The Puzzle of War

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- Review of game theory
- Review of the graphical model
- Game theoretic version of the model ... with math! ☹

WHY WAR?

Naive explanations

- "They hate each other"
- "They're crazy"
- They *chose* to go to war
  - Create a model in which war *does not* occur
  - Find the conditions that will break this result

GRAPHICAL MODEL

Graphical model

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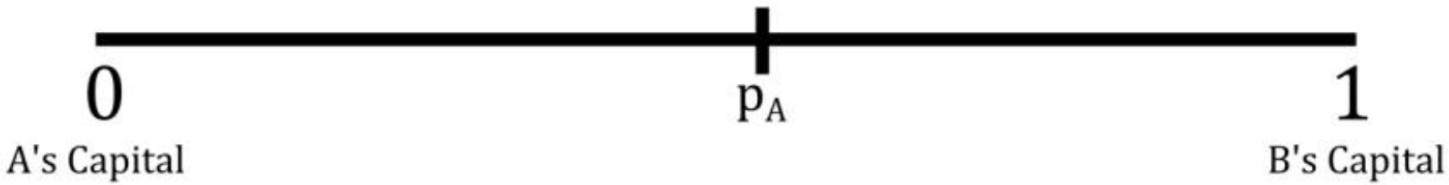
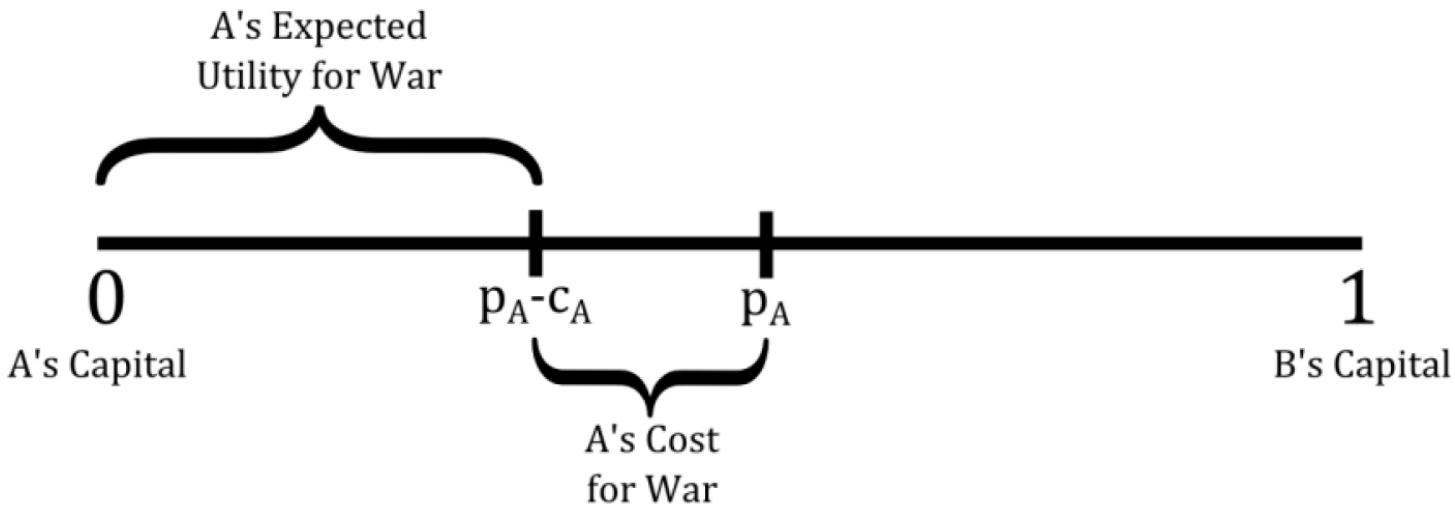
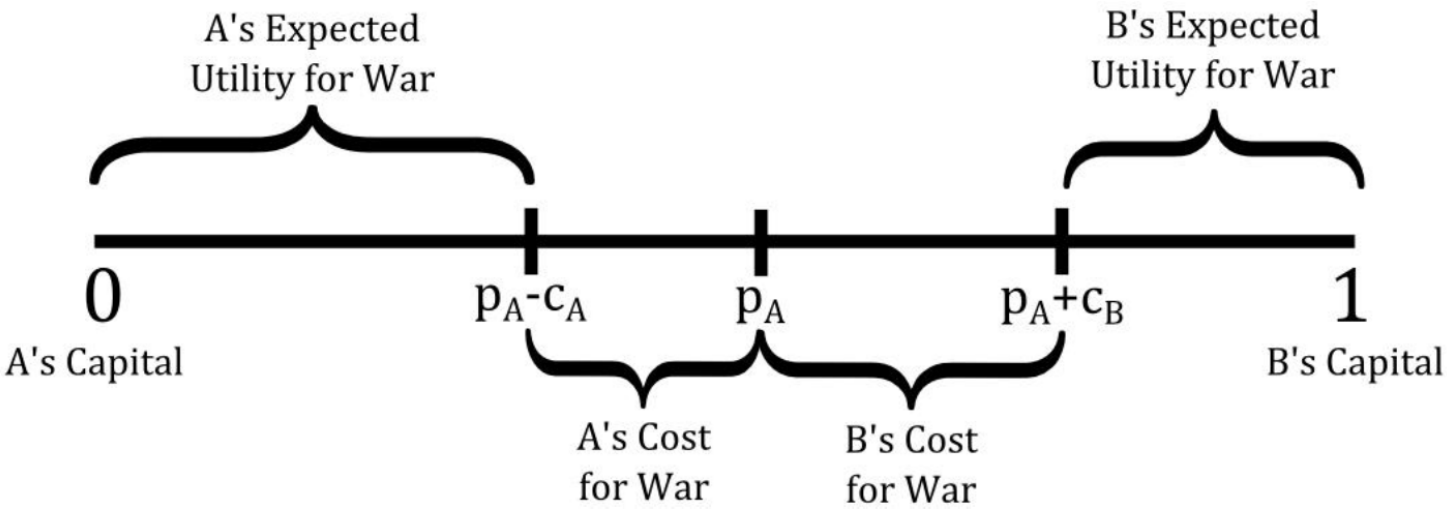
Graphical model



