Economics 270B
Ph.D. Development Economics

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University of California, Berkeley

Lecture 10 – April 13, 2015

I. Overview of International Economic Development
Lecture 1: Understanding economic growth and development (1/26)
Lecture 1B: Persistence of historical institutions and shocks
(read during holiday week of 2/16)

Lecture 2: The Psychology of Poverty (2/2)

II. Human Capital in Economic Development
Lectures 3-4: Education (2/9, 2/23)
Lectures 5-7: Health and nutrition (3/2, 3/9, 3/16)

III. Political economy
Lectures 8-9: Democracy, Corruption and Development (3/30, 4/6)
(guest lectures by Prof. Fred Finan)

Lecture 10: Ethnic and Social Divisions (4/13)
Lectures 11-12: The Political Economy of Conflict (4/20, 4/27)

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- Prerequisites: Graduate economic theory, econometrics

- Grading:
  Four referee reports – 40%
  Two problem sets – 20%
  → Problem set #2 due next Thursday (4/23)

  Research proposal – 30%
  → Due Friday 5/1

  Class participation – 10%
  No final exam

- All readings are available on bCourses

Any questions?

Lecture 10 outline

(1) An overview of violence and economic development (Blattman and Miguel 2010)

(2) Leading research questions in the field

(3) Why do wars occur when they are so destructive? Powell (2006)

(4) Models of poverty and armed conflict (Chassang and Padro-i-Miquel 2010)

(1) Violence and economic development

- Since 1980 over 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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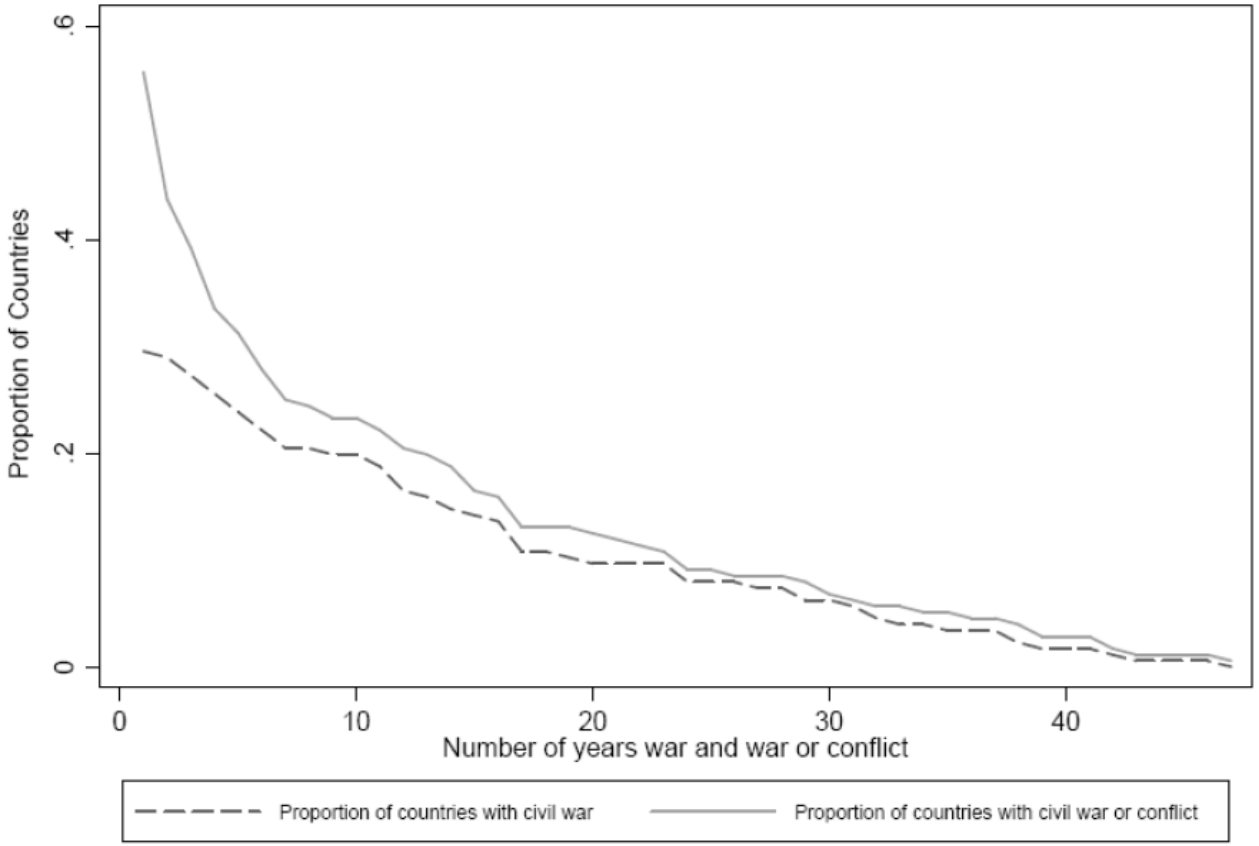
- The use or threat of force is a central political economy issue in many low income countries. Wars can destroy physical capital, reduce human capital accumulation, and impact both formal and informal institutions (norms, “culture”, etc.)

