Exam June 2013, Mikro B
Guide to answers[1]

Problem 1

In a perfectly competitive market for a consumer good, the government introduces a (small) tax of t $ per unit traded.

- 1a) How does the economic incidence ("who bears the tax burden?") depend on the statutory incidence (whether the supply side or the demand side has to pay the tax revenue to the government)?
- 1b) How does the economic incidence depend on the price elasticities of the demand side and the supply side of the market, respectively?

Hint: Introducing the tax, and marginally changing it, can be analyzed considering these two equations: $S(p_s) = D(p_s + t)$ and $S(p_d - t) = D(p_d)$.

Answer: The statutory incidence is insignificant. This is clear, as solving $S(p_s) = D(p_s + t)$ or $S(p_d - t) = D(p_d)$ is equivalent; it can also be illustrated in graphs, deducting t from the inverse demand curve (solving for the price received by the seller, p_s) or adding t to the inverse supply curve (solving for the price paid by the customer, p_d). Also, considering a marginal change in the two equations and using the definition of elasticity of demand and supply, respectively, it can be shown that $dp_s/dt = -|e_d|/(|e_d| + e_s)$, and $dp_d/dt = e_s/(|e_d| + e_s)$, with the sum of the absolute values of these two expressions obviously being 1, so the less elastic side of the market will bear the larger part of the tax burden.

Problem 2

In a small village in a remote part of the country, there are 200 inhabitants. Each inhabitant owns a car and is planning to buy one Smart-TV. This marvelous new product can be purchased locally, with no transportation costs involved.

There is, however, a shopping mall, some distance away, selling such a TV at a price $ 100 lower than the local shop. The road to the mall is very narrow. If n villagers drive to the mall, the total transportation costs for the n drivers, in terms of gas used and time spent, is $ n^2.

- 2a) Show that when the villagers make individual decisions on whether to go or not, 100 villagers will drive to the mall
- 2b) Is this outcome efficient? Please comment and provide some perspective

Answer: The marginal villager deciding to go is determined by setting the marginal benefit (100) equal to the average cost of going (n), hence 100 villagers will drive to the mall. The socially efficient result is found by setting the marginal benefit (100) equal to the marginal cost of going (2n), hence 50 villagers. This is clearly a case of "The Tragedy of the Commons". Efficiency may be obtained by road-pricing á la Pigou-tax.

Problem 3

[1] Note that this guide is only indicative, not providing a full answer to the problems, but outlining the corrects results, and the most important points to be made.

Consider a risk-averse von Neumann-Morgenstern-agent with Bernoulli utility u of income, where $u' > 0$, $u'' < 0$. The agent has the income M. There is an accident probability π, $0 < \pi < 1$. The accident causes an income loss of $L < M$.

An insurance company offers the agent insurance contracts at the price of λ per $ paid out in case of income loss.

- Show that the agent, if the price is actuarially fair, will choose an insurance contract implying full insurance.

Answer: Actuarially fair conditions means that the (state-independent) payment for each $ paid out in the accident state becomes π, *and this implies that the FOC becomes* $(1-\pi)\cdot u'(M-\pi\cdot K)\cdot\pi = \pi\cdot u'(M-L+(1-\pi)\cdot K)\cdot(1-\pi)$, *which can be reduced to marginal utility being identical in the two states. Hence, from strict concavity of u, income must be identical in the two states,* $(M-\pi\cdot K) = (M-L+(1-\pi)\cdot K)$, *so the contract involves* $K = L$.

Problem 4:

Consider a monopolist in a market with the demand side characterized by the demand function D(p). From the definition of the elasticity of demand with respect to price, and from the first order condition for profit maximization ("MR = MC"), please derive the correct expression for the ratio of price over marginal costs expressed in terms of the elasticity.

Answer:

MR can be written $p(x) + p'(x)\cdot x = p(x)\cdot[1+1/e(p(x))]$, *so* $p(x)/MC(x) = 1/[1-1/|e(x)|] > 1$.

