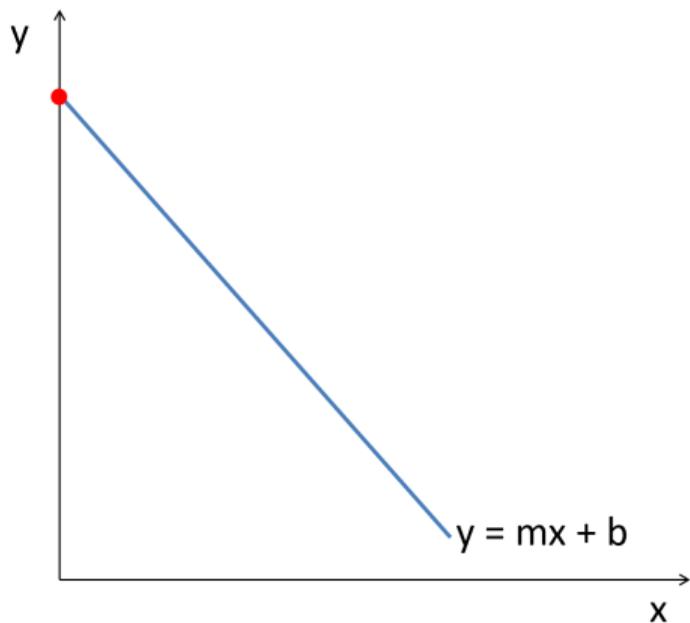


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$$y = mx + b$$

$$y = m(0) + b$$

How to Find the Coordinates of the Intercept



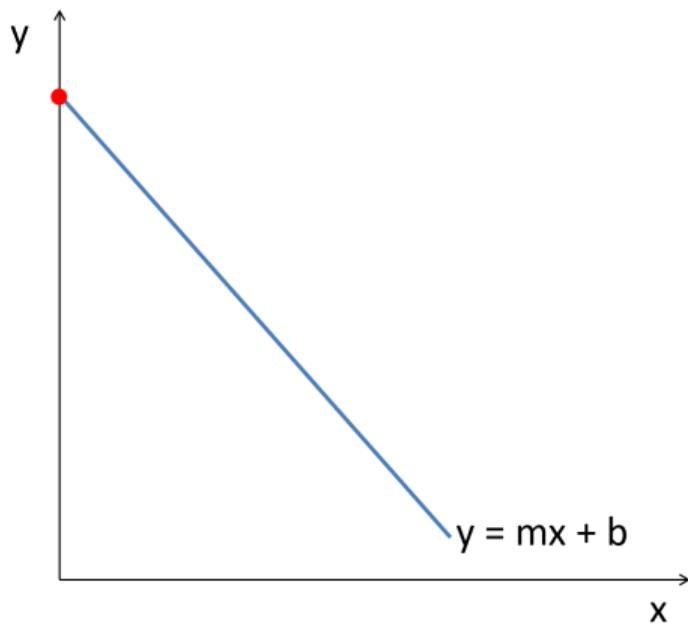
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$$= b$$

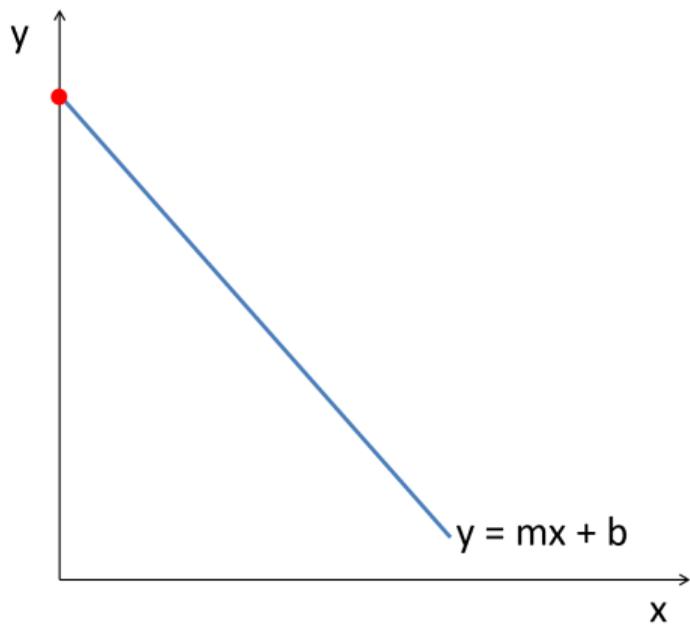
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- What if we know $x = \frac{1}{m}y - \frac{1}{m}b$?

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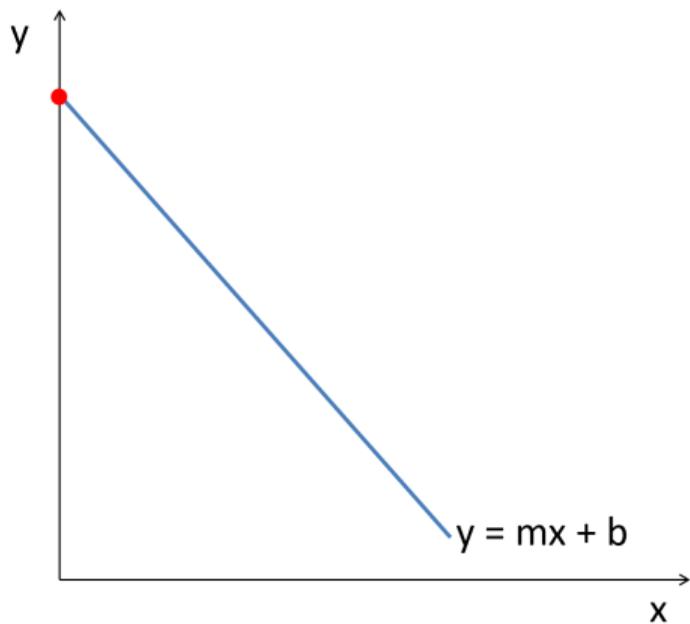


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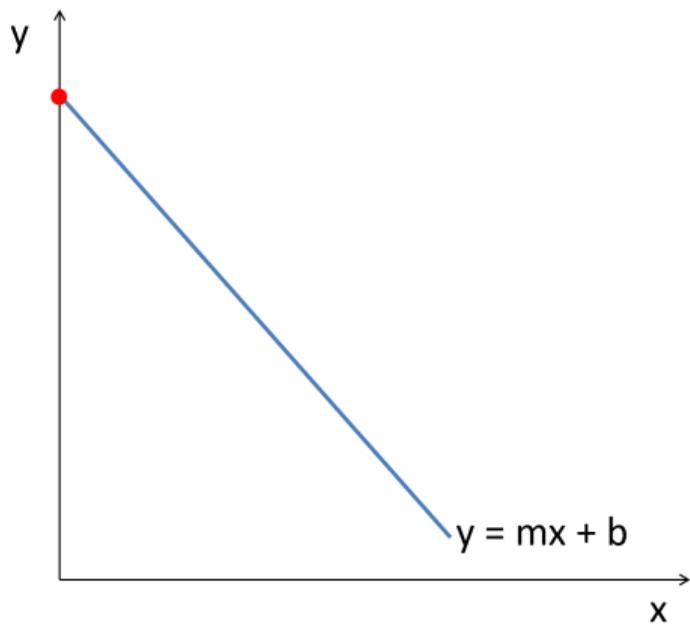
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$$-\frac{1}{m}y = -\frac{1}{m}b$$

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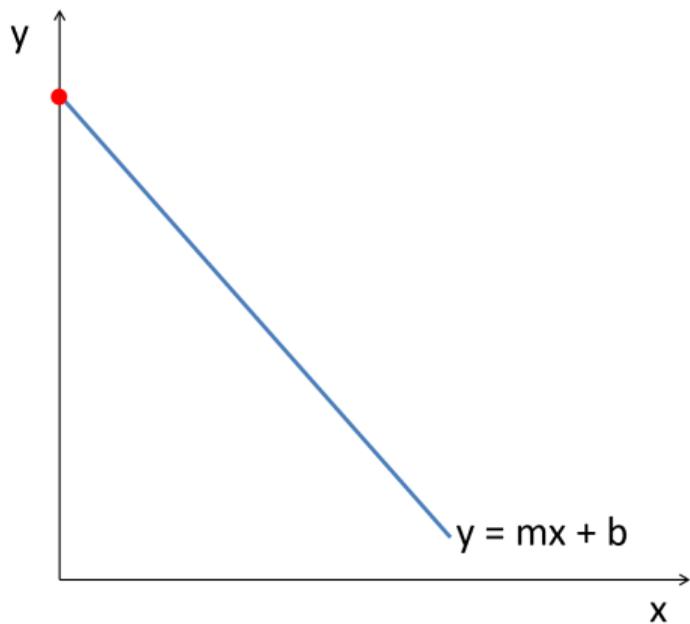
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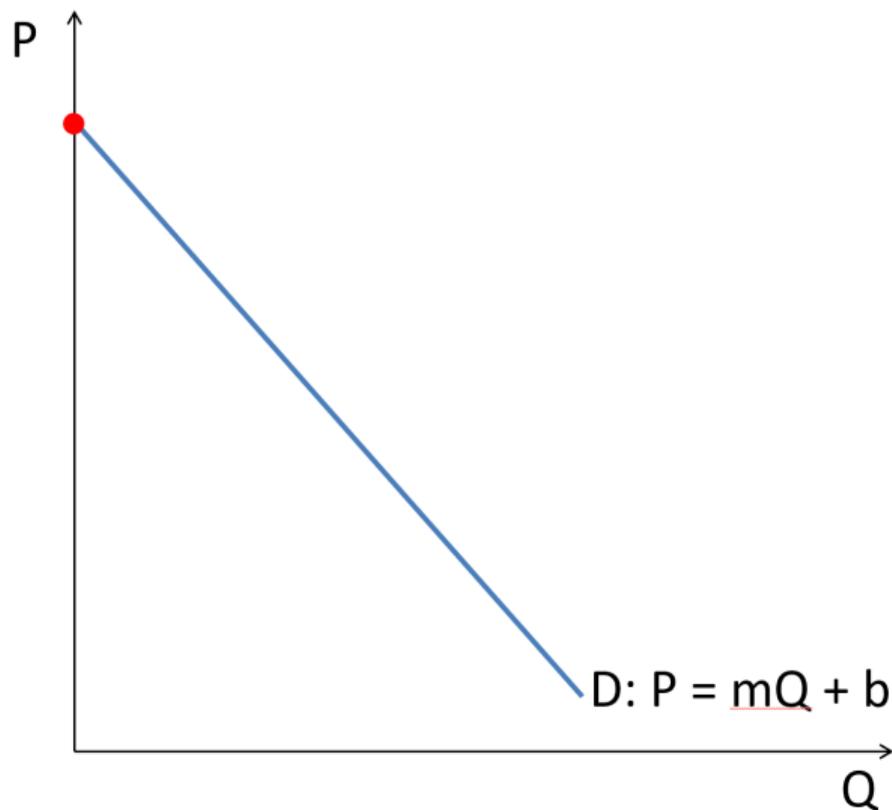
$$0 = \frac{1}{m}y - \frac{1}{m}b$$

