The Limits of the Liberal Peace

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Preface

I would like to thank the following individuals and institutions for helping and encouraging me in writing this dissertation and the articles included in it: First, Jon Hovi has been my formal advisor on both this dissertation and the master thesis preceding it. His detailed and constructive comments to the dissertation have been much appreciated. Second, thanks to Nils Petter Gleditsch for drawing me into the world of social science research in the first place by inviting me to be a co-author on what is Chapter 4 here, for his comments and advice to other parts of the dissertation, and for his continued support and amazing ability to obtain funding for me (and other students and young scholars associated with PRIO and NTNU). Third, to Scott Gates, who has been an inspiring director, co-author, and colleague during most of this period, and who has also contributed to improving the contents of the dissertation through his comments and discussions with me.

The chapters in Part II were written together with Nils Petter Gleditsch, Scott Gates, Tanja Ellingsen, and Arvid Raknerud. I would like to thank them for allowing me to use the articles here, and for all I learned from them in the course of conceptualizing, analyzing, and writing the papers. I would also like to thank my three employers during these years: The International Peace Research Institute, Oslo (PRIO), the Department of Political Science at the University of Oslo, and the Development Research Group in the World Bank, and their directors and chairs: Stein Tønnesson, Per Kristen Mydske, and Paul Collier.

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Over the years, I have also benefitted greatly from writing articles with

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Parts II–III are collections of articles, most of which have been published in academic journals. I have edited the published papers slightly: The bibliographies of the different chapters have been merged and moved to Part IV. I have also moved all appendices to Part IV. I have added cross-references to their placement within the dissertation. The journals retain copyright for the articles. The chapters were published as follows: Chapter 3: *American Political Science Review* 2001. Chapter 4: *Journal of Conflict Resolution* 1997. Chapter 5: *Journal of Peace Research* 1997. Chapter 6: *Journal of Conflict Resolution* 2004, and Chapter 8: *Journal of Peace Research* 2000

Part I

Overview

Chapter 1

The Limits of the Liberal Peace

1.1 Motivation and Structure of Dissertation

Immanuel Kant predicted in *Zum Ewigen Frieden* (1795/1991) that the world would see an ever-expanding zone of peace and commercial interaction among free republics. This argument received renewed attention in the 1990s, as a series of studies made use of structured historical data and statistical methods to test the following hypotheses:

- A pair of democratic states will be much more successful in maintaining peaceful relations than a pair that includes at least one non-democratic state.

- States that trade extensively with each other will have less war than pairs of states without such relations.

- Democracies are more peaceful internally than other regime types.

I will refer to these three hypotheses as the three components of the liberal peace. The 'liberal peace' term is more commonly restricted to the first two components (e.g. Oneal & Russett, 1999b; Russett & Oneal, 2001). In addition, Kant discusses the importance of 'cosmopolitan law'. Oneal & Russett (1999b) also include international organizations as the third leg of the 'Kantian tripod'. I will restrict the discussion here to the impact of democracy and trade. On the other hand, I will include the third claim above – the 'domestic democratic peace' – in the liberal peace, since many

of the arguments for why democracies should avoid war with each other also imply that they should be peaceful internally.

This dissertation has a threefold motivation. First, it seeks to contribute to the literature that systematically analyzes the empirical evidence for a liberal peace. Is there a liberal peace? How solid is the basis for concluding that there is one? The literature on the liberal peace has been expanding rapidly during the last few years. A majority of scholars are converging on the conclusion that the two first aspects of the liberal peace seem to be effective. Still, there is no unanimous agreement on the empirical evidence or on all methodological issues. The dissertation adds to this debate by suggesting methodological improvements and reanalyzing the questions with these methods and better data sets.

Second, it seeks to contribute to the theoretical foundation for the liberal peace, and to bridge the gap between the theoretical and empirical treatment of aspects of the liberal peace. Even if many agree that there is a liberal peace, there is less consensus on the theoretical explanation of it. Moreover, most of the cross-national quantitative studies in the field build the analyses on non-formal and sometimes vague theoretical arguments. The dissertation seeks to contribute by formulating formal models of the incentives for different choices and deriving testable hypotheses from these, and by demonstrating the empirical implications of facts such as the increase in the number of states in the international system.

Finally, and most importantly, the dissertation makes use of the conclusions from the research produced by these two motivations to demonstrate that even though there seems to be a liberal peace, it does not have universal applicability. In particular, economic development is a crucial precondition for a liberal peace.

<div align="center">***</div>

The dissertation is organized in five parts. The first part provides an overview of the dissertation and a review of the relevant literature. The remainder of the dissertation is a collection of stand-alone articles on several aspects of the liberal peace. Most of these articles have been published by academic journals, and appear here with only slight revisions. The dissertation therefore documents a research project which has been going on for several years – the oldest chapters (Chapter 4 and 5) were originally published in 1997.

The chapters were originally written and published as distinct articles. Still, they form a unified entity. They all derive from the same research project on the liberal peace.[1] They pose related research questions: Is there a democratic peace within or between states? Why is there such a democratic peace? Does trade between states alter their incentives for going to war? The nature of trade and of democracy is dependent on aspects of economic development – what are the implications of this for the relationships between democracy and war and between trade and war? Section 1.4 details how the individual chapters interrelate.

Moreover, the theoretical arguments in all the chapters are more or less explicitly based on a rational choice approach. Chapter 6 explicitly models the alternatives available to a decision-maker and bases the conclusions on what would maximize the decision-maker's utility. Finally, almost all of the chapters include a statistical analysis of historical data for a large number of countries over a long period of time. Most of the chapters also use the same statistical model – calendar-time Cox regression. The analytical approach is elaborated in Section 1.3.

Each chapter in Parts II and III includes brief literature reviews on the more specific topics they focus on. Chapter 2, however, reviews the broader literature on the liberal peace and other relevant topics which presents the general context the following chapters fit into. In particular, Chapter 2 shows how the interactive effects between democracy, trade, and development demonstrated in Part III are consistent with studies in related fields.

The stand-alone studies appear in Parts II–III. Part II presents three empirical studies of the democratic peace at the international and domestic levels, and a theoretical and empirical study of the trade and international conflict hypothesis. Part III shows empirically how development affects the robustness of the empirical findings associated with the liberal peace.

The overview is placed first in the dissertation as it both provides a synthesis of the dissertation and reviews the background for it. This allows me to present a literature review that puts the subsequent chapters in perspective, and to present a synthesis of the research project and some more general theoretical arguments and discussions before the more specific ones. The main findings of the dissertation are summarized in Section 1.5.

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[1] Parts of this research project has been conducted in close collaboration with projects directed by Nils Petter Gleditsch and Scott Gates at PRIO and PRIO's Centre for the Study of Civil War. My other contributions in this field are Dorussen & Hegre (2003), Elbadawi & Hegre (2004), Gates et al. (2003ab), Gleditsch & Hegre (2004), Hegre (1998; 2002; 2004b), Hegre, Gleditsch & Gissinger (2003), Hegre & Kim (2000), Hegre & Sambanis (2002), Mitchell, Gates & Hegre (1999), and Mousseau, Hegre & Oneal (2003).

That section also includes a brief discussion of how the research project has been evolving in terms of focus and findings.

1.2   Research Questions

The theoretical sections and the studies reviewed in Chapter 2 look into *why* we would expect to observe the three components of the liberal peace. The empirical sections take these theoretical discussions as points of departure and study a corresponding set of questions. The chapters largely answer these questions separately for the three components of the liberal peace: the domestic democratic peace, the international democratic peace, and the trade-and-conflict component.

1.2.1   Theoretical Questions

The chapters on the democratic peace – both the domestic and the inter-state component – largely take the empirical literature on the liberal peace as their point of departure and seek to rearticulate and sharpen the core research questions in this tradition than rather than develop new theory. The theoretical questions in this dissertation may be summarized as follows:

T 1 *How may the constraints and recruitment procedures that characterize democratic institutions affect state leaders' incentives to use military force internationally and domestically, and how do they affect the incentives for using military force against the state for leaders of other states and of opposition groups?*

One paradox in the literature is that even though most studies find democratic states to be peaceful toward each other (i.e., they observe a dyadic democratic peace), most studies also find that democracies are no more peaceful overall than non-democracies (there is no monadic or nation-level democratic peace). These two findings have to relate to each other, however, since a war that occurs between two countries (at the dyad level) implies that both countries are a war (at the national level).

T 2 *What is the relation between the observations of the dyadic democratic peace and the overall war propensity of democracies? What are the implications of this relation for the effect of democratization on war in the international system?*

The chapters on trade and conflict go more into details of why trade should be related to interstate peace. In particular, the dissertation focuses in particular on two 'mechanisms': the 'trade-losses' mechanism – how the expectation of disruptions in trade relations due to war between two states affects states' perceived costs of war – and the 'alternative-access' mechanism – how the ability to gain access to resources and markets in another country through trade alters states' incentives for wars of conquest:

T 3 *How may the economic ties between states associated with trade affect state leaders' incentives to use military force toward other states?*

Possible answers to this question have been formalized in a game-theoretic and an expected-utility model. The latter model also goes into a often-raised objection to the peace-through-trade hypothesis:

T 4 *Is trade likely to affect the incentives for conflict in asymmetric dyads?*

Possibly the most important theoretical contribution of the dissertation is to point out the importance of economic development. None of the arguments made are new, but I argue that they have largely been neglected in the sub-field and that they have important empirical implications:

T 5 *What difference do aspects of economic development such as literacy, governments' taxing capacity, and the territorial specificity of wealth make to democratic institutions' and trade between states impact state leaders' incentives to use military force?*

Finally, the discussion in Section 2.2 of the literature review (Chapter 2) attempts to pull some of these questions together:

T 6 *Is economic development a precondition for all three components of the liberal peace?*

1.2.2   Methodological Questions

Most of the chapters build on an established methodological tradition, but all seek to adapt and improve earlier research designs. At a very general level, the methodological questions posed in the dissertation are:

M 1 *What is the appropriate design to investigate the theoretical questions summarized above?*

M 2 *How should one deal with the problem that repeated observations of a country or a pair of countries are not independent?*

M 3 *What is the most appropriate way to measure the core variables in this research project: militarized conflict, democracy, trade interdependence, asymmetry, and development?*

- I will return to these questions in Section 1.3.2.

1.2.3   Empirical Questions

The empirical questions follow from the theoretical questions asked. Question T1 above gives rise to the following:

E 1 *Are countries with democratic institutions less likely to experience domestic armed conflict than countries with autocratic or partly democratic institutions, controlling for other factors?*

E 2 *Are countries with democratic institutions less likely to go to war with each other than other types of political institutions, controlling for other factors?*

From Questions T2, T3, and T4 follow:

E 3 *Are countries with democratic institutions less likely to become involved in interstate wars than other types of political institutions?*

E 4 *Will the recent world-wide 'waves of democratization' lead to fewer wars in the world?*

E 5 *Do high levels of trade between two states reduce the probability that they will go to war with each other?*

E 6 *If trade is associated with peace, does this apply to highly asymmetric dyads?*

These empirical questions are investigated in Part II. Part III focuses on the research questions related to development (Questions T5 and T6):

E 7 *If democracy is associated with peace, does this also apply to low-income countries?*

E 8 *If trade is associated with peace, does this also apply to trade involving low-income countries?*

1.3 Analytical Approach

1.3.1 Rational Choice Approach

The majority of the theoretical arguments discussed in this introduction and those developed in Parts II–III are implicitly or explicitly rational choice arguments.

In Chapter 6, I develop a formal model that explicitly formalizes how actors are likely to choose given clearly specified sets of options and their utilities to the actors. Representing the arguments in a formal model has certain advantages. Modeling helps to ensure logical consistency, enforces explicitness about assumptions, enables a more concentrated exposition of an idea than is possible with verbal arguments, and eases the extension of the argument.[2] Here, I am interested in the limits of the liberal peace. Game-theoretical models have shown themselves useful for clarifying the conditions under which a hypothesis is valid. For example, Powell (1991) demonstrated that some arguments concerning relative gains (e.g., Snidal, 1991ab) do not apply if a state has the opportunity to alter the rules of the game by the use of force, e.g. by eradicating the opponent as an independent actor. I use the model to investigate whether my model of the 'peace through interdependence' hypothesis yields the same conclusions in situations of asymmetry in the gains from trade, and whether we can expect the same conclusion for any level of socio-economic development. The formal modeling allows me to extend the argument to investigate under which conditions the liberal peace hypothesis applies.

The model in Chapter 6 also helps to disentangle important concepts that are related but theoretically distinct – in particular, the concepts of trade interdependence and of asymmetry. The model is thus instrumental in formulating a more precise measure of interdependence.

In the remaining chapters, the argument is more loosely based on the assumption that actor states, governments, or rebel groups are rational and act to maximize some sort of utility. In Chapter 3, for instance, potential rebel group leaders are thought to evaluate the utility of organizing an armed insurrection against the government, taking into account the expected probability of success, and the expected gain from forcing the government to alter its policies.

Harsanyi has defined game theory as 'the theory of rational behavior by *two or more* interacting rational individuals, each of them determined to

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[2]This discussion of advantages and disadvantages of game theory is based on Hovi & Rasch (1993: 28-33; 1996: 74-84, 96-99) and Hollis & Smith (1991: 135-141).

maximize his own interests, whether selfish or unselfish, as specified by his own utility function' (1986: 89, emphasis in original). A common criticism of game-theoretical arguments in international relations literature is that these assumptions are unrealistic. First of all, states (or rebel groups) are not individual actors, and may therefore have inconsistent and intransitive preferences due to weaknesses in the mechanisms of preference aggregation. Decisions may be the unintended consequences of group interactions and bureaucratic politics. Moreover, even if these organizations may usefully be conceived of as unitary actors, the strategic situations they face are often so complex that it is impossible to expect them to have all the information required to act rationally.

However, game theorists still defend these assumptions by pointing out that the advantages of game-theoretical modeling outweigh the disadvantages of such simplifications. Moreover, even if decisions in individual situations may not be characterized as rational, rationality may still be seen as a 'regulative idea' (Hovi & Rasch, 1996: 75). Rational models, then, predict how actors will act under ideal conditions.[3]

An important set of studies argues that war is a paradox if actors are rational: Since war is extremely destructive, a negotiated agreement would always be possible to construct that all parties would prefer to fighting – an agreement that reflects the parties' military power and their resolve to fight (Blainey, 1988; Fearon, 1994; 1995; Gartzke, 1999; Wagner, 2000). War is then most fruitfully seen as a result of a bargaining failure – 'war is in the error term' (Gartzke, 1999). Consequently, Fearon (1994; 1995) argues that systematic differences between states' propensity to go to war must be sought in differences in states' ability to signal their resolve and intentions to potential adversaries.

1.3.2   Statistical Method

I formulate the hypotheses emerging from the theoretical discussion as probabilistic 'laws'. These are tested using quantitative methods to analyze data for a large number of countries. Such hypothesis testing has several advantages relative to confronting the propositions with verbal information for a handful of case-studies. Using a large-N research design facilitates abstracting from particular instances and avoids the potential tendency for researchers to select cases that fit their theory. With more observations of a phenomenon, we may be more certain that confirming (or disconfirm-

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[3]See Hovi & Rasch (1996) for a further discussion.

ing/invalidating) observations were not just coincidences.

On the negative side, quantitative studies risk oversimplifying complex phenomena. For example, all wars are treated as being equal. In the analysis reported in Chapter 8, I treat the militarized dispute between Greece and Turkey in 1986 as an event equal to the Iran-Iraq 1980-88 war – they are both an instance of a fatal dispute. Although obviously a simplification, it may be justified: In all the chapters, I look at what determines the *onset* of wars. At the 'moment' they start, wars are quite similar: they are the immediate outcomes of actors that decide to use a military organization to obtain a political goal. After the onset, wars take diverging paths – Germany's attack on Poland in 1939 developed into a long, multilateral world war, whereas the Falklands war turned out to be fairly short and mainly confined to the islands themselves. This development could not be known by the actors with certainty in advance, however.

