Imperfect Information in Health Care Markets

Exercise Session 6 - Selection

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13.11.2023

Questions?

Exercise 10

a) - e) : What is the equilibrium?
f) : Why is it inefficient?
g) - j): What can be done to fix this?

We now have a continuum of people of length $1/2$. More precisely, we have a person i for each $i \in [0, 1/2]$. All people have the same utility function $u(x) = \sqrt{x}$ and the same income of 2500. However, they differ in terms of risk: Person i loses 1600 with probability i. We consider an insurance policy with full coverage, i.e. a policy that pays out 1600 in case of a loss. Every person knows his own risk but insurance companies cannot distinguish people (and will therefore have to offer the same premium to everybody).

Exercise 10g)

g) Consider an insurance subsidy to insurers, i.e. each insurer receives for each sold insurance a subsidy payment s. How high does s have to be to ensure efficiency?

10g)

$AC(i) = 400 + 800 \cdot i$

$WTP(i) = 2000 \cdot i - 400 \cdot i^2$

Subsidy for insurers

↳ insurer receives a subsidy payment s for each sold insurance

How high does s have to be to ensure efficiency?

With the subsidy, the average cost of the insurance are now given by

$$AC^s(i) = AC(i) - s$$

In equilibrium, $AC^s(i) = WTP(i)$

where i is the lowest type who buys insurance.

To get efficiency, we want $i = 0$

$$AC^{s}(0) \stackrel{!}{=} WTP(0)$$

$$400 + 800 \cdot 0 - s = 2000 \cdot 0 - 400 \cdot 0^{2} \qquad \text{plug in } i = 0$$

$$400 - s = 0$$

$$400 = s$$

To ensure efficiency, the subsidy payment has to be 400.

Exercise 10h)

h) Consider an insurance mandate (without subsidies), i.e. everyone is forced to buy an insurance contract. What is the equilibrium insurance premium? Who will benefit from the mandate? Who will lose out with the mandate?

$\boxed{10h)}$

Insurance mandate → everybody is forced to buy an insurance contract

In equilibrium under perfect competition, insurances will make zero profits.

$$P = AC(0)$$
$$P = 800 \cdot 0 + 400$$
$$P = 400$$

Who benefits from the mandate?

Everyone with a WTP of more than 400 benefits.

$(i > 0{,}209)$

Who is worse off with the mandate?

$WTP(i) = 2000i - 400i^2$

Everyone with a WTP of less than 400 is worse off.

$(i < 0{,}209)$

$$400 = WTP(i)$$

$$400 = 2000 \cdot i - 400i^2$$

$$0 = -400i^2 + 2000i - 400 \quad | : (-400)$$

$$0 = i^2 - 5i + 1$$

$$i_{1,2} = -\frac{-5}{2} \pm \sqrt{\left(\frac{-5}{2}\right)^2 - 1}$$

$$= 2{,}5 - \sqrt{6{,}25 - 1}$$

$$\approx 0{,}209$$

Exercise 10i)

i) Suppose insurers can now distinguish two groups: The people $i \geq 0.3$ and the people $i < 0.3$. Assume that insurers are allowed to offer different contracts to these two groups. Consequently, there are now two separate markets. What is the equilibrium on the "high risk market"? What is the equilibrium on the "low risk" market? Is the new situation more or less efficient than the one considered in the previous subquestions? Who benefits from group discrimination and who does not?

10i)

Insurers can distinguish two groups:

people $i < 0{,}3$ people $i \geq 0{,}3$

Insurers are allowed to offer different contracts to these groups

↳ 2 seperate markets

Equilibrium on the "high risk market": $i \geq 0{,}3$

-> everything is as before

(Only the people between $[0{,}38\,;\,0{,}5]$ bought the contract)

Equilibrium on the "low risk market": $(i < 0{,}3)$

$MC(i) = 1600 \cdot i$

$WTP(i) = 2000i - 400i^2$

If one type i in $[0; 0{,}3)$ buys a contract, everyone in $(i; 0{,}3)$ will also buy this contract.