$$-\frac{1}{m}y = -\frac{1}{m}b$$

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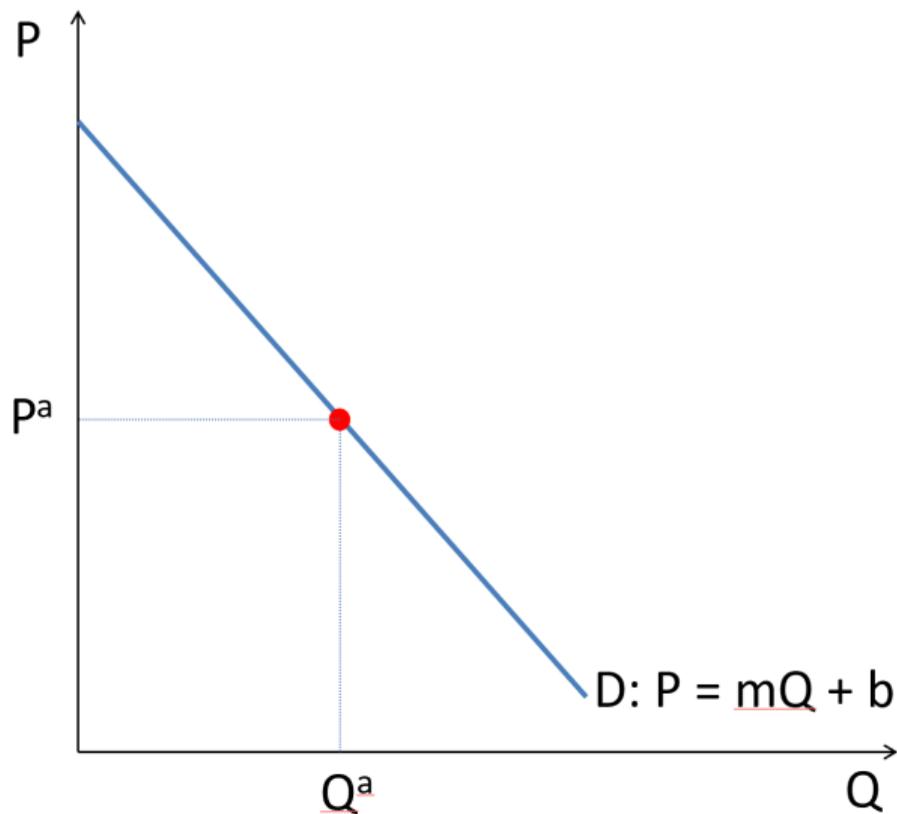
$$y = b$$

Nothing Changes If We Replace x and y with P and Q



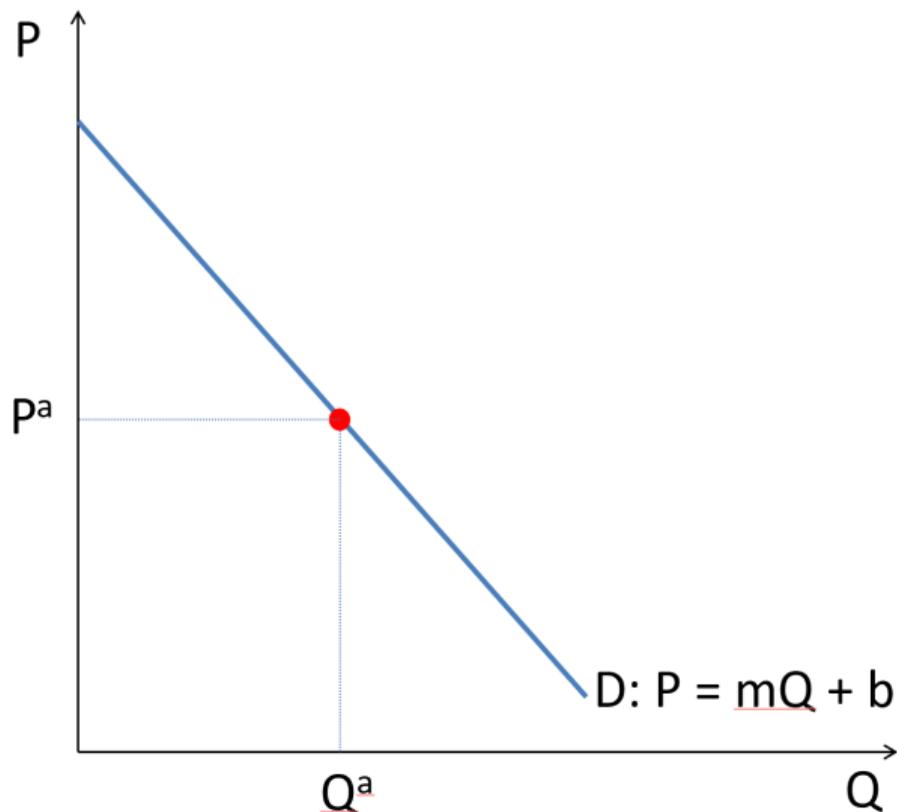
- Same logic to find P given $Q = 0$
- Same logic for the supply curve

Finding Other Relevant Points



- What if we know Q^a and want to find P^a ?

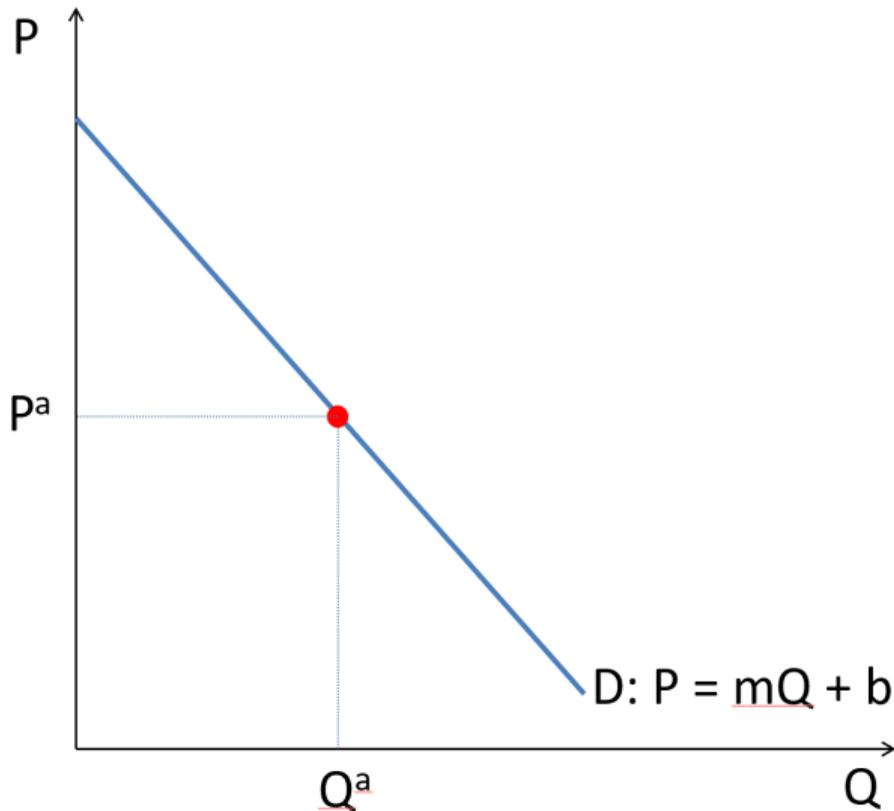
Finding Other Relevant Points



- What if we know Q^a and want to find p^a ?

