Lecture 3:
Using Supply and Demand to Analyze Markets

September 12, 2023

Course Administration

1. If there are any Blackboard functions you'd like me to activate (chat room, discussion board), please let me know
2. Use Numbers 1 of 3 should be turned in
3. Problem Set 3 posted
4. Use Numbers 2 of 3 is posted
   - don't start the night before!
5. Other administrative questions or issues?

Ripped From the Headlines

As a reminder, next week

Finder	Presenters
Kari H.	Annie T.
Eric W.	Rebecca R. ** new

Today's Ripped From the Headlines

Finder	Presenters
Annie T.	Trevor Z.
Rebecca R.	Bridget M.

Today: Using Supply and Demand to Analyze Markets

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

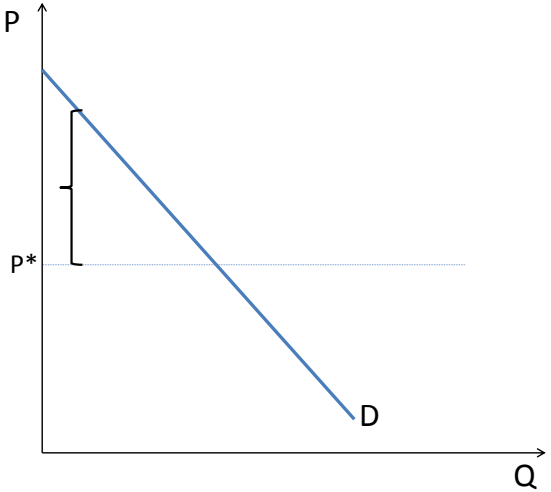
Consumer and Producer Surplus

Consumer Surplus

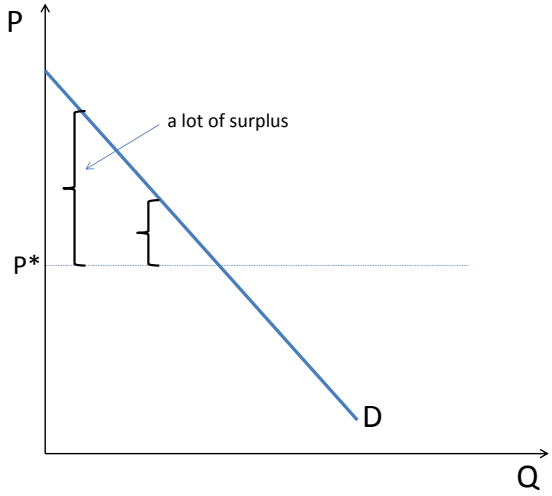
Consumer surplus $\equiv$ "difference between the amount consumers would be willing to pay for a good and the amount they actually have to pay"

Getting to Consumer Surplus

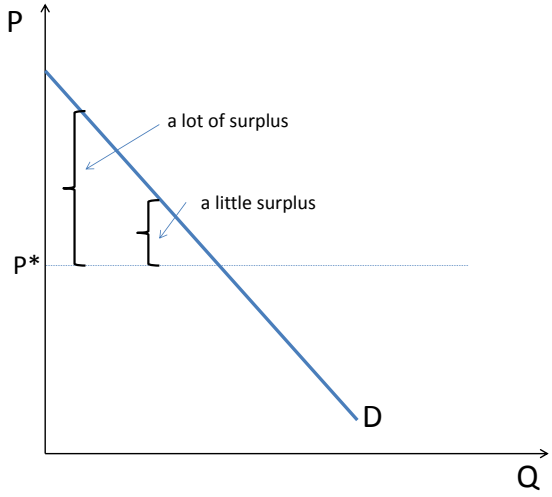
Is this a person with a little or a lot?



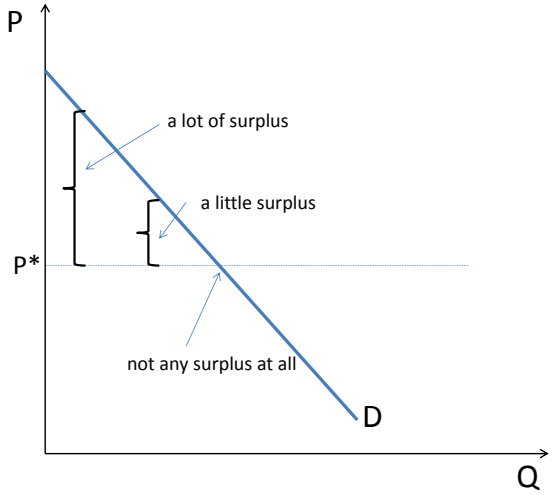
And this person?