Another simplification is to restrict the analysis to a limited set of explanatory variables such as democracy, trade, alliances, etc. The apparent assumption is that these variables are sufficient as explanations, and that other factors are irrelevant – factors such as the personality of political leaders, accidental events, and leaders' maneuvering in political issues that are not directly connected to the use of military force. These factors are obviously not irrelevant. However, they are difficult to measure according to the standards required by statistical analysis, and are therefore treated as unexplained variance. In the models in this subfield, the amount of unexplained variance is huge relative to that accounted for by the explanatory variables. A rough analogue to the R^2 in models with discrete dependent variables is the likelihood ratio index (Greene, 1997: 891), also referred to as the pseudo-R^2. In the analysis in Chapter 6, it is around 0.30. No studies of onset of interstate or internal war obtain much higher values than this. Hence, the virtue of the statistical models developed here is not their predictive power, but the ability to evaluate whether a variable makes a significant difference to the probability of an outcome. For this purpose, the amount of unexplained 'background noise' is not consequential as long as it is not systematically associated with the explanatory variables.

The term 'significant' needs further clarification in this context. Statistical analyses often select a random sample of observations from a population. For instance, they send a questionnaire to a set of individuals randomly sampled from a much larger population in order to infer something about the larger population. The significance level of a result then refers to the probability that an empirical association in the sample is rep-

resentative of the population. In the analyses in this dissertation, however, the entire populations of countries or pairs of countries ('dyads') constitute the 'samples': I have data for most wars for the great majority of countries, for periods ranging from 40 to 175 years. As discussed in Chapter 4, if one excludes some dubious cases, there have arguably been no wars between democracies since modern democracies started to emerge in the 18th century. Since all relations between democracies have been scrutinized, there is no need to infer from the available data whether this number is representative of the world – the number of wars between democracies that have occurred throughout history is a fact, definitional issues aside. The interesting question is whether this could have happened by chance. Interstate wars are very rare, and until recently there were not many democracies. If democratic dyads are as war-prone as other dyads, what is the probability that we would have observed zero wars between them? This implies that we look at world history during the past 200 years as one possible realization of a process that combines deep structural patterns such as a tendency for democracies to avoid wars with each other, and a large amount of random or unexplained events and mechanisms. Hence, the virtue of the statistical analysis of historical data is to be able to evaluate the strength of an observed pattern.

The quantitative democratic peace literature, along with the literature on trade and interstate conflict (see review below), has had a strong element of methodological discussion.[4] Doyle (1986) noted that there were few or no wars between democracies, but the proponents of the liberal peace needed to argue that this observation reflected a systematic relationship between democracy and peace. Bremer (1992) suggested a framework for analysis that allowed systematically testing whether the observed number of wars between democracies was lower than one would expect by chance. In this framework, the data set is formed by observing each pair of countries once for every year in the time-frame for the analysis. Each of these 'dyad-year' observations constitutes one unit of analysis. In the analogous study of the risk of civil war and of countries' overall war propensity at the nation level, each country is observed once for every year (or five-year period). For each of these observations, the researchers note the values for the dependent and explanatory variables, and use maximum likelihood estimation to identify coefficients for the explanatory variables that maximize the likelihood that

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[4] The liberal peace literature has given rise to methodological refinements along other lines than those pursued here. Examples are how to handle the problem of selection bias (Reed, 2002; Signorino, 2002) and the development of models that more closely reflect the logic of strategic models (Signorino, 1999; Signorino & Yilmaz, 2003; Reed, 2003).

we would observe this particular combination of outcomes for the dependent variable. The logistic regression model is the most common model for how the dependent variable relates to the dependent variable, but probit, poisson, and other models have also been used.

Chapter 5 describes this framework in more detail and shows that there are several problems associated with it: First, the dyad-year observations do not constitute independent observations as assumed by the statistical models that are employed. Consecutive observations of a country or a dyad are not independent: whether a dyad is at war or at peace in one year cannot be seen in isolation from whether it was at war or peace the previous year. Second, whether there is war or peace in one dyad cannot reasonably be seen as independent of whether one of the countries in the dyad is involved in a war with a third party. Another problem is that the traditional studies typically assume that the risk of war for a country or a dyad is constant over time if there is no change in the characteristics given by the explanatory variables. Hence, there is no room to account for varying international levels of tension, or for accounting for the systematic change in the risk of war in a random dyad resulting from the steady increase in the number of countries (see Section 5.3.2).

Chapter 6 introduces a directed-dyad setup, where the actions of state A towards state B are seen as separate from the actions of B towards A. This means that each dyad must be sampled twice for each observation time. As noted in Section 6.5.1, this introduces another source of dependence between the observations: Whether A decides to use military force towards B is obviously dependent on whether B has recently initiated hostilities towards A.

Calendar-Time Cox Regression

Many of these problems may be solved in the traditional dyad-year setup. The dependence of dyad-year or country-year observation on previous observations of the same dyad or country may be solved by restricting attention to onsets of war and using available information on how much time has passed since a previous conflict in the dyad or country to model explicitly the dependence on previous conflicts (Beck, Katz & Tucker, 1998). Variations in the baseline probability of war may be modeled by variables or non-parametric functions representing calendar time.

However, some problems cannot be solved when the analysis is restricted to annual observations. Chapter 5 discusses 'spatial dependence' – how the outbreak of a war in a dyad is dependent on whether wars are going on in

other dyads. For instance, the UK's decision to declare war on Germany in September 1939 was dependent on Germany's attack on Poland two days before. In order to be able to model this dependence, we need to sample all dyads every second day. In theory, one could analyze a dyad-day data set, but this would be extremely large and unwieldy. Moreover, there is very little information in all the consecutive observations of dyads at peace (after all, they are dependent observations).

The problem is even more acute in the directed dyad-year setup: The initiation of the use of force may be reciprocated within minutes, and most disputes are reciprocated. It is clearly not practicable to analyze dyad-minute data sets.

Chapter 5 suggests using calendar-time Cox regression to solve these problems, and this method is used in most of the chapters in the dissertation. The model is useful because the observational units are sampled only when there is a conflict event. If a war breaks out that involves the initiation of state A against B, B's reciprocation, C's support of B in the form of an attack against A, and A's subsequent reciprocation against C, all dyads are observed four times at the date on which this happens. If two years pass before there is a new war anywhere in the world, no dyads are observed until there is a new event.

Calendar Time vs. Duration Time

Time is central to all the studies in the dissertation. Two aspects of time are treated: calendar time and duration time.

The discussion of temporal dependence is based on the idea that states behave according to relevant events in the past. However, all the models assume that the importance of an event gradually recedes. In particular, the duration of a peace period strongly affects the probability that the peace will end: The relations between two countries are much more likely to be tense the first years after a war than after a couple of generations. This is what I refer to as *duration time*. Survival models are designed to account for how the risk of transition varies with duration time. Survival models express the hazard function – the probability $\lambda(T)$ of a transition from one state to another in a given (short) time unit – as

$$\lambda(T) = \alpha(T) \exp\left(\sum_{j=1}^{p} \beta_j X_j^d(T)\right)$$

where T is duration time, $\lambda(T)$ is the hazard at T, $\alpha(T)$ is a parametric

or non-parametric baseline function of time (which, in Cox regression, is estimated separately from the rest of the model), and $\exp\left(\sum_{j=1}^{p}\beta_j X_j^d(T)\right)$ models the relationship between the explanatory variables and the hazard function. The explanatory variables may vary with duration time, but the vector β_j of coefficients does not.

The impact of duration time may also be modeled in a binary time-series cross-sectional model such as logistic regression (Beck, Katz & Tucker, 1998). In such models, the logit for each dyad is expressed as

$$\text{logit}(t) = \sum_{j=1}^{p}\beta_j X_j^d(t) + \gamma(T)$$

Here, t is *calendar time* – July 13, 1956, or March 1, 2004. The explanatory variables are allowed to vary with calendar time. The impact of duration time T is modeled by means of a function $\gamma(T)$, which is simply included as another explanatory variable. Beck, Katz & Tucker (1998) suggest using 'generalized additive model' techniques to allow γ to vary non-parametrically with t, just as in Cox regression. However, one may also model γ parametrically in an ordinary logit model, e.g. with a decay function such as in Toset, Gleditsch & Hegre (2000). In practice, the decay function is similar in shape to the non-parametric function estimated in Beck, Katz & Tucker (1998).

The model used in most chapters of the dissertation represents a combination of these approaches. It is a survival (Cox regression) model where the baseline hazard function models variations in hazard due to calendar time t, whereas the dependence on duration time T is modeled by means of a (parametric) function γ.

$$\lambda(t) = \alpha(t)\exp\left(\sum_{j=1}^{p}\beta_j X_j^d(t) + \gamma(T)\right)$$

This model allows a very flexible representation of historical changes in the risk of war. Figures 3.2 and 5.2 show the baseline hazards for internal and international wars, respectively.

An alternative would be to model duration time non-parametrically as the baseline hazard function, and calendar time parametrically as an explanatory variable. I have chosen to use the calendar-time Cox regression as suggested in Chapter 5 since the changes in hazard as a function of

calendar time seem harder to represent parametrically than the changes due to duration time.

One side-effect of modeling calendar time non-parametrically is that the baseline hazard will absorb all variation due to systematic temporal changes in the explanatory variables. For instance, the average democracy score has increased steadily over the period for which I have data. The impact of this change is reflected only in the baseline hazard, not in the coefficient estimate associated with democracy. Given that there is an outbreak of war in one of the dyads in the system, the calendar-time Cox regression model estimates the probability that this happens in a democratic dyad relative to a non-democratic dyad existing at the same time. The advantage of this is that systematic changes in the way democracy is measured will result in a smaller bias in the results.

Levels of Analysis

Whether interdependence affects the probability of militarized interstate conflict may be studied at three different levels: systemic, nation, or dyadic. At the systemic level, we may ask whether changes in the level of world trade affect the calculations of individual states. Rosecrance's (1986) trading world and realist theories of hegemony are located at this level. At the nation level, we may ask whether a state's level of economic openness affects its international behavior. At the dyadic level, we may ask whether the level of trade between two specific countries affects their mutual relations. Chapter 4 analyzes systematically how empirical results at the different levels of analysis relate to each other.

In the chapters focusing on interstate conflict, I will largely restrict this analysis to the dyadic level. Although all three levels are interesting for the study of the liberal peace, the dyadic provides the closest focus on the core concepts: interdependence, defined as mutual dependence between two countries, and joint democracy.

In the chapters investigating internal conflict, the empirical analysis is at the country level – what factors determine a country's risk of internal conflict? The theoretical argument is more often dyadic, however, describing how governments interact with (potential) rebel groups. Dyadic-level data are largely unavailable for internal conflicts, however.

1.4 The Parts and Chapters of the Dissertation

The literature review in Chapter 2 notes some of the unresolved empirical and theoretical issues in the liberal peace literature, suggests some limitations to the empirical validity of different components of the liberal peace, and briefly discusses the literature on political consequences of economic development. The remaining chapters take up several of these issues in more detail.

The first three chapters in Part II address the domestic and international democratic peace literature. Most of the research questions in these chapters are empirical in nature. The democratic peace is investigated at several levels: Chapter 3 examines the relationship between democracy, democratization, and domestic war. Chapter 4 investigates the relationship between democracy and interstate peace at three levels: the dyadic (pairwise) level, the nation level, and the system level. If democracies do keep a separate (dyadic) peace, what is the impact of democracy for the peacefulness of countries or of the entire interstate system? Chapter 5 focuses specifically on the dyadic democratic peace while accounting for the systemic context pairs of countries find themselves in.

The final chapter in Part II studies the trade aspect of the liberal peace. Section 2.1.4 distinguishes between several possible reasons why trade should reduce interstate conflict. Chapter 6 formalizes two of these: that trade reduces the risk of war because trade increases the costs of war, and that trade provides an alternative way to secure access to resources. The chapter also look into one of the possible limitations of the liberal peace literature: Does trade reduce the risk of conflict also in very asymmetric pairs of countries, pairs consisting of one large and one small country, where the trade flow between them is of much greater relative importance for the small one than the large one?

Part II finds at least conditional support for several aspects of the liberal peace. However, in Section 2.2, I argue how important development is for democratization, democratic stability, and the risk of civil war. Not only is development closely related empirically to stable democracy and absence of civil war, but the theoretical arguments for why development should be associated with democracy are closely related to the arguments for why development should lead to civil peace. Part IV explores empirically and theoretically the implications of this for the relationships between democracy and trade and domestic and interstate armed conflict. Chapter 7 studies how democracy and development interact to explain the absence of domestic conflict. Chapter 8 studies how trade and democracy interact

with development to reduce the risk of interstate conflict.

The following section summarizes the individual chapters and places them in the context of the wider literature. The last section summarizes the conclusions of the chapters and the dissertation.

1.4.1   Part II: The Liberal Peace

The first three chapters in Part II study the first three research questions concerning the democratic peace and the empirical questions associated with them. The final chapter studies research Questions T3 and T4.

Chapter 3: Toward a Democratic Civil Peace

The research reviewed in Chapter 2 has found that coherent democracies and harshly authoritarian states have few civil wars, and intermediate regimes are the most conflict-prone (Muller & Weede, 1990; Fearon & Laitin, 2003). Political change also seems to be associated with domestic violence, regardless of whether that change is toward greater democracy or greater autocracy (Snyder, 2000). However, the intermediate regimes may also be the least stable regimes (Sanhueza, 1999). In Gates et al. (2003a), we investigate this question in detail. We argue why intermediate regimes are 'inconsistent': They mix autocratic institutitions, for which there is a tendency to change toward maximum concentration of power, with democratic institutions, where there is a tendency toward maximum diffusion of power. Hence, only consistent autocracies (political systems with maximum power concentration) and consistent democracies (systems with maximum power dispersion) are stable equilibria. Consistent with the theoretical argument, we clearly find that intermediate or inconsistent regimes are short-lived political systems.

This gives rise to a problem of identifying whether the greater violence of inconsistent regimes is due to their inconsistency or that they on average are young regimes. Is the inverted-U finding equivalent to the finding that states in political transition experience more violence? If both the level of democracy and the after-effects of institutional changes are relevant, to what extent is civil violence related to each factor? This forms the core question in Chapter 3. Based on an analysis of civil war in 152 countries in the period 1816–1992, the chapter concludes that intermediate regimes are most prone to civil war, even when they have had time to stabilize from a regime change, or when they are compared to other political systems of the same age: We find a significant and substantially strong positive

relationship between a decaying function of time since the previous regime change in the country. This relationship holds for all kinds of regime change, be they towards democracy or towards autocracy, and comes on top of a significant support for the hypothesis that inconsistent regimes are more civil war-prone than consistent regimes.

The chapter also shows that consistent autocracies are equally 'peaceful' as consistent democracies. However, in the long run, since intermediate regimes are less stable than autocracies and, in turn, autocracies less stable than democracies, durable democracy is the most probable end-point of the process of democratization. Thus, the democratic civil peace is not only more just than the autocratic peace, but also more stable.

Chapter 4: Three Levels of Analysis

The question of peace and regime type can be examined at the dyadic level, at the nation level, and at the system level.

As seen in Chapter 2, at the *dyadic level* it is fairly well established that democracies rarely if ever fight each other. At the *nation level*, the broad consensus is that there is no significant relationship between democracy and war participation: Democracies are involved in war just as often as non-democracies. This conclusion remains controversial, however. At the *system level*, there is little research; most authors have taken for granted that the answer can be inferred from the findings at the dyadic level or at the nation level.

Chapter 4 brings these three levels of analysis together in two respects. First, it presents empirical analyses of the relationship at each of the three levels, using the same data material as the basis for all analyses. The chapter confirms the democratic peace at the dyadic level and the lack of a relationship at the nation level. Before analyzing the relationship at the system level, it shows how the levels are connected logically in a simple mathematical representation of the international system.

