Game Theory for Strategic Advantage

15.025

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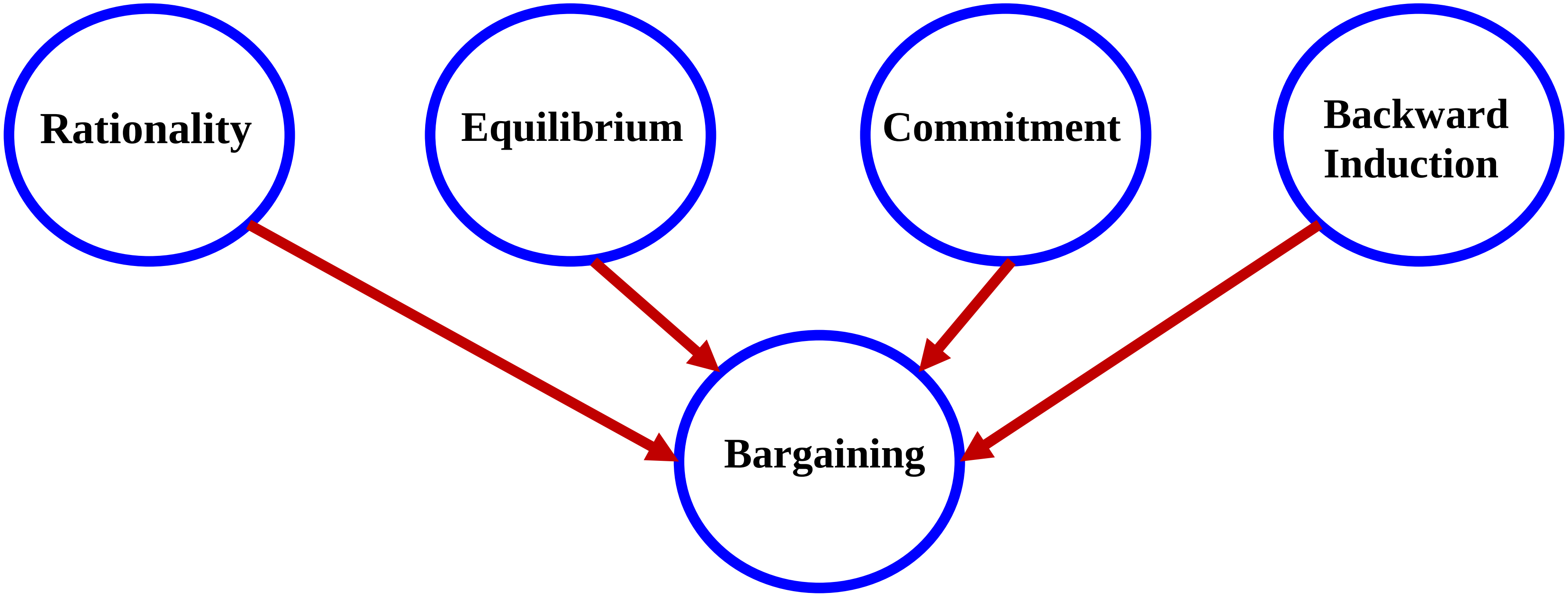
Overview of Foundations



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 = player *i*'s demand
- Payoffs: $x_i + 0.5*(10 - x_i - x_j)$ if $x_i + x_j \leq 10$

  zero if $x_i + x_j > 10$

- *i*'s best response: $x_i^* (x_j) = 10 - x_j$

Game-Theoretic Analysis

- Mutual best responses:
- $\boldsymbol{x_i = 10 - x_j}$
- $\boldsymbol{x_j = 10 - x_i}$
- 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 (<u>a</u>irbus, <u>b</u>oeing, and <u>i</u>beria)
- Simultaneous moves
- Each player makes a demand → $(\boldsymbol{x_a}, \boldsymbol{x_b}, \boldsymbol{x_i})$
- Iberia then picks either $\boldsymbol{x_a}$ or $\boldsymbol{x_b}$
- 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 (*Co-opetition*, Ch.4)

