Imperfect Information in Health Care Markets

Exercise Session 7 - Rothschild-Stiglitz

Questions about the lecture

Exercise 13 d)

If risk types were observable what would be the equilibrium contracts for the two risk types?

Exc. 13d)

risk aversion, competition $\Rightarrow$ full coverage, zero profits

$\Rightarrow$ the contracts will have coverage $q = 1$ and premium $p = \alpha \cdot L$, with $\alpha = \alpha_L$ or $\alpha = \alpha_H$

Exercise 13 e)

What is the Rothschild-Stiglitz equilibrium (i.e. the equilibrium when risk types are not observed by the insurance companies)? For which shares of high risk types is there a full coverage pooling contract breaking this equilibrium?

Exc. 13e)

How to construct the RS-equilibrium (candidate, because sometimes equilibrium does not exist):

- high type gets full coverage contract at fair premium (here: $\alpha_H \cdot L = \frac{5}{2}$)
- contract (p_L, q_L) for the low type satisfies two things:
  1. yields zero profits for insurances from the L-type $\Rightarrow p_L = q_L \cdot \alpha_L \cdot L = q_L \cdot \frac{5}{4}$
  2. high type is indifferent between his contract and (p_L, q_L)

$\Leftrightarrow$ utility of H-type of his contract: $u(9 - \frac{5}{2}) = u(6{,}5) = 43{,}875$

utility of (p_L, q_L)-contract:

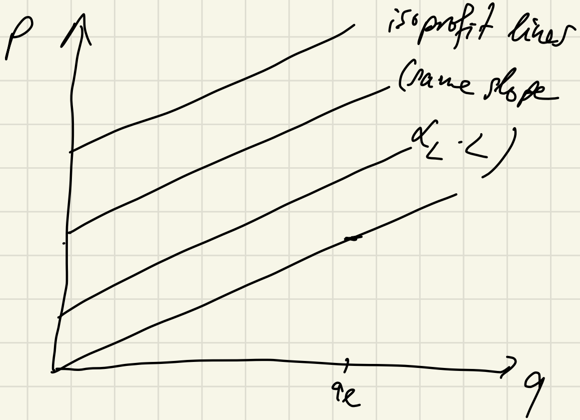
$$\frac{1}{2} \cdot u(9 - p_L - 5(1-q_L)) + \frac{1}{2} u(9 - p_L) \overset{!}{=} 43{,}875$$

