Economics 1410
Fall 2017 Harvard University

SECTION 6

1. Consider a good x with pre-tax price p. Suppose a unit tax of t is imposed on x, but not included in the posted price. Let demand for good x be denoted by $D(p,t)$, where the tax enters as a separate argument since it may not be fully salient. Supply and demand elasticities *with respect to the pre-tax price* are $\eta_{S,p}$ and $\eta_{D,p}$, respectively.

(a) Let θ represent the degree of salience, so that $\frac{\partial D}{\partial t} = \theta \frac{\partial D}{\partial p}$. Intuitively, what does this formula mean? What does it mean if $\theta = 1$? If $\theta = 0$? Show that $\eta_{D,t} = \theta \frac{t}{p} \eta_{D,p}$.

(b) We will derive the producer incidence formula in several steps.

(i) First, set supply equal to demand.

(ii) Next, differentiate this equation with respect to t. Rearrange to get

$$\frac{dp}{dt} = \frac{\frac{\partial D}{\partial t}}{\frac{\partial S}{\partial p} - \frac{\partial D}{\partial p}}.$$

(iii) Finally, use the elasticity formulas and definition of salience to get

$$\frac{dp}{dt} = \frac{\theta \eta_D}{\eta_S - \eta_D}.$$

(c) Explain what the above formula means intuitively.

2. We will now look at deadweight loss under imperfect salience. For simplicity, assume that supply is perfectly elastic at the pre-tax price p.

(a) There is originally no tax. Suppose that the government introduces a small tax t. To calculate the deadweight loss, we need to know the base and height of the triangle. Show that the base (reduction in quantity) is given by $t\frac{\partial D}{\partial t}$. Next, explain why the height is given by $t\frac{\partial D/\partial t}{\partial D/\partial p}$.

(b) Show that the deadweight loss formula is then $\frac{1}{2}\theta^2 t^2 \epsilon_{D,p} \frac{Q}{p}$. Explain the difference between this formula and the one with full salience.

3. Now suppose that we impose a (proportional) sales tax of τ, and that supply is again perfectly elastic at the pre-tax price p. The elasticity with respect to the posted price is $\eta_{D,p}$ and the elasticity with respect to $1+\tau$ is $\eta_{D,1+\tau} = \theta \eta_{D,p}$. Calculate the revenue-maximizing tax rate. Remember that revenue is given by $R = \tau p D$.