Tax incidence on supply and demand 2

The supply is $P = 4Q$, while the demand is $P = 20$, where P is the price expressed in dollars and Q represents the units of production per week.

- Find the equilibrium price and quantity (using both algebra and a graph).
- If the sellers have to pay a tax of $T = 4\$$ per unit, what happens to the exchanged quantity, the price that buyers pay, and the price that sellers receive (after the tax is deducted)?
- How is the tax burden distributed between buyers and sellers, and why?

Repeat the previous problem assuming that the buyer pays the tax, that the demand is $P = 28 - Q$, and that the supply is $P = 20$.

Solutions

We obtain the equilibrium price and quantity

$$4Q = 20$$
$$Q = 5$$

With this, we obtain the price:

$$P = 4 \cdot 5 = 20$$

Now we set up the three equations to introduce the tax:

$$P_O = 4Q$$
$$P_D = 20$$

$$P_D - P_O = 4$$

The fact that the tax is applied to consumers or producers makes no difference. Ultimately, we always have to solve these three equations. Rearranging the third one:

$$P_D = 4 + P_O$$

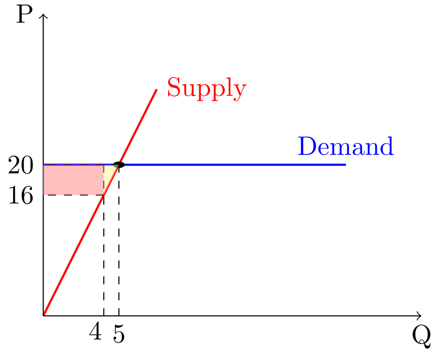
Now we insert this into the demand function and then equate supply and demand:

$$4 + P_O = 20$$
$$P_O = 16$$

$$16 = 4Q$$
$$Q = 4$$

$$P_D = 20$$

Therefore, we see that the quantity decreased, the consumer still pays the same, and the producer earns less. To see the distribution of the tax, we graph this situation:



The total tax revenue is $4 \cdot 4 = 16$, all of which is paid by the producer (red rectangle). Additionally, the producer's deadweight loss is the yellow triangle: $\frac{4 \cdot 1}{2} = 2$. The fact that, in this case, the entire tax burden is absorbed by the producer is due to the perfectly elastic demand. That is, if the producer changed the price of the good, they would not be able to sell anything, so they must reduce the price they receive in order to keep selling. The rule of tax incidence is that the burden falls on the more inelastic curve, and in this case, the producer's supply is more inelastic relative to the consumer's demand.

Now we assume a new supply and demand. The fact of who pays the tax is irrelevant to the analysis. Let's first solve for equilibrium without the tax:

$$28 - Q = 20$$

$$Q = 8$$

$$P = 20$$

Now we add the tax of 4:

$$P_O = 20$$

$$P_D = 28 - Q$$

$$P_D - P_O = 4$$

We solve for P_D

$$P_D = 4 + P_O$$

Now we insert this into the demand function and then equate supply and demand:

$$4 + P_O = 28 - Q$$

$$P_O = 24 - Q$$

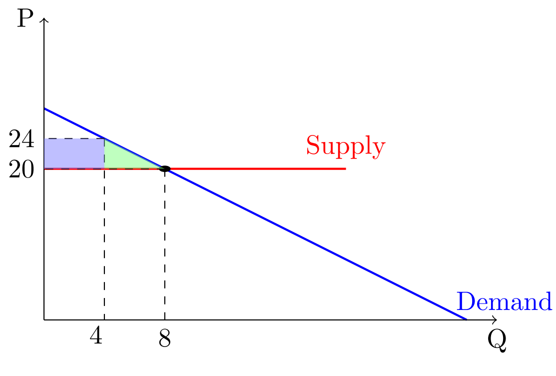
$$24 - Q = 20$$

$$Q = 4$$

$$P_O = 20$$

$$P_D = 24$$

Now let's graph the effect of the tax:



In this case, the tax revenue is the blue rectangle: $4 \cdot 4 = 16$. The green triangle represents the deadweight loss: $\frac{4 \cdot 4}{2} = 8$. In this case, the entire tax burden falls on the consumer because the producer has a perfectly elastic supply curve.