

ECC1000: Principles of Microeconomics

Lecture 4

Market efficiency and government policies



Outline

- What is efficiency?
 - Definition
 - Measurement: consumer surplus and producer surplus
- What's special about the competitive market allocation?
- Policy applications
 - Price ceiling
 - Price floor
- Taxes (subsidies)
 - Equivalence of sales and excise taxes
 - Tax incidence and elasticities
 - Deadweight loss of a tax and elasticities
 - Tax revenue and elasticities



What do you think are the objectives of the following policies?

- Freer trade agreement
- Privatization
- Minimum wage law
- Import quota and tariff
- Sales tax



Efficiency as a guiding principle for economic policies

- A resource allocation is efficient if it maximises **total surplus** received by all members of the society.
 - It maximizes the gains from trade (operating on the PPF).
 - You cannot produce more of one good without cutting the production of other good(s).
 - You cannot make one person better off without hurting other(s).
- However, the government may have goals that require trading off efficiency.
 - The loss in efficiency is called the **deadweight loss**.
- A good policy is the one that achieves the policy goal at a minimum deadweight loss.



Questions

- What is surplus?
- How do we measure it?
- What is so special about the competitive market?
(Is the competitive market allocation efficient?)
- If efficiency has to be traded off, what would be the least costly way of doing so?



What is surplus?

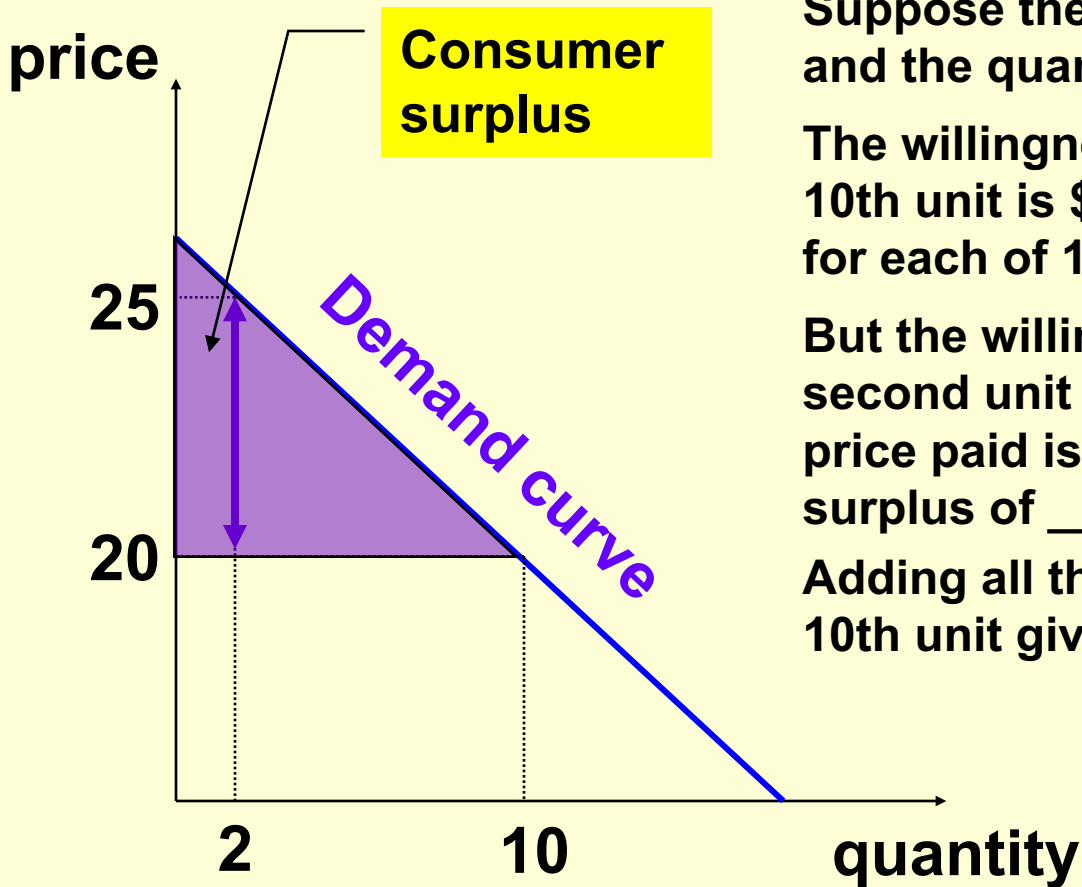
- **Consumer surplus** measures economic welfare from the buyer's side.
 - A buyer's willingness to pay minus the amount the buyer actually pays
 - If a pizza is worth \$12 to you but you paid \$10, then you enjoy surplus of _____. What if price is \$14?
- **Producer surplus** measures economic welfare from the seller's side.
 - The amount a seller receives minus the seller's cost
 - If a pizza costs \$6 to bake and you sell it for \$10, then you enjoy surplus of _____. What if the maximum you can charge is \$5?



Consumer surplus

- A buyer's willingness to pay
 - Is the maximum price that the buyer is willing and able to pay for a good.
 - It is reflected in the demand curve.
- Consumer surplus is the area below the demand curve and above the market price.
= value to buyers - amount paid

Measuring consumer surplus



Suppose the market price is \$20 and the quantity purchased is 10.

The willingness to pay for the 10th unit is \$20, which is payment for each of 10 units.

But the willingness to pay for the second unit is \$25, while the actual price paid is \$20, so there's surplus of _____.

