A MinMax Example

	L	C	R
U	3, -3	-2, 2	2, -2
M	-1, 1	0, 0	4, -4
D	-4, 4	-3, 3	1, -1

"Pure strategy minmax" for Row player?

M means Column player can make at most 1

"Pure strategy minmax" for Column player?

C

(M, C) is not a Nash Equilibrium!

Mixed Strategy MinMax

	L	C	R
U	3, -3	-2, 2	2, -2
M	-1, 1	0, 0	4, -4
D	-4, 4	-3, 3	1, -1

Consider Column player playing (1/3, 2/3, 0)

R plays U: gets 1 – 4/3 = -1/3

R plays M: gets -1/3 + 0 = -1/3

R plays D: gets -4/3 - 6/3 = -10/3

R is indifferent between U and M. Can guarantee herself a payoff of (-1/3) by mixing them (1/6, 5/6)

But how do we find this?

Compute Column player's minmax strategy

$$\text{Minimize } U_1^*$$

$$\text{subject to } \sum_{k \in A_2} u_1(a_1^j, a_2^k) s_2^k \leq U_1^* \quad \forall j \in A_1$$

Row player's utility from any action must be either exactly the minmax value or less (in which case it will be played with 0 probability)

$$\sum_{k \in A_2} s_2^k = 1$$

$$s_2^k \geq 0$$

Constrain Column player's strategy to be a probability distribution.

The Dual

$$\text{Maximize } U_1^*$$

$$\text{subject to } \sum_{j \in A_1} u_1(a_1^j, a_2^k) s_1^j \geq U_1^* \quad \forall k \in A_2$$

Row player's utility under any action selected by Column player must be at least the maxmin value

$$\sum_{j \in A_1} s_1^j = 1$$

$$s_1^j \geq 0$$

Constrain Row player's strategy to be a probability distribution.

Computing Row player's maxmin strategy!

Ben-Gurion’s Tri-lemma

(Based on James Stodder, “Strategic Voting and Coalitions: Condorcet’s Paradox and Ben-Gurion’s Tri-lemma” *Int. Rev. of Econ. Ed.* (2005))

Introduction

Soviet era joke: God comes to the Soviet people and says: “I will give each of you a choice of three blessings in life, but you can only have two out of the three. You can be an honest person, you can be a smart person, or you can be a member of the Communist Party. If you are smart and honest, then you cannot be a communist. If you are a smart communist, then you cannot be honest. And if you are an honest communist, then obviously, you must not be very smart.”

Ben-Gurion’s “tri-lemma”

In November 1947 ... David Ben-Gurion, then the leader of the Zionist movement in Palestine ... did not shrink from clearly laying out the choice before the Jewish people ... Who were they? A nation of Jews living in all the land of Israel, but not democratic? A democratic nation in all the land of Israel, but not Jewish? Or a Jewish and democratic nation, but not in all the land of Israel? Instead of definitively choosing among these three options, Israel's two major political parties – Labor and Likud – spent the years 1967 to 1987 avoiding a choice ... not on paper, but in day-to-day reality.

(Friedman, 1989, pp. 253–4)

Your setting: Starting a business

G: Good works, H: Honesty, P:Profitability

Left: G > H > P

Center: P > G > H

Right: H > P > G

Rules of the game

Options will be ranked.

Only two of three can be simultaneously picked

The first one will be the primary goal of the company

First: vote (and agree) on a finalist

Second: choose between the other two

Third: vote on top priority among the two finalists

Mechanics: Agenda Setting

- Each group will caucus together and pick a lead negotiator
- Lead negotiators will meet privately, in pairs, in sequence:

    L+C, C+R, R+L
- Followed by another round of pairwise meetings (same sequence)
- Each group will submit a vote on one option (G, H, P) for finalist
- If no winner, repeat (with one round of pairwise meetings) until there is

