2007), risk-seeking preferences and increasing returns to production (Skaperdas 2006), and an intertemporal incentive to weaken or eliminate a rival (Garfinkel and Skaperdas 2000a, 2007).

As noted in the chapter's opening, Hirshleifer's model is broadly consistent with the bargaining theory of war in the political science literature. For literature reviews, see Powell (2002) and Reiter (2003). Particularly instructive are the costly lottery models of war found in Fearon (1995) and Powell (2006). For a game-theoretic discussion of commitment problems, see chapter 10 of Dixit and Skeath (2004). For formal conflict-settlement protocols, see Isard and Smith (1982), Raiffa (1982), Brams and Taylor (1996), and Garfinkel and Skaperdas (2007, pp. 667–682). Models of third-party intervention include Amegashie and Kutsoati (2007) and Chang, Potter, and Sanders (2007).

6

Conflict between States*

For millennia, philosophers and sages have pondered the origins and horrors of war. Despite this long history of inquiry, it is only in the last century that scholars from political science, economics, and other disciplines have attempted to use the quantitative methods of social science to study the causes and effects of war. Building on the early work of Lewis Richardson, Pitirim Sorokin, and Quincy Wright, the social scientific study of war was well established by the mid-1960s around a community of scholars associated with the Correlates of War Project, the Peace Science Society (originally, Peace Research Society), the *Journal of Conflict Resolution*, and the like. Since then, a wealth of social scientific studies of war has appeared in journals and books across the various disciplines (Singer 2000, Anderton and Carter 2007). In this chapter we focus on armed conflict between states, before we turn to civil war in Chapter 7.

6.1. The Conflict Cycle

Conflicts typically pass through phases, as shown by Lund's (1996) life-cycle diagram in Figure 6.1, which plots the level of conflict between parties across time. The conflict in question may be interstate as covered in this chapter, intrastate as in Chapter 7, or extra-state as in Chapter 8. The bell-shaped curve represents the course of a typical conflict as hostility rises and falls over time. The vertical axis marks levels of conflict beginning with durable peace and rising successively to stable peace, unstable peace, crisis,

* The introductory paragraph, sections 6.1 and 6.2, and parts of section 6.4 of this chapter are adapted from Charles H. Anderton and John R. Carter, "A Survey of Peace Economics," published in *Handbook of Defense Economics*, volume 2, edited by Todd Sandler and Keith Hartley, pp. 1211–1258, Copyright © Elsevier 2007. We gratefully acknowledge Elsevier's permission to republish material from the article.

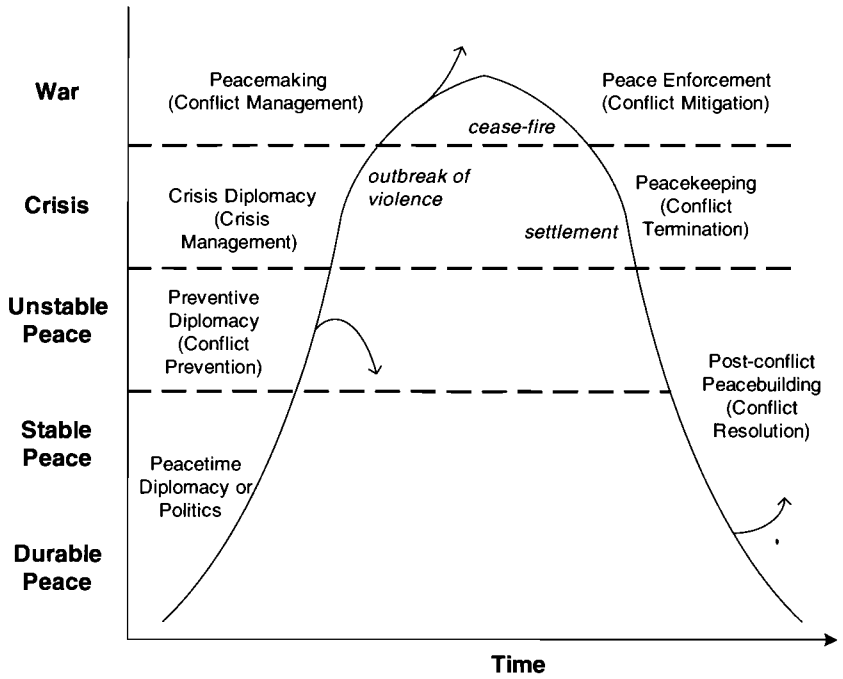


Figure 6.1. Lund's conflict life cycle (adapted from Lund 1996, p. 386).

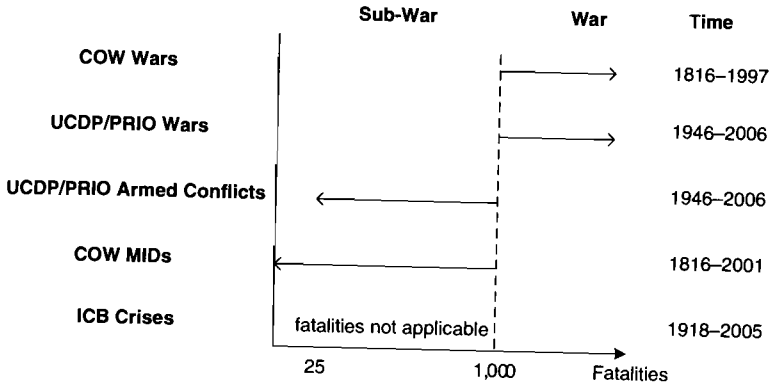
and war. Around the outside of the curve are terms used for third-party interventions at various stages of a conflict. The "P series" (preventive diplomacy, peacemaking, etc.) is typically used in discussions associated with the United Nations, and the "C series" (conflict prevention, conflict management, etc.) is used in the scholarly literature (Lund 1996, p. 385). The arrows along the curve show that wars can be prevented, can escalate, or can recur.

