NO CURE NO PAY — CONTRACTS WITH LIMITED LIABILITY

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- Health care cost are rising — there is an interest in increasing productivity
- Payment schemes should be constructed to increase output
- But most focus seems to be on motivating the “health organization”
- Usually contracts are linear — per item — fees or fixed wages
- I show that the optimal contract is a non-linear, contingent claim contract

CONTINGENT CONTRACTS

- Contingent contracts: payment is conditional on outcome
- Well known from real estate and US lawyers
- Schoonbeek and Kooreman 2005 shows that shows that in the optimal contingent state contract, the physician pays a penalty fees to the principal
- In many real life situations, such a contract may no be feasible
- Therefore i assume that the optimal contract is subject to limited liability

THE PLAN

- Assume that both physician and principal are risk neutral
- Introduce the model
- show that a fixed wage is optimal when effort is observed, and in-optimal if not
- Show that the optimal contract is non-linear
- Future work

THE MODEL

- The physician is employed by a health organization (hospital/municipal)
- The physicians work is measured by observable output y
- y is random, with density $g(y|e)$ where e is the physicians effort
- It is assume that $g(\cdot)$ has a monotone likelihood ratio property
$$\frac{\partial}{\partial y}\left(\frac{g_e(y|e)}{g(y|e)}\right) > 0$$
I.e. y and e are "complements"
- Effort comes at a cost $C(e)$

- The physicians payment is given by $r = R(y, e)$
- The physician has a utility function $u(r, y)$, which depends on payment and output
- Dependence on output allows for a “caring” physician
- The hospital has a budgetary income $v(y)$ from which it pays the physician

The main problem is to find a contract $r = R(y, e)$, with the property that expected utility of the physician

$$U(R, e) = \int u(R(y, e), y) g(y|e) \, \mathrm{d}y - C(e) \tag{1}$$

cannot be increased by a change in $R(y, e)$, without decreasing the expected net income of the hospital

$$V(R, e) = \int \left[y - R(y, e) \right] g(y|e) \, \mathrm{d}y$$

subject to the *incentive constraint* that effort in eq. (1) insures maximal utility

LIMITED LIABILITY

- A key feature of the model is limited liability
- Implies that the physician cannot be forced to pay for bad outcome and the hospital cannot be forced to pay more than the value of output
- Formally $0 \leq R(y) \leq y$
- Limited liability reduces the set of contracts
- E.g. it rules out a Mirrlees forcing contract

$$\max_{R,e} \int_0^\infty \left[u(R(y,e)) + \delta y\right] g(y|e)\,\mathrm{d}y - C(e) \tag{2a}$$

$$\text{s.t.} \int_0^\infty v(y - R(y,e))g(y|e)\,\mathrm{d}y \geq y_L^0 \tag{2b}$$

$$E[u(R,e)|e] \leq E[u(R,e^*)|e] \tag{2c}$$

$$0 \leq R(y,e) \leq y \tag{2d}$$

where eqs. (2a) and (2b) are the physicians and hospitals utility. eq. (2c) is the physicians *incentive constraint* and eq. (2d) is the limited liability constraint

- When effort is observable the problem becomes

$$\max_{R,e} \int_0^\infty \left[u(R(y,e)) + \delta y\right] g(y|e)\,\mathrm{d}y - C(e)$$
$$\text{s.t.} \int_0^\infty v(y - R(y,e))g(y|e)\,\mathrm{d}y \geq y_L^0$$

- Using point-wise optimization the optimal contract is implicitly given by

$$\frac{v'(y - R(y,e))}{u'(R(y,e))} = \frac{1}{\lambda}$$

  I.e. a fixed wage
- This is the *first-best* solution

- In the following I assume that both parties are risk neutral and the utility is additive and separable
- I.e. $u(\cdot) = R(y, e) + \delta y$ and $v(\cdot) = y - R(y, e)$

Mirrlees, James A. 1974. “Notes on Welfare Economics, Information and Uncertainty”. In *Essays on Economic Behavior under Uncertainty*, 243–258.

Schoonbeek, Lambert, and Peter Kooreman. 2005. “No cure, be paid: super-contingent fee contracts”, *Applied Economics Letters* 12 (9): 549–551.