25

Conflict and Development I

"No society is immune from the darkest impulses of man."
Barack Obama, *New Delhi, India 27 January 2015*

25.1. Introduction

We've discussed several ways in which a society adapts to uneven growth and possibly growing inequality. From savings and human capital accumulation, to occupational choice and the use of credit and insurance, we have a wide variety of market based, *economic* responses to unevenness and change. But economics isn't just about economics. It is impossible to study phenomena like inequality or uneven economic growth without pondering the political and social consequences.

For instance, organizing our thoughts along Hirschman's parable, uneven growth might initially provide hope. Those who find themselves in a non-growth sector might hope to be able to participate in the sectors that are growing by changing the sort of human capital they have, or — more realistically — changing the human capital their children will bring to the labor market. This is the route of *occupational choice*. Or growing sectors might stimulate incomes in other sectors; this is the route of *trickle down*. Third, government might use various supports, subsidies, salary adjustments, and protections, to twist the river of economic progress through different territories. This is the avenue of *political economy*, at least of the relatively peaceful kind. But there is also the possibility of frustration: if uneven growth is perceived as persistently exclusionary, society may enter a different and darker realm; this is the area of *conflict*. It is in this broad context that we will now study the links between economic development and social conflict.

By social conflict, we refer to within-country unrest, ranging from peaceful demonstrations, processions and strikes to violent riots and civil war. In whatever form it might take, a key feature of social conflict is that it involves groups — economic,

[†] Some material in this chapter and the next draws heavily on Ray and Esteban (2017). Indeed, much of these chapters is based on many years of joint research with Joan Esteban and more recently with Laura Mayoral, and I am very grateful to both of them.

religious, geographical — and is rooted, in some way or form, in notions of within-group identity and cross-group antagonism.[401]

Social conflict is endemic, and it is a central part of our lives in all societies. I should place things in context though. Appearances to the contrary, and though it may seem hard to believe, we possibly live in a safer world than in the past. For instance, Steven Pinker's book, *The Better Angels of Our Nature*, is a delightfully gruesome romp through the centuries, but an exemplary sanity check that argues that violence of all forms has been on the decline. And he is correct. Compared to the utter mayhem that prevailed in the Middle Ages and certainly earlier, we are surely constrained — at least relatively speaking — by mutual tolerance, the institutionalized respect for cultures and religions, and by the increased economic interactions within and across societies. To this one must add the growth of States that seek to foster those interactions for the benefits of their citizens, and that internalize the understanding that violence — especially across symmetric participants —- ultimately leads nowhere.

And yet, it isn't hard to understand why this sort of long-run perspective seemingly flies in the face of the facts. We appear to live in an incredibly violent world. Not a day appears to go by when we do not hear of some new atrocity: planes shot from the sky, suicide bombings, mass killings, fundamentalism of all hues, and calls to even more escalated violence. It isn't hard to feel firmly convinced that the world is fast sinking into an orgy of conflict and mutual annihilation. And yet, perspective is important. The Middle Ages, the early days of Christendom or the Mughal Empire did not have access to the internet where each act of savagery could be endlessly replayed on social media. With the calm afforded by a longer, historical view, a perspective that Pinker correctly brings to the table, we can place our tumultuous present into some context.

What today's violence does show, however, that peace and civility will always be strained as long as there are enormous inequities in the world. As students of development economics, it also means that there are limits to what can be gleaned from a model which *assumes* that economic and political processes are all peaceful, such as those stemming from well-functioning markets, or democratic voting, or passionate but friendly debate. The study of supply and demand, or competitive prices, or majority voting, or even lobbying, isn't enough.

But hold on a minute: what does economics have to do with social conflict? Isn't the latter just a story of one religious or ethnic group attempting to blow its enemy out of the water; a case, simply put, of primordial antagonism? No doubt, there is some truth to this primordialist business, especially when that hatred has been nurtured over decades or centuries of conflict. When all is said and done, perhaps conflict really *is* a "clash of civilizations" (Huntington, 1993), the unfortunate corollary of some religious or ideological dogma. Perhaps anti-Semitism is a primordial urge, or racism just a primitive abhorrence of the Other, or the caste system a product of some primeval, intrinsic desire to segregate human beings. Or perhaps such sentiments arise across generations: after all, a parent's instrumentalism is often his child's primordialism.

[401]That is not to argue that individual instances of violence, such as (unorganized) homicide, rape or theft are unimportant, and indeed, some of the considerations discussed in this chapter potentially apply to individual violence as well. But social conflict has its own particularities; specifically, its need to appeal to and build on some form of group identity: religion, caste, kin, occupational, or economic class. In short, social conflict lives off both identity and alienation.