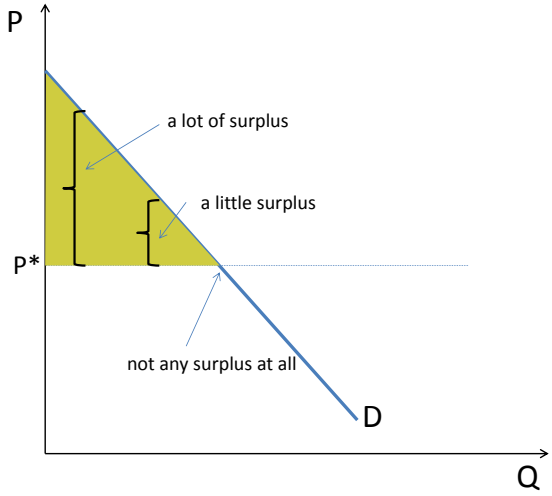
Where is Someone Without Surplus?



And Total Consumer Surplus?



The Whole Shebang of Consumer Surplus

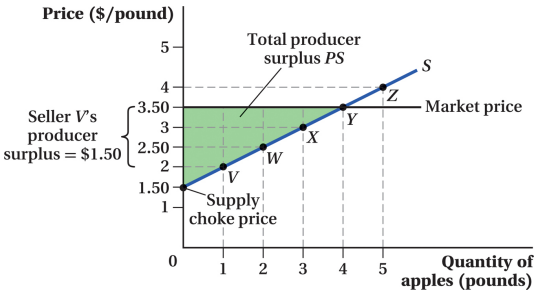


Identifying Consumer Surplus

- 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?



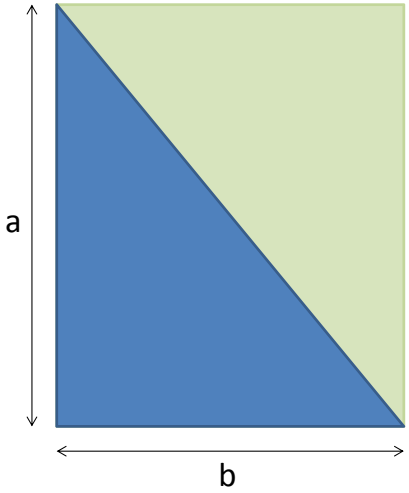
Why Should You Care About Surplus?

- 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

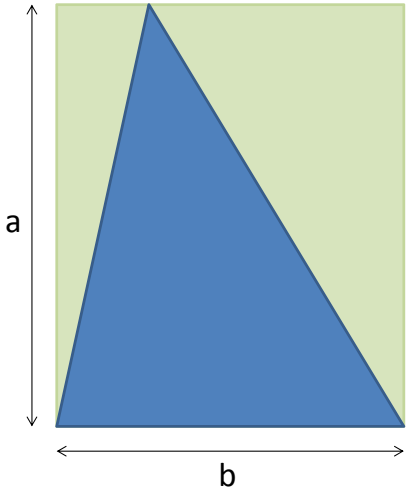
- How do shocks to supply or demand – which might be a function of policy choices – affect consumers and producers?
- We will analyze impact of decrease in supply
- You should be able to reason out an impact of an increase in supply, or changes in demand

Math Reminder: Area of a Triangle



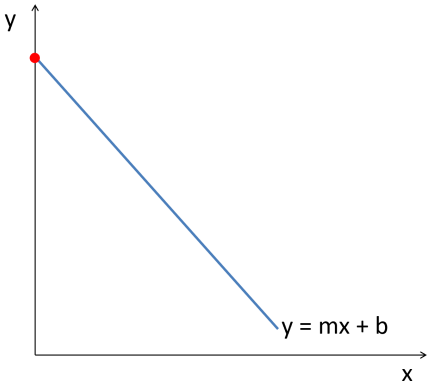
- Area of the triangle is $\frac{1}{2} * a * b$
- With linear supply and demand curves, you can find all the points on a triangle.
- We will always be working with linear demand and supply curves

What if it's Not a Right Triangle?



