

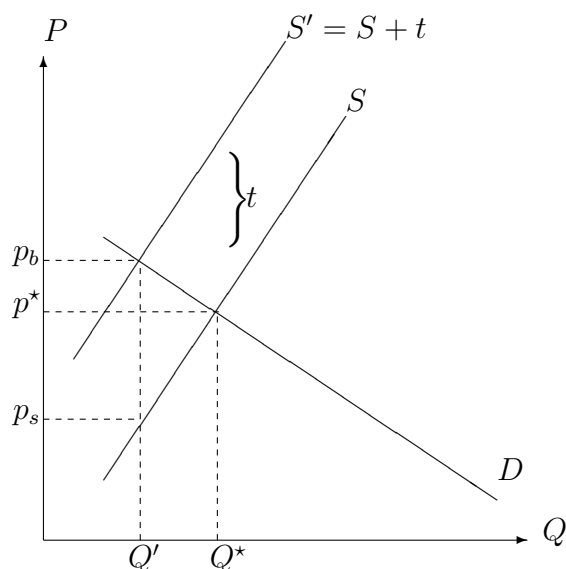
## A short introduction on tax incidence

Governments use two types of taxes on goods and services. One is the *ad valorem* tax such as the Texas sales tax: For every dollar spent by the consumers, the government keeps a fraction  $\alpha$ . For example, in Houston,  $\alpha = 8.25\%$ . So, if a consumer pays \$100 for a CD player, the government gets \$8.25 and the seller receives \$91.75.

The other type of sales tax is a *specific* or *unit* tax, where a specified dollar amount  $t$  is collected per unit of output. For example, in US, the federal government collects  $t = 18.4$  cents on each gallon of gas sold.

Since it is easier to analyze, we will concentrate on the specific tax. However, the qualitative results would be the same if we chose to analyze the sales tax.

Imposing a tax will have effects on prices, quantities sold and tax revenues. Consider the following picture:

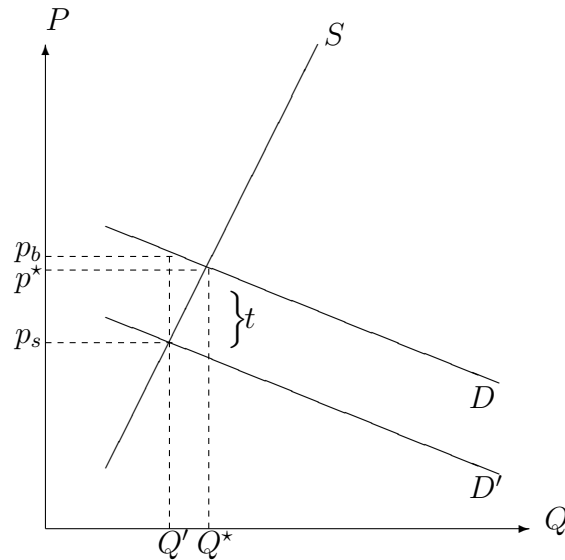


Without the government intervention, that is, without the tax, the equilibrium quantity sold in this market is  $Q^*$  and the equilibrium price is  $p^*$ . After the government imposes a specific tax of  $t$  dollars per unit sold on the sellers, the supply shifts by the amount of the tax. The supply curve is now  $S' = S + t$ . The price consumers will pay,  $p_b$ , is determined by the intersection of the demand and the new supply curves. Since the sellers are taxed, they will give  $t$  dollars per each unit sold to the government. Hence, the amount they receive is  $p_b - t = p_s$ .

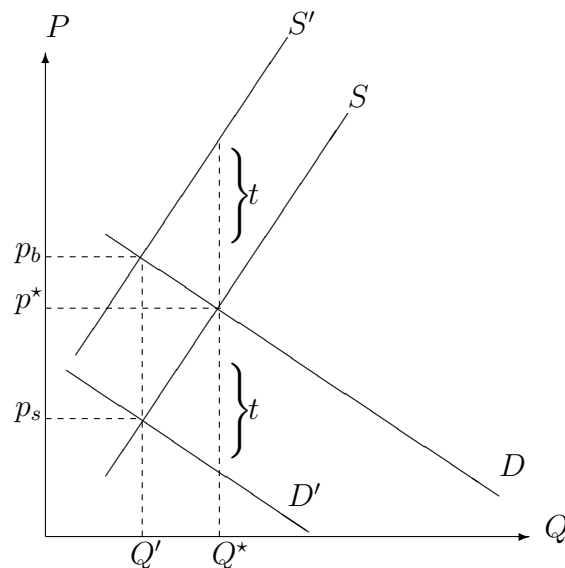
Note that, even though the tax is imposed on the sellers, sellers pass some of this burden on to the consumers: The consumers pay  $\frac{p_b - p_0}{t}$  percent and the sellers pay  $\frac{p_0 - p_s}{t}$  percent of the tax.

