Exam 2020-12-11, 13:00–16:00. Individual open book exam.

I (20p) Gigantic Corporation has invented a robot cashier, which can replace most human staff at checkout counters at just a fraction of the cost. The labor union representing retail workers in Northland has appealed to the government to impose a unit tax on robot cashiers, the revenue from which would be distributed to retail workers who lose their jobs at retailers that adopt the robotic cashier technology.

The union argues that, if set at a correct level, such a tax would increase economic efficiency by correcting a negative externality imposed by the adoption of robots on the retail workers. After all, the decision to utilize robotic cashiers is made without any consultation with the retail workers, whose incomes are reduced as a result. Evaluate the merits of this argument. (2–4 sentences.)

For the remaining questions, with the exception of IIa, you need to show the arguments and steps behind your reasoning, backed up by calculations where relevant.

II (20p) The unscrupulous Mr Montana is planning to engage in illegal tax avoidance. He could hide $1 million of cash savings in the vault of one of his three mansions: A, B or C. The local tax authority is aware of these vaults and of Mr Montana's total lack of scruples, but has the permission from a judge to raid only one mansion (if no hidden cash is found then no further permissions are granted). The cost of conducting an inspection is $200k, and any hidden cash that is found is transferred to the authority.[1]

   (a) Write down the payoff matrix of this game.

   (b) Describe the Nash equilibrium or equilibria.

III (30p) The vehicle dealer Oy Kärry Ab is the only seller of new Studebaker automobiles in Lintukoto. It has a contract with the manufacturer that allows it to purchase Studebakers at €115k per vehicle. The yearly demand for new Studebakers in Lintukoto is $Q^D(p) = 800 - 4p$, where the price is in €k. For each vehicle that Kärry deals it incurs a cost of €5k. Kärry also has a fixed cost of €3m/year for each automobile brand that it keeps in its product line. Kärry is currently selling Studebakers at €160k.

   (a) Kärry executives know that the manufacturer knows Kärry's cost structure and the local demand for its cars. They also know that the Lintukoto market provides a tiny fraction of the manufacturer's worldwide sales, so it is reasonable to assume that its marginal cost is essentially constant. Show how they can infer from the available information that the manufacturer's marginal cost is €35k.

   (b) Which retail price in Lintukoto would maximize the combined profits of the dealer and the manufacturer?

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[1]You can get 50% credit by answering a version with only mansions A and B.

(c) Kärry executives decide to make an offer to the manufacturer that would increase the profits for both. This involves paying a yearly license fee in exchange for a right to buy vehicles at a reduced wholesale price. Design an offer that, if accepted, would maximize the combined profits and divide the increase in profits equally between the dealer and the manufacturer.

IV (30p) Fishermen in the port towns of Dunwich and Rungholt catch cod in the same waters. The annual cod catch per boat is $Y(n) = 200 - 0.5n$ tons, where n is the total number of boats. The annual cost of operating a fishing boat is 100 guldens. Caught cod is salted and sold inland at a profit margin of 2 guldens per ton.

   (a) What is the efficient number of fishing boats? How many would operate in equilibrium with free entry?

   (b) Both towns are governed by town elders, who regulate the number of fishing boats in their respective towns with the sole purpose of maximizing the total profits in their own town. How many boats operate in Nash equilibrium?

   (c) Continued from part IVb. Town elders choose the number of fishing boats simultaneously every year, and their discount rate is 10% in both towns. Is there an equilibrium in which both towns receive half of the maximal total profits every year?