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

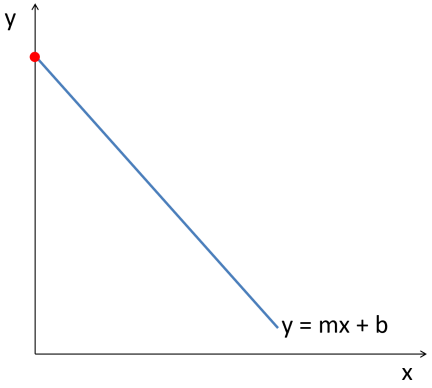
How to Find the Coordinates of the Intercept



- 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? $x = 0$
- How do we find y?

$$\begin{aligned} y &= mx + b \\ y &= m(0) + b \\ &= b \end{aligned}$$

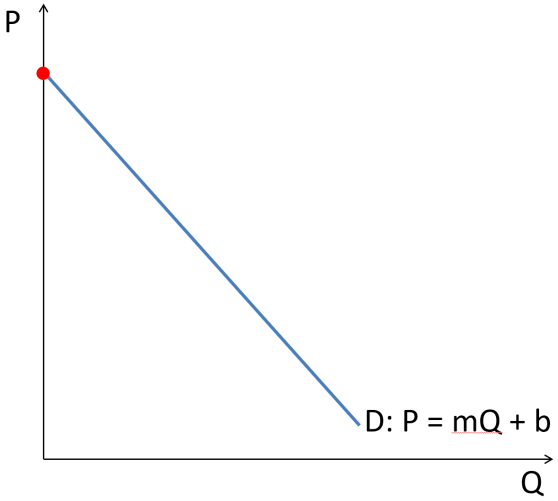
How to Find the Coordinates of the Intercept



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

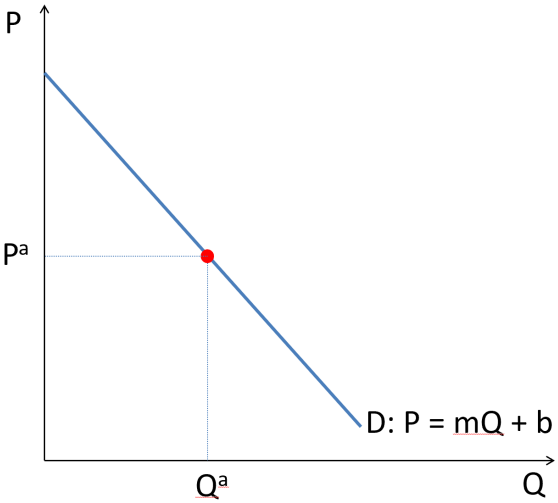
$$
\begin{aligned}
x &= \frac{1}{m}y - \frac{1}{m}b \\
0 &= \frac{1}{m}y - \frac{1}{m}b \\
-\frac{1}{m}y &= -\frac{1}{m}b \\
\frac{1}{m}y &= \frac{1}{m}b \\
y &= b
\end{aligned}
$$

Nothing Changes When 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?

$$\begin{aligned} P &= mQ + b \\ P^a &= mQ^a + b \end{aligned}$$

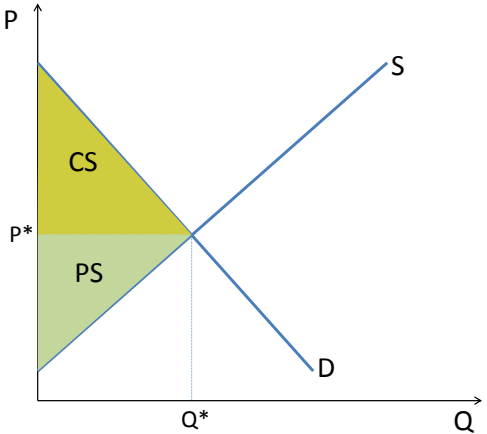
- Same logic for the supply curve

Analyze Impact of Decrease in Supply

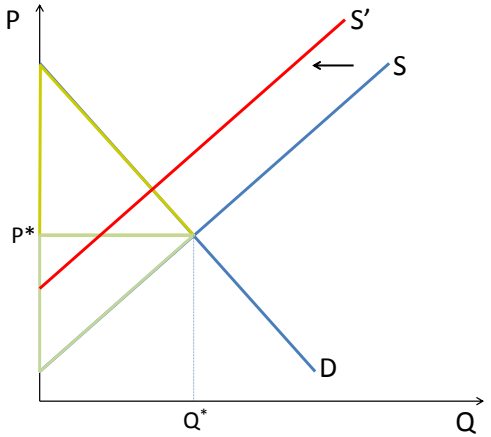
- Suppose it rains less in Cote d'Ivoire and chocolate production suffers
- We analyze the welfare consequences in the US chocolate market
- You can imagine using this framework for policy-induced shifts as well