Yet stopping there prevents us from seeing a deeper common thread: that by creating and fostering divisive attitudes, there are gains to be had, and often those gains are economic. By following the economic trail, by asking *cui bono?*, we can get further insights into the origins of prejudice and violence that will — at the very least — supplement a non-economic understanding of conflict. Even the most horrific conflicts, ones that seem entirely motivated by religious or ethnic intolerance or hatred, have that undercurrent of economic gain or loss that flows along with the violence, sometimes obscured by the more gruesome aspects of that violence, but never entirely absent. From the great religious struggles of the past to the civil wars and ethnic conflicts we see today, we can see (if we look hard enough) a battle for resources or economic gain: oil, land, business opportunities, or political power (and political power is, in the end, a question of control over economic resources).

In this chapter and the next, we will examine the links between economic development and social conflict. Above all, we want to set up a simple framework for thinking about conflict, that will help us address and potentially answer interesting questions that link economics to conflict. Among other things, we are interested in the following questions:

1. How is economic prosperity (or its absence) related to conflict? Does economic progress dampen violence, or provoke it?

2. Is the main form of economic violence between the haves and the have-nots? Or is it between ethnic groups of roughly similar economic status? Is conflict born of economic similarity or difference?

3. Do "ethnic divisions" — broadly defined to include race, linguistic divisions, and religious difference — potentially drive conflict?

Within-Country Conflicts After World War II

Within-country conflicts account for an enormous share of deaths and hardship in the world today. Since World War II there have been 22 inter-state conflicts with more than 25 battle-related deaths per year; 9 of them have killed at least 1000 over the entire history of conflict (Gleditsch et al, 2002). The total number of attendant battle deaths in these conflicts is estimated to be around 3 to 8 million (Bethany and Gleditsch, 2005).

The very same period witnessed 240 civil conflicts with more than 25 battle-related deaths per year, and almost half of them killed more than 1000 (Gleditsch et al, 2002). Estimates of the total number of battle deaths are in the range of 5 to 10 million (Bethany and Gleditsch, 2005).

To the direct count of battle deaths one would do well to add the mass assassination of up to 25 million non-combatant civilians (Political Instability Task Force, http://eventdata.parusanalytics.com/data.dir/atrocities.html) and indirect deaths due to disease and malnutrition which have been estimated to be at least four times as high as violent deaths (Global Burden of Armed Violence, 2008), not to mention the forced displacements of sixty million individuals by 2015 (http://www.unhcr.org/558193896.html).[a]

In 2015 there were 29 ongoing conflicts that had killed 100 or more people in 2014, with cumulative deaths for many of them climbing into the tens of thousands.

Figure 25.1 depicts global trends in inter- and intra-state conflict.

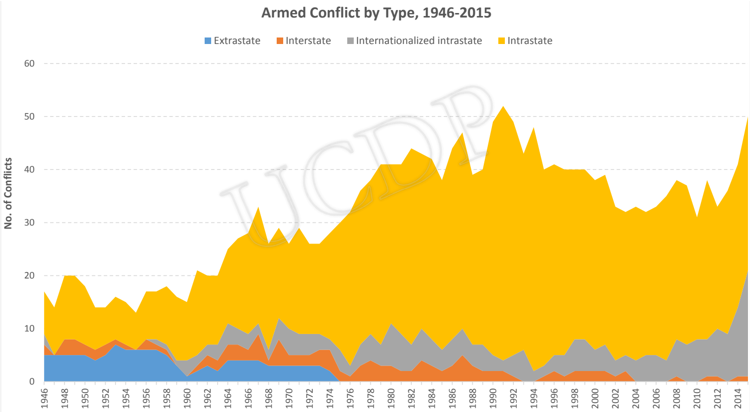

Figure 25.1. Armed Conflicts by Type. Conflicts include cases with at least twenty-five battle deaths in a single year. Source: Melander, Pettersson, and Themnér (2016).

[a]Such displacement also have a high cost in lives due to endemic sicknesses the newly settled population is not immune to (see Montalvo and Reynal-Querol (2007) and Cervellati and Sunde (2005)).

25.2. The Determinants of Conflict

We begin by setting up an extremely simple model that captures some of the essential features of a conflict. Economics will enter into it right from the start: both the gains from winning a conflict and the costs of engaging in it may depend on prevailing economic conditions.

25.2.1. Winning and Losing. Imagine a collection of groups engaged in conflict to seize a "prize." The prize may be something as concrete as oil revenues, land, or jobs. Or it could be somewhat more abstract, such as political power or religious dominance. We can think of one of the groups as a rebel group and another as the State that it fights, or it may be that all groups are non-State actors engaged in fighting one another (one of them possibly with the tacit or active support of the State). Later, we will return to these different interpretations, but for the sake of concreteness we think of all payoffs as money equivalents.