Here and in Chapter 7 we focus on the upper portion of the conflict cycle corresponding to crises and wars. Among the empirical aspects of crises and wars are four that we highlight: frequency, seriousness, onset, and termination. The frequency of interstate crises and wars refers to the number of conflicts per time period. The seriousness of conflict includes duration (represented by the width of the upper portion of the bell), severity (casualties), and intensity (casualties per unit time). Moving initially upward along the conflict-cycle curve, we would like to know the risk factors for the onset of crises and wars. Moving down the curve to the right, we are interested in elements that contribute to war termination.

6.2. Patterns of Armed Interstate Conflict

Prominent Datasets

Figure 6.2 summarizes five well-known interstate conflict datasets. The first is the Correlates of War (COW) Project's data for interstate wars. The second and third datasets are provided jointly by the Uppsala Conflict Data Program (UCDP) and the International Peace Research Institute, Oslo (PRIO) for interstate wars and other interstate armed conflicts. The fourth is COW's dataset for militarized interstate disputes (MIDs). The fifth is the



Correlates of War (COW) Wars:
Interstate war – combat between states involving a minimum of 1,000 battle deaths (military only) for the whole war among all states involved (Sarkees 2000).

Uppsala Conflict Data Program/International Peace Research Institute, Oslo (UCDP/PRIO) Wars:
Interstate war – combat between states leading to a minimum of 1,000 battle-related deaths (military and civilian) per year among all states involved (Gleditsch et al. 2002, UCDP/PRIO Codebook Version 4–2006).

Uppsala Conflict Data Program/International Peace Research Institute, Oslo (UCDP/PRIO) Armed Conflicts:
Armed conflict – Apply UCDP/PRIO's interstate war definition, but with battle-related deaths (military and civilian) of between 25 and 999 (Gleditsch et al. 2002, UCDP/PRIO Codebook Version 4–2006).

COW Militarized Interstate Disputes (MIDs):
Militarized interstate dispute – united historical case in which the "threat, display or use of military force short of war by one member state is explicitly directed towards the government, official representatives, official forces, property, or territory of another state" (Jones, Bremer, and Singer 1996, p. 168).

International Crisis Behavior (ICB) Crises:
Interstate crisis – a state's foreign policy leaders perceive a threat to basic values, a finite time for response, and a heightened probability of military hostilities (International Crisis Behavior Project at www.cidcm.umd.edu/icb).

Figure 6.2. Selected interstate conflict datasets.

International Crisis Behavior (ICB) Project's dataset on interstate crises. As shown in the upper portion of the figure, both COW and UCDP/PRIO recognize fatalities of 1,000 as a threshold for interstate war. For interstate conflicts short of war, COW counts fatalities from zero to 999, UCDP/PRIO covers fatalities between 25 and 999, and ICB does not apply any fatalities criterion. The time periods vary among the datasets: 1816–1997 for COW Wars, 1946–2006 for UCDP/PRIO Wars and Armed Conflicts, 1816–2001 for COW MIDs, and 1918–2005 for ICB Crises.

Further points of contrast among the datasets are discovered in the definitions in the lower portion of Figure 6.2. Notice that the datasets vary according to whether fatalities are counted per year or in total and whether those fatalities include both military and civilian deaths. Differences in definitions and other coding practices are important because they can lead to differences in the classification of specific conflicts. For example, the conflict between Chad and Libya in 1987 over the Aozou Strip is counted as an interstate war by UCDP/PRIO but not by COW. Important differences also exist between ICB and COW categorizations of sub-wars. One key difference is that classification as a COW MID requires a threat, display, or use of military force, whereas classification as an ICB crisis does not. Another is that an ICB crisis depends on what a state's leaders perceive or intend, whereas a COW MID can reflect decisions of subordinate personnel (e.g., an accidental or unauthorized threat, display, or use of force). These differences in classification result in substantial differences in coverage. For the period 1918–92, Hewitt (2003) identified 756 crisis dyads from ICB and 2,155 dispute dyads from COW. Of these, 501 conflicts were common to both datasets. At the same time, however, 255 (34%) of the crisis dyads did not show up as disputes, and 1,654 (77%) of the disputes did not count as crises.

Measures of Interstate Conflict

In what follows, we use data for MIDs and interstate wars to highlight the frequency and other empirical aspects of interstate conflict associated with the upper portion of the conflict life cycle. Before doing so, we need to emphasize two points about MIDs. First, according to COW definitions, a MID is not a war. The threat, display, and use of military force represent three sub-war categories in the MID definition. When a MID reaches a point where military combat is sufficiently sustained that it will lead to at least 1,000 total battle deaths, then COW reclassifies the MID as an interstate war (Jones, Bremer, and Singer 1996, p. 168). Second, some scholars depart from COW definitions by treating the *use* of military force between states as interstate war even though battle deaths are fewer than the 1,000 threshold. For example, the 1995 border conflict between Ecuador and Peru (known as the Cenepa War) totaled fewer than 1,000 battle deaths, but it is characterized as a war in some scholarly publications. Hence, MIDs involving the use of military force might be viewed as wars even though this is not COW's practice.

Figure 6.3 shows the number of new MIDs, called MID onsets, that occurred in the international system during five-year periods from 1816 through 2000. Figure 6.3 also shows the number of MID onsets that involved the use of military force (labeled MIDs-Use-Force) and the number of MID onsets that eventually rose to the level of interstate war (labeled MIDs-to-War). On the horizontal axis are indicated certain time periods identified as important by historians of international relations (Gochman and Maoz 1990, p. 198). Three facts stand out in the time series. First, the twentieth century witnessed considerably more MID onsets than did the nineteenth century. There were 2,297 MID onsets between 1816 and 2000, of which 1,986 (87%) occurred in the twentieth century (1900–99). Second, a high percentage of MIDs involved the use of military force, although this varies substantially by historical period. For the entire period 1816–2000, 1,645 MID onsets (72%) involved military force. During the Bismarkian era (1871–90), 36 of 85 MID onsets (42%) involved military force, whereas 904 of 1,173 MID onsets (77%) involved force during the Cold War (1946–89). Third, the percentage of MIDs that crossed COW's threshold for war is very small. Of the 2,297 MIDs that arose in the period 1816–2000, only 106 (4.6%) escalated to war.

