Econ 1101
Spring 2013
Week 4

Section 038

2/13/2013

Announcements

- Aplia experiment: 7 different times. Only need to participate in one to get bonus points. Times: Wed 9pm, Wed 10pm, Thurs 1pm, Thurs 9pm, Thurs 10pm, Friday 9pm, Friday 10pm.
- Aplia homework due Friday night, 11:45pm!
- Midterm 1 is on Feb 25th 7:30-8:30pm (room assignment will be posted on Moodle)!
  - If you know you will miss the midterm but can make the makeup, you MUST email headgrader@gmail.com to register for the makeup.
  - Deadline to register for makeup (with no penalty): Monday, Feb 18th, 4pm.
  - Review sessions: Wed Feb 20th, 4-5:30pm and 6-7:30pm, location TBA.
- Recitation this week: Very helpful examples of CS, PS, TS – and taxes.

Agenda for today

1. Link between Pareto efficiency and market allocation (The Adam Smith Theorem)
2. Taxes and Subsidies
3. Case Study with taxes

Last class

We introduced the concept of “efficiency”. We asked whether the market allocation (where equilibrium is determined by supply equal to demand) is an efficient one.

Definition of efficiency we will use in class: Pareto efficiency

- An allocation is Pareto efficient if it is feasible and you cannot make someone better off without making someone worse off

Remember the cheesecake example (6 slices of cheesecake total)

Pareto efficient if I get 5, student get 2?

Pareto efficient if I get 6, student get 0?

Pareto efficient if I get 2, student gets 2?

Last class, cont'd

Remember: Pareto efficiency says NOTHING about equality! I could have all the cheesecake and we will call that Pareto efficient.

So, you can think of a Pareto efficient allocation as one that maximizes the social pie.

Do you like the concept of Pareto efficiency?

Is it too restrictive? Or maybe too weak?

A different idea…

- **Kaldor-Hicks efficiency**: an outcome can still be considered efficient if those who are better off could compensate somehow those who are worse off (even if in fact no compensation will actually take place).

- Think of a huge public investment project (e.g. factory, highway), which is protested by a single household who enjoy living in peace and quiet.

We ended last class with two examples

Name	Res. Price	Cost	Name
D1	9	1	S1
D2	8	2	S2
D3	7	3	S3
D4	6	4	S4
D5	5	5	S5
D6	4	6	S6
D7	3	7	S7
D8	2	8	S8
D9	1	9	S9
D10	0	10	S10

Suppose we have an allocation where D8 consumes a widget but D2 does not. Is this Pareto efficient?

- No. D2 could give D8, say, $3 – and both are better off (D8 only values consuming a widget at $2, and he's getting $3 – while D8 only pays $3 for a widget, where he values it at $8)

Suppose we have an allocation where S7 produces a widget but S1 does not. Is this Pareto efficient?

- No. S7 could "outsource" to S1 – basically not producing anything but paying S1 $2 (for example) to produce a widget. S1 benefits since that's more than cost, S7 benefits because they "make" a widget for only $2 instead of $7.

So how do we get an allocation that is Pareto efficient? What is a Pareto efficient allocation in Econland? (the question we left off with last class)

Let's look at some general principles of efficient allocations.

General Principle 1

- Efficient allocation of consumption:
  - In any efficient allocation, consumers with the highest willingness to pay consume.

- So remember from the Econland example, D2 has higher willingness to pay than D8, but D8 consumes first, so this allocation is not efficient!

General Principle 2

- In any efficient allocation, producers with the lowest cost produce.

But how much to produce? How do we know how many “lowest cost” producers should produce?

Example

Back to Econland.

Name	Res. Price	Cost	Name
D1	9	1	S1
D2	8	2	S2
D3	7	3	S3
D4	6	4	S4
D5	5	5	S5
D6	4	6	S6
D7	3	7	S7
D8	2	8	S8
D9	1	9	S9
D10	0	10	S10

Consider an allocation where 3 widgets are produced (by S1, S2, S3) and 3 widgets are consumed (by D1, D2, and D3).

Pareto efficient?

Example

Back to Econland.

Name	Res. Price	Cost	Name
D1	9	1	S1
D2	8	2	S2
D3	7	3	S3
D4	6	4	S4
D5	5	5	S5
D6	4	6	S6
D7	3	7	S7
D8	2	8	S8
D9	1	9	S9
D10	0	10	S10

Consider an allocation where 8 widgets are produced (by S1-S8) and 8 widgets are consumed (by D1-D8).

Pareto efficient?

No.

Relative to the initial allocation,
S8 can give $5 instead of a widget.
Paying $5 is cheaper for S8 than making a widget.
D8 would rather have $5 than a widget.
So both better off, no one worse off.

Lesson

What did we learn from these two examples?

When Q=3, there is someone out there (D4) not consuming who is willing to pay more than it will cost someone (S4) to produce. So raise quantity.

When Q=8, there is someone out there consuming (D8) who is willing to pay less than what it is costing someone (S8) to produce.

So lower quantity.

From this, we get…

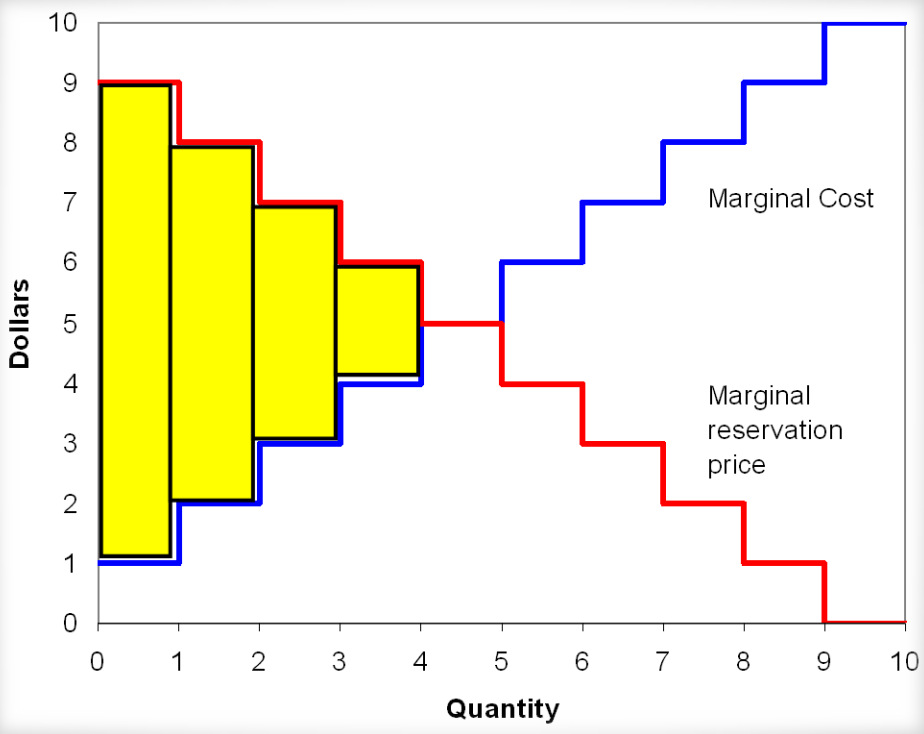
General Principle 3

- Efficient Quantity
  - In any efficient allocation, the quantity is where the marginal valuation of the last unit consumed equals the marginal cost of the last unit produced.