$$P = mQ + b$$

Finding Other Relevant Points

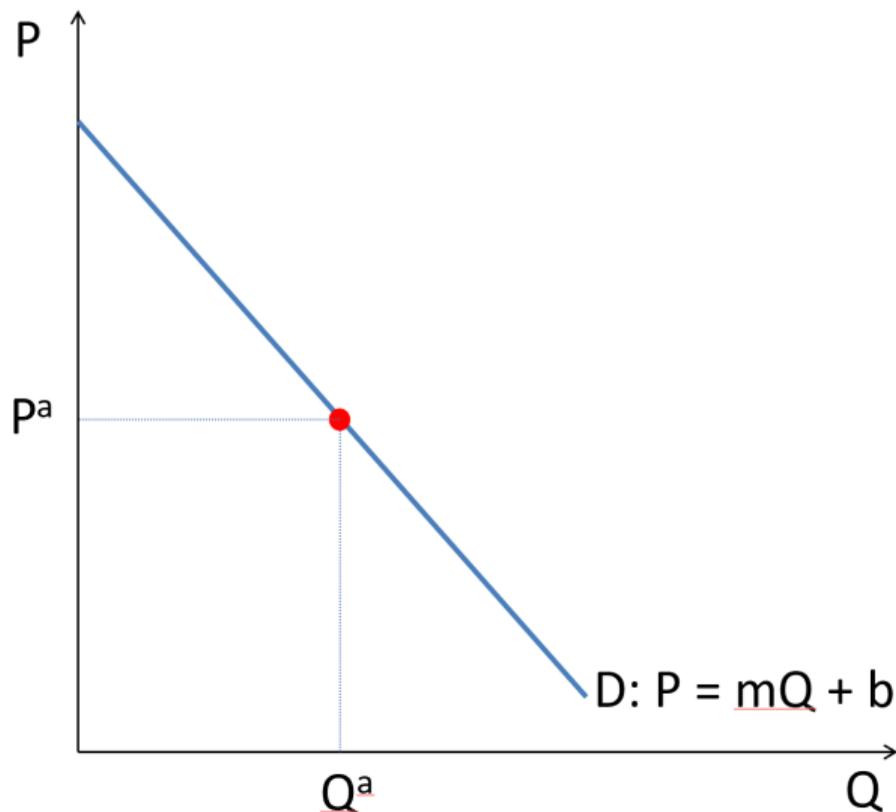


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$$P = mQ + b$$

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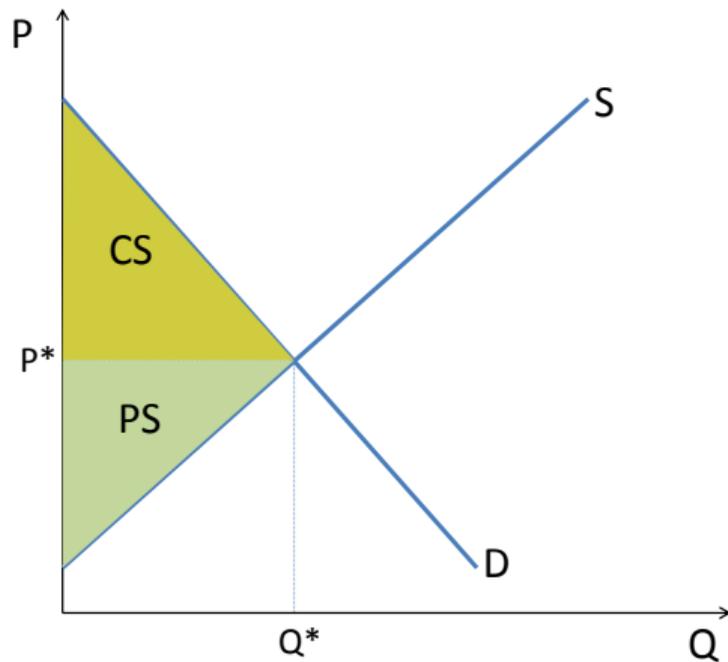
- Same logic for the supply curve

Analyze Impact of Decrease in Supply

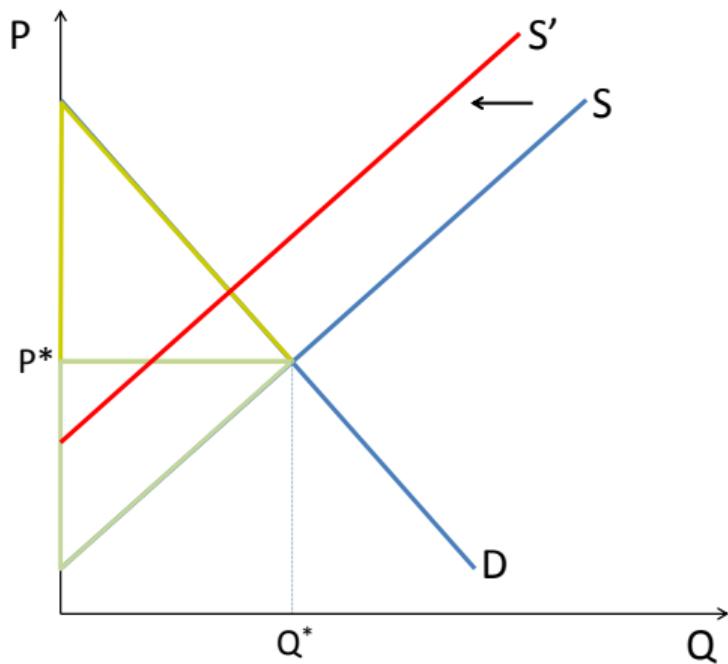
- Suppose it rains less in Cote d'Ivoire and chocolate production suffers
- We analyze the welfare consequences in the US chocolate market
- You can imagine using this framework for policy-induced shifts as well

Analyzing a Decrease in Supply

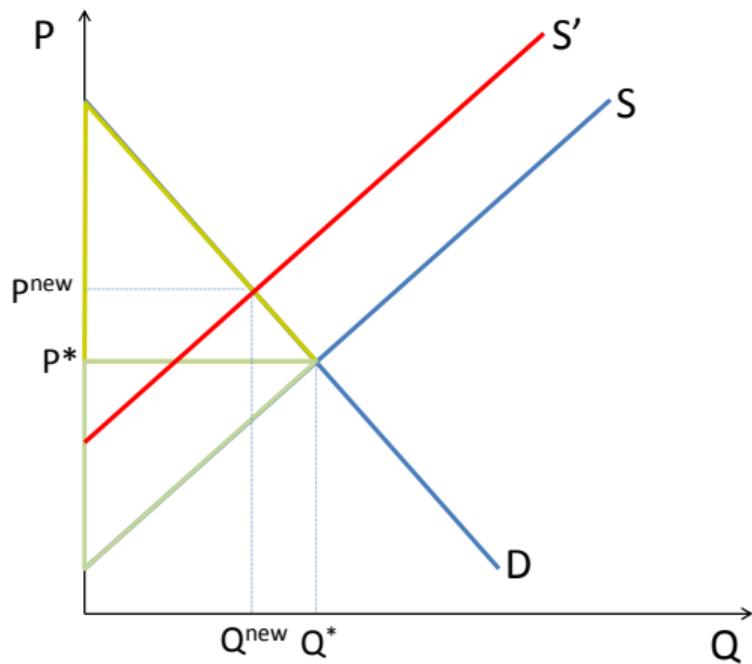
Initial Consumer and Producer Surplus



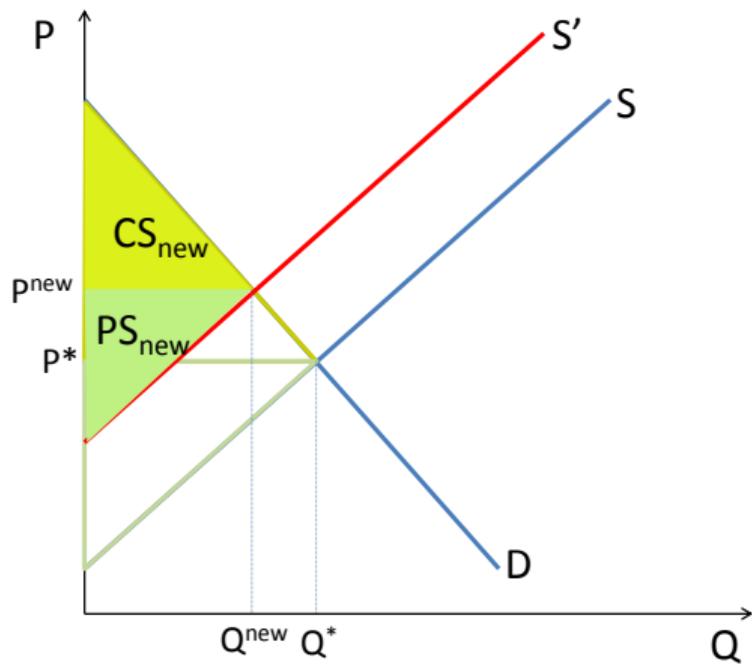
Supply Shifts Inward: What are P^{new} and Q^{new} ?