The model takes as its point of departure an expression for how the probability of war in a country in a given year is a function of the annual probability of war in each single relationship with another country, *and* the number of dyads it is partner to.[5] The chapter shows that if the relationships normally found hold at the dyadic and nation levels, the probability of war in a politically mixed dyad *must* be higher than the probability

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[5] The version of Chapter 4 published in the *Journal of Conflict Resolution* contained an error. This error has been corrected in Appendix B. The appendix shows that all the main conclusions of Chapter 4 hold even after correcting the error.

of war between two non-democracies, and that the relationship between democracy and war at the system level must be parabolic. The empirical analysis also finds the mixed dyads to be most war-prone.

This has implications for the amount of peace at the system level. Imagine a development of democracy in the international system as starting out with only non-democracies, the countries of the world are gradually democratizing, and the system is ending with only democracies (Figure 2.1 shows that the actual world in the 1800–2000 period corresponded to the first half of this trajectory). The model implies that the amount of interstate war would first increase as an increasing fraction of dyads are of the most war-prone, mixed type, and not start decreasing until the increase in the number of peaceful democratic dyads is sufficiently large to offset the increase in mixed dyads. Thus, increasing democratization in the world according to these results initially produces more war, and the reduction of war starts only at a relatively high level of democratization. The exact proportion of democracies at which this turning point occurs depends on the risks of war in the different dyad types relative to each other. The empirical analysis in the chapter shows that the historical data are roughly in correspondence with the predicted pattern. The turning-point identified in the chapter, 36%, should not be taken too literally since the analysis makes many simplifying assumptions. In the data set used in Chapter 4, the share of democracies in the world was hovering around this figure for most of the 20th century, but now seems to be stabilizing at a markedly higher proportion.

Among the simplifying assumptions in Chapter 4 is that the argument does not account for regional zones of democratic peace. Most wars are between neighboring countries or involve a major power. Maoz & Russett (1992; 1993) term these 'relevant dyads'. The remaining dyads are by implication 'non-relevant dyads'. If democracies are clustered in a few regions, there will be relatively few mixed dyads among the relevant dyads. This implies that an increase in the number of democracies may result in a world-wide decrease in interstate war at a lower proportion of democracies than the one identified in the chapter. Conversely, a single country's transition to democracy in a non-democratic region may considerably increase the global risk of war.

The chapter also raises a number of data issues.

The model of the connection between the levels also shows that if new countries enter the interstate system, the probability of war in a country must increase *or* the probability of war in the average dyad must decrease.

This fact is studied more closely in Chapter 5.

Chapter 5: The Hazard of War

Chapter 5 re-examines the statistical evidence for the democratic peace at the dyadic level. The chapter raises a number of methodological issues in the literature on the democratic peace and on trade and interstate conflict. It takes as the point of departure two influential contributions by Bremer (1992a) and Maoz & Russett (1993), which both analyze the relation between democracy and peace at the dyadic level. We argue in the chapter that these problems cannot be solved adequately within the traditional dyad-year framework. The chapter lays the methodological foundation for the analyses in Chapters 3, 6, 7, and 8. First, it takes up a claim by Spiro (1994) that the dyad-year observations are not independent, so that the p-values reported in the studies are biased downwards: the democratic peace is a less robust finding than it appears to be in e.g. Maoz & Russett (1993). The chapter shows that dependence between observational units is caused by the fact that both wars and spells of peace stretch over several years, and that continuing years are not independent of each other. Moreover, observations are dependent also because outbreak of war in one dyad often drags other dyads with it. These 'diffusion' wars are not independent, either. The chapter presents a model that solves this problem. First, the omission of ongoing years of war and the choice of calendar-time Cox regression solve one component of the 'temporal' dependence. An explicit model of how past wars influence the risk of war in subsequent years solves the other component of the temporal dependence.

The chapter solves the 'spatial' dependence by developing a model of how wars spread from one dyad to another. For instance, the model allows accounting for the idea that the risk of war between countries a and b increases if country a gets into a war with a country c that is allied to or a neighbor of b.

Second, the chapter takes up the connection between dyadic and nation-level probabilities of war identified in Chapter 4. An implication of those results is that the average dyadic probability of war must decrease with an increase in the number of states in the international system. It does not make sense to assume that the risk of a war involving Mongolia is altered as a result of the creation of new states in Africa. But Chapter 4 shows that if this increase does not affect Mongolia's nation-level probability of war, the probability of war in an average dyad has to decrease. None of the studies in the liberal peace literature have accounted for this fact, so

the assumption of stationarity required by the most common statistical methods is grossly violated. The chapter suggests a simple solution to the problem, and shows empirically that the relationship between system size and the dyadic hazard of war really is very strong. Fortunately for the liberal peace literature, the problem does not seem to bias the results very much.

Third, the chapter discusses Maoz & Russett's concept of 'relevant dyads'. Since some wars do occur in 'non-relevant' dyads, we argue that the complete elimination of them from the analysis is unfortunate. Moreover, it is not necessary with the computational power available today. On the other hand, the problem of a non-stationary baseline dyadic probability of war adds a new reason to distinguish between 'high-relevance' and 'low-relevance' dyads, since the non-stationarity is much more marked in non-contiguous dyads that do not include a major power or do not have any history of hostilities.

At the substantive level, the democratic peace is supported. The chapter shows that pairs of democracies really are significantly more peaceful than pairs of non-democracies, or mixed pairs. The analysis is also extended to investigate the seeming paradox that democracies are engaged in war as often as autocracies at the nation level. We expand the model of war diffusion to show that democracies have a strong tendency to join each other in wars (as in World War II or in the first Gulf War). This tendency is much more marked than their avoidance of mutual fighting. This explains why democracies are as war-prone as autocracies: If one democracy is attacked by or attacks a non-democracy, there is a high chance that other democracies will contribute to the war actions on the side of the democracy.[6] There is no corresponding joining behavior among autocracies. However, the chapter notes a peculiarity in the way Correlates of War codes war participation: joining war dyads may be included even when they are at a very low intensity level, such as Denmark's assistance in the first Gulf War. Many of these 'wars' would never have been included if they had not been part of a larger conflict. Hence, the risk of war in mixed dyads is lower than it appears. Again using Chapter 4, this has implications for the nation-level probabilities of war of democracies and non-democracies alike.

In contrast to Chapter 4, the analysis in Chapter 5 formulates an extensive model that controls for contiguity, power status, alliances, stability, diffusion of war, and recurrence effects.

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[6] Reiter & Stam (2002) disagree slightly with this conclusion, however.

Chapter 6: Size Asymmetry, Trade, and Conflict

Partly because of this potential for coercion, Barbieri (1996a; 2002) questions whether trade reduces conflict in asymmetric dyads, and whether trade even increases the risk of conflict, as structuralists argue (see p. 33). Chapter 6 focuses explicitly on the claim that *symmetrical* dependence on trade between two states is required for the trade bond to reduce the probability of interstate conflict. It points out that empirically testing these relationships necessitates more careful definitions of what is meant by 'high levels of trade' and asymmetry. First, I argue that asymmetry in a pair of countries is most fruitfully conceived of in terms of *size asymmetry* – more precisely defined as the size of one of the countries' production divided by the total production of the pair. Asymmetry might arguably be conceptualized in other ways – for instance, differences in the extent to which the two countries have alternative trading partners, export or import goods for which it is easy to locate alternative markets or suppliers, or differences in the extent to which they produce manufacturing goods. Some empirical studies of the relationship between trade and conflict have also constructed measures based on differences between the extent to which the bilateral trading relationship is important for the countries' economies. Size asymmetry is a simpler measure than these alternatives, however. I also show that the other measures of asymmetry that have been proposed are closely related to size asymmetry.

I further argue that the most commonly used measures of interdependence, the trade-to-production and trade-to-total-trade ratios, are themselves correlated with size asymmetry. This is a problem for the theoretical and empirical analyses that employ them, since it becomes difficult to identify what is the effect of trade and what is the effect of asymmetry. For this reason, these studies tend to produce ambiguous or counter-intuitive results that are hard to distinguish from other factors related to size asymmetries – such as differences in military power.

In Chapter 6, I suggest an alternative measure – *trade efficiency* – which models the extent to which individual economic entities (equally sized firms or individuals) within two countries trade with each other. The measure is justified in an expected-utility model of trade, distribution of resources, and conflict developed on the basis of Dorussen (1999), Hegre (2002), and Dorussen & Hegre (2003). The model is used to explore the relationships between the different conceptions of interdependence and size asymmetry.

The model considers two of the mechanisms discussed in Section 2.1.4 (pp. 49ff.). Trade is allowed to affect the incentives for conflict through eco-

nomic losses due to trade losses during war, and through the fact – pointed out by Rosecrance (1986; see Chapter 8 for a discussion) – that trade is an alternative to conquest: Conquest is attractive to rulers since increasing the number of production units increases taxable income. Moreover, economies of scale also increase the output of each production unit. Although trade does not increase the number of production units, it increases the countries' output by allowing a portion of these economies of scale. This reduces the value of conquest relative to the status quo distribution of production units.

For the particular pacifying mechanisms of trade studied here, the model supports the view that increasing trade efficiency reduces the incentives for conflict, but that this effect is most clearly seen in relatively symmetric dyads. When conceiving of trade interdependence as the trade-to-production and trade-to-total-trade ratios, the relationship is much more ambiguous.

The hypotheses derived from the theoretical model are tested in a statistical analysis. The analysis applies the Cox regression model developed in Chapter 5 to *directed dyads*. When analyzing the impact of asymmetry, it is necessary to be able to model the incentives and observed behavior separately for the two countries forming a dyad. In the empirical analysis of historical data, this requires that the actions of country A against country B are observed separately from the actions of B against A. This introduces additional dependence between observations, however, since a military retaliation by A against B obviously requires that B first initiates hostilities. I argue that this dependence cannot be solved in a directed dyad-year setup, but that the calendar-time Cox regression model allows a straightforward solution.

I also develop an empirical operationalization of the trade efficiency measure, and show that the results from the expected-utility model are largely supported for the 1950-92 period.

1.4.2   Part III: Development and the Liberal Peace

Chapter6 confirmed the hypothesis that there is a negative relationship between trade and the risk of interstate conflict, but that it is to some extent limited to symmetric relationships – relationships where the two states are of roughly equal size. In Part III, I explore the extent to which development is a limitation or even a precondition for the liberal peace (research Questions T5 and T6 above). In Chapter 7, I investigate how development affects the relationship between democracy and domestic conflict. In Chapter 8, I look at how development influences how trade and democracy alters

the risk of interstate conflict.

Chapter 7: Democracy, Development, and Internal Conflict

Chapter 3 demonstrated that there is an inverted-U-shaped relationship between level of democracy and the risk of armed conflict. The studies reviewed in Sections 2.2.1 and 2.2.2, however, have shown that there are strong relationships between development and democracy and between development and civil war. What are the implications of the fact that development leads to both more democracy and less internal conflict? Chapter 7 explores further the relationship between the three variables. I argue that we should expect the relationship between democracy and civil war to be contingent on development: Poor democracies are unstable and hence should be less efficient as institutions for conflict resolution, democratic institutions may require more resources than autocratic ones to contain insurgencies, and increased development brings with it pressure for constitutional changes in autocracies that may turn violent. All of these imply that the relationship between democracy and the risk of civil war should be different in developed and in non-developed countries. Conversely, the relationship between development and internal war should also depend on the particular political institutions in the country.

To test this, I estimate a set of statistical models of the determinants of internal armed conflict. I use three different measures of democracy: the Polity measure that is based on characteristics of formal institutions, Vanhanen's (2000) Polyarchy measure that measures actual participation and the extent of competition in elections, and a combination of these two. I also use three operationalizations of development: GNP per capita, literacy as a percentage in the population, and the value of minerals exports as a share of total exports. I find strong evidence that democracy is correlated with civil peace only for developed countries and for countries with high levels of literacy. Conversely, I find that the risk of civil war decreases with development only for democratic countries.

Chapter 8: What Does It Take To Be a Trading State

Chapter 8 investigates the liberal idea that trade between two states reduces the likelihood of militarized conflict between them. It takes the argument by Rosecrance (1986) as its point of departure: industrial-technological developments have made peaceful trading strategies more efficient today (see Section 2.2.4). This argument is juxtaposed with the empirical literature

on trade and conflict. Development affects the utility calculations of states: Since the costs of seizing and holding a territory increase with increased development, and the relative utility of occupying the territory decreases, the chance that the expected utility of occupation will exceed the expected costs decreases with increased development. Likewise, since the utility of trade increases with increased development, then increased development also makes it more likely that the expected costs of breaking the trade bonds will exceed the gains to be expected from occupation. Consequently, the relationship between trade and conflict is contingent on the level of development.

The chapter introduces a new measure of interdependence based on a gravity model of trade in addition to the trade-to-production ratio. The measure used in Chapter 8, called GMM, is closely related to the *trade efficiency* measure developed in Chapter 6: The GMM measure for a pair of countries is the residual resulting from estimating the gravity model of trade for that model (expression 8.3). The trade efficiency measure (expression 6.13) is closely related to the constant term α in expression 8.3. I also add an interaction term between trade and development to allow the effect of trade to vary with development. Using the Cox regression model developed in Chapter 5, I demonstrate that there is a negative relationship between trade and conflict, but that it is clear and strong only for dyads where both dyads have high income or per-capita energy consumption levels. Development itself is associated with peaceful behavior, but strongly only for trading pairs of states.

Chapter 8 reports the results of an analysis showing that the democratic peace also requires a minimum level of development to be efficient. Similar results are obtained in Mousseau (2000) and Mousseau, Hegre & Oneal (2003).

1.5   Main Findings

The research project has evolved over several years, and the emphasis has gradually shifted: At the outset, the project was primarily an empirical investigation of whether trade and democracy reduce the risk of domestic or interstate militarized conflict. Later, the project has focused more on theoretical aspects of the trade-and-conflict component, on the importance of asymmetrical trade relationships, and on an emerging realization that economic structural factors such as the transition to an industrialized or technology- and capital-based economy profoundly affect how trade and

democracy affect states' propensity to go to war with each other or to become embroiled in a civil war.

1.5.1 Is There a Liberal Peace?

This dissertation has sought to contribute to the literature on the liberal peace. The liberal peace has been somewhat loosely defined as a set of theories arguing that there is a strong tendency for domestic and international peace to follow when the large majority of individuals in a society – as contrasted to states or governments – have control over decisions in both political and economic issues. Liberals in general assume that the vast majority of individuals have a self-interest in peace since they can obtain material and non-material well-being only during peace. Hence, peace may be therefore be secured if narrow groups and would-be elites can be restrained through effective political institutions.

The theoretical sections have shown that there are multiple and partly overlapping explanations for why democracies do not fight each other, and for why states that trade extensively are able to avoid wars. In particular, I have discussed in detail how trade may act as an alternative to conquest of territories, and how trade losses incurred during a war may alter states' behavior (Chapter 6).

In the empirical parts of the dissertation, I have made use of new and more appropriate methods to study historical data on wars and militarized conflicts, trade, democracy, and other relevant variables, for a large fraction of the world's countries. The chapters have studied historical data for various time periods, varying from 1816–1992 to 1960–2000. Based on the theoretical discussion, I have also developed several new and more precise operationalizations of trade or interdependence, of asymmetry, and of democracy.

The empirical analyses largely support the finding that there is a liberal peace, at least under some specific conditions summarized below:

- Although fully democratic countries may or may not be more peaceful domestically than very authoritarian countries, democracies are more peaceful than countries with political institutions that are neither democratic nor autocratic (Chapters 3 and 7).

- Although democracies may be engaged in war as much as non-democracies, they have a strong tendency to maintain peace with each other and to ally with each other in war (Chapters 4, 5, and 8).