- Principles 1, 2, and 3 imply that in an efficient allocation for the widget industry in Econland:

  - Q = 5
  - S1, S2, S3, S4, S5 produce
  - D1, D2, D3, D4, D5 consume

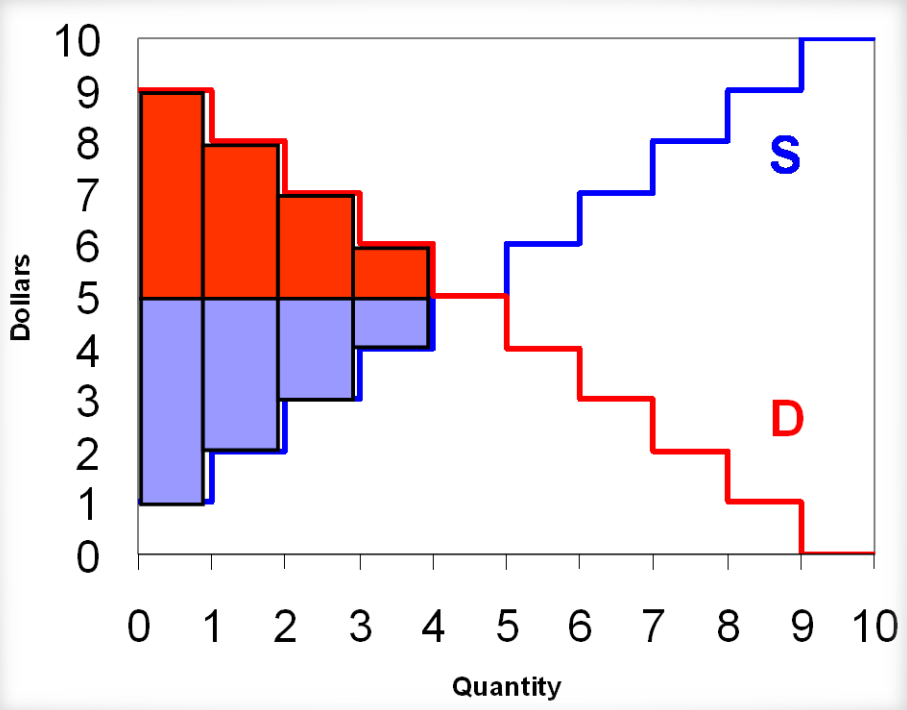
Graphically



$Q^{efficient}$ = 5, Social Surplus equals:
8+6+4+2+0 = 20

All of this should look familiar. Let's link this to the market.

Big Idea



Q = 5, S1, S2, S3, S4, S5 produce,
D1, D2, D3, D4, D5 consume
Market Allocation is Pareto Efficient!

First Welfare Theorem

Assume:

1. Market structure is perfectly competitive (not monopoly or oligopoly)

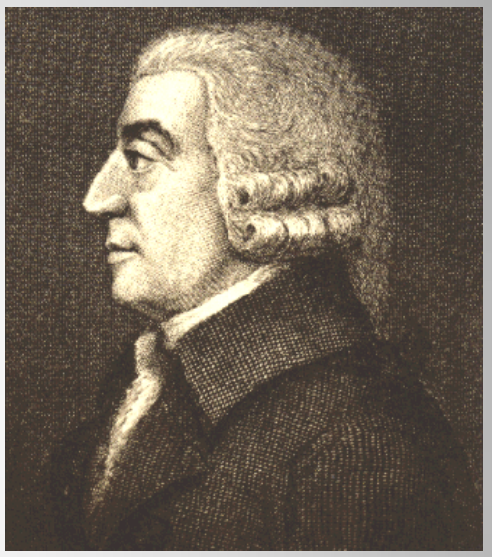
2. No externalities (my action hurts or benefits others, but I don't take into account - like pollution.)

Then the unregulated market (laissez-faire) allocation is Pareto efficient. (It maximizes the size of the social pie.)

First Welfare Theorem, cont'd

Also called "Adam Smith Theorem"

Remember quote about "invisible hand"



"Every individual... neither intends to promote the public interest, nor knows how much he is promoting it…(but)…by directing that industry (to) …its … greatest value, he is …led by an **invisible hand** to promote an end which was no part of his intention."

First Welfare Theorem, cont'd

The First Welfare Theorem also sometimes called:
Adam Smith Theorem or Invisible Hand Theorem

Now while the market maximizes the size of the pie (under the assumptions given above), you might not like the way it is divided up.

Market delivers on efficiency.

Not necessarily on equity.

Taxes

Big Picture:

- We will see how taxes distort decision making in Econland.

- With taxes we won't be getting socially efficient quantity (but remember, no externalities here).

- But the government gets revenue and it might do something useful with it….

Taxes, cont'd

Tax is a wedge between price consumer pays and price producer receives (Note: a tax is also sometimes represented as a curve shift. The wedge and the curve shift is saying the exact same thing, but I like the wedge representation better)

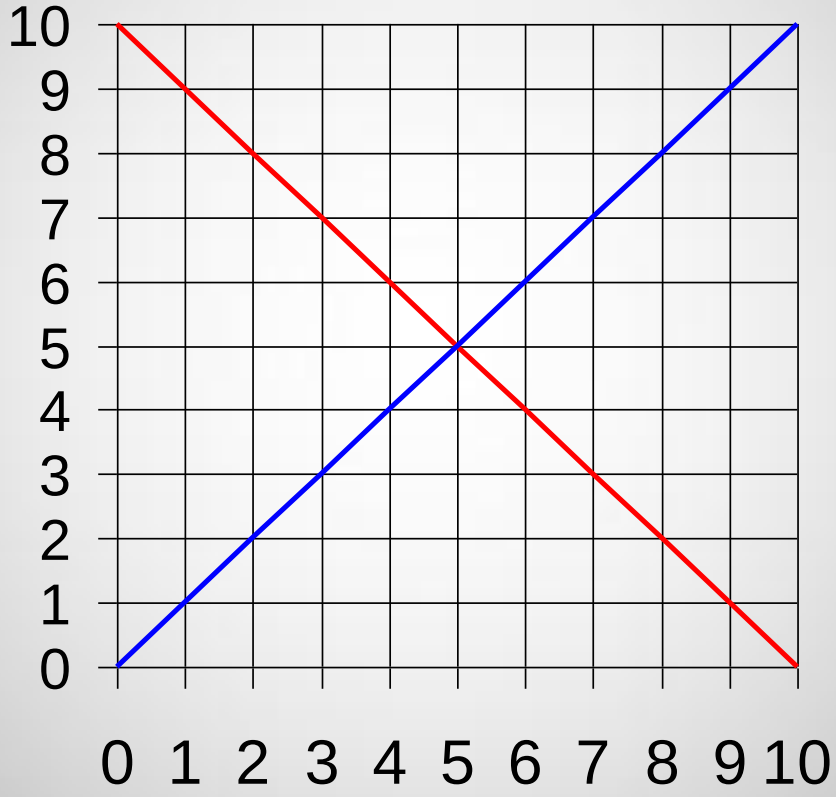
$P^d = \text{tax} + P^s$

P^d is price that the consumers pay (price for demanders)

P^s is price that the producers get (price for suppliers)

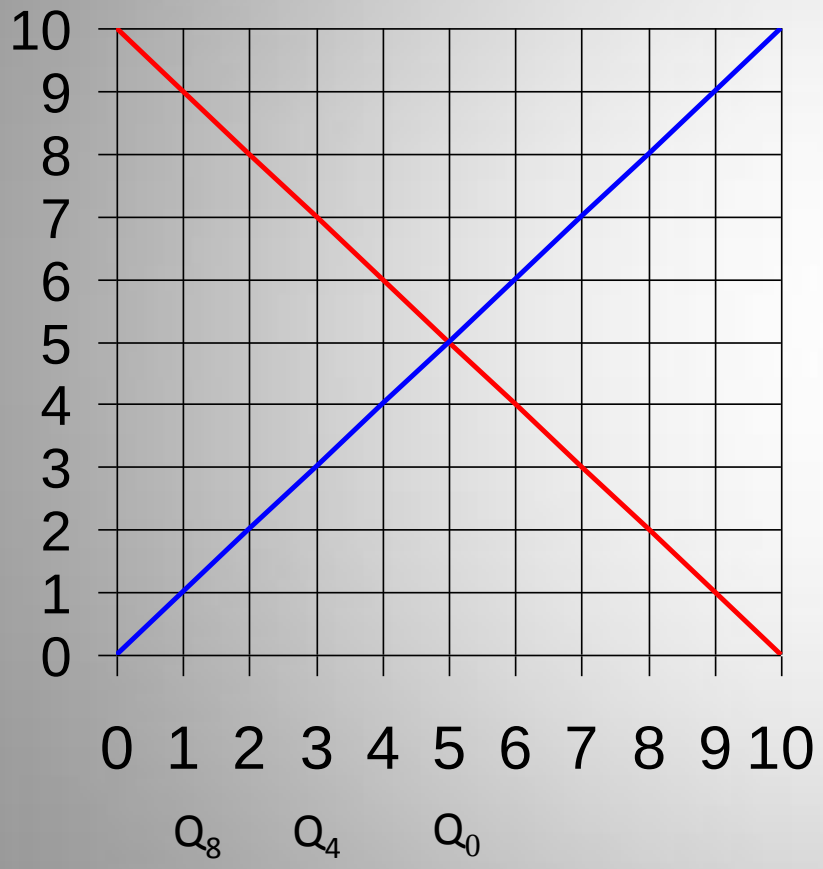
To find equilibrium under tax, find quantity where distance between demand and supply equals the tax. (the wedge)

Graphically



Equilibrium when tax = $4, $8?