Analyzing a Decrease in Supply

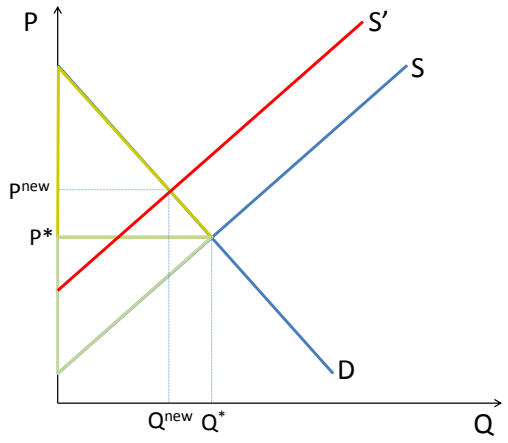
Initial Consumer and Producer Surplus



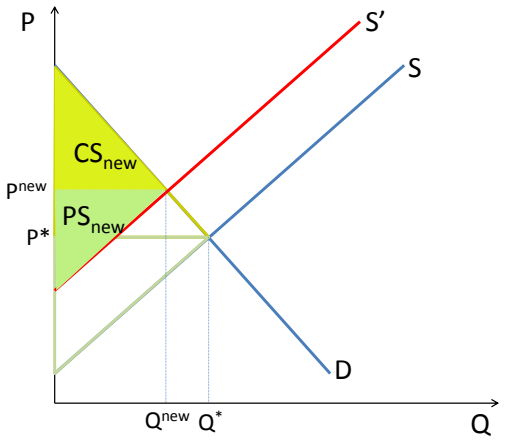
Supply Shifts Inward: What are P^{new} and Q^{new}?



Supply Shifts Inward: New CS and PS?



New Producer and Consumer Surplus



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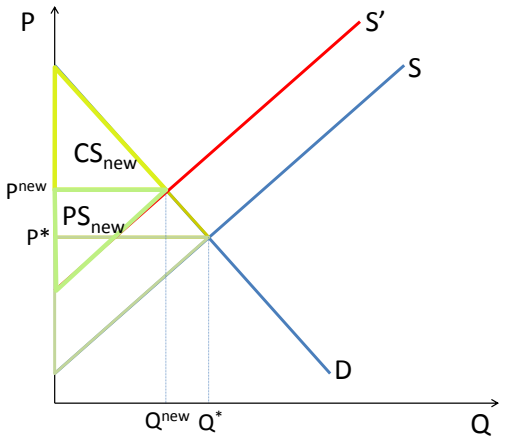
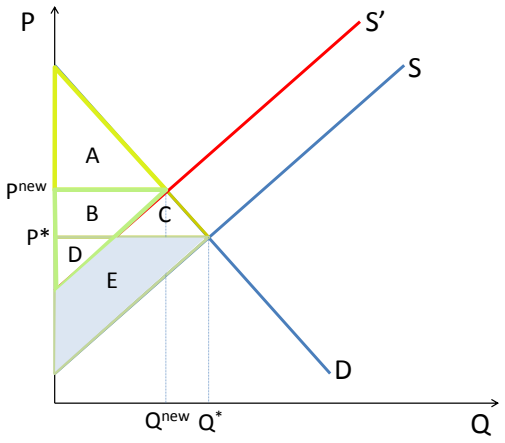
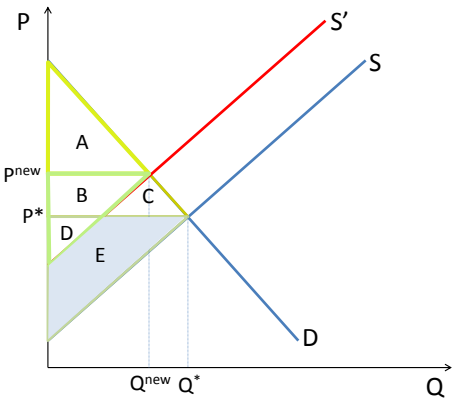


Figuring Out the Difference



Figuring Out the Difference, Details



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- 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
  - $\rightarrow$ consumer surplus

Use Numbers 1 of 3

Report Back on What You Found

- Oil
  - List three oil shocks, and classify as supply or demand
  - Be ready to explain why
  - Suggest impact on consumer or producer surplus
- One of the goods someone in your group chose
  - Choose a favorite shock to demand or supply
  - Be ready to explain why it is a demand or supply shock
  - Suggest impact on consumer or producer surplus

Oil Prices Over Time

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 distort market outcomes. Some trades that would occur in equilibrium do not occur.

