Signaling

14.12 Game Theory

Road map

1. Signaling games – review
   1. Pooling equilibrium
   2. Separating equilibrium
   3. Mixed
2. Job-market signaling (short, time permitting)
3. Review
4. Evaluations
Signaling Games

Beer – Quiche

\[ \begin{array}{c|c|c|c|c|c|c} & \text{duel} & \text{don’t} & \text{beer} & \text{quiche} & \text{duel} & \text{don’t} \\
0 & {} & {} & {} & {} & {} & {} \\
1 & {} & {} & {} & {} & {} & {} \\
2 & {} & {} & {} & {} & {} & {} \\
3 & {} & {} & {} & {} & {} & {} \\
\end{array} \]

\( t_w \) \{1\}

\( t_s \) \{0.9\}
Signaling Game -- Definition

- Two Players: (S)ender, (R)ceiver
  1. Nature selects a type $t_i$ from $T = \{t_1, \ldots, t_I\}$ with probability $p(t_i)$;
  2. Sender observes $t_i$, and then chooses a message $m_j$ from $M = \{m_1, \ldots, m_I\}$;
  3. Receiver observes $m_j$ (but not $t_i$), and then chooses an action $a_k$ from $A = \{a_1, \ldots, a_K\}$;
  4. Payoffs are $U_S(t_i, m_j, a_k)$ and $U_R(t_i, m_j, a_k)$.

Beer – Quiche

![Beer - Quiche Game Diagram]
Types of Equilibria

- A **pooling equilibrium** is an equilibrium in which all types of sender send the same message.
- A **separating equilibrium** is an equilibrium in which all types of sender send different messages.
- A **partially separating/pooling equilibrium** is an equilibrium in which some types of sender send the same message, while some others send some other messages.

A Pooling equilibrium
A Mixed equilibrium

Job Market Signaling
Model

• A worker
  – with ability $t = H$ or $t = L$ (his private information)
  – $\Pr(t = H) = q$,
  – obtains an observable education level $e$,
  – incurring cost $c(t,e)$ where $c(H,e) < c(L,e)$, and
  – finds a job with wage $w(e)$, where he
  – produces $y(t,e)$.

• Firms compete for the worker: in equilibrium,
  
  $$w(e) = \mu(H|e)y(H,e) + (1-\mu(H|e))y(L,e).$$

Equilibrium

$(e_H, e_L, w(e), \mu(H|e))$ where

• $e_t = \text{argmax}_e w(e) - c(t,e)$ for each $t$;

• $w(e) = \mu(H|e)y(H,e) + (1-\mu(H|e))y(L,e)$;

• $\mu(H|e) = \frac{q\Pr(e_H = e)}{q\Pr(e_H = e) + (1-q)\Pr(e_L = e)}$ whenever well-defined.
If t were common knowledge

No need to imitate
No need to imitate

want to imitate
A pooling equilibrium

A separating equilibrium
An intuitive separating equilibrium

\[ y(L,e) \]

\[ e_L = e^*(L) \]

\[ y(H,e) \]

\[ e_H \]