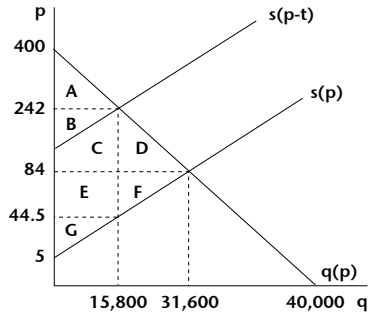
ECON 110, Prof. Hogendorn

Problem Set 4 Answers

1. *Fatburgers_a.*

   (a) Market demand: $q(p) = 400q_i(p) = 40,000 - 100p$. Market supply: $s(p) = 100s_i(p) = 400(p - 5)$.

$$\begin{aligned} 40,000 - 100p &= 400(p-5) \\ 42,000 &= 500p \\ p &= 84 \\ q(84) &= 31,600 \end{aligned}$$



   (b) This is a sales tax, so it is paid by producers and thus shifts the supply curve to $s(p - t)$ in the diagram. The new equilibrium price and quantity is found as follows:

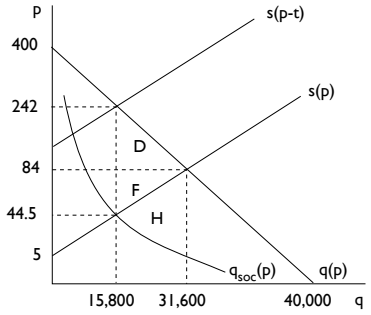
$$\begin{aligned} 40,000 - 100p &= 400(p-t-5) \\ 42,000 &= 500p - 400t \\ p(t) &= 84 + \frac{4}{5}t \\ q(p(t)) &= 31,600 - 80t \end{aligned}$$

(c) The government's revenue function is $R(t) = tq(p(t)) = 31,600t - 80t^2$. We can maximize this function by taking the derivative and setting equal to 0:

$$\frac{dR(t)}{dt} = 31,600 - 160t = 0 \Rightarrow t^* = 197.5$$

(d) First, using the formulas from (b) we can find that $p(197.5) = 242$ and $q(p(197.5)) = 15,800$. Then in the graph, we have the following:
$\Delta CS = -B - C - D$
$= -(242 - 84)15,800 - \frac{1}{2}(242 - 84)(31,600 - 15,800) = -3,744,600.$
$\Delta PS = -E - F$
$= -(84 - 44.5)15,800 - \frac{1}{2}(84 - 44.5)(31,600 - 15,800) = -936,150$
$DWL = D + F = \frac{1}{2}(242 - 44.5)(31,600 - 15,800) = 1,560,250$

(e) This is a very tricky question! There is actually a negative externality in *consumption* of fatburgers. That means that the social benefit is less than the demand curve. But we don't actually know anything about the shape of the q_{soc} curve, perhaps it is some nonlinear curve like in the diagram below. All that we know is that at the $q = 15,800$ point, the negative externality is exactly equal to the sales tax.

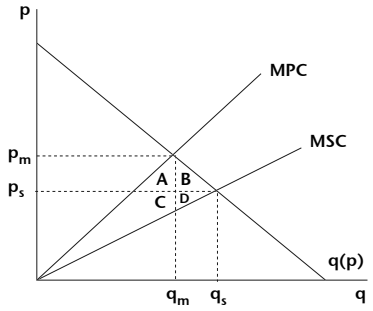


Without the tax, there would be a deadweight loss of area H. There would be too much consumption, and the costs $s(p)$ would exceed the benefits q_{soc}.

The sales tax corrects for the externality perfectly at the $q = 15,800$ point. It is not a true Pigouvian tax in the sense that if there were any shifts in the supply curve, it would no longer be optimal. But the supposed deadweight loss of $D + F$ that we found in part (d) turns out not to be a deadweight loss at all. Instead, it turns out that it was private consumer and and producer surplus that was exactly offset by the negative health externality.

2. *SiliconValley_a.*

   (a)



   (b) Free market: External benefits = $A + C$, Deadweight loss = $B + D$
   Social optimum: External benefits = $A + B + C + D$

   (c) It could provide a subsidy so that the price of web servers fell to p_s in the graph. This would increase quantity demanded to q_s and correct for the externality.

3. *NetAlone_a.*

   (a)

$$PV = \frac{100000}{1.10} + \frac{300000}{1.10^2} + \frac{500000}{1.10^3} + \frac{700000}{1.10^4} + \frac{1000000}{1.10^5} = 1813531$$

   The present value of the earnings per share is thus \$0.18. Paying \$1 per share is too much unless there will be extremely spectacular growth after 2013. A price of \$0.18 per share would be the fair value assuming that earnings beyond 2013 are not counted.