Lecture 2:
Using Supply and Demand to Analyze Markets

September 8, 2020

Overview

Course Administration

Ripped from the Headlines

In-Class Example

Elasticity, Briefly

Consumer and Producer Surplus

Price Regulations

Quantity Regulations

Course Administration

1. Reading quiz

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   - Make sure each lecture has someone before you double up – scroll down to see all lectures

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7. Using Numbers assignment 1 of 3

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7. Using Numbers assignment 1 of 3
8. Other administrative questions or issues?

Ripped From the Headlines

As a reminder, next week

Afternoon

Finder	Presenters
Blair Usedom	Tara Mayo-Pinnock

Evening

Finder	Presenters
Alexis Lewis	Dylan Desjardins
Danielle Angers	
Laura Brennan	

Lecture 2 Topics

- Consumer surplus
- Producer surplus
- Deadweight loss
- **Price regulations: floors and ceilings**
- Quantity regulations: quotas

Vanilla Price Controls

- Most of the world's vanilla is grown in Madagascar
- Since the 1890s when the French introduced it
- During the colonial era, French exporters capture most of the profits
- Think about supply shifters: How easily can vanilla producers switch into producing alternative goods?

Vanilla Price Regulation

First Republic, 1960 to 1972

- Government makes a Vanilla Stabilization Fund to purchase vanilla at a fixed price
- What is this – floor or ceiling?

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- When government price is above market price, the government holds onto the beans
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Second Republic, 1972 to 1995

- Socialist revolution
- Government still buys all the vanilla at a fixed price
- Market prices climb, but Madagascar price floor does not
- Other countries enter the vanilla market
- Government eventually buys four years' worth of beans to prop up prices
- Ends up burning 3/4 of vanilla bean stockpile

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All information is from here. And even more on vanilla in "Vanillanomics" here.

Now: In-Class Problems

- Do question 1 in break-out room
- I'll give you 8 minutes and the room will close
- I should be able to broadcast a message to you as needed
- You should be able to come back to the main room if you need
- We'll repeat this pattern as long as we have time

For Next Class

- Ripped from the Headlines
- Listen to Lecture 3
- Read GLS Chapter 2, Section 2.5
- Think about elasticity when you read the news

Lecture 2
Recorded Lecture Starts Here

Today: Using Supply and Demand to Analyze Markets

1. A tad bit of elasticity

Today: Using Supply and Demand to Analyze Markets

1. A tad bit of elasticity
2. Consumer and Producer Surplus
3. Price Regulations
4. Quantity Regulations
5. (skip in favor of later in depth coverage) Taxes
6. (skip) Subsidies

Elasticity

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- Elasticity measures the change in quantity for a given change in price
- Absolutely crucial for policy decisions

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- Absolutely crucial for policy decisions
- Health care reform: how do emergency room visits respond to health insurance expansion?
  - Consumers have cheaper emergency room substitutes
  - But the emergency room cost is also lower
  - How elastic is $Q^D_{\text{emergency room}}$? Does the elasticity change?
- Formally, percentage change in one value relative to percentage change in another

Elasticity

- $E \equiv$ percent change in quantity demanded divided by percent change in price

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

Perfectly Elastic and Inelastic Supply and Demand

Draw the usual supply and demand axes.

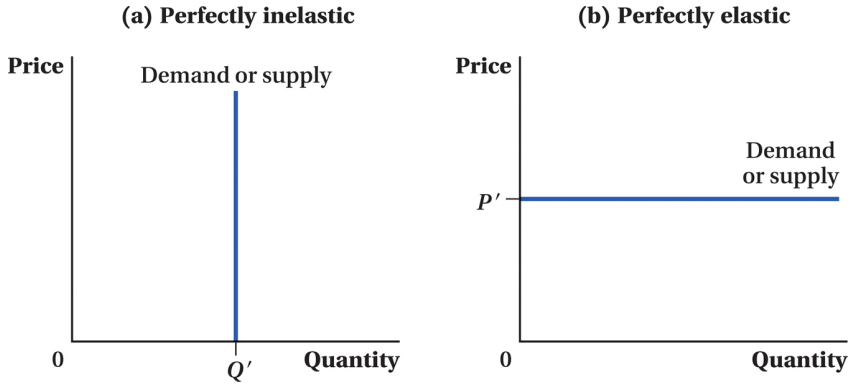
- If demand (or supply) is perfectly inelastic, what does the curve look like?

Perfectly Elastic and Inelastic Supply and Demand

Draw the usual supply and demand axes.

- If demand (or supply) is perfectly inelastic, what does the curve look like?
- If demand (or supply) is perfectly elastic, what does the curve look like?

Perfectly Elastic or Perfectly Inelastic Demand or Supply



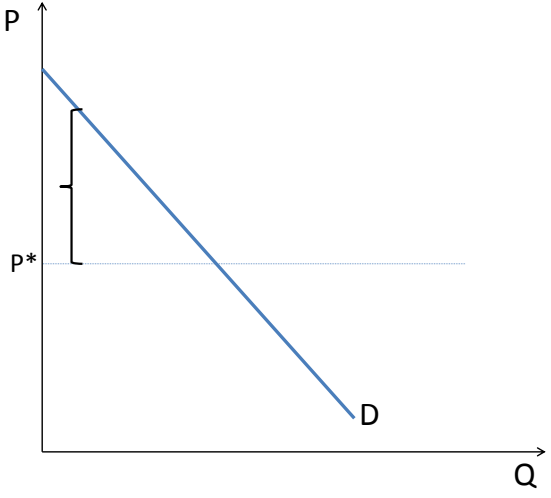
Consumer and Producer Surplus

Consumer Surplus

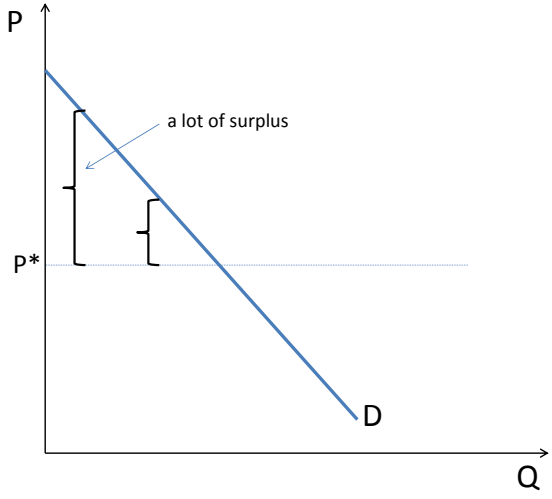
Consumer surplus $\equiv$ "difference between the amount consumers would be willing to pay for a good and the amount they actually have to pay"

Getting to Consumer Surplus

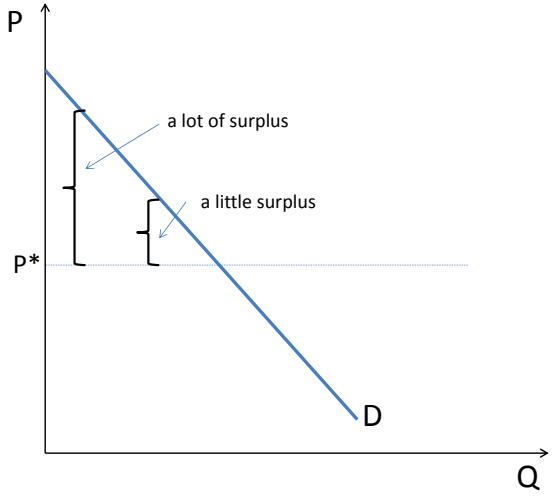
Is this a person with a little or a lot?