Mechanics: Voting

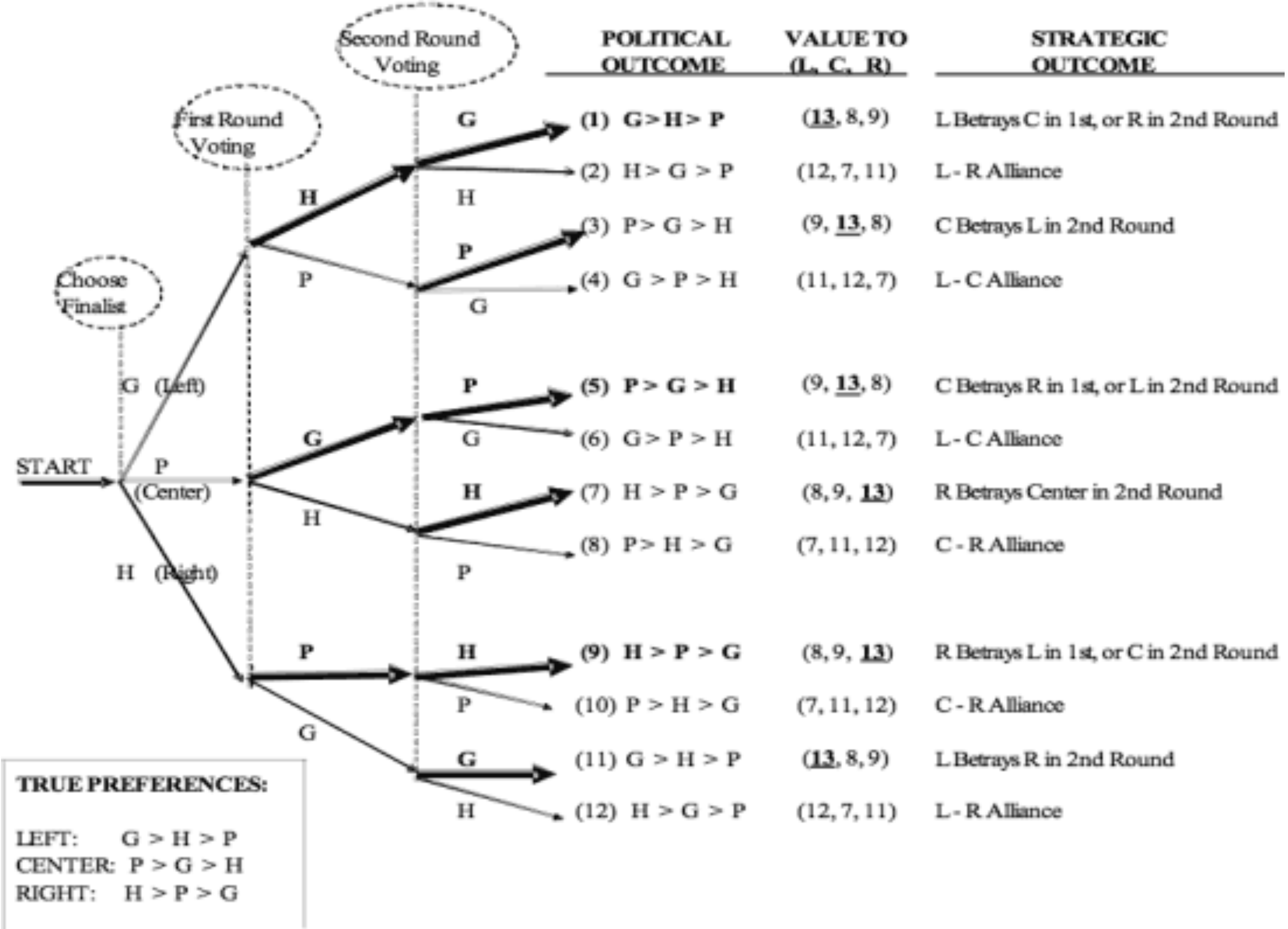
Round 1: Each group caucuses and then picks one of the two remaining options to join the finalist

Round 2: Each group caucuses and then picks one of the two finalists as the priority

Outcome values

Left: G > H > P
Center: P > G > H
Right: H > P > G

	Left	**Center**	**Right**
G>H>P	3x3000+2x2000=13000	3x2000+2x1000=8000	3x1000+2x3000=9000
H>G>P	3x2000+2x3000=12000	3x1000+2x2000=7000	3x3000+2x1000=11000
G>P>H	3x3000+2x1000=11000	3x2000+2x3000=12000	3x1000+2x2000=7000
P>G>H	3x1000+2x3000=9000	3x3000+2x2000=13000	3x2000+2x1000=8000
H>P>G	3x2000+2x1000=8000	3x1000+2x3000=9000	3x3000+2x2000=13000
P>H>G	3x1000+2x2000=7000	3x3000+2x1000=11000	3x2000+2x3000=12000


Second Round Voting
First Round Voting
Choose Finalist
START
G (Left)
P (Center)
H (Right)
POLITICAL OUTCOME
VALUE TO (L, C, R)
STRATEGIC OUTCOME
(1) G > H > P (13, 8, 9) L Betrays C in 1st, or R in 2nd Round
(2) H > G > P (12, 7, 11) L - R Alliance
(3) P > G > H (9, 13, 8) C Betrays L in 2nd Round
(4) G > P > H (11, 12, 7) L - C Alliance
(5) P > G > H (9, 13, 8) C Betrays R in 1st, or L in 2nd Round
(6) G > P > H (11, 12, 7) L - C Alliance
(7) H > P > G (8, 9, 13) R Betrays Center in 2nd Round
(8) P > H > G (7, 11, 12) C - R Alliance
(9) H > P > G (8, 9, 13) R Betrays L in 1st, or C in 2nd Round
(10) P > H > G (7, 11, 12) C - R Alliance
(11) G > H > P (13, 8, 9) L Betrays R in 2nd Round
(12) H > G > P (12, 7, 11) L - R Alliance
TRUE PREFERENCES:
LEFT: G > H > P
CENTER: P > G > H
RIGHT: H > P > G