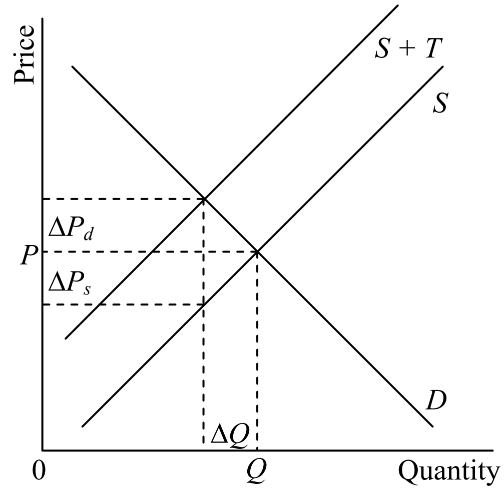
Elasticity and tax incidence



Consider the adjacent graph, which shows the impact of a unit tax of \$$T$ in a competitive market. Initially, the equilibrium price is P, and the equilibrium quantity is Q. The imposition of the tax causes the equilibrium quantity to fall by ΔQ, and the price to consumers increases by ΔP_d while the price to sellers falls by ΔP_s. The *incidence* of the tax measures the shares of the tax that falls on consumers and sellers. Since $\Delta P_d + \Delta P_s = T$, it is clear that consumers' share is $\frac{\Delta P_d}{T}$ and sellers' share is $\frac{\Delta P_s}{T}$. Our goal in this note is to relate these two shares to the elasticities of demand and supply.

To begin, recall that the elasticity of demand, E_d, can be written as $E_d = \frac{\Delta Q / Q}{\Delta P_d / P} = \frac{\Delta Q}{\Delta P_d}\frac{P}{Q}$. (We ignore the minus sign, treating both ΔP_d and ΔQ as positive amounts.) Suppose we solve this for ΔP_d as follows: $\Delta P_d = \frac{P}{Q}\frac{\Delta Q}{E_d}$. Likewise, we could find that $\Delta P_s = \frac{P}{Q}\frac{\Delta Q}{E_s}$.

Next, we make use of the fact that $T = \Delta P_d + \Delta P_s$, so $T = \frac{P}{Q}\frac{\Delta Q}{E_d} + \frac{P}{Q}\frac{\Delta Q}{E_s}$. If we multiply and divide the first term in this sum by E_s and the second term by E_d, we get a common denominator and can add the two terms to get $T = \frac{P\Delta Q E_s + P\Delta Q E_d}{Q E_d E_s} = \frac{P\Delta Q}{Q}\left(\frac{E_s + E_d}{E_d E_s}\right)$.

Making these two substitutions for ΔP_d and T, we can find that consumers' share of the tax is:

$$\frac{\Delta P_d}{T} = \frac{\frac{P\Delta Q}{QE_d}}{\frac{P\Delta Q}{Q}\left(\frac{E_s + E_d}{E_d E_s}\right)} = \frac{\frac{1}{E_d}}{\left(\frac{E_s + E_d}{E_d E_s}\right)} = \left(\frac{E_s}{E_d + E_s}\right).$$

A similar calculation shows that sellers' share of the tax is $\frac{\Delta P_s}{T} = \left(\frac{E_d}{E_d + E_s}\right)$.

Several conclusions emerge from these two share formulas:

- If the elasticities of demand and supply are equal, consumers' and sellers' share of the tax burden will be equal.
- For a given elasticity of supply, the larger is the elasticity of demand, the larger is the sellers' share, approaching 1 (100%) as supply becomes perfectly elastic.
- For a given elasticity of demand, the larger is the elasticity of supply, the larger is the consumers' share, approaching 1 (100%) as demand becomes perfectly elastic.