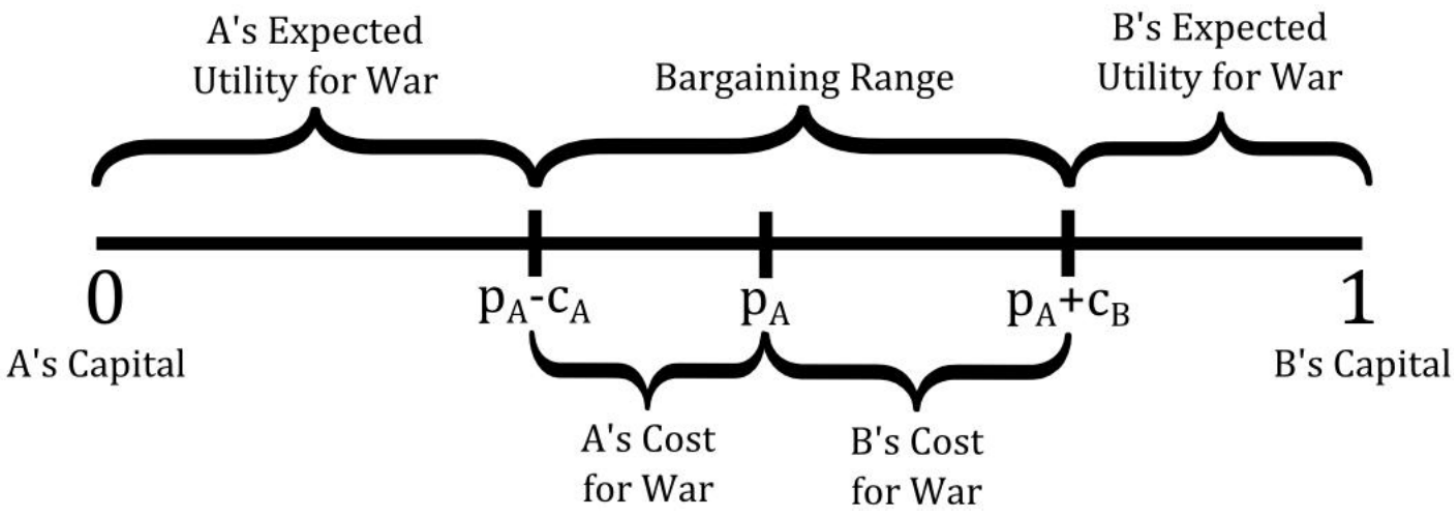
Graphical model



Graphical model



Graphical model



GAME-THEORETIC MODEL

War as a costly lottery

- Outcomes
  - Lose
  - Win
- Probability of each outcome
  - $Pr(Lose) = 0.98$
  - $Pr(Win) = 0.02$
- Payoffs
  - Win $= 100{,}000$
  - Lose $= 0$
- Value of the ticket?
  - $0.98 \times 0 + 0.02 \times 100,000 = 2,000$