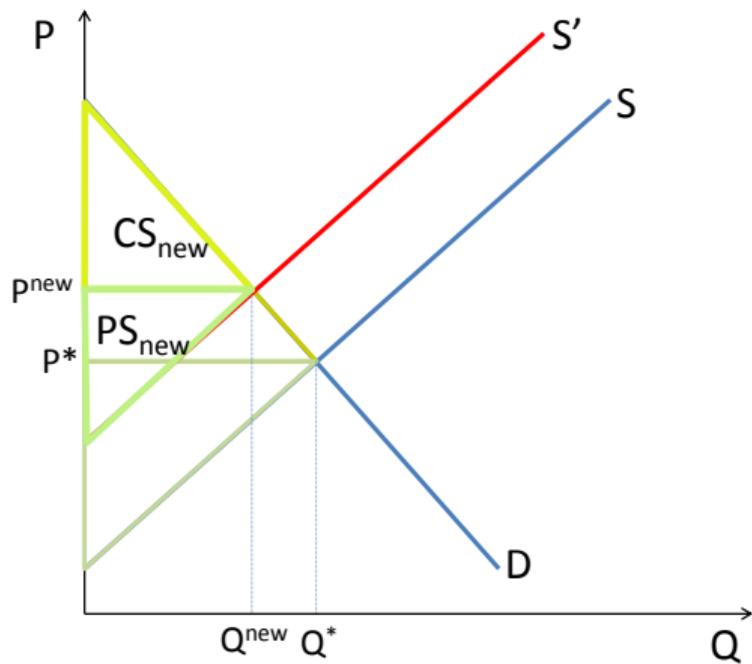
Supply Shifts Inward: New CS and PS?



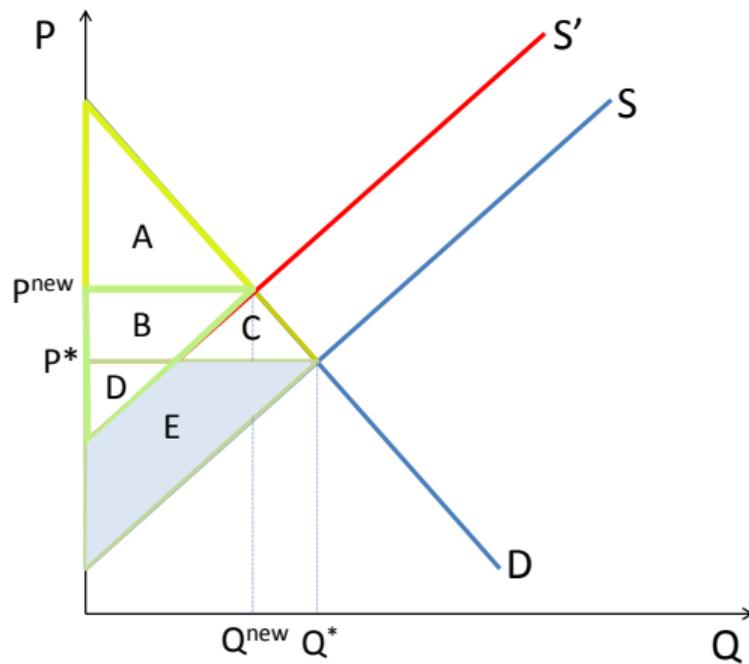
New Producer and Consumer Surplus



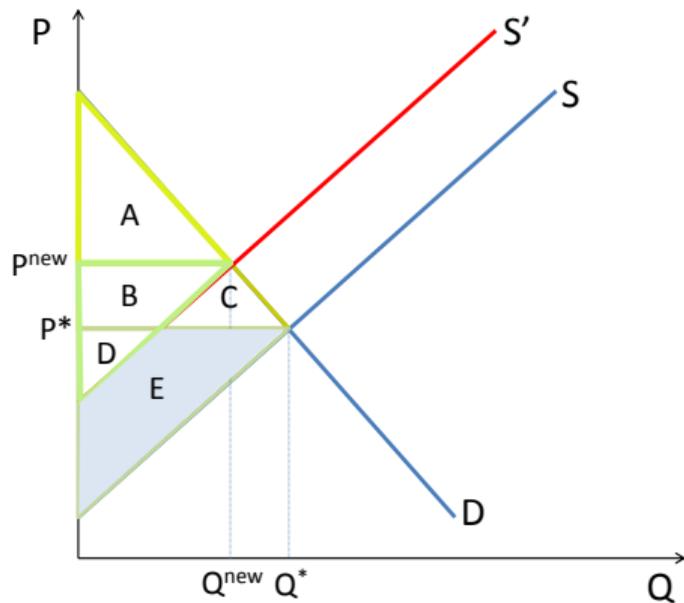
New Producer and Consumer Surplus



Figuring Out the Difference

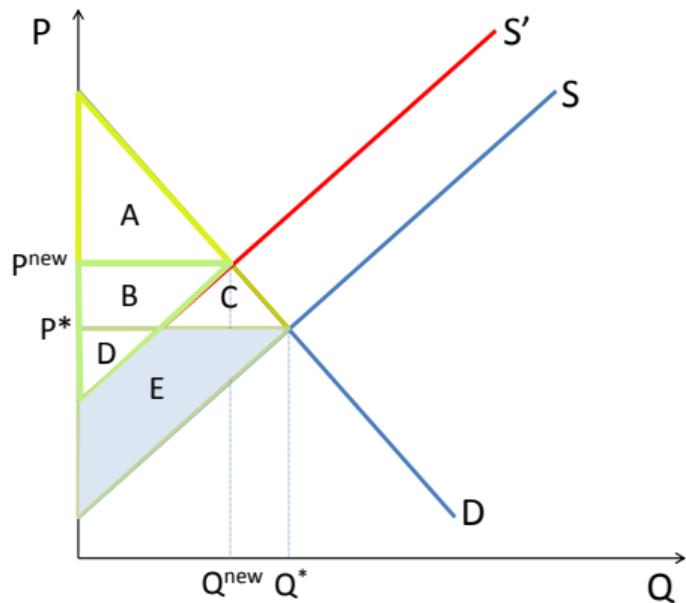


Figuring Out the Difference, Details



- Before
 - $CS =$

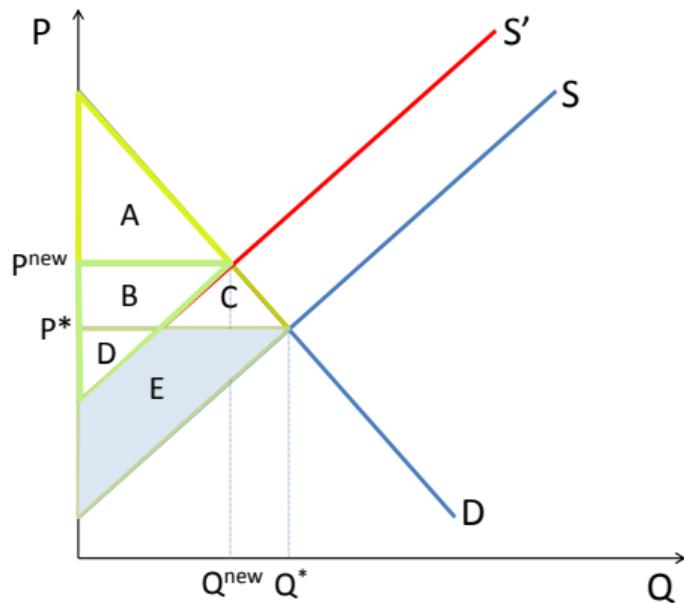
Figuring Out the Difference, Details



- Before

- $CS = A + B + C$
- $PS =$

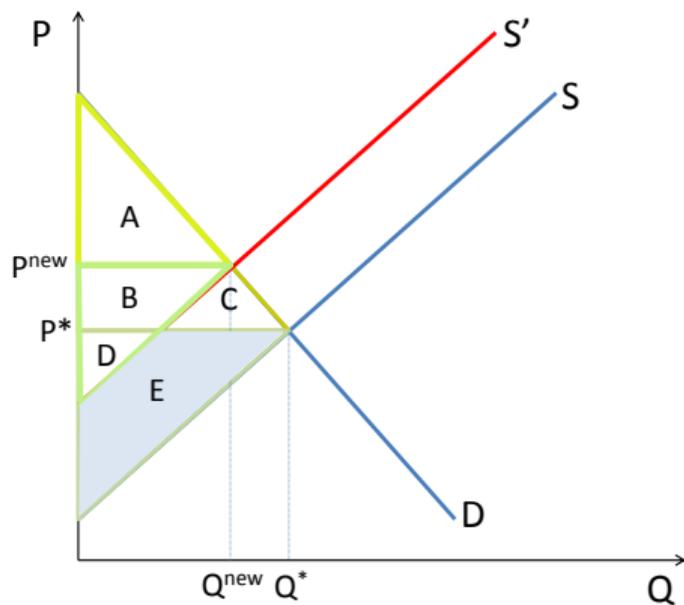
Figuring Out the Difference, Details



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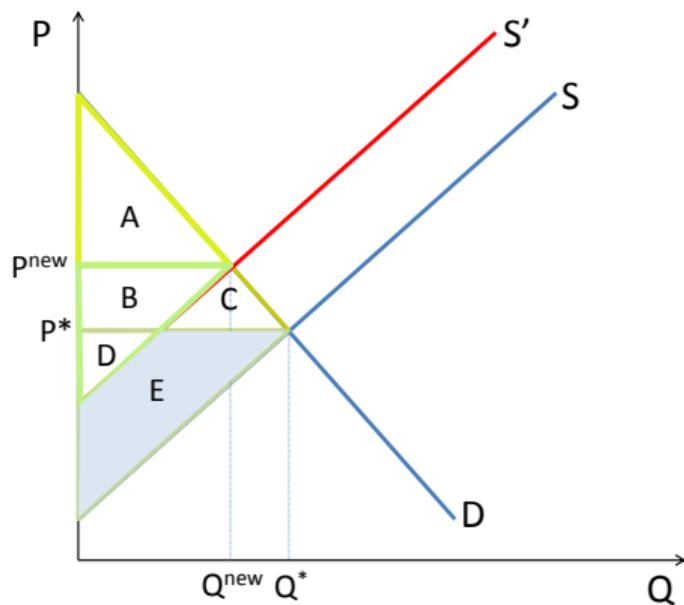
- $CS = A + B + C$
- $PS = D + E$