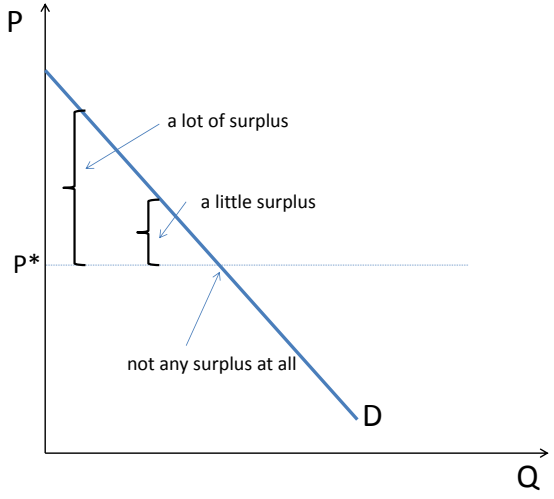
And this person?



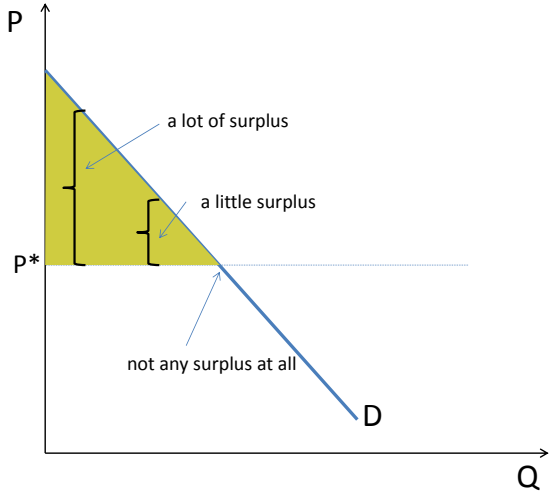
Where is Someone Without Surplus?



And Total Consumer Surplus?



The Whole Shebang of Consumer Surplus

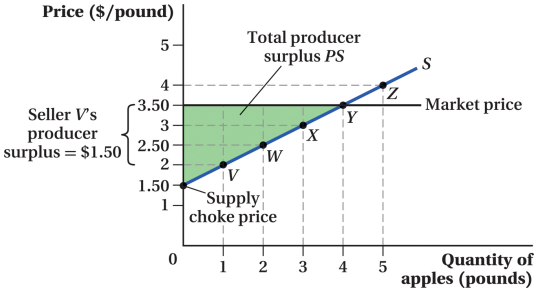


Identifying Consumer Surplus

- For what goods do you have a positive consumer surplus?
- For what 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 consumers benefits above the purchase price
- And supplier benefits below the purchase price

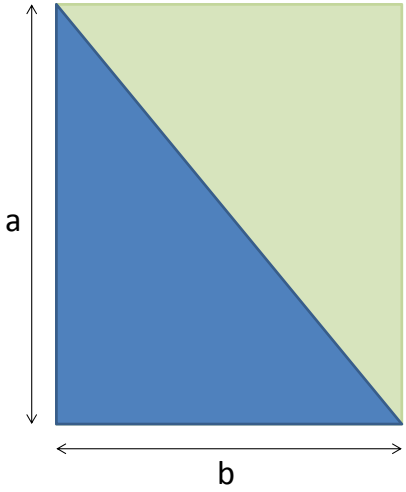
Understanding Consumer Surplus Key to Tech Profitability

- Maybe there is a little surplus unclaimed?
- Priceline.com founder said
  "In putting together an R&D laboratory [called Walker Digital], one of the problems we worked on was, how do you see the demand curve below the price of a product? All sellers of products in the modern economy sell by posting a retail price, or they negotiate a price on a market basis. Most prices are set by the seller. When the seller sets the price, there's a problem: They can't see how much demand there is below the dollar price they've set. We said, 'You know what? Could there be solutions in the new, modern age that would allow sellers to see the demand below the price line?' Hence the name of the company."

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

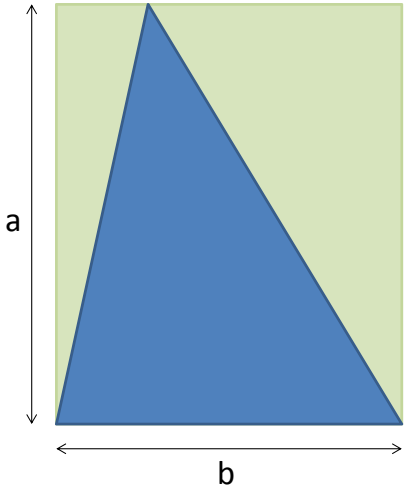
- How do shocks to supply or demand – which might be a function of policy choices – affect consumers and producers?
- We will analyze impact of decrease in supply
- You should be able to reason out an impact of an increase in supply, or changes in demand

Math Reminder: Area of a Triangle



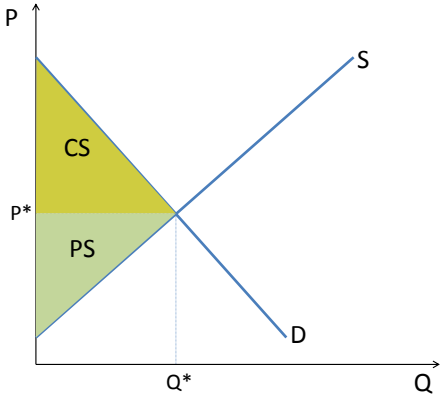
- Area of the triangle is $\frac{1}{2} * a * b$
- With linear supply and demand curves, you can find all the points on a triangle.
- We will always be working with linear demand and supply curves

What if it's Not a Right Triangle?



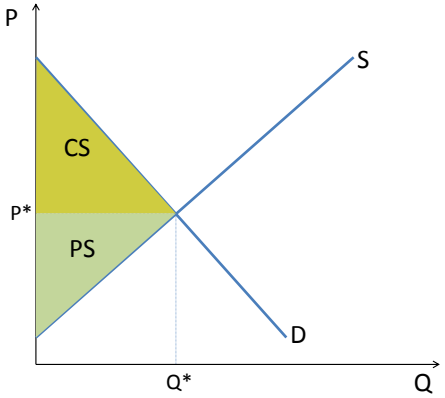
- What do you do?
- Still $\frac{1}{2} * a * b$

Finding All the Relevant Points



- (Q^*, P^*): Intersection of S and D
- Top of demand triangle?

Finding All the Relevant Points



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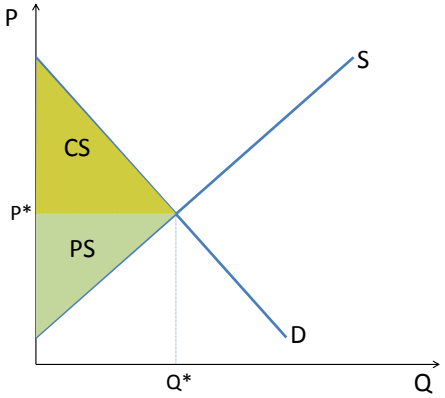
- Top of demand triangle? Solve for $Q = 0$ in demand curve: $(0, P_{Q_D=0})$
- Bottom of supply triangle?

