Amherst College
Economics 58
Fall 2010

Solutions to PS # 7

1. $C = q^2 + wq \quad MC = 2q + w$

a. $w = 10 \qquad C = q^2 + 10q$

$MC = 2q + 10 = P \qquad q = 0.5P - 5$

Industry $Q = \sum_{1}^{1000} q = 500P - 5000$

at 20, Q = 5000; at 21, Q = 5500

b. Here, $MC = 2q + .002Q$ for profit maximum, set = P

$q = 0.5P - 0.001Q$

Total $Q = \sum_{1}^{1000} q = 500P - Q \qquad Q = 250P$

P = 20, Q = 5000 Supply is more steeply sloped in this case where

Expanded output bids up wages.

P = 21, Q = 5250

2. a. The long-run equilibrium price is 10 + r = 10 + .002Q.

So, Q = 1050 ~50(10 + .002Q) = 550 - .1Q so

Q = 500, P = 11, r = 1.

b. Now Q = 1600 ~50(10 + .002Q) = 1100 - .1Q

Q = 1000, P = 12, r = 2.

c. Change in PS = 1(500) + .5(1)(500) = 750.

d. Change in rents = 1(500) + .5(1)(500) = 750. The areas are equal.

e. With tax $P_D = P_S + 5.5$

P_S = 10 + .002Q

P_D = 15.5 + .002Q

Q = 1050 -50(15.5 + .002Q) = 275- .1Q

1.1Q = 275 Q = 250 P_D = 16 r = 0.5

Total tax = 5.5(250) = 1,375

Demanders pay 250(16 - 11) = 1,250

Producers pay 250(11 -10.5) = 125

f. *CS* originally = .5(500)(21 -11) = 2,500

CS now = .5(250)(21 -16) = 625

PS originally = .5(500)(11 -10) = 250

PS now = .5(250)(10.5 -10) = 62.5

g. Loss of rents = .5(250) + .5(250)(.5) = 187.5

This is the total loss of *PS* in part b. Occurs because the only reason for upward sloping supply is upward slope of film royalties supply.

3. The Ramsey formula for optimal taxation

a. Use the deadweight loss formula from Problem 12.9:

$$L = \sum_{i=1}^{n} DW(t_i) + \lambda\left(T - \sum_{i=1}^{n} t_i p_i x_i\right)$$

$$\partial L / \partial t_i = .5\left[e_D e_S / (e_S - e_D)\right] 2\, t_i\, p_i x_i - \lambda p_i x_i = 0$$

$$\partial L / \partial \lambda = T - \sum_{i=1}^{n} t_i p_i x_i = 0$$

$$Thus \quad t_i = -\lambda (e_S - e_D) / e_S e_D = \lambda (1/e_S - 1/e_D)$$

b. The above formula suggests that higher taxes should be applied to goods with more inelastic supply and demand. A tax on a good discourages the consumption and production of that good. Thus, taxing a good with more inelastic supply and demand would result in less change in the consumption of the good. Therefore, the tax would produce smaller distortions: the DWL would be smaller.

c. This result was obtained under a set of very restrictive assumptions. First, it was obtained under partial equilibrium (the welfare analysis is undertaken in each market separately), ignoring the general equilibrium interactions between markets. Also, income effects and cross-price elasticities are not taken into account.

4. a. Long-run equilibrium requires $P = AC = MC$.

$$AC = \frac{k}{q} + a + bq = MC = a + 2bq \quad Hence \quad q = \sqrt{\frac{k}{b}} \quad P = a + 2\sqrt{kb}$$

b. Want supply = demand $\quad nq = n\sqrt{\frac{k}{b}} = A - BP = A - B(a + 2\sqrt{kb})$

Hence, $n = \dfrac{A - B(a + \sqrt{kb})}{\sqrt{k/b}}$.

c. Apparently *A* has a definitely positive effect on *n*. That makes sense since *A* reflects the "size" of the market. If $a > 0$, the effect of *B* on *n* is clearly negative.

d. If appears that fixed costs (*k*) have a negative effect on *n*. The effect of *a* is also negative (assuming it is a positive constant). The effect of *b* also seems to be negative. These results make sense. The first shows how greater fixed costs increase the typical firm's optimal size. The second and third show how higher marginal costs raise price and therefore reduce the number of firms.