

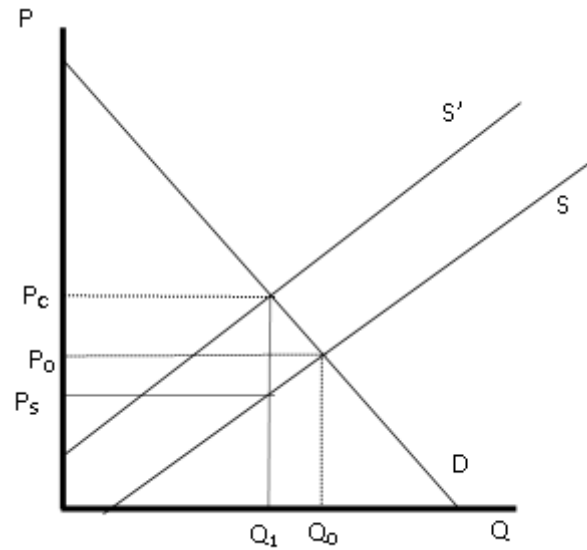
# Lecture # 6 – Taxes

Note: as we didn't finish the material on elasticity on Saturday, we will not cover all of the material on taxes on Monday. However, I've included all the notes here so that they are in one place. We won't discuss the articles related to tax policy until Wednesday.

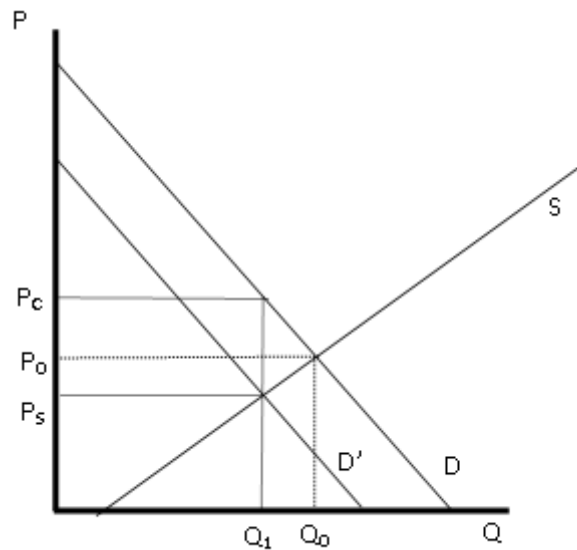
## I. Taxes

- Taxes can be represented by a shift of the supply curve or the demand curve.
  - Only one curve shifts.
  - The shift represents the amount of the tax.
  - Note that the difference between what consumers pay and suppliers receive is the tax
    - That is,  $P_C = P_S + \text{tax}$ , or  $P_S = P_C - \text{tax}$
  - Only shift the curve for the party that faces the legal incidence. That is the group from which the government collects the tax.
  - The new curve represents the curve faced by the other party.
    - Example: If a tax is placed on sellers, supply shifts up and in. This new supply curve is the supply faced by consumers.
      - In this case, the new supply curve represents  $P_C = P_S + \text{tax}$ , which is the amount of money consumers will have to pay to seller.
  - Equilibrium is where the shifted demand (supply) curve intersects the supply (demand) curve.
    - Intuition: the original curve represents the consumers' tastes. It tells us how much they are willing to pay for the good.
      - Consumers don't care about whether they pay money to the government or the supplier -- all that matters is the total amount they pay.
    - Suppliers, on the other hand, only care about the money that they receive after taxes are paid. When there is a tax on consumers, part of what consumers pay goes to the government. The shifted demand curve represents what is left to go to suppliers after the tax is paid.