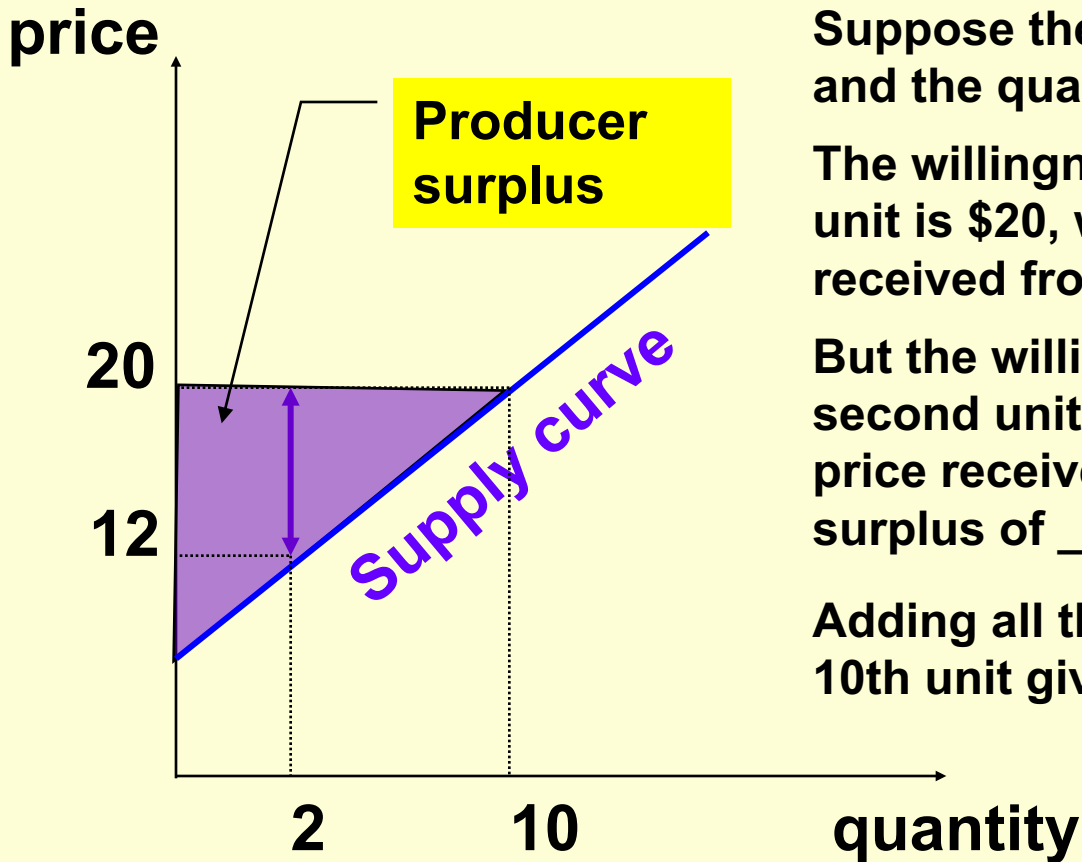
Adding all the surplus up to the 10th unit gives consumer surplus.



Producer surplus

- A seller's willingness to sell
 - Is the minimum price the seller is willing and able to sell the good for.
 - It can be measured by the seller's opportunity cost of supplying the good.
 - It is reflected in the supply curve.
- Producer surplus is **the area above the supply curve and below the market price**
= amount received - seller's costs

Measuring producer surplus



Suppose the market price is \$20 and the quantity sold is 10.

The willingness to sell the 10th unit is \$20, which is payment received from each of 10 units.

But the willingness to sell the second unit is \$12, while the actual price received is \$20, so there's surplus of ____.

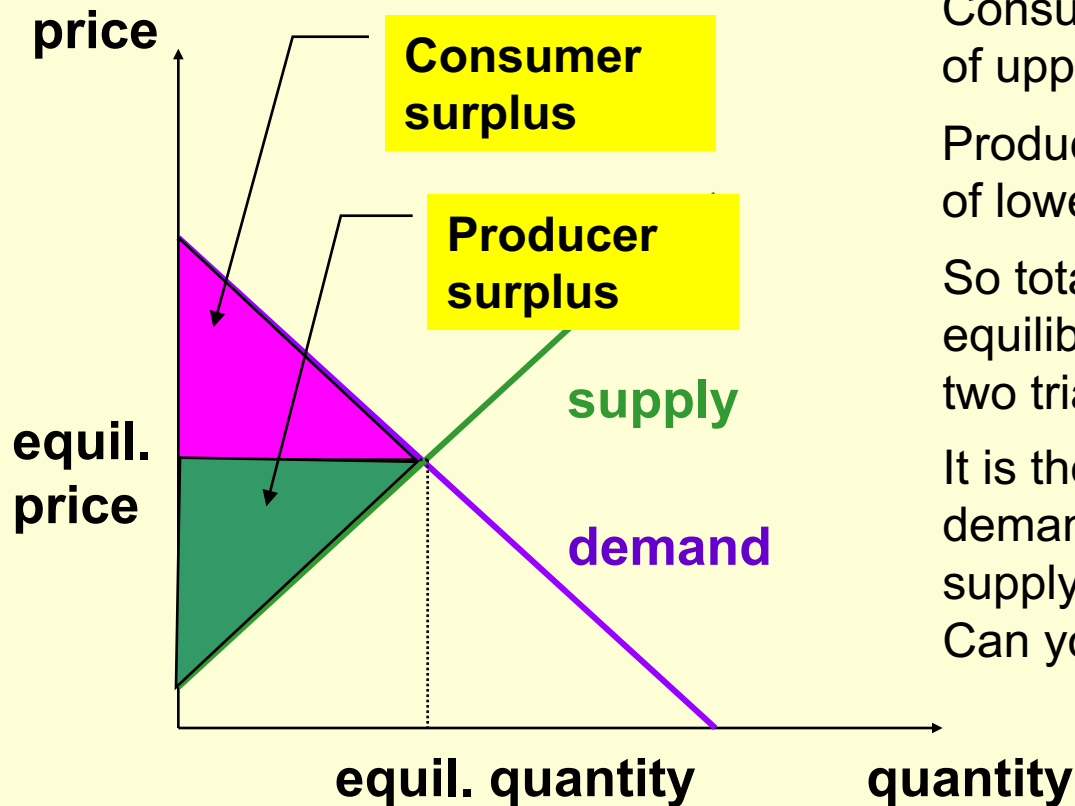
Adding all the surplus up to the 10th unit gives producer surplus.