Equilibrium graphically



	No Tax	$4 tax	Change
Q			
P^S			
P^D			

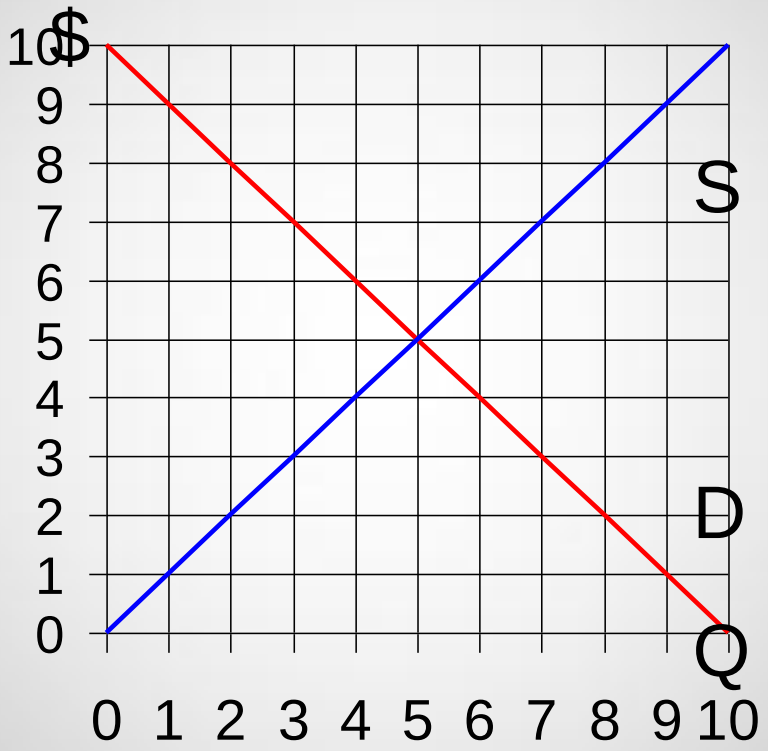
Taxes, cont'd

Great question: Are we always on the left side of the free market quantity with a tax?

What about a $4 widget subsidy

$P^S = P^D$ + subsidy

Subsidies, graphically



Equilibrium when subsidy = $4

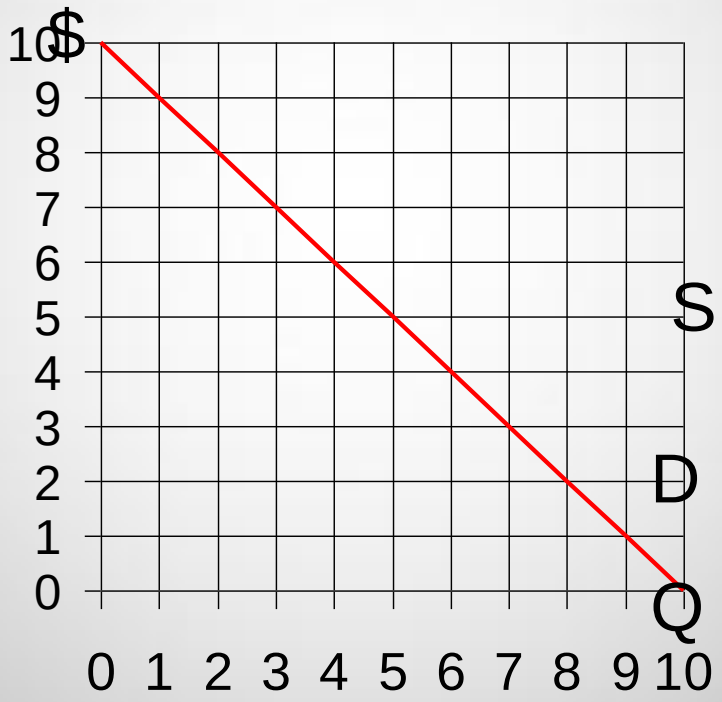
Taxes, cont'd

Great question: In Econland, after the $4 tax,

ΔP^D = +$2, ΔP^S =–$2. Do buyers and sellers always split the tax 50/50?

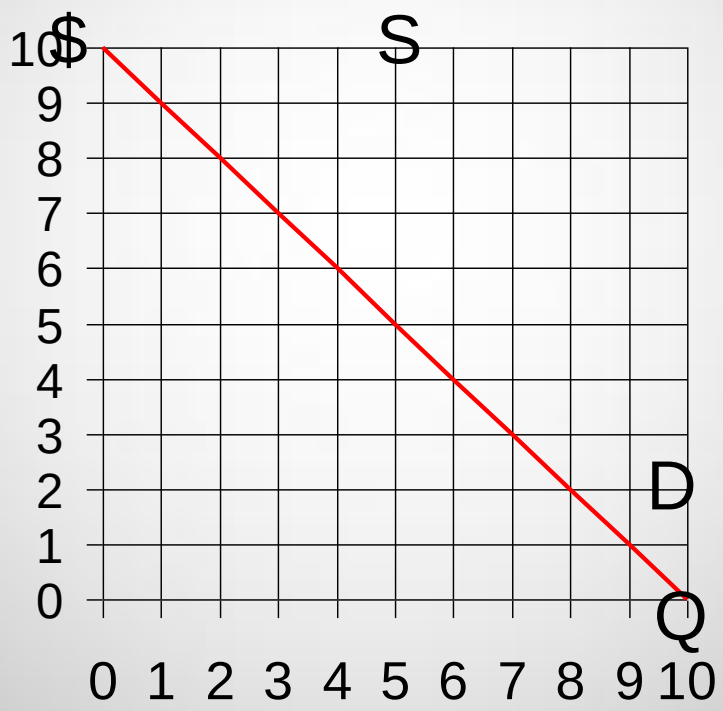
Taxes, cont'd

Suppose supply is perfectly elastic:



Taxes, cont'd

Suppose supply is perfectly inelastic



Big Idea

The more inelastic the side of the market you are on, the more you pay of the tax!

Does this make intuitive sense?

