LECTURE 7: RISK ADJUSTMENT + QUALITY COMPETITION

① GLAZER + MCGUIRE (2000):

- Consumer types $i \in \{H, L\}$
  - H: λ (sick)
  - L: $1-\lambda$ (healthy)

- two illnesses $j \in \{a, c\}$
  - a: acute → occurs with (normalized) prob 1
  - c: chronic → This is where adverse selection enters: $p_h > p_l$

- costs to treat: $\{m_a, m_c\}$
- insurance premium: r

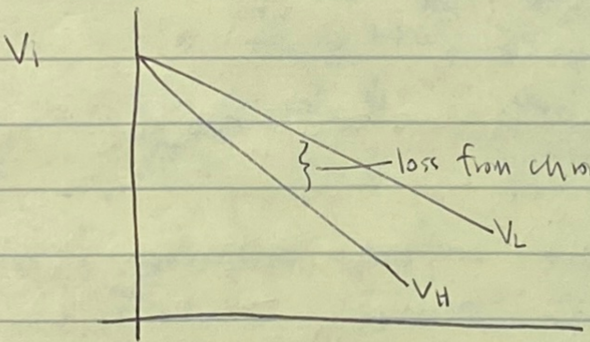
PATIENT

Then utility is: $V_i(m_a, m_c, r) = \underbrace{v_a(m_a)}_{\text{normalized to always happen}} + p_i v_c(m_c) - r$

→ sidenote: why no risk aversion for patients?

NOTE: who is better off with insurance?

What is the adverse selection problem here?



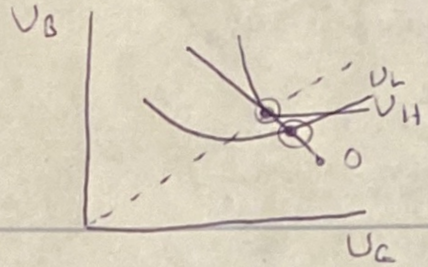
(holding m_a, r fixed)

SOCIAL PLANNER

GOALS: ① Efficiency: $v_a'(m_a^*) = v_c'(m_c^*) \Rightarrow$ why?

★ MC of treatment is 1 for both a and c! ★

Recall the Rothschild + Stiglitz graph:



- Separating eqbm

③ ② Equity in premiums:

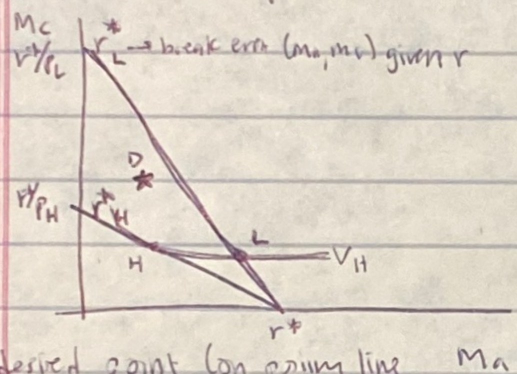
$$r^* = \underbrace{m_a^*}_{w/\ p_i = 1} + \underbrace{\underbrace{\left[\lambda p_H + (1-\lambda) p_L\right]}_{\text{average } p(c=1)} m_c^*}_{\text{Expected insurer cost}}$$

⇒ goals 1 + 2 define ★D

- what is the adverse selection problem here?
- Can you work out the math? [from patient perspective]

PLANS / PROVIDERS

note H contracts are less generous in treating C.



* without adjustment, what happens to market?
- low types will not have full insurance
- this is unfair as well as inefficient!

D is socially desired point (on pricing line where MB = MC = 1)

COMPETITIVE EQBM

An equilibrium requires that we stipulate contracts $(p m_a^*, m_c^*, r^*)$ such that:
- consumers maximize expected utility
- insurers make 0 profits

our competitive eqbm is not efficient – can risk adjustment help?

RISK ADJ.

