Arms Diffusion and War

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Introduction

- The invention of new military technology (firearms, nuclear weapons) is often followed by its diffusion around the world, and the introduction of new weapons into new locales is sometimes attended by war.
  - Were some of these wars *caused* by arms diffusion? If so, why did wars result in some cases but not others?
- Exploration through game-theoretic model between two states where new technologies are spreading.
- Authors analyze three historical examples of new technology and preemptive war
  - Musket Wars, US nuclear monopoly, and 1976 Six-Day War

Model Setup

- Two states (A and B) over the course of infinitely many periods
  - One offer per period
- States can accept, reject peacefully, or start war
  - If war is started, states enter a lottery based on the states' probability of victory
  - War results in cost paid by each state for each of the future rounds
- Peaceful responses are followed by a "Move by Nature"
  - Shifts the balance of power if a player receives new technology
- Probability of diffusion
  - "Once one state has the technology, the other state is more likely to receive it"
- Only one new technology available

Model SPE and Propositions

- P00, P01, P10, P11, Ca, Cb
- Mutual Armament Subgame
  - Proposition 1 – Once both players have the technology, there is no longer any uncertainty or possibility of a future shift in the balance of power. The players can thus find a settlement that both prefer to war. Peace prevails
- Diffusion Subgame
  - Proposition 2 – War can occur because state A has reason to fear the future, as state B cannot commit to not taking advantage of the technology once acquired and the balance of power has shifted in its favor
  - State B may offer concessions now before the power shift to avoid war
- Cumulative Diffusion
  - Proposition 3 - If state A has the technology, but state B does not, and ($p10 - p11 > Ca + Cb$), then state A's value of war increases over time until period n
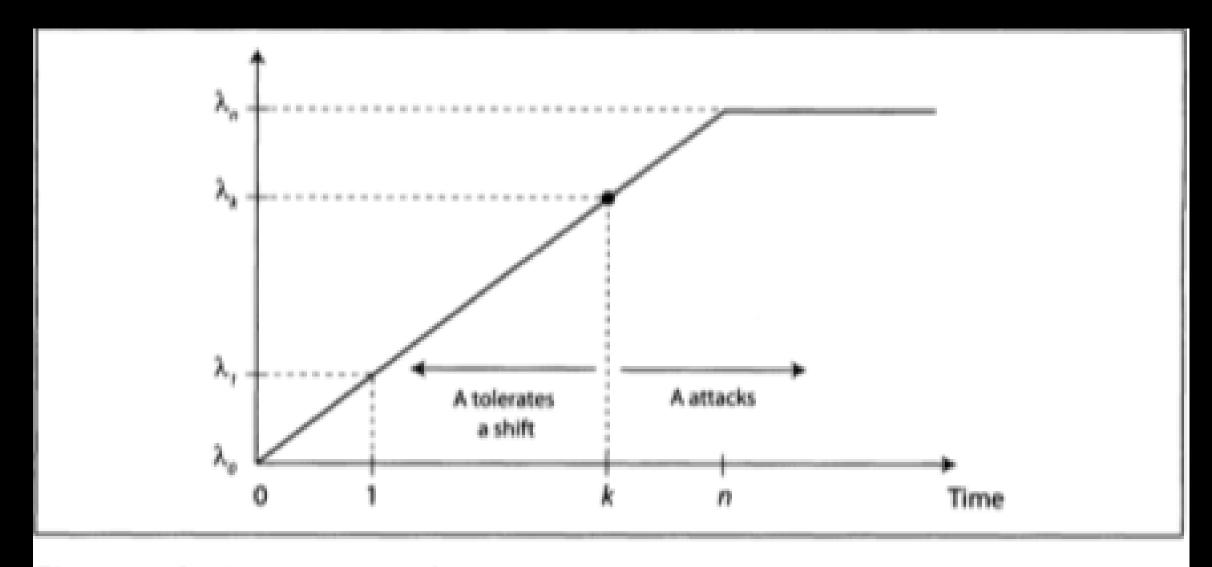
Figure 1. Gradually increasing λ_t and delayed attack

Model SPE and Propositions (continued)

- Introduction Subgame
  - Neither state has acquired the technology yet
  - Outcome based on the expected shift in the balance of power and probability of preventative war in the future
    - The player who expects to lose in the future may choose to fight now
- The further the outcome (Δp – the expected shift in balance of power) is from zero, the stronger the future favors one state over the other
- Proposition 4 – Whether war occurs depends on the relationship between expected shift in power and the expected future surplus (SA) of state A

Table 1. Example Parameter Values and Equilibrium Outcomes in Subgames ($\delta=.9$, $c_A = c_B = .1$)

	Parameter values								Subgame outcomes		
Case	λ_A	λ_B	λ_{AB}	λ_{BA}	p_{00}	p_{10}	p_{01}	p_{11}	Introduction	A has it	B has it
1	.1	.1	.25	.25	.5	.75	.25	.5	Peace	Peace	Peace
2	.1	.1	.2	.15	.5	.9	.25	.35	Peace	War	Peace
3	.1	.1	.2	.2	.5	.75	.1	.7	Peace	Peace	War
4	.1	.1	.2	.2	.5	.9	.1	.5	Peace	War	War
5	.1	.2	.3	.25	.6	.85	.15	.5	War	War	War
6	.2	.05	.25	.1	.3	.8	.1	.6	War	Peace	War
7	.1	.25	.3	.15	.7	.8	.2	.35	War	War	Peace
8	.01	.25	.3	.05	.6	.9	.1	.7	War	Peace	Peace