plug in $p_L = q_L \cdot \frac{5}{4}$

$\Leftrightarrow$ $q_L \approx 0{,}3355$

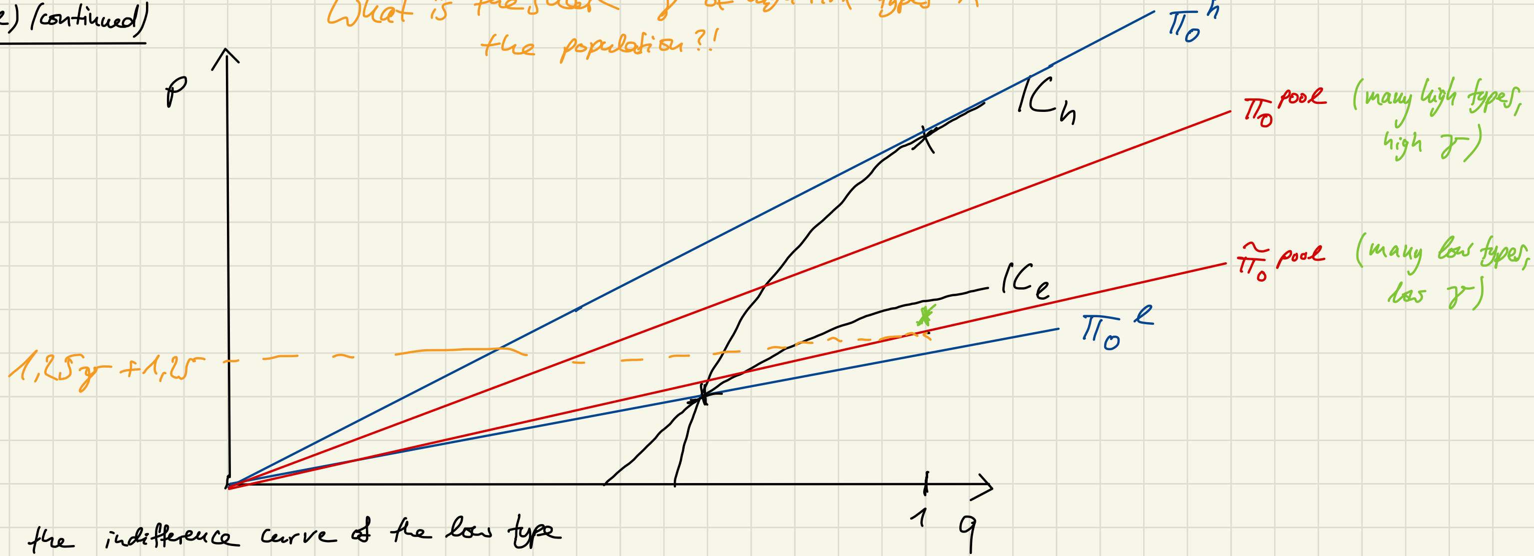
$\Rightarrow p_L \approx 0{,}4193$

$\Rightarrow$ Contract of the low type is $(p_L, q_L) = (0{,}4193; 0{,}3355)$



Exc. 13e) (continued)

What is the share γ of high risk types in the population?!



Whenever the indifference curve of the low type through her equilibrium candidate contract is above the zero-isoprofit pooling line (also partly above is sufficient), the RS-equilibrium candidate is broken by pooling.

Let us assume the share of high risk types is γ.

Then, the fair premium for a full coverage pooling contract would be $p = \gamma \cdot \alpha_h \cdot L + (1-\gamma)\cdot \alpha_\ell \cdot L$

$$= 1{,}25\gamma + 1{,}25$$

(expected) utility of low type from this full coverage contract:

$$u(9 - 1{,}25 - 1{,}25\gamma) = \ldots \approx 47{,}47 - 2{,}81\gamma - 0{,}78\gamma^2$$

exp. utility from his $(\underset{p}{0{,}4193};\ \underset{q}{0{,}3355})$ contract:

$$u((0{,}4193;\ 0{,}3355)) = \frac{1}{4}\cdot u(5{,}2582) + \frac{3}{4}\, u(8{,}5807)$$
$$\approx 46{,}44$$

for which share γ is the low type indifferent between these two contracts?

$\rightarrow \quad 46{,}44 \overset{!}{=} 47{,}47 - 2{,}81\gamma - 0{,}78\gamma^2$

$\Leftrightarrow \quad \dots \quad \Leftrightarrow \quad \gamma = 0{,}3365$ (since γ is a share between 0 and 1)

So, the equilibrium candidate is broken for $\gamma < 0{,}3365$ and no equilibrium exists in this case.

Exercise 15

Suppose that a low risk type is indifferent between his contract in the Rothschild-Stiglitz equilibrium candidate and a full coverage contract at premium $(\gamma\alpha_h + (1-\gamma)\alpha_l) * L$. What interpretation does the premium $(\gamma\alpha_h + (1-\gamma)\alpha_l) * L$ have? Demonstrate that in this case the Rothschild-Stiglitz equilibrium does not exist.

