• Referee report #2 passed back at end of class today
Lecture 7 outline

(1) Violence and economic development
(2) Why do wars occur when they are so destructive? Powell (2006)
(3) A economic conflict framework
    Garfinkel and Skaperdas (2006)
(1) Violence and economic development

• Since 1980 about 60% of all countries have had at least one year of armed civil conflict, with at least 25 battle deaths (PRIO/Uppsala dataset)

• Rates are particularly high in less developed regions: approximately 70% in Asia, Sub-Saharan Africa
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• Rates are particularly high in less developed regions: approximately 70% in Asia, Sub-Saharan Africa

• The use or threat of force is a central political economy issue in many less developed countries. Wars can destroy capital, reduce human capital accumulation, and impact both formal and informal institutions (norms, “culture”, etc.)
(1) Violence and economic development

- Studying the causes and consequences of civil war is central to international relations / political science, but until recently was ignored within development economics

- Leading undergraduate textbooks (Ray, Todaro) ignore the issue of war, conflict
  -- Few Ph.D. development economics syllabuses in leading programs touch on the issue
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• Leading development economists (Jean Dreze, Paul Collier) have increasingly pointed to civil war as a (the?) major cause of economic underdevelopment today (e.g. World Bank 2003 “Breaking the Conflict Trap”)
(1) Violence and economic development

• Why do civil wars occur when they are so destructive?
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• What is the “industrial organization” of armed groups?

• What is war’s impact on later development? (lecture 8)
(2) Powell (2006, *International Organization*)

- Focuses on the two questions:
  - Why do civil wars occur when they are so destructive?
  - Why do civil wars last so long?

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- The inefficiency puzzle of war: war destroys resources. Why can’t the two sides to a conflict bargain to reach a Pareto efficient outcome?
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- Closely related to the economic theory on bargaining breakdowns (Kennan and Wilson 1993 *JEL*) – to explain pretrial settlement vs. costly litigation, union-firm wage agreement vs. strike.
• The inefficiency puzzle of war: war destroys resources, Why can’t the two sides to a conflict bargain to reach a Pareto efficient outcome?

• Closely related to the economic theory on bargaining breakdowns (Kennan and Wilson 1993 JEL) – to explain pretrial settlement vs. costly litigation, union-firm wage agreement vs. strike.

• Explanations for why the Coase Theorem breaks down:
  (1) Informational problems (e.g., relative strengths)
  (2) Commitment problems* (need self-enforcing deals)
  (3) Non-rational explanations (mad rulers, ideology)

(2) Powell (2006, *International Organization*)
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- Informational problems have been the focus of most theory in this area – e.g., war starts because both sides are over-optimistic about their chances of winning
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- Powell shows that commitment problems are particularly important in dynamic settings where there are likely to be future shifts in relative power → deals renegotiated
  -- This holds both for bargaining across sides to a conflict, as well as bargaining among one side’s factions
(2) Powell (2006, *International Organization*)

- A simple take-it-or-leave it offer game in which two sides are bargaining over a pie (e.g., territory, oil rents)
- Baseline side $A$ controls territory $[0,q]$, $B$ controls $(q,1]$
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- Timing: B offers a new split \(x\) (A gets \([0,x]\), B gets \((x,1]\))
  -- A can accept, reject, or go to war
  -- If war, A wins all territory with probability \(p\), B with \(1-p\)
  -- Fighting destroys fraction of the pie \(d\)
  -- If the offer is rejected, B can pass (do nothing) or fight
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Side A fights if: \(\{p(1-d) + (1-p)(0)\} = p(1-d) > x\)
FIGURE 1. The bargaining problem

A’s payoff to fighting

B’s payoff to fighting

A

B

0

q

p(1−d)

(1−p)(1−d)

1

Bargaining range
(2) Powell (2006, *International Organization*)

- This can break down with imperfect information if side $A$ thinks its odds of winning are $p_A$ and side $B$ thinks its own chance of winning is $r_B$ and $p_A + r_B > 1$. There is a risk the bargaining set will be reduced to the empty set.
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- Sides can always agree to the lottery with winning odds equivalent to war and without the efficiency costs – but there is an incentive to renege on an unfavorable lottery outcome (no enforcement).
(2) Powell (2006, *International Organization*)

- Now imagine a dynamic two period extension
- Two sides, 1 and 2
- The key departure from the static theory is that:
  Probability that side 1 wins in period 1 = $p$
  Probability that side 1 wins in period 2 = $p + \Delta > p$
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• E.g., Iran vs. U.S. 2007 (pre-bomb) or 2017 (post-bomb),
  or China vs. U.S., as Chinese military power grows
(2) Powell (2006, *International Organization*)