Is the competitive market allocation efficient?

- Yes if it maximises the total surplus received by all members of a society.
- Or it maximises consumer surplus + producer surplus.
- In the competitive market, equilibrium allocation is determined by demand and supply.
- So,

Total surplus in competitive market equilibrium



Consumer surplus is the area of upper triangle.

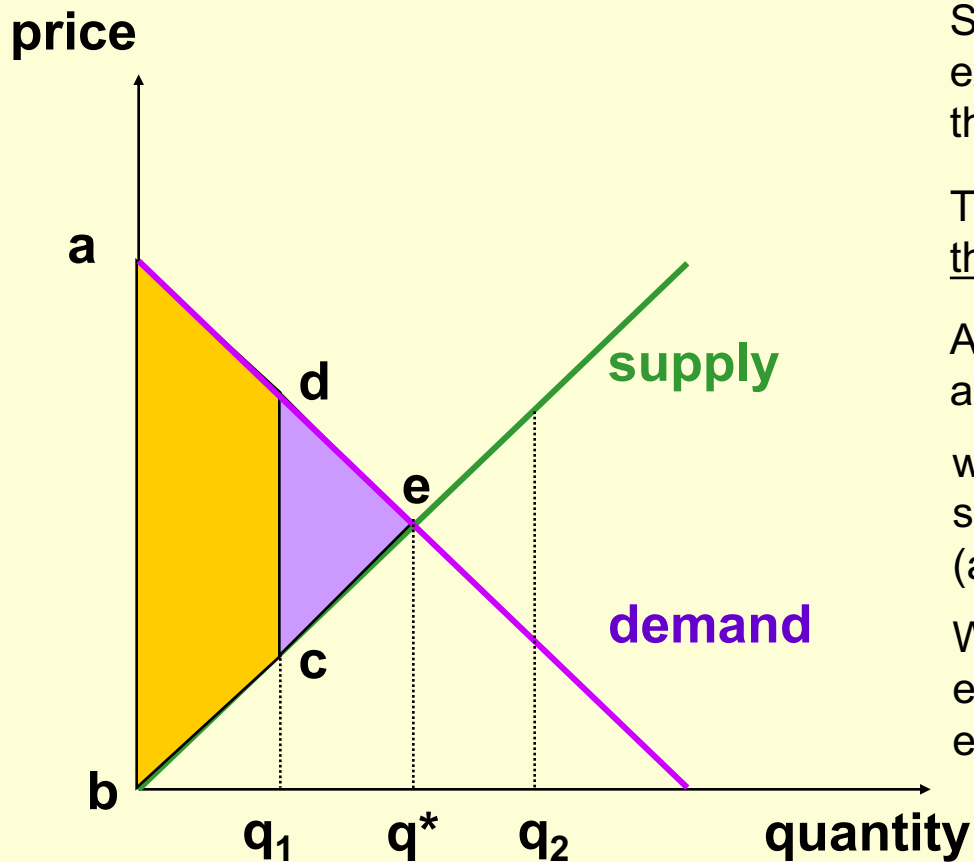
Producer surplus is the area of lower triangle.

So total surplus in market equilibrium is the sum of these two triangles.

It is the area under the demand curve and above the supply curve.

Can you do better than this?

Is the competitive market allocation efficient?



Suppose the quantity exchanged is q_1 , smaller than the equilibrium quantity q^* .

Then, value to buyers is larger than sellers' cost.

And total surplus is the area abcd,

which is smaller than the total surplus in market equilibrium (abe) by the area cde.

What happens if the quantity exchanged is q_2 , larger than the equilibrium quantity q^* ?



Is the competitive market allocation efficient?

- If the quantity exchanged is smaller than the equilibrium quantity, then more trade can increase total surplus.
 - Not all gains from trade are realized.
- If the quantity exchanged is larger than the equilibrium quantity, then less trade can increase total surplus.
 - More is produced than is socially desirable.
- So the competitive market equilibrium maximises total surplus, hence efficient.



Every individual...neither intends to promote the public interest, nor understands how much he is promoting it...He intends only his own gain, and he is in this, as in many other cases, led by **an invisible hand** to promote an end which was no part of his intention...

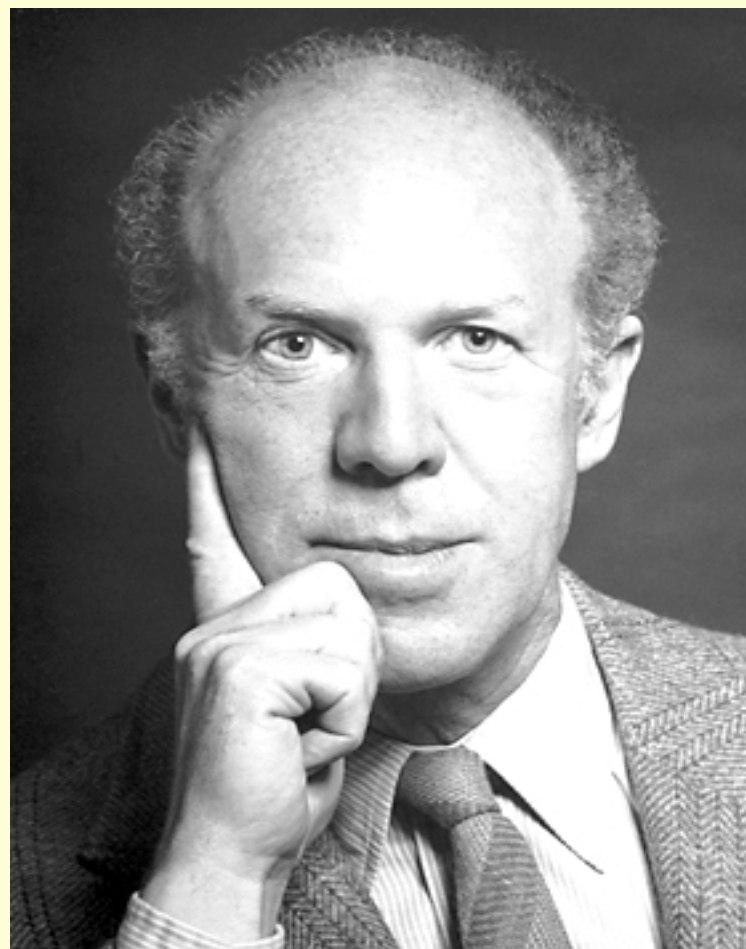
By pursuing his own interest he frequently promotes that of the society more effectually than when he really intends to promote it.