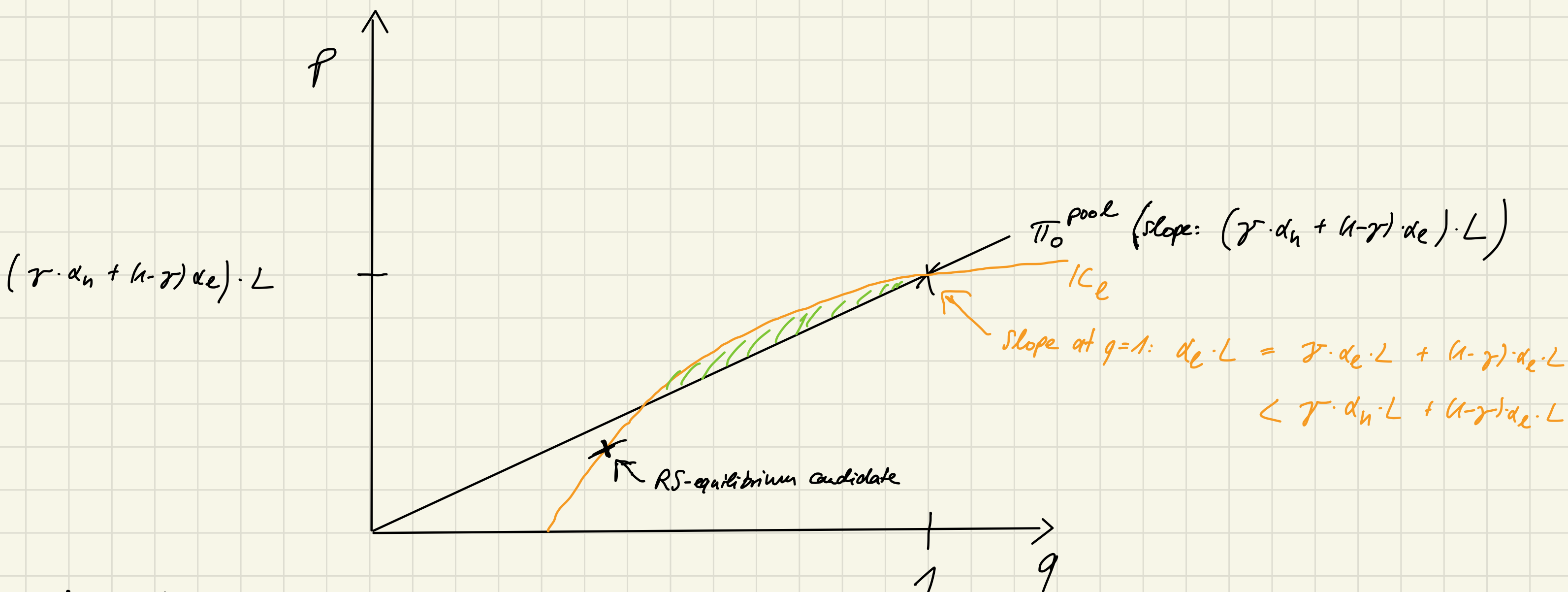
Exc. 15

The premium $(\gamma \cdot \alpha_h + (1-\gamma) \cdot \alpha_e) \cdot L$ is the expected cost for the insurance from a full coverage pooling contract.

Also, this number is equal to the slope of the pooling isoprofit curves.

Let's draw a picture of this situation:

Exc. 15 (continued)



Observation: At $q=1$, the slope of the IC of the low type is smaller than the slope of the isoprofit pooling line

and these two lines intersect at $q=1$.

$\Rightarrow$ IC of ℓ-type crosses the pooling isoprofit curve from above

$\Rightarrow$ there exists a profitable pooling contract, hence the RS-equilibrium does not exist.

↳ any contract in the green region!

Exercise 16

In the Netherlands, health insurance contracts can only be changed at the end of the calendar year. Discuss why such a regulation may or may not be a good idea. Do you know of other similar provisions or regulations?

Exc. 16

Such a regulation is a good idea for insurances:

- people switch from being low risk to being high risk and vice versa over time
  -> if immediate change of plan is allowed, people could buy no insurance and go full coverage once they fall ill (so nobody would buy a high coverage insurance even though they are risk averse)
- it might be easier for insurances to predict their costs for the upcoming year
- if people switch to high risk within the year, insurances might have higher cost than expected and run into liquidity problems

Comparison: German private plans that cover dental care only after 2 years.

equation from 13.b):

$$4\bar{u} = 163 - 2p^2 + 60q - 25q^2 - 14p + 10pq$$

$$\Leftrightarrow p^2 + \underbrace{(7-5q)}_{\text{"P"}}\cdot p \underbrace{- 81{,}5 - 30q + 12{,}5q^2 + 2\bar{u}}_{\text{"Q"}} = 0$$

$$\Rightarrow p = \frac{5q-7}{2} \pm \sqrt{\frac{(5q-7)^2}{4} - 12{,}5q^2 - 2\bar{u} + 81{,}5 + 30q}$$

$$= \frac{5q-7}{2} \pm \sqrt{\frac{1}{4}\cdot(25q^2 - 70q + 49) - \frac{1}{4}(50q^2 + 8\bar{u} - 326 - 120q)}$$

$$= \frac{5q-7}{2} \pm \frac{1}{2}\cdot\sqrt{-25q^2 + 50q + 375 - 8\bar{u}}$$

pq - formula:

$$x^2 + px + q = 0$$

$$\Rightarrow x = -\frac{p}{2} \pm \sqrt{\left(\frac{p}{2}\right)^2 - q}$$