Using Math to Understand Policy Implications

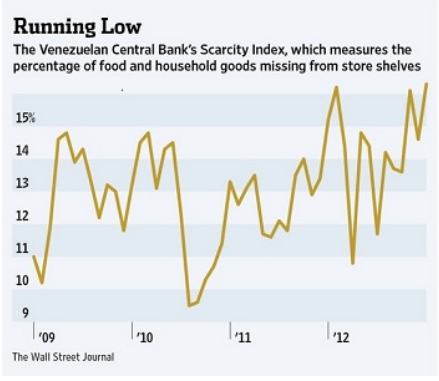
We assume $P_{ceiling} < P_{market}$. We'd like to know

- 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
- **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

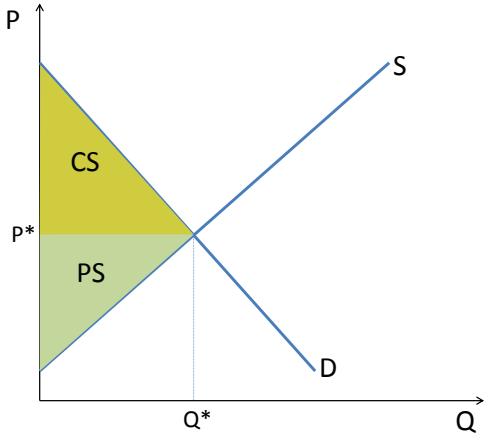
- Cottage cheese in Israel
  - in 2011, government removed price ceiling and prices spiked, leading to a revolt and a return of a ceiling
- Corn tortillas in Mexico
  - ceiling lifted in 1999, reimposed in 2007 amid soaring corn prices
- Other favorite examples?

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

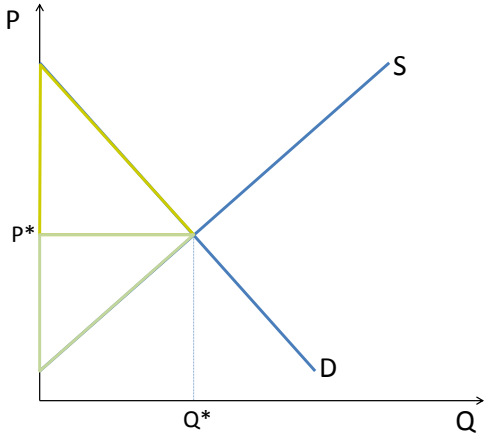
Graphing Impact of a Price Ceiling

Start with Market Equilibrium



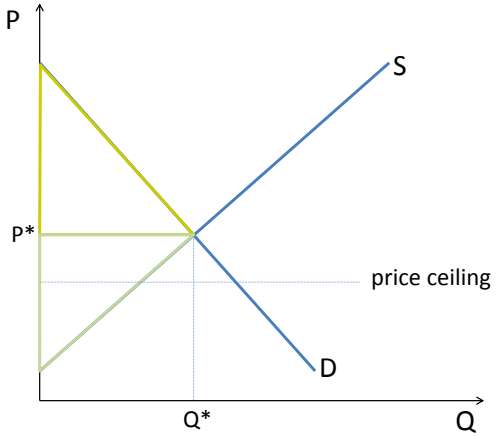
Graphing Impact of a Price Ceiling

Where is the Price Ceiling?



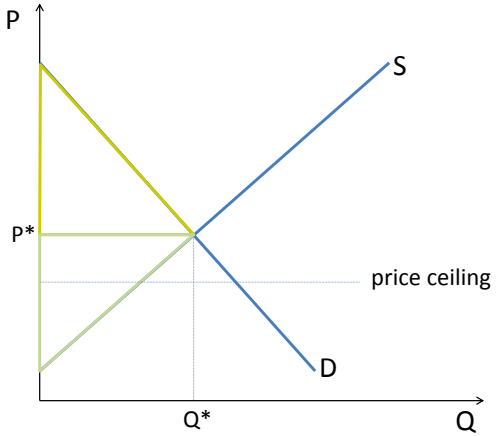
Graphing Impact of a Price Ceiling

Adding the Price Ceiling



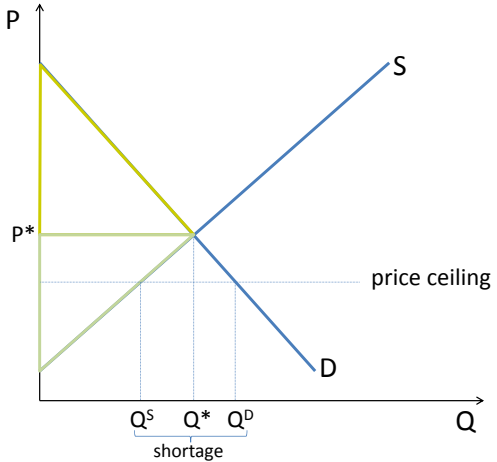
Graphing Impact of a Price Ceiling

Given the Price Ceiling, What Happens to Quantities?