Table 6.1 presents various measures of the seriousness of interstate wars, as distinct from MIDS, from 1816 to 2006. The table reveals that the average duration of interstate war was highest during the Interwar and World War II era (1919–45) followed by the Cold War era (1946–89). The severity in terms of deaths per war was greatest during the Interwar and World War II era followed by the Age of Imperialism (1891–1918). These two periods also had the highest average intensity, with the more severe being the Age of Imperialism.

6.3. Hirshleifer's Bargaining Model and Interstate War

Hirshleifer's bargaining model of conflict, introduced in Chapter 5, provides a useful framework for thinking about various aspects of interstate war. Recall in the model that a disputed resource is to be divided between two players *A* and *B*, here nation-states assumed to be unitary actors with

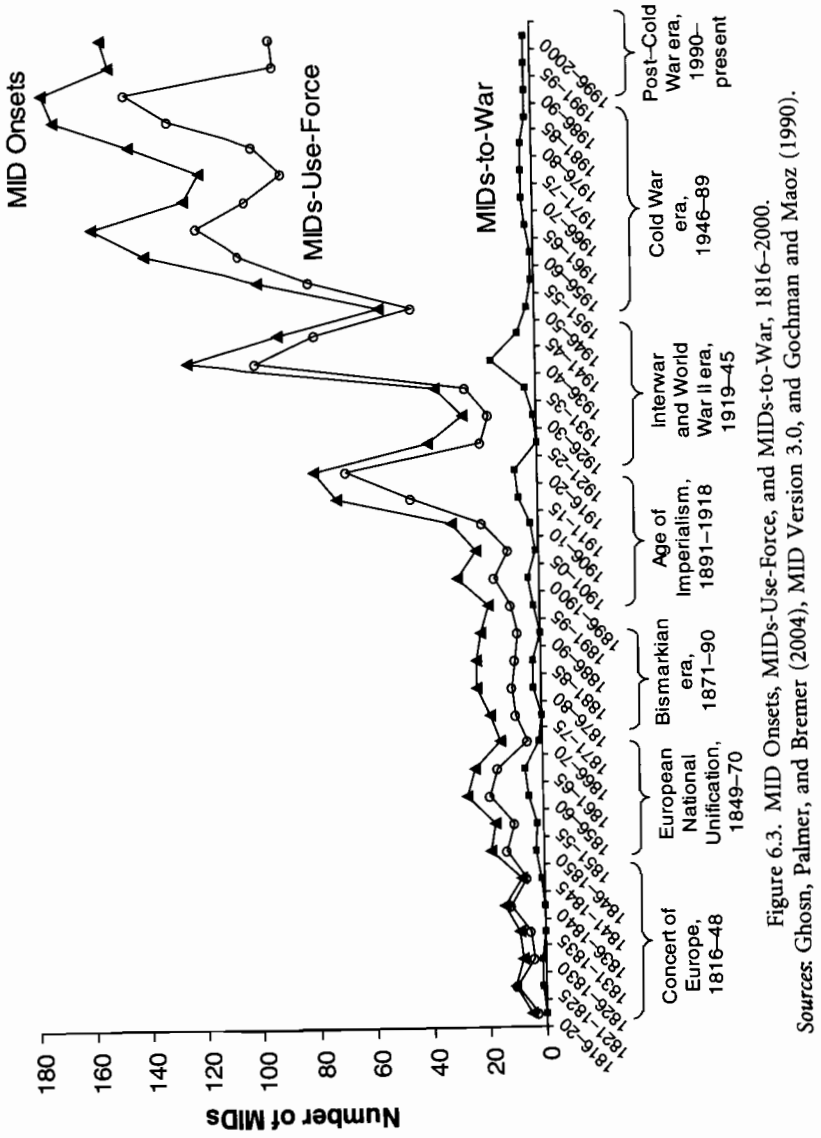


Figure 6.3. MID Onsets, MIDs-Use-Force, and MIDs-to-War, 1816–2000.
Sources: Ghosn, Palmer, and Bremer (2004), MID Version 3.0, and Gochman and Maoz (1990).

Table 6.1. *Interstate war duration, severity, and intensity, 1816–2006.*

Historical Period	Interstate War Onsets	Average Duration (days per war)	Average Severity (deaths per war)	Average Intensity (deaths per day)
Concert of Europe (1816–48)	5	350.0	32,762	93.6
European National Unification (1849–70)	15	392.3	59,301	151.1
Bismarkian era (1871–90)	6	406.0	53,055	130.7
Age of Imperialism (1891–1918)	14	265.7	638,075	2,401.5
Interwar and WW II era (1919–45)	16	557.0	1,132,556	2,033.3
Cold War era (1946–89)	22	490.0	150,333	306.8
Post–Cold War era (1990–2006)	3	395.3	26,390	66.8
1816–2006	81	428.0	392,742	917.6

Note: Franco-Prussian War ends in 1871.
Sources: Sarkees (2000), COW War Data Version 3.0 for 1820–1989 data; Uppsala Conflict Data Program (UCDP) and International Peace Research Institute, Oslo (PRIO) Armed Conflict Dataset v4–2007, Gleditsch et al. (2002), International Peace Research Institute, Oslo (PRIO) Battle Deaths Dataset Version 2.0, and Lacina and Gleditsch (2005) for 1990–2006 data.

egoistic preferences. The players divert secure resources into armaments and then divide the disputed resource through war or settlement. For simplicity it is assumed that each player's armaments are the same whether war or settlement is anticipated. If the players go to war, a portion of the disputed resource is destroyed, with the surviving portion divided between the players based on their comparative arms and military technologies. If they settle, the full amount of the disputed resource is divided by agreement, with the agreement enforced by the threat of war. After war or settlement, the players generate incomes from their final resources, which consist of their secure resources net of arms plus their share of the disputed resource net of any destruction. Settlement occurs if at least one player is better off and neither is worse off than would be expected under war. We highlight three implications that follow from the model.