Example

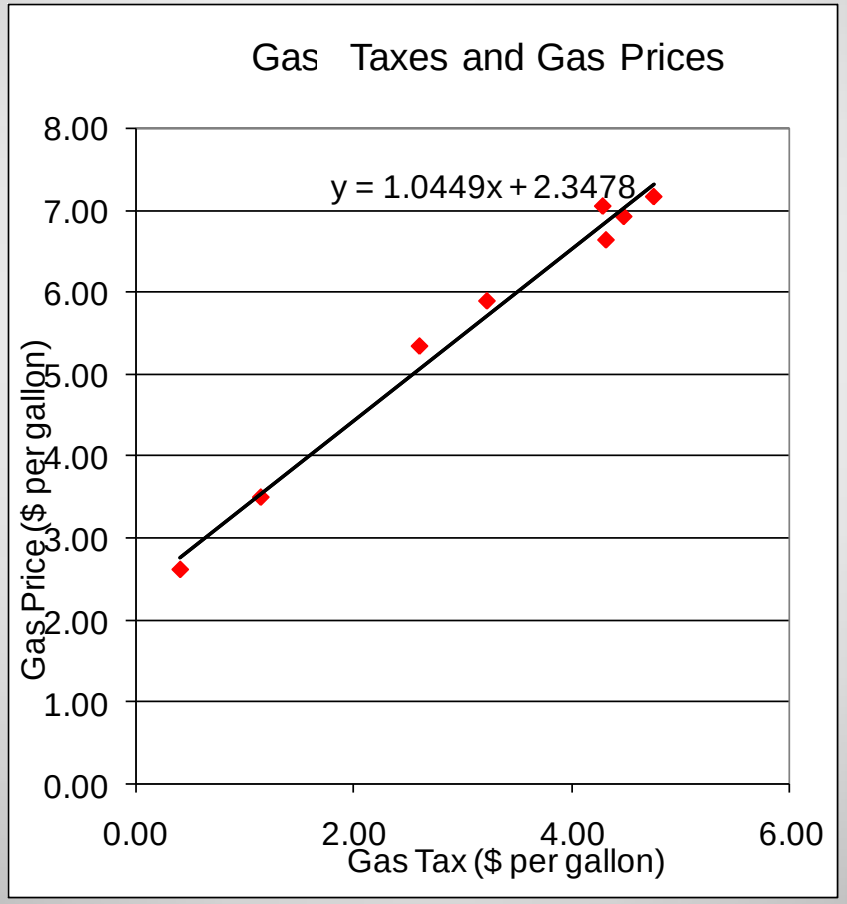
Let's look at retail gas prices and gas taxes across countries from Homework 3.

Key point: the world oil market is global. Since any one country tends to be small, its own demand has a small impact on world market. If Spain doubles its demand, it won't impact the global market (i.e. it won't drive the price of oil up on a global level)

Example, cont'd

Theory implies a gas tax in Spain gets passed on to consumers, Euro for Euro. How does the theory do?

Example, cont'd



Example, cont'd

The result is consistent with the theory. Note the slope of the regression line is approximately one. The figure shows that taxes are approximately passed along dollar for dollar to consumers.

Comparing the U.S., with a tax of .40 and a price of 2.61 with Germany, with a tax of 4.76 and a price of 7.17 (all in $ per gallon), the difference in gas price of 4.56 is approximately equal to the difference in tax of 4.36. Of course, other things can contribute to differences in gas prices across countries.

Taxes, cont'd

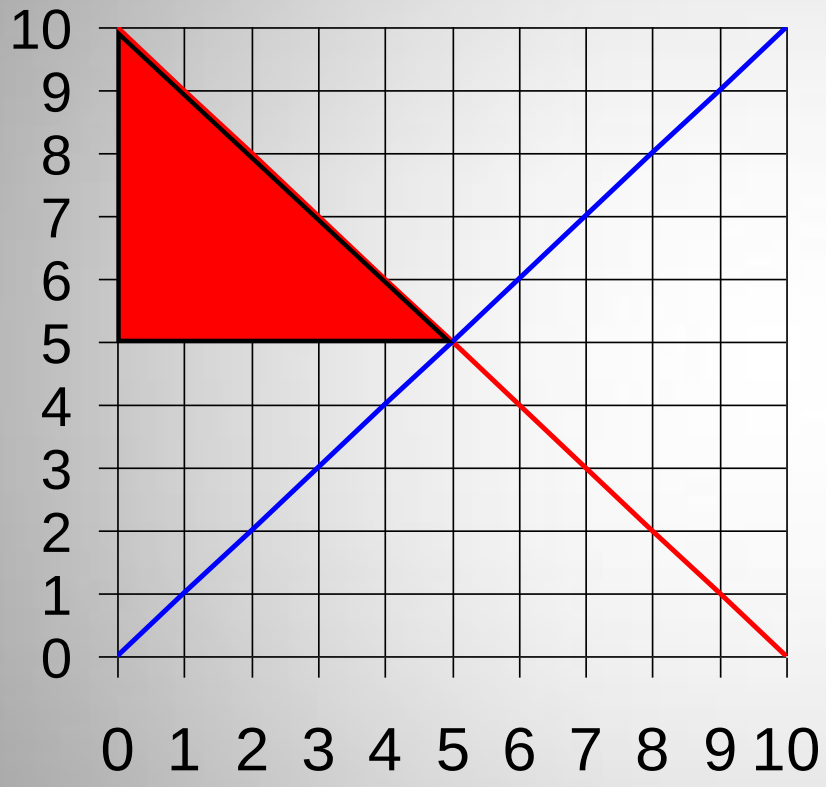
Let's get back to Econland and the $4 tax.

Let's do a welfare analysis of the effects of the tax!

Econland Surplus Calculation

	No Tax	$4 Tax	Change
Q	5	3	-2
P^S	5	3	-2
P^D	5	7	2
CS			
PS			
Gov't Surplus			
TS			

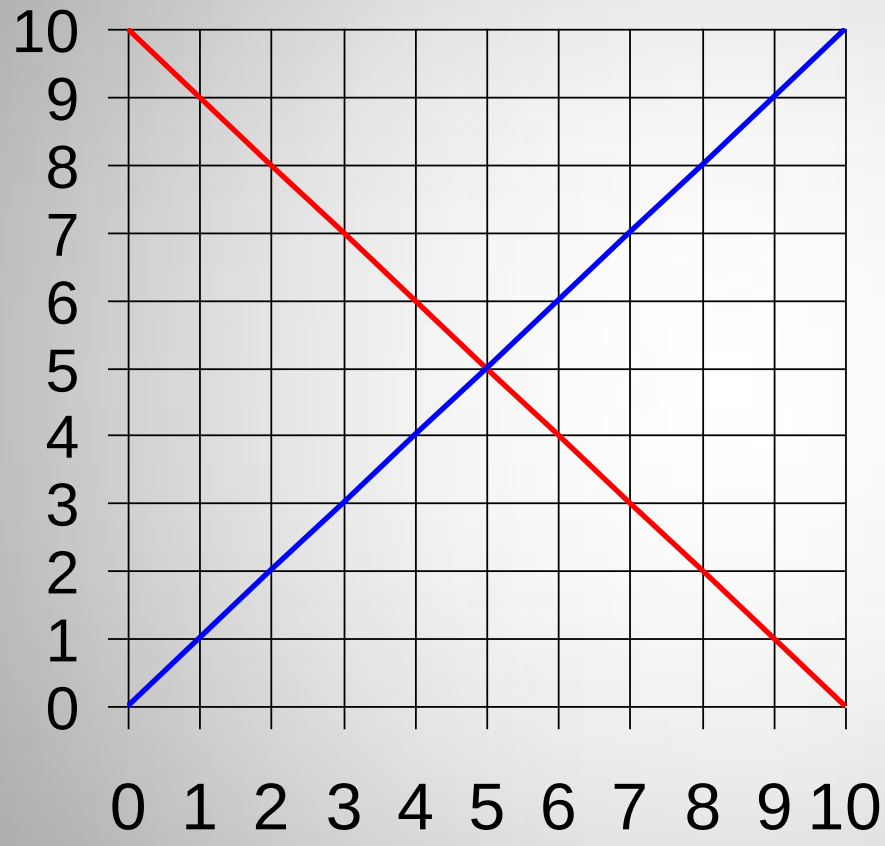
Econland Surplus Calculation



	No Tax	$4 Tax	Change
Q	5	3	-2
P^S	5	3	-2
P^D	5	7	2
CS			
PS			
Gov't Surplus			
TS			

