Guide[1] to answers, Written Exam for the B.Sc. or M.Sc. in Economics

Microeconomics B, 2nd Year

August 2015

Problem 1

Consider the worker Bjarne Blucollar who lives in a private-ownership economy with perfect competition. He has an initial endowment of 24 hours. These hours may be consumed as leisure or sold in the labor market. He consumes two goods, leisure and a composite consumption good. The price of labor is w, while the consumption good price is 1. In the face of such market conditions, we observe that Bjarne chooses to work for 10 hours, i.e. he sells 10 hours of his time in the labor market.

The government now introduces a proportional income tax, with employees paying a share, t, $0 < t < 1$, of their earnings in income tax; hence the after-tax-wage becomes $(1–t)\cdot w$.

After the tax has been introduced, Bjarne chooses, after careful considerations, to maintain a labor supply of 10 hours.

- Show, in a clear diagram, how there may be a dead-weight loss, even though his labor market behavior has not been affected. Please add comments.

Answer: Nechyba's diagram 19.6 illustrates that the Equivalating Variations (measured by the vertical distance from the former optimizing point C to the green line tangent to the new, lower indifference curve, having the steeper slope, corresponding to the higher pre-tax wage) exceeds the tax revenue (measured by the vertical distance from C to the new optimizing point A), both measured in terms of real consumption.

The point is that even if the un-compensated labor supply is perfectly inelastic, there is a dead-weight loss because the Hicks/compensated labor supply does in fact respond to changes in the after-tax wage rate.

Problem 2

The insurance company Principal Insurance (which is risk-neutral) is planning to sell an insurance contract to a von-Neumann-Morgenstern agent who is at risk of an accident happening which will reduce her income. The agent is able, through choice of behavior, to reduce the risk of the relevant accident happening; however, risk-reducing behavior requires effort which costs her in terms of disutility. The company is not able to control the behavior of the agent.

- Present and discuss the two constraints, Individual Rationality and Incentive Compatibility, that the company has to consider.

Answer: The relevant material is the note by Birgitte Sloth. The IR constraint says that the contract must offer A a sufficient income in the non-accident-state and/or the accident-state to ensure the

[1] What is presented here is not a full, satisfactory answer to the problems, but indicates the correct results and important points to be made.

agent an expected utility of at least her reservation utility level, including compensation for the utility loss due to efforts made to reduce the risk of accident

(the expression is $(1-\pi_f)u(c_1)+\pi_f u(c_2)-e \geq \underline{u}$ *when the agent is to choose careful behavior, in Sloth's memo).*

The IC constraint, says that the agent should not be tempted to choose a behavior that the company does not want (the expression is

$(1-\pi_f)u(c_1)+\pi_f u(c_2)-e \geq (1-\pi_s)u(c_1)+\pi_s u(c_2)$

when the agent is to choose careful behavior, in Sloth's memo).

The IR basically implies that the company should remove risk from the agent, whereas the IC is about providing incentives (stick and carrot) to induce the agent to pick the behavior wanted by the company, e.g. preventing full insurance, because this will mean that she has no incentive to engage in risk-reducing behavior at all. Note that it may become too expensive for the company to compensate A for careful behavior, and/or to provide incentives to choose careful behavior over careless behavior.

Problem 3

The market for sandwiches on campus has a demand side characterized by the demand function $D(p) = \max\{ 40 - p, 0\}$. Suppose, for simplicity, that sandwiches can be produced at zero costs by any firma active in the market.

The firm Allan's Sandwiches is already established, while Benny is considering establishing himself with Benny's Sandwiches, but only being able to decide his output after Allan has chosen his output; hence, if Benny enters the market, it will be as a Stackelberg-follower, Allan already having determined the number of sandwiches he is producing. To enter the market and start up producing sandwiches, however, will cost Benny the fixed amount FC. We will consider four different cases for the level of these fixed establishing costs.