Our basic story is as stripped-down as we can make it. Assume there are just two groups of sizes N_1 and N_2, and that each group has a homogeneous collection of members. Each person in each group contributes "resources" (time, labor, money, organization) that go into the conflict. Then one group wins and the other loses, and the chances of these outcomes depend on the resources that went in. A bit more formally, let r_1 and r_2 be the *individual* contributions in groups 1 and 2.[402] Then the total resources devoted to the struggle are given by

$$R = r_1 N_1 + r_2 N_2,$$

and we will suppose that each group has a chance of winning that's proportional to the resources contributed by it. In other words, the probability that group 1 wins the

[402]We presume that every individual contributes equally. Later, we relax this assumption.

conflict is given by

$$p_1 = \frac{r_1 N_1}{R}, \tag{25.1}$$

and a similar description applies for group 2. Following a tradition initiated by Gordon Tullock and others (see, for instance, Tullock 1980 and Skaperdas 1996), these descriptions of the probability of success are known as *contest success functions*, and we can use them to obtain the expected payoff from conflict. Neglecting for a minute the cost of the contributions, the expected payoff per-capita to group 1 is

$$p_1 w_1 + (1 - p_1)\ell_1,$$

where w_1 is the per-capita payoff to group 1 if it *wins*, and ℓ_1 is the corresponding per-capita payoff if it *loses*, all denominated in money. These payoffs incorporate the differential spoils from victory and defeat, so that w_1 is obviously a bigger number than ℓ_1. If we define $\pi_1 = w_1 - \ell_1$ to be the *net* per-capita payoff from winning, we have

$$\text{Expected Per-Capita Payoff } = p_1\pi_1 + \ell_1 = \frac{r_1 N_1}{r_1 N_1 + r_2 N_2}\pi_1 + \ell_1. \tag{25.2}$$

Figure 25.2 depicts this expected payoff as it varies with the resources contributed by group 1. (To do this, we mentally hold fixed the per-capita contributions r_2 by members of group 2, but later we will consider both changes.) On the horizontal axis we have contributions r_1. The upper curve depicts the payoff to conflict, as described by equation (25.2). It is a concave function of r_1, with steadily diminishing marginal returns to contributions.[403] Now we describe the lower curve.

25.2.2. The Cost of Contributions. Contributions don't come for free, of course. The larger is the value of r_1, the greater the monetary cost imposed on the group as a whole. But just what is this cost? Our units of r are fixed by the functional form that we have imposed in equation (25.1), but we need to convert these to money-equivalent expenditures, the money value of what it takes to provide labor and non-labor inputs, as well as organization. It is all a production function after all, albeit a rather sinister one. For instance, if all conflict resources are just labor, then contributions are measured in units of labor time: e.g., hours spent in protesting, rioting, looting or lobbying. Then the *monetary* equivalent of r_1 is lost income that could have been earned by diverting that labor time to economically productive causes. So the total cost is $w_1 r_1$, where w_1 is the going wage rate for members of Group 1. That wage rate could itself rise as more resources are deployed to conflict, so the overall cost of resource expenditure will typically be convex, just as the expected benefit is concave. So we suppose that the individual cost of contributing an amount r in group 1 is given by a function $c_1(r)$, which is increasing and convex. (There is a similar function c_2 for group 2.) The lower curve in Figure 25.2 depicts this cost function.

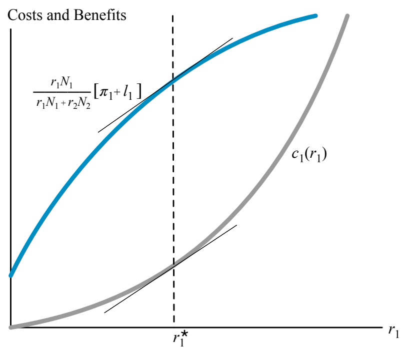

Figure 25.2. Costs and benefits of conflict.

[403]You can verify this by differentiating equation (25.2) with respect to r_1.

25.2.3. Net Payoffs and Group Behavior. Given the two functions describing payoffs and costs, it is easy enough to figure out the per-capita contributions r_1 by our group. Imagine that there is a group leader who acts in the interests of the group, and seeks to maximize the *net* expected per-capita payoff from conflict. Combining our two functions, that net payoff is given by

$$\frac{r_1 N_1}{r_1 N_1 + r_2 N_2}\pi_1 + \ell_1 - c_1(r_1), \tag{25.3}$$

which is graphically equal to the vertical distance between the two curves depicted in Figure 25.2. A rational group leader will therefore demand contributions from group members that maximize the vertical distance between the two curves, for that is where the *net* payoff is unambiguously highest. This gives rise to our usual mantra: set marginal benefit (from resource contributions) equal to marginal cost, as shown at the special point r_1^* in Figure 25.2.

