Game Theory for Strategic Advantage

15.025

Alessandro Bonatti
MIT Sloan
Overview of Foundations

- Rationality
- Equilibrium
- Commitment
- Backward Induction

Bargaining
Today’s Class

Bargaining fundamentals

1. Players

2. Added Values

3. Procedures
   • Right of first refusal
   • Clauses as commitments
Iberia Deal: Background

• Iberia replacing Boeing 747s
• Airbus, Boeing offer similar planes
• Current fleet mostly Airbus
• Boeing participates ➔ Months-long “dogfight”
• Iberia’s CFO “structured everything to maintain tension up to the last 15 minutes”
Iberia Deal: Key Elements

• Switching costs (current and prospective)
  — .....  
• Price competition vs. product competition
  — .....  
• Determinants of bargaining power

• “With 200 airlines and two plane makers, you think we’d get a little more respect.” 
  
  (Airbus’ Top Salesman)
Co-opetition: Games at HBS

• Professor and students play cards
• Dean puts up $2,600 in prize money
• Free-form negotiation with one rule
• *Bargain on an individual basis*
The Logic of Added Value

- Cards example
  - Added value = extra surplus (“pie”) generated when you are in the game
  - Can never obtain more than your added value

- Cities for NFL teams

- 3G licenses (after spring break)

- “Larger share of a smaller pie” = monopoly power
John Nash’s Bargaining Game

• The “demands game”:
  – Two players split a pot worth $10 million
  – Simultaneous moves
  – Each player makes a “demand”
  – Compatible demands: split the difference evenly
  – Incompatible demands: lose everything

• Sounds familiar?
Game-Theoretic Analysis

- Players: $i$ and $j$
- Actions: $x_i = \text{player } i\text{'s demand}$
- Payoffs: $x_i + 0.5*(10 - x_i - x_j)$ if $x_i + x_j \leq 10$
  
  $\text{zero if } x_i + x_j > 10$

- $i$’s best response: $x_i^* (x_j) = 10 - x_j$
Game-Theoretic Analysis

• Mutual best responses:
  • $x_i = 10 - x_j$
  • $x_j = 10 - x_i$
  
• Every exact split ($x_i + x_j = 10$) is an equilibrium!

• Added values = ??

• Often select “focal point:” the equilibrium (5, 5)
Competing Demands Game

• Three players (Airbus, Boeing, and Iberia)
• Simultaneous moves
• Each player makes a demand \((x_a, x_b, x_i)\)
• Iberia then picks either \(x_a\) or \(x_b\)
• Compatible demands: split the difference evenly
• Incompatible: lose everything
Game-Theoretic Analysis

- Backward induction: Iberia picks $x_a$ if $x_a < x_b$
- Ties broken by coin flip
- $u_i = x_i + 0.5*(10 - x_i - \min\{x_a, x_b\})$ (if sum<10)
- $u_a = x_a + 0.5*(10 - x_i - x_a)$ (if $x_a < \min\{10 - x_i, x_b\}$)
- Best responses:
  - $- x_i*(x_a, x_b) = 10 - \min\{x_a, x_b\}$
  - $- x_a*(x_i, x_b) = \min\{10 - x_i, x_b - \varepsilon\}$
- Unique Nash Equilibrium: $(x_i = 10, x_a = x_b = 0)$
- Added values??
Demands Game: Key Elements

- 2 sellers vs. 1 buyer
- More generally: *relative scarcity* ("short side")
- Strategic move: create scarcity!

In practice (suppose you are selling):
1. Add buyers!
2. Reduce objects!
Bringing Players In \textit{(Co-opetition, Ch.4)}

- Boeing thought it was worth to play... Why?
- What if it isn’t?
  - Nutrasweet (Monsanto) vs. Holland Sweetener
  - CSX vs. Norfolk Southern (railroads)
- Get paid to play!
  - McCaw, LIN, and BellSouth (telephone licenses)
- Always ask: who stands to gain? \textit{Cicero}
Alternating Offers

• New bargaining protocol

• Sequential version of the demands game

• First mover: what do you ask for? *Ultimatum*
Ultimatum Game

• Dividing $10 million
• Player 1 makes a first and final offer
• Player 2 can accept or reject
• Game tree?

• B.I. outcome: \{ demand \( x_1 = 10 \), accept \}
• Culture & background matter
Alternating Offers

• Bargaining protocol matters!

• Sequential version of the demands game

• First mover: what do you ask for? *Ultimatum*
  – Knowledge of rationality
  – Knowledge of the game

• What if the other player can make a counter-offer?

• How can you change the rules to your advantage?
**Right of First Refusal**

- **Incumbent** makes **offer** $x_1$
- **Player** accepts or keeps
- **Rival** can make (costly!) offer $x_2$
- **Player** may sign or reject
- If sign: **Incumbent** can match
- If reject: **Incumbent** can make new offer
- **Player** chooses one of **incumbent’s** offers (if any)
Right of First Refusal

• If player doesn’t sign offer sheet, incumbent won’t upgrade offer

• Player will accept original offer

• Incumbent would match any offer of $10m or less
Right of First Refusal

- Whatever the player’s action, the Rival loses by making an offer.

- Two backwards-induction outcomes.

- Incumbent wins.

$$x_1^* = 0$$
RoFR: Winners and Losers

- **Incumbent** wins with an offer of (close to) zero!
- Would you make an offer (as the **Rival**)?
  - What are the actual payoffs?
  - Symmetric game?
  - Salary cap?
  - Repeated interaction?
- Why does the **player** lose out?
Player’s Switching Cost

- **Without** the RoFR: the incumbent exploits the switching-cost advantage (worth $2)
- **With** the RoFR: the player can be offered the whole $10 million by the incumbent – how?
- Why does RoFR help?
- The player **commits to rejecting** a lower offer!
Takeaways

1) Relative scarcity $\rightarrow$ value added $\rightarrow$ bargaining power

2) Rules can play in your favor

3) Clauses as commitments

4) Get paid to play!
15.025 Game Theory for Strategic Advantage
Spring 2015

For information about citing these materials or our Terms of Use, visit: http://ocw.mit.edu/terms.