Written Exam for the B.Sc. in Economics winter 2013-14

Microeconomics B

Final Exam

21/01/2014

(3-hour closed book exam)

Please note that the language used in your exam paper must correspond to the language of the title for which you registered during exam registration. I.e. if you registered for the English title of the course, you must write your exam paper in English. Likewise, if you registered for the Danish title of the course or if you registered for the English title which was followed by “eksamen på dansk” in brackets, you must write your exam paper in Danish.

This exam question consists of 3 pages in total

Exercise 1

Consider a market that is perfectly competitive with no externalities present.

State whether the proposition below is true or false:

> "*If the supply is perfectly inelastic, then the producer will carry all the economic incidence of the tax.*"

Also, comment on the following statement:

> "*A government that wants to design a tax system for the sole purpose of collecting a tax revenue should use the following principle: minimize the tax rates and broaden the tax base.*"

Answer:

1) A perfectly inelastic supply implies that whatever price that the sellers receive he/she will be willingly to sell a given amount. The equilibrium condition then becomes $D(p+t) = \bar{S}$ where p is the seller's price. Since the equation must hold for any tax rate t the seller's price must adjust one-to-one. Intuitively, if the consumers pay a higher price the reduction in demand leaves the demand below the supply, and there can be no equilibrium. Graphically, the supply curve is horizontal, and the demand function shifts upward.
2) Since the deadweight loss is approximately quadratic increasingly in the tax rate, while the tax revenue is at most linearly increasing, the tax rate should be a small as possible in order to minimize the inefficiency. The deadweight loss can be approximated by $\frac{1}{2}\gamma dt^2$ for some $\gamma \geq 0$ while the revenue is changed by qdt when the initial tax rate was $t = 0$. One can note that in the case of question 1 there is no DWL and the revenue is one-to-one increased by the tax rate.

Exercise 2

Bente has a Bernoulli-function $u(x) = \ln(x)$ on income, and a wealth/income of 500 (thousand dkk). However, there is a probability off 2 per cent that his/her house is damaged in an autumn storm. This will imply a loss of a wealth/income of 200 (thousand dkk) in repairment costs.

An insurance company offers an insurance policy, where you choose the insurance amount K (thousand) dkk. to be paid out in the case of house damage. The insurance premium is 3 per cent of the insurance amount, and is paid regardless of any insurance event.

a) Derive Bente's first order condition for the optimal insurance amount
b) Find the optimal insurance amount.
c) Will Bente fully insure herself? Comment.

Answer:

a) We have that: $\frac{0.02}{0.98}\frac{c_2}{c_1} = \frac{0.03}{0.97}$. Or the utility is $0.02\ln(300 - 0.03K + K) + 0.98\ln(500 - 0.03K)$ the FOC becomes $\frac{0.02*0.97}{300+0.97K} - \frac{0.98*0.03}{500-0.03K} = 0$ or $\frac{0.02}{0.98}\frac{500-0.03K}{300+0.97K} = \frac{0.03}{0.97}$.

b) Substituting into the budget $0.03c_1 + 0.97c_2 = 494$ such that the solution is $c_1 = \frac{2}{3}494 = 329{,}3$ and $c_2 = \frac{98}{97}494 = 499$. Then the insurance amount is $K = \frac{0.907}{0.03} = 30.24$. From the FOC in K we get $\frac{0.02}{0.03}\frac{0.97}{0.98}(500 - 0.03K) = 300 + 0.97K$ or $\frac{\frac{2}{3}*\frac{97}{98}*500-300}{0.97+0.02\frac{97}{98}} = K = 30.24$.

c) Only when the premium is actuarial fair and the expected payment equals the premium, will the consumer insure fully. We see that the expected profit is $\gamma K - \pi K = 0{,}33$ thousand.

Exercise 3

A beekeeper owns n beehives selling the honey on the local market. The nearby orchard has a large field of apple trees from which it harvests its fruits and sells them on the local market. In collecting the honey from the trees the bees fertilize the trees which then carry more fruit. Assume that the beekeeper and the orchard sell their products in perfectly competitive markets.

a) Comment on the following statement:

> “*From a social point of view, the amount of honey produced and sold will be too small.*”

b) Would you expect the externality to persist in the long run?