Finding All the Relevant Points



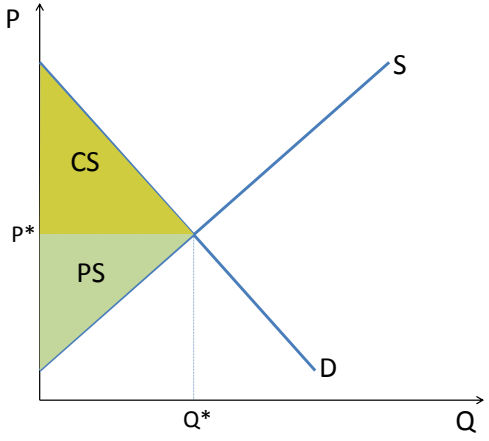
- (Q^*, P^*): Intersection of S and D
- Top of demand triangle? Solve for $Q = 0$ in demand curve: $(0, P_{Q_D=0})$
- Bottom of supply triangle? Solve for $Q = 0$ in supply curve: $(0, P_{Q_S=0})$

Analyze Impact of Decrease in Supply

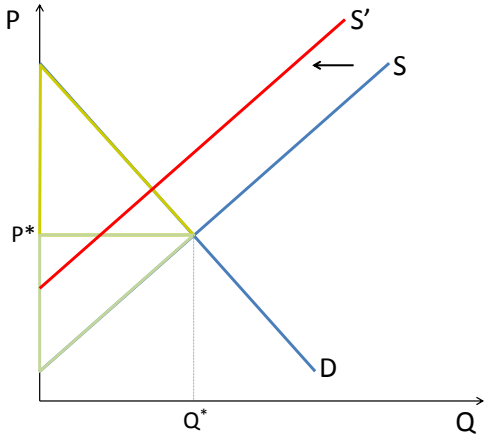
- Suppose it rains less in Cote d'Ivoire and chocolate production suffers
- We analyze the welfare consequences in the US chocolate market
- You can imagine using this framework for policy-induced shifts as well

Analyzing a Decrease in Supply

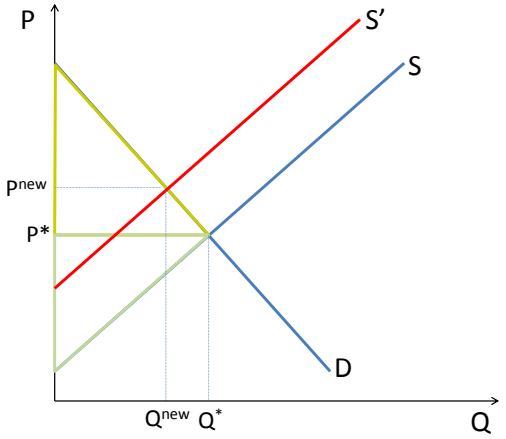
Initial Consumer and Producer Surplus



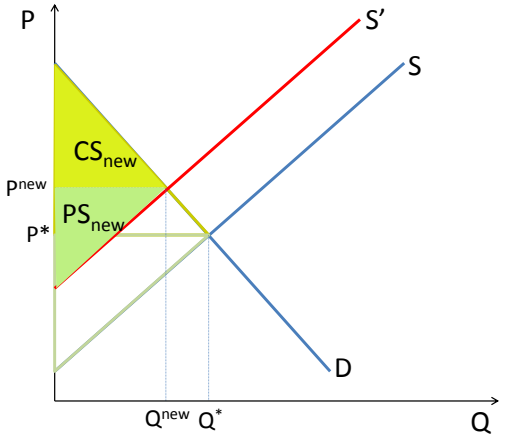
Supply Shifts Inward: What are P^{new} and Q^{new}?



Supply Shifts Inward: New CS and PS?



New Producer and Consumer Surplus



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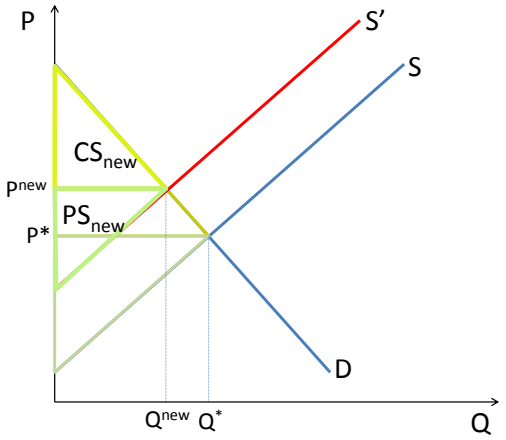
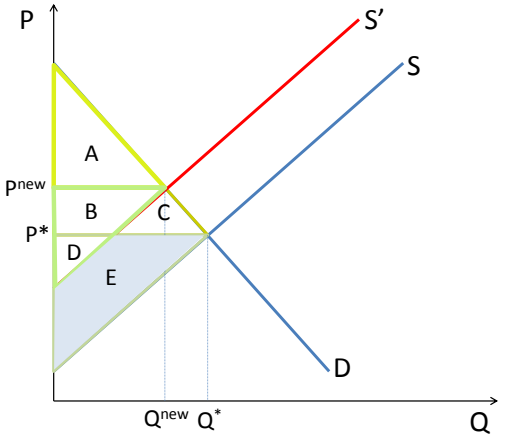
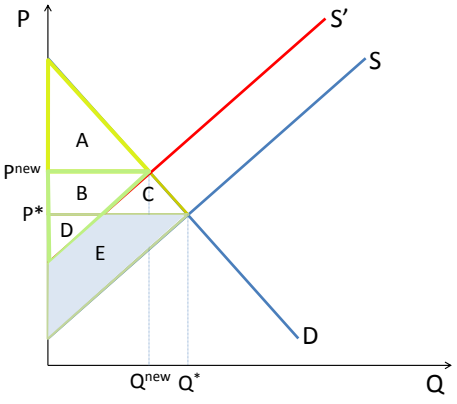


Figuring Out the Difference

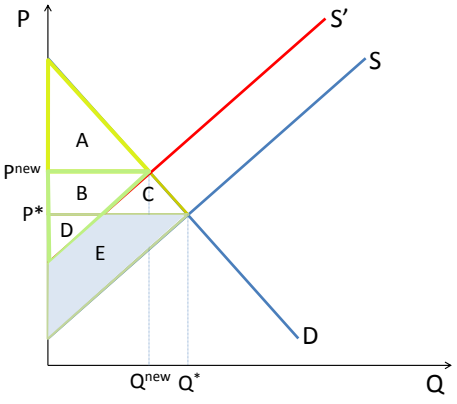


Figuring Out the Difference, Details



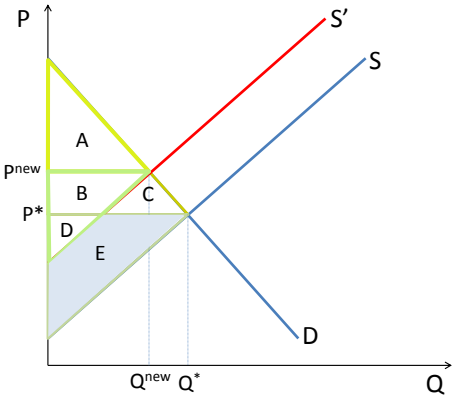
- Before
  - $CS =$

Figuring Out the Difference, Details



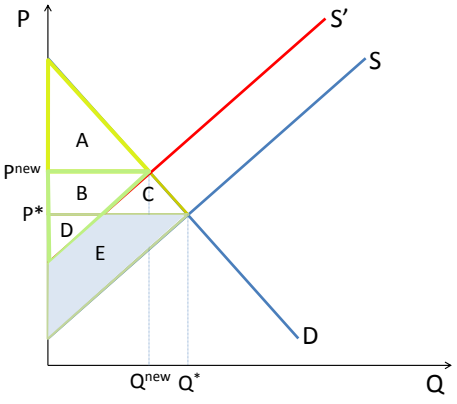
- Before
  - $CS = A + B + C$
  - $PS =$

Figuring Out the Difference, Details



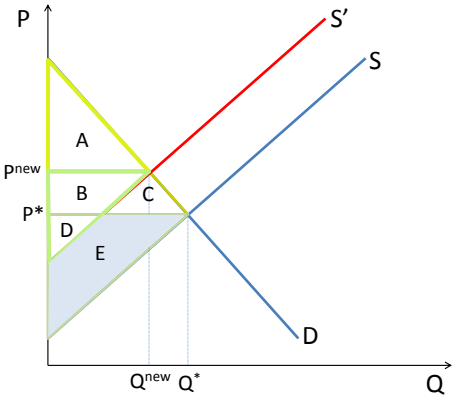
- Before
  - $CS = A + B + C$
  - $PS = D + E$

