Module 3: Moral Hazard - Introduction

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- Moral hazard arises naturally in many settings.
- In general, these settings feature the following characteristics:
  - Agent's actions are not observable: asymmetric information.
  - Agent's actions affect the payoff (or welfare) of others.
  - It is costly for the agent to take the "right" action.
- Examples:
  - A CEO working for the firm's shareholders.
  - An entrepreneur who needs financing.
  - A firm deciding whether or not to invest in product "quality".
  - An individual who purchases health insurance.

Moral Hazard and Insurance

- Recall our insurance model:
  - Two possible outcomes (states of the world): good (G) outcome or bad (B) outcome.
    - *Bad:* your house burns down.
    - *Good:* your house doesn't burn.
    - Good outcome occurs with probability $p \in (0,1)$ (Bad outcome occurs with prob. $1-p$).
  - We assumed that probability p was exogenous. What if p depends on homeowner's actions?

- Suppose p depends on agent's "effort" level e.
  - Homeowner may take precautions or not.
    - Insurance company cannot observe if owner takes precautions or not.
    - Cost of effort e for homeowner: $c(e) = e$.
  - Suppose that $p(e)$ satisfies
    - $p' > 0$ and $p'' < 0$
    - $p(0) = a \geq 0$: with zero effort, fire occurs with probability $1 - a$.

Case 1: No Insurance

- Suppose there is no insurance available.
  - Then, consumer's income at state of the world:
    - $y_G = y$
    - $y_B = y - L$ (assume $y > L$)
  - Consumer's utility if he chooses effort e:
    - $u(y) - e$ in good state.
    - $u(y - L) - e$ in bad state.
  - We assume that $u' > 0$ and $u'' < 0$.

- Consumer's problem is to choose effort level e.
  - Consumer chooses e to solve:

$$\max_e \{p(e)\, u(y) + [1 - p(e)]\, u(y - L) - e\}.$$

- FOC

$$\begin{aligned} p'(e^*)\, u(y) - p'(e^*)\, u(y - L) - 1 &= 0 \Rightarrow \\ p'(e^*) &= \frac{1}{u(y) - u(y - L)}. \end{aligned}$$

  - SOCs?
  - $e^* > 0$ (as long as $p'(0) > \frac{1}{u(y) - u(y-L)}$).
    - If there is no insurance available, consumer will put effort.

Case 2: Insurance Market

- Suppose now that consumer can purchase insurance (coverage C):
  - $y_G = y - \pi C$
  - $y_B = y - L - \pi C + C = y - L + (1 - \pi) C$
- Assume that insurance market is competitive + firms expect consumer to put effort e.
  - Zero profits implies that $\pi = 1 - p(e)$.
  - Consumer will buy coverage $C = L$:
  - Consumer's income in both states is $y - \pi L$.
- Given the price of coverage π, how much effort will consumer put?

$$\max_e \{u(y - \pi L) - e\}.$$

  - Consumer chooses $e = 0$, so $\pi = 1 - p(0) = 1 - a$.
  - Everyone ends up paying a very high premium!
  - If $a = 0$, then $\pi = 1$. Consumer's payoffs are $u(y - L)$.
    - Consumer is better off without an insurance.
    - Insurance market would shut down, since there is no demand!
    - Same would be true if a is close to zero.

References

Board S., (2011), Lecture Notes.

Bolton and Dewatripont, (2005), *Contract Theory*, MIT Press.

Ortner J., (2013), Lecture Notes.