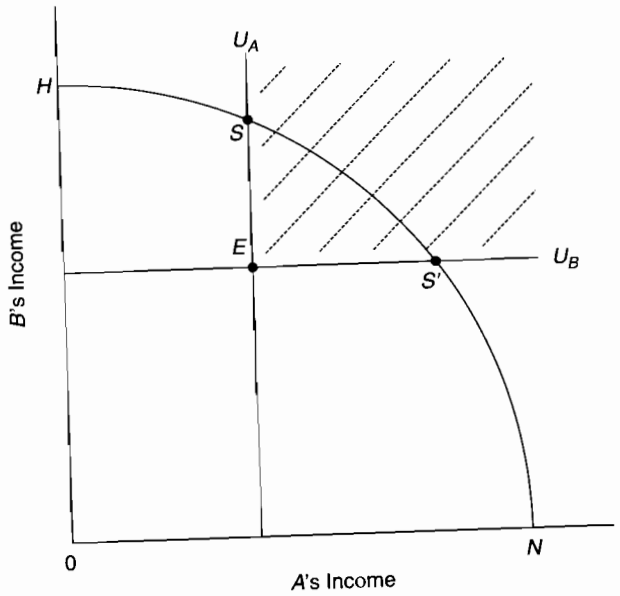


Figure 6.4. Bargaining model with complete information and no commitment problems (adapted from Hirshleifer 1995, p. 172).

First, given complete information and the absence of commitment problems, peaceful settlement rather than war is predicted. In Figure 6.4, suppose that if war occurs, both players expect the distribution of income to occur at point *E*. If the disputed resource is divided peacefully, alternative income distributions are possible, as shown by the settlement opportunity curve *HN*. Because potential settlements between points *S* and *S'* along the opportunity curve offer gains to both players relative to point *E*, peaceful settlement is predicted. The intuition is straightforward: the avoidance of the destructive costs of war provides a peace dividend that can be translated into mutual gains, thus leading the players to settle.

Second, again given complete information and the absence of commitment problems, relative power and the costs of war will influence the terms of settlement but not its occurrence. This follows immediately as a corollary of the first implication. If in Figure 6.4 there occurs a change in relative power or costs, a new conflict point and settlement-opportunity curve will be generated. However, as long as war remains destructive and hence costly, the new conflict point will lie inside the new opportunity curve. Thus, while the range of mutually advantageous settlements will be different, the prediction nonetheless will be for settlement rather than war.

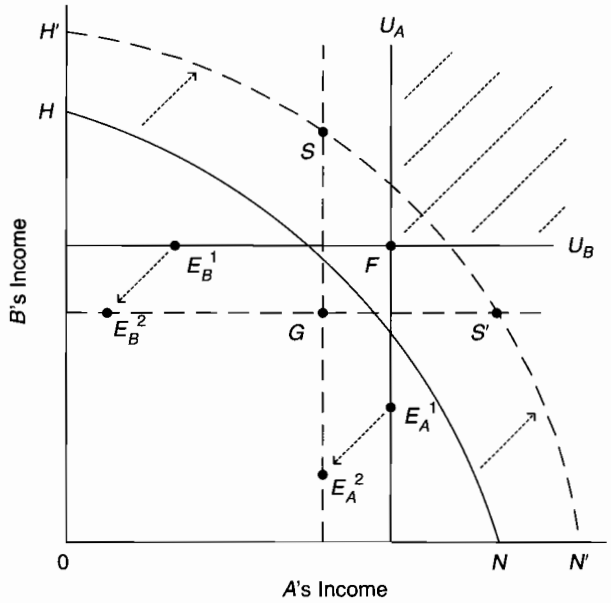


Figure 6.5. Bargaining model with incomplete information and increased cost of war.

Third, given incomplete information or potential commitment problems, relative power and the costs of war will influence not just the terms of any settlement but also whether the predicted outcome will be settlement or war. Here we illustrate the proposition for an increase in cost when there is incomplete information. Other more intricate cases are possible involving relative power and potential commitment problems.

In Figure 6.5, suppose both players have common knowledge of the destructiveness of war but incomplete information about their relative powers. Contrast now two scenarios. In the first, player *A* expects the outcome of war to be at point E_A^1, while player *B* expects it to be at E_B^1. As a consequence, the highlighted region of mutual gain forms to the northeast of point *F*. Because this region lies entirely outside of the settlement-opportunity curve *HN*, war is the predicted outcome. In the second scenario, suppose that the destructiveness and hence the cost of war is greater. The higher cost has two effects in Figure 6.5. First, increased destructiveness decreases postwar incomes and thus moves the respective conflict points inward to points like E_A^2 and E_B^2. Second, because of the decreased payoffs to war, players divert fewer secure resources into armaments; this

in turn translates into larger postsettlement incomes, thus moving the settlement-opportunity curve outward to a curve like $H'N'$. The combined effect of the higher cost of war is a much-expanded region of mutual gain that forms to the northeast of point G. Because in this scenario the opportunity curve intersects the region of mutual gain, a peaceful outcome is predicted somewhere along $H'N'$ between points S and S'. Thus, in the presence of incomplete information, a higher cost of war can make peaceful settlement more likely.

6.4. Selected Empirical Studies of Interstate Conflict

Risk Factors for Interstate Armed Conflict

A vast empirical literature on the determinants of interstate armed conflict has appeared in recent decades, pushed by continued advancements in data, computing power, and statistical methods. The objective of most studies is to estimate the likelihood of armed conflict by applying regression techniques to pooled time-series data for countries (called monads) or for country-pairs (called dyads). Depending on the particular hypotheses, the studies typically focus on one or two explanatory variables, while including other possible factors for control purposes. Based on Hirshleifer's bargaining model, factors that foster incomplete information and commitment problems can be expected to increase the risk of armed conflict. Also, to the extent that incomplete information and potential commitment problems characterize the international system, variables that affect relative power and the costs of war should be relevant. Here we sample the risk-factor literature by briefly surveying a few studies that focus on territory, economic interdependence, and economic development. Along the way we make note of important political and military capability variables that are also considered.