- Adam Smith (1776), *The Wealth of Nations* -

Kenneth Arrow (1921- 2017)
1972 Nobel laureate



Gerard Debreu (1921-2004)
1983 Nobel laureate

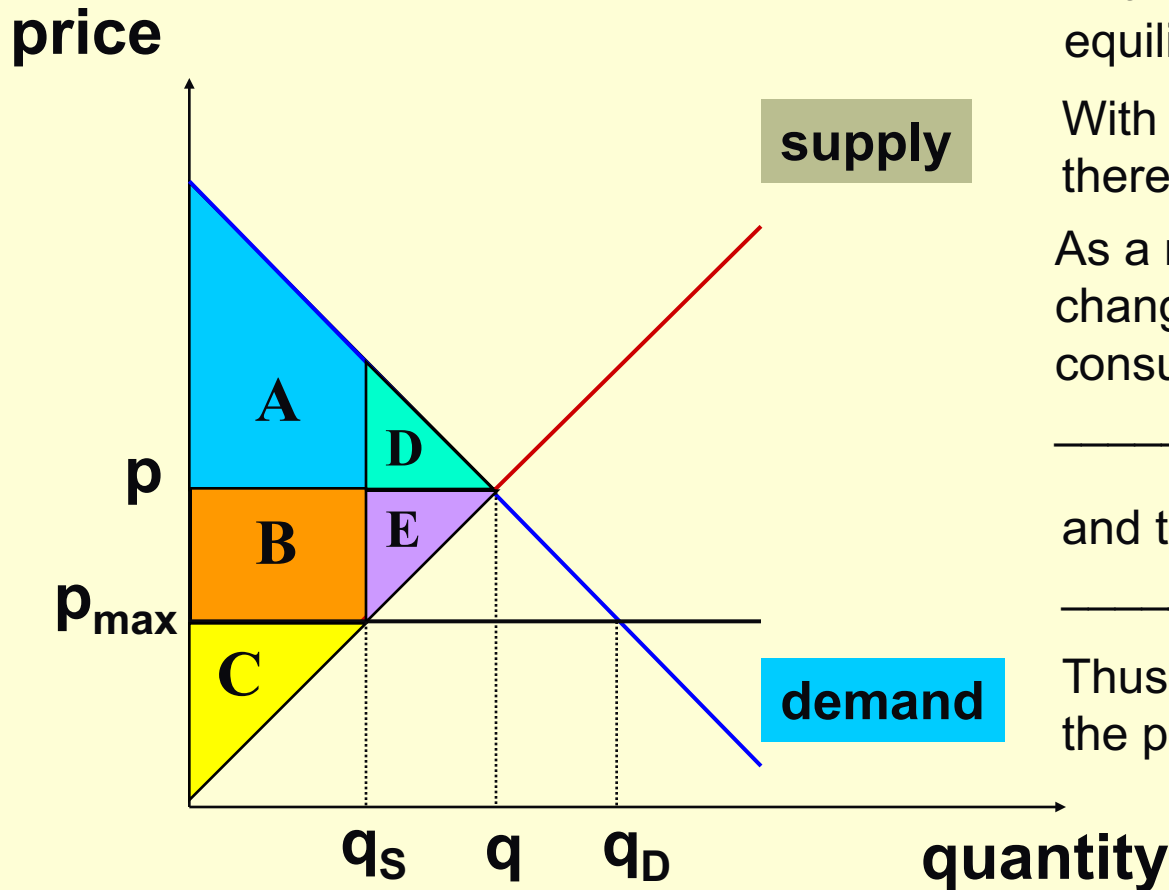




Application 1: price ceiling

- Price ceiling: a legal maximum on the price (to be effective, it has to be lower than the equilibrium price)
- Examples: rent control, price ceiling on gasoline, cap on health care service
- Objectives: promotion of equity (or to satisfy voters?)
- Outcome:
 - Consumer surplus may or may not increase (some consumers are worse off).
 - Producer surplus decreases.
 - Overall, total surplus decreases - deadweight loss due to excess demand (shortage).

Application 1: price ceiling



Without the price ceiling, the equilibrium is (p, q) .

With the price ceiling at $p_{\max}$, there is excess demand of $q_D - q_s$.

As a result, producer surplus changes from _____ to _____, consumer surplus changes from _____ to _____,

and total surplus changes from _____ to _____.

Thus the deadweight loss of the price ceiling is _____.



