

## 11.4 The Informed Player Moves Second: Screening

- In screening games, the informed player moves second, which means that he moves in response to contracts offered by the uninformed player.
  
- ✓ An offer conveys no information about the uninformed player.

◆ Education V: Screening with a Discrete Signal

○ Players

✓ a worker and two employers

○ The order of play

0 Nature chooses the worker's ability  $a \in \{2, 5.5\}$ ,  
the *Low* and *High* ability each having probability 0.5.

The variable  $a$  is observed by the worker,  
but not by the employers.

- 1 Each employer offers a wage contract  $w(s)$ .
- 2 The worker chooses education level  $s \in \{0, 1\}$ .
- 3 The worker accepts a contract, or rejects both of them.
- 4 Output equals  $a$ .

- Payoffs

$$\begin{aligned} \checkmark \quad \pi_{worker} &= w - 8s/a && \text{if the worker accepts contract } w \\ &0 && \text{if he rejects both contracts} \end{aligned}$$

$$\begin{aligned} \checkmark \quad \pi_{employer} &= a - w && \text{for the employer whose contract is accepted} \\ &0 && \text{for the other employer} \end{aligned}$$

◆ The unique equilibrium

○ Education V has no pooling equilibrium.

✓ If one employer tried to offer the zero profit pooling contract,

$$w(0) = 3.75,$$

the other employer would offer  $w(1) = 5.5$  and

draw away all the *Highs*.

- Separating Equilibrium 5.1

- ✓  $s(Low) = 0$        $s(High) = 1$

- $w(0) = 2$        $w(1) = 5.5$

- Beliefs do not need to be specified in a screening model.

- ✓ The uninformed player moves first,  
so his beliefs after seeing the moves of the informed player  
are irrelevant.

✓ The informed player is fully informed,  
so his beliefs are not affected by what he observes.

✓ This is much like simple adverse selection.

○ The modeller does not need to refine perfectness in a screening model.

◆ Education VI: Screening with a Continuous Signal

○ Players

✓ a worker and two employers

○ The order of play

0 Nature chooses the worker's ability  $a \in \{2, 5.5\}$ ,

each ability having probability 0.5.

The employers do not observe ability, but the worker does.



- 1 Each employer offers a wage contract  $w(s)$ .
- 2 The worker chooses education level  $s \in [0, 1]$ .
- 3 The worker chooses a contract, or rejects both of them.
- 4 Output equals  $a$ .

- Payoffs

$$\begin{aligned} \checkmark \quad \pi_{worker} &= w - 8s/a && \text{if the worker accepts contract } w \\ &0 && \text{if he rejects both contracts} \end{aligned}$$

$$\begin{aligned} \checkmark \quad \pi_{employer} &= a - w && \text{for the employer whose contract is accepted} \\ &0 && \text{for the other employer} \end{aligned}$$

◆ A separating equilibrium

- Pooling equilibria generally do not exist in screening games with continuous signals, and sometimes separating equilibria in pure strategies do not exist either.
- Separating (Nash) Equilibrium 6.1 (with a unique equilibrium path)

$$\checkmark \quad s(Low) = 0 \quad s(High) = s^*$$

$$w(s) = 2 \quad \text{if } s < s^*$$

$$5.5 \quad \text{if } s \geq s^*$$

- ✓ In any separating contract,  
the *Lows* must be paid a wage of 2 for an education of 0,  
because this is the most attractive contract that breaks even.
- ✓ The separating contract for the *Highs* must maximize their utility  
subject to the constraints discussed in Education I.
- ✓ the participation constraints for the employers
  - $w(0) \leq a_L = 2$       and       $w(s^*) \leq a_H = 5.5$
  - Competition between the employers turns the inequalities  
into equalities.

✓ the self-selection constraint for the Lows

- $U_L(s = 0) = w(0) - 0 \geq w(s^*) - 8 s^*/2 = U_L(s = s^*)$
- This constraint is satisfied as an equality if  $s^* = 0.875$ , and is true for higher values of  $s^*$ .

✓ the self-selection constraint for the Highs

- $U_H(s = s^*) = w(s^*) - 8 s^*/5.5 \geq w(0) - 0 = U_H(s = 0)$
- This constraint is true, regardless of the value of  $s^*$ .

- ✓ The education level for the *Highs* in Separating Equilibrium 6.1 is unique at 0.875,  
because the employers compete to offer the most attractive contract that satisfies the participation and incentive compatibility constraints.
  
- ✓ The most attractive is the separating contract that Pareto dominates the other separating contracts by requiring the relatively low separating signal of  $s^* = 0.875$ .

- Competition in offering attractive contracts rules out pooling contracts.

- ✓ The nonpooling constraint,

required by competition between the employers, is

- $U_H(s = s^*) = w(s^*) - 8 s^* / 5.5 \geq U_H(\text{pooling}).$

- ✓ The nonpooling constraint is satisfied even with the most attractive possible pooling contract,

which leads to  $U_H(\text{pooling}) = 3.75.$