25.3. Economic Change and Conflict

Our apparatus allows us to consider various economic forces that could bear on conflict. There are many, but some of them stand out as central.

25.3.1. The Prize Effect. Economic change could affect the size of the prize to be won in a conflict. The term w_1 may be affected by factors as diverse as oil revenues, the payoffs from seizing power, windfall gains to a rival, or policies such as trade liberalization. But ℓ_1 is affected by the same factors as well. So the effect on the *net* gain $w_1 - \ell_1$ can be quite nuanced. For instance, it may be that both w_1 and ℓ_1 are dampened by an economic shock (such as a recession), and yet the difference π_1 goes up. In principle, matters could go either way: economic growth could raise or lower the gains from conflict.

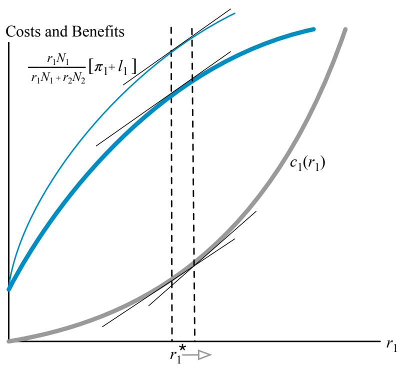

Figure 25.3. Change in the Prize.

If π_1 rises, the expected payoff curve rises and becomes steeper at every point. For the same cost function, the optimal resource contribution by group 1 must go up, as shown in Figure 25.3. For instance, more natural resources may divert the energies of different groups into wasteful conflict. Or economic growth may be conflict enhancing, if that growth is unevenly distributed across groups in society, or generates new sources of seizable revenue.

25.3.2. The Opportunity Cost Effect. This second channel works via economic changes that affect the *cost* of engaging in conflict. Think of allocating your time between productive work and conflictual activity. When the society is poor, your opportunity cost of engaging in conflict is lower. If economic growth raises your wages (and wages all around), the opportunity cost of conflict will go up: the higher payoffs from engaging in non-conflict activities will lower the incentive to enter into conflict.

Figure 25.4 displays this change. The cost function swivels upwards when the opportunity cost of engaging in conflict increases. That lowers the optimal contribution of resources by the group.

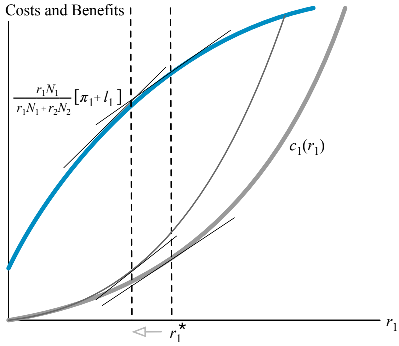

Figure 25.4. Change in costs.

As in the case of the prize effect, a variety of interpretations are possible and we should be sensitive to the details and subtleties of different cases. For instance, the arguments just given implicitly assume that conflict is principally carried out by individuals devoting *labor* to the struggle. But conflict resources are also provided in terms of *money* and not *time*. To the extent that this is true, the arguments are reversed. An increase in income can make it easier to make financial contributions, while at the same time, it increases the *labor*-denominated opportunity costs of directly engaging in conflict. The net effect can depend on the structure of the “conflict technology": that is, the extent to which it uses capital rather than labor. As an example: the United States is a rich country. It does not have a military draft. And yet, militarily, it is extremely active. If individuals pay for an active military out of financial contributions (taxes) then the costs of engaging in conflict can be far lower than if that payment is made by requisitioning labor from every household (the draft), particularly so when economic inequality is high. It is easier to look the other way when tax dollars go into conflict, rather than a young person from every household.

25.3.3. State Capacity and Conflict. So far we have said very little about the rival group that our group is up against. Presumably similar considerations apply to that entity as well. Our theory of conflict is not just one of optimization by a single group, but a story of the “equilibrium interaction" of several groups, as they all adjust their efforts and contributions in response to one another. We will study such models below.

For now, let’s put our rival group to a different use. I want to think of it not as any ordinary group, but as the State, so that the situation we’re considering is really a struggle between our Group 1 and a government that confronts it. So, think of r_2N_2 as *state capacity* (SC): the ability of the State to confront and contain unrest. A weak State will have a low effective value of SC, thus allowing an insurgent Group 1 to overpower it more easily. On the other hand, a large value of SC means that the State is extremely powerful to begin with, and can easily crush any opposition.