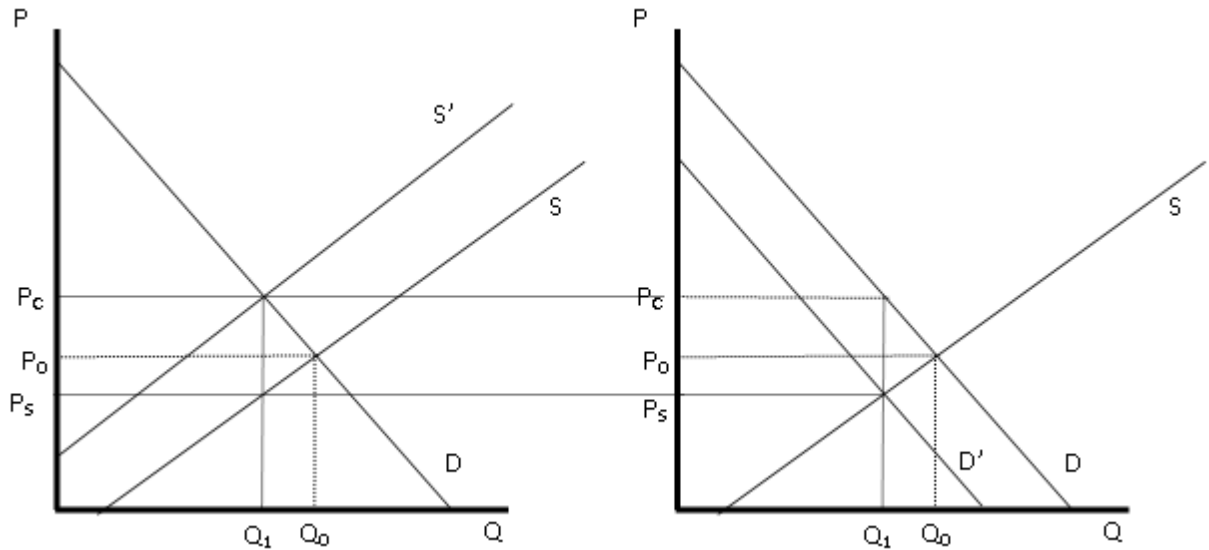
- The graph below illustrates the case when shifting supply.
  - Quantity falls after the tax.
  - Consumers pay more -- their new price is  $P_C$ .
  - Because suppliers use some of that money to pay the tax, they keep less. They only get to keep  $P_S$ .
    - The difference between  $P_C$  and  $P_S$  is the amount of the tax.



- Similarly, we could represent the tax by shifting demand instead.
  - Here, the new demand curve represents  $P_S = P_C - \text{tax}$ . It is how much money suppliers will get from consumers after consumers pay the tax.
    - That is because consumers only care about the total amount they pay. They don't care who they pay the money to.
  - Quantity falls after the tax.
  - Consumers pay more -- their new price is  $P_C$ .
  - Because consumers use some of that money to pay the tax, they give less to the seller. Sellers only get to keep  $P_S$ .
    - The difference between  $P_C$  and  $P_S$  is the amount of the tax.
- Note that in both cases, the new price for consumers comes from the *original* demand curve, and the new price for sellers from the *original* supply curve.



- The economic burden of the tax does not depend on the legal burden.
  - Taxes will generally be shifted, so that both parties bear part of the burden. The amount shifted is the same whether the legal incidence falls on consumers or producers.
  - Note in the figures below that prices shift by the same amount whether the legal burden is on suppliers (left) or consumers (right).



- Steps to solving a mathematical example
  1. Solve for the pre-tax equilibrium.
  2. Shift in the demand (supply) curve and find the new equation. This is the demand (supply) curve faced by suppliers (consumers).
    - *Remember to only shift **one** of the curves!*
    - Recall that  $P_c = P_s + \text{tax}$ . Thus, to shift supply, note that the demand curve equals the old supply curve plus the amount of the tax.
    - Similarly, the equation above can be rewritten as  $P_s = P_c - \text{tax}$ . Thus, to shift demand, note that the old supply curve equals the old demand curve minus the amount of the tax.
    - In either case, the result is to change the y-intercept of either the demand or supply equation by the amount of the tax.
  3. Find the intersection of the new demand (supply) curve with the old supply (demand) curve. This gives you the new equilibrium quantity.
  4. To find the prices, plug the quantity into the *original* demand and supply curves.
    - Plugging Q into the original demand curve gives you the price consumers pay.
    - Plugging Q into the original supply curve gives you the price suppliers get to keep.
    - To check your work, the difference between these prices should be equal to the tax.