Figuring Out the Difference, Details



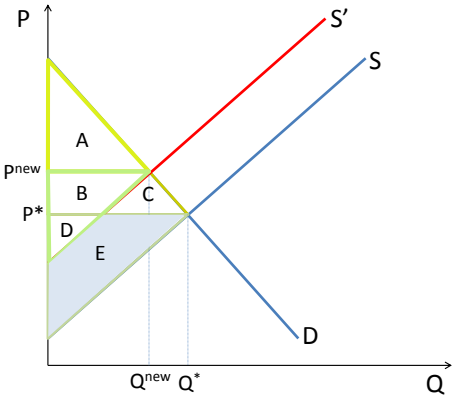
- Before
  - $CS = A + B + C$
  - $PS = D + E$
- After
  - $CS =$

Figuring Out the Difference, Details



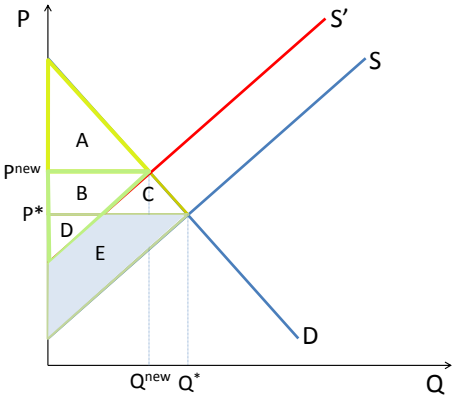
- Before
  - $CS = A + B + C$
  - $PS = D + E$
- After
  - $CS = A$
  - $PS =$

Figuring Out the Difference, Details



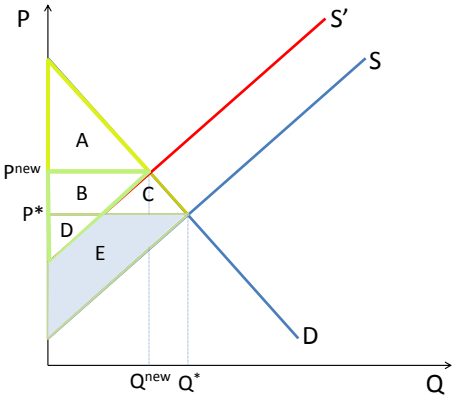
- Before
  - $CS = A + B + C$
  - $PS = D + E$
- After
  - $CS = A$
  - $PS = B + D$

Figuring Out the Difference, Details



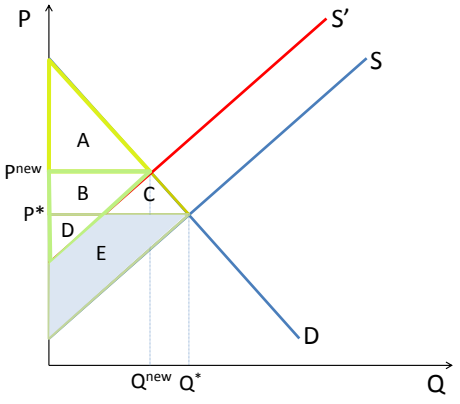
- Before
  - $CS = A + B + C$
  - $PS = D + E$
- After
  - $CS = A$
  - $PS = B + D$
- Difference
  - $\Delta CS =$

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

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"
2. Price Floor $\equiv$ a regulated "lowest lawful price for a good or service"

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

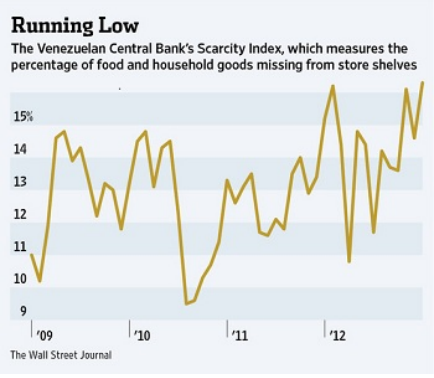
We assume $P_{ceiling} < P_{market}$. We'd like to know

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

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

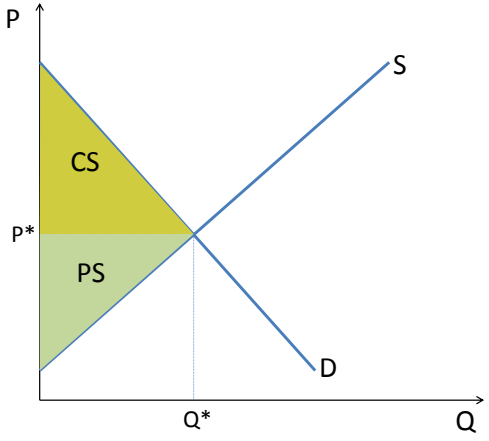
- Cottage cheese in Israel
  - in 2011, government removed price ceiling and prices spiked, leading to a revolt and a return of a ceiling
- Corn tortillas in Mexico
  - ceiling lifted in 1999, reimposed in 2007 amid soaring corn prices
- Other favorite examples?

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

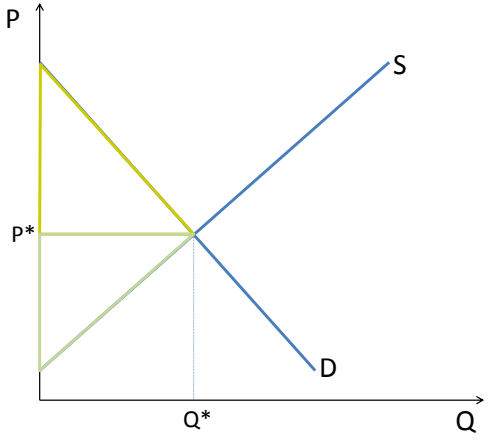
Graphing Impact of a Price Ceiling

Start with Market Equilibrium



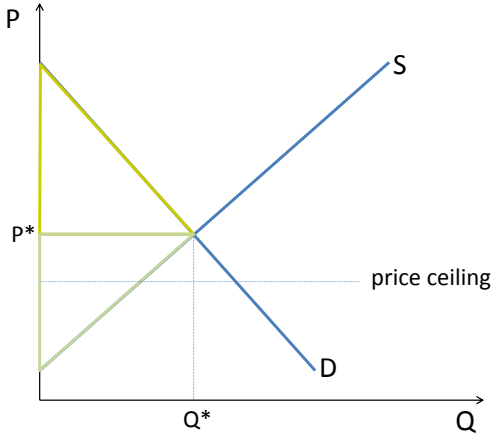
Graphing Impact of a Price Ceiling

Where is the Price Ceiling?



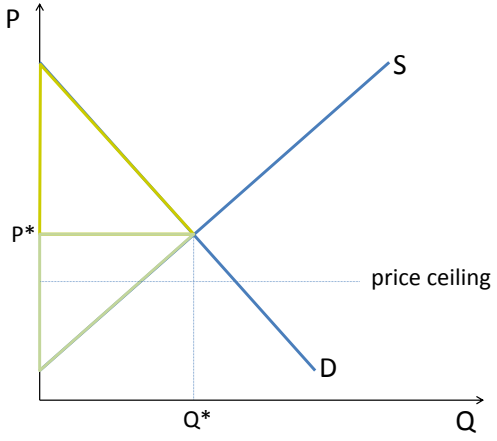
Graphing Impact of a Price Ceiling

Adding the Price Ceiling



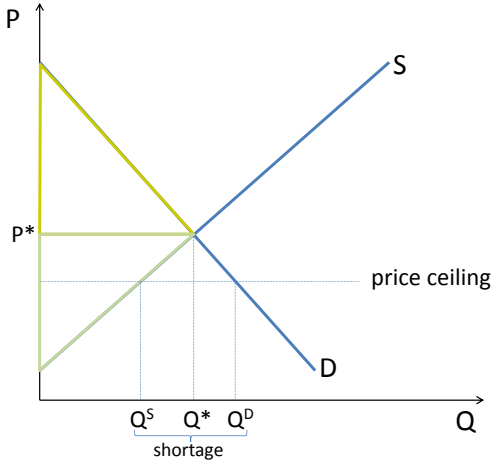
Graphing Impact of a Price Ceiling

Given the Price Ceiling, What Happens to Quantities?