Graphing Impact of a Price Ceiling

Price Ceilings Cause Shortages



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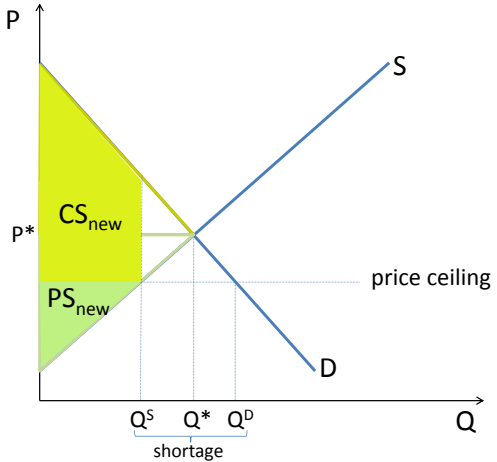
Figuring Out the Difference



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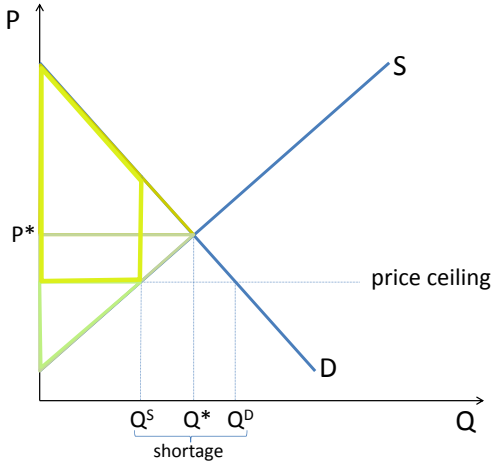

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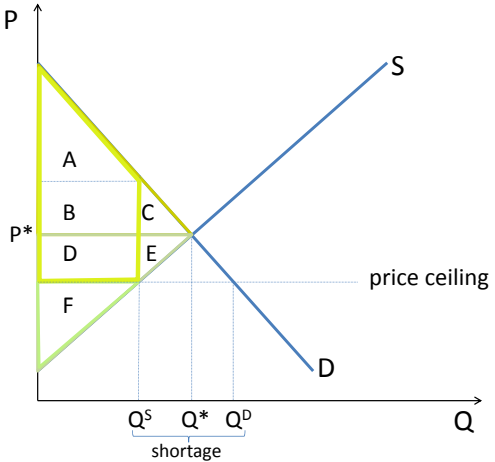

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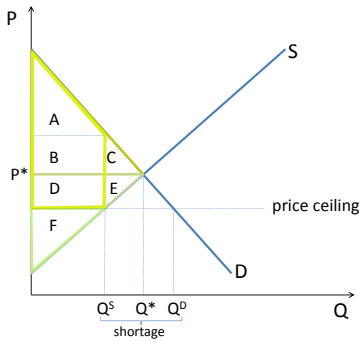

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  - $\Delta PS = F - (D + E + F) = -(D + E) < 0$
  - transfer from producers to consumers is D
  - Note that nobody gets C or E after $\rightarrow$ trades that don't take place $\rightarrow$ DWL $= C + E$

