

**Economics 270c**  
Development Economics

Lecture 7 – February 27, 2007

Lecture 1: Global patterns of economic growth and development (1/16)

The political economy of development

Lecture 2: Inequality and growth (1/23)

Lecture 3: Corruption (1/30) – Guest lecture by Ben Olken

Lecture 4: History and institutions (2/6)

Lecture 5: Democracy and development (2/13)

Lecture 6: Ethnic and social divisions (2/20)

★ Lecture 7: Economic Theories of Conflict (2/27)

Lecture 8: War and Economic Development (3/6)

Human resources

Lecture 9: Human capital and income growth (3/13)

Lecture 10: Increasing human capital (3/20)

Lecture 11: Health and nutrition (4/3)

Lecture 12: The Economics of HIV/AIDS (4/10)

Lecture 13: Labor markets and migration (4/17)

Lecture 14: Environment and development (4/24)

Lecture 15: Social Learning and Technology Adoption (5/1)

- 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)
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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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  - Few Ph.D. development economics syllabuses in leading programs touch on the issue
- 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”)

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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?
- Builds on earlier work by Fearon (1995, 2003)

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

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- 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)

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- But informational explanations have limitations. They have particular difficulty explaining the occurrence of long-running civil wars, where information is very good
- 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  $1-p$
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- Side  $A$  fights if:  $\{p(1-d) + (1-p)(0)\} = p(1-d) > x$



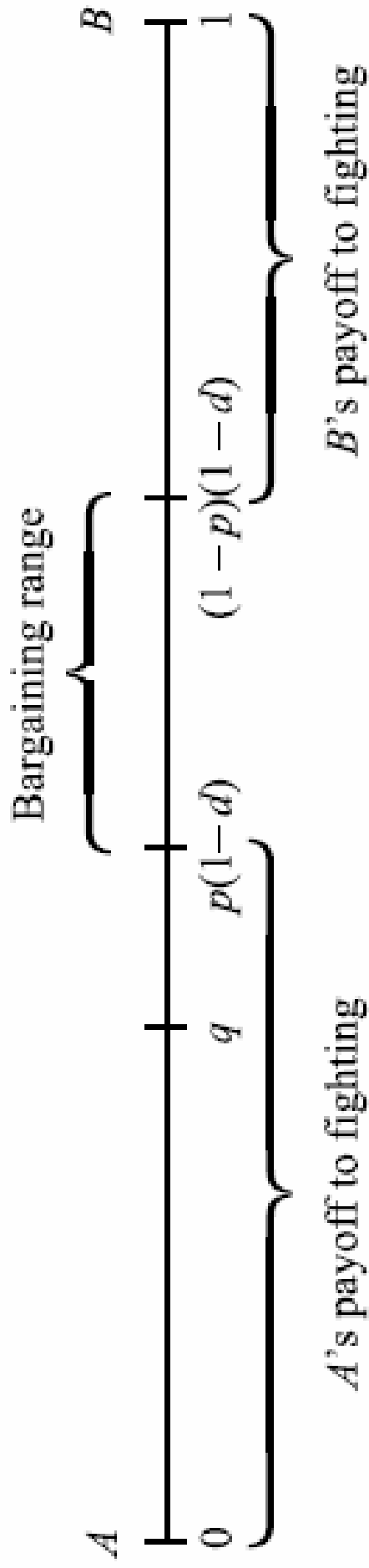


FIGURE 1. *The bargaining problem*

## (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

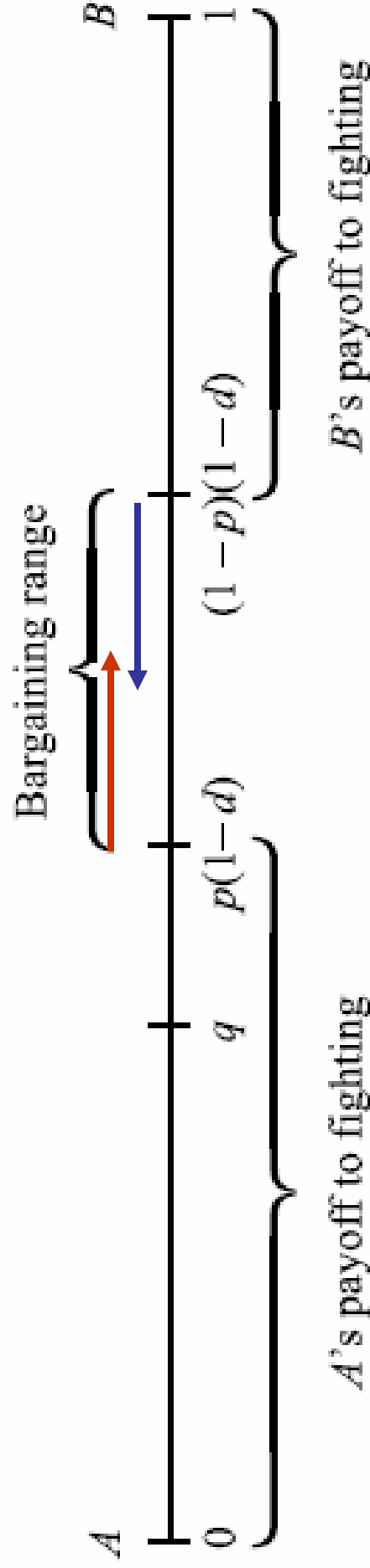


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- This intuitively seems a more plausible explanation for the start of a war than several years into a civil war
- Sides can always agree to the lottery with winning odds equivalent to war and without the efficiency costs – but there is an incentive 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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Probability that side 1 wins in period 2 =  $p + \Delta > p$
- E.g., Iran vs. U.S. 2007 (pre-bomb) or 2017 (post-bomb),  
or China vs. U.S., as Chinese military power grows

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- 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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- Related Acemoglu and Robinson (2001), Fearon (2003)

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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  $r \rightarrow 0$  and  $\lambda \rightarrow 0$  (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

### (3) Garfinkel and Skaperdas (2006, *Handbook of Defense Economics*)

- 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”  $G$ )

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- 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:

$$\begin{aligned} p_1(G_1, G_2) &= f(G_1) / \{f(G_1) + f(G_2)\} \text{ if } f(G_1) + f(G_2) > 0 \\ &= 0.5 \text{ if } f(G_1) + f(G_2) = 0 \end{aligned}$$

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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:

$$p_1(G_1, G_2) = \{1 + (G_2 / G_1)^m\}^{-1}$$

- 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:

$$V_i = p_i(G_1, G_2) * 2R - G_i$$

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- FOC:  $\frac{\partial V_1}{\partial G_1} = \frac{(\partial p_1 / \partial G_1) * 2R}{MB} - \frac{1}{MC} = 0$

$$\rightarrow mG_1^{m-1}G_2^m / \{G_1^m + G_2^m\}^2 * 2R - 1 = 0$$

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- Solve for  $G_1^*(G_2)$  and for  $G_2^*(G_1)$ . The symmetric pure-strategy (Nash) equilibrium is  $G_i^* = (m/2)R$



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- The more powerful / destructive each weapon ( $m$  larger) the lower is equilibrium utility.  
Better “technology” → lower utility?

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- Many extensions are possible:
  - Incorporate economic (non-military) production
  - Asymmetric military efficiency across the sides
  - Dynamic models (like Powell 2006)
- 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?

# Whiteboard #1

# Whiteboard #2

# Whiteboard #3



# Whiteboard #4

# Whiteboard #5