Figure 1: The distribution of civil war or conflict years across countries, 1960-2006



Sources: Data based on UCDP/PRIO armed conflict database database (Gleditsch, et al. 2002; Harbom and Wallensteen 2007). Civil wars are those internal conflicts that count more than 1,000 battle deaths in a single year. Civil war or conflict includes cases with at least 25 battle deaths in a single year.

Figure 2: Proportion of countries with an active civil war or civil conflict, 1960-2006

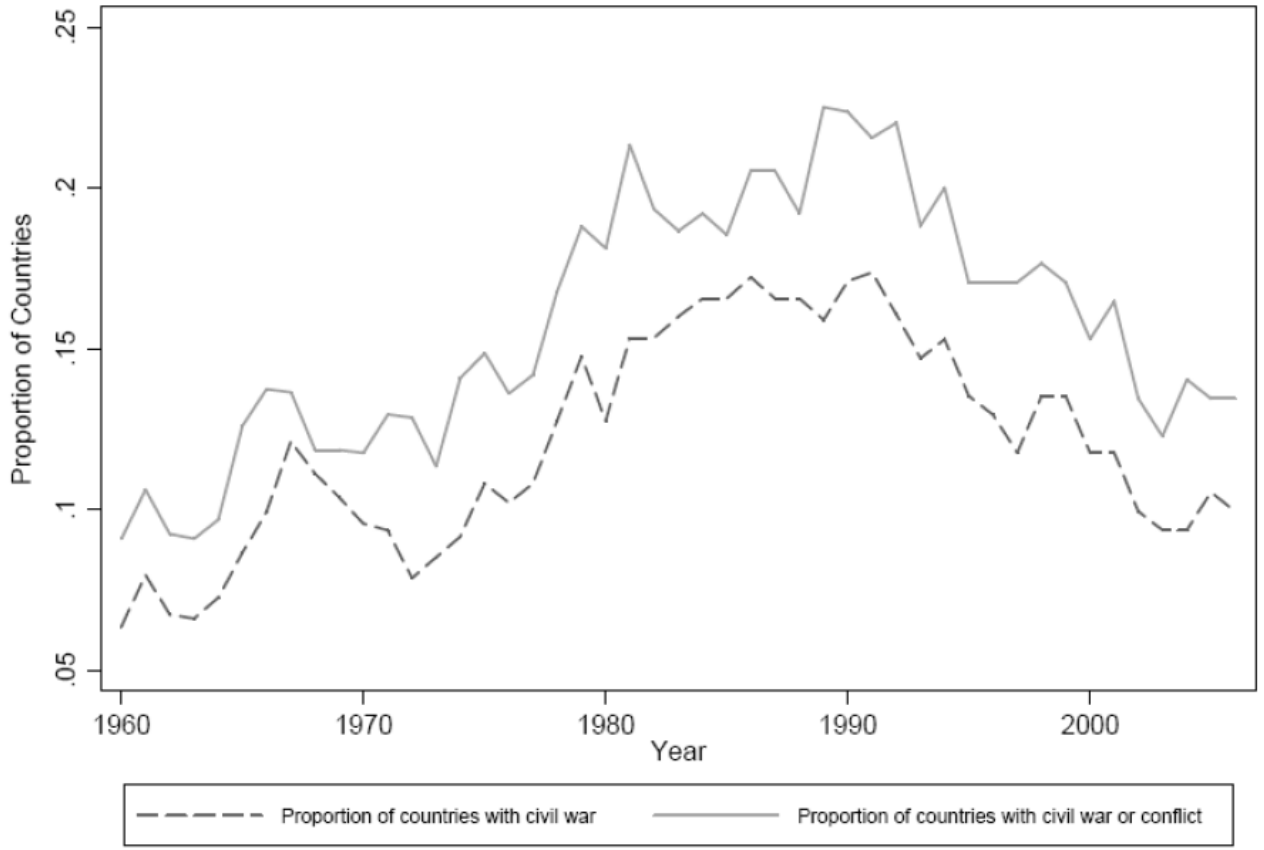