- In the long run, the democratic peace finding implies that democratization will lead to less interstate war (Chapter 4).

- Countries that trade extensively have a lower risk of go to war with each other. This holds for a wide range of different measures of trade interdependence (Chapters 6 and 8).

1.5.2   Are There Limits to the Liberal Peace?

However, the dissertation also identifies some limitations to and preconditions for the liberal peace. One often-noted limitation studied in Chapter 4 is that:

- Democracies are not peaceful toward non-democracies, and may even tend to engage in more conflictual relations than pairs of non-democracies.

This has important consequences for the relationship between democracy and peace at the system level:

- The high risk of conflict in 'mixed' dyads – pairs consisting of one democratic and one non-democratic country – implies that worldwide democratization is not likely to decrease the system-level amount of war until a minimum fraction of the world's countries are democratic.

The analysis of war diffusion in Chapter 5 shows that democracies tend to support each other in wars that have been started in mixed dyads, resulting in a high number of wars in the mixed dyads:

- The high risk of conflict in mixed dyads is largely due to the war-joining behavior of democracies.

The theoretical and empirical analysis also identifies limitations to the trade-and-conflict component:

- The trade-and-conflict relationship is clearly strongest for dyads that are of roughly equal size, since the trade relationship generally is most important for equally sized countries, both in absolute terms and relative to both countries' economies or to the individual firms in each country.

- At the same time, the underlying risk of war tends to be highest for equally sized countries.

More importantly, all aspects of the liberal peace are clearly strongest for developed countries and pairs of countries.

- Rich, industrialized democracies clearly are better at maintaining a civil peace than poor, primary-commodity-dependent ones (Chapter 7)

I suggest that there are several reasons for this. First, rich democracies are more consolidated and stable than poor ones (or are expected to soon become consolidated). This is largely due to the fact that the political stakes are relatively low in rich countries where elites have more attractive alternative opportunities to earn income – there is relatively more to gain from securing property rights in order to establish capital-intensive production than to seek to physically control a part of the economy. At the same time, citizens are well-educated and have an economic surplus to participate actively in the democratic process, and may hence use the democratic political system to effectively constrain elite behavior. Democracies in poor states with limited resources may also find it difficult to stave off attacks from marginal groups that may benefit from challenging the government militarily.

- Both trade and democracy are more effective in reducing the risk of interstate war in relations between rich or industrialized countries (Chapter 8).

The reasons are related to why development strengthens the domestic democratic peace: in relations between developed countries, there is relatively little to gain from attempting conquest of foreign territories – the territories are to a large extent valuable only as long as the citizens voluntarily agree to be productive, and as long as domestic and international investors prefer to invest there and not in other countries. For non-industrialized countries, conquest may solve countries' dependence on access to a wide range of resources and large markets. This, however, may also be obtained through trade – rich countries are more likely to pursue trading-state strategies than military-political strategies. For all pairs of countries, the extent of the trade flow also tells us something about how much a country would gain from controlling the economy of the other country. If war is generally attractive to states, they will tend to go to war with their main trading partners. Hence, trade is ineffective in reducing conflict between non-developed countries. If war is generally non-attractive, trade is effective in reducing conflict.

- Similarly, the democratic peace seems to be considerably stronger among high-income countries than among low-income countries (Chapter 8; Mousseau, Hegre & Oneal, 2003).

The explanations are related to the ones summarized above: If low-income democracies are generally unstable, and citizens are unable to effectively constrain the elites, none of the suggested mechanisms of the democratic peace are likely to be very effective when such countries are involved. Likewise, if territorial expansion through conquest is generally attractive to a country, it may also be attractive to the citizens.

Chapter 2

Literature Review

This chapter is divided into two sections. Section 2.1 reviews the literature on liberalism and the liberal peace in order to show how the subsequent chapters relate to the studies in this rapidly expanding field. Section 2.2 serves two aims: Firstly, it reviews a set of contributions on the relationship between development and democratization, and development and war. Secondly, drawing on these contributions, it attempts to strengthen the claim made in Part III that development to a certain extent is a *precondition* for the liberal peace.

2.1 The Liberal Peace

The liberal peace may be summarized as a set of theories arguing that there is a strong tendency for domestic and international peace to follow when the large majority of individuals in a society – as contrasted to states or governments – have control over decisions in both political and economic issues. Liberals in general assume that the vast majority of individuals have self-interest in peace since they can obtain material and non-material well-being only during peace. Hence, peace may be therefore be secured if narrow groups and would-be elites can be restrained through effective political institutions.

2.1.1 Liberalism

The liberal peace literature is part of a wider class of liberal writing. Central to liberalism is a focus on *individuals* as the primary actors. Liberal thinking on international relations has always challenged two realist as-

sumptions: The nation-state is not the only important actor in international politics (cf. Holsti, 1995: 40)[1], and the question of war and peace does not dominate all other issues.

> Liberals view states as the most important collective actors [...], but they are seen as pluralistic actors whose interests and policies are determined by bargaining among groups and elections. Liberals believe that human and state interests are shaped by a wide variety of domestic and international conditions. Ultimately they are determined by bargaining power among interest groups, but these groups' definition of their interests are affected by a host of factors (Zacher & Matthews, 1995: 118–119)

Liberal economic and political theories have been closely related since the 18th century. The liberal concern for the individual was emphasized by Adam Smith and David Ricardo in their work in economics. Kant, Paine, Bentham, James and John Stuart Mill all argued for free trade, liberty for individuals *and* for republican or democratic government.

Several of the liberal ideas were linked up in the liberal opposition to mercantilism: Mercantilism saw the wealth in the world as constant. Trade, then, was a zero-sum game. Moreover, accumulating gold was seen by mercantilists as equivalent to increasing state power, since war was financed largely through the state's gold reserves and through loans. Given these assumptions, all economic and individual interests were necessarily subordinated to the pursuit of state power.

The theoretical work by (liberal) economists (Smith, Ricardo, Samuelson) has shown that trade is a positive-sum game for most actors within the states, and that protectionism typically only benefits narrow groups that are closely related to those having political power. Hence, increasing state power through trade restrictions is against the interest of most citizens. The liberal opposition to the traditional political systems then automatically meant an opposition to their economic doctrine: 'Mercantilism was seen to arise from the nature of aristocratic states, and therefore the political priority of liberals was to topple the interventionist, power-seeking state structures that were the legacy of the eighteenth century' (Buzan, 1984: 600).

Realism and *structuralism* are the main contenders to liberalism among theoretical approaches to international relations. Although the term 're-

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[1]Due to its view on actors, this group of theories is also referred to as pluralism (Hollis & Smith, 1991; Viotti & Kauppi, 1987).

alists' subsumes a wide variety of scholars, they share a set of assumptions of the conditions for international interaction (see Holsti, 1995: 36-37; Mearsheimer, 1995: 10): Realists see the mode of organization – anarchy, or the absence of any authority above the individual, sovereign states – as the most important feature of the international system. Without such an authority, enforcement of laws and regulations is impossible. Given these structural conditions, the most basic interest of states becomes survival, since all other interests are dependent on the existence of the state. At the same time, all states have a potential to hurt or destroy each other – there exists no means to ensure survival that cannot be used for attack. This is the 'security dilemma': if one state increases its security, the security of other states will decrease (see, e.g., Snyder, 1984). The other states, in turn, will arm to regain their relative loss, such that in the end the first state is as insecure as at the onset. States may never be sure of each other's intentions, in particular since occupying another state is one way to increase security. War will always be a possibility in the relationship between states. For realists, non-state actors play only subordinate parts on the world stage.

Mercantilism used to be the economic doctrine corresponding to realism, since the doctrine aims at maximizing state power. This is still reminiscent in some realist writings that emphasize relative gains versus absolute gains. (e.g., Grieco, 1988; Powell, 1991; Mosher, 2003). However, the assumption that trade is a zero-sum game has largely been abandoned.

Although realism is most well-known as a theoretical approach in international relations, it also has relevance in the study of domestic conflict. And indeed, Hobbes' *Leviathan* (1651/1968), a core philosophical contribution for realism, was written as a defense of absolutist state power against the background of the English civil wars of the 1640s. Realism applies where groups or individuals act in the absence of a common, powerful authority. This is the situation in the relations between most sovereign states, and also in states where the government is unable to enforce a monopoly on the use of large-scale violence.

The eclectic set of ideas labeled 'structuralism' here emphasizes the importance of global structures. Many of these, but not all, draw on the writings of Karl Marx. Structural theories typically disagree with the realist focus on states as the primary actors: Marxist see states only as tools for the capitalist class (although like other organizations, they may have their own dynamics, cf. Wallerstein, 1974: 402). The structure and dynamics of the entire world system are seen as more fundamental driving forces than

the individual states. Structural theories conflict with liberal theories as to whether all economic exchange is mutually beneficial. The structure of the system, structuralists argue, ensures that this exchange is unequal, such that some parts of the system will exploit other parts. Marxist versions of this argument also see the exchange in itself as nothing but exploitation of the proletariat by the capitalist class.

2.1.2   The Domestic Democratic Peace

The first component of the liberal peace is the domestic democratic peace. Democracy is often referred to as a system for peaceful resolution of conflicts, as conflicting claims by rival social groups are solved by majority votes or consensual agreements. Democracies often also guarantee a minimum set of individual rights and minority rights through the constitution, and institutionalize power-sharing mechanisms such as two-chamber parliaments, regional self-determination, etc. Democracies both allow discontent to be expressed and have mechanisms to handle it. Hence, since peaceful negotiation is feasible and less costly, armed rebellion will not be profitable. Thus, the literature that sees conflict as resulting from 'relative deprivation' (Gurr, 1970), clearly implies that democracies should be more peaceful internally than other regime types. If individuals are denied the political rights and the economic benefits they see themselves as entitled to, they will react with aggression and organize violent political opposition, according to this theoretical approach. We should therefore observe less civil war the more democratic countries are.

Autocracy, on the other hand, is seen as inviting revolutions in this literature. But at the same time, autocracies often have powerful mechanisms for repression (and may make use of them without losing legitimacy, in contrast to democracies). Autocracies repress not only armed uprisings, but also inhibit the formation of the organizations that protests require before they can reach the stage of armed insurgencies. Democracies will also be willing to crack down on armed rebels if they see their demands as illegitimate, but may be reluctant to deny the opposition the right to organize.

It follows from this that regimes that feature both democratic and autocratic characteristics, are partly open yet lack effective means of solving conflicts. In such political systems, repression is difficult since some organization of opposition groups and some opposition expression of discontent is allowed, but mechanisms to act on the expressed discontent are incomplete (cf. Davies 1962:7, Boswell & Dixon, 1990:543; Muller & Weede, 1990;

Chapter 4). Hence, repression is ineffective at the same time as 'grievance' is not addressed. Moreover, such institutional arrangements are unstable because the institutions that make up the regime are internally inconsistent, and often reflect an underlying power struggle that may erupt in open violence. I will refer to these as inconsistent regimes.

Changes in the political institutions of a country are likely to be accompanied with a heightened risk of civil war (cf. Snyder, 2000). Relevant changes are the introduction or abolishing of elections of a parliament and/or the executive, an increase or a decrease in the degree to which the executive is accountable to the parliament or other bodies, or an increase or decrease in the share of population that is allowed to vote. Firstly, changes in a democratic direction are likely to be accompanied with reduced repression, which allows communal groups increased opportunities for mobilization. At the same time, it takes time to establish the new institutions and to make them sufficiently efficient to accommodate the kinds of accommodation typical of established democracy. Moreover, groups that increase their political influence will raise their expectations for real improvements in their living conditions, but these changes can take a long time to realize even with the best intentions. This is likely to lead to protests, perhaps violently (Davies, 1962). Moreover, the changes in the political institutions – whether in democratic or autocratic directions – by definition alters the power distribution in the system (at least in theory), which again leads to changes in the distribution of resources within the economy. This means that some gain and others lose. Losers then have an incentive to use unconstitutional means or to incite armed insurgencies to reestablish the previous status quo.

The study in Chapter 3 analyzes empirically both the relationship between regime type and civil war and the relationship between recent changes in political institutions and conflict. The chapter also discusses the implications of the fact that the inconsistent regimes also are the least stable political systems.

A number of other studies find empirical confirmation of this 'inverted U' relationship: Muller (1985), Boswell & Dixon (1990), Muller & Weede (1990), Ellingsen (2000), de Soysa (2002), Fearon & Laitin (2003), and Chapter 3. Other studies, however, do not agree with these findings. Elbadawi & Sambanis (2002) find some support for the idea that inconsistent regimes are more civil war prone than other regime types, but conclude that the finding is not very robust. Collier & Hoeffler (2002) find no support for this hypothesis at all.

Fearon & Laitin (2003) also find that political instability in the three years previous to the year of observation doubles the risk of civil war, and Sambanis (2001) that democratic change increases the risk of revolutionary war. Elbadawi & Sambanis (2002: 18) obtain more mixed results. They conclude that recent political instability increases the risk of civil war in many models, but that the finding is sensitive to the choice of lag structure for the political system variable.

The evidence for a domestic democratic peace might not be robust

One explanation of the discrepancies in the results for the relationship between democracy and internal conflict is that the estimate for the political system variables tends to become insignificant when controlling for income (GNP per capita) – as done in Collier & Hoeffler (2002) and Elbadawi & Sambanis (2002) – rather than energy consumption per capita, as done in chapter 3.[2] This may not be surprising, given the strong positive correlation between income and democracy (see Section 2.2). This correlation is less strong between energy consumption per capita and democracy.

There are two additional possible explanations for why we might fail to observe a robust negative and monotonic relationship between democracy and conflict, even if there 'truly' is one:

The first is that the *conflict variable* is too heterogeneous. If (potential) armed conflict originates in a broad social movement that seeks to redress economic or political 'deprivation' among a majority of the population, a democratic political system that addresses this deprivation may have a preventive effect (Gurr, 1970). However, if (potential) armed conflict originates in violent efforts by marginal but well-organized groups too forward their narrow self-interest, democratic political systems may not be able nor willing to meet these demands and cannot have a preventive effect (Collier & Hoeffler, 2002; Fearon & Laitin, 2003). On the contrary, democratic regimes' inability to use very repressive measures may make such predation easier.

Collier (2000) and Collier & Hoeffler (2002) take this argument further by noting that grievance/deprivation conflicts have a tendency to be transformed to the second type. The conflict variables typically employed in empirical studies fail to distinguish between these two types. This may explain the non-robustness of the results even if the grievance/deprivation

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[2]But note that de Soysa (2002: 412) obtains significant support for the inverted U when controlling for GDP per capita.

theory is correct. I will discuss Collier's argument in more detail below.

The second is that the *democracy measure* may be too narrow. To maintain a civil peace, democracy arguably must have the following characteristics:

1. The government is popularly accountable and constrained

2. Citizens have a bundle of social and political rights

3. The government is capable of actively affecting the societal distribution of resources, as well as of preventing abuses of one social group by another

Most democracy data sets measure the extent to which governments are accountable and constrained (although they concentrate on 'free and fair elections' rather than accountability). Only Freedom House (annual) measures the extent to which citizens have social and political rights, but only imperfectly. This measure has not been used by many studies of conflict. No direct measure of capability exists, and measuring it is inherently difficult. Relevant aspects of capability are: stability (long-term credibility), consistency (absence of severe conflict over institutional design; see Gates et al., 2003a), taxing capacity, bureaucratic effectiveness, and military effectiveness. Political systems that combine democratic and autocratic features may be regarded as having low capability because of lack of consistency. The mid-range in the Polity index employed in Chapter 3 and Fearon & Laitin's (2003) 'Anocracy' dummy serve as proxies for the two first aspects. The inverted-U relationship found in Chapter 3 indeed indicates that capability-as-consistency may be important. Below, I will argue that GDP per capita is a proxy for the stability and effectiveness of a political system, and also for its military effectiveness.

