i

Candidate instructions

ECON4240 – Equilibrium, Welfare and Information

This is some important information about the written exam in ECON4240. Please read this carefully before you start answering the exam.

Date of exam: Wednesday, May 22, 2019

Time for exam: 9.00 – 12.00 (3 hours)

The problem set: The problem set consists of three questions, with several sub-questions. They count as indicated. Start by reading through the whole exam, and make sure that you allocate time to answering problems you find easy. Multiple choice questions are graded such that you will always be better off providing an answer, than to leave it blank.

Sketches: In this exam, you may submit sketches on questions 2 and 3. You are to use the sketching sheets handed to you. You can use more than one sketching sheet per question. See instructions for filling out sketching sheets below. It is very important that you make sure to allocate time to fill in the headings (the code for each problem, candidate number, course code, date etc.) on the sheets that you will use to add to your answer. You will find the code for each problem under the problem text. You will NOT be given extra time to fill out the "general information" on the sketching sheets (codes for each problem, candidate number etc.) Do NOT hand in sketches on question 1. **Sketches handed in for the multiple choice questions, will not be included in the assessment.**

Resources allowed: No written or printed resources - or calculator - is allowed (except if you have been granted use of a dictionary from the Faculty of Social Sciences).

Grading: The grades given: A-F, with A as the best and E as the weakest passing grade. F is fail.

Grades are given: Wednesday, June 12, 2019

1

Multiple choice questions

Problem 1

Each correct sub-question gives 2%. All correct questions gives 20%.

1. Suppose you are covered under health insurance and you are insured against all or most of the costs of visits to the doctor. As a result you are likely to make greater use of medical services of all kinds. This tendency of people with insurance to change their behavior in a way that leads to more claims against the insurance company is called

Select one alternative

- moral hazard ✓
- signaling
- screening
- adverse selection

2. The fact that big banks are considered “To Big to Fail,”

Select one alternative:

- creates a problem of adverse selection. Bank regulators solve this problem by screening the banks to separate healthy banks from unhealthy banks.
- creates a lemons problem. In the long run equilibrium, only the “lemon” banks will survive.
- creates a problem of adverse selection. Bank regulators solve this problem by signaling their hidden information.
- creates a problem of moral hazard. Banks take hidden actions that determine the riskiness of their loan portfolios. Because of the free insurance the big banks get, the big banks will select loan portfolios that are excessively risky. ✓

3. The limited liability constraint:

Select one alternative

- makes it difficult to induce high effort ✓
- helps the talented individuals to obtain a larger payoff
- induces sellers to offer better-quality products
- ensures the agents will want to accept the contract

4. The shutdown contract:

Select one alternative

- emerges in adverse selection when it is optimal to offer a contract that only the "good" type will accept ✓
- emerges in adverse selection when it is optimal to offer a contract that only the "bad" type will accept
- emerges in moral hazard when the principal decides the agent should not exert high effort
- none of the others

5. In moral hazard:

Select one alternative

- A negative transfer for low outcome is optimal with a risk-neutral agent ✓
- The only way to incentivize high effort is to punish low outcome with a negative transfer
- A negative transfer for low outcome is optimal with a risk-averse agent
- none of the others

6. In a Walrasian equilibrium,

Select one alternative

- firms use market power to increase their profits. ✓
- Walras law states that the allocation is Pareto efficient.
- Walras law states the any Pareto efficient allocation can be decentralized.
- consumers are price takers. ✗

7. Strategic actions of firms

Select one alternative

- can increase their profits if there is limited competition. ✓
- increases their profits under Bertrand competition.
- always increases their profits under Cournot competition.
- always increases their profits.

8. Compare the impact on the supplier and the consumer when imposig a small tax in partial equilibrium:

Select one alternative

- the actor with the less elastic response takes the higher price change. ✓
- The relative price response of producer over consumer price is determined by the ratio of the income over the profits.
- the actor with the more elastic response takes the higher price change.
- The relative price response of producer over consumer price is determined by the ratio of the long-run equilibrium response to the short-run equilibrium response.

9. In general equilibrium

Select one alternative

- the value of excess demand must sum to zero. ✓
- the Walrasian equilibrium is always unique.
- the First Theorem of Welfare Economics implies full competition.
- a tax will always improve the welfare.

10. The Samuelson Rule states that optimal allocation of a public good requires that

Select one alternative

- the sum of the marginal willingness to pay across agents has to equal the marginal production cos ✓
- the marginal willingness to pay has to equal the sum of marginal production costs.
- individuals are taxed proportionally to their income.
- the subsidies for the public good are financed through the Grove mechanism.

Delvis riktig. 18 av 20 poeng.