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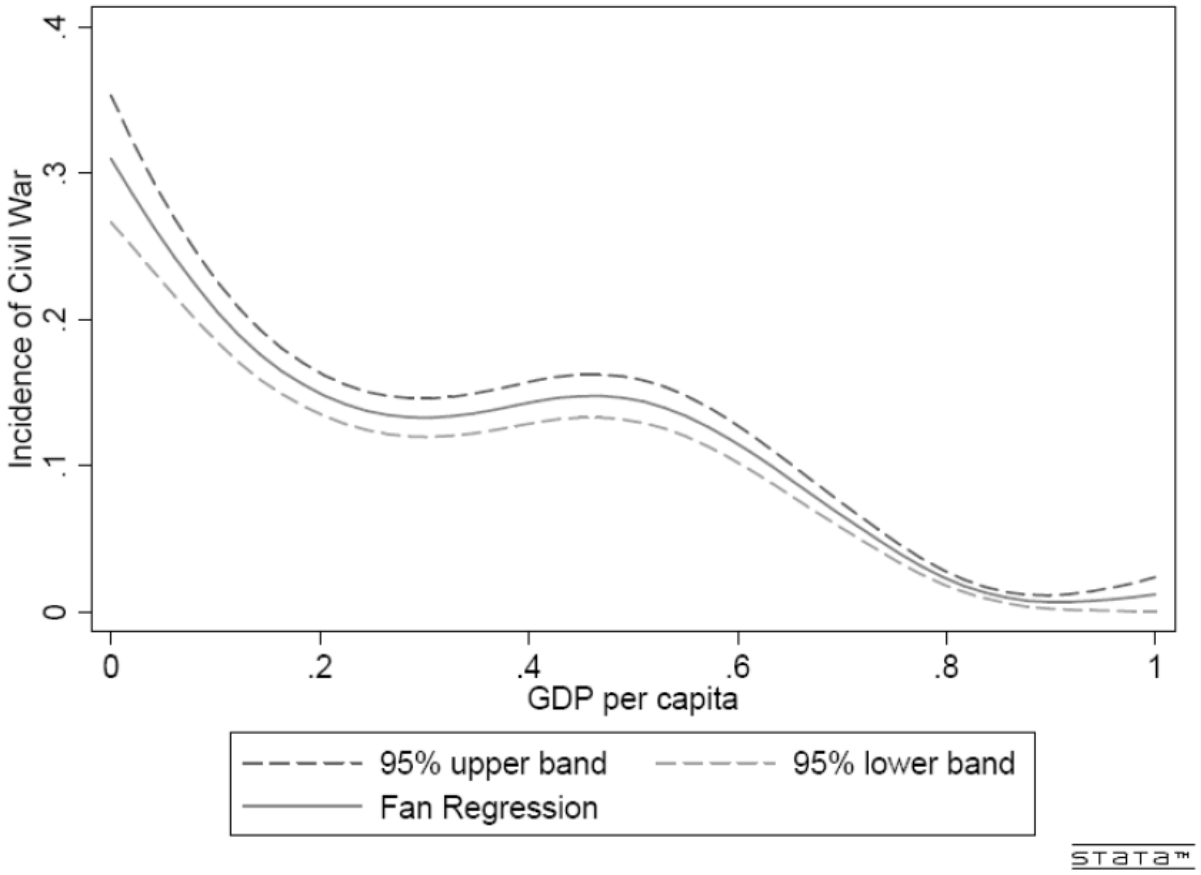
Figure 3: Incidence of civil war by country income per capita, 1960-2006



Sources: Figure displays the results of a Fan regression of the incidence of civil war on GDP per capita (bandwidth=0.3, bootstrapped standard errors). Population and GDP data are drawn from the World Development Indicators (World Bank 2008). Civil war incidence is drawn from the UCDP/PRIO armed conflict database (Gleditsch, et al. 2002; Harbom and Wallensteen 2007).

