Lecture # 6 – Elasticity/Taxes

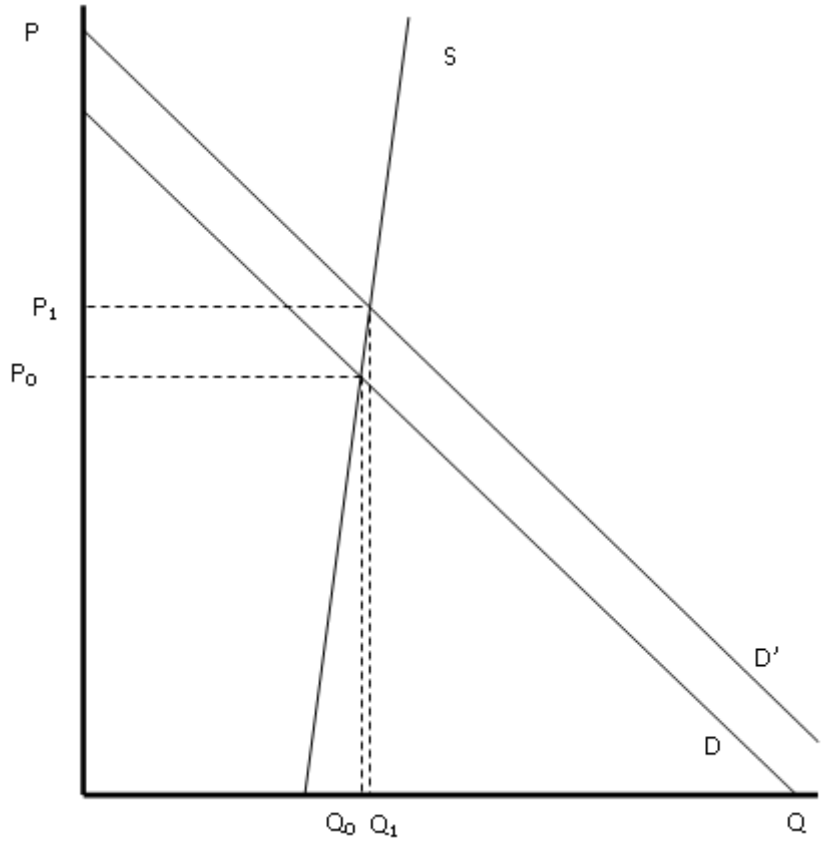
I. Elasticity

- Price elasticity of demand (continued)
  - Elastic vs. inelastic
    - absolute value > 1 = *elastic*
    - absolute value < 1 = *inelastic*
    - Elasticity and revenue:
      - When price is inelastic, price and revenue move together. An increase in price raises revenue.
        - *Intuition*: if demand is inelastic, consumers will not respond much to a change in price. Most people still purchase the good, and they pay more to do so.
      - When price is elastic, price and revenue move in the opposite direction. Revenues fall when the price is raised.
        - *Intuition*: if demand is elastic, consumers respond strongly to a change in price. The drop in quantity dominates the increased price.
- Cross-price elasticity of demand -- the percentage change in quantity demanded of good *x* due to a 1% change in price of good *y*.
  - $e_{xy} < 0$ implies complements (e.g. coffee and sugar)
  - $e_{xy} > 0$ implies substitutes (e.g. honey and sugar)
- Income elasticity of demand -- the percentage change in quantity demanded due to a one percent change in income.
  - $e_I < 0$ is an inferior good
  - $e_I > 0$ is a normal good
    - $e_I > 1$ is a luxury
    - e_I between 0 and 1 is a necessity
- Although the above examples are for demand, note that we can do the same thing for supply.

II. Short-run vs. Long-run elasticities

- Factors influencing elasticity include:
    - Availability of substitutes
    - Need: how important is the good to consumers
    - Time: consumers are more flexible when they have more time to change (more on this below)
    - Expenditure as a percentage of income
        - Price changes matter more when the good uses up a larger share of your income
- In this section, we focus on the role of time.
- Short- vs. long-run elasticity
    - For most goods, demand is more inelastic in the short run than the long run
        - More opportunities to change behavior are available in the long run.
        - For example, when gas prices rise, people can't do much right away, but eventually they can buy more fuel-efficient cars.
    - For *durable* goods, demand is more elastic in the short run.
        - Durable goods are goods that last a long time, such as cars. When prices rise, people can put off buying a new car. However, eventually they will need to buy one, so demand becomes more inelastic as time passes.

- The *Economist* articles on housing prices illustrate differences between the short and long run.
    - In the short-run, supply is very inelastic. Thus, as demand increases, prices rise sharply.

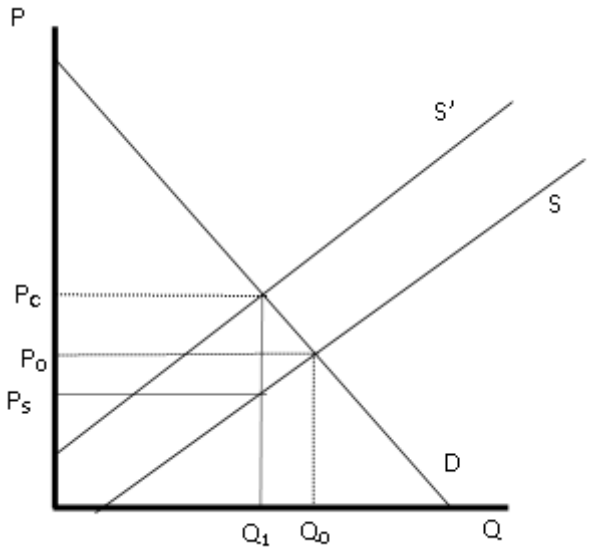


    - As we'll discuss in class, this affects how different policy responses are likely to work.