Knytte håndtegninger til denne oppgaven?
Bruk følgende kode:

8 4 2 6 1 8 5

2

Plutonians and health

Problem 2 - weight 40%

In Plutonia, each individual has an income of 10 plutons. The utility function is given by $U(c) = c - 0.05c^2$, where c denotes consumption. Plutonians might get sick. When a Plutonian gets sick, s/he needs to visit a hospital. A hospital visit costs 8 plutons and cures the sickness completely. Plutonians differ in terms of genetic predisposition to getting sick. Type A and type B have a probability of illness of 20%. Type C has a probability of illness of 80%. There are 25% of Plutonians of type A, 25% of type B, and 50% of type C.

1. In the absence of health insurance, find the expected utility of each type of Plutonian.

Fill in your answer here

We assume that consumpiton is measured in the number of plutonians that a given person has. In that case, we can find the expected utility by adding the probability that a certain person gets sick multiplied by the utility the person gets in that case, and the probability of not getting sick multiplied by the utility in that case. In the case of sickness, the person is left with 2 plutonians and the utility is 1.8, and otherwise the person has 10 plutonians and a utility of 5. Each type then has an expected utility of:

A: E(U) = 0.2 * 1.8 + 0.8 * 5 = 4.36
B: E(U) = 0.2 * 1.8 + 0.8 * 5 = 4.36
C: E(U) = 0.8 * 1.8 + 0.2 * 5 = 2.44

2. The government is planning to provide health insurance. Since everyone is risk averse, the (inexperienced) government assumes that everyone in Plutonia will buy insurance (even though subscription is not mandatory). Types are not observable. The government plans to break even: it charges a premium that exactly covers the expected medical costs of those getting sick. What is such a premium?

Enter text here

If the government plans to break even, the premium must be exactly equal to the expected average cost of each person. Since the government assumes that everyone will buy insurence, we can find this premium be each individuals expected medical costs by their percentage of the population:

Premium = E(cost) = 8 * 0.2 * 0.25 + 8 * 0.2 * 0.25 + 8 * 0.8 * 0.5 = 0.4 + 0.4 + 3.2 = 4

3. Will every Plutonian buy insurance coverage? Show that this is not the case (i.e., the participation constraint of some type is violated).

Enter text here

People will only buy insurence if they expect greater utility from being insured. This means that they will buy insurence if the expected ulitily from having 6 plutonians, i. e. what they have left after paying for the insurence, is more than the expected utility we calculated in the first problem. The utility they get from 6 plutonians is 4.2. This is more than the expected utility for group C under no insurence, but just short of the expected utility for the other two groups. Therefore, group C will want to buy, but groups A and B will rather not.

4. What is the premium ensuring zero profits to the government, when individuals optimally choose whether to buy insurance? Who will buy insurance?

Enter text here

With a lower premium than 4, groups A and B might be incouraged to buy in, but it will not be enough to cover the costs, so the governement will have negative profits. Thus, with only one available premium, there is no way to make groups A and B buy insurence and not sustain a loss for the governement. The premium that will ensure zero profits, then, is one that is equal to the expected cost of covering only thos from group C. This will be equal to 8 * 0.8 = 6.4. This will make all those in group C buy insurence since the expected utility from 3.6 plutonians is more than their expected utility otherwise.

5. An economist advices the government to offer instead two insurance products. *Full coverage* (FCOV) covers completely the price of the hospital visit; the premium is given by the answer to 4. Partial coverage (PCOV) contributes to cover the medical expenses partially (the individual pays the rest) for a lower premium. How should the government design the PCOV insurance (making zero profits)? Does this strategy solve the asymmetric information problem? Briefly discuss.

Enter text here

Since the first insurence is designed for group C, the other must have a premium equal to the expected cost of covering groups A and B to make zero profit. This means a premium of 8 * 0.2 = 1.6. This will give them a utility just over the one they get from no insurence.

There will be no reason to suspect that groups A and B will have any incentive to buy the high premium full insurence package. We have already seen that they have a larger expected utility from not buying anything at all. However, group C might want to buy this cheaper package rather than the full coverage. It is unclear since we do not know exactly how much it actually covers and what the probability of uncovered sickness for someone from group C would be, but if it covers enough for the lower price to be worth it, people from group C might be incouraged to mimic groups A and B and buy the cheaper, partial coverage.

6. A health research institute has found a way to cure the predisposition of type C Plutonians to illness: the cure ensures that type C individuals will never become sick again. The cure costs 6.8 plutons. In the absence of health insurance, will an individual of type C buy the cure? What if the FCOV and PCOV insurances are available? How is this a moral hazard problem?

