ECON 110, Prof. Hogendorn

Problem Set 4

1. *Fatburgers.* There are 400 fatburger consumers and 100 fatburger producers. The price of a fatburger, p, is measured in cents. Each of the 400 consumers has demand curve

$$q_i(p) = 100 - \frac{p}{4}$$

Each producer has supply curve

$$s_i(p) = 4(p - 5)$$

(a) Determine the market supply and demand, find the equilibrium price, and draw on a graph.

(b) The government imposes a per-unit sales tax of t cents per fatburger. Find the new equilibrium price and quantity as a function of t.

(c) Show that the government achieves the maximum possible tax revenue when it sets $t = 197.5$ cents. You will need to find and maximize the government's revenue as a function of t.

(d) How much does the tax in part (c) reduce consumer surplus and producer surplus, and how much deadweight loss does it cause? Show on a graph as well as giving numerical results.

(e) You have just learned that when people eat fatburgers, it causes significant long-term health problems. Much of the cost of these health problems is paid for by the government rather than the individuals. In fact, careful analysis suggests that the government ends up paying $1.975 in health costs for every fatburger eaten. Show how this information changes the graphical analysis of part (d). (Numerical results are not necessary.)

2. *SiliconValley*. In Silicon Valley, there are many information technology (IT) firms clustered in one place. This is usually attributed to positive externalities in production: when firm produces a product, the skilled workers can exchange ideas with one another, with venture capitalists, and so on. Thus, firms in Silicon Valley are more productive than similar firms elsewhere.

   (a) Graph the supply and demand curves for one IT good (e.g. web servers) in Silicon Valley. Show the positive externality in production.

   (b) Label the graph to show the external benefits and the deadweight loss in both the free-market and the socially optimal situations.

   (c) If the California government were to intervene in this market, what should it do?

3. *NetAlone*. Suppose netalone.com is an Internet startup that specializes in e-business consulting. The following table summarizes the company's projected earnings in the next 5 years:

Year	Earnings
2009	100,000
2010	300,000
2011	500,000
2012	700,000
2013	1,000,000

   The CEO of netalone.com announced that the company was going to issue 10,000,000 shares of common stock and the IPO (initial public offering) price was set at $1 per share. (A share of stock entitles you to a share of ownership of the company, and the company's value is based on its earnings.) Suppose the market discount rate is 10%. Based on the above earnings forecast, will you buy the stock? What do you think is a more reasonable price?

Review Problems only, not to turn in:

(The material covered in this review problem will not be on the exam.)

4. *Library.* There are 1,000 residents of a small town, each of whom has a demand for library books given by

$$q = 1,100 - 50p$$

where q is the *total* number of books in the town's public library (thus, library books are a public good). Currently, the library has 100 books. Additional books cost $20 each.

(a) What is each consumer's consumer surplus? (Remember *not* to include the price of the books, which were bought in the past.)

(b) Will any of the residents voluntarily buy another book for the library? Why, or why not? Show on a diagram.

(c) What is the socially optimal number of books for the library to own? How much would the town have to tax each resident to pay for the books? Show on a diagram. (Hint: remember to add up demand curves *vertically* for a public good.)

(d) If the town implements the tax and buys the books for the library, what is each resident's consumer surplus?

Answers to Review Problems:

4. *Library_a.*

(a) Each consumer has a choke price of $22, so the consumer surplus is:
$$\frac{1}{2}(22 - 20)100 + 20 \cdot 100 = 2,100$$

(b) The demand curve slopes down and intersects the $20 price at exactly 100 books. Therefore, the value of one more book is $20

for any one resident; they are indifferent between buying another one or not. At most, one resident might buy one more book, but after that there is no private incentive to buy more.

(c) The inverse demand curve provides a measure of each resident's value of books. If we add up all of their demand curves vertically, the total value of books to the town is:

$$v(q) = 22,000 - 20q$$

If we set this value equal to 20, $q^* = 1,100$, so the town needs to buy an additional 1,000 books. The tax per person is $\frac{1,000 \cdot 20/}{1000} = 20$, areas $B + C$ in the diagram.
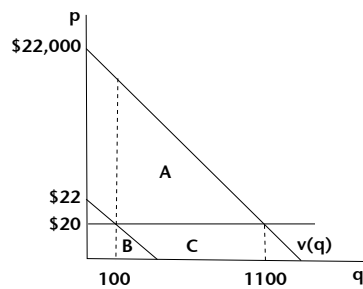
(d) Total consumer surplus is everything under the demand curve minus the tax:

$$\frac{1}{2}(22 - 0)1100 - 20 = 12,080$$

4