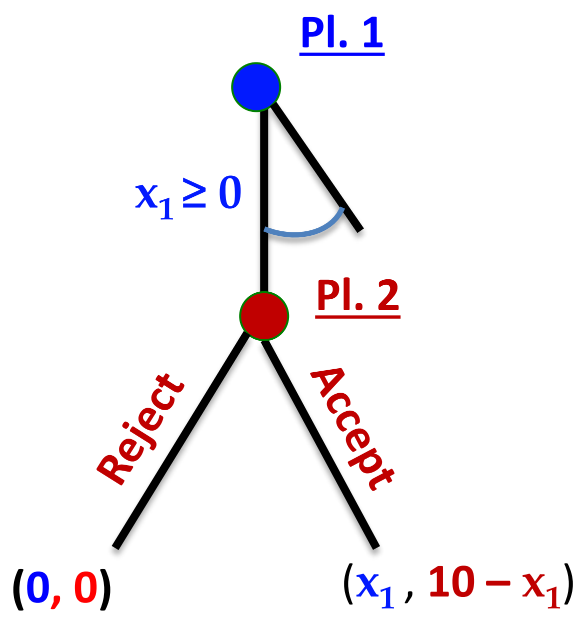
- Boeing thought it was worth to play… Why?
- What if it isn't?
  - Nutrasweet (Monsanto) vs. Holland Sweetener
  - CSX vs. Norfolk Southern (railroads)
- Get paid to play!
  - McCaw, LIN, and BellSouth (telephone licenses)
- Always ask: who stands to gain? *Cicero*

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?



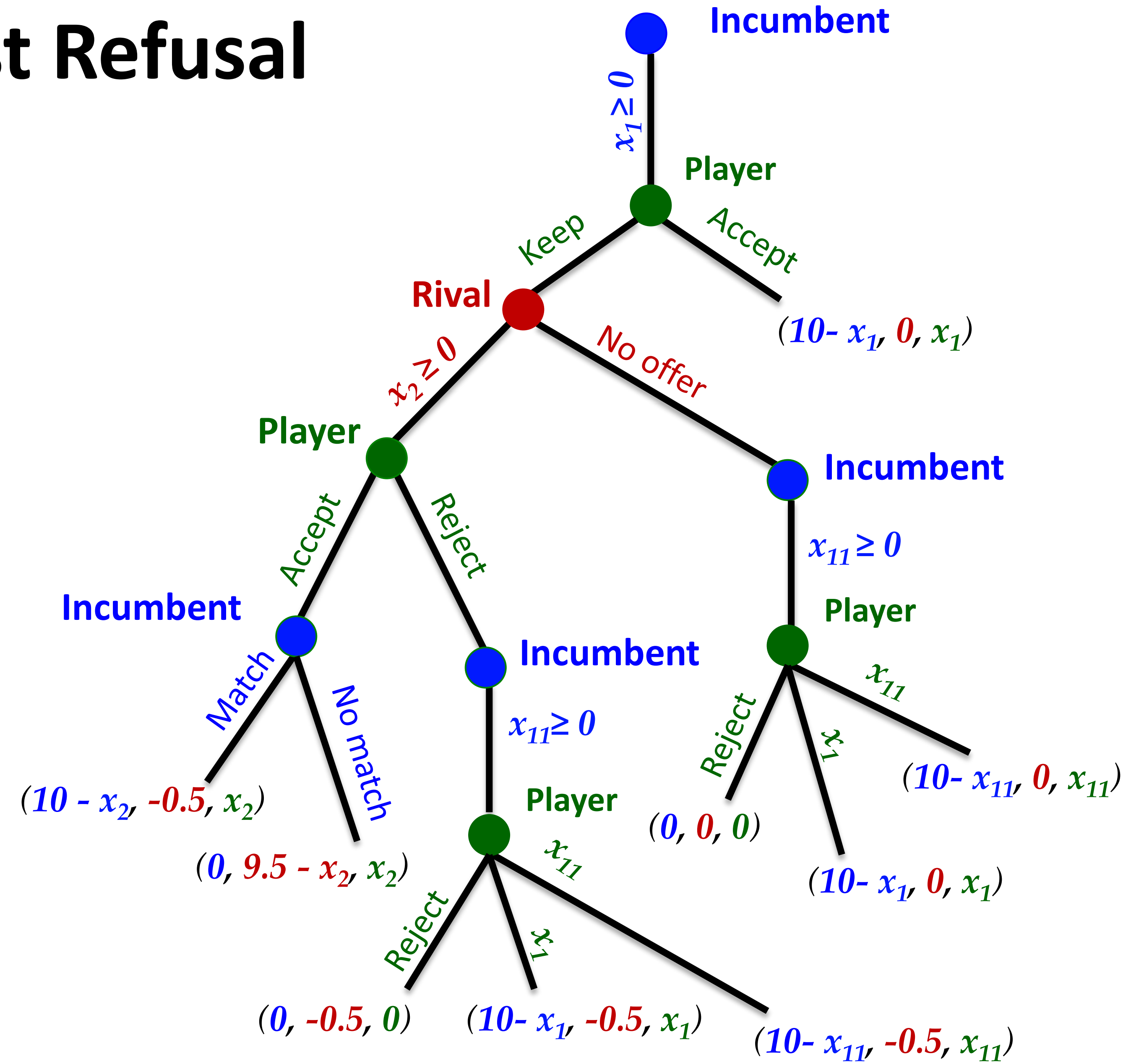
- B.I. outcome: { *demand* $x_1 = 10$, *accept* }
- Culture & background matter

