B.E. International Program

Faculty of Economics, Thammasat University

EE 465/463 Project Evaluation

Semester 2/2014

Practice Problem 1

(*Covers materials from chapters 1-5*)

1. Boardman et al., chapter 1 question 2

The effects of a tariff on imported kumquats can be divided into the following categories: tariff revenues received by the treasury ($8 million); increased use of resources to produce more kumquats domestically ($6 million); the value of reduced consumption by domestic consumers ($4 million); and increased profits received by domestic kumquat growers ($5 million). A CBA from the national perspective would find costs of the tariff equal to $10 million-the sum of the costs of increased domestic production and forgone domestic consumption ($6 million + $4 million = $10 million). The increased profits received by domestic kumquat growers and the tariff revenues received by the treasury simply reflect higher prices paid by domestic consumers on the kumquats that they continue to consume and, hence, count as neither benefits nor costs. Thus, the net benefits of the tariff are negative (-$10 million). Consequently, the CBA would recommend against adoption of the tariff.

a. Assuming the agriculture department views kumquat growers as its primary constituency, how would it calculate net benefits if it behaves as if it is a spender?

b. Assuming the treasury department behaves as if it is a guardian, how would it calculate net benefits if it believes that domestic growers pay profit taxes at an average rate of 20 percent?

2. Boardman et al., chapter 2 question 6

Because of a recent wave of jewelry store robberies, a city increases police surveillance of jewelry stores. The increased surveillance costs the city an extra $500,000 per year, but as a result, the amount of jewelry that is stolen falls. Specifically, without the increase in surveillance, jewelry with a retail value of $1 million would have been stolen. This stolen jewelry would have been fenced by the jewelry thieves for $600,000. What is the net social benefit resulting from the police surveillance program? Assume that the thieves are not given standing in this situation.

3. Boardman et al., chapter 2 question 7

Excessive and improper use of antibiotics is contributing to the resistance of many diseases to existing antibiotics. Consider a regulatory program in the United States that would monitor antibiotic prescribing by physicians. Analysts estimate the direct costs of enforcement to be $40 million, the time costs to doctors and health professionals to be $220 million, and the convenience costs to patients to be $180 million (all annually). The annual benefits of the program are estimated to be $350 million in avoided resistance costs in the United States, $70 million in health benefits in the United States from better compliance with prescriptions, and $280 million in avoided resistance costs in the rest of the world. Does the program have positive net benefits from the national perspective? If not, what fraction of benefits accruing in the rest of the world would have to be counted for the program to have positive net benefits?

[Note: Use the spreadsheet provided.]

4. Boardman et al., chapter 3 question 1

A person's demand for gizmos is given by the following equation:

$$q = 6 - 0.5p + 0.0002I$$

where, q is the quantity demanded at price p when the person's income is I. Assume initially that the person's income is $40,000.

a. At what price will demand fall to zero? (This is sometimes called the choke price

because it is the price that chokes off demand.)

b. If the market price for gizmos is $10, how many will be demanded?
c. At a price of $10, what is the price elasticity of demand for gizmos?
d. At a price of $10, what is the consumer surplus?
e. If price rises to $12, how much consumer surplus is lost?
f. If income were $60,000, what would be the consumer surplus loss from a price rise from $10 to $12?

5. Boardman et al., chapter 3 question 2

At the current market equilibrium, the price of a good equals $40 and the quantity equals 10 units. At this equilibrium, the price elasticity of supply is 2.0. Assume that the supply schedule is linear.

a. Use the price elasticity and market equilibrium to find the supply schedule. (Hint: the supply schedule has the following form: $q = a + (\Delta q/\Delta p)$p. First, find the value of $\Delta q/\Delta p$, and then, find the value of a.)

b. Calculate the producer surplus in the market.

c. Imagine that a policy results in price falling from $40 to $30. By how much does producer surplus fall?

d. What fraction of the lost producer surplus is due to the reduction in the quantity supplied and what fraction is due to the fall in price received per unit sold?