Territory

Throughout history, issues of territory have played a prominent role in interstate conflict. Contemporary examples of territorial conflict include the Spratly Islands (involving China, the Philippines, Vietnam, Taiwan, Malaysia, and Brunei), the Golan Heights (Israel and Syria), and Kashmir (India and Pakistan). Disputes can be over land borders (e.g., Ecuador and Peru), maritime boundaries (e.g., Australia and East Timor), or access to resources like oil and minerals (e.g., Chad and Libya over uranium deposits in the Aozou Strip). Under the broad heading of territory we include not only issues of boundaries and natural resources but also geographic considerations of proximity and contiguity.

As noted by Fearon (1995), the control of territory often has high strategic and/or economic advantage that translates into future military power. For this reason, bargaining concessions involving territory can cause an anticipated shift in relative power, giving the recipient state an incentive to renege on an agreement at a future date by exploiting its strengthened position. Consequently, a territorial dispute can generate a serious commitment problem, possibly leading to preventive war. In this way, the risk of armed conflict can be expected to be higher for territorial disputes than for nonterritorial disputes, other things equal. Proximity and contiguity can likewise increase the risk of armed conflict. States that are closer to each other have an easier time projecting military power against each other. Thus, as will be explored more fully in Chapter 9, the closer two countries are to each other geographically, the lower is the cost of their fighting one another, and hence the greater is the risk of armed conflict between them. Furthermore, proximity can increase the ability of a state to surprise its rival with a devastating first strike. Thus, states that are closer to one another, and especially those that are contiguous, are more likely to face the sort of commitment problem that favors preemptive war. As a practical matter, contiguous countries might be more apt to find themselves in disputes because of the frequency and multiplicity of their interactions (Bremer 2000). At the same time, proximity and contiguity can facilitate bilateral trade, which might reduce the risk of conflict, as suggested by the liberal peace hypothesis introduced in Chapter 3 and discussed further in the next subsection.

According to Hensel (2000, p. 78), a "substantial body of empirical evidence . . . finds a close relationship between conflict behavior and such geographic factors as contiguity and territorial issues." Senese's (2005) study of the risks of MID onset and escalation to war provides a good example of evidence supportive of Hensel's statement. The sample spans the period 1919–95 and includes almost a half million observations, where an observation is a dyad-year, meaning a pair of countries in a single year. Each observation is coded as to whether the dyad experienced a MID onset in that year; each MID onset in turn is coded as to whether the dispute escalated to war. Thus, there are two dependent variables, one indicating MID onset and the other war onset. The key risk assessment variables include an indicator for whether countries within a dyad were contiguous, another indicator for whether a territorial disagreement existed between them, and the interaction of the two indicators. Control variables used by

Senese include measures of alliance, democracy, major power status, economic development, and relative capability.

Senese's (2005, p. 777) statistical results show that both contiguity and territorial disagreement between states increase the risk of MID onset. The probability of a MID onset during a given year is estimated to increase from 0.001 for a noncontiguous dyad with no territorial disagreement to 0.038 for a contiguous dyad with territorial disagreement. The results pertaining to war onset are similar for territory, but not for contiguity. Senese finds clearly that a territorial dispute increases the risk that a MID will escalate to war. In particular, the estimated impact of a territorial dispute increases the probability of war onset from 0.030 to 0.282 for noncontiguous dyads and from 0.020 to 0.094 for contiguous dyads. Surprisingly, contiguity is estimated to decrease the probability of MIDs' escalating to war. According to Senese, a territorial MID without a shared border might imply a greater difficulty of resolving such a dispute by a means short of war. Another possibility is that the effect of contiguity might be underestimated owing to the omission of a dyadic trade variable, which could be positively correlated with contiguity but negatively correlated with armed conflict.

Economic Interdependence

In Chapter 3 we introduced the liberal peace hypothesis, according to which trade partners are less likely to engage in armed conflict against each other, other things equal. One rationale for the hypothesis is that trading nations face higher opportunity costs of war because of the economic gains they stand to forgo when war disrupts trade between them. Other rationales have been proposed, including reduction in misinformation and promotion of shared values or of trust between trading partners (Gartzke, Li, and Boehmer 2001, Reed 2003, Bearce and Omori 2005). Evidence relevant to the liberal peace hypothesis in the context of interstate conflict is provided by Russett and Oneal (2001) and Martin, Mayer, and Thoenig (2008). The studies are similar inasmuch as both find that bilateral trade openness reduces the likelihood of armed conflict between trade partners, everything else the same. The studies differ, however, in their conclusions about the effect of multilateral trade openness on the risk of conflict.

Russett and Oneal (2001) test the liberal peace hypothesis for a large sample of about 40,000 dyad-years. Their sample spans most years between 1886 and 1992 but is restricted to what Russett and Oneal term politically relevant dyads, which are dyads that were contiguous or contained at least one major power. Conflict is measured by a variable indicating whether the

two countries in a dyad were involved in a militarized interstate dispute (MID) during the given year. For each country in a dyad, bilateral economic interdependence is gauged by how much the country traded with its partner relative to its GDP. The country in the dyad with the lower trade dependence is considered the weak link, so its dependence is treated as determinant of the likelihood of militarized disputes. Based on the liberal peace hypothesis, Russett and Oneal expect that bilateral interdependence lowers the risk of a militarized dispute. Russett and Oneal (2001, p. 137) note that if countries in a dyad also engage in multilateral trade, then bilateral disputes can disrupt trade with third countries, further raising the opportunity cost of bilateral conflict. Thus, Russett and Oneal hypothesize that multilateral trade openness, measured by a country's total trade relative to its GDP, also reduces the risk of interstate conflict. For control purposes, Russett and Oneal include variables for contiguity, distance between the countries, minor power status, shared alliances, shared intergovernmental organizations, democracy, and relative power.