Consumer Surplus at $P^D = 5$

Econland Surplus Calculation

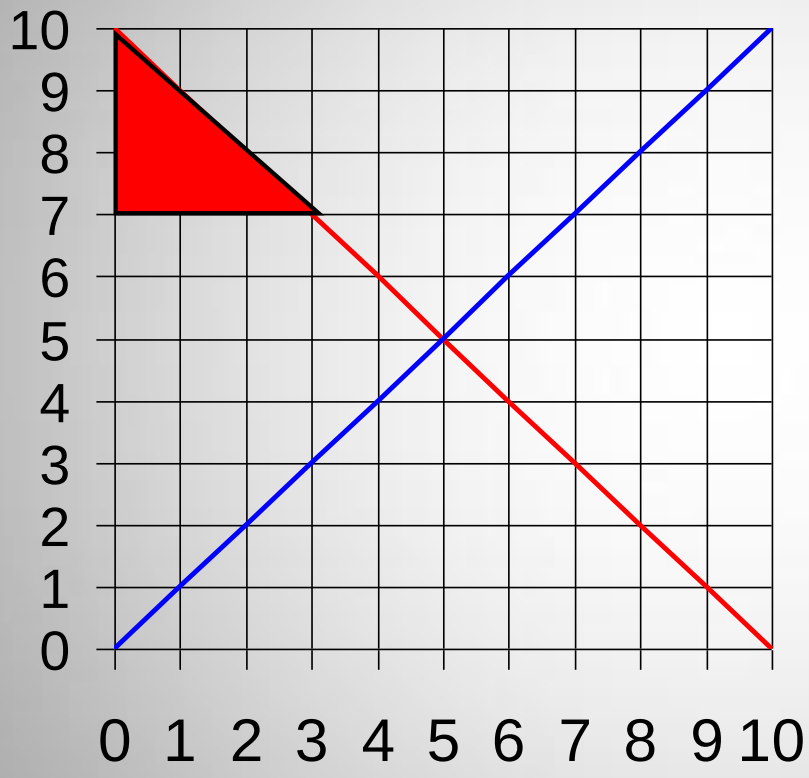


	No Tax	$4 Tax	Change
Q	5	3	-2
P^S	5	3	-2
P^D	5	7	2
CS	12.5		
PS			
Gov't Surplus			
TS			

$4 tax in Econland.

P^D increases from $5 to $7

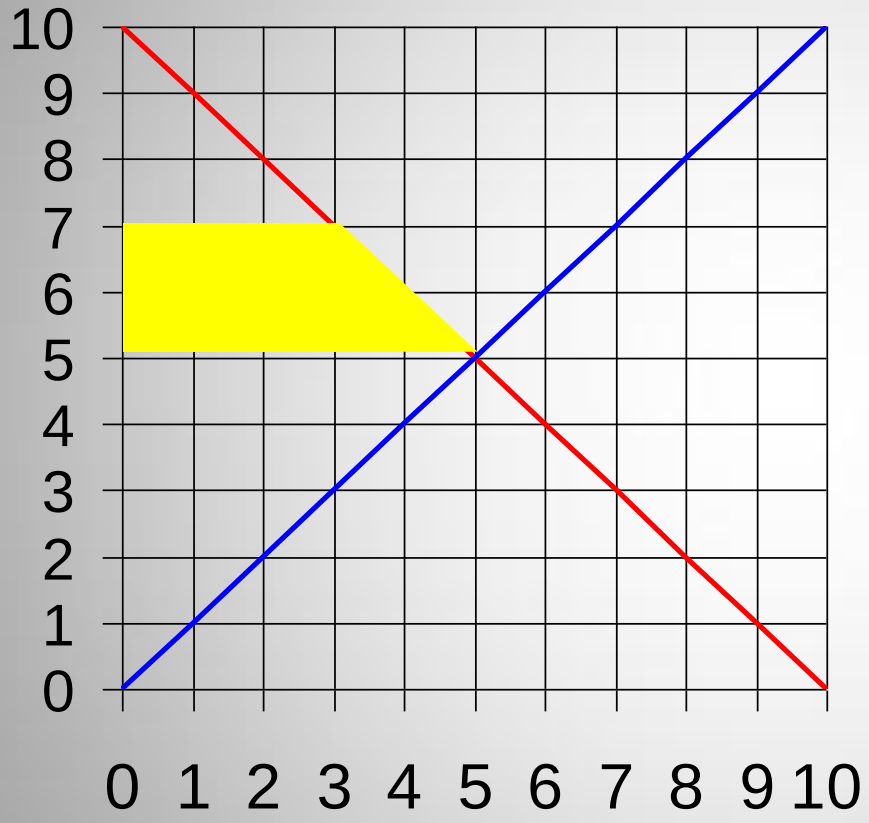
Econland Surplus Calculation



	No Tax	$4 Tax	Change
Q	5	3	-2
P^S	5	3	-2
P^D	5	7	2
CS	12.5	4.5	
PS			
Gov't Surplus			
TS			

Consumer Surplus at $P^D = 7$

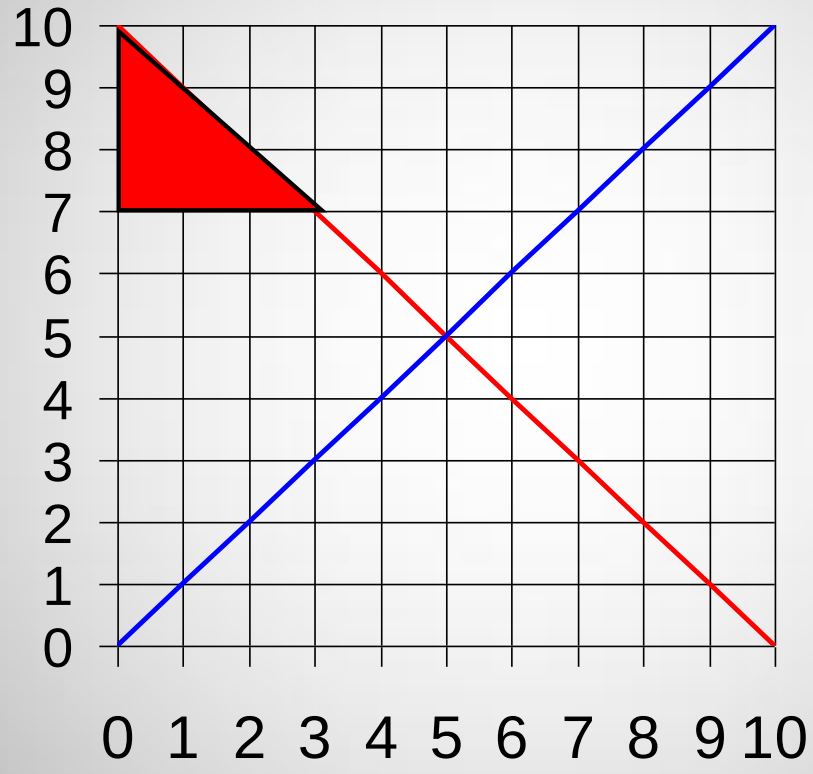
Econland Surplus Calculation



Change in Consumer Surplus (ΔCS)
(P^D from 5 to 7)

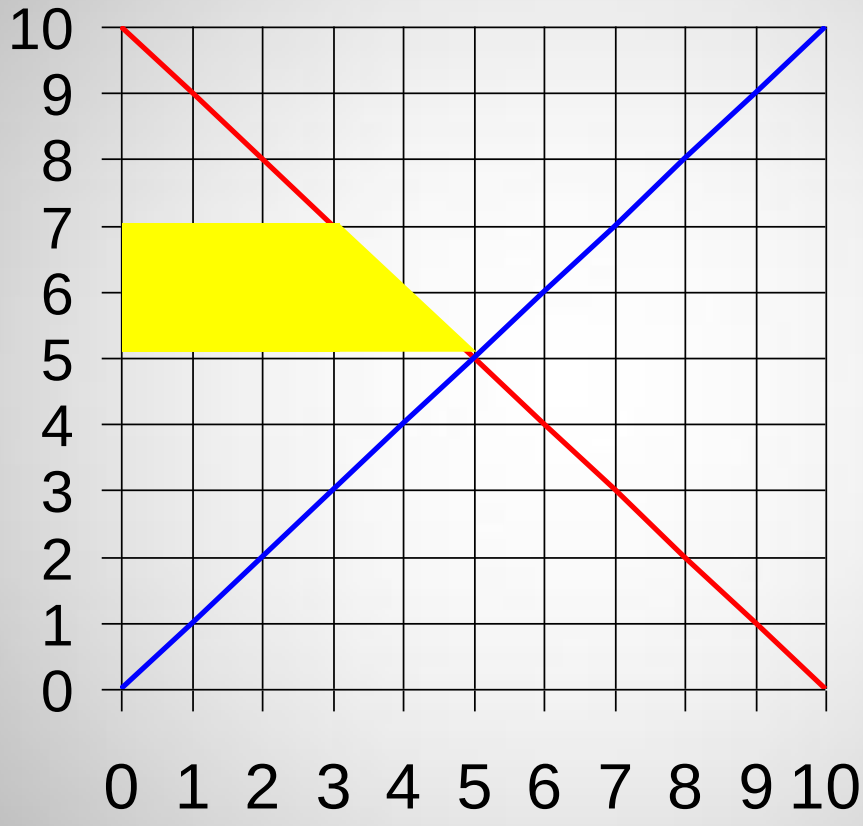
	No Tax	$4 Tax	Change
Q	5	3	-2
P^S	5	3	-2
P^D	5	7	2
CS	12.5	4.5	-8
PS			
Gov't Surplus			
TS			