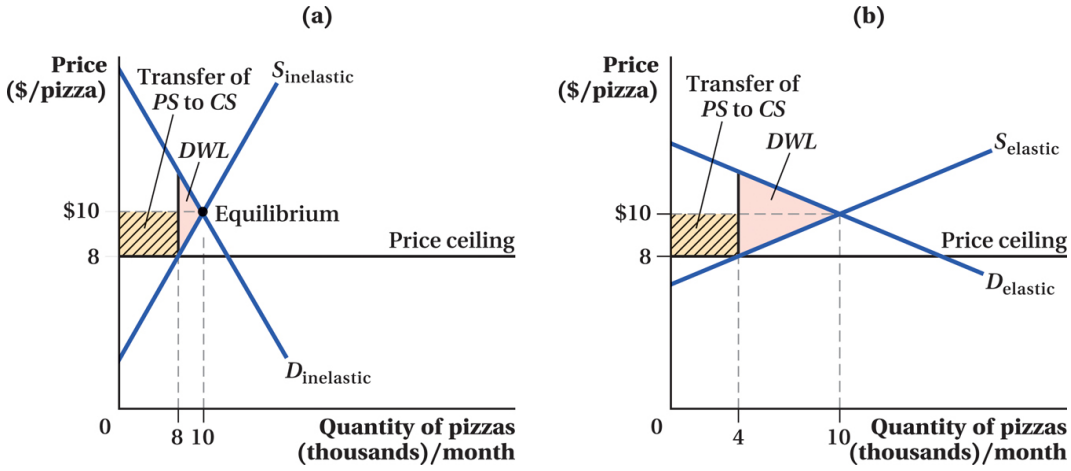
Deadweight Loss

- 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

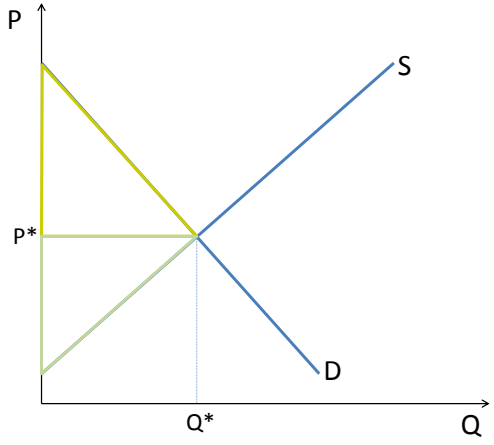


Impact of Price Floors

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

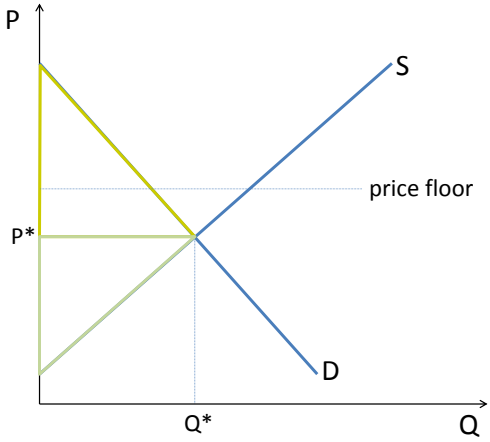
Graphing Impact of a Price Floor

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



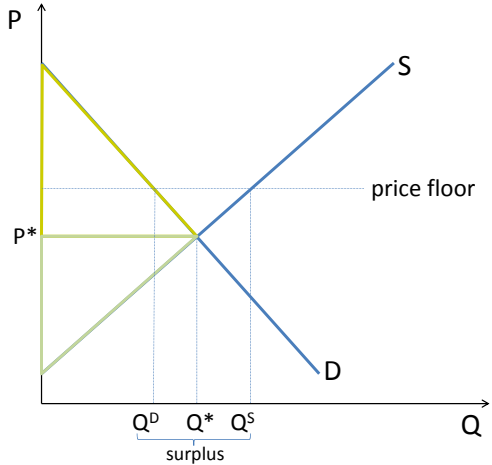
Graphing Impact of a Price Floor

What Are Q^S and Q^D?



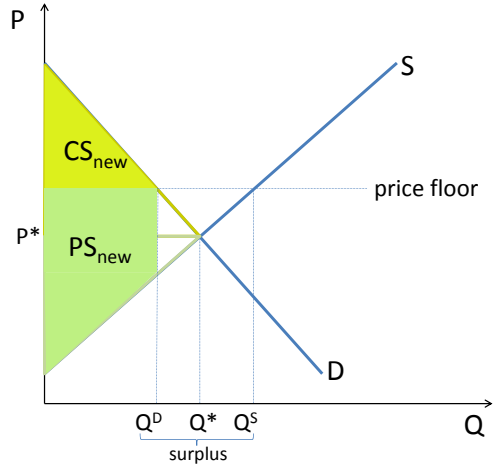
Graphing Impact of a Price Floor

Where are New PS and CS?

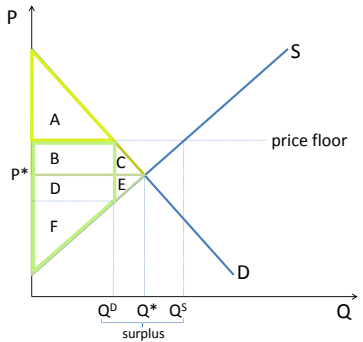


Graphing Impact of a Price Floor

Now, Compare to Old CS and PS



Figuring Out the Difference, Details



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Example: 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 elasticity: 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?
- When government price is above world market price, the government holds onto the beans
- When government price is below world market price, the government sells beans

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, prices fall
- Government eventually buys four years' worth of beans to prop up prices
- Ends up burning 3/4 of vanilla bean stockpile

