Game-Theoretic Analysis of Long Wars

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MEDS Department Background

- Was at forefront of Game Theory Revolution in Economics.
- Led to several Nobel Prizes – Bengt Holmstrom, Paul Milgrom and Roger Myerson.
- Main impact of this work was in studying incentives in auctions, within companies, and between oligopolistic companies.
- This research continues: My colleague Nicola Persico is studying how procurement when low bidders are also low quality producers.
- Newer direction has been in political science including voting. I work in international relations though I have a PhD in Economics

What is a Game?

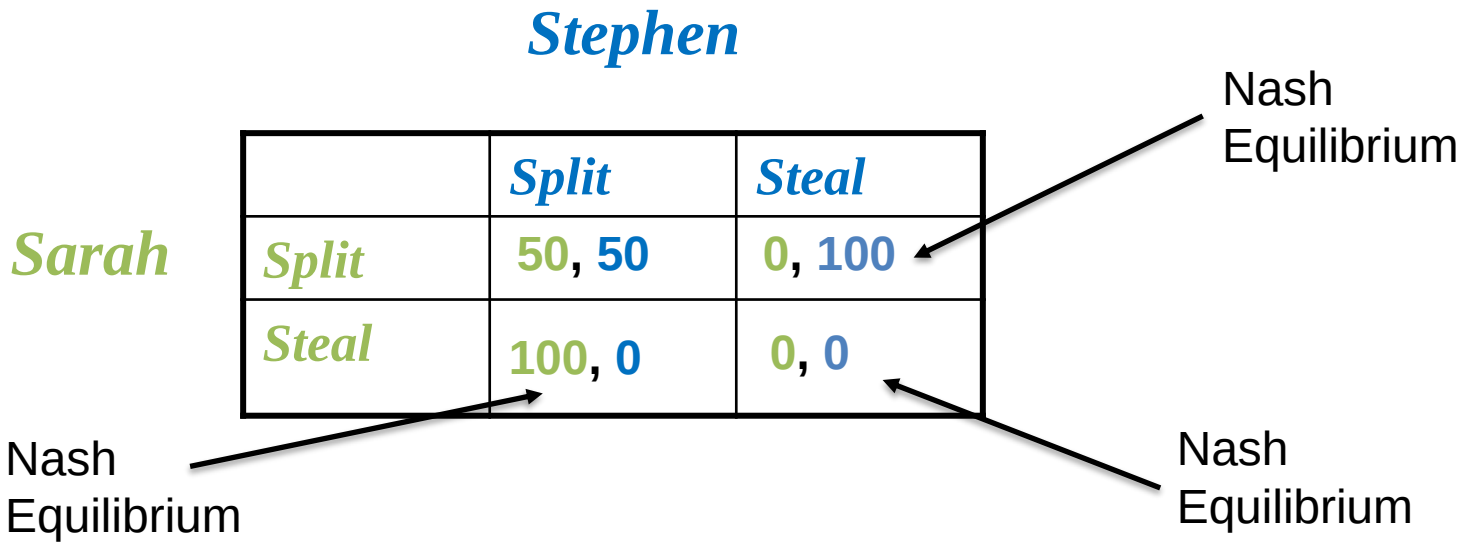
- A *game* specifies:
  - The *players*
  - For each player, the *actions* available to them
  - For each player, and list of actions taken by all players, each player's *payoff*
  - *Nash equilibrium:* A profile of actions is a Nash equilibrium if no player can change their action unilaterally and increase their payoff.

Golden Balls: Split or Steal?

What will happen?

A. Both split
B. Stephen splits, Sarah steals
C. Sarah splits, Stephen steals
D. Both steal

Golden Balls



- This game has two players, Sarah and Stephen, two actions, Split and Steal, and payoffs as written in the matrix with Sarah's payoff written first and Stephen's second. Sarah chooses a Row and Stephen chooses a Column. It has three Nash equilibria: (Split, Steal), (Steal, Split) and (Steal, Steal).

Long Wars

- I am going to offer a theory for why wars might last a long time even though opposing parties have many opportunities to come to a peaceful agreement and avoid the costs of war.
- For example, between 1945 and 1999, there were 128 civil wars and of these a quarter lasted 12 years or more and a tenth lasted at least 20 years (Fearon (2004)).
- I offer a theory of long wars based on one side in the conflict having more information about their strength than the other (*asymmetric information*). I will then study the strategy of a third party that seeks to make the war shorter.

Classical Theory of War

- "[W]ar is simply a continuation of political intercourse, with the addition of other means. We deliberately use the phrase 'with the addition of other means' because we ... want to make clear that war in itself does not suspend political intercourse or change it into something entirely different," Carl von Clausewitz, *On War*, 1832.
- Negotiations are interspersed with the threat of war which is used as leverage to extract concessions.
- I am going to offer a game theory analysis of this but I am going to suppress the mathematics.

Negotiations

- Two players, player A and player B contest a resource.
- Negotiations and conflict take place over time.
- Each period, player A can make an offer to split the resource. This will be like an invasion of player B's territory. It is like Steal except player A can offer a specific division of value and not just try to take all the pie. Also, the players move sequentially.
- Player B can then accept or reject. If player B accepts, the conflict ends, and the proposed split is implemented. If player B rejects, then there is a value-destroying battle.
- A battle is like the (Steal, Steal) outcome in Golden Balls.