(1) Violence and economic development

- Studying the causes and consequences of civil war is central to international relations / political science, but until the last decade (or so) was largely ignored within development economics

- In the 1990s and early 2000s, leading undergraduate textbooks (Ray, Todaro) ignored war and conflict, and few Ph.D. development economics syllabuses in leading programs touched on these issues

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

- Focuses on the two questions:

  -- Why do civil wars occur when they are so destructive?

  -- Why do many civil wars last so long?

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

- Some key assumptions are related to Ellman and Wantchekon (2000), especially regarding the inability for political sides to “commit” to deals.

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- A recent example: the outbreak of violence in Libya in February 2011. E.g., army units breaking with the regime in Benghazi and fighting with insurgents.
- Libya experts expected bloody retaliation against the losing side, no matter who won.

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- Libya experts expected bloody retaliation against the losing side, no matter who won.
- Why couldn't various armed units agree **to share power** (or the spoils of power) and avoid the physical destruction and loss of life that ensued by fighting?
- Why did the "revolution" in Tunisia succeed (more or less) peacefully, with different political groupings taking turns in power, while Libya had civil war?

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

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- Explanations for why the Coase Theorem breaks down:

  (1) Informational problems (e.g., on relative strengths)

  (2) **Commitment problems** (need self-enforcing deals)

  (3) Non-rational explanations (crazy rulers, ideology, a taste for revenge or violence? Fehr and Schmidt 1999)

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- But informational explanations have limitations. They have particular difficulty explaining the occurrence of long-running civil wars, where information is (quickly) very good

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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 (e.g., civilian vs. military leaders)

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- A simple take-it-or-leave it offer game in which two sides are bargaining over a pie (e.g., territory, oil rents), [0,1]
- Baseline side *A* controls territory [0,q], *B* controls (q,1]

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  -- *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 (status quo) or fight

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- Side *A* fights if: EU (war for A) > EU (B's offer to A):