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

Quantity Regulations

Two Types of Quantity Regulations

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

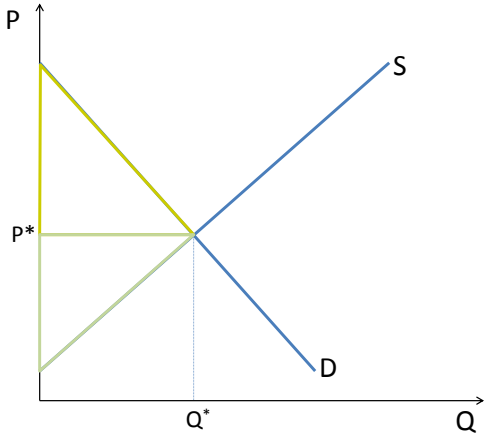
1. Quota $\equiv$ a regulated (almost always limited) "quantity of a good or service provided"
2. Government provision of a good or service (skip for time reasons)

Analyzing Quotas

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

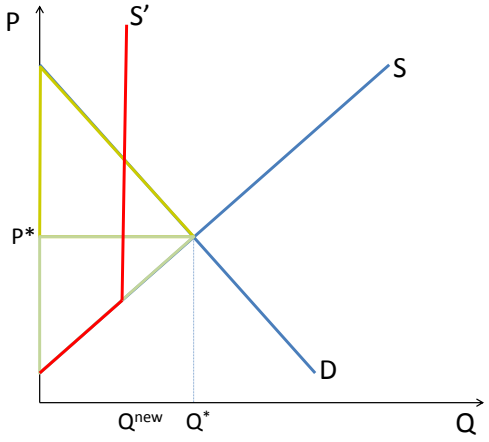
Quotas in Pictures

Market Equilibrium: How Does Supply Change with a Quota?



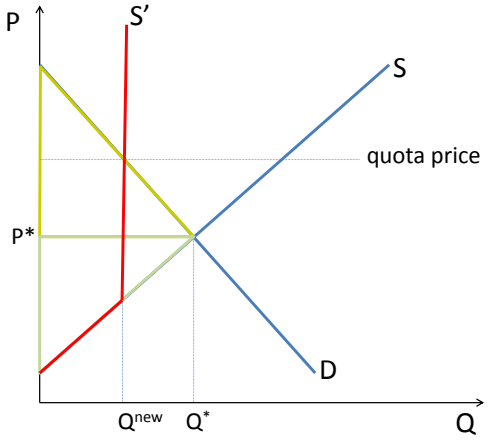
Quotas in Pictures

Supply with a Quota: What Happens to Price?



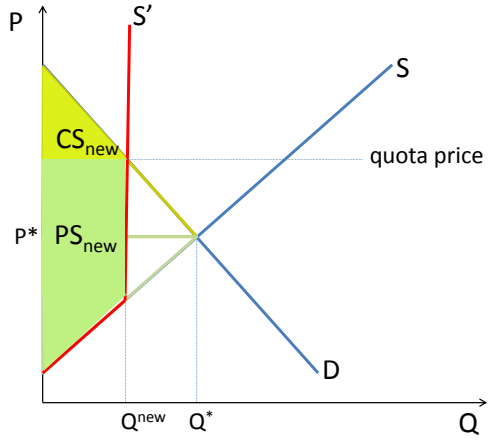
Quotas in Pictures

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



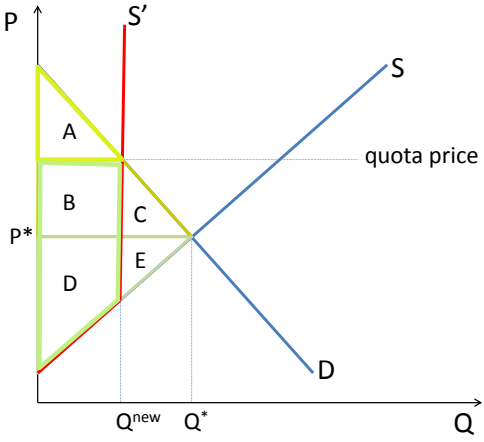
Quotas in Pictures

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

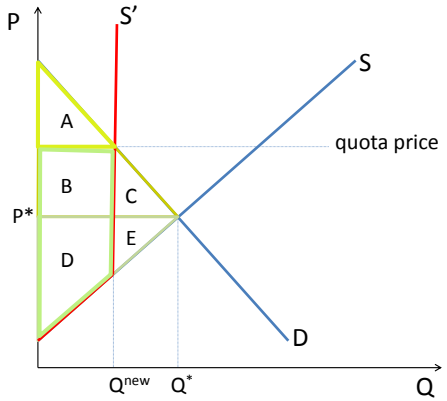


Quotas in Pictures

Figuring Out the Differences



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

For Next Class

- Ripped from the Headlines
- Read GLS Chapter 4
- Use Numbers 2 of 3 due week after next