Based on their statistical analysis, Russett and Oneal conclude that interstate trade has an important effect in reducing the risk of armed conflict. In their central results, Russett and Oneal (2001, p. 171) estimate the probability of MID involvement to be about 0.03 for the typical dyad-year. From this baseline they calculate that if bilateral trade dependence increases by one standard deviation above the sample mean, the risk of MID involvement falls to 0.017, or by 43 percent. Russett and Oneal (2001, p. 148) also report that when both trade dependence and multilateral trade openness are considered, each makes a substantial and independent contribution to reducing the risk of a MID. In response to certain methodological challenges, Oneal and Russett (2003a, 2003b) report additional estimates for the pacific effect of trade based on alternative approaches. These estimates of the risk reduction due to trade tend to lie in the range of 20 to 40 percent, and they rise to about 60 percent when the conflict variable is changed from MID involvement to MID onset with fatalities. Although we focus here on economic interdependence, Russett and Oneal also report empirical evidence of the pacific effects of democracy and intergovernmental organizations. Hence, Russett and Oneal (2001, p. 29) interpret their results as strongly supportive of a Kantian vision wherein peace stands on the three-part foundation of economic interdependence, democracy, and international law and organization.

To test the pacific effect of trade, Martin et al. (2008) begin with a bargaining model of war with asymmetric information. They then introduce a trade model that allows for differentiated products and also

multiple trade partners with varying distances among them. From the combined models the authors derive their first hypothesis, which states that, because of the opportunity cost of forgone gains, when two countries trade more, they are less likely to fight each other. Martin, Mayer, and Thoenig go on to consider the effects of multilateral trade openness on the risk of bilateral conflict, and on this issue their theory is intriguing. If bilateral conflict does not disrupt trade with third parties too much, then a country with high multilateral trade openness may have a relatively low opportunity cost of bilateral conflict. The intuition for this result is that a country with high multilateral trade openness will have ample opportunity to offset forgone bilateral gains by trading elsewhere, thus lowering the opportunity cost of bilateral conflict. Hence, Martin, Mayer, and Thoenig's second hypothesis is that an increase in multilateral trade openness increases the risk of bilateral conflict.

Martin, Mayer, and Thoenig test their hypotheses for a sample of more than 500,000 observations, where each observation is a dyad-year. The sample spans the years between 1950 and 2000 and includes all dyads for which data are available. Conflict is measured by a variable indicating whether the two countries in a dyad were involved in a MID during the given year that involved the display of force or the use of force, or that crossed the threshold into war. For each dyad, bilateral trade openness is measured by the arithmetic average of each country's bilateral imports relative to its GDP. To measure multilateral trade openness, the authors use the arithmetic average of total imports of the two countries in the dyad, excluding their bilateral imports, divided by their GDPs. Control variables include contiguity, distance between the countries, number of peaceful years since the last MID, similarity of language, shared military alliance, UN voting correlation, and democracy.

Based on their statistical analysis, Martin, Mayer, and Thoenig conclude that the risk of bilateral interstate conflict falls with greater bilateral trade openness but rises with greater multilateral trade openness. For dyads with a bilateral distance of less than 1,000 km, the average risk of interstate conflict is 0.045 in 2000. From this baseline, Martin, Mayer, and Thoenig find that if bilateral trade openness declined to the level that prevailed in 1970, the risk of interstate conflict would rise to 0.048. For multilateral trade openness, a return to the lower level that prevailed in 1970 would reduce the risk of interstate conflict to 0.034. On net, Martin, Mayer, and Thoenig suggest that the increase in bilateral and multilateral trade openness that occurred between 1970 and 2000 increased the risk of interstate conflict for proximate countries from 0.037 to 0.045. The authors also report that the bilateral and multilateral trade effects on interstate conflict are much smaller for less proximate countries.

Note that Russett and Oneal (2001) and Martin et al. (2008) find that bilateral trade openness reduces the risk of interstate conflict, but they reach opposite conclusions on the effects of multilateral trade openness. Possible explanations of the discrepancy between the two studies include their use of different statistical methods, different samples (politically relevant dyads vs. all dyads), different sample periods (1886–1992 vs. 1950–2000), and different measures of conflict (MIDs vs. higher-level MIDs) and of bilateral and multilateral trade openness (weak link vs. arithmetic average). Discrepant results in social scientific studies of conflict are, of course, quite common. One of the benefits of cumulative social scientific inquiry is that both common and discrepant results emerge. The former tend to increase confidence in the results, whereas the latter tend to spur new research designed to better understand phenomena.

Economic Development

In Book V, Chapter 1 of the *Wealth of Nations*, Adam Smith (1776) provided a remarkable account of the effect of economic development on interstate conflict. Smith considered four levels of economic development: hunting, pastoral, agricultural, and manufacturing. According to Smith, the least developed (hunting) and most developed (manufacturing) societies would be unlikely to initiate war because of high opportunity costs. In hunter societies, armies would be limited in scale because if people spent time away from hunting and gathering, they would substantially reduce their means of livelihood. In developed societies, soldiers would have to be drawn away from manufacturing, leading to a significant loss in output. For moderately developed pastoral and agricultural societies, however, Smith believed that the opportunity cost of war was relatively low. Shepherds could bring their herds with them to war and maintain them during periods between battles. In agricultural societies, once the seeds were planted, younger men could participate in wars with little loss in output because crop maintenance could be left to women, children, and older men. Smith's ideas implied an inverted U-shaped relationship between economic development and the risk of war onset.

Most modern statistical studies assume a linear or logarithmic relationship between development and interstate armed conflict (see, e.g., East and Gregg 1967, Hegre 2000, Senese 2005). An exception is Boehmer and Sobek (2005, p. 5), who hypothesize an inverted-U relationship between development and armed conflict because the "changing orientation of

economies from agricultural and extractive activities eventually to service-based economies alters the cost-benefit calculations concerning territorial acquisition." Less developed countries lack the wherewithal to project military power, and more advanced service-oriented countries have less to gain from territorial pursuits. In the middle are moderately developed countries that are most prone to armed conflict.