$$\{p(1-d) + (1-p)(0)\} = p(1-d) > x$$

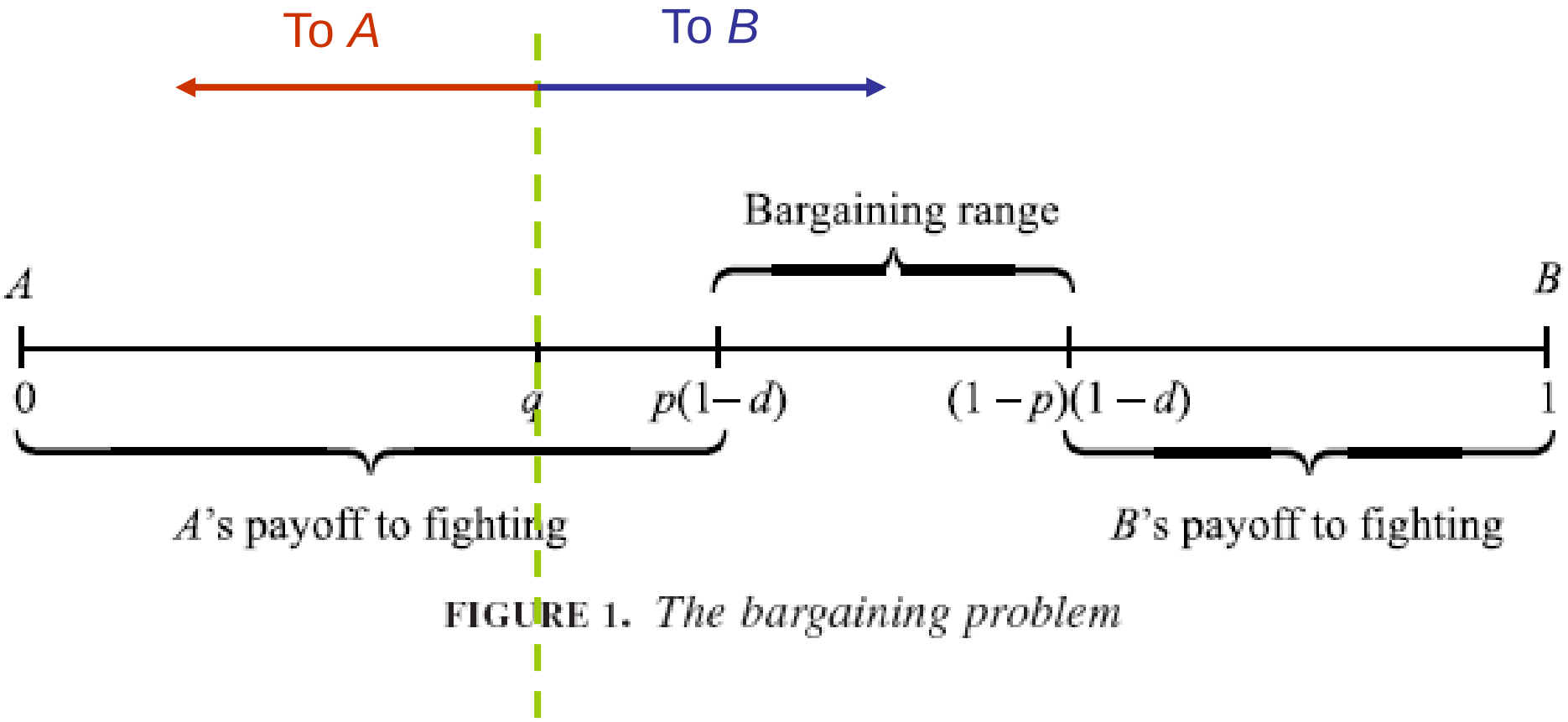

FIGURE 1. *The bargaining problem*

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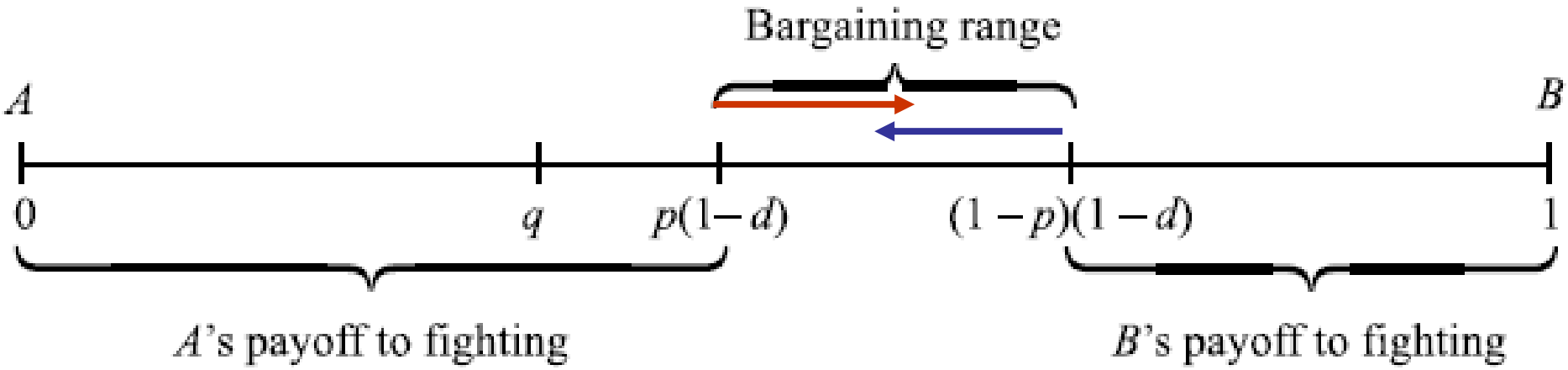
- This can break down with imperfect information if side *A* thinks its odds of winning are p_A and side *B* thinks its own chance of winning is r_B, and $p_A + r_B > 1$. There is a risk the bargaining set will be reduced to the empty set



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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 (if no enforcement, i.e., commitment problems)

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

- Now imagine a dynamic two period extension
- Two sides, now called *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. 2015 (pre-bomb) or 2016 (post-bomb), or China vs. U.S. as Chinese military power grows.

(3) 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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- Similar logic applies to **first-strike advantage**: attacking first gives a temporary increase in winning odds (relative to waiting). First strike advantages may allow a side to capture strategically important areas (e.g., high ground)

  -- More generally large first strike advantages may be destabilizing under a Prisoner's dilemma type logic

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- Imagine side *2* is a unitary actor, but side *1* is not

  -- Side *1* is composed of two factions, α and β, where α is currently in power. The faction in power decides about war and peace and determines the allocation of income across factions. Let α's odds of remaining in power be higher during war (r') than during peace (r, s.t. $r < r'$)

  -- A faction receives share λ of total side income if it is currently out of power. Related to checks and balances.