Figuring Out the Difference, Details



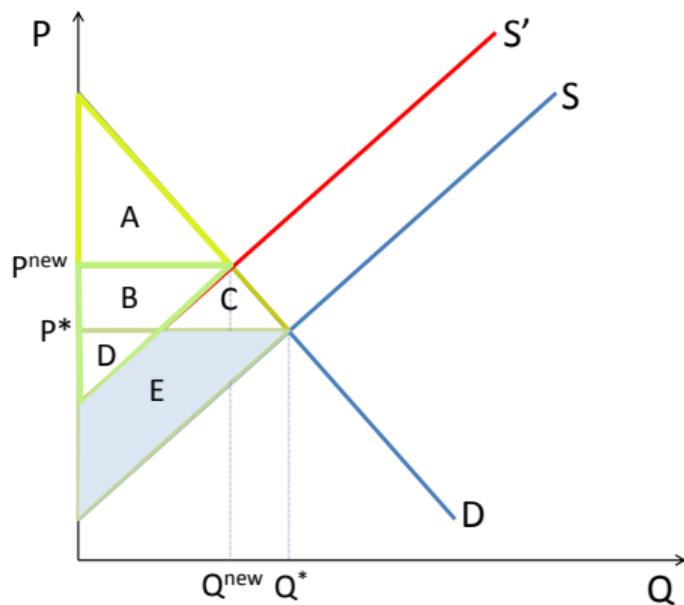
- Before
 - $CS = A + B + C$
 - $PS = D + E$
- After
 - $CS =$

Figuring Out the Difference, Details



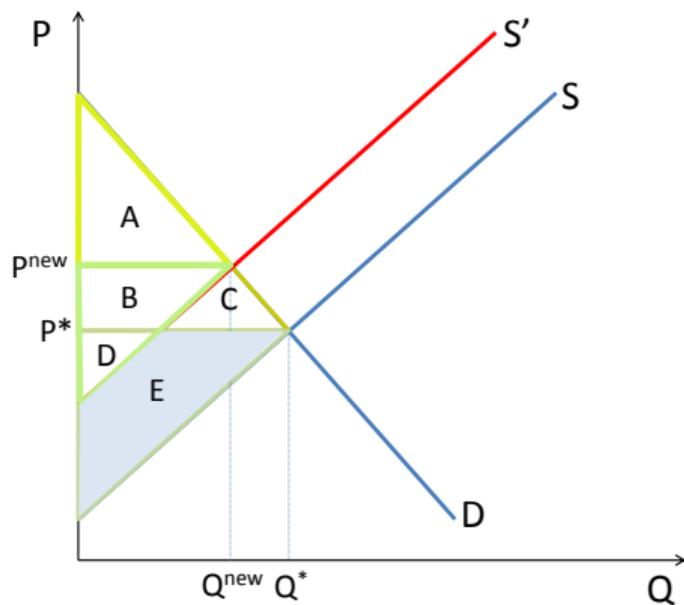
- Before
 - $CS = A + B + C$
 - $PS = D + E$
- After
 - $CS = A$
 - $PS =$

Figuring Out the Difference, Details



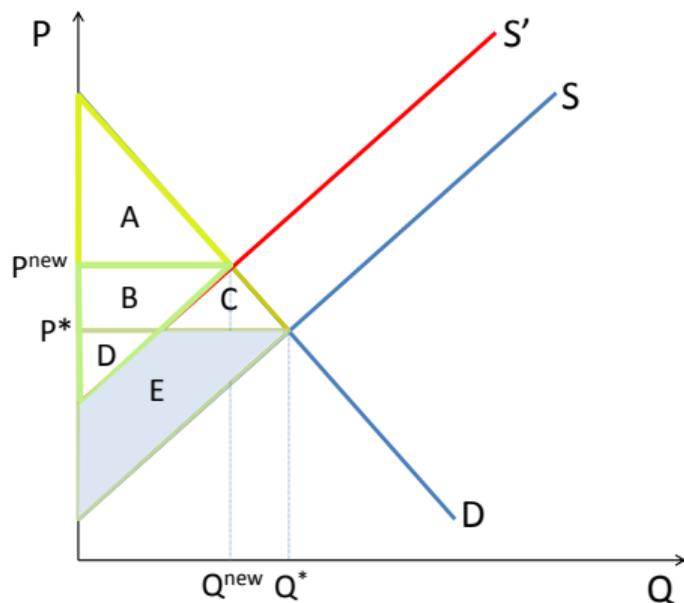
- Before
 - $CS = A + B + C$
 - $PS = D + E$
- After
 - $CS = A$
 - $PS = B + D$

Figuring Out the Difference, Details



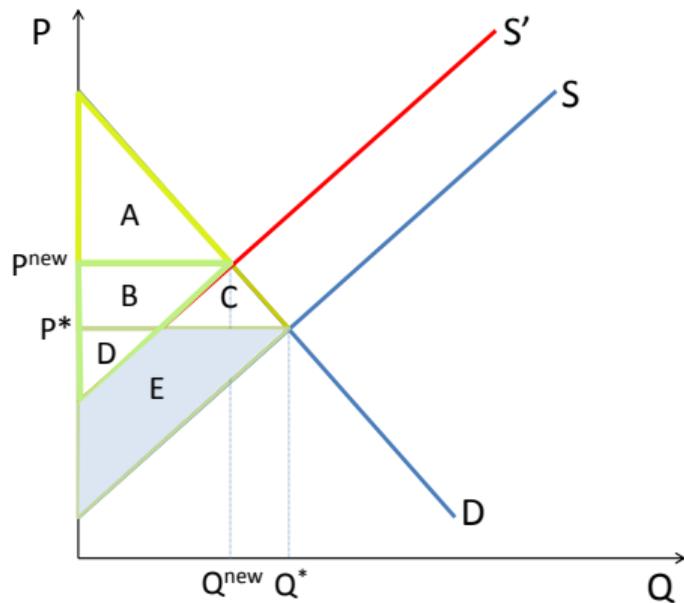
- Before
 - $CS = A + B + C$
 - $PS = D + E$
- After
 - $CS = A$
 - $PS = B + D$
- Difference
 - $\Delta CS =$

Figuring Out the Difference, Details



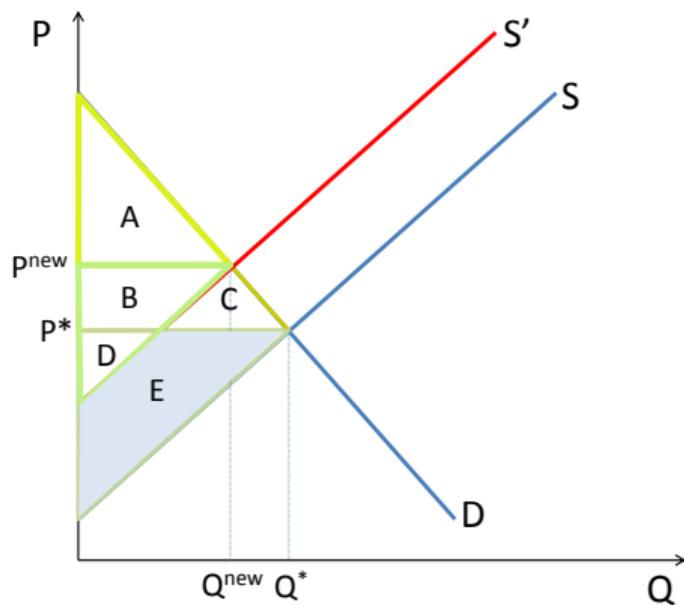
- Before
 - $CS = A + B + C$
 - $PS = D + E$
- After
 - $CS = A$
 - $PS = B + D$
- Difference
 - $\Delta CS = A - (A + B + C) = -(B + C) < 0$
 - $\Delta PS =$

Figuring Out the Difference, Details



- Before
 - $CS = A + B + C$
 - $PS = D + E$
- After
 - $CS = A$
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 - $\Delta PS = (B + D) - (D + E) = B - E$, sign ambiguous

Figuring Out the Difference, Details



- Before
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- After
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 - $PS = B + D$
- Difference
 - $\Delta CS = A - (A + B + C) = -(B + C) < 0$
 - $\Delta PS = (B + D) - (D + E) = B - E$, sign ambiguous
 - Note that nobody gets C or E after

Using Triangles: Estimate the consumer surplus from the Internet

See *Economist* article

- Consumer willingness to pay for broadband
 - initial price of broadband
 - price declines
 - surplus is at a minimum the price decrease
- Consumer time saved in searching
 - 7 minutes on google vs 22 minutes at the U of Michigan library
 - value time saved
 - multiple by number of questions
 - → consumer surplus

Price Regulations

Price Regulations

Two Flavors

- ① Price Ceiling \equiv a regulated “highest lawful price for a good or service”
- ② Price Floor \equiv a regulated “lowest lawful price for a good or service”

Price Regulations

Two Flavors

- ① Price Ceiling \equiv a regulated “highest lawful price for a good or service”
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Price regulations distort market outcomes. Some trades that would occur in equilibrium do not occur.