Model Summary

- The introduction of a new technology is more likely to cause war when
  - States can confidently estimate its effects
  - When the technology is expected to benefit one side asymmetrically
  - When sates expect that when one state acquires the technology first, one or both states might attack the other to preserve its monopoly

The Musket Wars

- Early 19th century, 30 years of conflict between the Maori tribes of New Zealand
- New technology – Firearms traded with European ships
- Armed tribes launched all-out campaigns to annihilate, enslave, or permanently expel other (non-armed) tribes
- Armed tribes owned a "fleeting" advantage over other non-armed tribes, and could not be assured of safety after advantage is gone
- The wars ended once all remaining tribes possessed muskets
- Proposition 1 and 2

The End of the US Nuclear Monopoly

- New technology: Nuclear weapons – US (1945) and USSR (1949)
- Question: Why didn't the United States launch a preemptive war against the Soviet Union to preserve its nuclear monopoly?
  - Conventional wisdom – Either the material costs of war were too high in the period, or the moral costs of preemptive war were unacceptable to the US public
- Authors' expiation – Proposition 3
- "The US assessed the probability that the USSR would acquire the bomb in year t, as quite low during 1945 – 1950 and increasingly slow for 1951 – 1952" – Hesitation stems from belief that the US had time to spare

The 1976 Six-Day War

- Short conflict between Israel and Egypt and its allies (Syria, Jordan, and Iraq)
- New technology: Nuclear weapons
  - However, neither state had acquired the new technology yet
- As Egypt moved troops into Sinai, Israel feared that a preemptive attack was imminent to delay its nuclear program. Feeling threatened, Israel launched an attack on Egypt's air forces
- Proposition 4 – The expected shift in the balance of power strongly favored Israel, explaining the incentive for Egypt to strike preemptively

Implications and Recommendations

- The development of new military technologies by advanced powers can lead to widespread diffusion, shifts in the balance of power, and in some cases preventative war
- Two of the discussed cases were indirectly caused by the willing transfer, instead of indigenous development, of technologies from advanced countries
  - Maori tribes and Israel nuclear assistance
- Recommendations to powerful states who transfer new technology
  - Slow implementation
  - Concealment of future change signals
  - Minimizing shocks to the balance of power

Bargaining Over Power: When Do Shifts In Power Lead To War?

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Introduction

- In international relations, rapid shifts in relative power can lead to war. In these cases, the declining state fears that it will negotiate in a position of weakness once the balance of power has shifted, and it is argued, prefers fighting now
  - Question: Why do states not negotiate over the causes and speed of the shift that leads to conflict? Why would the rising state not offer concessions today of capabilities that reduce his expected power tomorrow?
- Sequential bargaining model and complete information
  - When do large and rapid changes in relative power lead bargaining to break down into war?

Critique of Related Literature

- Previous models agree that rapid shifts in power generate fear in the declining state, potentially resulting in war.
  - However, these models do not include the opportunity for states to bargain over "power" itself

A Commitment Problem

- Model – Two states (A,B) negotiate over the occupation of territory X, over two periods.

- Country A expects country B to grow stronger in the next period. Then, A anticipates that B will want a larger share of the territory tomorrow, and when the shift is large and rapid, no concessions from B can satisfy A. As a result, A prefers fighting now before B becomes stronger

- Proposition 1 – A peaceful SPE cannot be established due to the fact state B cannot credibly commit to a large concession in the next period

Solving The Commitment Problem

- Players bargain not only over territory occupation, but over a set of resources determining a states likelihood of victory in war
  - R = [0,1]
- Proposition 2 – All SPE are peaceful when players can negotiate
  - In this subgame, states are able to negotiate over "resources" and "capabilities"
- Examples of capabilities concessions
  - Removal of troops from the border
  - Abandoning developing weapons programs
- By giving up certain capabilities now, state B changes his expected outcome in the next period, offering a credible commitment

Negotiating Over Power In Practice

- Washington Naval Treaty of 1922
  - United States, Great Britain, Japan, France, and Italy
  - High tensions curbed with disarmament conference of 5 signatories
  - Limitations of rapidly growing US Navy eased the possibility of war
- Roots of Power and the European Coal and Steel Community (ECSC)
  - A goal to "make war not only unthinkable but materially impossible"
  - Constant negotiation of two pillars are war prevent uncontrollable shifts in relative power

Limitations Of Model

- Territory or population might not matter as much as the model suggests
  - Great Britain vs. Brazil
  - Luxembourg vs. Russia
- Some capabilities are non negotiable
  - Resolve, military training, morale, knowledge, or experience
  - A rising players cannot make concessions involving these capabilities
- How a state values the future compared to the present cannot be quantified in model

Limitations Of Model (continued)

- Beyond bilateral bargaining
  - Subgame – states A, B, and C
  - War may occur in equilibrium due to the fact that B (the rising state) must make concessions to both states
- Domestic constraints
  - Intrinsic or religious value to territories
  - Commitment problems caused by shifts in leadership