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- Payoff for side *1* faction α 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 α to settle. For an extreme case, imagine $r \rightarrow 0$ and $\lambda \rightarrow 0$ (faction α is likely to lose power during peace, and faction β will give them very little). Then the ruling faction chooses war $\forall x$ if $p[r'(1-\lambda)(1-d) + (1-r')\lambda(1-d)] > 0$

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- 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 α. If faction β could credibly commit to split future income more equally (by changing laws or institutions) to make α as well as off as they would be with war, then war could be avoided.

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- Possible solutions:

  -- Strong institutions (laws, constitutions, power-sharing)

  -- Transfer secure assets (Swiss bank accounts, land)

  -- **Third parties** (U.N. blue helmets) to enforce deals, but important caveats

(4) Violence and economic development

- Recall that 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)

- Are these conflicts largely the cause of their poverty, or the consequence of poverty? (Or both – or neither?)

  -- Endogeneity and omitted variables are key issues in the estimation of these relationships

(4) Violence and economic development

- Now: Focus on theoretical explanations for a link between poverty and violence

- Next week: empirical evidence on the causes of conflict (e.g., poverty, extreme climate) as well as consequences

  -- We will discuss evidence that both low income levels and slow income growth are associated with **more** armed civil conflict, and also discuss limitations

(4) Violence and economic development

- The “opportunity cost” argument for why poverty is related to conflict: Collier and Hoeffler (2004) argue that *“recruits must be paid, and their cost may be related to the income foregone by enlisting as a rebel. Rebellions may occur when foregone income is unusually low.”*
- This, however, neglects to consider that when income is low, there may also be less to fight over (i.e., the pie shrinks as well)

- This is the basis for Fearon and Laitin (2003) and Fearon’s (2007) dismissal of **opportunity cost** arguments in favor of **state capacity** arguments

(4) “Classic” conflict theory

- Two traditions of modeling conflict:
- Economics: **Contest functions** in which actors decide whether to put resources/effort into fighting or producing
- Political Science: Focus on the decision to fight as a byproduct of **bargaining** failure

- However, in their canonical formulations, neither of these classes of models can account for the relationship between income and fighting: if the costs of fighting are proportional to income, fighting is independent of the size of the pie to be shared in most models

(4) A simple economic model

- Economics focuses in the use of scarce resources
- Hence a typical approach to modeling conflict stresses the use of resources (or effort) to appropriate production
- It typically posits a **contest function** that determines the probability of prevailing as a function of fighting effort, see Grossman (1991), Skaperdas (1992), Hirshleifer (1995), Esteban & Ray (1999) and other work

- Examine a simple version of these models to see if it can explain the relationship with income

(4) A simple economic model

- Two groups $i \in \{1, 2\}$, fighting for a pie of size θ
- They can devote resources g_i to the fight, and pay linear costs for these resources. As we will see, the argument does not hinge on linearity, but it simplifies the algebra

- Simple contest function:

$$\Pr(1 \text{ wins}) = \frac{g_1}{g_1 + g_2}$$

(4) A simple economic model

- Given this technology, group *i* maximizes

$$\theta \frac{g_i}{g_i + g_{-i}} - g_i$$

- The first order conditions are simply

$$\theta \frac{g_{-i}}{\left(g_i + g_{-i}\right)^2} - 1 = 0$$

- Adding up you get

$$g_i + g_{-i} = \frac{\theta}{2}$$

(4) A simple economic model

- So the bigger the pie, the more resources are wasted (here, half of the total income)
- It seems to predict that we should see **more** fighting in rich societies, something that is not empirically true

- But an obvious problem with these models is that they do not distinguish between investing and actual fighting
- Note that if fighting costs were proportional to θ (due to higher opportunity costs of time / resources), then there would be no relationship with income whatsoever

(4) “Why war?” Commitment problems

- One of three leading reasons for conflict described in Fearon (1995) is **commitment problems**
- Three sub-causes: (1) Preventive war, (2) Preemptive war (**offensive advantage**), (3) Bargaining over issues that affect future power

- Here discuss a simple model of offensive advantage based on Chassang and Padro-i-Miquel (2010) to illustrate the logic of these models, and explore income effects further

(4) A static model of fighting

- Start with a static (one period) model
- Consider two groups $i \in \{1, 2\}$ on 2 units of land
- One group controls $1+\lambda$ units of land, the other $1-\lambda$
- Each group also has 1 unit of labor

- Production function: $f(L,I) = \theta LI$

  where θ is the productivity of the land, L is the amount of land, and I is the amount of labor devoted to work. θ is a natural measure of economic development.

