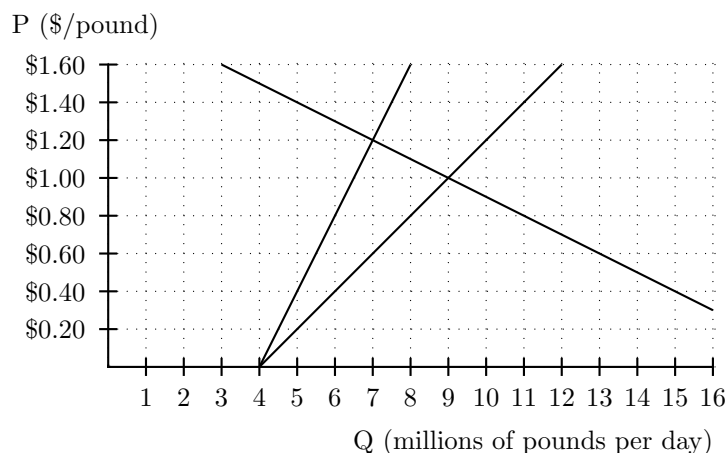


4. Below is a hypothetical market for oranges.



Suppose that the government decides to impose a sales tax of 50% on the sellers of oranges. (With a sales tax, if sellers sell a pound of oranges for \$1, they get to keep \$.50 and have to pay the government \$.50; if they sell a pound of oranges for \$2, they get to keep \$1 and have to pay the government \$1.)

- (a) (5 points) Show the impact of this tax on the supply and demand curves above.
- (b) (5 points) Explain (as if to a non-economist) why the tax shifts the curves the way it does.

At a price of, say, \$.80, sellers actually get to keep \$.40 after-tax, so with a market price of \$.80 and a 50% tax they should be willing to supply as much as they were willing to supply at a price of \$.40 without the tax. Similarly, with a market price of \$1.20 and a 50% tax they should be willing to supply as much as they were willing to supply at a price of \$.60 without the tax.

- (c) (5 points) Calculate the economic incidence of the tax, i.e., the amount of the tax burden borne by the buyers (T_B) and the amount borne by the sellers (T_S). Then calculate their ratio $\frac{T_B}{T_S}$.

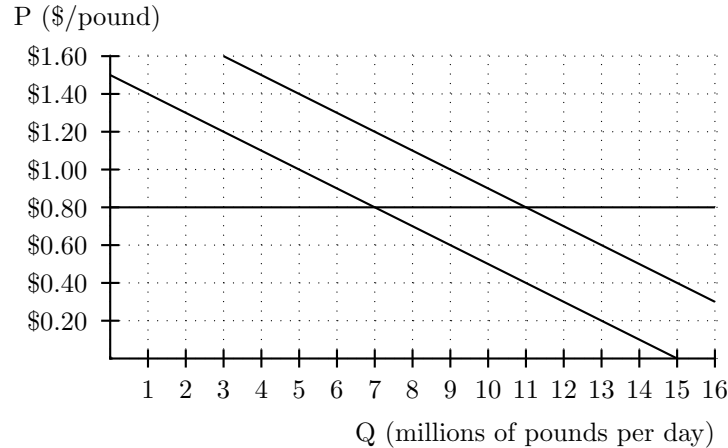
The new equilibrium price is \$1.20 per pound. Since buyers paid \$1.00 per pound originally, they are paying \$.20 more than before. Sellers used to receive \$1.00 per pound; now they receive \$1.20, but they pay 50% in taxes, so they effectively receive \$.60 per pound. This is \$.40 less than before.

The ratio of the tax burdens is $\frac{T_B}{T_S} = \frac{.2}{.4} = \frac{1}{2}$.

- (d) (5 points) Calculate the price elasticity of supply, ε_S , at the original (pre-tax) equilibrium. Then calculate the price elasticity of demand, ε_D , at the original (pre-tax) equilibrium. Then calculate their ratio, $\frac{\varepsilon_S}{\varepsilon_D}$. How does this ratio compare to the ratio of the tax burdens?

The price elasticity of supply is about .556; the price elasticity of demand is about -1.111 . Their ratio is $-\frac{1}{2}$, which is of the same magnitude as the ratio of the tax burdens!

5. Below is a hypothetical market for oranges.



Suppose that the government decides to impose a per-unit tax of \$.40 per pound on the buyers of oranges.