Question for discussion

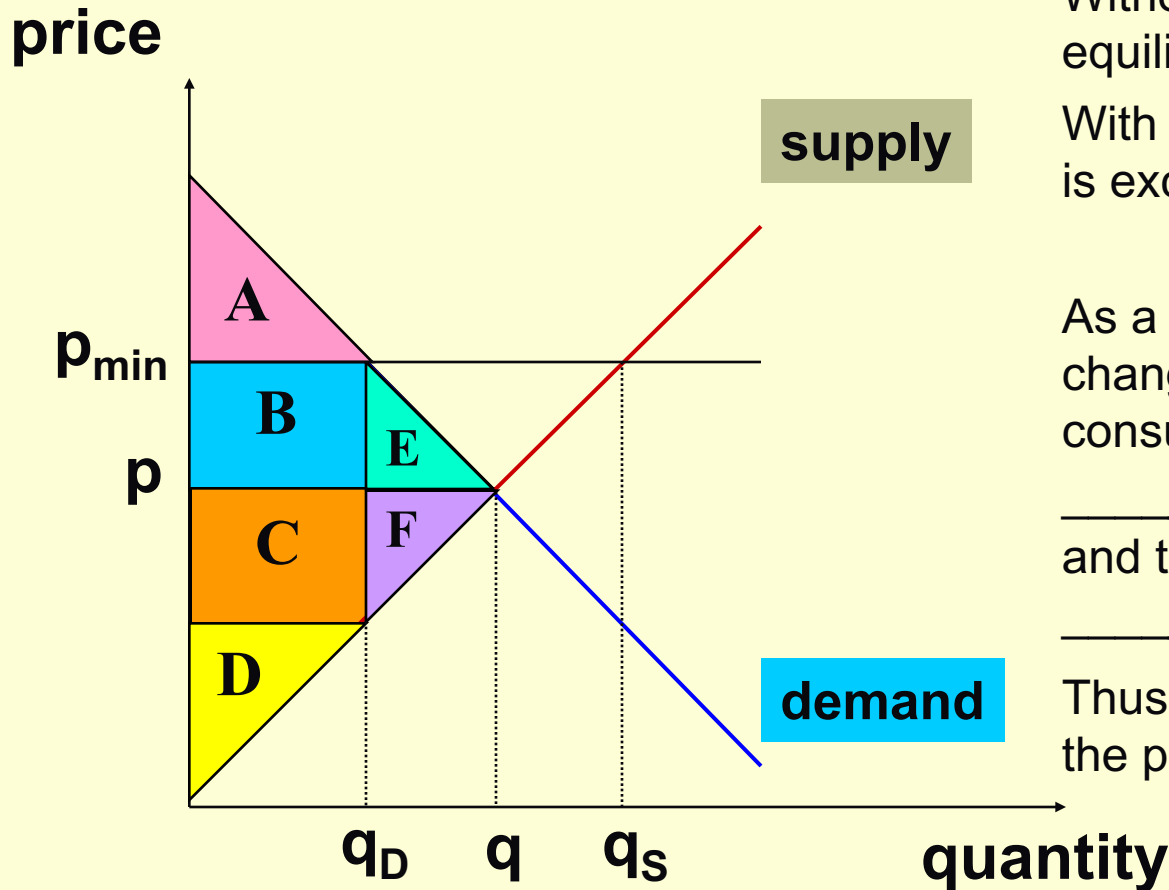
- Who are to blame for the long queues at the petrol station during oil price hikes or labour disputes?



Application 2: price floor

- Price floor: a legal minimum on the price that can be charged (to be effective, it has to be higher than the equilibrium price)
- Examples: minimum wage
- Objectives: promotion of equity (or to satisfy voters?)
- Outcome:
 - Consumer surplus decreases.
 - Producer surplus may or may not increase.
 - Overall, total surplus decreases - deadweight loss due to excess supply (surplus).

Application 2: price floor



Without the price floor, the equilibrium is (p, q) .

With the price floor at $p_{\min}$, there is excess supply of $q_S - q_D$.

As a result, producer surplus changes from _____ to _____, consumer surplus changes from _____ to _____, and total surplus changes from _____ to _____.

Thus the deadweight loss of the price floor is _____.



Taxes

- The largest source of government revenue is various taxes.
- In general, taxes discourage market activity, leading to deadweight losses.
 - Progressive income taxes reduce work incentives.
 - When goods and services are taxed, the final price consumers pay is higher and the quantity sold is smaller.
- A ‘good’ tax is the one that raises required revenue at a minimum deadweight loss.
- Our quest for a ‘good’ tax starts NOW...

Tax revenue in Australia (2014-15, in \$billion)
 (Source: Australian Bureau of Statistics, <http://www.abs.gov.au>)

Commonwealth Government	\$ billion	% of total taxes
Taxes on income	259	57.9
Taxes on goods and services (GST)	93	20.8
Other taxes	5	1.1
Total	357	79.9
State and Local Governments		
Payroll taxes	22	4.9
Taxes on property	45	10.1
Other taxes	23	5.1
Total	90	20.1
Total taxes for all levels of governments	447	100



Size of government for selected OECD countries (total tax revenue as a percentage of GDP)

	1975	1985	1995	2000	2015
Canada	31.9	32.5	35.6	35.6	32.2
US	25.6	25.6	27.9	29.9	26.9
Australia	26.5	29.1	29.6	31.8	25.8
Japan	20.8	27.4	27.8	27.1	28.3
Korea	15.1	16.4	19.4	23.6	26.8
France	35.9	43.8	43.9	45.2	44.6
Germany	35.3	37.2	38.2	37.8	40.6
UK	35.3	37.7	35.0	37.4	39.0
Sweden	42.0	48.2	48.5	53.8	45.8
Denmark	39.3	46.5	48.8	49.4	49.0
OECD average	30.3	33.6	35.9	37.2	34.8