The new average costs for the insurance in this low risk market are given by

$$AC^{new}(i) = \frac{1}{2}(1600 \cdot i + 1600 \cdot 0{,}3)$$

$$= 800i + 240$$

In equilibrium:

$$AC^{new}(i^*) = P = WTP(i^*)$$

$$800\, i^* + 240 = 2000\, i^* - 400\, i^{*2}$$

$$400\, i^{*2} - 1200\, i^* + 240 = 0 \qquad | :400$$

$$i^{*2} - 3 i^* + 0{,}6 = 0$$

$$i^* = -\frac{-3}{2} \pm \sqrt{\left(\frac{-3}{2}\right)^2 - 0{,}6}$$

↳ as $i^* \in [0; 0{,}3)$

$$= 1{,}5 - \sqrt{2{,}25 - 0{,}6} \approx 0{,}215$$

$\Rightarrow$ On the low risk market, everyone in $[0{,}215; 0{,}3)$ buys a contract at premium

$$P = AC(0{,}215) = 800 \cdot 0{,}215 + 240 = 412$$

Efficiency 2.

- This situation is more efficient as more people are insured.
- people in (0,215, 0,3) benefit as they get an insurance at a premium below their WTP
- everyone else is as well off as before

Exercise 10j)

j) With the previous subquestion in mind, what happens if insurers can identify people better? (For example, distinguish more and more subgroups as in the previous subquestion.) What are the consequences for welfare? Who benefits and who loses?

$\boxed{10j)}$

What happens if insurers can identify people better?

Problem of adverse selection essentially disappears, as $AC < WTP$ for all/nearly all people

→ almost everyone buys insurance

⇒ Welfare increases, people in $[0; 0{,}38]$ will benefit compared to one group, but people in higher groups might lose.

For example, those who are close to 0,5 as they will be offered a higher premium contract than in the one group case.

Exercise 11

You work for a profit maximizing health insurer which recently understood the problem of adverse selection. Your boss asks you what to do to increase/maintain profits in light of the adverse selection problem. What do you answer?

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Adverse selection problem:

Problem of adverse selection: attraction of high risk consumers

→ tailor insurance plans toward healthy people:

- offer partial coverage contracts
- improve risk assessment
- bonus programs for eg. fitness corses, gym memberships
- pay back part of the premium in case no care was used

→ make it unattractive for chronically ill and unfit people

- don't cover certain brands of medication or treatments for chronic diseases.

- Signing insurance contract online / 3rd floor without elevator

- advertisments more online

- build office in neighborhood with high socioeconomic status/ or advertise especially there

- cap on payouts

The Rothschild - Stiglitz Model

Starting point: Insurances are aware of the adverse selection problem (People that buy insurances typically have higher risks)

Main idea: Insurances offer a menu of contracts (coverage - premium pairs) that are designed in such a way that different risk types self-select into the contract designed for them

q (coverage), P (premium)

→ The RS - Model analyses how these contracts are designed in the simple case of two possible risk types (high & low)

The Players: Insurances, high risk types, low risk types

$\alpha_h > \alpha_l$

Insurances:
- Maximize expected profits (offer menu of coverage - premium pairs)
- No administrative costs
- Make 0 profit under perfect competition

- They know the share of high risk type in population $\gamma \in (0, 1)$

→ Their zero-isoprofit-lines indicate which contracts are profitable for them (depending on the type buying the contract)

- iso-profit curve for level $\bar{\pi}$: all combinations (q, p) leading to profit $\bar{\pi}$

  ↳ $p(q \mid \pi = \bar{\pi}) = \bar{\pi} + \alpha q L$ (slope αL)

High + Low risk tyes:
- Want to get the best possible contract (higher coverage + lower price)
- Risk type is private information of consumers

→ Their indifference curves indicate which contracts they prefer over other contracts

- all (p, q) combinations leading to expected utility $\bar{U}$

  ↳ Expected utility: $E(u) = \underbrace{\alpha}_{\text{prob of loss}} u(\overbrace{W}^{\text{Wealth}} - \underbrace{p}_{\text{what's paid to the insurance}} - \underbrace{(1-q)L}_{\text{what's paid by the insurance}}) + (1-\alpha)\, u(W-p)$

- the slope of the IC's is higher than the slope of the iso-profit curve for $q < 1$ (same slope for $q = 1$)
- the slope of the indifference curve is higher for higher α

Equilibrium: System of contracts (coverage-premium pairs)

- every offered contract yields non-negative expected profits
- no insurance can increase its expected profits by offering another contract
- consumers maximize expected utility

Exercise 12

In this exercise we show that in the Rothschild-Stiglitz model only one contract per type can be sold in equilibrium. We do this by contradiction. Suppose this was not true, i.e. suppose there were two contracts (p_1, q_1) and (p_2, q_2) that are bought by consumers with high risk.