- The key insight: if side 2 (currently strong) fights now it has a good chance at the whole pie in both periods, before side 1 can negotiate a better deal in the future (a pre-emptive war of sorts)
  -- Side 1 may not be able to offer enough today (no more than the entire current pie) to deter this attack, if it cannot credibly lock-in future transfers to side 2
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- Imagine side 2 is a unitary actor, but side 1 is not
  -- Side 1 is composed of two factions, $\alpha$ and $\beta$, where $\alpha$ is currently in power. The faction in power decides about war and peace and determines the allocation of income across factions. Let $\alpha$’s odds of remaining in power be higher during war ($r'$) than during peace ($r$)
  -- Both factions need to receive at least share $\lambda$ of total side income to avoid fighting among themselves
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- Payoff for side 1 faction $\alpha$ to settling is: $r(1-\lambda)x + (1-r)\lambda x$

- Payoff for side 1 faction $\alpha$ to fighting is:
  
  $$p[r'(1-\lambda)(1-d) + (1-r')\lambda(1-d)] + (1-p)(0)$$
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- It is possible that no $x$ in the earlier bargaining range (with unitary actors) leads faction $\alpha$ to settle. For an extreme case, imagine $r \to 0$ and $\lambda \to 0$ (faction $\alpha$ is likely to lose power during peace, and faction $\beta$ will give them very little). Then the ruling faction chooses war $\forall x$ if $p[r'(1-\lambda)(1-d) + (1-r')\lambda(1-d)] > 0$
(2) Powell (2006, *International Organization*)

- In contrast in the unitary actor case there was peace for all $x > p(1-d)$. Why can’t peace be achieved here?

- Settling rather than fighting shifts the future distribution of power against $\alpha$. If faction $\beta$ could credibly commit to split future income more equally with (by changing laws or institutions) to make $\alpha$ as well as off as they would be with war, then war could be avoided.
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• Possible solutions:
  -- Transfer secure assets (Swiss bank accounts, land)
  -- Third parties (U.N. blue helmets) enforce deals

(2) Powell (2006, *International Organization*)

- Formally model the likelihood of success in a war, and explore trade-offs between production and appropriation

- Extend the probability of winning $p$ in the Powell model to be a function of investments in weaponry (“guns” $G$)
Formally model the likelihood of success in a war, and explore trade-offs between production and appropriation.

Extend the probability of winning $p$ in the Powell model to be a function of investments in weaponry ("guns" $G$).

Two sides $i \in \{1, 2\}$, with weapons $G_1$ and $G_2$.

Total available resources / "pie" to fight over $2R$.

Probability $1$ wins $p_1(G_1, G_2)$, with $\partial p_1/\partial G_1 > 0$, $\partial p_1/\partial G_2 < 0$.
(3) Garfinkel and Skaperdas (2006)

- The functional form typically used for contest functions:
  \[ p_1(G_1, G_2) = \frac{f(G_1)}{f(G_1) + f(G_2)} \text{ if } f(G_1) + f(G_2) > 0 \]
  \[ = 0.5 \text{ if } f(G_1) + f(G_2) = 0 \]
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• The most widely used form: \( f(G_i) = G_i^m \), in which case the ratio of military spending by the two sides determines success:
  \[ p_1(G_1, G_2) = \left\{ 1 + \frac{G_2}{G_1} \right\}^{-1} \]

• Under risk-neutrality, equivalent to a split of the pie rather than the probability of winning the whole pie
(3) Garfinkel and Skaperdas (2006)

- The utility/welfare of each fighting side is:

\[ V_i = p_i(G_1, G_2) \times 2R - G_i \]
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- The peaceful outcome \( G_1 = G_2 = 0 \) is not an equilibrium, since even tiny military spending \( G_1 = \varepsilon \rightarrow p_1(\varepsilon, 0) = 1 \)

- FOC: \( \frac{\partial V_1}{\partial G_1} = \frac{\partial p_1}{\partial G_1} \times 2R - 1 = 0 \)

  \[
  \rightarrow mG_1^{m-1}G_2^m / \{G_1^m + G_2^m\}^2 \times 2R - 1 = 0
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• Solve for \( G_1^*(G_2) \) and for \( G_2^*(G_1) \). The symmetric pure-strategy (Nash) equilibrium is \( G_i^* = (m/2)R \)
(3) Garfinkel and Skaperdas (2006)

- Plugging in, the equilibrium utility for agent $i$ is
  \[ V_i^* = [1 - m/2]R \]
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- If both sides could sign a binding contract to commit to $G_1 = G_2 = 0$, both would be considerably better off, but there is no party to enforce the contract. Thus we get a costly arms race
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• Plugging in, the equilibrium utility for agent $i$ is
  \[ V_i^* = (1 - \frac{m}{2})R \]

• If both sides could sign a binding contract to commit to $G_1 = G_2 = 0$, both would be considerably better off, but there is no party to enforce the contract. Thus we get a costly arms race.

• The more powerful / destructive each weapon ($m$ larger) the lower is equilibrium utility.
  Better “technology” $\rightarrow$ lower utility?
(3) Garfinkel and Skaperdas (2006)

• Many extensions are possible:
  -- Incorporate economic (non-military) production
  -- Asymmetric military efficiency across the sides
  -- Dynamic models (like Powell 2006)
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• What should the goals of this literature be within development economics?
  -- Modeling the organizational structure of armed groups, and how this affects their choices
  -- Better theoretical understanding of why civil wars start and why they persist
  -- What else?