How does a change in state capacity affect our group’s willingness to conduct a conflict; that is, to expend per-capita resources r_1? Consult Figure 25.5 in what follows. The Figure shows three cases. In the first, depicted by the uppermost blue curve, SC (which is not directly shown) is tiny and the State is very weak. Then it is easy to see that the probability of success shoots up very quickly as our group increases its own efforts: success can come at a low price. In the second case, shown by the lowest blue curve, SC (again not shown) is huge, and the State is very strong. In this case, our group will need to expend an enormous quantity of resources to increase its win probability. *In both cases, the group fights very little, but for different reasons.* In the first, victory comes easily, and the State can be quickly overpowered: these are akin to bloodless coups. In the second case, victory is near-impossible, and our group gives up, expending little or no effort towards conflict. Both impotent and powerful States can look peaceful, but differently so. Therefore, Figure 25.5 shows the resources expended in these two extreme cases, r_h and r_ℓ, as close together.

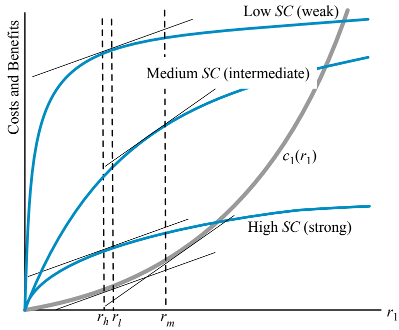

Figure 25.5. State capacity.

It is in intermediate situations, depicted by the payoff curve between the two extremes, that conflict can be maximal. An exercise problem will ask you to verify this with the help of a little bit of calculus. You will see that as SC goes up, the optimal choice of r_1 first rises (to r_m) and then falls back, as suggested by Figure 25.5. In short, in the intermediate case, the State is neither so weak that it can be easily overpowered, nor is it strong enough that victory is a pipe-dream. Then a group will fight hard to secure its victory, and that victory may well be a Pyrrhic one. Visible statistics will take particular note of such conflicts, so that States with intermediate capacity may well look the most conflictual.

25.4. More on Interactive Models of Conflict

So far we've talked about reactions by any one group to economic change. We can also study the reactions of both groups *as a simultaneous, interactive process*. We've seen such cases of strategic interaction before, and we know how to approach them using game theoretic methods (but see the Game Theory Appendix if you're feeling rusty). The story is subtle but with a bit of patience, not at all difficult to understand. Nevertheless, feel free to skip this section on a first reading.

25.4.1. An Interactive Solution Expressed as Two Equations. To begin with, recall our net payoff function for Group 1, summarized in the expression (25.3). Let's put some more structure on this payoff. First, we may as well focus on the net gains π_1, and set ℓ_1 to equal zero, as it has no impact on optimal choices. Second, we will suppose that r_1 has a quadratic payoff cost $(1/2)r_1^2$. This is a particularly simple cost function that captures the idea that the higher the effort required, the higher is the *marginal* cost of engaging in conflict. Putting these together, we have the more structured form for net payoff per person:

$$\frac{r_1 N_1}{r_1 N_1 + r_2 N_2}\pi_1 - (1/2)r_1^2, \tag{25.4}$$

and a similar expression applies to the rival Group 2:

$$\frac{r_2 N_2}{r_1 N_1 + r_2 N_2}\pi_2 - (1/2)r_2^2. \tag{25.5}$$

What follows needs a little bit of calculus, but it will be rewarding, so bear with me. Each group seeks to set its marginal benefit from conflict equal to marginal cost, and we are going to restate in terms of algebra exactly what we did in Figure 25.2:

$$\pi_1 \left[\frac{N_1}{N_1 r_1 + N_2 r_2} - \frac{N_1^2 r_1}{(N_1 r_1 + N_2 r_2)^2} \right] = r_1. \tag{25.6}$$

The left hand side of this equation is the marginal benefit from conflict (as you can easily see by differentiating the expected gross payoff $\frac{r_1 N_1}{r_1 N_1 + r_2 N_2} \pi_1$ with respect to r_1), while the right hand side is the marginal cost (as you can see once again by differentiating the marginal cost $(1/2) r_1^2$, again with respect to r_1). A little algebra applied to equation (25.6), and remembering that p_1 is given by equation (25.1), yields the convenient simplification

$$\pi_1 p_1 (1 - p_1) = \pi_1 p_1 p_2 = r_1^2 \tag{25.7}$$

(come on, try it, it isn't hard!), and an corresponding expression holds for Group 2:

$$\pi_2 p_2 p_1 = r_2^2. \tag{25.8}$$

Armed with these two equations, we can say quite a bit about group divisions and conflict. In what follows, we consider two kinds of prizes.

