Lecture # 7 -- Taxes

I. Taxes

- Steps to solving a mathematical example
  - Solve for the pre-tax equilibrium.
  - 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 $P_C = P_S$ + 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 $P_S = P_C$ - 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.
  - Find the intersection of the new demand (supply) curve with the old supply (demand) curve. This gives you the new equilibrium quantity.
  - 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: Pc = 34-2Q
  Supply: Ps = 1 + Q

  Without a tax, we calculate the initial equilibrium price and quantity
  Pc = Ps
  34- 2Q = 1 + Q
  33 = 3Q
  => Q = 11
  Pc = Ps = 1+ 11 = $12

  Now suppose the government levies a tax: Tax = $3 per unit
  Key Step: Pc = Ps + Tax
  34 -2Q = 1 + Q + 3
  34 – 2Q = 4+ Q (shifted supply curve)
  30 = 3Q
  => Q= 10, Pc = 34 -2*10 = 14, Ps = 1+ Q = 11
  *Double check: Pc – Ps = 14 -11 = $3

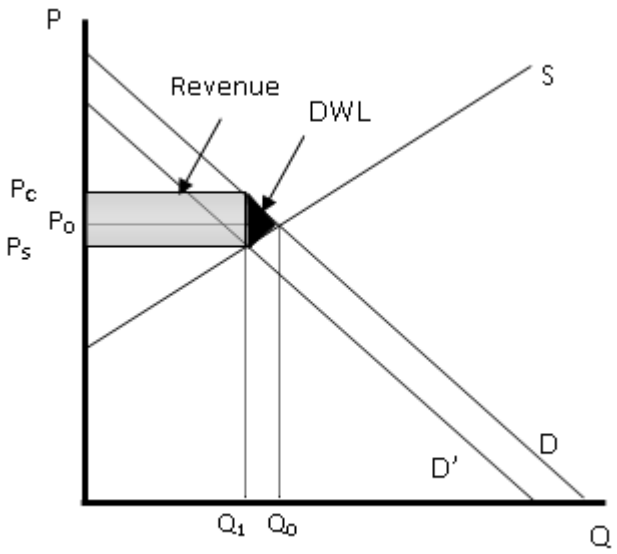
  To calculate the changes in consumer surplus and producer surplus
  The initial equilibrium (without a tax):
  CS = 0.5*(34-12)*11 = $121
  PS = 0.5*(12-1)*11 = $60.5
  CS + PS = $181.5

  After the tax is levied:
  CS' = 0.5*(34-14) *10 = $100
  PS' = 0.5*(11-1)*10 = $50
  Tax Revenue = 3*10 = 30
  CS' + PS' + TR = $180
  DWL = 181.5 – 180 = $1.5

  *Double check the area of the triangle (base: tax per unit; height: change in the equilibrium quantity)
  DWL = 0.5* (11-10)*3 = $1.5

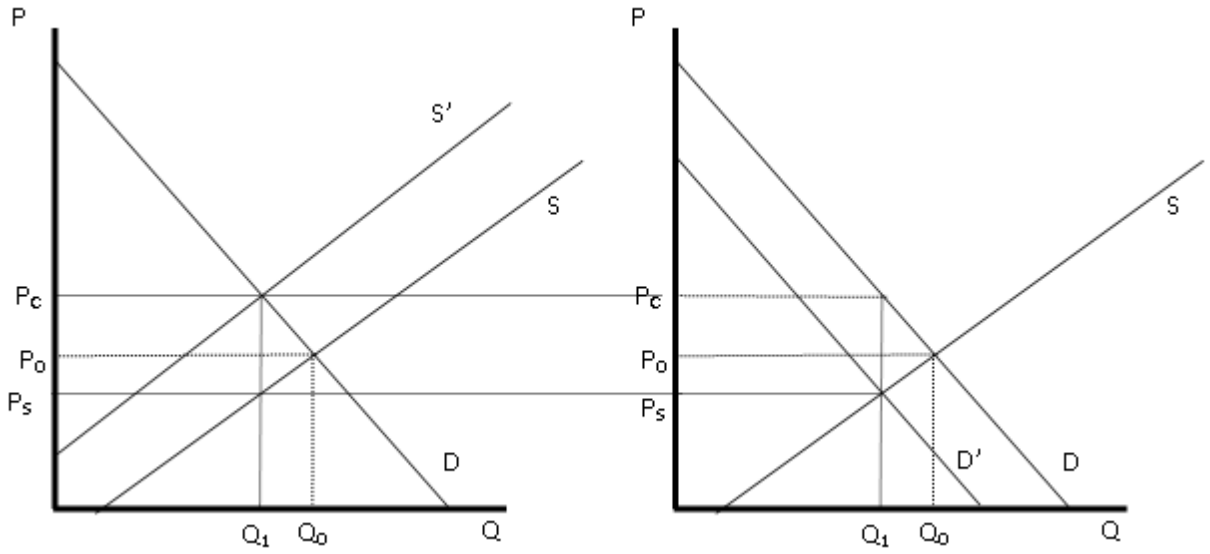
  Incidence of Tax (Tax = $3 per unit)
  P_0 = $12, Pc = $14, Ps = $11
  Change in Pc = $ 2
  Change in Ps = $ 1
  So we see that consumers bear a larger burden of the tax in this case.

- 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.

