Lecture 7. Agency Theory
Part 1. Adverse Selection

- In real world most transactions are characterized by asymmetry of information between parties
- In many cases transaction parties as well as external actors (e.g. State authorities or other 3rd parties) seek to minimize this assymmetry and to reduce associated transaction costs

Principal – agent framework

- Contract between two parties
- Principal (P) delegates decision rights to agent (A):

- Asymmetry of information:
  - Hidden characteristics
  - Hidden actions
- As a result – agent's opportunistic behavior

Asymmetric information and opportunism: examples

Market	Principal	Agent	Opportunism
Labour market	Employer	Candidate	Mispresentation of information about skills / experience
	Firm Owner	Manager	Choice of non-optimal investment policy
	Manager	Worker	Shirking
Insurance market	Insurance company	Car owner	Risky behavior
Transportantion market	Passenger	Taxi driver	Non-optimal route
Procurement market	Buyer	Supplier	Low quality goods

Questions to discuss

- What are the consequences of informational assymetry?

- What types of opportunim emerge due to the informational asymmetry in transactions?

- How an to what extent institutions may help to prevent and reduce consequences of such opportunism?

Adverse selection

Adverse selection – ex ante opportunism:

informed agent manipulates private information to get better contract conditions

Adverse selection at the labor market

- Candidates with different productivity

$$\alpha \in \{\alpha_1; \alpha_2\} \quad 0 < \alpha_1 < \alpha_2 \quad p(\alpha = \alpha_1) = q.$$

- Symmetric information

$$\begin{cases} w_{\alpha_1} = \alpha_1 \\ w_{\alpha_2} = \alpha_2 \end{cases}$$

- Asymmetric information
- $w = q \cdot \alpha_1 + (1 - q) \cdot \alpha_2$ Adverse selection

Adverse selection

When adverse selection arises?

- Hidden information
- Measurement cost

- Whether these conditions hold in this example?

Example: Public procurement

- Supplier is chosen via special procedure determined by Procurement Law

  Principal– buyer (public agency, public firm, Ministry etc.)

  Agent – supplier (private firm)

- Seeking the balance between transparency of procurement procedure and detailed term of reference / contract

Why we do not see market failures at all markets with asymmetric information?

Adverse selection problem can be often solved by institutions that exist at the markets

Institutions

- Improve informational exchange
- Constrain opportunistic behavior increasing costs of such behavior

Institutions can be created and sustained by market participants as well as by the State

Example: reputation at procurement market: how it works?

Why direct enforcement might not be an option?

Warranties

How it works?

- Seller sends a signal (by providing the warranty)
- This information helps buyers to form expectations about quality
- These expectations shape incentive to make a purchase

Institutions as mechanisms to cope with adverse selection

Who have losses from AS?

- Principal
- Agents of certain types
- Third party

Institutions can be created and maintained by different actors:

- Agents (warranties, reputation) → signaling
- Principal (contract design) → screening
- Third party (laws, regulations, informational provision)

Signaling

Signaling – informed party (agent) perfoms certain actions to creadibly reveal his/her hidden information (info about characteristic) to prevent adverse selection

Signaling game, or why people get higher education

$$U(w, e, \alpha_i) = u(w) - c(e, \alpha_i)$$

$$u' > 0 \quad u'' < 0$$

$$\frac{\partial c}{\partial e} \geq 0 \qquad \frac{\partial^2 c}{\partial e^2} \geq 0 \qquad \frac{\partial c}{\partial \alpha} < 0 \qquad \frac{\partial^2 c}{\partial e \, \partial \alpha} < 0$$

Timing

- Nature defines the productivity
- Candidate (informed party) gets an education of certain level and therefore sends a signal to the employer (non-informed party)
- Emloyer, having certain beliefs, form expectations about candidate's productivity
- Emloyer offer the contract menu to potential candidate
- Candidate makes a choice (chooses on contract or reject them all)
- Payoffs are realized

Separating equilibria

employer' beliefs about education and productivity

$e < e^*$ → low productivity

$e \geq e^*$ → high productivity

workek: 0 or e

$$u(\alpha_1) - c(0, \alpha_1) \geq u(\alpha_2) - c(e^*, \alpha_1)$$
$$u(\alpha_2) - c(e^*, \alpha_2) \geq u(\alpha_1) - c(0, \alpha_2)$$

- При $e^* \in [\underline{e}; \bar{e}]$

$$\begin{cases} e_1 = 0; & w = \alpha_1 \\ e_2 = e^*, \ e^* \in [\underline{e}; \bar{e}]; & w = \alpha_2 \end{cases}$$

for low productivity

for high productivity

Pooling equilibrium

$e < e^*$: low productivity with $P = 1$;

$e \geq e^*$: low productivity with q

high $(1-q)$

- Self-selection

$$u(q \cdot \alpha_1 + (1-q)\alpha_2) - c(e^*, \alpha_1) \geq u(\alpha_1) - c(0, \alpha_1)$$

$$u(q \cdot \alpha_1 + (1-q)\alpha_2) - c(e^*, \alpha_2) \geq u(\alpha_1) - c(0, \alpha_2)$$

$$u(q \cdot \alpha_1 + (1-q)\alpha_2) - c(e^0, \alpha_1) = u(\alpha_1) - c(0, \alpha_1)$$

$$E_q(\alpha) = q \cdot \alpha_1 + (1-q) \cdot \alpha_2$$

- Hiigher education is not efficient?