To test their hypothesis, Boehmer and Sobek construct a sample of over 5,000 observations spanning the period from 1870 to 1992, where each observation is a monad-year, meaning a single country in a single year. For each observation, they record whether the country initiated a new MID, was involved in a new MID over territory, or participated in a new MID with fatalities. The first two of these dependent variables measure the onset of interstate conflict, and the third measures the seriousness of conflict. Energy consumption per capita is used to measure a state's level of economic development. To permit a nonlinear effect, both the log and the log-squared of per capita consumption are included in the regression analysis. Control variables include economic openness, population growth and density, democracy, and military capability.

Boehmer and Sobek's statistical results indicate that economic development affects all three measures of interstate conflict in an inverted-U fashion. For example, they find that as the level of development increases from its minimum to its maximum sample value, the estimated probability of MID onset in a given year rises from 0.0014 to 0.0275 before falling to 0.0088. Similarly, they estimate that the probability of a state's involvement in a new MID with fatalities is 0.0003 for less developed states and 0.0002 for highly developed states, but 0.0026 for moderately developed states. Based on their analysis, Boehmer and Sobek project that moderately developed countries are most at risk for interstate armed conflict (e.g., China, India, Iran, Pakistan, and Nigeria), while in the future the risk will rise with continued development by poorer states (e.g., Liberia, Sudan, and the Democratic Republic of Congo).

Conflict Termination

Duration

Hirshleifer's simple bargaining model of conflict introduced in Chapter 5 and reviewed earlier is essentially static and for that reason can say little about strategic interaction once war begins. More formal models, however, allow for multiple periods and hence the possibility of intrawar bargaining and eventual war termination (see, e.g., Filson and Werner 2002, Slantchev

2003, Powell 2004, and Smith and Stam 2004). Absent commitment problems, incomplete information can generate inconsistent expectations and the initiation of war. As war proceeds, the adversaries update their expectations based on information revealed through battlefield outcomes, offers and counteroffers, and continued willingness to fight. This process continues until expectations converge sufficiently to permit mutually advantageous settlement. The challenge presented to social scientists when testing these models is that expectations and the private information on which they rest are unobservable.

Slantchev (2004) addresses this challenge by postulating that initial military parity implies relatively high uncertainty over who will win; this uncertainty in turn provides the incentive to delay settlement in order to gain or transmit information that will be advantageous in further bargaining. The hypothesis that follows is that the closer to parity is the observed initial relative capability, the longer is the expected duration of war, other things equal. Slantchev tests this hypothesis based on a sample of 104 interstate wars that occurred between 1816 and 1991. His dependent variable is war duration measured in months, and with military parity as his key explanatory variable, he includes a number of control variables such as terrain, contiguity, and democracy. His central finding is that military parity increases war duration, as predicted. For example, at the 12-month mark, the estimated probability that war will continue is less than 10 percent if the war began with military preponderance but more than 40 percent if it began with military parity (Slantchev 2004, p. 821). Expected duration is also increased when terrain is difficult, the adversary states are noncontiguous, the initiator is democratic, or more than two countries are involved.

Third-Party Intervention

Much like the literature on the risk factors for war, empirical research on third-party intervention has grown enormously. Hirshleifer's bargaining model in Chapter 5 shows clearly that intervention can promote peace if third parties succeed in coordinating expectations or resolving commitment problems. Numerous questions then arise that can be addressed by empirical analysis. Most fundamentally, how successful are third-party interventions at resolving conflict? But also, where, when, how, and by whom is intervention most successful?

Frazier and Dixon (2006) illustrate how such questions can be addressed using large-sample regression analysis. To gauge the successfulness of intervention, they begin with a sample of more than 2,200 dyads of countries involved in MIDs between 1946 and 2000. For each dyad they indicate

whether or not the MID reached a negotiated settlement, thereby generating the dependent variable. At the same time, independent variables are constructed to indicate the presence or absence of various mediation methods (e.g., diplomatic approaches, legal processes, or military involvement) and mediator identities (including states, coalitions, or intergovernmental organizations [IGOs]). Also included in their analysis are control variables for dispute duration and for the presence of a major power country in the dyad.

Frazier and Dixon's (2006, p. 398) fundamental result is that "the presence of a third-party intermediary's efforts tend to substantially improve the probability that disputes are settled by negotiated means." In particular, they estimate that the probability of negotiated settlement roughly quadruples from a baseline of 0.100 to a new level of 0.397 when an intermediary is present. In their more detailed analysis, they find that the likelihood of negotiated settlement is most responsive to intermediary military intervention and IGO involvement. Consistent with other research, they also find that negotiated settlement is less likely when the dispute is short-lived or the dyad includes a major power.

Economic Costs of World War I

In Chapter 1, we identified three economic costs of conflict: diversion of resources, destruction of resources, and disruption of economic activities. In Chapter 2, we showed how the three types of costs can be presented in the context of a production possibilities model. Diversion of resources because of conflict implies fewer alternative goods, such as food and clothing, along a production possibilities frontier (PPF). Destruction of resources causes the PPF to shift in, implying diminished production possibilities over all goods. Disruption of economic activity, such as the loss of trade, leads to further decreases in national income and consumer well-being.

In Figure 6.6 we illustrate these categories of cost by summarizing the estimated economic costs of World War I that were due to diversion of resources, destruction of property, loss of human life, and disruption of trade. Estimates of the first two costs, resource diversion and property loss, are based on figures originally provided by Bogart (1919). We assume his estimates are denominated in 1918 dollars and then deflate them to 1913 using the consumer price index. The resource diversion costs of $123 billion include expenditures by belligerent and neutral governments for military personnel and equipment in excess of expenditures that would have been made without the war. Property losses of $22 billion include the costs of destroyed or disabled factories, farms, and merchant ships.