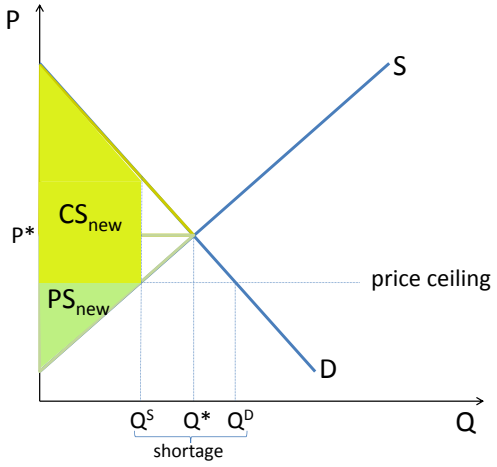
Graphing Impact of a Price Ceiling

Price Ceilings Cause Shortages



Graphing Impact of a Price Ceiling

Figuring Out the Difference



Graphing Impact of a Price Ceiling

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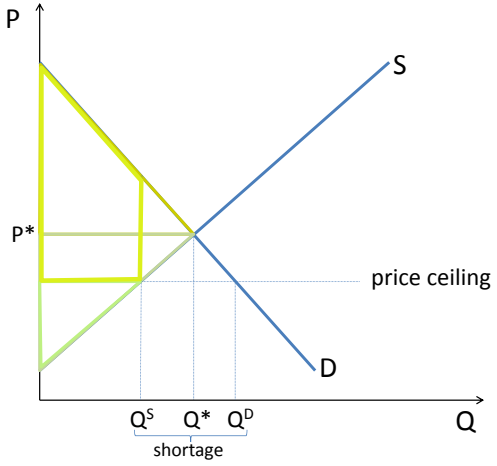
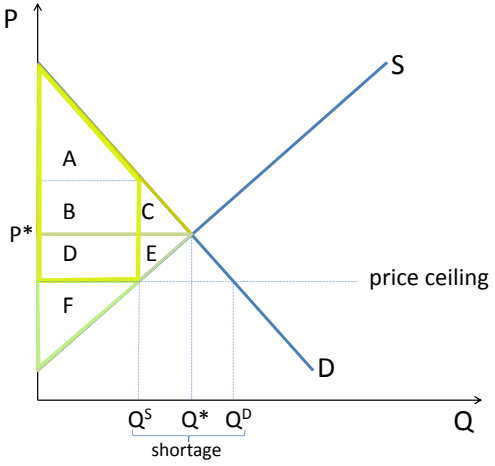
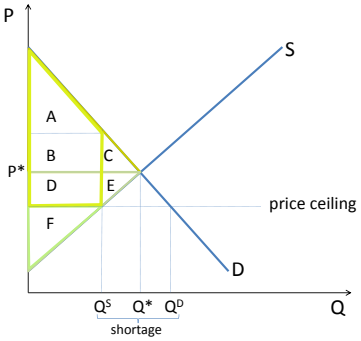


Graphing Impact of a Price Ceiling

Figuring Out the Difference

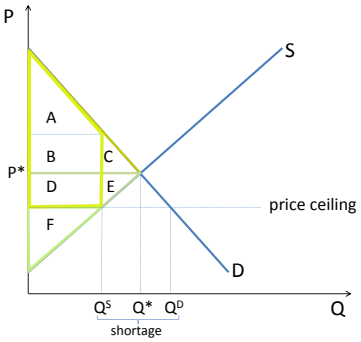


Figuring Out the Difference, Details



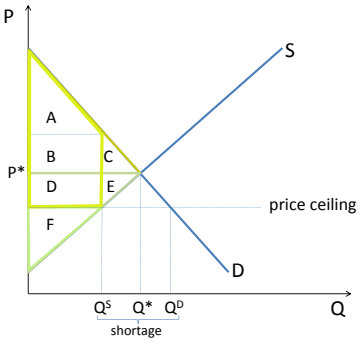
- Before
  - $CS =$

Figuring Out the Difference, Details



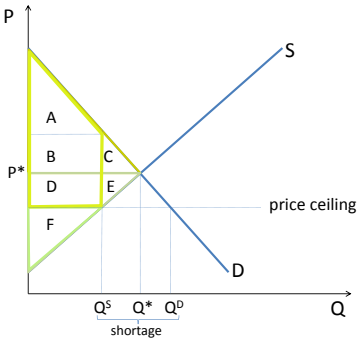
- Before
  - $CS = A + B + C$
  - $PS =$

Figuring Out the Difference, Details



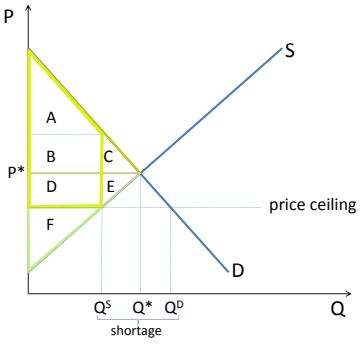
- Before
  - $CS = A + B + C$
  - $PS = D + E + F$

Figuring Out the Difference, Details



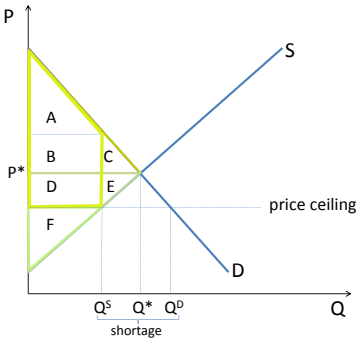
- Before
  - $CS = A + B + C$
  - $PS = D + E + F$
- After
  - $CS =$

Figuring Out the Difference, Details



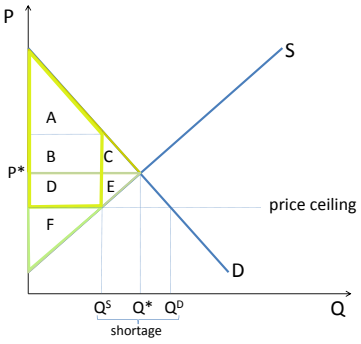
- Before
  - $CS = A + B + C$
  - $PS = D + E + F$
- After
  - $CS = A + B + D$
  - $PS =$

Figuring Out the Difference, Details



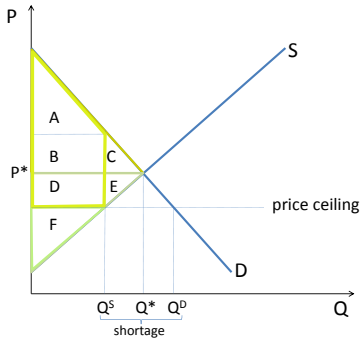
- Before
  - $CS = A + B + C$
  - $PS = D + E + F$
- After
  - $CS = A + B + D$
  - $PS = F$

Figuring Out the Difference, Details



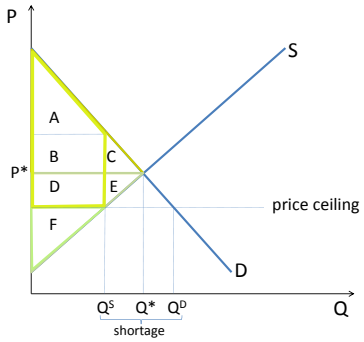
- Before
  - $CS = A + B + C$
  - $PS = D + E + F$
- After
  - $CS = A + B + D$
  - $PS = F$
- Difference
  - $\Delta CS =$

Figuring Out the Difference, Details



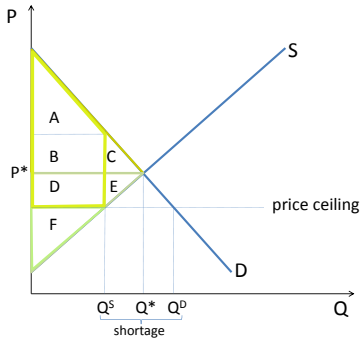
- Before
  - $CS = A + B + C$
  - $PS = D + E + F$
- After
  - $CS = A + B + D$
  - $PS = F$
- Difference
  - $\Delta CS = (A + B + D) - (A + B + C) = D - C$, sign ambiguous
  - $\Delta PS =$