Econland Surplus Calculation



Consumer Surplus at $P^D = 7$

Econland Surplus Calculation



Change in Consumer Surplus (ΔCS)
(P^D from 5 to 7)

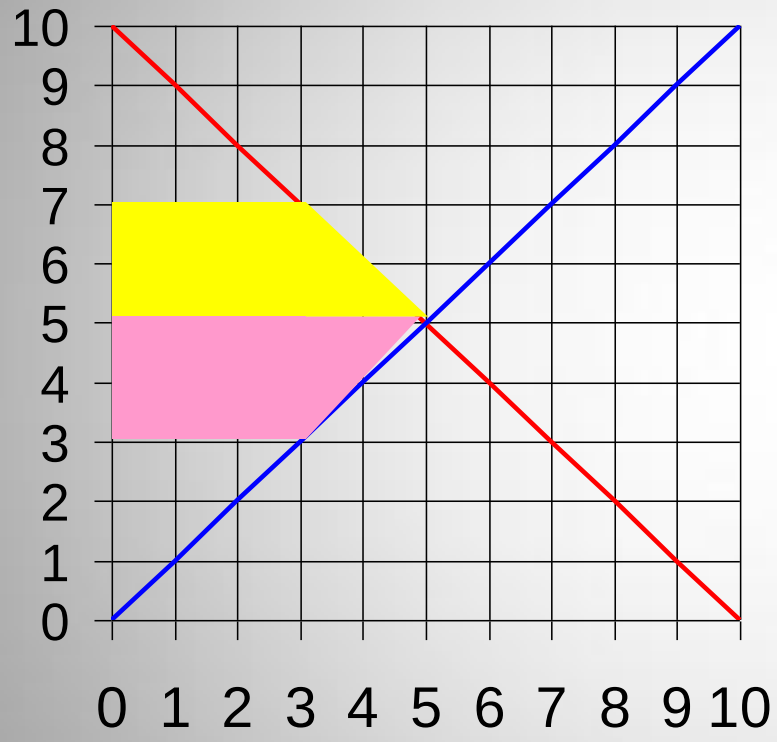
Econland Surplus Calculation

This trapezoid can be broken into two parts

Rectangle: The first three units are bought whether there is a tax or not, (maybe it will help to think that D1, D2, and D3 have a high reservation price, so even after the tax they are willing to buy) and the rectangle is just their loss in consumer surplus because of a higher price for consumers.

Triangle: This represents the loss in surplus resulting from the tax lowering consumption from 5 units to 3 units. As a result of the tax, two people won't consume anymore.

Econland Surplus Calculation



ΔCS and ΔPS

(P^D from 5 to 7)
(P^S from 5 to 3)

	No Tax	$4 Tax	Change
Q	5	3	-2
P^S	5	3	-2
P^D	5	7	2
CS	12.5	4.5	-8
PS	12.5	4.5	-8
Gov't Surplus			
TS			

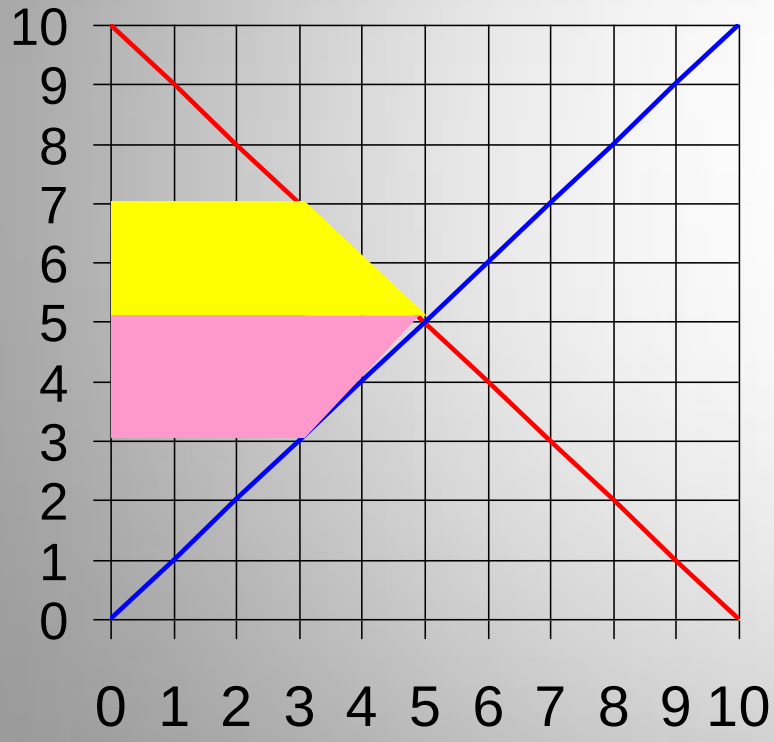
Econland Surplus Calculation

	No Tax	$4 Tax	Change
Q	5	3	-2
P^S	5	3	-2
P^D	5	7	2
CS	12.5	4.5	-8
PS	12.5	4.5	-8
Gov't Surplus	0		
TS	25		

Econland Surplus Calculation

	No Tax	$4 Tax	Change
Q	5	3	-2
P^S	5	3	-2
P^D	5	7	2
CS	12.5	4.5	-8
PS	12.5	4.5	-8
Gov't Surplus	0	12	12
TS	25	21	-4

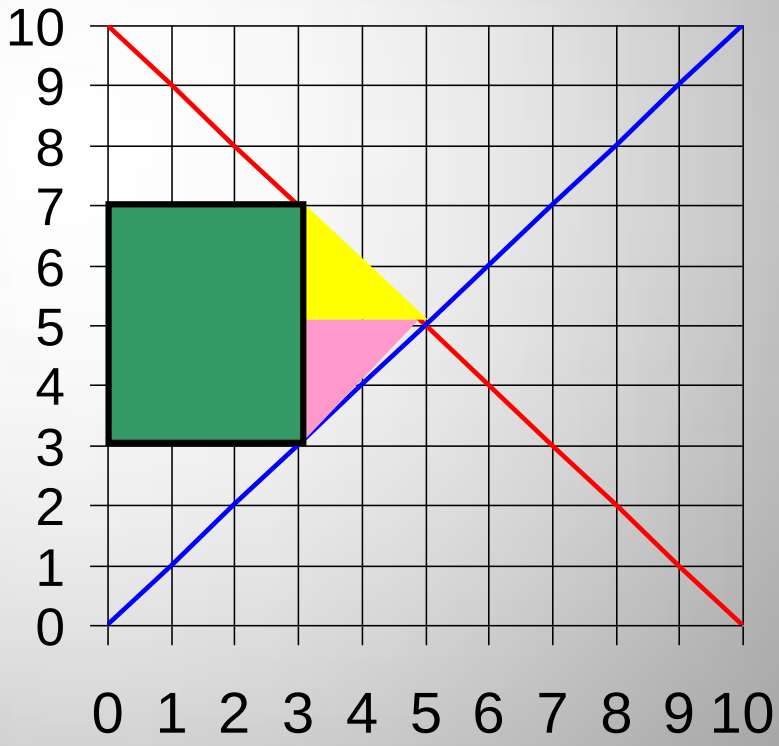
Econland Surplus Calculation



Change in Government Surplus

$\Delta GS = Q \times tax$

$= 3 \times 4 = 12$



Taxes, cont'd

Allocation with tax not Pareto Efficient.

