Exercise 2

Consider a competitive market with the following supply and demand curve $Qs = \frac{100}{8}P$, $P = 400 - 2.92Q$

a) Find the equilibrium

b) Assume the government imposes a tax on each unit sold, T=30. Find the new equilibrium by specifying which group will bear more the tax burden.

Solution

a) We simply obtain the direct aggregate demand from the inverse aggregate demand in order to work only with respect the price.

$Q_D = \frac{400 - P}{2.92}$, in equilibrium we have Qs=Qd, that is:

$\frac{400 - P}{2.92} = \frac{100}{8}P$ by solving you obtain the equilibrium price P*=10.7, and by substituting in demand or supply curve you obtain the quantity Q*=133.

b) In this case tax is on the supply side, then the new market clearing condition is:

$P_G = P_N + 30$

the shift in this case occurred on the supply side, supply curve shifts leftward. From the direct supply curve with obtain the inverse one as $P = \frac{2}{25}Q$

By substituting the inverse demand and supply like

$P_G = 400 - 2.92Q$

$P_N = \frac{2}{25}Q_N$

Market clearing condition becomes.

$400 - 2.92Q = \frac{2}{25}Q + 30$

That gives: Q=123.33, given this equilibrium quantity we can substitute in the gross and the net price equations and obtain the equilibrium prices:

$P_N = \frac{2}{25}(123.33) = 9.86$

$P_G = 9.86 + 30 = 39.86$

When can see that consumers is the group that bears more the tax burden since

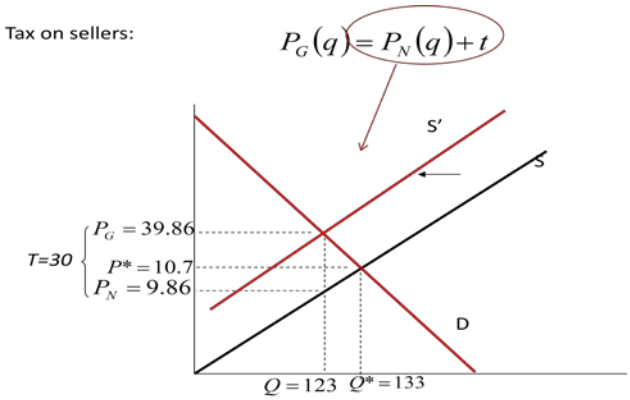
$P_G - P^* = 29.16 > 0.84 = P^* - P_N$

An additional proof of that could be provided by the elasticity of demand and supply, that are:

$\left|\varepsilon_{D,P}\right| = \frac{\partial Q_D}{\partial P}\frac{P}{Q} = \frac{1}{2.92}\frac{10.7}{133} = 0.0275$

$\left|\varepsilon_{S,P}\right| = \frac{\partial Q_S}{\partial P}\frac{P}{Q} = \frac{25}{2}\frac{10.7}{133} = 1.0056$

Supply curve is more elastic then supplier bear less the tax burden.



Exercise 3

Assume the following inverse demand for apple juice P= 100 – Q, where P and Q are the price and the quantity of bottle. The inverse supply curve is P = 4Q. Market is competitive.

1) Compute the price and the quantity of equilibrium and the total surplus. Provide a graphical representation.

2) Assume now that an environmental group is able to convince the government to impose a tax of 20 on each bottle bought in order to give incentive to recycle. Compute the new quantity and prices.

3) Show in the graph the loss for the total surplus and the tax revenue (you are not required to compute the exact values

Solution

1) Equilibrium quantity is Q* = 20 with price P* = 100 - 20 = 80

Consumer surplus is:

$$\frac{20 \cdot (100-80)}{2} = 200$$

Producer surplus is:

$$\frac{20 \cdot 80}{2} = 800$$

Total surplus: 200 + 800 = 1000

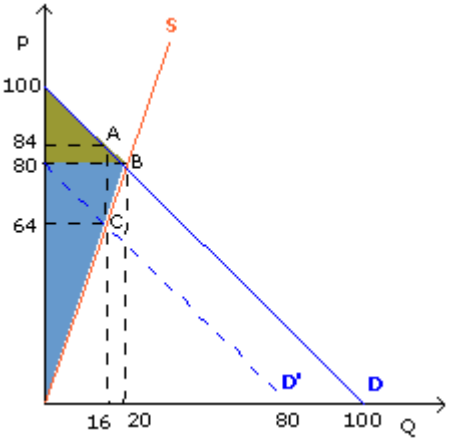
2) Imposing the tax on each bottle bought implies the following market clearing condition:

$$P_G - T = P_N$$

100 –Q-20=4Q

That gives Q=16, P_N = 64 and P_G = 84

c) The loss of total surplus (Deadweight loss) is given by the area of the triangle A-B-C. The tax revenue is given by the rectangular area in 84 - A - C - 64.



Since the equilibrium price without tax are such that P_N =64<P* = 80< P_G,=84 the tax burden is unequally shared by producers and consumers. In particular, since from the graph it is possible to see that the supply curve is more inelastic than the demand curve then the burden falls more on producers.