Enter text here

If there is no incurence available, the utility for a person from group C from buying the cure and thus being left with 3.2 plutonians exeeds the expected utility from not doing so (what we found in problem 1). This means that if the cure is the only alternative, everyone from group C will buy it. However, if the insurence with premium 6.4 also exists, this is a cheaper option that gives the exact same outcome, so everyone from group C will do that instead. If the government keeps up the insurence program as it is, they then discourage full treatment. In most cases, it is in the government's best interest to have as healthy a population as possible, but this program does not give people the right incentives to do so.

Besvart.

Knytte håndtegninger til denne oppgaven?

3 6 8 6 4 2 8

Bruk følgende kode:

3 Exchange Economy

Problem 3 [40%, each of i-iv 10%]
Two agents, denoted a and b, live in a 2-commodity exchange economy and have the following utility functions:

$$U(x_a, y_a) = \left(\alpha x_a - \frac{x_a^2}{2}\right) + y_a$$
$$U(x_b, y_b, x_a) = \left((\alpha + \gamma x_a)x_b - \frac{x_b^2}{2}\right) + y_b$$

with $\alpha > 0$ and $\gamma \in \mathbb{R}$. Initial endowments are $w_a = (\bar{x}_a, \bar{y}_a)$ and $w_b = (\bar{x}_b, \bar{y}_b)$. All agents are price takers. Please normalize the price for good y to unity. You may assume an interior solution.

i) Explain the difference between the first and the second welfare theorem of economics. Which of them is more important for policy making? Explain why.
Given the situation above, please explain how one of the theorems applies.

Fill in your answer here

The first welfare theorem states that under certain conditions, the market equilibrium will be Pareto efficient. The second says that any Pareto efficient allocation can be realized as a market equlibrium, given a certain initial endowment.

To understand what this means, we first need to know what Pareto efficiency is. An allocatoin is said to be Pareto efficient if there is noe way we can make someone better off without someone else being worse off. If the only way to increase someone's utility is to take away the utility of someone else, we are in a Pareto efficient state. Any allocation that does not use all the resources to their full extent is thus not Pareto efficient, and even if all resources are in use, redistribution may give room for improvements.

So the first theorem states that under some conditions, the market will ensure an allocation that utilizes all the resources and where everyone cannot be better off or equally happy at the same time. These conditions are the ones that make up our definition of perfect competition. They assume, amoung other things, that all actors are price takers, that consumers maximize utility while firms maximize profits, full informaiton and no transaction costs, and that there are no market failures such as externalities and public goods. Basically, there are no frictoins that prevent the actors from maximizing their well being without concern for what others are doing.

There is, however, not only one Pareto efficient allocation, as there is a whole spectrum of allocations where no one can be made happier without taking from someone else. This is where the second theorem comes in. It states that we can arrive at any one of these allocations as long as we distribute the resources in a particular way to begin with. In a perfect market, the equilibrium will be Pareto efficient, and we can finetune exactly (at least in theory) where on the spectrum of Pareto efficient allocations we will arrive.

The question of which one is more important for policy depends upon which kind of policy we are talking about. Generally, I would say that the second is the more important, since it gives policy makers the possibility to arrange the kind of equilibrium they see fit with different kinds of redistribution policies. This provides an important tool in social planning. However, the first one is also of some importance, since it helps indicate which kinds of markets that should be intervened in, and which ones should be rather be left alone.

In the situation in question, teh utility of person b not only depends on his consumption of goods, but also on person a's consumption of good x. Depending on the sign of gamma, person a's consumption exibits either a positive or negative externality on person b. In this case, since all the conditions for perfect competition are not met, the first theorem cannot guaratee us that a Pareto efficient allocation will be realized.

Please write your answer to part i in the box above. Please solve parts ii, iii, and iv on a sheet of paper (to be scanned).

ii) Derive the aggregate demand for good x. What is the equilibrium allocation of good x? What are the equilibrium prices?

iii) For which values of γ is the allocation Pareto efficient? How do you call the issue arising for other values of γ (please consider both γ positive and negative). Derive the Pareto efficient allocations for all values of γ.

iv) Assume you can tax or subsidize agent a's consumption of good x_a. What level of the tax or subsidy is required to reach Pareto efficiency? What is special here and does not always hold in general equilibrium?

Besvart.

Knytte håndtegninger til denne oppgaven?