If citizen rights and government capability are as crucial for how democracy reduces the likelihood of conflict as the accountability aspect, we may fail to observe it with the standard measures of democracy. I will return to this in Section 2.2 and in Chapter 7.

Why there might not be any relationship

Collier (2000) distinguishes between two motivations for organizing a militarized opposition to the government. The first is 'greed': rebels aspire to *private* wealth by capturing resources extra-legally. The other is 'grievance': rebels aspire to rid the nation, or the group of people with which

they identify of an unjust regime or to force through redistribution. Gurr's relative deprivation theory clearly assumes the latter motivation.

Collier argues that it is impossible to ask rebel leaders about their 'true' motivations. Leaders that are motivated by greed have an incentive to couch the motivations in terms of grievance rather than greed – for public relations reasons (their private interests are likely to be against the public interest within the country, and are unlikely to attract international support), and for organizational/recruitment reasons (even if recruits join the rebel army primarily for the pecuniary benefits, they will also prefer to see their activities as a fight for a common good).

How can researchers then conclude anything about the true motivations? Collier's answer is to infer motivation from patterns of observed behavior. He argues that if greed is the dominant motivations, we would expect to see more rebellions in countries where there are good opportunities for financing a rebellion: Countries in which where there is an abundance of commodities that are easy to obtain control over, and that are marketable outside the country. An abundance of young men without work and few alternative income-earning opportunities lower recruitment costs and hence increases the financial viability of the conflict.

If grievance is the dominant motivation, rebellions should primarily appear in countries with deep ethnic or religious divisions, economic inequality, lack of political rights government economic impotence and poor growth rates.

Collier & Hoeffler (2002) find that all the economic factors listed here have explanatory power. Lack of economic growth is the only grievance indicator that is associated with a high risk of internal armed conflict.

Why is the 'grievance theory' not supported? Collier (2000) points out that would-be rebels that plan to establish an army to address grievance face three important problems.

The first is a collective action problem faced by potential recruits: Justice, revenge, and relief from grievance are public goods and so subject to the problem of free-riding: Whether the government gets overthrown is not dependent on whether an individual personally joins the rebellion. Individually, his or her preferred choice would be that others fight the rebellion while he or she benefits from the justice that the rebellion achieves.

The second is a coordination problem. Rebellions have to be large to be successful. Recruits will be reluctant to join the rebel group before it has a reasonable chance of success, since defeat would mean death or imprisonment. Hence, the rebel leader will not be able to recruit before it

already has recruited a minimum number.

The third is a time inconsistency or commitment problem: The rebels have to fight *before* they achieve justice, most often in the form of overthrowing the current government. After the victory, the rebel leader has an incentive to act just like the replaced government. He has a stronger incentive to promise things than to actually deliver them. Since successful militaries have to be organized in a strict hierarchical manner, the leader of a victorious armed rebellion often has the organizational apparatus required to defend his position as head of the state even when his followers realize that the promises have been broken.

The free-rider, coordination, and time-inconsistency problem are difficult obstacles to overcome for grievance-motivated rebellions Solutions to the free-rider problem regularly involve drawing on social capital and existing patterns of tit-for-tat behavior. Rebel groups use ethnic identities to achieve this (Gates, 2002). This possibly explains why internal wars tend to be ethnic in nature, and why extremely fractionalized countries have less civil war: If there are no sizeable ethnic groups, the recruitment pool will be too small.

An alternative way to solve the free-rider, coordination, and time-inconsistency problems is to rely on the greed of the potential recruits, and offer the soldiers a salary and allow them to loot the territory they control. Such incentive structures avoids the free-rider problem because soldiers are paid as they go and immediately enjoy the benefits of rebellion; there is no coordination problem since rebellions will be able to distribute the rewards even without outright victory, and there is no time-inconsistency problem because rewards are immediate.

For these reasons, Collier (2000) argues that greed-motivated rebellions are much more likely.

If grievance-motivated rebellions do emerge, they are likely to be transformed to greed-motivated ones since they in a prolonged war are forced to rely on the same types of incentives as the greed-motivated ones. Moreover, civil war tends to alter society in ways that invite the emergence of new rebel groups and shadowy economic activities. Collier lists four opportunities for profit that are created during war: People shorten their time horizons, and become more opportunistic. This will benefit some types of firms more than others. There is an increase in criminality as resources to the police are diverted to the military or counter-insurgency activities. This also leads to capital flight – markets become disrupted, information becomes more costly and particular, and entry into trading becomes more

difficult. This creates opportunities for monopolistic trade. Finally, the scope for rent-seeking predation increases for the rebels (and for the governments as they become less open to scrutiny).

The 'liberal peace' term is normally restricted to how trade and democracy reduces countries' propensity to become involved in interstate militarized conflict. The domestic democratic peace is closely related, however. A basic assumption is that the vast majority of individuals have an interest in peace. This coincides with Kant's point of departure, as discussed in the next section. In the grievance-based argument, this preference for peace requires that individuals are granted certain fundamental rights from the elites controlling the state. In the greed-based argument, only a narrow minority ever have an interest in the organized use of military force. In order to impose this preference for peace on the society, political institutions that constrain both the rulers and more peripheral armed groups are necessary, just as is the case in the other components of the liberal peace.

The literature on civil war is less explicit on the role of economic liberty than the literature on interstate conflict (see Section 2.1.4). Note however, that greed-motivated rebellions always will violate the economic interests and (possibly only informal) rights of other citizens, since the appropriated resources originally belonged to them or to groups they are members of.

2.1.3   The International Democratic Peace

The international democratic peace hypothesis has spurred an enormous amount of empirical studies since the seminal studies by Rummel (1979, 1983), Doyle (1983ab; 1986), and Maoz & Russett (1993).[3] In this section, I will present Kant's argument in some detail. I will then go through four different explanations for why democracies should be peaceful in relations with each other.

Kant's Perpetual Peace

Kant's thinking on war between states was re-introduced to the field of international relations by Michael W. Doyle (1983ab; 1986), and has since been the primary philosophical reference for the democratic peace literature.[4]

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[3] This earlier literature is reviewed in Chapter 4.

[4] Kant was by no means the first to forward these ideas, though. Enlightenment theorists such as Rousseau, Montesquieu, Paine, and Godwin all precede him in arguing that states founded on democratic principles must also be against war (Flessen, 1999: 13-17; Gates, Knutsen & Moses, 1996: 6-7).

Kant's vision of a *perpetual peace* is in particular found in *Zum Ewigen Frieden* (Kant, 1795/1991). It rests on three 'definitive articles' of peace: The first of these is that 'The Civil Constitution of Every State shall be Republican'. Kant defines the republican constitution as 'founded upon three principles: firstly, the principle of freedom for all members of a society (as men); secondly, the principle of the dependence of everyone upon a single common legislation (as subjects); and thirdly, the principle of legal equality for everyone (as citizens)' (p. 99). Republics are peaceful since 'the consent of the citizens is required to decide whether or not war is to be declared' (p. 100):[5]

> [I]t is very natural that they will have great hesitation in embarking on so dangerous an enterprise. For this would mean calling down on themselves all the miseries of war, such as doing the fighting themselves, supplying the costs of the war from their own resources, painfully making good the ensuing devastation, and, as the crowning evil, having to take upon themselves a burden of debt which will embitter peace itself and which can never be paid off on account of the constant threat of new wars. But under a constitution where the subject is not a citizen, and which is therefore not republican, it is the simplest thing in the world to go to war. For the head of state is not a fellow citizen, but the owner of the state, and a war will not force him to make the slightest sacrifice so far as his banquets, hunts, pleasure palaces and court festivals are concerned. He can thus decide on war, without any significant reason, as a kind of amusement, and unconcernedly leave it to the diplomatic corps (who are always ready for such purposes) to justify the war for the sake of propriety. (p. 100)

The other two articles are 'The Right of Nations shall be based on a Federation of Free States', and 'Cosmopolitan Right shall be limited to Conditions of Universal Hospitality'.

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[5] Kant takes pain to distinguish his republic constitution from the democratic one (Kant, 1795/1991: 100-102). This has been used to argue that Kant's peace was not democratic at all (Gates, Knutsen & Moses, 1996: 6). However, Kant's classification of regime types follows Aristotle's. Here, democracy means direct democracy. This 'is necessarily a despotism, because it establishes an executive power through which all the citizens may make decisions about (and indeed against) the single individual against his consent' (Kant, 1795/1991: 101, emphasis in original). What is required for the perpetual peace is a constitution where the executive power is separated from the legislative power. To ensure this, the government must necessarily be representative, he argues (p. 101). This definition of a republic is not inconsistent with modern, representative democracy.

Kant argues that the perpetual peace is guaranteed by nature, and even by war itself (pp. 108-114). Nature has made it possible for people to make a living all over the world. War is nature's means of scattering the peoples of the world to everywhere on earth. Moreover, the threat of war with a neighboring people has forced each people to 'form itself internally into a state in order to encounter the other as an armed power' (p. 112, emphasis in original). Kant further argues that republics will emerge from this state formation because 'the republic constitution is the only one which does complete justice to the rights of man' (p. 112).

Kant's idea of a democratic peace has been the focus for a large number of studies in the past fifteen years, studies with theoretical as well as empirical focus.[6] Key empirical works are Doyle (1986), Bremer (1992), and Maoz & Russett (1992; 1993). Much of the present work on the liberal peace builds on the framework laid out in these articles.

Kant's argument has been expanded in the modern democratic peace literature. Four different reasons why democracies keep a separate peace may be distinguished. The first two were formulated by Maoz & Russett (1993): a normative and a structural explanation.[7]

A Normative Explanation

The normative explanation holds that 'the culture, perceptions, and practices that permit compromise and the peaceful resolution of conflicts without the threat of violence within countries come to apply across national boundaries toward other democratic countries' (Maoz & Russett, 1993). States 'externalize' the norms guiding the domestic political processes: Democratic institutions build on norms that encourage compromise solutions and reciprocation, and norms that strictly inhibit the complete removal from political life of the loser in political contest – defeat does not mean elimination of a chance to try again. Finally, the political process is supposed to be completely non-violent.

To work, the peace-preserving mechanism of the normative explanation requires an expectation that the other state adhere to the same set of norms domestically – the international system is anarchic such that no norms or forms of behavior can be enforced 'from above'. The least restrictive norms then dominate the democratic norms, since a democratic state is not likely to adhere to norms that endanger their survival. A normative explanation does not imply that democracies are pacifist.

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[6] See Gleditsch (1992), Chan (1997), and Chapter 4 for reviews of the literature.

[7] For a critique of the normative and the structural explanations, see Rosato (2003).

A related argument is that wars of conquest are normatively wrong, since they by definition are violations of the liberal principle that citizens of the (conquered) state have the right to elect their own leaders. Wars of 'liberation', and particularly wars to impose democracy on non-democratic states, are an exception, since they may be instrumental in granting such rights to the citizens of the conquered state.

A Structural Explanation

According to the structural explanation, democratic political leaders are required to mobilize domestic support to their international policies. Political mobilization takes time in democratic political system – decisions have to go through the legislature, the political bureaucracies, and key interest groups. Executives are constrained by other bodies (such as parliaments) which ensure that the interests of citizens and powerful organizations are taken into account. Debate is public, such that information on the real costs of war are likely to enter the decision calculus. Shortcuts to political mobilization can only be accomplished in situations that can be appropriately described as emergencies. Democratic political leaders will be removed from office if they fail to evaluate this correctly. These institutional/structural factors slow down the decision process and helps avoiding capricious or ill-informed behavior.

Moreover, as Kant argues, citizens typically perceive costs of war to be high. Hence, they will be more reluctant to grant such support where they are able to influence foreign policy than will more narrow groups (such as aristocracies, military leaders, particular interest groups) when they have influence.

A Signaling Explanation

A third explanation is based on a signaling argument. An important group of theories in international relations model war as a bargaining process 'under the shadow of power' – i.e., a negotiation where the threat of the use of force is used by one or both parties to attempt to improve their bargaining position (Fearon, 1995; Gartzke, 1999; Morrow, 1999; Powell, 1996; Wagner, 2000). In these theories, the fact that we observe war is a paradox: There will always exist a negotiated solution that is preferable to war for both sides. Why are states not able to agree to this solution 'in the shadow of power', a solution that reflects the distribution of power and willingness to use power (resolve)? Given the incentives to avoid war (war

is extremely costly and risky), state leaders who disagree on some issue could simply tell each other what they would be willing to accept rather than fight, and then choose a mutually acceptable bargain.

One answer is uncertainty about the other side's capabilities or resolve: There will always be an incentive to exaggerate own capabilities or resolve in order to improve the bargaining position. States have an incentive to misrepresent their willingness to fight in order to gain a better deal. Hence, merely telling each other what they are willing to accept is not credible.

The idea that the outcome of a negotiation is a function of the parties' resolve and capabilities poses a problem for the democratic peace argument: Structural constraints and norms against the use of force in this perspective merely increase the costs of using force, and reduces the resolve. Increasing the costs of using force for side A will not decrease the risk of side B using force, only reducing the credibility of side A's threat. Reducing the credibility of the threat of using force will only serve to weaken the bargaining position of that side – the bargaining solution will simply shift in B's favor to a point where A's threat to use force is again credible. Increasing both sides' costs of using force will not alter the net risk of using force.

Fearon (1994) develops an alternative explanation of the democratic peace that builds on and is consistent with this framework. His point of departure is to view international crises as public events carried out in front of domestic political audiences. This fact is crucial to understanding why crises occur and how they unfold. Fearon develops a formal model to show this: At each moment in the model, a state can choose to attack, back down, or escalate the crisis further. If it backs down, its leaders suffer audience costs – backing down is often seen as a sign of unsuccessful foreign policy.

The model seeks to show how states may solve the problem of credibly signaling their resolve. International crises are a response to this dilemma, Fearon argues. States resort to risky and provocative actions (such as mobilization or deployment of troops) to signal their willingness to fight. Such behavior may not act as signals in themselves, however. If mobilization is not very costly, it may just be regarded as a bluff. Both parties have an incentive to bluff, to mobilize, and then to back down when they realize the bluff is discovered. Even if they do not want to bluff, they have an incentive to *credibly* commit themselves to a position that they will marginally prefer to war, since they cannot be sure that the adversary has the correct perception of their capabilities and their resolve. Fearon's argument is that audience costs are good commitment devices. Audience costs are the costs

that a leader suffers when backing down. For example, what would happen to the approval ratings of George W. Bush in the US if he backed down from the confrontation with Iraq?

Audience costs enable states to learn about an opponent's willingness to use force in a dispute, since they may lead leaders on one or both sides to become locked into their positions and so will be unable to back down. Hence, states with relatively high audience costs are less likely to back down. At the same time, they also need a lower amount of escalation or crisis-inducing behavior to signal intentions. Democracies have higher audience costs because the public may remove leaders after policy failures. Hence, democracies may be better at signaling intentions and may more credibly commit to policies. This provides a third explanation of why democracies are better able to maintain peaceful relations than non-democracies.

Incentives for Territorial Expansion

A fourth explanation of the democratic peace is derived from Rosecrance (1986). It takes the incentives for political leaders to expand the territory they control as its point of departure.

The fundamental 'national interest' for democracies and autocracies alike is to secure survival and to increase wealth. As realists hold, ensuring survival may be the most fundamental, because without the survival of the state no other goals can be obtained. Democratic leaders should be equally willing to ensure survival of the state and the political system as are autocratic leaders. Democracies are therefore equally likely to go to war when they perceive security to be threatened. However, leaders in the two regime types differ fundamentally with respect to for whom they want to increase wealth, since democratic leaders rely on the support of a much broader constituency. This affects their choice of strategy (See Section 2.1.4 for a discussion of the strategies available to states).