Using Math to Understand Policy Implications

We assume $P_{ceiling} < P_{market}$. We'd like to know

- how much worse off producers are
- how much better or worse off consumers are
- what the difference is between these \equiv transfer
- how much surplus is lost

Using Math to Understand Policy Implications

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- **Deadweight loss** \equiv reduction in total surplus as a result of market inefficiency

Using Math to Understand Policy Implications

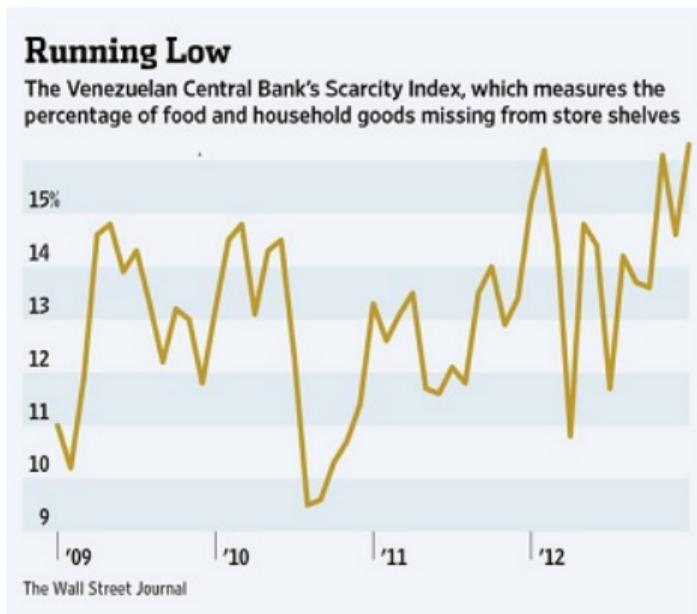
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- how much surplus is lost
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Use algebra and geometry to do this. What does your intuition tell you happens to quantity when the government sets $P_{ceiling} < P_{market}$?

Should be Quite Clear to Venezuelans

Venezuelan Presidents Chavez and Maduro Respond to Inflation with Price Ceilings



Policy Aside: Other Price Ceiling Examples

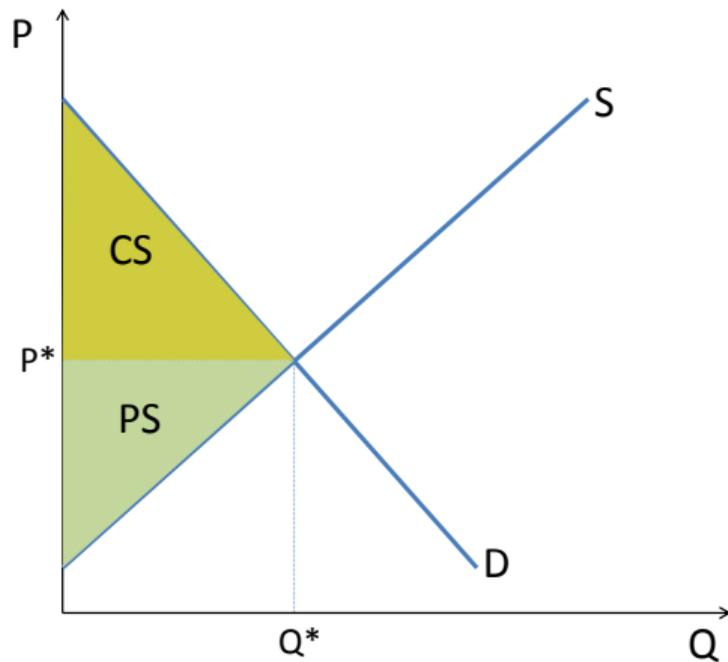
- Cottage cheese in Israel
 - in 2011, government removed price ceiling and prices spiked, leading to a revolt and a return of a ceiling
- Corn tortillas in Mexico
 - ceiling lifted in 1999, reimposed in 2007 amid soaring corn prices
- India's "Maximum Retail Price"
 - highest price at which retailer can sell product
 - more info [here](#)
- Other favorite examples?

Think About the Problem in Steps

- 1 Find the initial P_{market} and Q_{market}
- 2 Find the initial CS
- 3 Find the initial PS
- 4 Find the P_{new} and Q_{new} after the ceiling
- 5 Find the final CS
- 6 Find the final PS

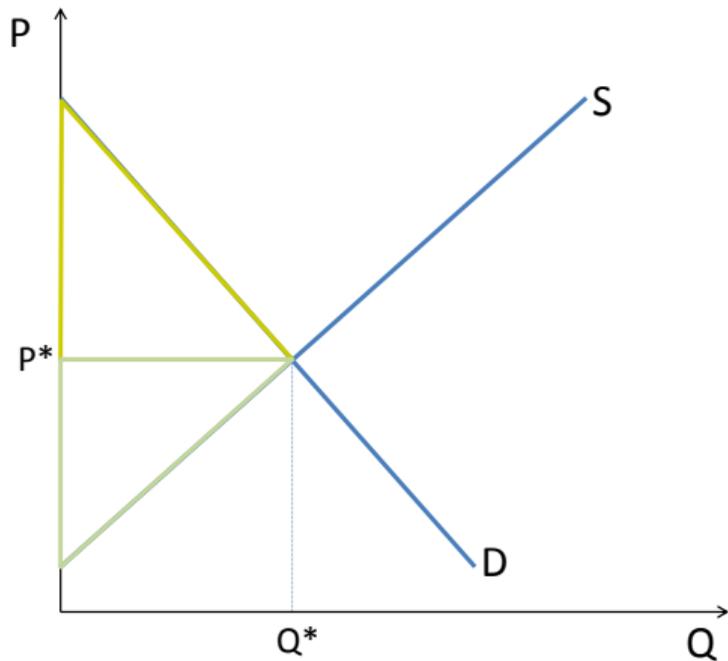
Graphing Impact of a Price Ceiling

Start with Market Equilibrium



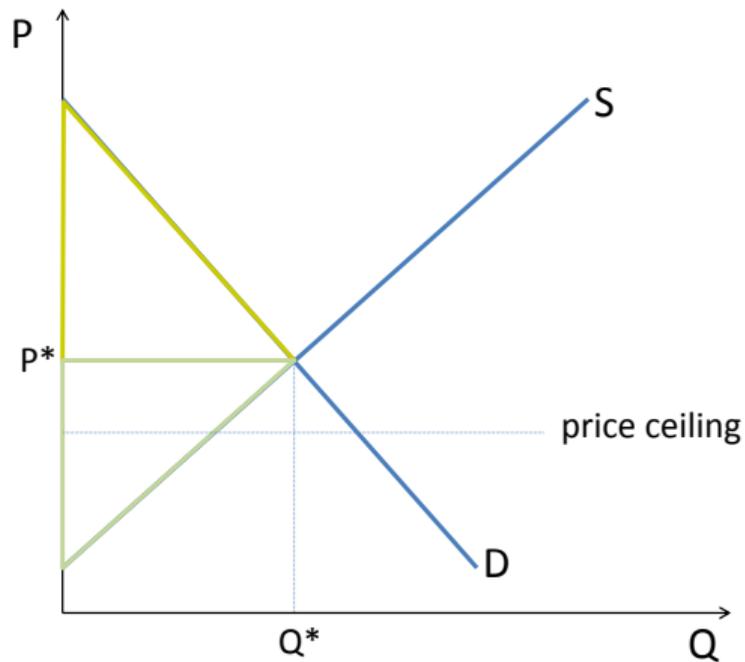
Graphing Impact of a Price Ceiling

Where is the Price Ceiling?