(4) A static model of fighting

- There is a war if either of the groups decides to attack.
- If there is a war, $c \in (0,1)$ units of labor are diverted from production to fighting (the "cost" of warfare).

- There is an offensive advantage in that the group that attacks wins with probability $P \geq 1/2$.
- The winner seizes the land of the loser and consumes all production.

(4) A static model of fighting

- Allow players to bargain, and leave the bargaining protocol free, with the following conditions.

(1) Players can commit to peaceful transfers of land (since land transfers may be particularly hard to “undo”)

(2) Players can commit not to attack in exchange for transfers of land

(3) Bargaining is successful if it leaves each contender better off than launching a surprise attack. This captures the fact that a side can launch an attack at any moment

(4) If bargaining is unsuccessful, one side is picked at random and it can launch a surprise attack

(4) A static model of fighting

- Throughout this discussion, focus on the most peaceful equilibrium attainable.
- Just to quickly summarize, the timing of the game is:

(1) Bargaining occurs

(2) If bargaining is successful, agreed transfers of land take place, followed by consumption

(3) If bargaining is unsuccessful, there is a war where one player (picked at random) wins with probability *P*

(4) A static model of fighting

- Solving the static model
- Denote by *T* the agreed amount of land that the richer side transfers to the poorer side.
- For bargaining to succeed, there must exist a *T* s.t.:

(1) $$P2\theta(1-c) \leq (1+\lambda)\theta - T\theta$$

- and, at the same time

(2) $$P2\theta(1-c) \leq (1-\lambda)\theta + T\theta$$

(4) A static model of fighting

- Lemma 1: There exists a T that satisfies both (1) and (2) if and only if peace is sustainable under equal land-holdings, i.e., $P2\theta(1 - c) \leq \theta$

- In this class of models, the role of bargaining is to smooth over inequality by allowing the rich to make transfers to the poor instead of fighting.
- It follows that it is enough to examine the case of equal land distribution to determine whether peace is sustainable or not. This simplifies the problem.
- Note that if bargaining were not assumed to be efficient, then initial inequality could contribute to conflict, i.e., the Coasian logic would break down.

(4) A static model of fighting

- Thus the condition for war to be inevitable is:

(3) $$P \geq \frac{1}{2}\frac{1}{(1-c)}$$

1. θ does not appear: since the costs of fighting (labor in this model) are proportional to income, θ drops out
2. For fighting to occur, *P* needs to be greater than 1/2

- When the offensive advantage is large enough (*P* large), no group can credibly commit **not** to attack.
- But note that as the opportunity cost increases the system is more stable (peace is ensured for $c \geq 1/2$).
- Below we will assume that (3) is **not** satisfied, so that if the model is static, peace is ensured for all θ.

(4) A dynamic model of fighting

- Concern for the future can affect fighting as it **increases the stakes** in a model where victory is long-lasting.
- To examine if this is enough to link fighting with income, consider an infinite horizon model where in each period:

(1) Bargaining occurs

(2) If bargaining is successful, agreed transfers of land take place, followed by consumption

(3) If bargaining is unsuccessful, there is a war where one player (picked at random) wins with probability *P*

- After fighting, the losing side is eliminated from the game forever (and consumes zero).

(4) A dynamic model of fighting

- Search for the **most peaceful** subgame perfect equilibrium of this game.
- Lemma 1 also applies to this game, so only need to examine the case with equal land holdings.

- Two pieces of notation.

1. The value of the continuation subgame after victory (V), where δ denotes per period time discounting:

$$V^V = 2\theta / (1 - \delta)$$

2. The value of the continuation subgame if peace (P):

$$V^P$$

(4) A dynamic model of fighting

- The condition for peace to be sustainable is now:

$$P[2\theta(1 - c) + \delta V^W] \leq \theta + \delta V^P$$

- Plugging in the values of V^W and V^P, and using the highest possible value for V^P $(= \theta / (1 - \delta))$:

$$P[2\theta(1 - c) + \delta(2\theta/(1 - \delta))] \leq \theta + \delta\theta / (1 - \delta)$$

- So permanent peace is sustainable if:

$$P \leq \frac{1}{2} \frac{1}{1 - c(1 - \delta)}$$

(4) A dynamic model of fighting

- So, we obtain that making the model dynamic implies:

(1) Peace is more difficult to obtain as δ increases (in other words, as groups are more patient and weigh the future "pie" more heavily)

(2) There is still **no dependence** on the size of the economy θ because fighting costs are proportional to the size of the pie

- In particular this means that **permanent changes in income** still do **not** affect the propensity to fight.
- How to reconcile this with the strong empirical pattern? Income levels could correlate with institutional strength or the nature of economic production, which could be the real underlying causes (Fearon and Laitin 2003)

(4) A model with transitory shocks

- Consider a time-varying θ_t that is independently drawn every period from F(θ).
- F(θ) *has full support on* (0,+∞).
- Denote $E(\theta) \equiv \theta^*$.