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
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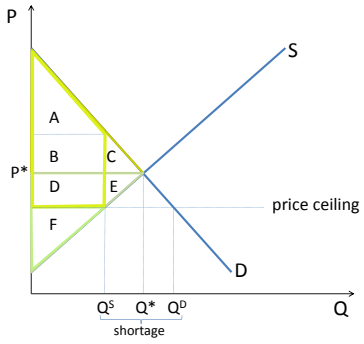
  - transfer from producers to consumers is

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
  - Note that nobody gets C or E after $\rightarrow$ trades that don't take place $\rightarrow$ DWL $= C + E$

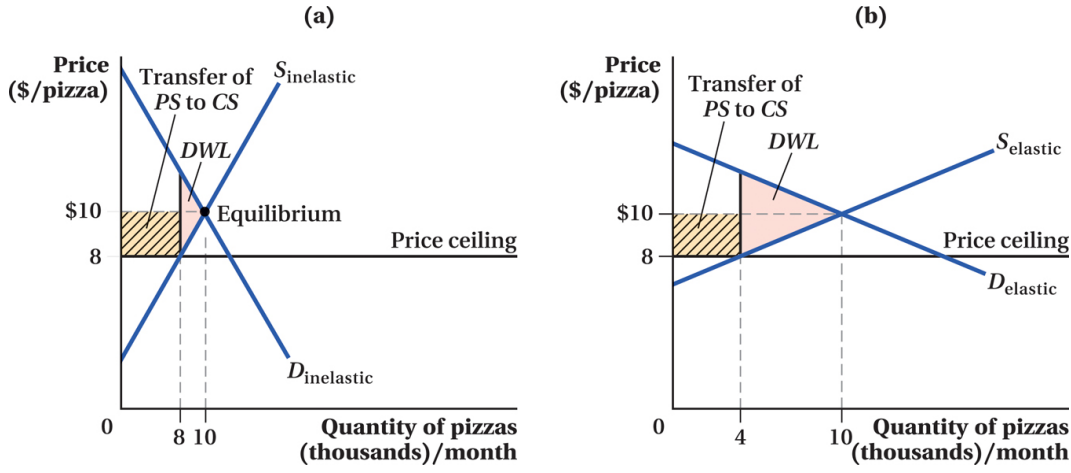
Deadweight Loss

- 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



Impact of Price Floors

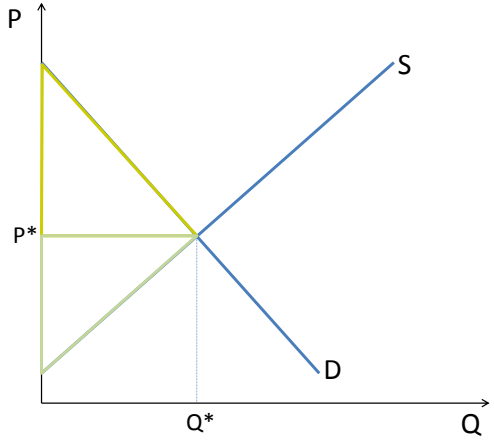
- Price floor $\equiv$ regulated "lowest lawful price for good or service"
- Generally rarer than price ceilings
- Examples?

Impact of Price Floors

- Price floor $\equiv$ regulated "lowest lawful price for good or service"
- Generally rarer than price ceilings
- Examples?
  - minimum wage
  - quite hard to come up with other good examples!

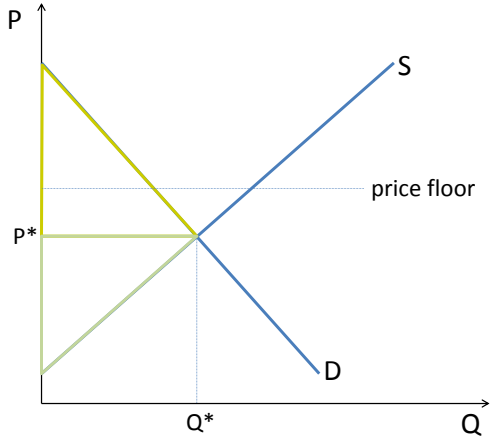
Graphing Impact of a Price Floor

Initial Equilibrium, No Floor: Where Does Price Floor Go?



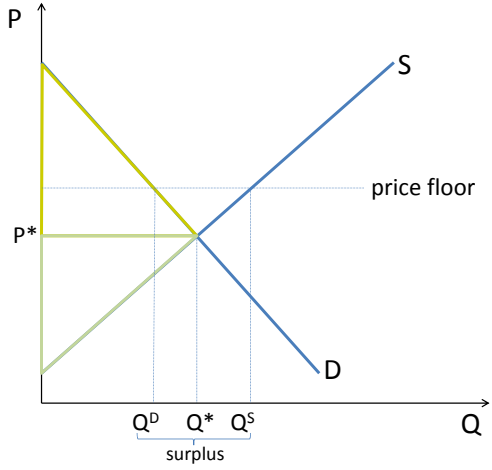
Graphing Impact of a Price Floor

What Are Q^S and Q^D?



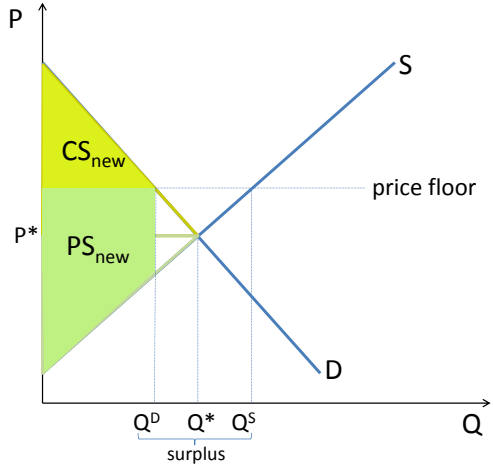
Graphing Impact of a Price Floor

Where are New PS and CS?

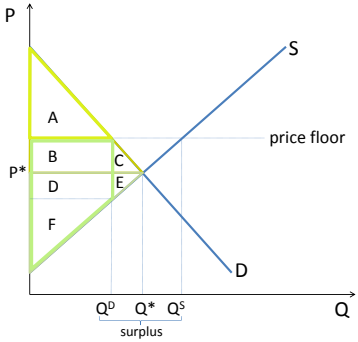


Graphing Impact of a Price Floor

Now, Compare to Old CS and PS

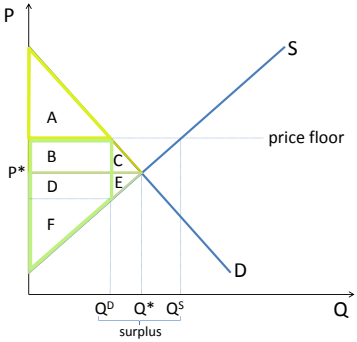


Figuring Out the Difference, Details



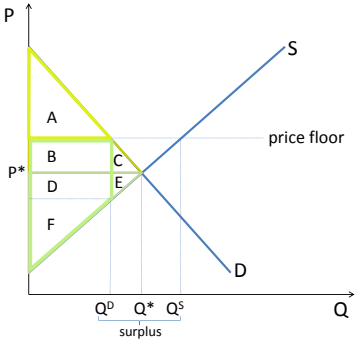
- Before
  - $CS =$

Figuring Out the Difference, Details



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

Figuring Out the Difference, Details



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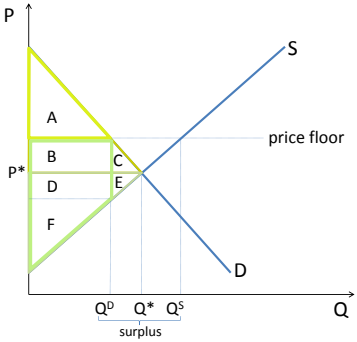
Figuring Out the Difference, Details