Problem 5:

Consider three persons, Andy, Bert and Catherine, living in the same building, with a small garden in front. Let G be the total sum of money they spend on this garden; the more they spend, the more flowers, plants, etc.

Each of them has, initially, an individual wealth of $ 10. Their preferences can be represented by the following utility functions, with x_i being the income agent i has after contributing to the garden, i = A, B, C:

$u_A(x_A,G) = x_A - 1/G$

$u_B(x_B,G) = x_B - 7/G$

$u_C(x_C,G) = x_C + ½G$

Each of them can donate a non-negative amount, no larger than the individual initial wealth, to contribute to the amount G.

- 5a) Identify the efficient level of G
- 5b) Using the concept Lindahl Equilibrium, please identity the corresponding Lindahl prices
- 5c) How would the situation change if the initial distribution of wealth were that A has $ 5, B has $ 15, and C has $ 10.

- 5d) Assume, with the initial wealth distribution being (10,10,10), that C's utility function is changed to $\underline{u}_C(x_C,G) = x_C + (11/10)\cdot G$ and comment on how this changes the situation.

Answer: FOC for efficiency is $1/G^2 + 7/G^2 + ½ = 1$*, which gives us* $G^* = 4$*, and Lindahl prices (1/16, 7/16, ½). The distribution of wealth plays no role as all preferences are quasi-linear (as long as we have FOC-solutions). With the changed preferences for C, G actually depends on the distribution of wealth, the solutions being* $10 \leq G \leq 30$*,* $t_A = 1/G^2$ *,* $t_B = 7/G^2$ *,* $t_C = 1 - t_A - t_B$*. Note, however, that only for G-values satisfying* $G^2 - 10G - 8 \leq 0$*, or* $G \leq 10.75$ *(approximately) is it possible to (Lindahl-)implement an efficient allocation without having to transfer income from A and/or B to C. For higher quantities of G, such transfers must be made, to enable C to afford high quantities of G.*

<u>Problem 6:</u>

The gourmet boutique Choca-Shocka-Shop sells chocolate, for simplicity thought of as a continuous good. Also, for simplicity, assume that production is costless, i.e. MC = 0. The shop faces two potential customers. The slightly richer Mrs. A whose (ordinary Marshall) demand function is given by $D_A(p) = \text{Max}\ \{20 - p, 0\}$, and the slightly less rich Mrs. B with $D_B(p) = \text{Max}\ \{16 - p, 0\}$.

For a series of various cases, competition-wise, mentioned shortly, you are asked to identify the following in equilibrium:

- quantity sold to A and B
- price pr. unit chocolate, or amount paid for a "package", for A and B
- consumer surplus for A and B
- profits for the chocolate seller
- deadweight loss

Please find the above mentioned list of figures for each of the five following cases of competition:

- 6a) The chocolate seller succeeds with first-order (perfect) price discrimination
- 6b) The seller is able to follow a second-order price discrimination policy
- 6c) The seller can, as a monopolist, set different unit prices for each customer, i.e. third-degree price discrimination
- 6d) The seller can, as a monopolist, set one common unit price for both customers
- 6e) The seller acts as if there is perfect competition

Answer:
FOPD: $q_A = 20, S_A = 200, CS_A = 0, q_B = 16, S_B = 128, CS_B = 0, \pi = 328, DWL = 0.$
SOPD: $q_A = 20, S_A = 152, CS_A = 48, q_B = 12, S_B = 120, CS_B = 0, \pi = 272, DWL = 8.$
TOPD: $q_A = 10, p_A = 10, CS_A = 50, q_B = 8, p_B = 8, CS_B = 32, \pi = 164, DWL = 82.$
M: $q_A = 11, p = 9, CS_A = 60½, q_B = 7, CS_B = 24½, \pi = 162, DWL = 81.$
PC: $q_A = 20, p = 0, CS_A = 200, q_B = 16, CS_B = 128, \pi = 0, DWL = 0$
Note how profits decrease gradually…

Ref.: mtn, 8. juni 2013