25.4.2. A Public Prize. Suppose that two groups are fighting over a *public prize*. The essential defining quality of such a prize is that the per-capita payoff to a group member is independent of the *size* of the group. When India wins (or loses) a cricket match, it isn't as if there is a fixed aggregate pool of joy (or sorrow) that is minutely shared by every Indian. It's the same per-capita feeling, no matter how many are sharing it.[404] More generally, law and order, a clean environment, or a free press are universal public goods that come readily to mind, and they apply to all, not just the members of a particular group. But in the particular context of a conflict, the examples are could be more group-specific: religious or cultural dominance, political control, primordial hatred for a rival, the provision of particular types of religious or discriminatory education, or economic protection by means of tariffs — or even, occasionally, cricket or soccer.[405]

For simplicity, suppose that the payoff is symmetric across the two groups, so $\pi_1 = \pi_2 = \pi$. Then equations (25.7) and (25.8) immediately tell us that $r_1 = r_2$. In particular, if we denote overall population by $N = N_1 + N_2$, then

$$p_1 = \frac{N_1}{N} \text{ and } p_2 = \frac{N_2}{N}, \tag{25.9}$$

so that win probabilities are exactly proportional to group population shares.

Go ahead and add it all up; then overall conflict R is given by $R = r_1 N_1 + r_2 N_2 = rN$, where r is the common per-capita expenditure of conflict resources. Using equation (25.7)–(25.9), we can easily solve out for the common value of r:

$$r = \sqrt{\pi p_1 p_2} = \sqrt{\pi \frac{N_1}{N} \frac{N_2}{N}} = \sqrt{\pi n_1 n_2},$$

where n_1 and n_2 are the population shares of the two groups; they add up to 1. Total conflict is therefore given by

$$R = N \sqrt{\pi n_1 n_2}. \tag{25.10}$$

[404] By the way, this also goes some way towards explaining why India, one of the poorest but most populous countries in the world, is *the* financial powerhouse in the world of cricket.

[405] Ryszard Kapuściński's 1991 book, *The Soccer War*, is an account of a conflict between Honduras and El Salvador, ignited in part by a soccer match between the two countries.

How does conflict change with the distribution of population across the two groups? Equation (25.10) yields the answer: it will generally be inverted-U shaped in the population share of any one group, rising and then falling as n_1 runs the gamut between 0 and 1 (while n_2 simultaneously runs the other way). Conflict is at a maximum when the two groups are fully polarized, with equal population strengths in each group.

To be sure, this highly symmetric outcome is the result of our assumption that the stakes on both sides are symmetric. If the prizes have asymmetric value, then conflict will not be maximal at equal population strengths, but at some other value of group share. Yet the inverted-U property will still persist. The same is true if conflict is across two groups with unequal financial power.[406]

The above relationship between conflict and group distribution holds only if there is ongoing conflict. It may be that both parties willingly desist from entering into conflict in the first place. To analyze such questions, it is imperative to have some notion of what peacetime payoffs look like.[407] The simplest way to approach this question is to suppose that under peace, each group is awarded an equal per-capita payoff; say by power-sharing or giving equal airtime (or none) to all religions and cultures. Because there is no expenditure on conflict resources under peace, the payoff is extremely simple: it is just equal to $\pi/2$ for all members of society. Meanwhile, we can easily predict the net expected payoffs to conflict: for group 1, say, they are given by

$$n_1\pi - (1/2)r_1^2 = \pi[n_1 - (1/2)n_1(1-n_1)]$$

where we're using the solution $r_1 = \sqrt{\pi n_1 n_2} = \sqrt{\pi n_1(1-n_1)}$. For Group 1 to willingly risk conflict, then, this expected payoff must exceed the peacetime payoff; that is, we must have

$$\pi[n_1 - (1/2)n_1(1-n_1)] > \pi/2,$$

which on simplification yields the condition

$$n_1 + n_1^2 > 1. \tag{25.11}$$

This is an intriguing condition. It is satisfied when the share of the first group is about 2/3 or larger. It is not satisfied at lower values because even though the stakes are higher — a full π rather than half of it — there are costs of conflict, and a group would anticipate some of those costs in deciding whether or not the struggle is worth it. Our analysis tells us that the net payoffs are higher under conflict only when a group is "large enough," and for two groups that threshold condition is approximately 65%.

The deduction that when the prize is public, larger groups are more likely to intimidate smaller groups, is an example of the *tyranny of the majority*, a phrase made famous by the writings of Alexis de Toqueville (1835). We've already seen this in the context of voting; we see that a similar outcome can hold under conflict as well. Indeed, in the introduction to his essay, "On Liberty," John Stuart Mill writes:

"Society ... practices a social tyranny more formidable than many kinds of political oppression ... Protection, therefore, against the tyranny of the magistrate is not enough; there needs protection also against the tyranny of the prevailing opinion and feeling,

[406]There is an even more subtle consideration when three or more groups are in conflict. *Even if* the groups are symmetric in their prizes and in their financial strengths, conflict will generally not be maximized when the population shares in all three groups are the same. Generally, maximal conflict will occur when *two* of the groups are big. This lies at the heart of an important issue that we will return to later.