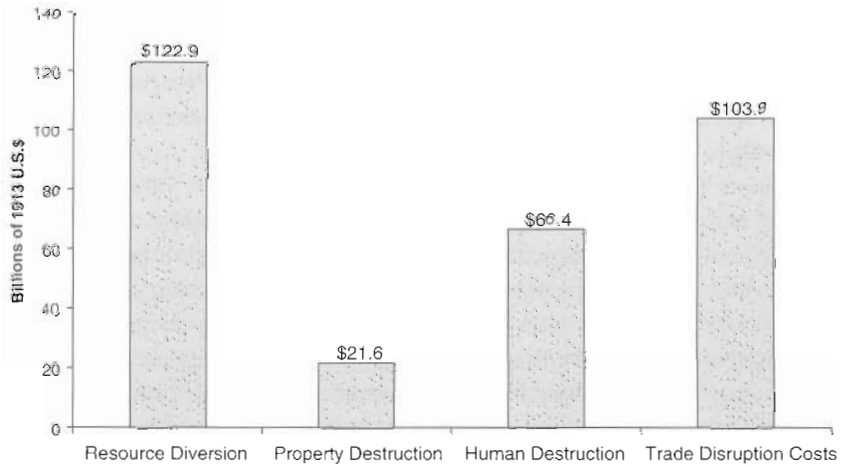


Figure 6.6. Diversion, destruction, and disruption costs of World War I. *Sources*: Bogart (1919), Glick and Taylor (2008).

Estimates of the costs of human loss and trade disruption come from Glick and Taylor (2008). They impute the human cost of war by applying the prevailing average real wage to each life lost and half this wage to each person wounded in war. They also impute as income lost the value of trade forgone during the war. Because the costs of human loss and trade disruption were experienced both during and after the war, Glick and Taylor convert the flow of costs into one-time costs using standard amortization methods. Their final estimates of the economic costs of human loss and trade disruption associated with World War I are respectively $66 billion and $104 billion in 1913 dollars.

When the costs of resource diversion, property destruction, human loss, and trade disruption are combined, the estimated economic costs of World War I total $315 billion in 1913 prices. To appreciate the magnitude of such costs, consider that the world GDP in 1913, as reported by Glick and Taylor, equaled $204 billion. Thus, according to the estimates in Figure 6.6, the economic costs of World War I totaled more than one-and-a-half times the *world's* 1913 GDP, a truly staggering cost indeed.

6.5. Bibliographic Notes

The social scientific study of interstate armed conflict was inspired by Sorokin (1937), Wright (1942), Richardson (1960a, 1960b), and, according to Singer (2000, p. 5), the Polish economist de Bloch (1899). Isard

(2000) and Singer (2000) describe the emergence in the 1950s and 1960s of a critical mass of scholars devoted to the scientific study of war, which led to the establishment of the Center for Research on Conflict Resolution at the University of Michigan in 1957 and the Peace Science Society (International) in the early 1960s.

Economic choice perspectives of war are significant in the early literature of conflict economics. Schelling's (1960, 1966) classic works treated conflict initiation, management, and termination as a process of expectations formation among players within a mixed-motive bargaining game. Isard (1969) and Isard and Smith (1982) utilized oligopoly principles to develop numerous theoretical procedures for preventing, shortening, or terminating conflict. Raiffa (1982) presented practical procedures for managing business conflicts, with obvious parallels to interstate conflicts. Boulding (1962) explored a number of ways in which conflicts end. Wittman (1979) presented necessary conditions for war termination, while Cross (1977) emphasized the role of learning in conflict bargaining. Each of these contributions by economists treated the onset, duration, and termination of conflict as the result of players' rational cost-benefit calculations in the context of changing circumstances and information. For reviews of the thought of early (pre–World War II) economists on war, see Coulomb (1998), the edited volume of Goodwin (1991), and the special issue of *Defence and Peace Economics* (Brauer 2003).

The rational cost-benefit approach to war is not without controversy, as suggested by the extensive discussions of the approach among social scientists. For elaboration and critique of the rational choice approach to war, see Bueno de Mesquita (1981) and Singer (2000). To sample the debate on the rationality assumption in conflict studies, see Brown et al. (2000), Quackenbush (2004), and Vahabi (2004).

Geller and Singer (1998) provide an extensive summary of risk factors for interstate armed conflict based on approximately 500 statistical studies and numerous theoretical perspectives. Vasquez's (2000) edited volume reviews what social scientists have learned about the determinants of interstate war and highlights important issues for future research. A special issue of *Conflict Management and Peace Science* (Kadera and Mitchell 2005) offers spirited discussion and debate on statistical methods used in conflict research.

Rasler and Thompson (2006) provide a valuable summary of the empirical literature on territoriality and interstate armed conflict. Their own empirical investigation finds that contested territory and contiguity in the context of strategic rivalry is a particularly potent combination for the risk of militarized disputes and their escalation to war between states.

Vigorous research and debate continues on the effects of economic interdependence on interstate conflict. For various theoretical and empirical perspectives, see the edited volumes of Mansfield and Pollins (2003) and Schneider, Barbieri, and Gleditsch (2003), the special issue of *Journal of Peace Research* (Schneider and Barbieri 1999), and Polachek and Seiglie's (2007) extensive overview.

For additional empirical studies of war duration and termination, see Bennett and Stam (1996) and Ramsay (2008). See Schrodt and Gerner (2004), Beardsley, Quinn, Biswas, and Wilkenfeld (2006), and a special issue of *International Interactions* (Feng and Kugler 2006) for additional empirical studies of third-party mediation of interstate conflicts. See Wall, Stark, and Standifer (2001) for a review of the quantitative literature on mediation.

Comprehensive studies on economic diversion, destruction, and disruption from interstate war are surprisingly rare. For additional studies on the economic costs of interstate war, see Harris (1997) on the Iran-Iraq war of 1980–88, Broadberry and Harrison (2005) on World War I, and Harrison (2000) on World War II. For studies of the effects of interstate conflicts on economic growth and global financial markets, see Koubi (2005) and Schneider and Troeger (2006), respectively.