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?

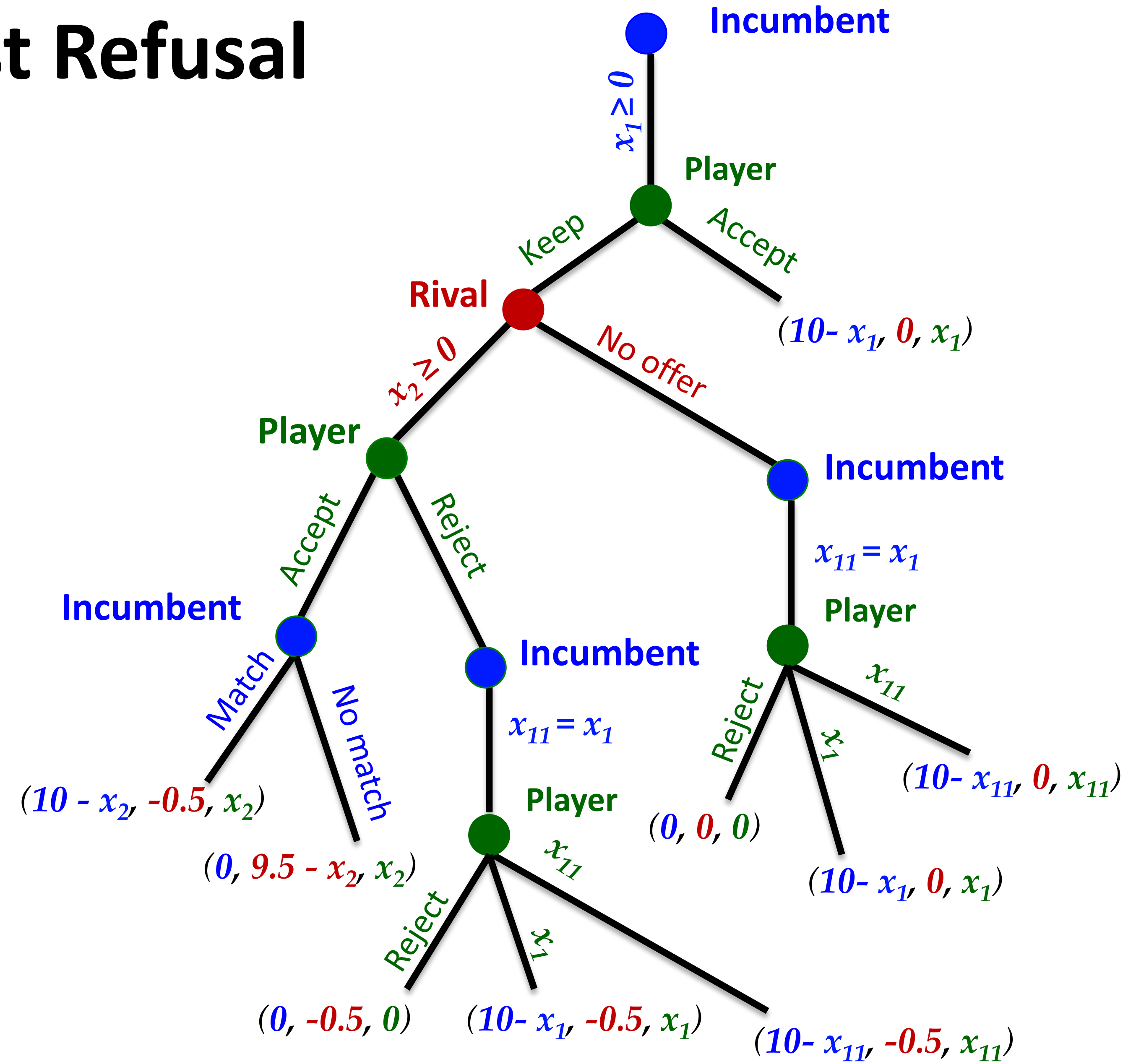
Right of First Refusal

- 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

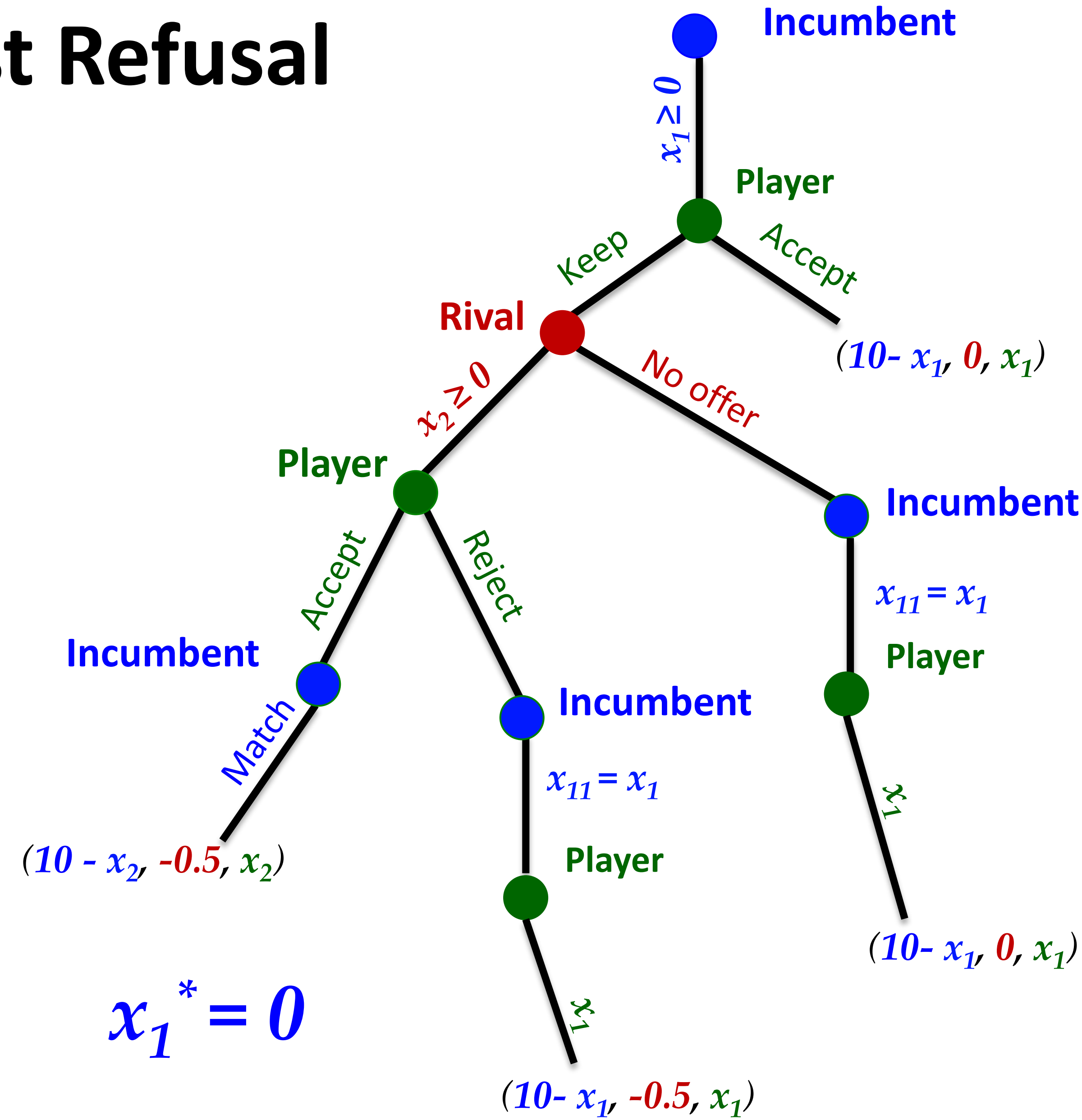
- If player doesn't sign offer sheet, incumbent won't upgrade offer
- Player will accept original offer
- Incumbent would match any offer of $10m or less



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 → value added → bargaining power

2) Rules can play in your favor

3) Clauses as commitments

4) Get paid to play!