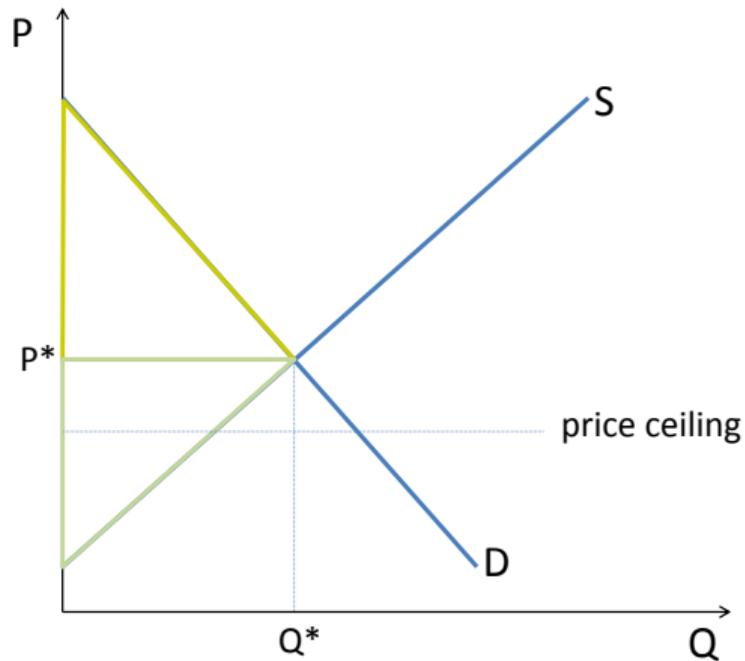
Graphing Impact of a Price Ceiling

Adding the Price Ceiling



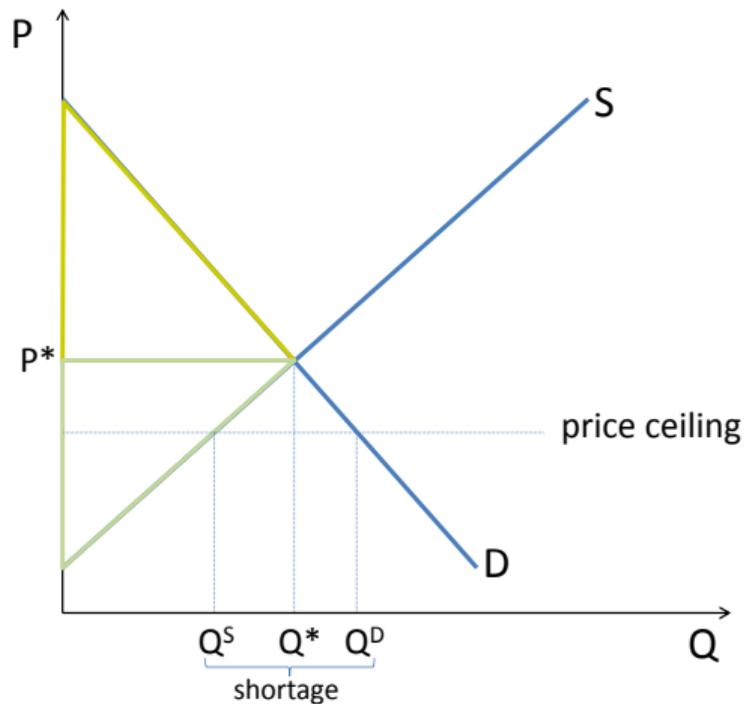
Graphing Impact of a Price Ceiling

Given the Price Ceiling, What Happens to Quantities?