- (a) (5 points) Show the impact of this tax on the supply and demand curves above.
- (b) (5 points) Explain (as if to a non-economist) why the tax shifts the curves the way it does.

At a market price of, say, \$1.00, buyers have to pay an extra \$.40 in tax, so they are effectively paying \$1.40 per pound. So they should be willing to buy at a market price of \$1.00 with the tax as much as they were willing to buy at a market price of \$1.40 without the tax.

Another approach: the marginal benefit curve shifts down by \$.40 because the marginal benefit of each unit is reduced by that amount by the tax.

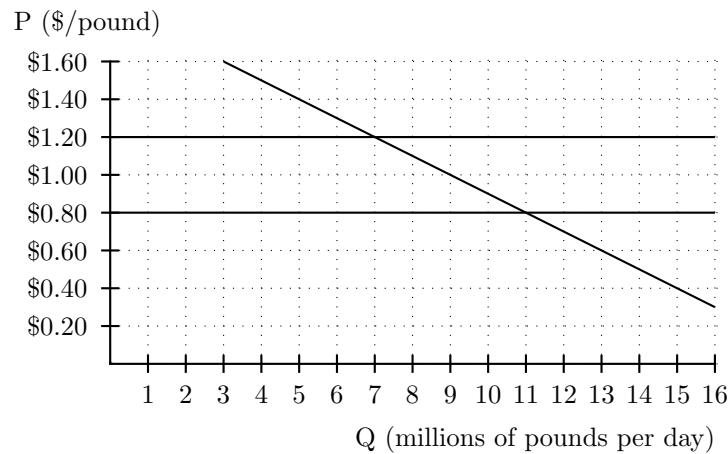
- (c) (5 points) Calculate the economic incidence of the tax, i.e., the amount of the tax burden borne by the buyers (T_B) and the amount borne by the sellers (T_S).

The original equilibrium price, \$.80 per pound, is the same as the original equilibrium price. So the sellers receive the same amount

per pound both before and after the tax; hence, they bear none of the economic burden of the tax. The buyers must therefore pay all of it: they paid \$.80 per pound before the tax, and now pay \$.80 per pound to the sellers plus \$.40 per pound to the government, for a total of \$1.20 per pound. So the buyers bear the entire \$.40 tax burden.

- (d) (5 points) How would the economic incidence of the tax change if the \$.40 per-unit tax was placed on the sellers instead of on the buyers? Use the graph below to analyze this situation, and briefly explain your answer.

The economic incidence of the tax would not change; this is the tax equivalence result. Ultimately, the incidence of the tax is determined by the relative elasticities of the supply and demand curves; the party that bears the brunt of the economic incidence of the tax is that party that is least able to avoid the tax, i.e., the party with the most inelastic curve. Since the supply curve in this problem is perfectly elastic, the buyer will bear the entire economic tax burden, regardless of whether the legal tax burden falls on the buyers or the sellers.



6. Consider a market with demand curve $q = 500 - 20p$ and supply curve $q = 50 + 25p$.
- (a) What is the original market equilibrium price and quantity?
Solving the two equations simultaneously we have $500 - 20p = 50 + 25p$, which simplifies to $45p = 450$ or $p = 10$. Plugging this back in to either of the two original equations yields $q = 300$.
- (b) What do the demand and supply curves look like with a \$2 per-unit tax on the buyers?

The supply equation is unchanged and the demand equation becomes $q = 500 - 20(p + 2)$, i.e., $q = 440 - 20p$. Solve this equation and the supply equation simultaneously to get the new equilibrium price and quantity.

- (c) With a \$2 per-unit tax on the sellers?

The demand equation is unchanged and the supply equation becomes $q = 50 + 25(p - 2)$, i.e., $q = 25p$. Solve this equation and the demand equation simultaneously to get the new equilibrium price and quantity.

- (d) With a 20% sales tax on the buyers?

The supply equation is unchanged and the demand equation becomes $q = 500 - 20(1.2p)$, i.e., $q = 500 - 24p$. Solve this equation and the supply equation simultaneously to get the new equilibrium price and quantity.

- (e) With a 20% sales tax on the sellers?

The demand equation is unchanged and the supply equation becomes $q = 50 + 25(.8p)$, i.e., $q = 50 + 20p$. Solve this equation and the demand equation simultaneously to get the new equilibrium price and quantity.