[407]See Esteban and Ray (J Peace Research xx) and Mayoral and Ray (2015).

against the tendency of society to impose, by other means than civil penalties, its own ideas and practices as rules of conduct on those who dissent from them ..."

But matters are a bit different when the prize is private, as we shall now see.

25.4.3. A Private Prize. Change the nature of the prize: to an excludable, *private* good. To fix ideas, suppose that conflict is over the control of oil revenues, and that the spoils once seized will be divided among the members of the winning group. Fortunately for you (and me too, writing this), little changes in the description of the resulting equilibrium. The per-capita prize is still what it is — π_1 and π_2 — and the same equations (25.7) and (25.8), reproduced here for convenience, describe group behavior:

$$\pi_1 p_1 p_2 = r_1^2 \text{ and } \pi_2 p_2 p_1 = r_2^2. \tag{25.12}$$

But now, in contrast to the case of public goods, the per-capita value of the prize *will* change with group size, and we will need to take this into account. This leads to a slightly more involved analysis than the one in the previous section, but with a little patience we will have no problem in understanding it. Let's assume that there is a resource pool of size Π over which the conflict occurs. Then, remembering that the spoils are divided among the winners, we have $\pi_1 = \Pi/N_1$ and $\pi = \Pi/N_2$, and using this in equation (25.12), we must conclude that

$$(r_1/r_2) = \sqrt{N_2/N_1}. \tag{25.13}$$

This is a very interesting equation. Observe that it is quite distinct from the case of public goods, in which r_1 and r_2 were the same. Now they are different, but in a very specific way: *the smaller group fights harder in per-capita terms.*

We can use equation (25.13) to pin down the winning probability, say for group 1. Because of the different per-capita exertions that we've just chronicled, this probability is no longer the same as the population share. Recall that by assumption, the winning probability for a group is the share of resources contributed to conflict by that group, which is

$$p_1 = \frac{r_1 N_1}{r_1 N_1 + r_2 N_2}.$$

Using equation (25.13) and manipulating this expression just a bit, it is easy to see that

$$p_1 = \frac{N_1(r_1/r_2)}{N_1(r_1/r_2) + N_2} = \frac{\sqrt{n_1}}{\sqrt{n_1} + \sqrt{n_2}} = \frac{\sqrt{n_1}}{\sqrt{n_1} + \sqrt{1 - n_1}}, \tag{25.14}$$

where n_1 and n_2 are the population shares, just as before. This expression is different from the public goods case, where p_1 exactly equals population share n_1. Figure 25.6 depicts its shape as the population share of the group changes. The probability of success rises nonlinearly with group size. It is high relative to group size for small groups, and small relative to group size for large groups. (A little experimentation with a computer will convince you that p has the shape in the Figure.[408]) The extra boost for small groups comes from the fact that even though the *overall* prize is the same for the two groups, the *per-capita* value is higher for the smaller group, because the prize is divided across fewer people. For the same reason, large groups have less reason to fight, and their win probability, while higher, understates the group size.

[408] For instance, go to wolframalpha.com and ask it to plot p as a function of n_1 as in (25.14).

Just as in the case of public goods, we can study conflict intensity and conflict initiation. Recall Equation (25.10) for public goods conflict, reproduced here for convenient comparison:

$$R = N\sqrt{\pi n_1 n_2}. \tag{25.15}$$

This is inverted-U shaped in population distribution, and finds its maximum at equal population shares $n_1 = n_2$ over the two groups. Matters are similar under private goods conflict, but the derivation is slightly more complicated. Recall that $\pi_1 p_1 p_2 = r_1^2$, where $\pi_1 = \Pi/N_1$. It follows that

$$r_1^2 = \frac{\Pi}{N_1} p_1 p_2 = \frac{\Pi}{N_1} \frac{N_1 r_1}{R} \frac{N_2 r_2}{R} = \Pi \frac{r_1 r_2 N_2}{R^2},$$

and now remembering from Equation (25.13) that $r_1/r_2 = \sqrt{N_2}/\sqrt{N_1}$, and combining this with the formula above, we have

$$R^4 = \pi^2 n_1 n_2, \tag{25.16}$$

where π is defined to be Π/N, the society-wide average of the private resource. Under private goods conflict, the equilibrium amount of conflict is once again inverted-U shaped in the population distribution, though the specific argument needed to get to Equation (25.16) is somewhat different from its public goods counterpart (25.15). Both public goods conflict and private goods conflict appear to be maximized for symmetric population distributions. However, the next chapter will describe differences when three or more groups are involved.