- Signals of i's type (H, L) are shown to regulators + plans:

$$s \in \{\underset{\text{good signal}}{0}, \underset{\text{bad signal}}{1}\} \quad \text{where } P(s=1|H) > P(s=1|L)$$

- signals are "noisy": $q_i = Pr(s=1 \mid i \in \{H, L\})$ [so $q_H > q_L$]
- Then posterior beliefs $\lambda_i = Pr(i = H \mid s=1) = \dfrac{Pr(s=1 \mid i=H) \cdot P(i=H)}{Pr(s=1)}$

so $\lambda_H \approx \lambda \cdot q_H$ and $\lambda_L \approx (1-\lambda) \cdot q_L$

GLAZER + MCGUIRE (2000) continued

- Signals give information on contracting C
- Is this a separating eqbm still? ⇒ ~~[illegible]~~ — YES BUT...

Now model looks like:

1. Everyone pays r^*
2. Plans choose $(m_a^*, m_c^*) \mid r^*$
3. Consumers buy plans
4. Regulator pays plans: $\tilde{r}^* = m_a^* + [p_H \lambda_s + (1-\lambda_s) p_L] m_c^*$ for $s \in \{0, 1\}$

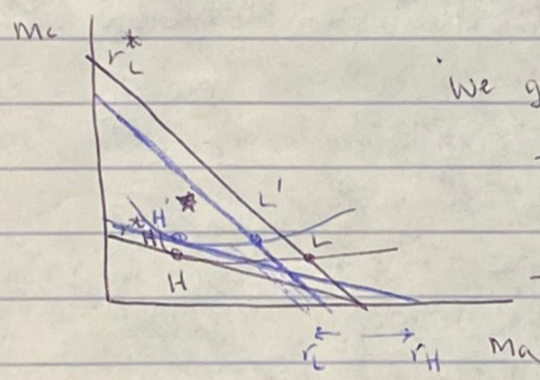
Now two contracts exist:

① for H types: $(m'_{aH}, m'_{cH}) = \arg\max \left[V_a(m_a) + p_H V_c(m_c) \right]$ ~~same~~

s.t. $m_a + p_H m_c - \tilde{r}_H = 0$

↳ risk adjusted payment

② For L types: $(m'_{aL}, m'_{cL}) = \arg\max \left[V_a(m_a) + p_L V_c(m_c) \right]$ s.t. $m_a + p_L m_c - \tilde{r}_L = 0$



We get closer to D!

- conventional risk adjustment helps, but does not resolve issues.
- How does this affect goals ① + ②?

OPTIMAL RISK ADJUSTMENT

↱ compensate a weak signal with a tax/subsidy transfer

- what if we "over" or "under" paid based on signals?

Take

$$r_H^* = m_a^* + p_H m_c^* \qquad \Longleftrightarrow \qquad r_H^* = q_H r_1^* + (1-q_H) r_0^*$$

$$r_L^* = m_a^* + p_L m_c^* \qquad\qquad\qquad r_L^* = q_L r_1^* + (1-q_L) r_0^*$$

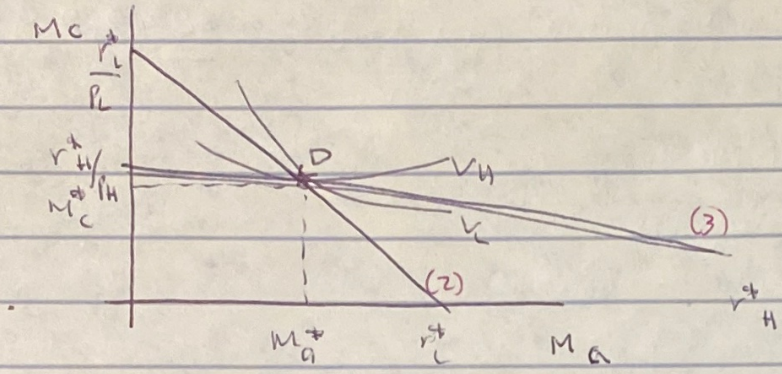
← what you pay for s=0

↳ what you pay for s=1

we want to implement this

this does s...