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  - $CS =$

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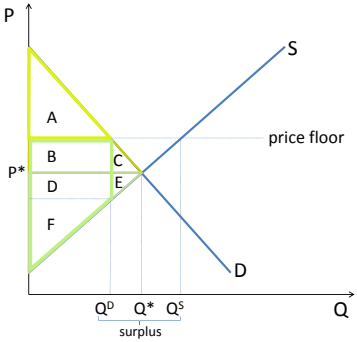

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- After
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  - $PS =$

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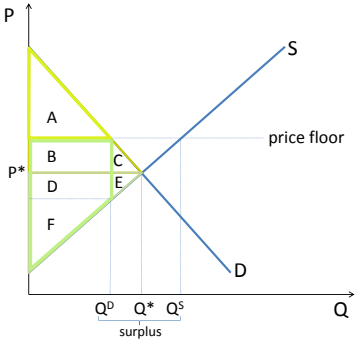

- Before
  - $CS = A + B + C$
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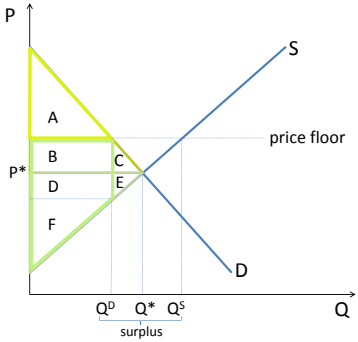
- After
  - $CS = A$
  - $PS = B + D + F$

Figuring Out the Difference, Details



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- After
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  - $PS = B + D + F$
- Difference
  - $\Delta CS =$

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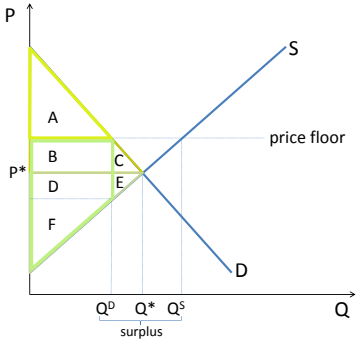

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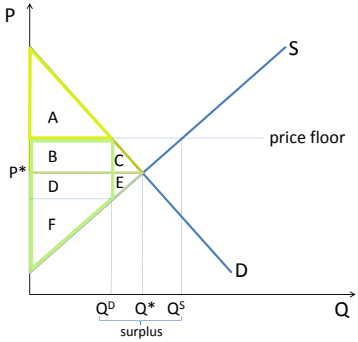

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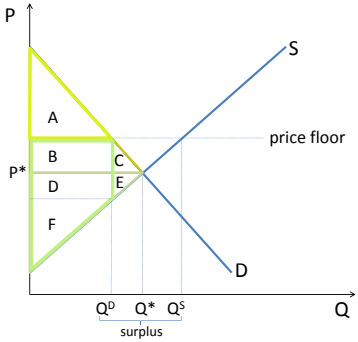

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- After
  - $CS = A$
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  - transfer from consumers to producers is

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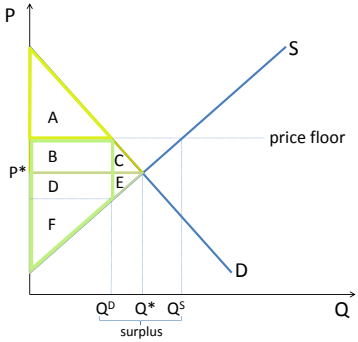

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  - Note that nobody gets C or E after $\rightarrow$ trades that don't take place $\rightarrow$ DWL $= C + E$

Quantity Regulations

Two Types of Quantity Regulations

We just looked at regulations on price. Now we consider regulations on quantity.

1. Quota $\equiv$ a regulated (almost always limited) "quantity of a good or service provided"
2. Government provision of a good or service (skip for time reasons)

Analyzing Quotas

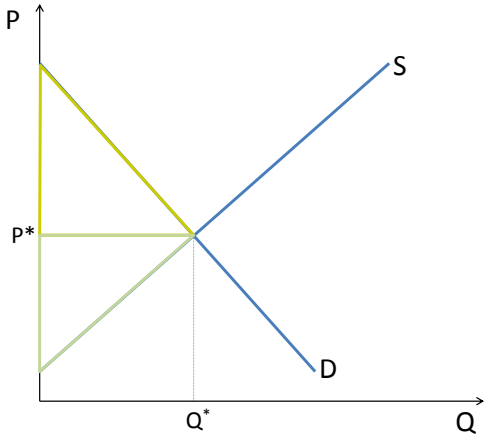
- Now we explore the impact of a quota on price
- Give an example of a market with quotas

Analyzing Quotas

- Now we explore the impact of a quota on price
- Give an example of a market with quotas
- See this Obama White House report on the perils of occupational licensing

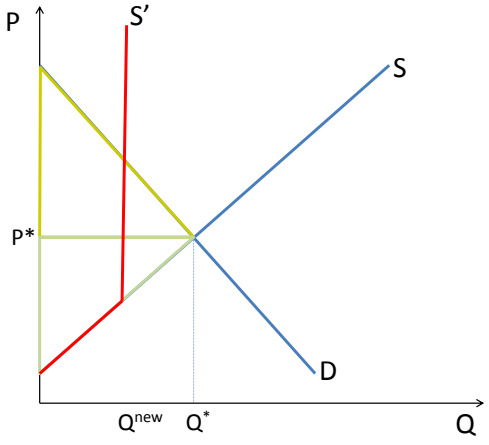
Quotas in Pictures

Market Equilibrium: How Does Supply Change with a Quota?



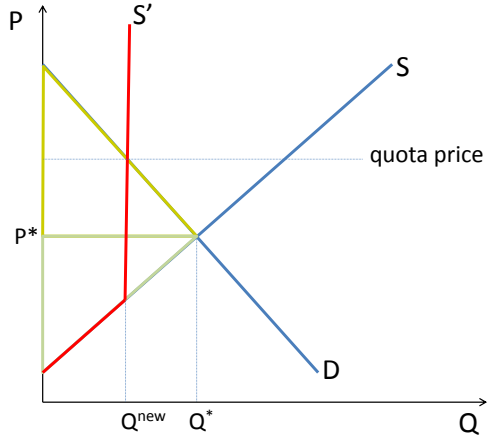
Quotas in Pictures

Supply with a Quota: What Happens to Price?



Quotas in Pictures

Supply with a Quota: What Happens to CS and PS?



Quotas in Pictures

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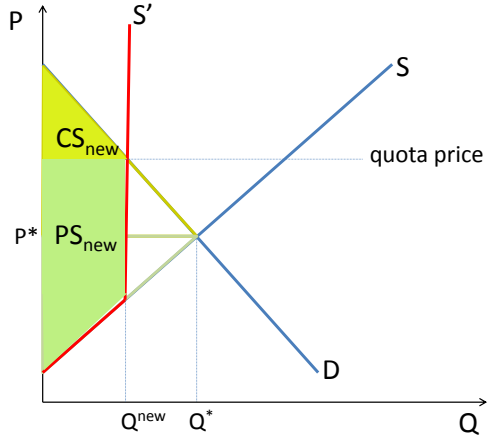
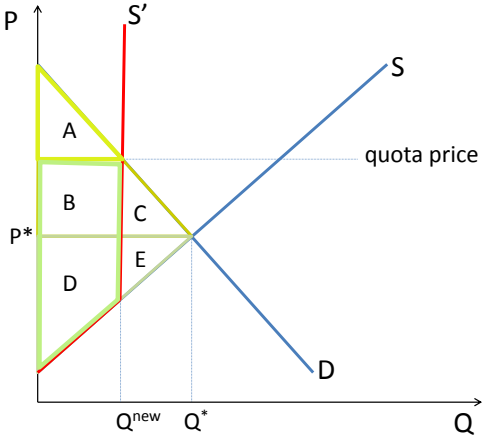
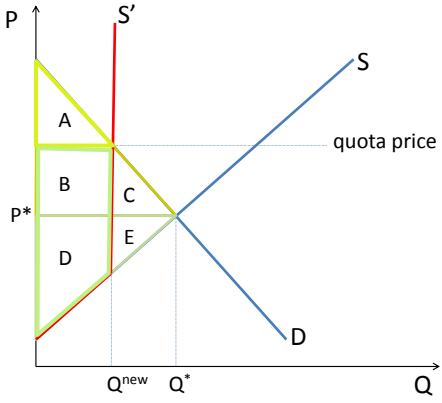