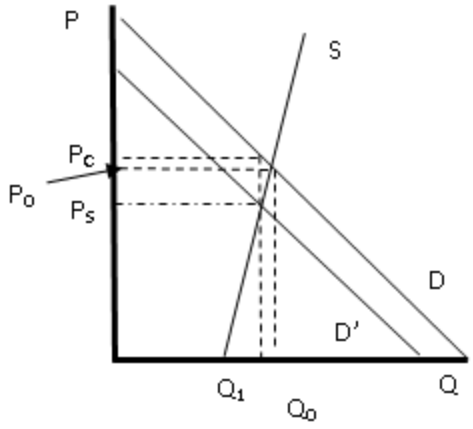


II. Tax Incidence

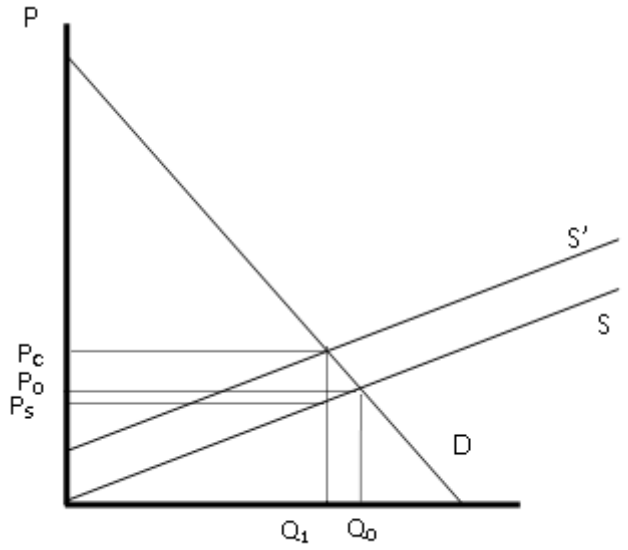
- The economic burden of the tax does not depend on the legal burden.
  - Taxes will generally be shifted, so that both parties bear part of the burden. The amount shifted is the same whether the legal incidence falls on consumers or producers.
  - Note in the figures below that prices shift by the same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



- 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.



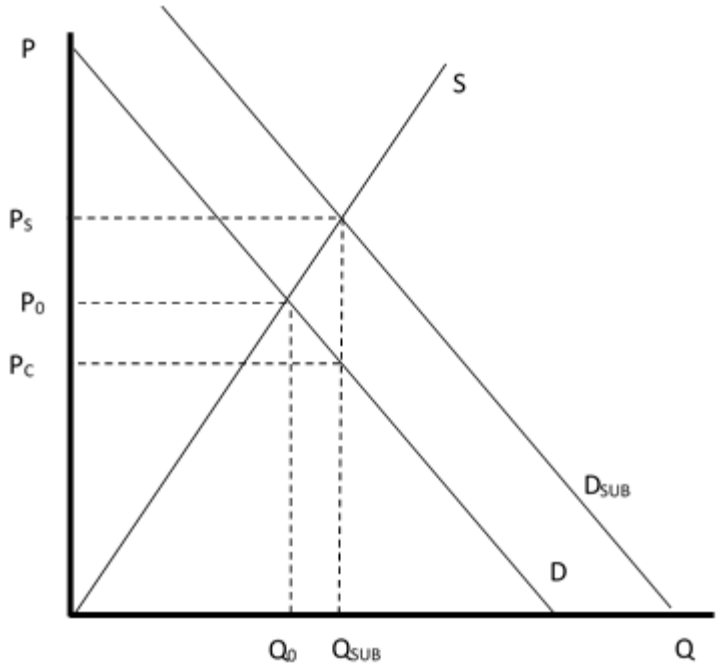
- Compare to a case where supply is elastic. Here, the increase in consumer price is greater. Consumers bear a larger burden of the tax.



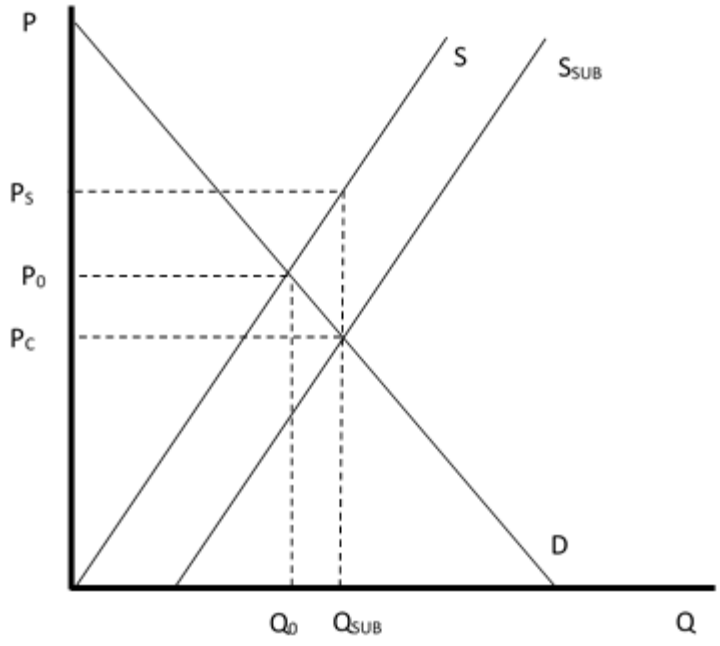
- Note as well that it doesn't matter whether supply or demand has shifted. In one case above, I shifted demand. In the other I shifted supply.
- The *Post-Standard* article on the gasoline tax cap is an example.
  - Consumers can avoid the increased tax by going to another county. They have more flexibility than gas station owners in Onondaga County, who cannot move.
- Similarly, the *Economist* article on property taxes discusses why taxing land is efficient.
- Finally, the article on corporate income taxes highlights several factors that affect how likely the burden of the corporate tax could be passed on to others, including labor.
  - Note how these examples relate to elasticity.

III. Subsidies

- 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)



- As before, the result is the same if we shift supply instead:



- 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.