Answer:

a) There is a positive externality from the honey-production, thus there is a social marginal benefit from the honey production. This implies that the social marginal cost of honey production is lower than the private marginal costs. Thus, the production of honey is inefficiently low when this is not taken into account by the beekeeper. An appropriate drawing is sufficient, while a mathematical model is also acceptable but not required. In a supply-demand diagram of the honey market it is important that the social marginal cost curve lies below the private supply curve, in that the social marginal costs are lower due to the positive externality on fruit production.

b) One could argue that a merger would be beneficial and a higher profit be obtained by both the owners of the beekeeper and the orchard. In this way one could expect that they would merge for mutual benefits.

Exercise 4

Consider a monopolist of patented CPU-microchip who services a market with two types of consumers: consumer A-types with an utility function $u_A(x,t) = \sqrt{x} + t$ with x being the number of units sold by the monopolist to the consumer and t is the amount of money spend on other goods. Similarly, the consumer B-types have an utility function given by $u_B(x,t) = \frac{3}{2}\sqrt{x} + t$.

The monopolist knows that there is a share $\alpha > 0$ of A-consumers, and the marginal costs are constant equal to $c > 0$.

a) Find the optimal first degree price discriminating strategy of the monopolist. Comment on the consumption of each type.
b) Assuming that the monopolist cannot observe the type of a consumer, what are the optimal packages offered.
c) Are consumer A-types worse off in b) compared to a)? Are B-types? Comment.

Answer:

a) The first price discrimination is to set a non-linear price scheme, such that each type consume an amount $x_A = \frac{1}{4c^2}$ and $x_B = \frac{9}{16}\frac{1}{c^2}$. The fixed price is given by the consumer's surplus which is $F_A = \sqrt{x_A} - \frac{1}{4c} = \frac{1}{2c}$ and $F_B = \frac{3}{2}\sqrt{x_B} - \frac{9}{16}\frac{1}{c} = \frac{9}{16}\frac{1}{c}$. They must however also pay the unit costs such that the total payment is $R_A = F_B + cx_A = \frac{1}{2c}$ and $R_B = F_B + cx_B = \frac{9}{8c}$. The B-types consumer a greater amount.
b) The monopolist should solve: choose a pair of packages (x_A, R_A) and (x_B, R_B) to maximize profits: $R_A + R_B - c(x_A + x_B)$ such that $\sqrt{x_A} - R_A = 0$ and $\frac{3}{2}\sqrt{x_B} - R_B = \frac{3}{2}\sqrt{x_A} - R_A$ where the first is the participation constraint of A-types and the second is the incentive compatible constraint of B. We can eliminate the constraints and obtain the profits given by $\sqrt{x_A} + \left(\frac{3}{2}\sqrt{x_B} - \frac{3}{2}\sqrt{x_A} + \sqrt{x_A}\right) - c(x_A + x_B) = \left(\frac{3}{2}\sqrt{x_B} - cx_B\right) + \left(\frac{1}{2}\sqrt{x_A} - cx_A\right)$. The first order conditions then becomes

$$\frac{1}{4}\frac{1}{\sqrt{x_A}} = c$$

And thus $x_A = \frac{1}{16}\frac{1}{c^2}$, and for B-types

$$\frac{3}{4}\frac{1}{\sqrt{x_B}} = c$$

which is identical to the first best amount in a). The fixed charge is then $R_A = \sqrt{x_A} = \frac{1}{4c}$ and $R_B = R_A + \frac{3}{2}(\sqrt{x_B} - \sqrt{x_A}) = \frac{1}{4c} + \frac{3}{4}\frac{1}{c} = \frac{1}{c} < \frac{9}{8}\frac{1}{c}$.
c) A-types are not better off nor worse off: the consumer surplus is unchanged. The B-types are better off since they get their first best quantity but pays an amount less than in the first best, being able to obtain a lower price because they can threaten to buy the A-package.