

# 444 Lecture 2.4 - Dominance

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Brian Weatherson

- Explain strong dominance and weak dominance.

## Associated Reading

Bonanno, section 2.2.

## A Simple Game

	Left	Right
Up	4, 1	2, 0
Down	3, 0	1, 1

Here's how to read this table.

1. Two players, call them Row and Column.

## A Simple Game

	Left	Right
Up	4, 1	2, 0
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Here's how to read this table.

1. Two players, call them Row and Column.
2. Row chooses the row, Column chooses the column - between them they choose a cell.

## A Simple Game

	Left	Right
Up	4, 1	2, 0
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Here's how to read this table.

1. Two players, call them Row and Column.
2. Row chooses the row, Column chooses the column - between them they choose a cell.
3. Each cell has two numbers - the first is Row's payout, the second is Column's payout.

## Strong Dominance

	Left	Right
Up	4, 1	2, 0
Down	3, 0	1, 1

- Whatever Column does, Row is better off playing Up rather than Down.
- We say that Up **strongly dominates** Down.

## Strong Dominance

	Left	Right
Up	4, 1	2, 0
Middle	5, 0	0, 0
Down	3, 0	1, 1

- Adding options doesn't change things.
- Up still dominates Down, even if it isn't always best.



## Strong Dominance

	Left	Right
Up	3, 1	0, 0
Middle	2, 0	2, 0
Down	0, 0	3, 1

- This is **not** a case of dominance.
- Even though Middle is never the highest value, it isn't dominated by any one option.

## Strong Dominance

Strategy  $S_1$  strongly dominates strategy  $S_2$  if for any strategy  $S$  by the other player(s), if  $S$  is played, then  $S_1$  returns a higher payoff than  $S_2$ .

## Weak Dominance

Strategy  $S_1$  weakly dominates strategy  $S_2$  if for any strategy  $S$  by the other player(s), if  $S$  is played, then  $S_1$  returns a payoff that is at least as high  $S_2$ , and for some strategy by the other player(s),  $S_1$  returns a higher payoff than  $S_2$ .

- The difference is that weak dominance allows for **ties**.

# Two Dominance Notions

## Strong Dominance

- Always better.

## Weak Dominance

- Never worse.
- Sometimes better.

## Weak Dominance

	Left	Right
Up	4, 1	2, 0
Down	3, 0	2, 1

- I've changed the payoffs in the bottom right cell.
- Now Up does not strongly dominate Down.
- But it does weakly dominate Down.

## For Next Time

We'll look at some examples of famous two by two by two games.