Equilibrium refinement, Cho-Kreps criteria

- Too many equilibria?
- How to choose the most appropriate one?
- How to interpret «strange» signals?

$$e^* \in \left[\underline{e};\ \bar{e}\right] \qquad e' : \underline{e} < e' < e^*$$

- Low productivity

$$u(\alpha_2) - c(e', \alpha_1) \qquad u(\alpha_2) - c(e', \alpha_1) < u(\alpha_1) - c(0, \alpha_1)$$

- High productivity

$$u(\alpha_2) - c(e', \alpha_2) \qquad u(\alpha_2) - c(e', \alpha_2) > u(\alpha_2) - c(e^*, \alpha_2)$$

Is this model good for Russian labor market?

- Does education has an impact on produtivity?
- Why / under what conditions employers should trust such a signal as university diploma?
- Why employers might prefer candidates with higher education even if education doesnt' increase productivity?
- Whether part-time education can be a good signal?

Signals at various markets

- Warranties
- Advertisment
- Obligatory licensing
- Membership on voluntary professional associations

Screening

Screening– what principal (non-informed party) can do to reveal agent's private information (agent's characteristics) and prevent adverse selection

Screening at the labour market

Screening contract

Two options to choose from:

- Contract with flat wage

or

- Wage that grows with seniority

Questions:

- Why this is a screening contract?
- Who chooses what?
- What information could be revealed?

University diploma as a screening mechanism

Screening contract:

- Contract with high wage (if candidate brings diploma from good university)

or

- Contract with low wage (if candidate brings diploma from low quality university or no diploma at all)

Who chooses prestigious university?

Screening: optimal contracting

- Principal and agents of two types

$$c_i = \frac{\theta_i}{2} e_i^2 \qquad \theta_2 > \theta_1$$

$$w_i = w_i(e_i)$$

$$\max_{w_1, w_2, e_1, e_2} \quad \pi = e_1 + e_2 - (w_1 + w_2)$$

- Symmetric information

$$\max_{w_1, w_2, e_1, e_2} \quad \pi = e_1 + e_2 - (w_1 + w_2)$$

$$\begin{Vmatrix} w_1 - \frac{\theta_1}{2} e_1^2 \geq 0 \quad (IR_1) \\ w_2 - \frac{\theta_2}{2} e_2^2 \geq 0 \quad (IR_2) \end{Vmatrix} .$$

$$e_1^* = \frac{1}{\theta_1} \qquad e_2^* = \frac{1}{\theta_2}$$

$$\left\langle w_i^* = \frac{1}{2\theta_i}, e_i^* = \frac{1}{\theta_i} \right\rangle$$

Asymmetric info

Adverse selection and potential solution

$$\max_{w_1,\, w_2,\, e_1,\, e_2} \quad \pi = \alpha_1(e_1 - w_1) + \alpha_2(e_2 - w_2)$$

$$\left\|\begin{array}{ll}
w_1 \geq \dfrac{\theta_1}{2} e_1^2 & (IR_1) \\
w_1 \geq \dfrac{\theta_1}{2} e_1^2 + \left(w_2 - \dfrac{\theta_1}{2} e_2^2 \right) & (IC_1) \\
 & \\
w_2 \geq \dfrac{\theta_2}{2} e_2^2 & (IR_2) \\
w_2 \geq \dfrac{\theta_2}{2} e_2^2 + \left(w_1 - \dfrac{\theta_2}{2} e_1^2 \right) & (IC_2)
\end{array}\right. .$$

Asymmetric info

$$\max_{w_1, w_2, e_1, e_2} \quad \pi = \alpha_1 (e_1 - w_1) + \alpha_2 (e_2 - w_2)$$

$$\left\| \begin{array}{l} w_1 - \frac{\theta_1}{2} e_1^2 = w_2 - \frac{\theta_1}{2} e_2^2 \\ w_2 - \frac{\theta_2}{2} e_2^2 = 0 \\ e_1^2 > e_2^2 \end{array} \right. .$$

$$\hat{e}_1 = \frac{1}{\theta_1} = e_1^* \qquad \left(\hat{w}_1 > w^* = \frac{1}{2\theta_1} \right)$$

$$\hat{e}_2 = \frac{1}{\theta_2 + \frac{\alpha_1}{\alpha_2}(\theta_2 - \theta_1)} < \frac{1}{\theta_2} = e_2^* \qquad \left(\hat{w}_2 < w^* = \frac{1}{2\theta_2} \right)$$