PLCY 788 Problem Set 10

Topics: Competitive market equilibrium; market intervention; monopoly.
This set is for pure enjoyment; do not hand in. Solutions will be distributed shortly.

1) There are 200,000 identical consumers each with the utility function U=X^2Y and income of $400 and the price of Y is $1. Meanwhile there are 20,000 firms operating in the market for X, each producing according to the technology X=K^{1/2}L^{1/2}. In the short run K is fixed at 9, and the prices of r and w are $9 and $4 respectively. [Note: This problem is similar to problems 1-7 on pages 358-359 of BH, although the production function has been changed slightly. Do the BH version for additional entertainment.]

a. Derive the short run market equilibrium price and quantity. You will need to find market supply (use the SR MC curve aggregated to the industry level) and market demand (find the individual ordinary demand function for X and aggregate to the market level). Then set S=D to find equilibrium price, and use that to obtain equilibrium quantity. Round your answer to the nearest 100,000 (for market quantity).

b. How much does each firm produce? Are profits or losses being made? Draw the firm and market diagrams and indicate profits or losses.

c. Now derive the long run equilibrium price and market quantity. Remember this is CRS technology. (The LR cost function for this technology was shown in the problem set 10 guide and was done in class when I first presented cost functions.) Explain why we cannot predict the number of firms that will operate in the industry.

d. Say the number of firms in the industry in the long run is 100,000. How much capital does each firm employ? What is the firm’s new short run cost function (or SR supply curve) in the long run?

2) This question is similar to problems 14-19 in BH. Suppose that Supply (short run) and Demand in a competitive industry are given by the equations below, and that technology is CRS.

\[ X_d = 1000 - 10p \]
\[ X_s = 10 + 200p \]

a. Find the short run competitive equilibrium price and quantity.

b. Impose a $1 per unit tax on producers and find the equilibrium transaction price under the tax, quantity traded, the amount received (net) by suppliers and amount paid by consumers.

c. Show the original and new equilibrium in a diagram, and indicate the tax revenue and deadweight loss. Calculate the amount of the tax revenue paid by the consumer and producer respectively. Calculate the supply and demand elasticity and relate them to the share or quantity of the tax revenue paid.

d. Suppose now that the tax is imposed on the consumer. Calculate the equilibrium transaction price, quantity, amount paid by consumer and amount received (net) by producer. These should be the same as in (b), illustrating the point that a per unit tax can be viewed as either a tax on consumers or producers.

e. Calculate the deadweight loss of the tax in the short run.

f. What happens in this market in the long run? Use firm and industry diagrams in your explanation. What is the incidence of the tax in the long run? Why?
A local artisan in Chapel Hill has a marginal cost of 10 and faces two demand curves for her homogenous product, one from local town residents and one from Carolina alumni who live elsewhere:

Alumni: \[ p_1 = 150 - q_1 \]
Residents: \[ p_2 = 25 - 0.5q_2 \]

a) If she practices price discrimination, what will she charge residents and alumni? What will her profits be?

b) Show that demand is more elastic in the market with the lower price.

c) Would the artisan’s profits be higher if she did not discriminate and only charged one market price? [Hint: You must aggregate the individual demand curves to get one market demand curve and then calculate output, price and profits.]

4) In class we discussed the imposition of a per unit tax in a market, which shifts up the marginal cost curve (and average cost curve) of the firm. Consider instead the imposition of a lump-sum tax on a firm. This tax is independent of output and so does not affect marginal cost. It does however affect average cost. Analyze the impact of a lump-sum tax on long run firm and market output, and market price under scenarios described below.

a. The good is produced and traded in a competitive market by firms with identical cost functions.

b. The good is produced by a monopolist.

c. Who bears the burden of the tax under each scenario? What is the relationship between tax burden and market competitiveness? What does your result imply about the political economy of tax policy?