General effect of tax

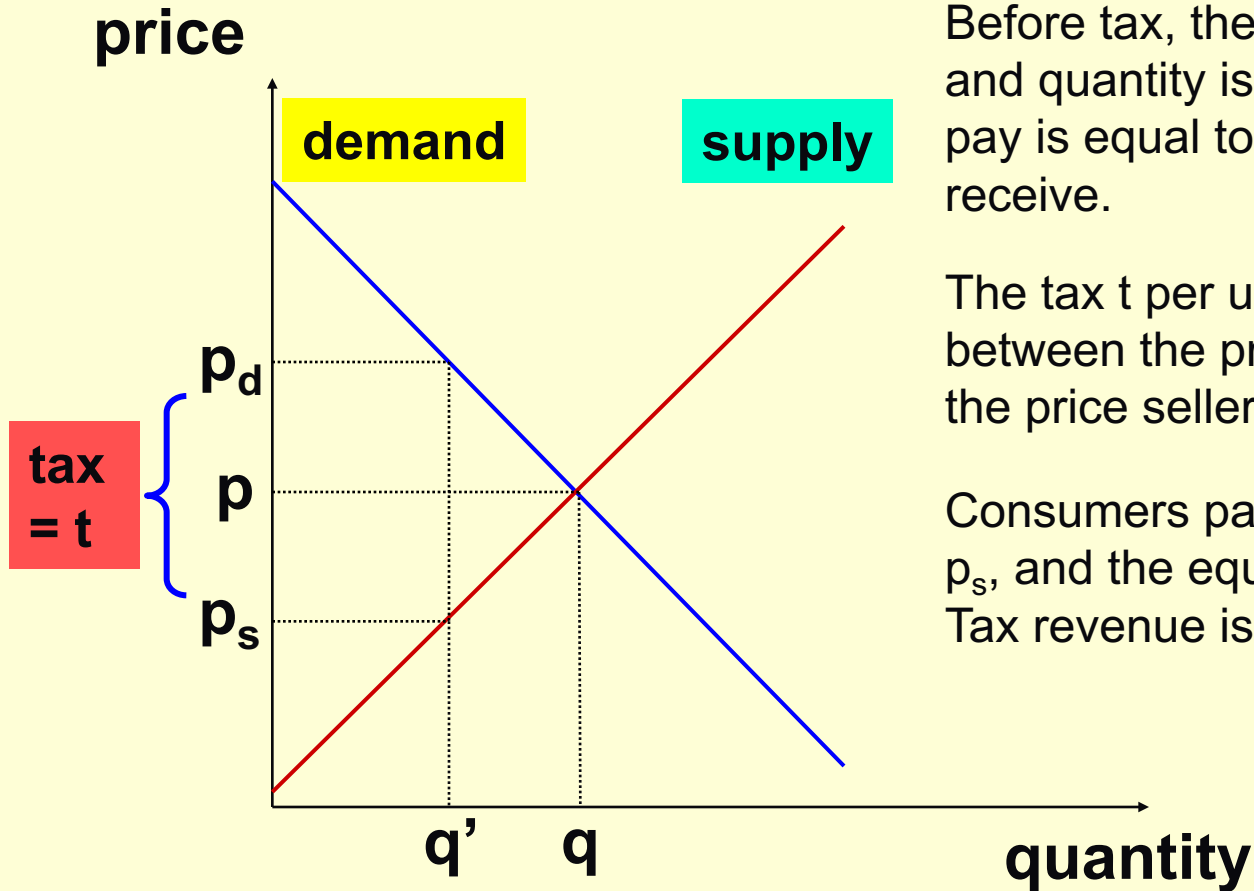
- When buyers and sellers trade, they often have to pay a 'tax' to the government (the GST in Australia, the VAT in Europe, etc.).
- Compared to the case without tax, buyers pay more and sellers receive less. The difference is called the tax wedge: $\text{buyers' price} = \text{sellers' price} + \text{tax}$.
- Questions
 - How does tax change the market equilibrium?
 - Does it depend on whether tax is levied on consumers (sales tax) or producers (excise tax)?
 - Who (buyers or sellers) bears a larger burden of the tax (tax incidence)?
 - What is a 'good' tax?



Exercise

- Demand: $Q^D = 270 - P$; supply: $Q^S = 230 + P$.
- Calculate the equilibrium quantity and price.
- If the government levies \$10 per unit on consumers (sales tax),
 - How much is the equilibrium quantity after tax?
 - How much is the after-tax price buyers pay?
 - How much is the after-tax price sellers receive?
- Repeat the above questions when the government levies \$10 per unit on producers (excise tax).
- Which party bears a larger burden of the tax?

Effect of a tax



Before tax, the equilibrium price is p and quantity is q . The price consumers pay is equal to the price producers receive.

The tax t per unit creates a wedge between the price consumers pay and the price sellers receive.

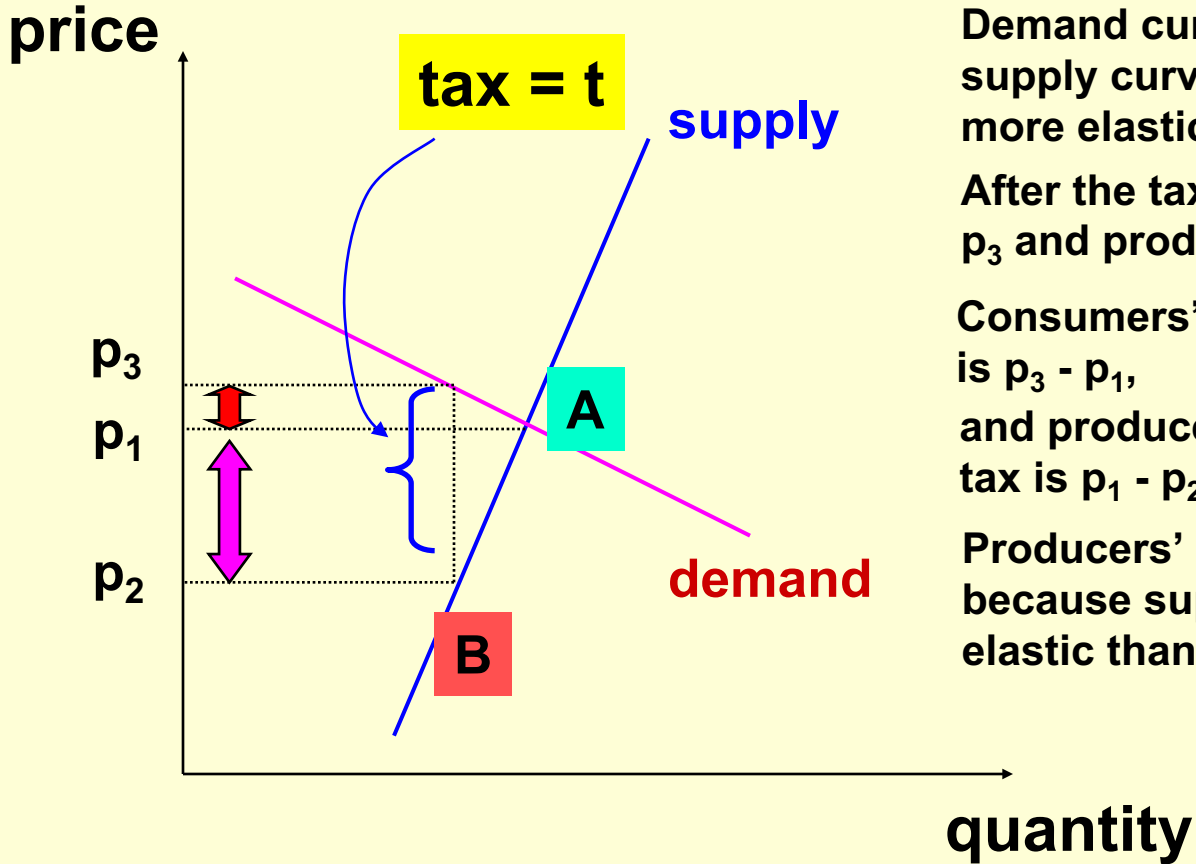
Consumers pay p_d , producers receive p_s , and the equilibrium quantity is q' . Tax revenue is _____.