- Interpretation: think of rainfall shocks that change the productivity of agriculture in every period but are (pretty much) *i.i.d.* across time
- The key piece of intuition: adverse transitory shocks temporarily reduce the opportunity costs of fighting (today) relative to the size of the pie in the long-run (which is unchanged). This makes fighting more attractive today.

(4) A model with transitory shocks

- Timing (similar to above):

(1) θ_t is revealed and observed by both players

(2) Bargaining occurs

(3) If bargaining is successful, agreed transfers of land take place, followed by consumption

(4) If bargaining is unsuccessful, there is a war where one player (picked at random) wins with probability *P*

- If there is fighting, the loser is once again eliminated from the game forever.

(4) A model with transitory shocks

- Again, focus on the most peaceful Subgame Perfect Equilibrium. Lemma 1 also applies to this game, so focus directly on a situation of land endowment symmetry.

- Denote by V^P the value of the most peaceful Subgame Perfect Equilibrium.

- Given V^P and V^N, peace is again sustainable only if:

$$P[2\theta_t(1 - c) + \delta V^N] \leq \theta_t + \delta V^P$$

which is equivalent to

(4) $$\theta_t [1 - 2P(1 - c)] \geq \delta [PV^N - V^P]$$

(4) A model with transitory shocks

- Now note the following:

$$V^P \leq \theta^* / (1 - \delta) \leq V^N/2 \leq PV^N$$

- Hence, we have: $P > 1/2 \rightarrow \delta [PV^N - V^P] > 0$

  and therefore permanent peace is impossible: there should be a state of the world "bad" enough (with θ_t close enough to zero) that players choose to fight

- Implication: sufficiently low income leads to civil war. In this case the loss caused by war ($2c\theta_t$) is quite small.

(4) A model with transitory shocks

- Work out the equilibrium more formally when groups play simple threshold strategies.
- The highest V^V must be attained by a strategy that only prescribes fighting when it is inevitable: in "low" states of the world. This is a stationary threshold strategy.
- Denote the threshold by $\underline{\theta}$. We then have indifference between peace and fighting when:

$$V^P = F(\underline{\theta})\left[\frac{1}{2}\{2E(\theta \mid \theta < \underline{\theta})(1-c) + \delta V^V\}\right]$$

$$+(1-F(\underline{\theta}))[E(\theta \mid \theta > \underline{\theta}) + \delta V^P]$$

(4) A model with transitory shocks

- This expression reduces to

$$V^P = \frac{\theta^*}{1-\delta} - \frac{cF(\underline{\theta})E(\theta \mid \theta < \underline{\theta})}{1-\delta(1-F(\underline{\theta}))}$$

- Hence, the difference between victory and peace is the future cost of fighting. Plug this into (4) to obtain a fixed point condition for $\underline{\theta}$ (not shown).
- Proposition: For every $P > 1/2$, $c \in (1 - 1/(2P),1)$, $\delta \in (0,1)$, there exists a $\underline{\theta} \in (0,\infty)$ such that fighting is inevitable when $\theta_t < \underline{\theta}$.
- Simple intuition: groups choose to fight when the economic situation is sufficiently bad, since the cost of fighting is low relative to the potential reward.

(4) A model with transitory shocks

- Comparative statics: the propensity for fighting to break out is increasing in δ (weigh the future more*)* and *P (*greater first strike advantage), decreasing in *c* (waste of resources due to war)
- Bottom line: the opportunity cost logic has some theoretical bite but only really in the case of **transitory income shocks** rather than permanent levels.

- If poorer countries also tend to have larger aggregate shocks, this channel could potentially explain part of the cross-country relationship, too.
- Closely related case: risk of current conflict rises with the discovery of mineral / natural resources (e.g., oil) that promise higher future income levels.

(4) A model with transitory shocks

- Next lecture: discuss empirical evidence (macro and micro) and identification challenges in more detail

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