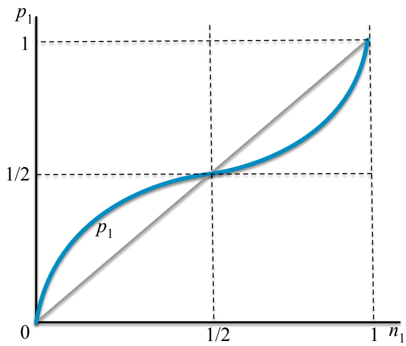

Figure 25.6. Win probability with private prize.

As with public goods, we can study conditions under which a group will initiate conflict. Once again, we look at equal payoffs in peacetime, so that each individual gets the same (gross and net) payoff $\pi = \Pi/N$. So Group 1 will want to initiate conflict if

$$p_1\pi_1 - (1/2)r_1^2 = p_1\pi_1 - (1/2)\pi_1 p_1 p_2 \pi_1 = (1/2)\pi_1\left[p_1 + p_1^2\right] > \pi,$$

where we are substituting out for r_1 using equation (25.12). Because $\pi_1 = \Pi/N_1$ and $\pi = \Pi/N$, this last inequality tells us that the required condition for conflict is just

$$\frac{p_1 + p_1^2}{2} > \frac{N_1}{N} = n_1. \tag{25.17}$$

Equation (25.17) is a slightly tougher nut to crack than the corresponding condition (25.11) for the public goods case, but crack it we shall. Figure 25.7 plots n_1 on the horizontal axis as it ranges between 0 and 1. It plots p_1 exactly as in Figure 25.6, as well as its square p_1^2, as functions of n_1. The function p_1^2 is smaller than p_1 for values between 0 and 1, and so is pushed down relative to p_1. These are the two thin curves. The Figure then displays the average of p_1 and p_1^2, just as the left-hand side of equation (25.17) wants us to do; this is the thick curve. Equation (25.17) informs us that a group will want to initiate conflict if this thick curve lies above the 45^0 line, also helpfully shown in the Figure. It is immediate that conflict will be preferable to peace for group sizes below some threshold $n_1^* < 1/2$. With private prizes, *smaller groups are more likely to initiate conflict than larger groups*.

This is a reversal from the public goods case, in which *larger* groups were more interested in initiating conflict. It isn't that smaller groups are necessarily more likely to win; we've already seen that they are not (scan Figure 25.6 again). It is that they are more likely to win *relative to their population shares*, and this is what causes them to throw their hat into the conflict ring.[409] Vilfredo Pareto (1927) and Mancur Olson (1965) both studied this phenomenon. In contrast to the tyranny of the majority, the Pareto-Olson thesis argues that small groups may be more effective than large groups. In the words of Pareto (1927, p. 379), who was remarking on protectionist tendencies in trade,

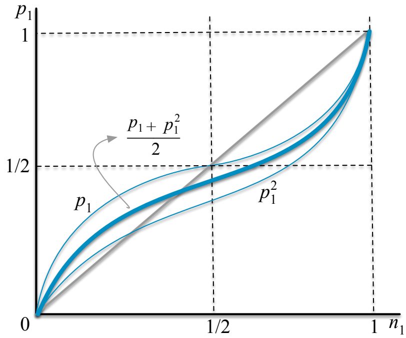

Figure 25.7. Small groups initiate private goods conflict.

> "[A] protectionist measure provides large benefits to a small number of people, and causes a very great number of consumers a slight loss. This circumstance makes it easier to put a protection measure into practice."

It is clear that this argument fundamentally depends on the presumption that the prize is an excludable private good, so that group size erodes per-capita payoffs.[410] In this section, we've shown carefully that the same intuition works for situations of conflict. The bottom line is I want you to appreciate the sharp contrast in group incentives when a public prize is at stake, as opposed to a private prize. The tyranny of the majority applies to the former, and the Pareto-Olson thesis applies to the latter.

These are examples of the testable implications that can be gleaned even from a model as simple and stripped-down as this one. Now it's time to look at the data with the new glasses our theory gives us.

[409]Without wishing to unnecessarily complicate matters, but in the hope of carrying my more careful readers, I should sound a note of caution here. The analysis above assumes that there are no fixed costs to entering into conflict. If there are, very tiny groups will not entertain violent ambitions simply because the entry ticket is too expensive. Think of the analysis above applying only to groups that pass that entry ticket threshold.

[410]This point has been noted in various settings by Chamberlin (1974), McGuire (1974), Marwell and Oliver (1993), Oliver and Marwell (1988), Sandler (1992), Taylor (1987), Esteban and Ray (2001, 2011), and Mayoral and Ray (2015). xx add, change?