Tax incidence

- Then who bears a larger burden of a tax?
- Intuition?
 - Tax increases consumer price, and decreases producer price.
 - Those who can avoid the adverse change in price will do so by leaving the market, bearing a less (or no) burden.
 - Those who cannot will bear a larger burden.
 - This flexibility is related to elasticities.
- A tax burden falls more heavily on the less price-elastic side of the market.

Tax incidence



Demand curve is flatter than supply curve, so demand is more elastic.

After the tax, consumers pay p_3 and producers receive p_2 .

Consumers' burden of the tax is $p_3 - p_1$,
and producers' burden of the tax is $p_1 - p_2$.

Producers' burden is larger because supply is less elastic than demand.



Questions for discussion

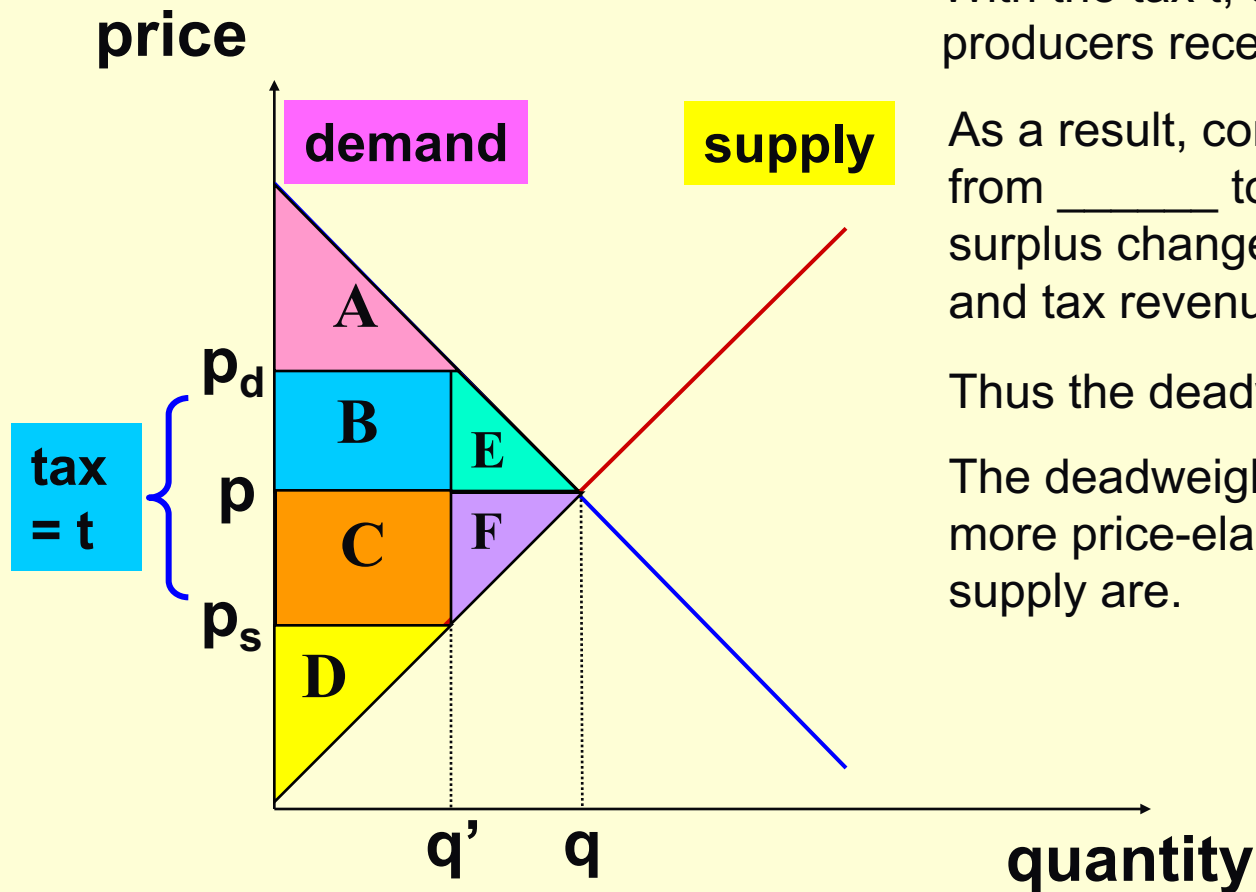
- When the GST (goods and services tax) was introduced in Australia in 2000, basic food items were exempt. What would have been the impact of the GST on food if it were not exempt?
- What is a likely effect of a tax on beer?
- On luxury goods?