An autocratic leader may benefit disproportionally from war. The prosperity of a dictator typically depends on the amount of resources that can be extracted from the economy. There is an upper limit to such extraction from a given territory. Beyond a threshold, increasing the tax rate will hurt the economy to such an extent that tax income will not increase. When that limit is reached, further growth in government revenues requires an expansion of the tax base. This can happen either through internal growth or through military expansion. For a dictator, it is quite certain that territorial expansion increases prosperity. The same holds if the head of the

state is accountable only to a distinct minority group in the country (such as the traditional monarch was accountable to the aristocracy), in which case his/her policies are likely to maximize growth for these groups only. Since a large share of the population does not benefit from these policies, the policies may still be very successful even if they are not reflected in improved utilization of resources, or growth in GDP per capita. At the same time, the autocratic leader is able to make groups without political power bear a disproportionate share of the costs – most notably, to risk their life in actual fighting.

The benefit of occupation is less certain for the constituency of a democracy, where the benefits to a larger extent are shared among all political actors (at least ideally). Since the benefits of occupation have to be shared between almost as many as those who have to bear the costs, the net expected utility of military conquest is much less likely to be positive. Moreover, in order to extract much from the conquered territory, the population resident there have to be denied the same political rights as the citizens of the occupying country. This may add political costs to the economic costs (Rosecrance, 1986).

Consequently, the political costs of war is much higher in democracies, as implied by the democratic peace hypothesis. Again, there are exceptions: A state may obtain their citizen's consent to risk their lives to expand the territory of the state if the acquired land is distributed to them, or if they otherwise reap economic gains from the expansion.

Individual welfare also depends on the access to resources such as oil or steel. A large country is more likely to have all necessary resources on its territory, such that large countries have a much more secure supply. Welfare is also dependent on large export markets.

Hence, democratic institutions did not hinder the expansion of the British Empire nor the settlement of the USA at the expense of indigenous populations.

Limitations of the Democratic Peace

The debate on the democratic peace has directed attention to a number of possible limitations to the empirical validity of the democratic peace.

Firstly, it has often been noted that the democracies are particularly peaceful only in relation to other democracies (Small & Singer, 1976; Chan, 1984; Chapter 4). Toward non-democratic states, they are at least as belligerent as non-democracies are between themselves (however, see Rummel, 1995; Ray, 1995, and Benoit, 1996 for opposing views and Russett & Oneal,

2001: 49–50 for a discussion). Kant (1795/1991) warned against wars for liberal purposes. In recent years, 'making the world safe for democracy' has repeatedly been forwarded as a justification for warfare. The democratic peace itself gives fuel to this justification. If it holds, wars to overturn non-democratic regimes may hinder wars in the future. And indeed, large wars and interventions by democratic countries tend to be followed by democratizations (Kegley & Hermann, 1996; Mitchell, Gleditsch & Hegre, 1999; Gates et al., 2003b; Kadera, Crescenzi & Shannon, 2003; Christiansen, 2004; Christiansen, Gleditsch & Hegre, 2004).

Peceny, Beer & Sanchez-Terry (2003) investigate whether there is a separate 'dictatorial peace', but do not find such dyads to be clearly more peaceful than the mixed dyads. Werner (2000), on the other hand, find 'politically similar' states to be less likely to engage in conflict than non-similar states. These issues are discussed at length in Chapters 4 and 5.[8]

Another issue is that young democracies may not behave in the same manner as consolidated ones. Mansfield & Snyder (1995, 2002) argue that the democratization process is dangerous. In addition to the time it takes for democratic institutions to become functional, the democratization process itself tends to increase the risk of war. Both new and old elites have an incentive to use nationalist rhetoric to bolster their domestic support when institutions are fragile. At the same time, old elites are still powerful and may have an interest in an assertive foreign policy. Their empirical findings are contested, however (Ward & Gleditsch, 1998).

All of the four explanations listed above require well-functioning institutions to be effective. If the democratic institutions are not fully functional, either because they are young and unconsolidated or because they are inconsistent, democratic norms at work in the normative explanation are not likely to be fully rooted. The structural explanation explicitly requires that the institutions are effective in constraining executives that might have an interest in belligerent behavior. Likewise, in the signaling explanation, democratic leaders do not face the same audience costs in weak or new democracies as in well-developed ones. And democracies will only alter the incentives for conquests if power-dispersion is extensive. Section 2.2.3 elaborates on how economic development is related to these issues.

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[8] The chapters were written before the publication of Werner (2000) and Peceny, Beer & Sanchez-Terry (2003), however.

2.1.4   Trade and Interstate Conflict

Kant (1795/1991) also pre-shadowed the third component of the liberal peace: that trade between states reduces the risk of conflict between them. Although nature separates the nations, Kant argues, it also unites them. And this is where the economic aspect of the liberal peace enters Kant's argument:[9]

> On the other hand, nature also unites nations which the concept of cosmopolitan right would not have protected from violence and war, and does so by means of their mutual self-interest. For the spirit of commerce sooner or later takes hold of every people, and it cannot exist side by side with war. And of all the powers (or means) at the disposal of the power of the state, financial power can probably be relied on most. Thus states find themselves compelled to promote the noble cause of peace, though not exactly from motives of morality. And wherever in the world there is a threat of war breaking out, they will try to prevent it by mediation, just as if they had entered into a permanent league for this purpose (p. 114, emphasis in original).

It is important to note that Kant's argument rests on individual self-interest, not on idealistic moral concepts: 'the problem of setting up a [republican] state can be solved even by a nation of devils (so long they possess understanding)' (p. 112). For Kant's state of nature is a state of war, just as is Hobbes' (Kant, 1975/1991: 98).

This section reviews how modern liberal reasoning on the relationship between interdependence and peace may be divided into four categories, with partly overlapping explanations for why trade should promote peace. The first two identify causal processes between two interacting states (at the dyadic level), whereas the two other concentrate on processes within the interacting states.[10]

A series of empirical studies find that states that trade extensively have a lower risk of interstate militarized conflict (see in particular Oneal & Russett, 1997, 1999ab; Russett & Oneal, 2001). A few studies find no relationship between trade and conflict (Beck, Katz & Tucker, 1998) or a positive relationship (Barbieri, 1996ab, 2002). Some of these studies are reviewed in more detail in Chapters 6 and 8.

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[9] In fact, this quotation is the only reference to the 'trade promotes peace' thesis in *Perpetual Peace.*

[10] See McMillan (1997) and Schneider, Barbieri & Gleditsch (2003) for surveys of the literature on interdependence and conflict.

Trade costs

Modern exponents of the first mechanism have hardly changed Montesquieu's 250-year old wording: 'The natural effect of commerce is to bring about peace. Two nations which trade together, render themselves reciprocally dependent: if the one has an interest in buying the other has an interest in selling; and all unions are based upon mutual needs' (*De l'esprit des lois*, Book XX, ch. II, 1748, quoted in Hirschman, 1945/1980: 10).

This reciprocal dependence is usually called interdependence. Interdependence, according to Keohane & Nye (1977: 8-12), is mutual dependence between states, meaning that situations and events in one state affect other states, and vice versa. Interdependence may be cultural, technological, political, or economic. The more costs and benefits the relationship entails, the more interdependent will the states be. Such relations may also have varying degrees of symmetry. If a relation between two states is entirely asymmetric, it is a relation of dependence. Moreover, Keohane & Nye (pp. 12-13) distinguish between sensitivity and vulnerability: 'Sensitivity involves degrees of responsiveness within a policy framework – how quickly do changes in one country bring costly changes in another, and how great are the costly effects?' For example, most oil-importing countries are sensitive to an oil embargo, since this will entail higher oil prices, costs of reallocation, etc. Country a's vulnerability concerns the extent to which it may counter the costs (in the long run) by political measures. Vulnerability rests on the relative availability and costliness of the alternatives that various actors face. If state a cuts off its oil exports to country b, b is more vulnerable the more costly it is to replace this oil import with domestic production or imports from other countries, or to replace oil with other sources of energy.

Polachek (1980, also see Polachek, Robst & Chang, 1999) investigates the impact of economic costs on the incentives for conflictive behavior in an expected utility model. In the model in Chapter 6, the fear of trade losses reduces the incentives for the use of force through its negative effect on production and consumption. The model represents the argument that the greater the mutual dependence, the less the risk of war. It shows, however, that the relationship must be symmetrical for the trade costs to affect the military calculations of states.

Territory and trade: Antithetical routes to wealth

As Kant noted (see Section 2.1.3, p. 48 above), liberals assume that trade
cannot exist side by side with war. In *The Great Illusion* (1910; 1938),
Norman Angell depicts territorial expansion and expansion through trade as
contrasting objectives for nations. Richard Rosecrance (1986) argues that
states are forced to make a choice between expanding territory or increasing
trade as a basis for increasing wealth, power, and welfare. Naturally, all
states are concerned with territory, since

> nations are themselves territorial organizations. Unchecked ex-
> pansion by one state will impinge upon the territory controlled by
> others. Second, power, an objective of state policy, was historically
> defined in territorial terms. The state with the greatest land mass
> would have the largest population, the greatest stock of natural re-
> sources, and presumably as well the largest wealth' (1986: 6-7).

Consequently, wars of conquest are means to increasing territory, power
and wealth. An alternative route is international trade. But war and trade
are antithetical routes to wealth:

> If national policies of economic growth depend upon an expanding
> world market, one country can hardly expect to rely primarily upon
> territorial aggression and aggrandizement. To attack one's best cus-
> tomers is to undermine the commercial faith and reciprocity in which
> exchange takes place. Thus, while the territorial and military-political
> means to national improvement causes inevitable conflict with other
> nations, the trading method is consistent with international coopera-
> tion. (Rosecrance, 1986: 13-14)

This view is not a contradiction or opposition to the classical 'peace
through interdependence' hypothesis, but an extension of it:

> While trading states try to improve their position and their own
> domestic allocation of resources, they do so within a context of ac-
> cepted interdependence. They recognize that the attempt to provide
> every service and fulfill every function of statehood on an independent
> and autonomous basis is extremely inefficient, and they prefer a sit-
> uation which provides for specialization and division of labor among
> nations. One nation's attempt to improve its own access to prod-
> ucts and resources, therefore, does not conflict with another state's
> attempt to do the same (p. 24).

Changing their orientation from the military-political world to the trading world does not imply that trading states relieve themselves of security concerns. On the contrary, economic interdependence has to be accompanied by military interdependence: 'Trading states will also normally form alliances as a precaution against sudden intrusion by military-political nations' (p. 24).

Merely aggregating one state's set of dyadic relationships does not imply that trading-state and military-political strategies are mutually exclusive at the state level. It is conceivable that states may trade peacefully with a group of states, while using expansionist strategies towards other. Rosecrance, however, argues that states tend to emphasize the same strategy towards all states (1986: 29–30). Openness of a state decreases if it engages in war or other external military engagement: militarized conflict tends to disrupt trade routes with all trading partners (disruption through war actions, blockades, and the closing down of important infrastructure such as harbors). Conflicts may also disrupt production for exports in the country by diverting production from traded goods to military goods. Conflicts – even merely the expectation of them – may also discourage investment from overseas because of the heightened risk of losses resulting in lower expected returns. Moreover, in order to involve itself in an extensive bilateral trade relationship with another state, the dyadic liberal argument implies that a state needs to trust that the other will behave peacefully towards it. If a state is aggressive towards third parties, this trust may be undermined. In sum, if a state engages in a militarized conflict with one other state, it risks that trade with all other states is hurt. The converse, then, also applies: As openness increases, conflict decreases. That is, the relationship between trade and conflict is one characterized by reciprocal effects, where trade influences conflict and vice versa.

The broadness of the political constituency also affects the alternative gains from a trading-state strategy. For instance, both democracies and autocracies have business interests. Business interests generally don't like wars since they fear a cut-off of trade with the enemy or with third parties. If business interests have access to foreign policy, they will influence the state in the direction of trading-state strategies. In democracies, it is more likely that business interests have influence over foreign policy decisions. This also implies that democracies should be more likely to choose trading-state strategies.

The model in Chapter 6 formalizes how trade may be an alternative to conquest. Chapter 8 discusses further the ideas of Rosecrance (1986),

and show that trade reduces conflict most under circumstances that tend to favor the trading-state strategy.

Trade as signal

Morrow (1999) and Gartzke, Li & Boehmer (2001) base their argument on the bargaining failure model of war (see Section 2.1.3). Just as political audience costs enables democratic leaders to credibly signal their intention, market reactions may function as signaling devices. Threatening to use force is likely to induce domestic and international economic actors to seek alternative markets or suppliers, or to prefer to invest in other countries. Since high dependence on international trade or foreign investment (or opportunities for domestic investors to invest abroad) makes threats costly, such states are less likely to be misrepresenting their resolve. This reduces the danger of wars due to the miscalculation of the opponent's intentions.

Trade as channel for contact and understanding

Another mechanism between trade and peace is that trade leads to cooperation on mutual elimination of trade restrictions (Keohane, 1984: 75-78). Such cooperation may be formalized into an international regime. According to liberal theorists, these regimes dampen conflicts in themselves. They serve as fora for negotiations, highlight the states' common interests, broaden the involved states' repertoire of non-military means of force through issue-linking, and ease the inclusion of third-party mediators to conflicts. Thus, trade helps to put into practice Kant's second and third definitive articles of a perpetual peace (cf. Section 2.1.3 above).

Trade increases wealth

Weede (1995) argues that international trade leads to peace through changes within the states: Free trade increases the wealth of countries. Greater wealth, in turn, tends to reduce class conflict and to invite domestic compromises, and consequently leads to democracy. Democracies, in turn, do not wage war with each other, according to the democratic peace thesis. This forms a strong causal chain, where trade primarily affects the monadic (nation) level, but reinforces a dyadic effect through wealth and democracy. This causal chain is discussed at more length below, in Section 2.2 and in Chapter 8.

Limitations to the trade-and-conflict relationship

Realists stress the dominance of security issues over economic issues. Not seeing this, they claim, is to ignore the fact that the international system is anarchical. As a logical consequence, then, the most important realist counter-arguments question the direction of causation in the liberal reasoning. Anticipating the costs of broken trade ties in wartime, a state will have an incentive to limit its trade with other states if it perceives the probability of war with them in the near future to be high. This is a classic realistic argument, found in Waltz (1979) and perhaps most explicitly in Copeland (1996).

Others argue that states that see each other as potential enemies avoid entering into trade relationships (cf. Gowa & Mansfield, 1993; Pollins, 1989b). Empirically, several studies indicate that the causation runs in both directions in dyadic relationships (Kim, 1998; Reuveny & Kang, 1996; 1998): To the extent that two states are interacting, the interaction is either characterized by peaceful trade or by a hostile and possibly militarized no-trade relationship. Oneal, Russett & Berbaum (2003), however, find that trade reduces conflict even when controlling for the influence of past conflict.

Realists also argue that interdependence is a double-edged sword. If a country is dependent on resources in another country, it may be tempted to secure access to the resources by occupying the other country, thereby unilaterally solving its 'dependency problem' (Copeland, 1996: 10; Liberman, 1996: 148; Mearsheimer, 1990: 45; Skaperdas & Syropoulos, 1996; Dorussen & Hegre, 2003). A rupture of international trade may also create losses beyond the loss of the gains from trade. The economy has to readjust, it will lose productivity, and social problems may emerge from the ensuing unemployment. All in all, the country may be worse off than if the trade ties never had existed (see also Buzan, 1984: 620-621; Hirschman, 1945/1980: 26-29). This argument is especially valid if the trade relation is asymmetrical.

Another aspect of this point is the relative-gains argument. According to realists, states care more about relative gains than about absolute gains: Economic gains may be converted to military force. This is what Hirschman (1945/1980: 14) refers to as the supply effect of foreign trade: 'By providing a more plentiful supply of goods or by replacing goods wanted less by goods wanted more (from the power standpoint), foreign trade enhances the potential military force of a country'. The security dilemma therefore dictates that states should care more about relative gains and losses than

absolute gains.