NOW WE GET A POOLING EQBM:



key insight: r_0^* + r_1^* move around slopes of (2) and (3)

PROOF SKETCH:

goal: need to show that (r_H^*, r_L^*) is ① an eqbm

② the socially optimal eqbm

STEP 1: construct candidate eqbm: $(m_a^*, m_c^*, r^*) \mid r_H^*, r_L^*$ (1)

STEP 2: rule out alternate paths

1. A Pareto-improvement → does not exist since (1) is efficient
2. A "cream-skimming" plan
3. A "H-type, profit-making" plan

} does not exist: no other profit-maxing solution given slope of (2) + (3)

∎

What are r_0^*, r_1^*?

$$r_0^* = [q_H r_L^* - q_L r_H^*]/[q_H - q_L]$$
$$r_1^* = [(1-q_L) r_H^* - (1-q_H) r_L^*]/[q_H - q_L]$$

Intuitively:

- if signal is imprecise ($q_H - q_L \to 0$), then payment differences get large ($r_1^* \to \infty$, $r_0^* \to -\infty$)

what is actually provided?

PROVIDERS

First, no risk adjustment:

$$V(e,m) = \tilde{\lambda}_0(e)\,\pi_L + (1-\tilde{\lambda}_0(e))\,\pi_H - e - m + \tilde{\lambda}_1(e,m)\,\pi_L + (1-\tilde{\lambda}_1)\,\pi_H$$

Providers choose (e,m) to maximize:

- note $\pi_L - \pi_H > 0$ (easier to treat healthier patients)
- hence, what happens in eq'm? <u>Focus on L types</u>

Now, what about risk adjustment?

- if risk adjustment is perfect, $\pi_L - \pi_H \to 0$
- then

$$V(e,m) = \pi - e - m + \pi$$

* what is optimum now? $e^* = 0$ (good)

$m^* = 0$ (bad!)

How can we fix this? <u>Pay-for-prevention</u>

- give providers a bonus $\alpha[x(m) - \underline{x}(0)]$

  average prevention

- now $V(e,m) = 2\pi - e - m + \alpha[x(m) - x(0)]$

  so m^* solves: $\alpha[x'(m)] = 1$

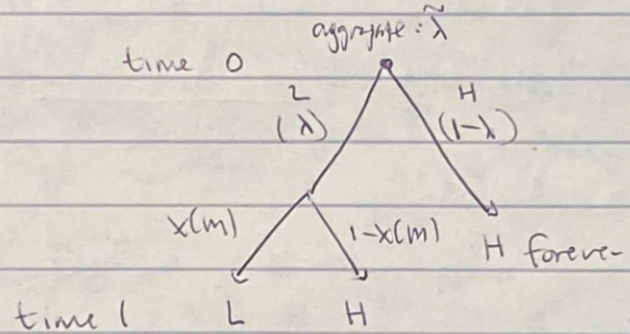
- provider chooses α s.t. $\alpha = \tilde{\lambda}_0(e)\,[\text{[illegible]}]$

  $\times [(B_L - C_L) - (B_H - C_H)]$

- is this feasible?

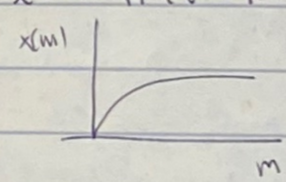
② EGGLESTON, ELLIS + LU (2012): Risk adjustment + prevention

- dynamic distortions from RA:
- still have $i \in \{H, L\}$ with costs $c_L < c_H$
  (H: $1-\lambda$, L: λ)
- but patient risk can change over time!



m ~~(e)~~ represents health investment and $x(m)$ $Pr(i=L|m)$.

EX:



Suppose $\tilde{\lambda}(e,m)$ where $\tilde{\lambda}_1 = \tilde{\lambda}_0(e)\,x(m)$.

Can we implement m^*?

SOCIAL PLANNER

m^* is defined based on: $W = B(m) - m - e$

$$B(m) = \tilde{\lambda}_0(e)\,x(m)\,\{\underbrace{[B_L - c_L]}_{\text{net benefit from } m \text{ for } L} - [B_H - c_H]\}$$

note $B_L > B_H$ and $c_L < c_H$

→ $e^* = 0$ (why?)

→ Hence the FOC is given by

$$\frac{\partial B(m)}{\partial m} = 0 \text{ or } \underline{\tilde{\lambda}_0(e)\left[(B_L - c_L) - (B_H - c_H)\right]}\,x'(m) = 1.$$

→ Notes on comparative statics:

- As $\tilde{\lambda}_0 \uparrow$ (lower aggregate risk), $x'(m) \downarrow \Rightarrow$ <u>more investment in prevention</u>
- As relative benefits $\uparrow$, same response.