Pareto efficient allocations maximize the size of the pie. We can see from the loss of the triangle (the deadweight loss) that the pie is not as big as it can be.

Going back to the cheesecake example – some cheesecake pieces are being thrown into the trash, so consumers, producers, and government are not getting that cheesecake. Since in the free market, the total surplus is maximized (Pareto efficient), the allocation with tax is not Pareto efficient (because it does not maximize the size of the total surplus, as we have a dead weight loss).

Call in the Economics Doctor

Diagnosis the source of inefficiency.

Problem: Breakdown of General Principle 3, Efficient Quantity where

- Marginal Reservation Price (MRP) equal to Marginal Cost (MC).

- Q = 3 is too small (Tax puts wedge between MRP and MC)

(But note General Principle 1 and 2 continue to hold. Get efficient allocation of consumption and production.)

What about government spending?

Suppose the government needs money.

- D10 did something special, Government revenue is needed to give him a prize of $12.

Alternative 1

- Head Tax $0.60 a person.
- Tax 20 people raises $12.
- No deadweight loss from widget tax.

Tax widgets, quantity changes compared to free market

Tax heads, quantity is the same as free market

- **No distortions of behavior**

What about government spending?

- Example: In 1377 in England, everyone over the age of 14 had to pay a goat to the Crown (to fight war with France)

- Head tax is a regressive tax (low income taxes that are a higher proportion of their income than high income people)

What about government spending?

Alternative 2:

- Tax of $2 for people with last names <=3. (So S1,S2,S3, D1,D2,D3 all pay $2)

Pareto improvement compared to $4 widget tax. Why?

Principle:

- Taxes that distort decision making reduce the size of the social pie compared to taxes that don't distort decisions.

Subsidies

Back to Econland

- Campaign promise: Get to 90% widget coverage (Q=9)

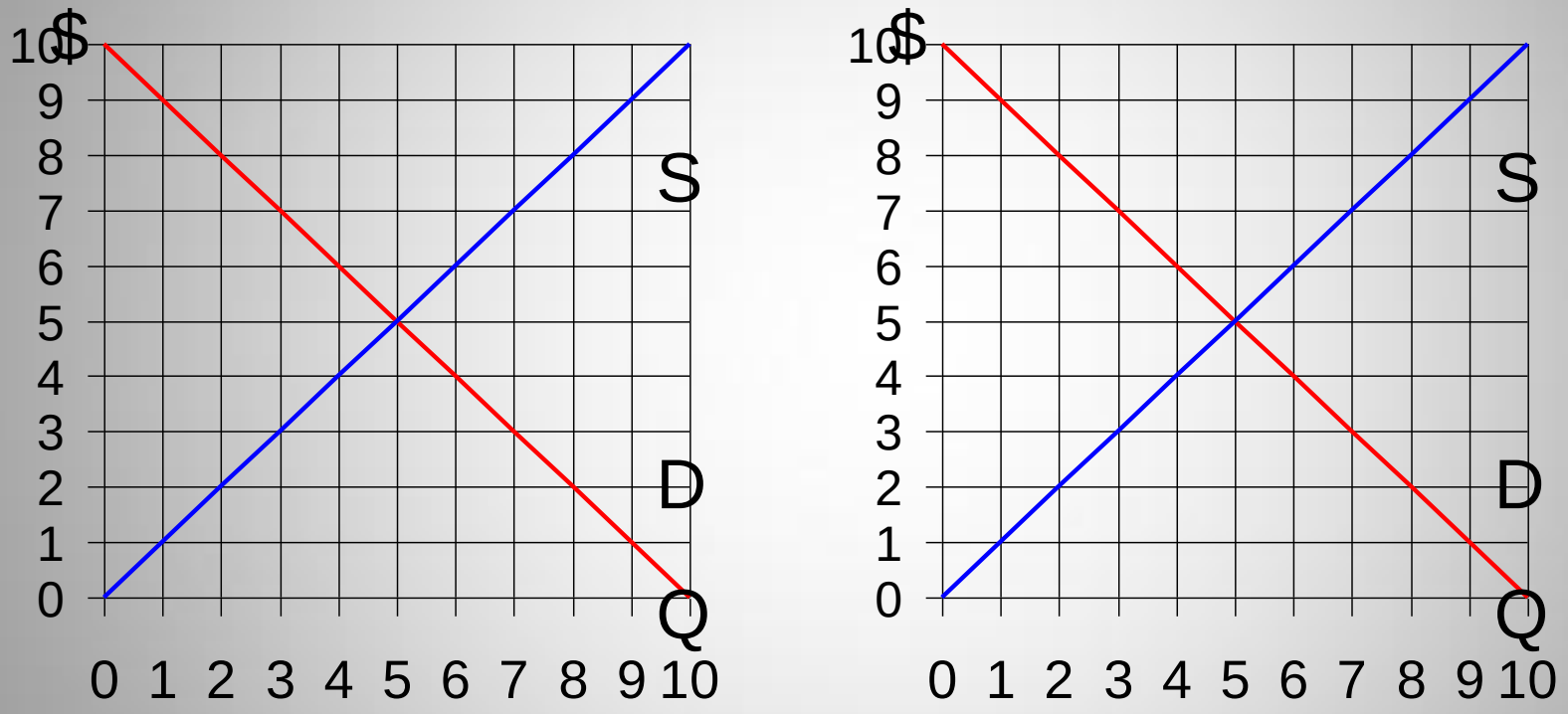
Got to pick a subsidy so that:

P^D =1 (a price that D1-D9 would be willing to pay)

What should the subsidy be?

Name	Res. Price	Cost	Name
D1	9	1	S1
D2	8	2	S2
D3	7	3	S3
D4	6	4	S4
D5	5	5	S5
D6	4	6	S6
D7	3	7	S7
D8	2	8	S8
D9	1	9	S9
D10	0	10	S10

Subsidies, cont'd



Equilibrium when subsidy = ____

Medicare and Social Security

New information about the demographics of Econland:

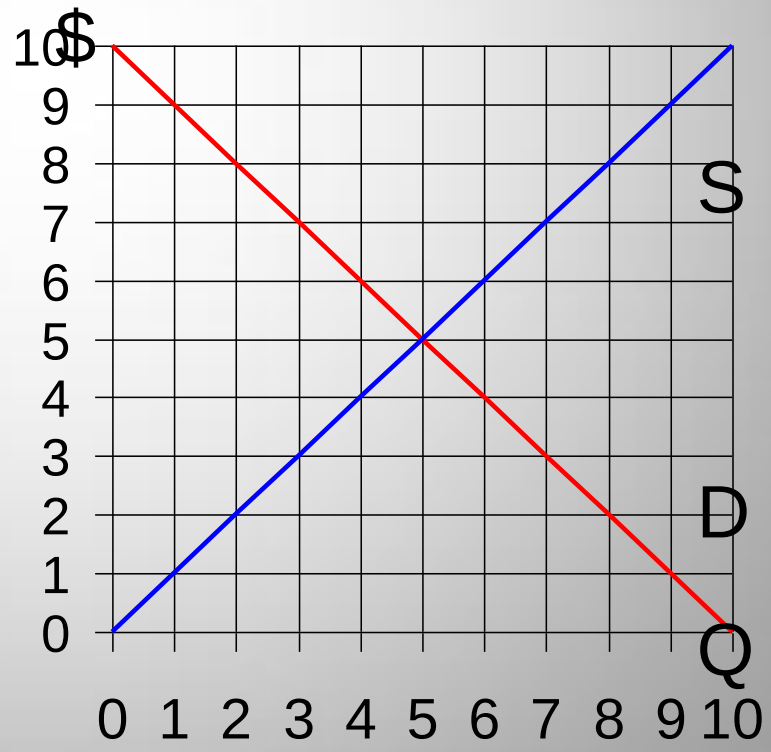
- D1 and S1 are the youngest people in the economy. Age 1 in Econland years.
- D2 and S2 are age 2, and so on.
- Today's D1 and S1 will become next year's D2 and S2. Today's D2 and S2 will become D3 and S3, and so on.