Another realist objection is that a liberal zone of peace requires a hegemon to blossom. According to hegemonic stability theory (see Keohane, 1984), order in world politics is typically created by a single dominant power – a hegemon. Without this hegemon, the order will collapse. The liberal peace requires adhesion to the rules of a liberal international economic power. The only way this can be enforced, the argument goes, is through an economically and militarily superior power. Military power is crucial to the hegemonic stability theory, since economic issues may become military-security issues if they are crucial enough to basic national interests. 'A hegemonic power must possess enough military power to protect the international political economy it dominates from incursion by hostile adversaries' (Keohane, 1984: 39). In fact, the hegemonic stability theory is the systemic variant of the argument in the previous section. Just as bilateral trade requires the expectation of stable, peaceful relations between the two states, a liberal economy requires a stable, regulated system – a liberal international regime, as it is often labeled (Keohane, 1984: 49ff.) Just as domestic economic activity will be restrained if private property rights are not protected by the state, economic activity between countries will be difficult if there is no hegemon with economic and military power to enforce the rules. A liberal economy is dependent on, as a pre-existing condition, the peace and stability it is supposed to explain (Buzan 1984: 607).

Related to this is the argument that the liberal peace is an artifact of the Cold War. The Western states have had high levels of trade and an unprecedented period of peace in the 50 years following World War II, but this cannot be seen independently of the fact that the same states were on the same side in the global contest with the Soviet Union (Farber & Gowa, 1995).

Finally, the trade and interstate conflict component of the liberal peace does not have a domestic counterpart as does the democratic peace. There seems to be no relationship between the extent to which countries trade and their risks of internal conflict, apart from the indirect effect through the fact that trade promotes economic growth and development (Hegre, Gleditsch & Gissinger, 2003; Elbadawi & Hegre, 2004).
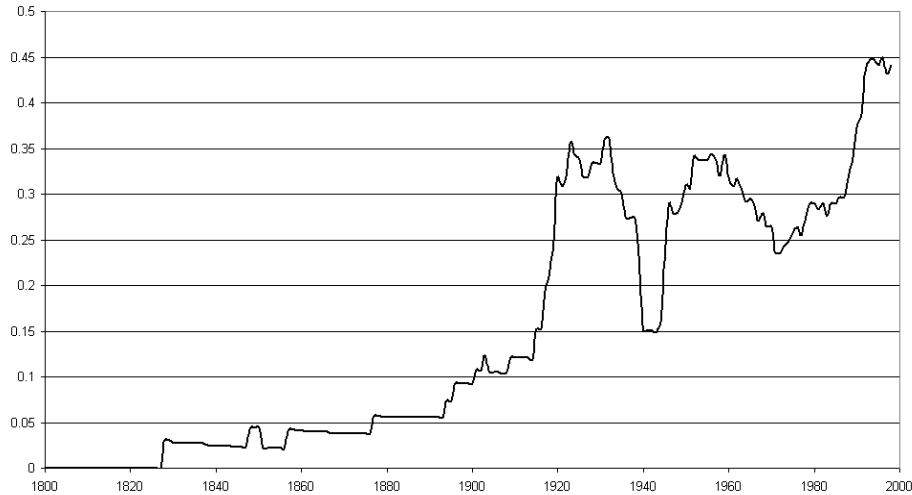
Figure 2.1: Proportion of the world's countries that are democratic according to Gates et al. (2003b), 1800–2000

2.2 The Role of Economic Development

A central argument in this dissertation is that socio-economic development profoundly affects the liberal peace – development is to some extent a precondition for the emergence of peaceful liberal zones. Section 2.2.1 summarizes the literature on the relationship between development and democracy. The next sections shows that several scholars have argued that development affect the incentives for warfare, and possibly also for the liberal peace itself.

2.2.1 Development and Democracy

Figure 2.1 shows how the proportion of the world's countries that are democratic have changed over time. The figure is taken from Gates et al. (2003b). A country is coded as democratic if it scores at least 0.5 on an indicator that ranges from 0 (completely autocratic) to 1 (fully democratic). The indicator is the average of three sub-indicators that evaluate the democraticness of the political institutions in terms of the recruitment process for the executive, the constraints on the executive, and the extent to which the population of the country is allowed to participate in elections.

The increase in the number of democracies coincides with the spread

of industrialization. This link from development to democracy is a classic in modernization theory dating back to Lipset (1959: 75), who proclaimed that 'the more well-to-do a nation, the greater the chances it will sustain democracy'. These views have found support in several recent empirical studies (Burkhart and Lewis-Beck, 1994; Barro, 1996; Londregan and Poole, 1996; Vanhanen, 1997; Przeworski et al., 2000; Gates et al., 2003ab, Boix & Stokes, 2002).

What is meant by development? The concept may be defined in terms of income per capita, education or literacy, or the structure of the economy (e.g. industrialization, dependence on primary commodity extraction). I will look at the relationship between development and democracy distinguishing between these three aspects.

Lipset (1959) argues that higher income and better education for 'the lower strata' would lead to a more compromise-oriented view of politics. Rich countries also have greater surpluses to distribute; this permits modernization through education, occupational mobility, free flow of information, and organizational experience. Taken together, these factors encourage adaptability and compromise, tolerance, and moderation. Increased access to material assets and thus also to political resources, together with greater institutional diversity, act as preconditions for stable democracy.

Higher average income is also associated with a more diversified economy with more alternative economic opportunities. This is important for the emergence or stability of democracy, according to Lipset (1959:84): 'If loss of office is seen as meaning serious loss for major power groups, then they will be readier to resort to more drastic measures in seeking to retain or secure office'. Moreover, wealth is associated with the presence of nongovernmental organizations and institutions 'which can act as sources of countervailing power, and recruiters of participants in the political process' (Lipset, 1959:84). Poverty is also associated with nepotism, which again reduces the chances of building an efficient bureaucracy.

Dahl (1989:251ff.) argues that a 'modern dynamic pluralist society' (abbreviated MDP) is particularly favorable for the establishment and stability of democracy, partly because of the attitudes and beliefs such societies foster, and partly because such society disperses power away from any single center toward a variety of individuals, groups, associations, and organizations:

> What is crucial about an MDP society is that on the one hand it
> inhibits the concentration of power in any single unified set of actors,
> and on the other it disperses power among a number of relatively in-

> dependent actors. Because of their power and autonomy, the actors
> can resist unilateral domination, compete with one another for ad-
> vantages, engage in conflict and bargaining, and pursue independent
> actions on their own. Characteristic of an MDP society is a dispersion
> of political resources, such as money, knowledge, status, and access
> to organizations; of strategic locations, particularly in economic, sci-
> entific, educational, and cultural affairs; and of bargaining positions,
> both overt and latent, in economic affairs, science, communications,
> education, and elsewhere. (Dahl, 1989; 252)

In addition to lacking the political resources mentioned here, poor peo-
ple don't have the surplus needed to be politically active, and are more
risk-averse because of their marginal income. They are more vulnerable
to intimidation because a larger share of their property can be physically
destroyed.

The link between development and democracy has also been explained
in terms of education. Lipset (1959) notes that 'education presumably
broadens men's outlooks, enables them to understand the need for norms
of tolerance, restraining them from adhering to extremist and monistic
doctrines, and increases their capacity to make rational electoral choices'
(p. 79). In addition to Lipset's argument for education's beneficial effect on
these democratic values, a higher median education level may also stabilize
democracies through making it harder for elites to exploit the political
system for their own benefit: education allows a population to effectively
monitor politicians' actions. To take one example: a free press is vital to
a functioning democracy, but is not likely to make much of a difference if
the vast majority of the population is illiterate. This potential exploitation
is likely to undermine and delegitimize the democratic system in the long
run, as the electorate slowly realizes how it is misused.

A high average level of education is also important for building an ef-
ficient bureaucracy, another vital component of a well-functioning democ-
racy.

Dahl's argument quoted above applies both to income and education.
It is hard to distinguish these variables: Income, education and literacy are
typically correlated, and in many of the arguments discussed above it is
hard to distinguish between the effects of education and those of income.

The third aspect of development – the structure of the economy – is also
related to the likelihood that a country democratizes or remains either au-
tocratic or democratic. Ross (2001) shows empirically that resource wealth
is negatively correlated with the level of democracy. He puts forward three

causal mechanisms that may explain this correlation:

The first he terms the 'rentier effect' (pp. 333–35): Autocratic governments use the revenues from the abundant resources to relieve social pressures that might otherwise lead to demands for greater accountability and representation, either through low taxes or no taxes at all, or use parts of the income for spending on patronage, or uses the rent-based largesse to prevent the formation of social groups that are independent of the state, either deliberately or simply through the relative insignificance of private economic actors. The second is called the 'repression effect' (pp. 335–36): The resource wealth allows the governments to spend more on internal security, which allows them to effectively repress the opposition.[11] The third mechanism is referred to as the 'modernization effect' (pp. 336–): In line with the discussion above, Ross notes that economic development is associated with high levels of education, occupational specialization, and urbanization. Resource-led growth, however, may not lead to higher education levels and occupational specialization, and hence fails to increase the probability of democratization.

Ross' argument predicts that resource-rich autocracies tend to remain stably autocratic, but also implies that resource-rich democracies are relatively unstable. This is the focus of Wantchekon (2000), who argues that destabilization often happens to resource-rich democracies. If the ability of the state to enforce the law is weak, incumbent governments have an informational advantage over the availability of rents to distribute to voters, and/or discretionary power to distribute these rents. To counter an incumbent who spends government resources in ways that maximizes his/hers electoral gains, the opposition will have an incentive to turn to illegal means such as inciting riots or staging coups to counter the incumbency advantage. This mechanism is stronger the more rents there are to distribute. Both Ross (2001) and Wantchekon (2000) report results from cross-sectional statistical studies that confirm that there is a negative correlation between democracy and mineral resource dependence.

It is also possible to phrase this mechanism in terms of Dahl's diffusion of power: The income from natural resources as oil and minerals typically employ very few people and generate enormous taxes. In a country where

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[11]Ross (2001) also notes that resource wealth may exacerbate ethnic tensions if the resources are geographically concentrated in the region of a minority group which will claim the rights for the monopoly of its extraction. If so, the increased military spending might be a result of the perceived security threat rather than a means to preemptively deter the opposition. Still, increased military spending is not likely to increase the probability of democratization.

a large proportion of the income stems from such sources, power is dispro-
portionally concentrated in the state and the few companies and the skilled
labor that do the actual extraction. The lack of diffusion of power creates
an unfavorable condition for democracy.

Przeworski and Limongi (1997) and Przeworski et al. (2000: 88) point
out that the relationship between democracy and development may come
about in two ways: either because democracies 'may be more likely to
emerge as countries develop economically, or, having been established for
whatever reasons, democracies may be more likely to survive in developed
countries.' Modernization theory implies the former process – increases in
literacy, income, etc. creates a 'pressure' for democratization, or 'favor-
able conditions' for successful democratic transitions (Dahl, 1989:239ff.).
Przeworski et al. (2000) present results supporting the second of these
mechanisms only.

Boix & Stokes (2002) challenge these findings, and show that when
reanalyzing Przeworski et al.'s models for a longer time-frame transitions
to democracy really becomes more likely when average income rises. In
a formalization of Przeworski & Limongi's intuitive explanation, they also
challenge the theoretical rationale for their findings: If, as Przeworski &
Limongi assume, a lower marginal utility of consumption at higher levels of
consumption reduces the gain from winning the struggle for dictatorship,
income growth both stabilizes democracy and increases the ruling factions'
incentives to democratize. Boix & Garicano (2002) explains this relation-
ship in terms of asset specificity, or the mobility of capital: The mobility
of capital places an upper threshold on the tax rate the median voter in
a democracy will choose. With a lower expected tax, the wealthy are less
likely to block democracy. Since the process of economic development is
a story of a shift to more mobile capital, this explains the empirical reg-
ularity. Their model is also consistent with the observation that primary
commodity-dependent countries are less likely to become and remain de-
mocratic, since primary commodities are highly country-specific assets.[12]

2.2.2 Development and Civil War

As discussed above, Collier (2000), Collier & Hoeffler (2002), Collier et al.
(2003), and Fearon & Laitin (2003) argue that the opportunities for orga-
nizing a rebel army is more important to explain the occurrence of civil

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[12]In addition, the model and empirical results in Boix & Garicano (2002) shows that
high inequality in the distribution of income also prevents the formation and preservation
of democratic institutions.

war than the motivations people might have for rebellion. Such opportunities are typically present in countries with low income and education levels. Empirically, the link from aspects of development directly to domestic peace is one of the most robust findings in recent large-N studies on the determinants of civil war. The discussion of these findings can also be decomposed into the three aspects of development discussed here.

Opportunity Costs

Collier and Hoeffler's (2002) 'predation theory' assumes that there will always be someone who has sufficient grievances to be willing to start a rebellion against the government. Hence, whatever the motivation, the rebellion can only be carried out if it is financially viable. Average income affects the viability through opportunity costs: The recruits of the rebel groups must be paid, and their cost is likely to be lower the lower their alternative income is. Hence, everything else equal, it is easier to maintain a rebellion in countries or regions with low average income than in richer regions.

Collier & Hoeffler support their argument by estimating a statistical model of the determinants of civil war using three proxies for alternative economic opportunities for potential recruits: GDP per capita, male secondary school enrollment, and the growth of the economy. GDP per capita captures the average income in the country, school enrollment is an alternative occupation to rebellion in the short run and promises improved income in the long run, and the growth rate indicates the amount of new income opportunities.

Government Military Capabilities

Moreover, Collier and Hoeffler (2002) and Fearon and Laitin (2003) note that per capita income is also related to governments' military capabilities. Rich countries with a solid tax base are more able to deter rebellion than poor countries, everything else being equal. Fearon & Laitin further note that a high per capita income is associated with high financial, administrative, and police capabilities, a terrain more 'disciplined' by roads and agriculture (p. 10), and a higher level of penetration by central administration. All this favors the state's ability to counter insurgencies, and thus reduces the probability of civil war.[13]

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[13]The argument is reminiscent of the discussion of realism above. Hobbes' *Leviathan*, a prime reference for realist international relations scholars, specifically argued for con-

Although Collier & Hoeffler use a measure of education levels – secondary schooling – as an independent variable in their analysis, they interpret it more as a proxy of opportunity costs for potential recruits than an indicator of a direct effect of education. One possible way that education might have a direct effect on the risk of armed conflict is to extend Dahl's argument that education increases the power resources that lies in the citizens themselves: In most civil wars, the civil population suffers. Ordinary citizens do not want rebel movements to operate in their neighborhood. Rebel groups typically are dependent on the civil population for food and other resources, and use their military power to obtain this. In many civil wars, citizens organize to resist this predation. However, limiting the activity of rebel movements involves a collective action problem (Fearon & Laitin, 1999). In this sense, resistance of rebel groups is analogous to the process of establishing democracy (limiting the power of the incumbent king or sovereign), which also involves a collective action problem (Weingast, 1997). Hence, it is possible that the structural changes/mechanisms that enables citizens to overcome their collective action problem with respect to limiting the sovereign (e.g. literacy, efficient means of communications, free time, sources of income that are independent of the state, property that is secure from physical destruction) are the same (or rather, related to) as those that enable them to overcome the collective action problem with respect to rebel movements. Education and literacy, then, may affect the risk of civil war directly. A high per-capita income is also likely to work in this way.

Structure of the Economy

In Collier & Hoeffler (2002), the structure of the economy also affects the income side of the rebel groups' finances. They argue that civil war is particularly likely in countries that have certain types of natural resource abundance, since control over such resources provides an attractive source of income for the rebel organization. This is particularly true for commodities that are located in territories a rebel group can easily defend, such as resources that are located far from the capital, e.g. tropical timber in remote regions of the country (Le Billon, 2001:569ff). The resources must also be extractible without much physical investment, since the extraction often takes place in a war zone, and preferably be easy to bring to international markets. Alluvial diamonds is an example of a commodity that satisfies the two last requirements. Natural resource dependence or abun-

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centrating power in a sovereign (the Leviathan) in order to avoid the disadvantages of domestic anarchy.

dance is also found to hamper growth (Sachs & Warner, 1995; Auty, 2001), which again is associated with conflict (de Soysa, 2000, ch. 7).