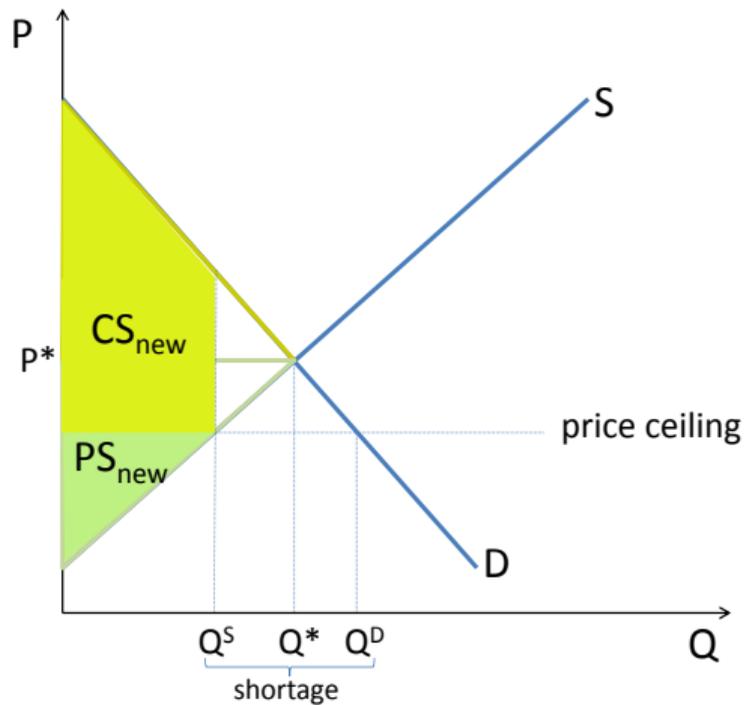
Graphing Impact of a Price Ceiling

Price Ceilings Cause Shortages



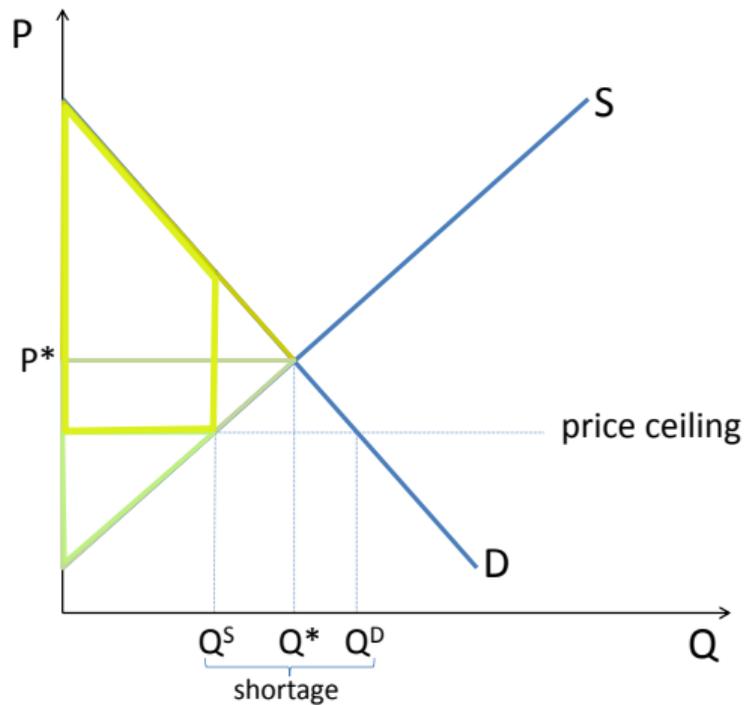
Graphing Impact of a Price Ceiling

Figuring Out the Difference



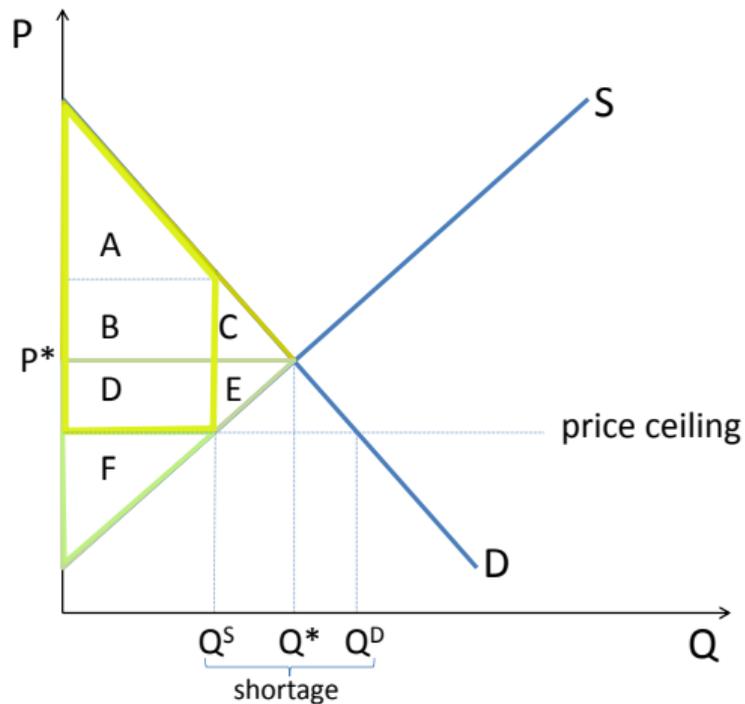
Graphing Impact of a Price Ceiling

Figuring Out the Difference

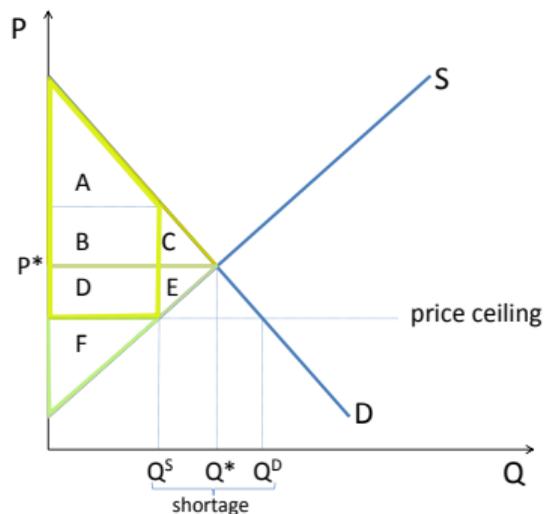


Graphing Impact of a Price Ceiling

Figuring Out the Difference

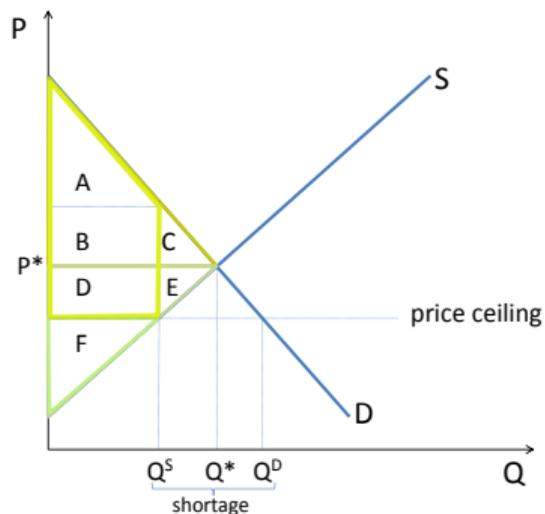


Figuring Out the Difference, Details



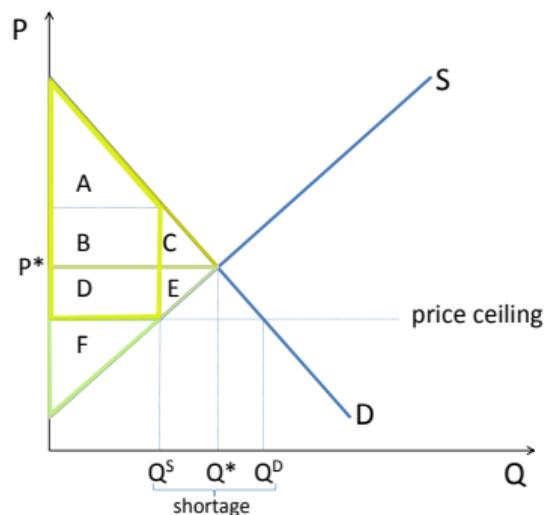
- Before
 - $CS = A + B + C$
 - $PS = D + E + F$
- After
 - $CS = A + B + D$
 - $PS =$

Figuring Out the Difference, Details



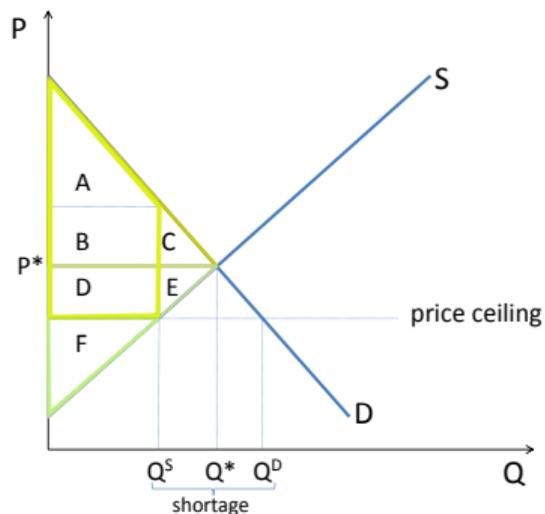
- Before
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Figuring Out the Difference, Details



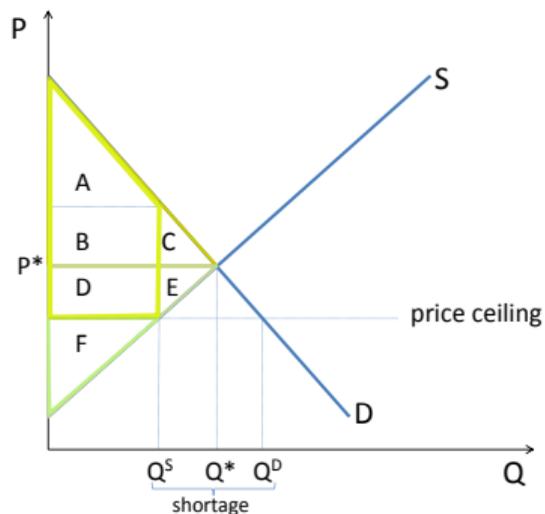
- Before
 - $CS = A + B + C$
 - $PS = D + E + F$
- After
 - $CS = A + B + D$
 - $PS = F$
- Difference
 - $\Delta CS =$

Figuring Out the Difference, Details



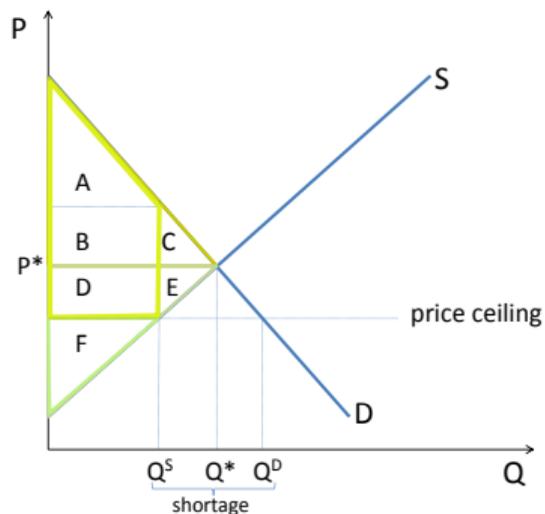
- Before
 - $CS = A + B + C$
 - $PS = D + E + F$
- After
 - $CS = A + B + D$
 - $PS = F$
- Difference
 - $\Delta CS = (A + B + D) - (A + B + C) = D - C$,
sign ambiguous
 - $\Delta PS =$

Figuring Out the Difference, Details



- Before
 - $CS = A + B + C$
 - $PS = D + E + F$
- After
 - $CS = A + B + D$
 - $PS = F$
- Difference
 - $\Delta CS = (A + B + D) - (A + B + C) = D - C$, sign ambiguous
 - $\Delta PS = F - (D + E + F) = -(D + E) < 0$
 - transfer from

Figuring Out the Difference, Details



- Before
 - $CS = A + B + C$
 - $PS = D + E + F$
- After
 - $CS = A + B + D$
 - $PS = F$
- Difference
 - $\Delta CS = (A + B + D) - (A + B + C) = D - C$, sign ambiguous
 - $\Delta PS = F - (D + E + F) = -(D + E) < 0$
 - transfer from producers to consumers is D

Deadweight Loss

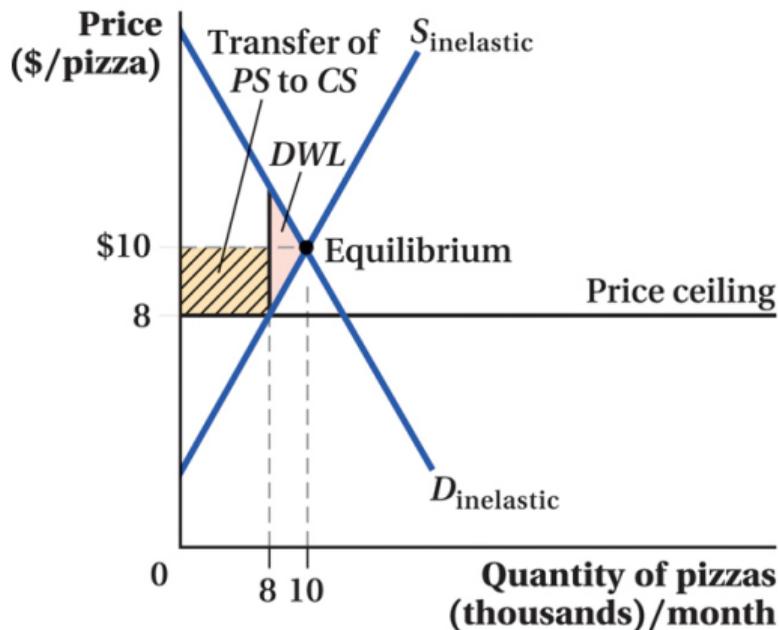
- Lost surplus from trades that fail to occur because of the policy
- Should be balanced against benefits from a policy

Deadweight Loss and Elasticities

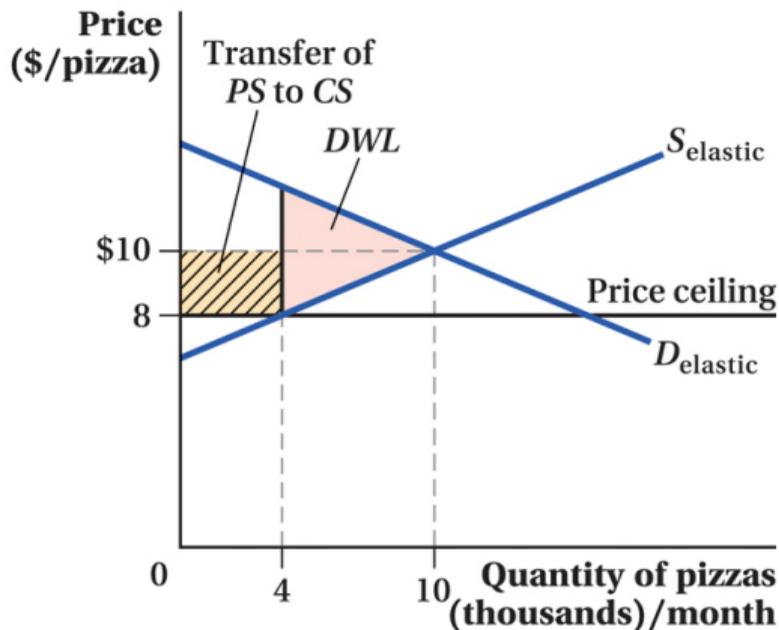
- Consider DWL size as a share of the transfer (D from our picture)
- Elasticities determine size of transfer and DWL
- Do we have a greater DWL in more or less elastic markets?

DWL Higher for More Elastic Demand and Supply

(a)



(b)



For Next Class

- Ripped from the Headlines
- Read GLS Chapter 3.1-3.3
- Use Numbers 2 of 2 due week after next