Suppose now that the tax is levied on buyers instead of sellers. The demand curve for the product - the price that consumers will pay for each quantity - does not change. But the

demand curve as seen by sellers - the amount that sellers can charge for each quantity is now reduced by  $t$  to  $D'$ . The new equilibrium is established at quantity  $Q'$  where consumers pay  $p_b$  and sellers receive  $p_s$ .

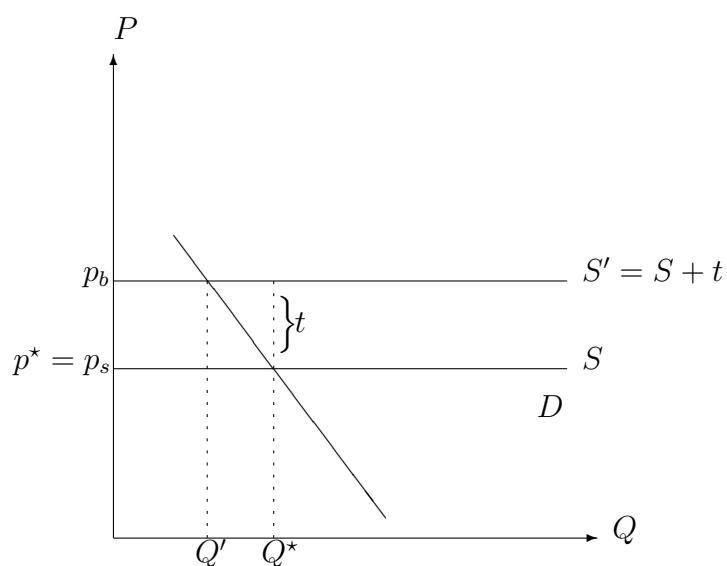


It is important to note that the effects of the tax on the price that consumers pay and that sellers receive are the same regardless of who pays the tax in an administrative sense. The incidence of the tax is independent on where it is levied; as the following picture illustrates:



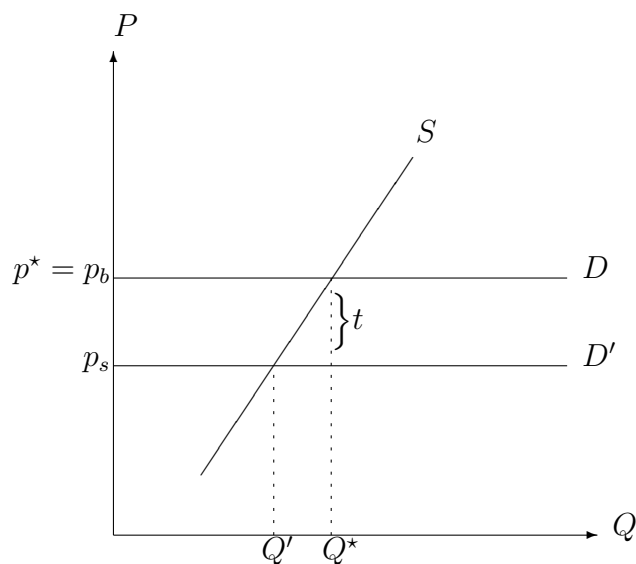
Here, if the  $\$t$  per unit tax is levied on the sellers, the supply curve will shift to  $S'$  and if it is levied on the buyers, the demand curve will shift to  $D'$ . As you can see, the amount consumers pay and producers receive is exactly the same under both cases.

What does affect the incidence of the tax is the relative elasticities of supply and demand. Consider the following example where the supply is perfectly elastic.



Here we see that the tax will be entirely shifted forward onto consumers. Since the supply curve is perfectly elastic any attempt to offer a lower price to sellers will result in zero units supplied. None of the tax can be shifted backward onto sellers.

Consider another example where the demand curve is perfectly elastic.



Here the tax is shifted entirely onto sellers since any attempt to charge consumers a higher price will result in the quantity demanded falling to zero. As an exercise, try to answer who is affected by the tax, if (i) the supply is perfectly inelastic, (ii) the demand is perfectly inelastic.

Now let's look at the relationship between tax incidence and elasticity. The relationship between elasticities and tax incidence can be written as

$$\Delta p = \left( \frac{\varepsilon_s}{\varepsilon_s - \varepsilon_d} \right) \Delta t,$$

where  $\varepsilon_s$  is the price elasticity of supply,  $\varepsilon_d$  is the price elasticity of demand, and the Greek letter  $\Delta$  denotes "change"

By utilizing this equation, it should now be very easy to see who bears the tax when either supply or demand is perfectly inelastic. For example, if the price elasticity of supply is 0, that is, supply is perfectly inelastic,  $\varepsilon_s = 0$  hence  $\Delta p / \Delta t = 0$ ; whatever the amount of tax is, the consumers are not affected. The tax incidence completely falls upon the sellers. Conversely, if the price elasticity of demand is perfectly inelastic, that is  $\varepsilon_d = 0$ , then  $\Delta p = \Delta t$ : The tax is paid completely by the buyers.