4240 - Equilibrium, Welfare & Information
Retake Exam, Spring term 2018

Problem 1 *(20 points, 2.5 per question)*

Please check the (unique) correct sentence or answer for each of questions i-viii) below.

i) The first fundamental theorem of welfare economics

      A. states that markets always clear.

      B. states that market equilibria satisfying certain assumptions are Pareto efficient.

      C. characterizes conditions under which we can implement an allocation as a market equilibrium.

      D. gives the conditions under which the Walrasian equilibrium exists.

ii) A tax in general equilibrium

      A. always increases welfare.

      B. always decreases welfare.

      C. can increase or decrease welfare.

      D. always eliminates the deadweight loss.

iii) In an oligopoly

      A. firms act strategically and the market allocation is always efficient .

      B. the market allocation is only efficient if firms do not act strategically.

      C. firms act strategically and the market outcome can be efficient.

      D. the market allocation cannot be efficient.

iv) Coasian bargaining

      A. solves all real world externality problems.

      B. proofs the existence of a Walrasian equilibrium.

      C. implements the Pigovian tax.

      D. can lead to Pareto improvements in a setting with externalities if transaction costs are low.

v) When both buyers and sellers have little information,

      A. none of the others answers is correct.

      B. insurance markets will face a problem of adverse selection.

      C. insurance markets will face a problem of moral hazard.

      D. insurance markets will collapse.

vi) With adverse selection,

    A. risk-loving individuals are worse off.

    B. risk-averse individuals are worse off.

    C. both risk-loving and risk-averse individuals are worse off.

    D. none of the above.

vii) Paul buys a car from Sam, with the agreement that Sam repairs the motor:

    A. this is a problem of adverse selection.

    B. this is a problem of moral hazard.

    C. this is a problem of both adverse selection and moral hazard.

    D. this is not a problem of asymmetric information, but of trust.

viii) With moral hazard:

    A. the principal exploits the risk aversion of the agent to ensure a larger profit.

    B. the principal will bear all the risk.

    C. the principal would optimally ask the risk-averse agent to share profits.

    D. none of the above.

Problem 2 *(30 points, 10 per question)*
Two agents, denoted a and b, live in 2-commodity exchange economy and have the following utility functions:

$$
\begin{aligned}
U(x^a) &= \log(x_1^a) + \log(x_2^a) \\
U(x^b) &= \log(x_1^b) + \sqrt{x_2^b}
\end{aligned}
$$

Initial endowments are $w^a = (18, 4)$ and $w^b = (0, 8)$. All agents are price takers.

i) Derive the first agent's demand function $x_1^a(p_1, p_2)$ as a function of prices only.

ii) Derive the second agent's demand functions $x_1^b(p_1, p_2)$ and $x_2^b(p_1, p_2)$ as a function of prices only.

iii) Calculate the excess demand function $z_1(p_1, p_2)$ for the first consumption good and determine the equilibrium price ration and the equilibrium consumption levels.

Problem 3 *(10 points)*
Two firms are producing the identical good q. The first firm's cost of production is $C_1(q_1) = c_1 q_1$, and the second firm's cost of production is $C_2(q_2) = c_2 q_2$. The firms face the (inverse) demand $P(Q) = a - Q$, where $Q = q_1 + q_2$. Calculate the Cournot equilibrium. Do you expect the price in a Bertrand equilibrium to be higher or lower (no calculation needed)?

Problem 4 *(40 points, 10 per question)*

A small soap producer operates in a local monopolistic market. Depending on the proportion r of "bio" ingredients, the production cost is $\frac{r^2}{2}$. Barbara wants to buy a unit of soap. Her utility function is $U = \theta r - p_r$, where p_r is the price of soap of type r and $\theta > 0$ is a preference parameter. As usual, the utility of not purchasing a soap is normalized to 0.

i) Assume Barbara is a representative consumer. What is the first best solution for the producer (complete information)?

ii) Assume that consumers are of two possible types. The high type $\bar{\theta}$ is more interested in "bio-labels" than the low type consumer $\underline{\theta}$. The proportion of $\bar{\theta}$ consumers is $\pi \in (0,1)$. State the maximization problem for the producer and compute the second-best solution.

iii) Assume now that the quality of the soap is not directly observable to the consumer. The consumer wishes to purchase a unit of soap from the firm. By assumption, r is either 0 (no bio products used) or 1 (production entirely uses bio products). Moreover, the consumer has many allergies and knows that the probability of having an alergic reaction is smaller with a high-quality soap (i.e. $r = 1$). More precisely, let the alergic reactions be measured by $\tilde{\theta}$ which takes values $\theta \in \{\underline{\theta}, \bar{\theta}\}$ with $Prob\left(\theta = \bar{\theta}\,|\,r = 1\right) = \pi_1 > \pi_0 = Prob\left(\theta = \bar{\theta}\,|\,r = 0\right)$. The realization of $\tilde{\theta}$ is observable and can be used in court. Thus, the consumer can offer to the firm a contract that pays a price $p\left(\tilde{\theta}\right)$ that depends on the realization of $\tilde{\theta}$. State the maximization problem of the consumer (asymmetric information case) and determine the second-best optimum.

iv) Assume that the firm is worried about the mediatic effect of being considered a bad firm. This can be seen as similar to making the firm risk averse. Briefly discuss how this would influence the optimal contract.