Medicare and Social Security

Econlandcare

- Once people hit age 10, they get $2.25 to cover illness and expenses.
- D10 and S10 are the only ones who qualify. So program costs government $4.50.

How can we finance this with a widget tax?



Medicare and Social Security

A widget tax of \$1 results in: $Q^e = 4.5$ widgets, $P^D = 5.5$, $P^S = 4.5$

Compared to free market:
$\Delta CS = 10.125 - 12.5 = -2.375$
$\Delta PS = 10.125 - 12.5 = -2.375$
ΔGov't = +4.5
$\Delta TS = -.25$

Deadweight loss per dollar collected is .25/4.5 = .056

All this is for year 1.

Medicare and Social Security

New Development! (Year 2)

- New medical treatments prolong life to 11 Econland years!

Treatment is more costly then before. Will cost $3.00 per person per year

- Program cost this year = $6 (cost for D10 and S10)

Suppose policy this year:

- "Kick the can down the road" (in other words, procrastinate and pay later)
- Tax rates left the same, Econland borrows $1.50 from China to finance budget deficit of $6 – $4.50 = $1.50

Medicare and Social Security

Year 3

- Start with national debt = $1.50
- Meet D11 and S11!
- They still qualify for program, and now also D10 and S10.

If we keep the program as is, cost of Econlandcare = $12 = 4*$3.

Suppose fighting in Congress leads to another year of kicking can down the road.

- Current deficit = $12 – $4.5 = $7.50
- Add to debt of 1.50 at start of year (and leaving out interest payments for simplicity) yields a new debt of $9=$1.50+$7.50

Medicare and Social Security

Year 4

- Runaway debt unsustainable in the long run and this is the year that the poop hits the fan.

- Suppose hypothetically Econland tries to pay off the entire debt in one year with no change in the program.

Needed: $12 to fund program

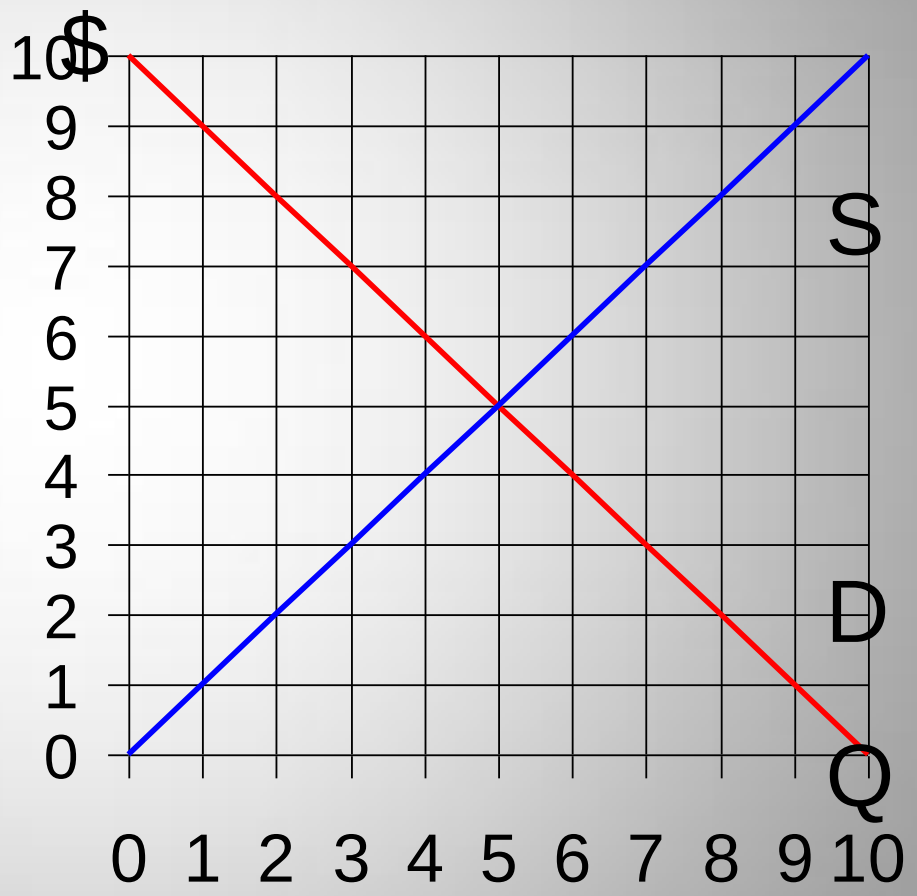
$9 to pay debt

= total of $21 in revenues.

- How are we going to get that?

Medicare and Social Security

How much should we tax to get $21 in revenue?*



*this may be a trick question

Medicare and Social Security

Tax	Q	Revenue	Dead-wgt Loss	Dead-wgt loss per $ rev
1	4.5	4.5	.25	.056
2	4	8	1	.125
4	3	12	4	.333
5	2.5	12.50	6.25	.50
6	2	12	9	.75

Impossible to raise $21!

$12.5 is maximum!
Attainted at tax of $5 which does a tremendous amount of damage (For every dollar taken in, 50 cents of dead weight loss.)

Medicare and Social Security

What will happen?

- Not going to raise $21
- Even if we set the tax high, still going to have to cut back on the program somehow.

Example (Plan A)

- In year 4, set tax = $4, raise $12.
- Cut program so seniors get $2 instead of $3

- Program costs $8 (4 people, $2 each). From tax, the government is bringing in $12, so have $4 this year to start paying down debt….

Medicare and Social Security

Discussion of this outcome

1. High taxes in year 4 are very damaging to the widget economy. (33 cents lost per dollar in government revenue)

2. Equity issue – intergenerational transfer

Go back to year 3 when D10 and D11 were getting $3. They paid into a system earlier in their lives where the widget tax was only $1

Current young people are paying $4 in tax. But they will only get $2 in benefits.

Medicare and Social Security

3. Costs of kicking can down the road.

- Putting off the problem made the problem worse. The greater the tax, the greater the distortion. Keeping taxes low in year 2 and year 3 led to a big debt that forced up tax rates to damaging levels later.

Debt finance for a "one-shot" expenditure makes economic sense:

- For example, U.S.' involvement in World War II lasted four years and then was over (though debt finance spread payments over time)
- Or for an individual in buying a house to borrow to spread the payments over time

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Paying for senior citizens' healthcare is different. It isn't "one shot." It will always be there. If you get behind on your payments, tomorrow you have to pay not only for today's cost, but tomorrow's as well.

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Policy Alternatives Plan B.

Year 2: freeze benefits at $2.25

- Raise retirement age to 11 starting year 3 (so only “11 year olds” get to get Econlandcare).

Effects (compared to Plan A)

1) Taxes stay low so not much damage to the economy.

2) Effects on beneficiaries:

  - D10 and S10 in year 2 get $2.25 instead of $3.00, so need to come up with $.75 on their own. (And in year 3)
  - For year 3, the current D10 and S10 get nothing. So need to come up with $3 on own. D11 and S11 need to come up with $.75 on their own also.

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What do we think of this?

- On one hand: these people should be happy compared to the old days (year 1) when people died at age 10.
- On the other hand, there may be a concern that old people would suffer too much financial hardship.
- Or maybe Plan B is irrelevant because old people have enough political clout to keep Plan B off the table.

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Plan C?

- Perhaps some coverage starting age 10. (Maybe targeted based on need? But be wary that targeting to poor creates own-incentive problems as the old may spend down assets to qualify for benefits.)

- But unlike plan A, start cutting the benefits sooner, and start raising taxes earlier, so as to not kick the can down the road.