6. Boardman et al., chapter 3 question 3

Imagine a person's utility function over two goods, X and Y, where Y represents dollars. Specifically, assume a Cobb-Douglas utility function:

$$U(X,Y) = X^a Y^{(1-a)}$$

where $0<a<1$.

Let the person's budget be B. The feasible amounts of consumption must satisfy the following equation:

$$B=pX+Y$$

where p is the unit price of X and the price of Y is set to 1.

Solving the budget constraint for Y and substituting into the utility function yields

$$U = X^a (B-pX)^{(1-a)}$$

Using calculus, it can be shown that utility is maximized by choosing

$$X=aB/p$$

Also, it can be shown that the area under the Marshallian demand curve for a price increase from p to q yielding a change in consumption of X from x_p to x_q is given by

$$\Delta CS = [aBln(x_q)-p\ x_q]- [aBln(x_p)-p\ x_p]-(q-p)x_q$$

When B=100, a=0.5, and p=.2, X=250 maximizes utility, which equals 111.80. If price is raised to p=.3, X falls to 204.12.

a. Increase B until the utility raises to its initial level. The increase in B needed to return utility to its level before the price increase is the compensating variation for the price increase. (It can be found by guessing values until utility reaches its original level.)

b. Compare ΔCS, as measured with the Marshallian demand curve, to the compensating variation.

[Note: Use the spreadsheet provided. Use iteration to solve for a price change from $.20 to $.30 instead of $0.4.]

7. Boardman et al., chapter 4 question 3 (a)

A country imports 3 billion barrels of crude oil per year and domestically produces another 3 billion barrels of crude oil per year. The world price of crude oil is $90 per barrel. Assuming linear schedules, economists estimate the price elasticity of domestic supply to be 0.25 and the price elasticity of domestic demand to be 0.1 at the current equilibrium.

a. Consider the changes in social surplus that would result from imposition of a $30 per barrel import fee on crude oil that would involve annual administrative costs of $250 million. Assume that the world price will not change as a result of the country imposing the import fee, but that the domestic price will increase by $30 per barrel. Also assume that only producers, consumers, and taxpayers within the country have standing. Determine the quantity consumed, the quantity produced domestically, and the quantity imported after the imposition of the import fee. Then estimate the annual social net benefits of the import fee.
b. Economists have estimated that the marginal excess burden of taxation in the country is 0.25 (see Chapter 3). Re-estimate the social net benefits assuming that 20 percent of the increase in producer surplus is realized as tax revenue under the existing tax system. In answering this question, assume that increases in tax revenues less the cost of administrating the import fee are used to reduce domestic taxes.
c. The reduction in the country's demand for imports may affect the world price of crude oil. Assuming that the import fee reduces the world price from $90 to $80 per

barrel, and thus, the after-tax domestic price is $80 + $30 = $110 per barrel, a net increase in domestic price of $20 per barrel, repeat the analysis done in parts a and b.

8. Boardman et al., chapter 5 question 2

Recall exercise 3 from Chapter 4 in which a country imposes an import fee on the crude oil it imports. Assume that prior to the imposition of the import fee, the country annually consumed 900 million short tons of coal, all domestically mined, at a price of $66 per short ton. How would the CBA of the import fee change if, after imposition of the import fee, the following circumstances are assumed to result from energy consumers switching from crude oil to coal?

a. Annual consumption of coal rises by 40 million short tons, but the price of coal remains unchanged.

b. Annual consumption of coal rises by 40 million short tons and the price of coal rises to $69 per short ton. In answering this question, assume that the prices of other goods, including coal, were not held constant in estimating the demand schedule for crude oil.

c. Annual consumption of coal rises by 40 million short tons and the price of coal rises to $69 per short ton. In answering this question, assume that the prices of other goods, including coal, were held constant in estimating the demand schedule for crude oil. Also assume that the demand schedule for coal is completely inelastic.

d. The market price of coal underestimates its marginal social cost by $15 per short ton because the coal mined in the country has a high sulphur content that produces smog when burned. In answering this question, assume that, as in question 2.a, the annual consumption of coal rises by 40 million short tons, but the price of coal remains unchanged.