

Written Exam for the B.Sc. in Economics summer 2014

**Mikro B**

Final Exam

12. August 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**

### Problem 1

Consider the von Neumann-Morgenstern agent Arthur with Bernoulli utility function of income  $u(x) = x^{1/2}$ . There are two possible states of the world, each having probability 50 %. In state 1 he has an income of 25. In state 2, an accident with an income loss of 16 occurs, reducing his income to 9.

There is a market for insurance, and Arthur is considering buying insurance from Pressure Insurance who is risk-neutral. An insurance contract  $(K, \Gamma)$  has Pressure paying the insurance sum  $K$  to Arthur when state 2 occurs, and Arthur paying Pressure the amount  $\Gamma$  in insurance fees in both states.

Suppose that the insurance market is characterized by perfect competition: Arthur may choose any non-negative value of  $K$  he desires, and the insurance fee he has to pay then becomes  $\Gamma = \frac{1}{2}K$ .

- a) Write the maximization problem that Arthur faces, solve it, and describe the income level Arthur will have in each state, as well as his expected utility, after having chosen a maximizing contract.

Now suppose that Pressure Insurance does in fact have monopoly power. It wants to maximize its expected profits, but has to make sure to design the insurance contract  $(K, \Gamma)$  such that Arthur receives his reservation level of expected utility (what he is able to obtain without insurance).

- b) Write the maximization problem that Pressure faces, solve it, and describe the income levels Arthur will have, as well as his expected utility, when having accepted the contract designed by Pressure.
- c) Which level of expected profits will Pressure earn in a) and in b), respectively, and which of the market outcomes will be efficient?

### Problem 2

Consider the market for beer, characterized by perfect competition, the market demand function being  $D(p) = \text{Max}\{a - b \cdot p, 0\}$  and the supply function being  $S(p) = \text{Max}\{c + d \cdot p, 0\}$  with  $a, b, c, d > 0$  and  $a > c$ .

The government has introduced a tax of  $t$  per beer. The Minister of Finance, worried about getting in trouble with the European Union for having too large public deficits, is keen to “increase the beer tax very significantly”, in order to create a higher tax revenue, limiting the public deficit.

- Find an expression for the beer tax revenue as a function of  $t$ ; furthermore, give the Minister some good advice.

### Problem 3

Arthur and Bill each sell drinks on campus on Friday nights. The market demand for drinks is given by the function  $D(p) = \text{Max}\{240 - 2 \cdot p, 0\}$ . They can sell with no fixed costs. Both of them have constant marginal costs of 30 (producing and selling one more drink).

- a) Determine the Cournot equilibrium, i.e. the quantities sold, the price, and the profits made.
- b) What will happen to the equilibrium, if Arthur would be able to find a better supplier, enabling him to sell drinks at marginal costs below 30?

#### Problem 4

Consider an economy with two agents both of whom have an initial endowment of a private good (money). One unit of the private good can be transformed into one unit of a public good. The two agents have preferences which can be represented by utility functions  $u_A(x_A, G) = v_A(G) + x_A$  and  $u_B(x_B, G) = v_B(G) + x_B$ , respectively. We assume that both  $v$ -functions are strictly increasing, strictly concave, and continuously differentiable.

- a) Show, mathematically and/or in a clear diagram, how voluntary individual donations to finance production of the public good will typically result in an inefficient outcome
- b) Show, by a mathematical example and/or in a clear diagram, how, in the case of voluntary individual donations, one agent may free-ride on the other agent's donation

#### Problem 5:

Consider a monopolist who faces a downward-sloping and differentiable demand curve and who has chosen to produce a positive quantity.

- Please derive mathematically how, in the profit-maximizing situation, the price charged by the monopolist depends on the marginal costs and the elasticity of demand, respectively.

#### Problem 6

Please define, explain and comment on the concept "Lindahl Equilibrium"