4 5 0 8 1 7 0

Bruk følgende kode:

Oppgavekode Question code	Dato Date	Emnekode Subject code	Kandidatnummer Candidate number	Oppgavenummer Question number	Sidetall Page number
4 50 8 1 7 0	22/5/19	ECON4240	171302	3	1

Tegneområde Drawing area

ii) $\max U_a$ s.t. $p x_a + y_a = m_a$

$\Downarrow$

$\mathcal{L}'_{x_a} = \alpha - x_a - \lambda p = 0$

$\lambda = \frac{\alpha - x_a}{p}$

$\mathcal{L}'_{y_a} = 1 - \lambda = 0$

$\lambda = 1$

$\Downarrow$

$\frac{\alpha - x_a}{p} = 1 \Rightarrow x_a = \alpha - p$

$\max U_b$ s.t. $p x_b + y_b = m_b$

$\Downarrow$

$\mathcal{L}'_{x_b} = \alpha + \gamma x_a - x_b - \lambda p = 0$

$\lambda = \frac{\alpha + \gamma x_a - x_b}{p}$

$\mathcal{L}'_{y_b} = 1 - \lambda = 0$

$\lambda = 1$

$\Downarrow$

$\frac{\alpha + \gamma x_a - x_b}{p} = 1 \Rightarrow x_b = \alpha + \gamma x_a - p = \alpha + \gamma(\alpha - p) - p = (\alpha - p)(1 + \gamma)$

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4508170	22/5/19	ECON4240	171302	3	2

Tegneområde Drawing area

Aggregate demand:

$$x_a + x_b = \alpha + \rho + (\alpha - p)(1+\gamma) = (\alpha - p)(2+\gamma)$$

In equilibrium, we need the excess demand to equal 0. That means:

$$x_a + x_a - \bar{x}_a - \bar{x}_b = 0$$

$$(\alpha + \rho)(2+\gamma) = \bar{x}_a + \bar{x}_b$$

$$p = \alpha - \left(\frac{\bar{x}_a + \bar{x}_b}{2+\gamma}\right)$$

The allocation will then be:

$$x_a = \alpha - \left(\alpha - \left(\frac{\bar{x}_a + \bar{x}_b}{2+\gamma}\right)\right) = \frac{\bar{x}_a + \bar{x}_b}{2+\gamma}$$

$$x_b = \left(\alpha - \left(\alpha - \left(\frac{\bar{x}_a + \bar{x}_b}{2+\gamma}\right)\right)\right)(1+\gamma) = \left(\frac{\bar{x}_a + \bar{x}_b}{2+\gamma}\right)(1+\gamma)$$

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H 5 0 8 1 7 0	22/5/19	ECON4240	171302	3	3

Tegneområde Drawing area

iii) With $\gamma \neq 0$, there is some kind of externality from person a's consumption of good x unto person b's marginal utility of good x. Such an externality makes the equilibrium inefficient, since person a does not take the utility of person b into account. Only if $\gamma = 0$ will the externality be gone so that the market equilibrium is efficient. If $\gamma > 0$, person a consumes too little, since his consumption affects person b positively. The opposite is the case if $\gamma < 0$.

In order to find the Pareto efficient allocation for all γ, we must derive the maximum utility for one person, say a, while holding the other's constant:

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Tegneområde Drawing area

$$\max U_a \quad s.t. \quad U_b = \bar{U}_b$$

$$x_a + x_b = \bar{x}$$

$$y_a + y_b = \bar{y}$$

$$\Downarrow$$

$$\max \left(\alpha x_a - \frac{x_a^2}{2}\right) + y_a \quad s.t. \quad \left((\alpha + \gamma x_a)(\bar{x} - x_a) - \frac{(\bar{x} - x_a)^2}{2}\right) + \bar{y} - y_a$$

$$\Downarrow$$

$$L'_{x_a} = \alpha - x_a - \lambda\left(-\alpha - 2\gamma x_a + \gamma\bar{x} + \bar{x} - x_a\right) = 0$$

$$\lambda = \frac{\alpha - x_a}{\bar{x}(1+\gamma) - \alpha - x_a(1+2\gamma)}$$

$$L'_{y_a} = 1 - \lambda(-1) = 0$$

$$\underline{\lambda = -1}$$

$$\Downarrow$$

$$\frac{\alpha - x_a}{\bar{x}(1+\gamma) - \alpha - x_a(1+2\gamma)} = -1$$

$$\Downarrow$$

$$\underline{x_a = \frac{\bar{x}(1+\gamma)}{2\gamma+2} \Rightarrow x_b = \bar{x} - x_a = \bar{x}\left(\frac{1+\gamma}{2\gamma+2}\right)}$$

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Tegneområde Drawing area

These results were not exactly what I had expected. With an externality, it is usually optimal to allocate more to person a if the externality is positive, $\gamma > 0$, and less if it is negative. In my answer, X is split evenly for all values of γ, except for -1 where the answer breaks down. There may be some calculation errors.

iv) Generally, we want to subsidize consumption of good x if $\gamma > 0$, and tax it if $\gamma < 0$. However, since too large amounts of x can result in negative marginal utility for either a or b, it is not necessarily this that increases efficiency