- Here are the numbers from the example in class today

A numeric example on the tax effect:

Demand:  $P_c = 34 - 2Q$

Supply:  $P_s = 1 + Q$

Without a tax, we calculate the initial equilibrium price and quantity

$$P_c = P_s$$

$$34 - 2Q = 1 + Q$$

$$33 = 3Q$$

$$\Rightarrow Q = 11$$

$$P_c = P_s = 1 + 11 = \$12$$

Now suppose the government levies a tax: Tax = \$3 per unit

**Key Step:**  $P_c = P_s + \text{Tax}$

$$34 - 2Q = 1 + Q + 3$$

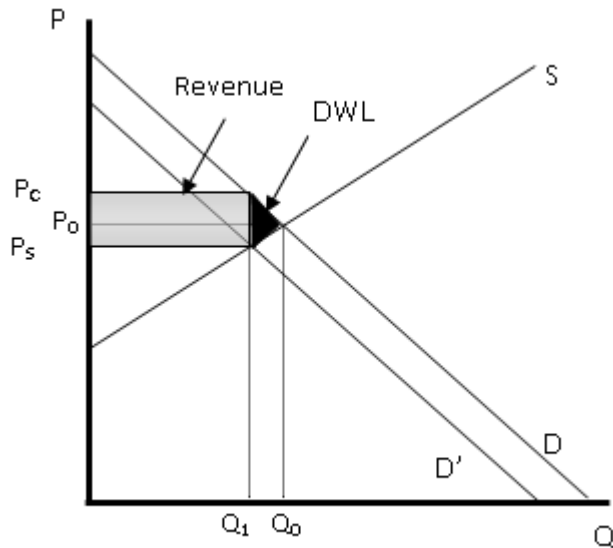
$$34 - 2Q = 4 + Q \text{ (shifted supply curve)}$$

$$30 = 3Q$$

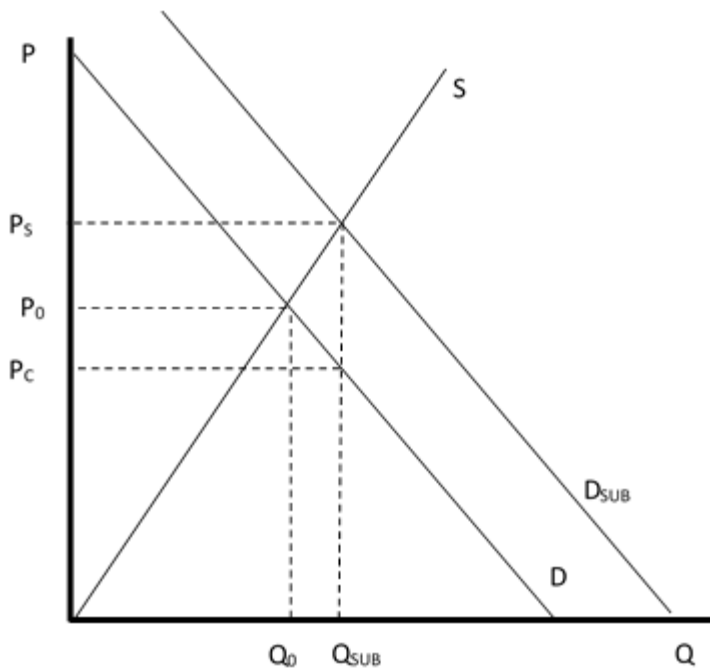
$$\Rightarrow Q = 10, P_c = 34 - 2 \cdot 10 = 14, P_s = 1 + Q = 11$$

$$\text{*Double check: } P_c - P_s = 14 - 11 = \$3$$

- Below is an illustration showing the deadweight loss and the revenue collected from a tax.
  - As shown in class, consumer and producer surplus will be smaller after the tax.
    - Remember to always use the original demand and supply curves to find consumer and producer surplus.
  - Some of the original surpluses now go the government as tax revenue.
  - However, some simply disappears. This is *deadweight loss*.
    - The deadweight loss occurs because some sales that took place before the tax (and were beneficial to consumers and producers) no longer occur.
    - The deadweight loss is a measure of the *inefficiency* of the tax.
  - Elasticity is also important for efficiency.
    - Since deadweight loss comes from beneficial transactions that no longer take place, it is greater when there is elastic supply and demand.