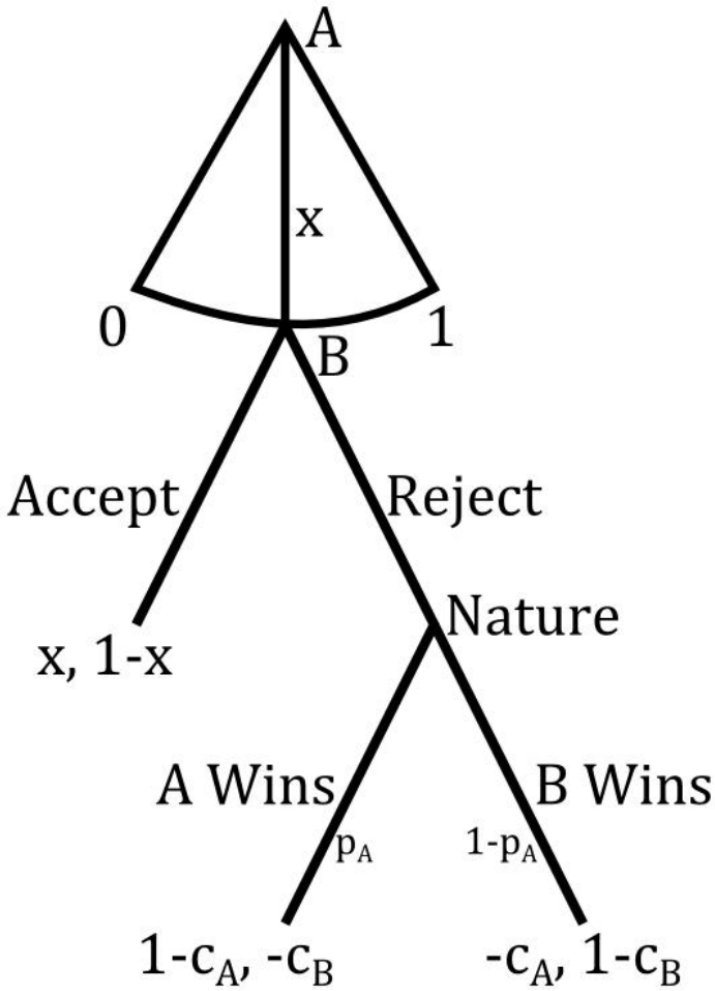
Elements of a game

- Players
- Actions
- Preferences

Model

- Players: Country A, Country B
- Outcome: Divisions of a piece of territory of size $= 1$
- Country A gets x
- Country B gets $1 - x$
- Game: Country A offers a division: $\{x, 1 - x\}$
- Country B: accepts or rejects
  - If Country B accepts, territory is divided
  - If Country B rejects, they go to war
  - Country A wins entire territory with probability p_A
  - Country B wins entire territory with probability $1 - p_A$
  - Country A pays cost c_A, Country B pays cost c_B

Game tree


A
x
0
1
B
Accept
Reject
Nature
x, 1-x
A Wins
B Wins
p_A
$1-p_A$
$1-c_A, -c_B$
$-c_A, 1-c_B$

Country B's dilemma

- $EU_B(Accept) = 1 - x$
- $EU_B(Reject = War) = (1 - p_A) \times (1 - C_B) + p_A \times (-c_B) = 1 - p_A - c_B$
- Accept if $EU_B(Accept) \geq EU_B(Reject)$
- $1 - x \geq 1 - p_A - c_B$
- $x \leq p_A + c_B$
- Player 1 offers:
- $x^* = p_A + c_B$ THE MINIMUM OFFER

Country A's dilemma

- $EU_A(Offer) = x^* = p_A + c_B$
- $EU_A(War) = (p_A) \times (1 - c_A) + (1 - p_A) \times (-c_A)$
- Accept if $EU_A(Offer) \geq EU_A(War)$
- $p_A + c_B \geq p_A - c_A$
- $c_A + c_B \geq 0$ ALWAYS TRUE
- There exists an equilibrium such that Country A makes an offer and Country B accepts. No war.
- Solution (NE) is: $\{x, 1 - x\} = \{p_A + c_B, 1 - p_A - c_B\}$

Comparative statics (predictions)

- How does x^* change as..?
- p_A increases
- x^* increases
- c_B increases
- x^* increases
- c_A increases
- x^* stays the same

Why war?

1. Asymmetric information (+ incentives to misrepresent)
2. Commitment problems
3. Indivisibility

Mistakes?

What have we learned?

- Review of the graphical model
- Game-theoretic model
- Why war? (key concepts)