Battles

- Battles are inefficient because they destroy value and delay agreement.
- In each battle, there is a chance that player A collapses.
- Player B might be *weak* or *strong*. Weak player B collapses with higher probability than strong player B.
- Player B knows whether they are weak or strong. Player A does not know player B's strength (*asymmetric information*). Player A thinks player B is weak with some probability.
- If one player collapses and the other does not, the latter gets the whole surplus.
- If neither player collapses, player A makes an offer to player B next period, etc., etc.

Civil and Interstate Wars

- The basic model is drawn from political science.
- **Civil War:** Player A is the "government" and player B is an "insurgent group". Agreement leads to an efficient division of value. During fighting some of this value are dissipated by the costs associated with conflict.
- **Asymmetric Interstate War:** Player A is country A and player B is country B. At the efficient status quo division of land, player A and B get payoffs which maximize total value. Fighting costs dissipate some of this value. Only country A has offensive capability and can invade country B which can only defend itself.

Background to Negotiations: Technology of Conflict

- The nature and technology of war determine the probability of collapse.
- If collapse rates during battles are low, this leads to a war of attrition in the absence of negotiations. *Examples*: Siege warfare with fort technology. American Civil War and WW1. Weak government with inadequate policing where the guerrilla might “swim in the people as the fish swims in the sea” (Mao).
- If collapse rates during battles are high, wars are quick and decisive in the absence of negotiations. *Examples*: Siege cannons destroyed fort walls quickly. Napoleon's army moved quickly through enemy land, capturing territory with little resistance. Blitzkrieg tactics played a similar role at the start of World War II.

Negotiations and BATNA

- Remember from Negotiations class that BATNA is the Best Alternative To a Negotiated Agreement.
- Collapse rates in battle define BATNAs in our model of war.
- Indeed, player A is trying to drive player B down to their BATNA.
- Problem is player A does not know player B's BATNA as they do not know if player is weak or strong.
- Weak player B has a low BATNA as they are likely to collapse in battle.
- Strong player B has a higher BATNA as they are less likely to collapse in battle.

More BATNA

- The key issue is player A does not know their own BATNA!
- This is because they do not know player B's strength.
- If player B is weak, player A's BATNA is high as player B is more likely to collapse in battle.
- If player B is strong, player A's BATNA is low as player B is less likely to collapse in battle.
- So, in the war context, when one player does not know the other's strength, it naturally follows that they do not know their own BATNA.
- This feature is the novelty of wars of strength with asymmetric information.

Implications for Nash Equilibrium

- Since player A does not know player B's strength, player B can bluff and pretend to be strong even when they are weak and reject any offer that a strong player B would reject.
- Player A is left with a dilemma:
  1. Player A could make a generous offer that even strong player B would accept. But then they are overpaying weak player B
  2. Player A could make a lower offer and risk a battle.
- The greater that chance player B is weak, the better the second option looks.

Our Theory of War

- War is the result of player A calling player B's bluff.
- The bluff may backfire because player B might actually be strong.
- It may also backfire as weak player B continues to bluff hoping to get a large payout sometime in the future if they survive a battle.

Main Result

- When the chance that player B is weak is high enough, there will be war as player A calls player B's bluff.
- War will be longer the greater the difference between the BATNA of strong player B and weak player B as this increases the incentive to bluff,
- War will be longer the less value is destroyed by war.
- War will be longer the less likely player A and weak player B are to collapse, so conflict is a war of attrition.

Third Party Intervention

- Suppose player A is a major power and player B is a minor power or insurgent group that player A seeks to subjugate.
- A third party intervenes in the conflict but does not know player B's strength
  - They might seek to help player B
  - They might have "no dog in the fight" and seek only to maximize welfare by shortening the conflict (or lengthen it in a proxy war).
- Policies will have different impacts on the factors that determine the length of war.

Policies that Help The Strong

- Suppose a third party gives air defense weapons to player B but these weapons are useful only if player B is strong and knows how to use them. They are useless if player B is weak.
- The BATNA payoff of strong player B goes up but the BATNA payoff to weak player B stays the same.
- The payoff to feigning strength strategy increases for weak player B.
- The policy backfires.

Policies that Help The Weak

- Suppose the third party gives player B training in using advanced weapons. The training is useful for weak player B but not strong player B.
- This decreases the incentive to feigning strength and might make wars shorter.
- However, weak player B is simply less likely to collapse in battle making wars longer.
- Intuitively, a third party who wants to maximize welfare should go “all in” and employ policies that help weak player B so much that asymmetric information is irrelevant. Half measures could backfire by prolonging the conflict.

Policies that Hurt Player A

- Suppose the third party cuts off player A's supply of weapons and weapons parts.
- This has the direct effect of shortening the conflict simply because player A is more likely to collapse in the absence of agreement.
- However, strong player B’s BATNA increases more rapidly that weak player B’s.
- This increases the incentive to feign strength.
- So, hurting player A can backfire unless the damage to their strength is severe.

Sanctions

- Suppose the third party puts restrictive trade embargoes and sanctions on players A so payoffs during battle decrease.
- It becomes more costly to fight battles for player A and conflict ends more quickly. The effect on the expected length of the conflict is unambiguous.
- If the third party wants to decrease the duration of the conflict, strong sanctions are optimal.

Going Forward

- In conversations with Air Force about this research.
- More broadly, organizing a conference with other faculty at NU in McCormick and Weinberg Political Science and policymakers.
- Hope is to make policy making more informed by the logical thinking and careful empirical work that characterizes academia.
- This is the norm in anti-trust regulation and monetary policy.

Thank You!

Reunite. Reignite.

Reunion