Deadweight loss of a tax

- Taxes create a deadweight loss by reducing the quantity exchanged and the gains from trade.
- The size of the deadweight loss depends on elasticities.
- If sellers or buyers can more flexibly adjust to the adverse changes in price, then the deadweight loss is larger (as more gains from trade will be lost).
- The deadweight loss is larger if demand and/or supply is more price-elastic.

Deadweight loss of a tax



With the tax t , consumers pay p_d , and producers receive p_s .

As a result, consumer surplus changes from _____ to _____, producer surplus changes from _____ to _____, and tax revenue is _____.

Thus the deadweight loss is _____.

The deadweight loss is larger, the more price-elastic demand and/or supply are.



Tax revenue and elasticities

- Tax revenue = $\text{tax} \times (\text{quantity exchanged})$
- The size of tax revenue depends on elasticities.
- Taxes reduce the quantity exchanged, more so if demand and/or supply are more price-elastic.
- The tax revenue is smaller if demand and/or supply is more price-elastic.



Tax: recap

Tax incidence

- Who bears how much of the tax burden
- A less price-elastic side of the market will bear a larger burden of the tax

Deadweight loss

- By reducing the gains from trade, a tax creates a deadweight loss, or a reduction in total surplus
- The deadweight loss is larger in more price-elastic markets

Tax revenue

- Tax revenue is larger if a tax leads to a smaller decrease in the quantity exchanged
- Tax revenue is larger in less price-elastic markets



Questions for discussion

- We now know how useful and important elasticities are!
- Which of the following will have relatively a smaller deadweight loss of a tax? Beer or luxury goods?
- Which of the following will result in relatively a larger tax revenue? Beer or luxury goods?
- Example of a 'good tax' (smallest deadweight loss + largest revenue collected)?



Is this an ideal tax?

● https://www.youtube.com/watch?v=5o98_hia8tA

● Poll tax

- Small deadweight loss?
- Large revenue?
- What is a problem?

● Thatcher government (1979 – 1990)

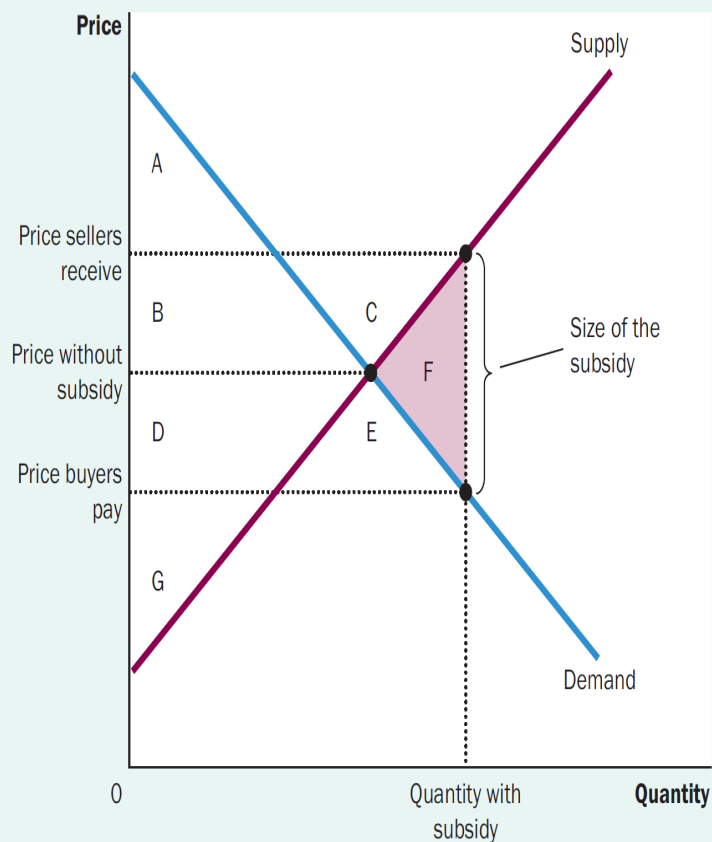
- Introduced in 1989 a flat-rate poll tax, a tax to be paid by every adult at a fixed amount set by their local authority,
- Led to nation-wide riots, e.g., ABAPTF (All Britain Anti-Poll Tax Federation), DDD (Don't Register, Don't Pay, Don't Collect),
- And the downfall of Thatcher government, and the poll tax replaced by council tax (levied based on property value).



Subsidy

- Payment by the government to consumers or producers for each unit of good bought or sold
- Is opposite to tax (or negative tax)
- Examples: Medicare rebate, petrol subsidy, housing subsidy, water usage in farms in many countries
- Main effects
 - Compared to the case without subsidy, buyers pay less and sellers receive more (the incidence depends on elasticities).
 - More is traded than without subsidy.
 - So isn't this a good thing then?

Subsidy: incidence and deadweight loss



After subsidy, consumer surplus changes from _____ to _____, so consumers gain by _____.

After subsidy, producer surplus changes from _____ to _____, so producers gain by _____.

Total amount of subsidy government pays is _____.

So subsidy creates a deadweight loss equal to _____.

What is a simple reason for the deadweight loss?



Recap and what is to come

- Resource allocation is efficient it maximizes total surplus
 $\text{= consumer surplus} + \text{producer surplus}$.
- The competitive market allocation as determined by demand and supply is efficient.
- When policies (price controls, taxes, subsidies) pursue goals other than efficiency, they create deadweight loss.
- A 'good' policy is the one that achieves the goal at minimum deadweight loss.
- Next week, we apply the demand and supply model to international trade (Ch. 9).