Determine, for each of the four cases, a) through d), the following:

- The output from each of the firms
- The market price
- The profit for each of the firms

- a) FC = 0
- b) FC = 105
- c) FC = 9
- d) FC = 4

Answer: B's best response, if entering the market, is $R_B(x_A) = 20 - \frac{1}{2}x_A$, *so the standard Stackelberg solution, which is what happens in*

a), is A producing 20, B producing 10, price being 10, and profits being 200 for A and 100 for B.

Hence, in b), B will certainly not establish a business, so we get the monopoly solution, A producing 30, price being 30, profits for A being 900. In c) and d), A has to consider deterring B from entering. We get $x_A^{ED} = 40 - 2\cdot(FC)^{1/2}$, *which will give A profits of* $(40 - 2(FC)^{1/2})\cdot 2FC$.

This means that in c), the ED-profit is 204 which is better than the Stackelberg-200, so A will produce 34, the price becomes 6, and profits for A 204.

In d) the ED-profit is only 144, se we get the same result as in a), except, of course, B is only getting a profit of 96, not 100.

Problem 4

Consider an economy with two agents, Hillary and Iris, who share the driveway leading to their two houses. The lighting of this driveway at night is a public good for the two of them, and is measured by the quantity $G \geq 0$. Financing 1 unit of lighting costs 1 unit of the private good, hence $C(G) = G$. Initially, the women have strictly positive initial endowments of the private good, e_H and e_I. Hillary has the utility function $u_H(x_H,G) = v_H(G) + x_H$, while Iris has $u_I(x_I,G) = v_I(G) + x_I$. We assume that both v_H and v_I are strictly increasing, strictly concave and differentiable, so both $v_H'(G)$ and $v_I'(G)$ are decreasing in G.

- Argue why voluntary private donations from Hillary and Iris, these donations being g_H and g_I, respectively, will result in a sub-optimal level of lighting

Answer: With private donations, the FOC in the NE leads to the expression $v_H'(G) = 1$ and $v_I'(G) = 1$, hence $v_H'(G) + v_I'(G) = 2$.

But the FOC for efficiency is $v_H'(G) + v_I'(G) = 1$. As both $v_H'(G)$ and $v_I'(G)$ are decreasing in G, this means that the efficient level for G is higher than the NE-level obtained with private donations.

Problem 5

The McKinley High School Choir consists of ten boys and ten girls. It has been suggested that a famous music instructor, Mr. Schuester, is hired to improve the choir's chance of winning the state competition for choirs, coming up in two weeks. The cost of hiring him is 2,000 $. If he is hired, every member pays an even share of this amount. Each girl is willing to pay 120 $ to hire the instructor, and each boy is willing to pay 81 $.

The school principal is considering interviewing the kids to find out how much they are willing to pay. However, his wife, who is a professor in Economics warns him that they may not be truthful in their answers. She talks him into introducing a Clarke-Grove mechanism to find an efficient solution.

- What will the outcome be: Will the instructor be hired? And how much will each of the boys and each of the girls pay?

Answer: The net value of hiring will be +20$ for each girl and –19$ for each boy, so the aggregate becomes +10 $, and hence the contract is on.

However, each girl is a pivotal agent, as 9(+20)+10*(–19) = –10, so each boy pays 100 $, whereas each girls pays 110$, including the Clarke tax.*

It does not seem very sensible, that the members end up paying 2100 $ for something that has a collective value of 2010 $, but this is classic dilemma with this sort of mechanism.

Problem 6

Kenneth Arrow contemplated on ways to create a Social Choice Function, which would basically aggregate individual preferences into society's preferences, in a way that obeys a number of axioms.

- Show that choosing some specific citizen's preferences to be those of society will satisfy Arrow's axioms, except the "No Dictatorship" axiom.

Answer:
-Universal Domain: Choosing one agent's preferences does not in any way restrict the domain on which the SCF can operate.
- Pareto Unanimity: If all citizens prefer x over y, so does "our" citizen, so society will prefer x over y.
- Rationality Axiom: If all citizens have rational (complete and transitive) preferences, so does "our" citizen, hence, so will society.
- Irrelevance of Independent Alternatives: Society's choice between x and y will depend only on "our" citizen's choice between these two, and hence not depend on how citizens rank other alternatives.

ref.: mtn 9. august 2015