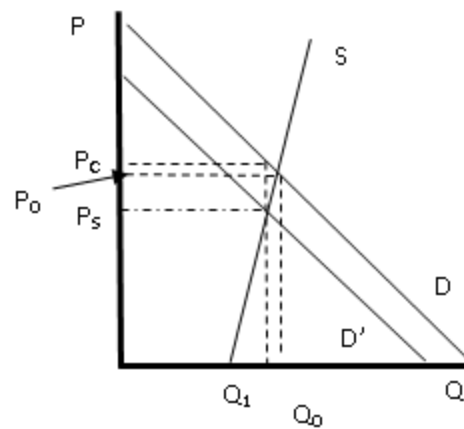


- In the case of a subsidy, we shift the demand or supply *out* by the amount of the subsidy
  - The example below shifts demand
    - Quantity increases because of the subsidy
    - As before, we find the prices using the *original* supply and demand curves
      - Consumers pay a bit less ( $P_C$ )
      - Since the government adds the subsidy, sellers make a bit more money ( $P_S$ )



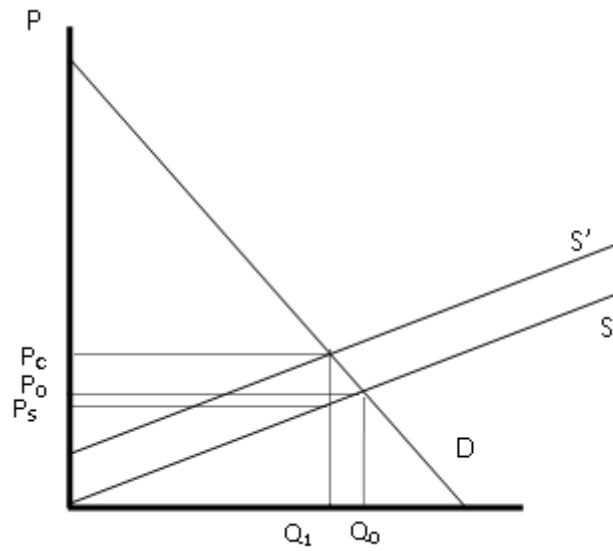
## II. Tax Incidence

- Elasticity and tax incidence
  - The greater share of the economic burden of a tax falls on the more inelastic party. Economists refer to the share of the economic burden as *tax incidence*.
    - Intuition: inelastic parties are less able to change their behavior in response to a tax. Thus, they have a harder time avoiding the tax.
    - Here is an example with an inelastic supply curve:
    - Because supply is inelastic, the drop in supplier price is greater than the increase in consumer price. Suppliers bear a larger burden of the tax.





- Compare to a case where supply is elastic. Here, the increase in consumer price is greater. Consumers bear a larger burden of the tax.



- Note as well that it doesn't matter whether supply or demand has shifted. In one case above, I shifted demand. In the other I shifted supply.

- The readings provide several examples.
  - The *Post-Standard* article on the gasoline tax cap is shows how consumers can avoid the increased tax by going to another county.
  - Similarly, the *Economist* article on property taxes discusses why taxing land is efficient.
  - Finally, the *Economist* article on wage subsidies shows that the same rules for incidence apply for subsidies.
    - In this case, since a subsidy provides a benefit, it is the inelastic party that benefits from the subsidy.
    - In the wage subsidy example, studies show that most of the benefit goes to workers (suppliers of labor). That suggests that labor supply is more inelastic, as illustrated below.
      - Note that the price paid to workers goes up by a lot ( $P_S$ ) but firms only pay a little less than they did before ( $P_C$ ). Thus, most of the revenues from the subsidy are going to workers.