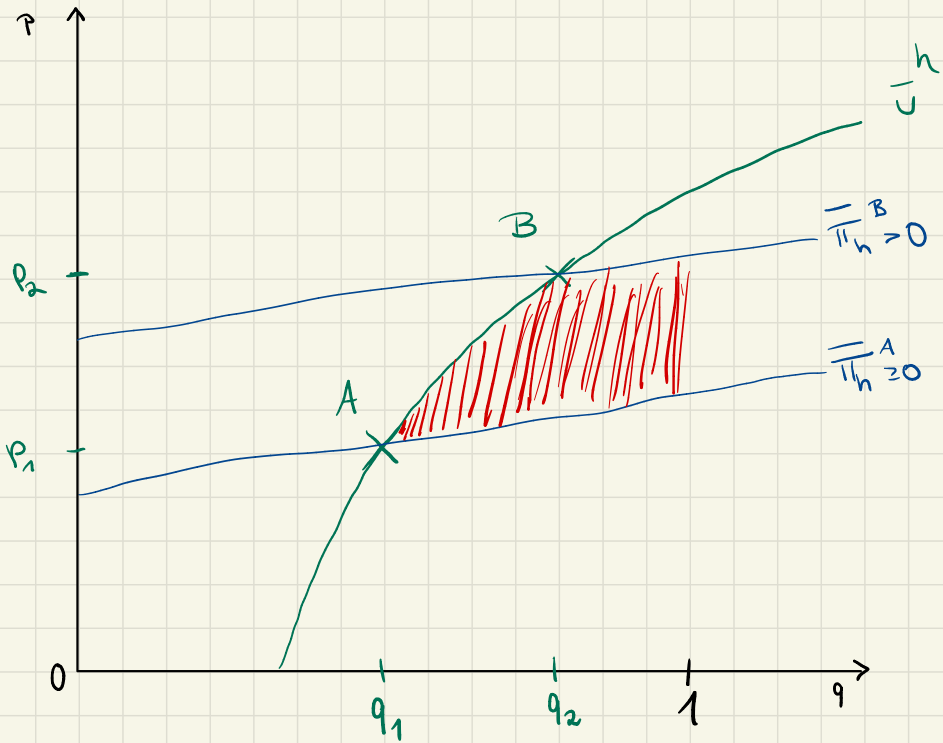
a) Draw in a coverage, premium diagram such two contracts and the indifference curve of the high risk consumers.

b) Draw the isoprofit lines of the insurers through these contracts.

c) Find a deviation contract that yields strictly positive profit (and is bought by some players if offered).

d) Now suppose there were two contracts (p_1, q_1) and (p_2, q_2) that are bought by consumers with **low** risk. Do the same as above but be careful when arguing that the deviation contract is strictly profitable.

12 Show that the high types will not buy two different contracts.
By contradiction: Start by assuming that they do buy different contracts in equilibrium.



a) The indifference curve has to go through both contract as otherwise they would only buy one of these contracts.

b) As insurances want to make positive profits, they would not offer contract A if it made negative profits.
(iso-profit lines have to flatter than IC for q<1)

c) All contracts in the red-area yield positive profits for the insurance and are preferred by the high risk types (because they are below their IC)

(We do not know whether the low risk type would buy these contracts or not, but we DO know that if he buys it, it will result in positive profits for the insurance since $\alpha_\ell < \alpha_h$)

$\Rightarrow$ Contradiction, as a contract in the red region is at least weakly preferred by both the insurances and the consumers

$\Rightarrow$ High types do not buy two contracts in equilibrium