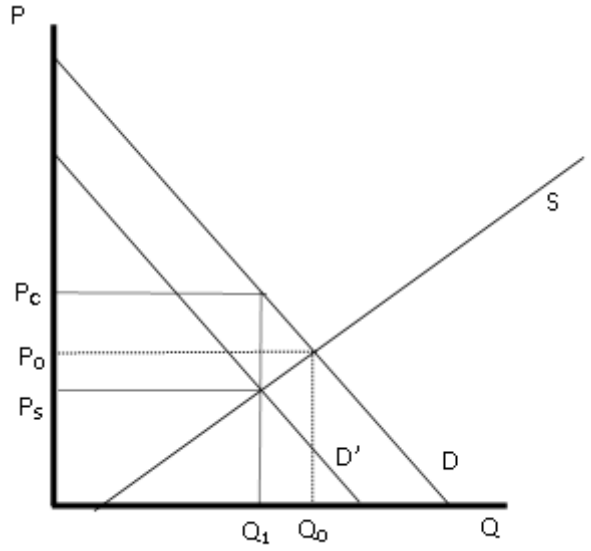
III. Taxes

- 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.

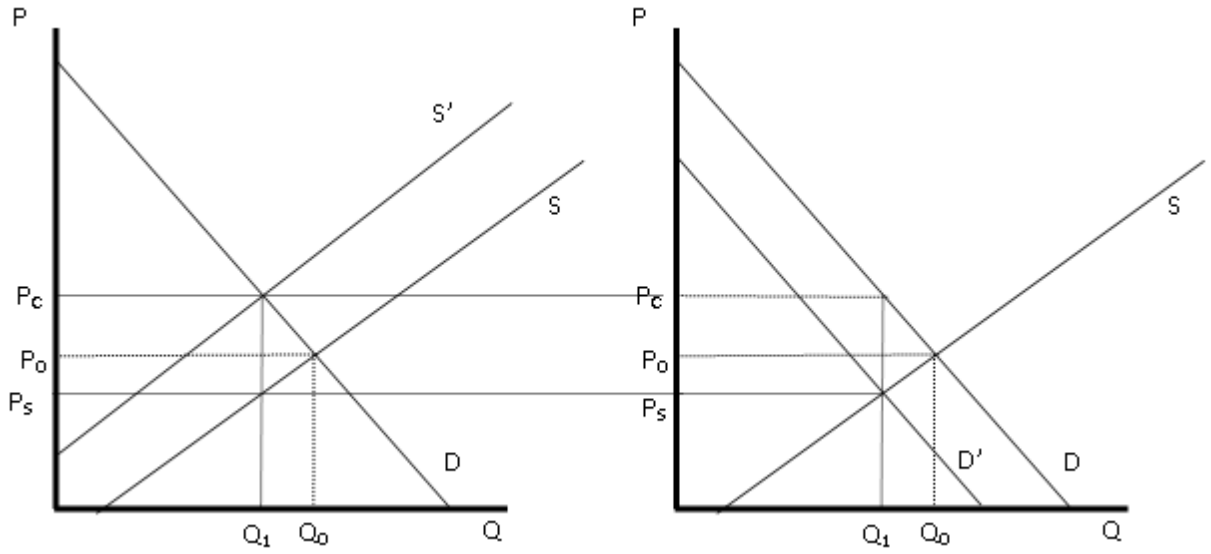
- The graph below illustrates the case when shifting supply.
  - Quantity falls after the tax.
  - Consumers pay more -- their new price is P_C.
  - Because suppliers use some of that money to pay the tax, they keep less. They only get to keep P_S.
    - The difference between P_C and P_S is the amount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



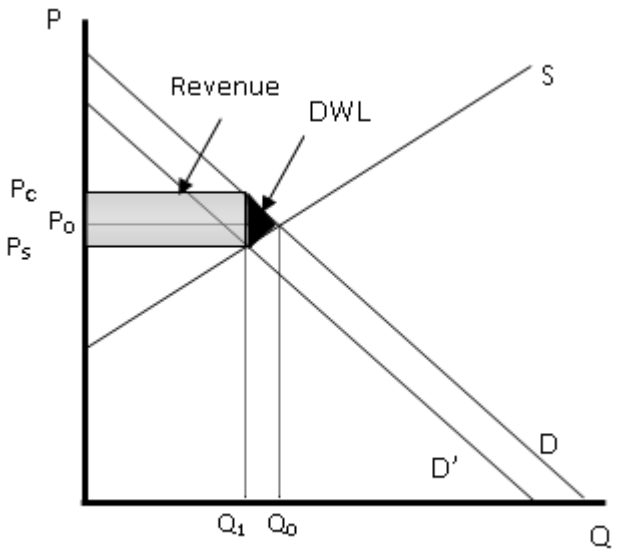
- Similarly, we could represent the tax by shifting demand instead.
  - Here, the new demand curve represents $P_S = P_C$ – tax. It is how much money suppliers will get from consumers after consumers pay the tax.
    - That is because consumers only care about the total amount they pay. They don't care 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).



- 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.



- 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.