Quotas in Pictures

Figuring Out the Differences

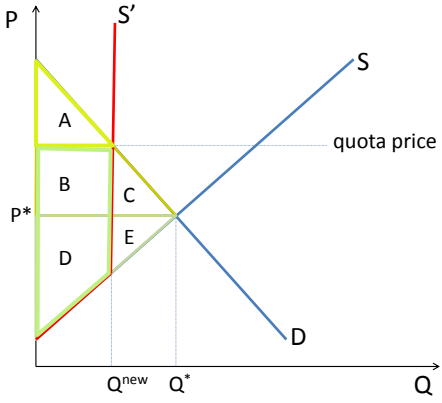


Figuring Out the Difference, Details



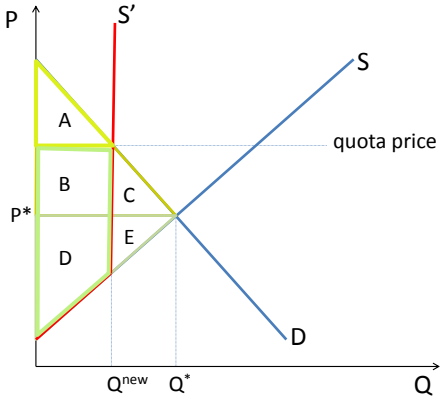
- Before
  - $CS =$

Figuring Out the Difference, Details



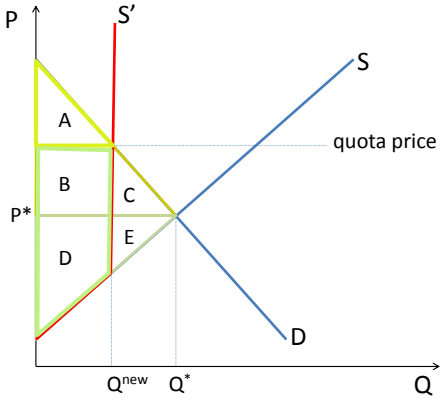
- Before
  - $CS = A + B + C$
  - $PS =$

Figuring Out the Difference, Details



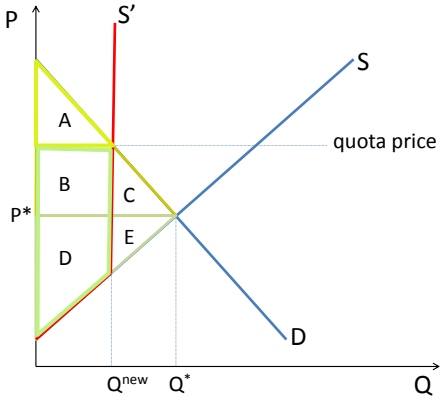
- Before
  - $CS = A + B + C$
  - $PS = D + E$

Figuring Out the Difference, Details



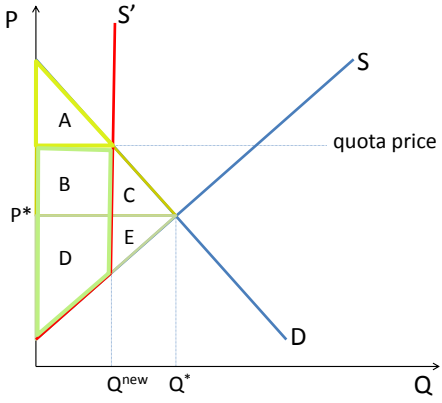
- Before
  - $CS = A + B + C$
  - $PS = D + E$
- After
  - $CS =$

Figuring Out the Difference, Details



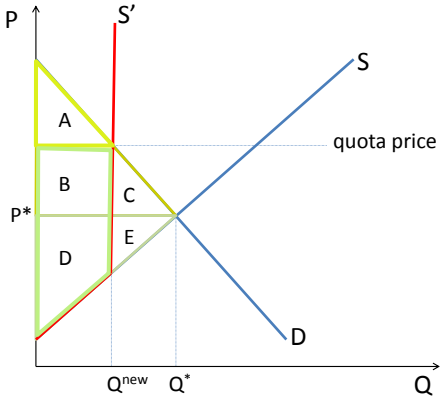
- Before
  - $CS = A + B + C$
  - $PS = D + E$
- After
  - $CS = A$
  - $PS =$

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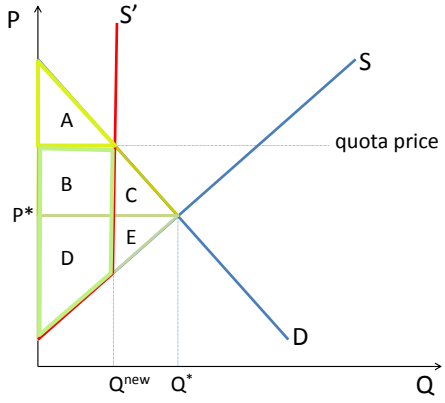
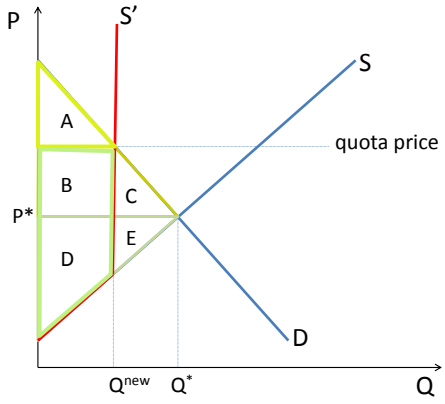
  - $PS = B + D$
- Difference
  - $\Delta CS =$

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



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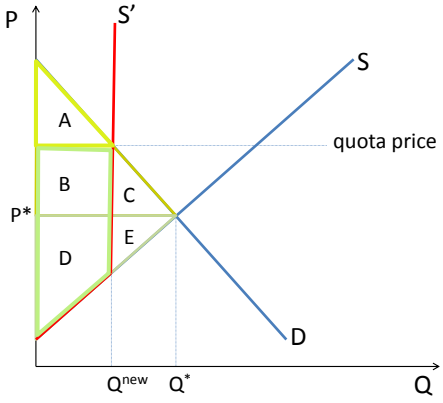
  - $PS = D + E$
- After
  - $CS = A$
  - $PS = B + D$
- Difference
  - $\Delta CS = A - (A + B + C) = -(B + C) < 0$
  - $\Delta PS = (B + D) - (D + E) = B - E$, sign ambiguous
  - transfer from

Figuring Out the Difference, Details



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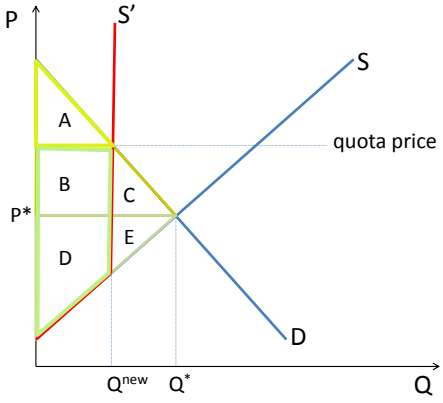
Figuring Out the Difference, Details



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  - $\Delta CS = A - (A + B + C) = -(B + C) < 0$
  - $\Delta PS = (B + D) - (D + E) = B - E$, sign ambiguous
  - transfer from consumers to producers is B
  - Note that nobody gets C or E after $\rightarrow$ trades that don't take place $\rightarrow$ DWL $= C + E$

Recap of Today

1. Elasticity Reprise
2. Producer and Consumer Surplus
   - Definitions
   - Impact of a decrease in supply on surplus
3. Price Regulations
   - Price ceilings
   - Price floors
4. Quantity Regulations
   - Quotas