Other types of natural resources tend to favor the government, on the other hand. Oil extraction and mining (including kimberlite diamonds), for instance, is seldom controlled by rebel groups because of the large investment typically required. Moreover, when large oil revenues or loans based on expected revenues start flowing into the state budgets, governments are often able to invest in military capabilities that will effectively deter any armed insurrection (cf. Ross, 2001).[14]

Chapters 3 and 7 show how important per-capita income – which is closely related to the structural factors discussed here – is for reducing the risk of internal conflict. Moreover, Chapter 8 shows that similar processes apply in international relations: Rosecrance's (1986) description of how development alters the incentives for choosing between a trading-states or a military-political strategy. In relations between developed countries, it is hard to make conquered territories profitable. Hence, trade is a relatively more attractive way to gain access to resources. This is analogous to the incentives for predation discussed in the internal war literature. The alternative for elites to the 'military-political strategy' – predation – is to agree with each other to secure property rights and to use the organizational capabilities they possess to make the property they control maximally profitable, just as international trade does.

2.2.3   Development and the Democratic Peace

In addition to altering states' choice between Rosecrance's two strategies in itself, the democratic peace hypothesis (Bueno de Mesquita et al., 1999; Doyle, 1986; Maoz & Russett, 1993; Russett, 1993) may imply that the nature of the political regime alters how development affects this choice.

The democratic peace may also require that the states are developed: Democracy and development reinforce each others' tendencies to favor trading-state strategies. Citizens of poor countries may have more to gain from territorial expansion since the economy is land-based, implying that the democratic peace is less valid for poor countries than for rich ones.

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[14]In countries that have an abundance of this type of resources, government becomes the prize over which fighting takes place. This type of contest is modeled in Skaperdas & Syropoulos (1996) and Skaperdas (2002): They show how the availability of rent increases the intensity of conflict. They also note how that the existence of 'secure resources' – resources that cannot be appropriated – is important, and that the amount of waste or destruction in conflict reduces intensity of conflict.

Conversely, extensive illiteracy, poor communications, and weak political institutions in under-developed countries constrain citizens' ability to use democratic institutions to restrict rulers. Such ideas are important for the argument that developed countries are more likely to sustain democracy (Burkhart & Lewis-Beck, 1994; Lipset, 1959).

Mansfield & Snyder (1995; 1996; 2002) argue that democratization and lack of democratic consolidation at the very least diminishes the extent to which democracy constrains states' military behavior. Since democracies in low- and middle-income countries are markedly more unstable than high-income countries (Przeworski et al., 2000; Gates et al.. 2003ab), this implies that the democratic peace should be strongest for high-income countries.

Finally, Mousseau (2000: 479) argues that it is the intensity in market transactions in developed society that leads to democratic consolidation, since 'if individuals in developed market economies tend to share the social and political values of exchange-based cooperation, individual choice and free will, negotiation and compromise, universal equity among individuals, and universal trust in the sanctity of contract, then individuals in developed market economies tend to share of democratic values. The same market norms are incompatible with using military force in foreign affairs (pp. 480–481). Hence, democracies funded on these norms will avoid arbitrarily using force towards other states sharing these norms. However, since market transactions are more intense in developed democracies, the democratic peace should be stronger the more developed the two states in the dyad are.

Chapter 8, Mousseau (2000), and Mousseau, Hegre & Oneal (2003) show empirically that the democratic peace is stronger in developed dyads than in dyads with at least one non-developed state.

2.2.4 Development, Trade, and Interstate War

Rosecrance (1986) argues that commerce is gradually replacing con-quest as a means of advancing the national interest. Well into the twentieth century, he holds, the international system was founded on the assumption that land was the major factor in both production and power. This 'obsession with land' was the major cause of war since states could improve their position by building empires or invading other nations to seize territory (1996: 48). During the twentieth century, however, mobile factors of production – capital and labor – are surpassing land in importance for productive strength. This means a relative decline in the value of land. This development coincides with increasing nationalist resistance, which increases the cost of

holding an occupied territory and of extracting re-sources from this. This
has an impact of the frequency of war, Rosecrance argues, since 'labor,
capital, and information is mobile and cannot be definitely seized' (1996:
48).

This change is partly a systemic change – technological changes reduc-
ing transaction costs and the increase in nationalist resistance has gradu-
ally tipped the system-wide balance in favor of the 'trading world' at the
expense of the 'military-political world'. However, eco-nomic and techno-
logical development within the individual states also change the individual
orientation of the states: Referring to recent conflicts involving Bosnia,
Iraq, India, and Pakistan, Rosecrance states that '[l]ess developed coun-
tries, still producing goods that are derived from land, continue to covet
territory. In economies where capital, labor, and information are mobile
and have risen to predominance, no land fetish remains' (1996p. 46). In-
dustrialization, then, induces states to become more dependent on trade
and less inclined to initiate wars over territorial issues. Developed states
continue to be prepared to defend their existing borders, but regard territo-
rial expansion as to costly to pay. If Rosecrance is right, we should expect
that developed states trade more and engage less in war. This hypothesis
is explored and supported empirically in Chapter 8.

Development is central for Rosecrance's argument in two respects. Firstly,
the trading-state strategy is based on improving (or developing) the utiliza-
tion of resources within the existing territory in order to increase wealth and
power. The military-political strategy attempts to achieve growth through
increasing the amount of resources available through expanding the terri-
tory, without improving the use of the resources. In this sense, develop-
ment is an objective of the trading-state strategy, but not necessarily of the
military-political strategy.

Secondly, development alters the incentives for choosing between the
two strategies. Industrialization increases the demands for natural re-
sources, rendering the trading state/military-political dilemma more acute.
With economic expansion, the demand for resources and labor increases.
Industrialization in general leads to a situation where the domestic supply
of resources and labor becomes too narrow. This argument is central for
Choucri & North (1975; 1989), who see industrializing to increase a state's
'lateral pressure' – the extension of a country's behavior and interests out-
side its territorial boundaries. Lateral pressure will manifest itself both in
the form of trade or territorial expansion. Growth through development
may also lead to power transitions that in turn lead to conflict (Organski

& Kugler, 1980).

It is important, however, to distinguish between the process of industrializing and the status of being industrialized, to distinguish between economic growth and economic structure. Lateral pressure theory and power transition theory both predict war to follow when a country moves from being non-industrialized to industrialized, but not after the industrialization is completed and the power and resource-access balances are reestablished. Lateral pressure theory, however, do suggest that the access to resources is relatively more important for developed, highly diversified economies than for less diversified economies. Modern trade theory increasingly focuses on economies of scale in accounting for the volume of trade, irrespective of comparative advantage (Ethier, 1995: 47–68). This access to resources can either be secured through conquest or through commerce. Industrialization may spur states to secure this access through military means (Liberman, 1993). Moreover, industrialization increases the state's interaction capacity. This indicates that industrialization in a country may lead to either more trade or more war.

Other aspects of industrialization imply that industrialization decreases the likelihood of conflict. Industrialization tends to increase the costs of fighting wars on one's own territory: Potential aggressors will be aware that sophisticated factories and elaborate infrastructure take more time to reconstruct if damaged than do agricultural fields. Industrialization, then, should constrain leaders from initiating wars that risk being fought on own territory. Moreover, the technologically advanced weapons possessed by industrialized countries are very destructive. Aggressors, then, should be reluctant to attack such targets, as the costs of retaliation may be unbearably high.

Highly diversified economies are dependent on a wide range of imported goods and markets. The more diversified its economy, the less likely it is that a state may secure access to a significant portion of its needs through the occupation of a single state. Industrialization and development is associated with increasing demand for resources and labor only up to a certain point. Beyond that point, further development is primarily dependent on access to capital, technology, and highly specialized knowledge. Access to these factors is much harder to gain through conquest than is the case for natural resources and labor. This implies that to the extent that industrialization really increases the amount of warfare through the mechanisms of lateral pressure, this is valid only up to a certain point.

Increased dependence on capital – foreign or domestic – also affects the

expected costs of warfare. To the extent that foreign investors avoid engagements in countries that are likely to get involved in a war, this adds to the economic costs of war for industrialized countries. Domestic capital is also likely to flee the country if war breaks out. Less capital-intensive economies are less constrained by these considerations (Gartzke, Li, & Boehmer, 2001). All in all, the relative utility of conquest should decrease when the economy becomes less dependent on land and natural resources, and more dependent on capital and knowledge.

In addition, as the level of development increases, the diversity of materials used, and even the sheer magnitude of the quantities consumed and the size of the markets needed, weighs against a military strategy (Brooks, 1999). The increased diversity of inputs increases the amount of new territory needed for self-sufficiency. Development may provide the motive and means for a state to seize a particular territory from another by force, but it also increases its dependence on third parties. War hampers trade with third parties either because of political reactions or because the heightened risk resulting from conflict increases the price of traded goods. Since world conquest is an unrealistic scenario for any state, the constraints imposed on developed states by their increased trade with a great number of other nations is apt to outweigh the prospect of gaining control over one particular territory. Supportive of this view, Chapter 8 concludes that the pacifying impact of trade may be conditional to higher levels of development.

2.2.5   Development and the Liberal Peace

The discussion above shows how the three components of the liberal peace theory share some important fundamental assumptions: A country or a region will benefit from a liberal peace if individual citizens are given political rights so that they can influence the country's foreign policy, and/or if individual citizens, and firms are allowed to trade freely irrespective of national borders.

The discussion also shows that the liberal peace is most likely to be observed in circumstances where it is hard to take physical control over assets or over individuals. Democracy is most likely to emerge where individuals are in a position to engage in political debate, or to vote with their feet if not allowed to cast a ballot, and in societies where those in power are economically dependent on the skills and cooperation of large segments of the society. Civil wars are most likely in countries where narrow groups have an incentive to organize armies to gain control over assets they can make profits out of. In order to be able to capture them, these assets must

be capturable and preferably bound to a particular territory, and the incumbent government must be too weak to defend them. In order to be profitable, they must be either extractable without access to much capital, or the rebel group must gain control over the entire state. The same factors dictate when states have incentives to conquer foreign territories.

Socio-economic development crucially alters these circumstances. Increased literacy enables citizens to become informed and participate in the political process. Large numbers of educated citizens may more easily threaten to gain political concessions through strikes or threats of migration. Poor people are typically easy to intimidate since small negative changes to their income or destruction of property can have fatal consequences.

Development is also a transition from production of territory-specific, physical assets such as natural resources or agricultural commodities, to production assets that require human and financial capital. Such assets are not easily appropriable.

This has empirical implications for the liberal peace: The incentives for important components of the liberal peace: democratization, trade, and warfare all depend on the security and distribution of resources. Financial capital and human skills are intrinsically more secure factors than assets specific to a particular piece of land. Human skills are also more equally distributed than any other factors. Hence, the transition from an economy primarily based on land to one based on capital should make the liberal peace more feasible. The section then discusses how these implications are borne out in the analyses in Chapters 8 and 7.

The chapters in Part III indicate that development is a precondition of the liberal peace.

The relationship between development, democracy, and international conflict is further explored in Mousseau, Hegre & Oneal (2003), where the model in Oneal & Russett (1999) is extended to include the interaction terms between democracy and development, trade and development, and trade and democracy. That study indicates even more strongly that the liberal peace is partly dependent on development.

Part II

The Liberal Peace

Chapter 3

Toward a Democratic Civil Peace: Democracy, Political Change, and Civil War

This chapter was written jointly with Tanja Ellingsen, Scott Gates, and Nils Petter Gleditsch, and was originally published as Hegre et al. (2001).

Abstract

Coherent democracies and harshly authoritarian states have few civil wars, and intermediate regimes are the most conflict-prone. Political change also seems to be associated with domestic violence, regardless of whether that change is toward greater democracy or greater autocracy. Is the greater violence of intermediate regimes equivalent to the finding that states in political transition experience more violence? If both level of democracy and political change are relevant, to what extent is civil violence related to each factor? Based on an analysis of civil war in 152 countries in the period 1816–1992, we conclude that intermediate regimes are most prone to civil war, even when they have had time to stabilize from a regime change. In the long run, since intermediate regimes are less stable than autocracies and, in turn, autocracies less stable than democracies, durable democracy is the most probable end-point of the process of democratization. Thus, the democratic civil peace is not only more just than the autocratic peace, but also more stable.

3.1   Through Democracy to Peace?

The 'third wave of democratization' (Huntington 1991; Vanhanen 2000) has raised hopes for a more peaceful world. The thesis of the democratic peace suggests that the spread of democracy will promote a decline in interstate warfare (Doyle 1986; Russett 1993), at least once the unsettling effects of the transition period have been overcome (Ward and Gleditsch 1998). But does democratization also lead to civil peace?

A fair amount of research has examined how regime type or the level of democracy relates to domestic conflict. Much of this research has focused on the result that semi-democracies (regimes that are somewhere between a democracy and an autocracy) exhibit a higher propensity for civil conflict than both democracies and autocracies. Another strand of research focuses on how changes in regimes lead to domestic conflict. This has implications for the former finding, since semi-democratic regimes have been shown to be more prone to regime change. This, we argue, raises the question whether the conflict-proneness of semi-democracies and that of countries in transition are complementary findings or in fact one and the same finding. Tying these two explanations together in a study of civil war is the key issue examined in this chapter. We link level and change in an empirical analysis, using data from 152 of the world's countries in the period 1816–1992. We also explore the implications of the direction and magnitude of political change. We formulate a statistical model that overcomes some of the problems in research building on country-years – such as the fact that country-years do not constitute independent observations as well as the possibility that the amount of civil war in the system of states fluctuates over time. Finally, our work adopts a multivariate framework with several control variables, among them socioeconomic and cultural factors, as well as spatial and temporal contagion. A separate analysis, with a more extensive set of control variables, is performed for the post-World War II period.

3.2   Democracy, Democratization, and Civil War

3.2.1   Level of Democracy and Civil War

Harshly authoritarian states and institutionally consistent democracies experience fewer civil wars than the intermediate regimes (de Nardo 1985; Francisco 1995; Muller and Weede 1990). The basic regularity underlying this finding is that semi-democracies (institutionally inconsistent regimes)

possess inherent contradictions as a result of being neither democratic nor autocratic. Such regimes are partly open, yet somewhat repressive, a combination of characteristics that invites protest, rebellion, and other forms of civil violence. Repression leads to grievances, inducing groups to take action against the regime. Openness allows for groups to organize and engage in activities against the regime. Institutional contradictions such as these imply a level of political incoherence, which, in turn, is linked to civil conflict.

A number of works support this hypothesis of an inverted U-curve between democracy and domestic violence. Much of this work, however, is based on a small number of cases or a short time-period. For instance, Francisco (1995) examines only three cases: the former German Democratic Republic, Czechoslovakia, and the Palestinian Intifada. The study by Muller and Weede (1990) was limited to events data collected by Taylor and Jodice (1983) for the period 1973–77.[1]

Ellingsen and Gleditsch (1997) confirmed the inverted U-curve between democracy and civil violence using data for a longer period, 1973–92. Using two different measures of democracy, they found democracies to experience civil war very rarely. First-world democracies had no civil war at all over this period. Moreover, they also found that by far the highest frequency of conflict occurs in semi-democracies, yielding a clearly inverted U-curve across all levels of economic development.

3.2.2   Political Change and Civil War

The road to democracy is complicated and can lead to internal violence and even to the collapse of the state (Bratton and van de Walle 1996; Casper and Taylor 1996). Autocratic countries do not become mature consolidated democracies overnight. They usually go through a rocky transition, in which mass politics mixes with authoritarian elite politics in a volatile way. Political change leads to the deconsolidation of political institutions and, in turn, to a heightened risk of civil war. The effect of regime change on domestic violence has been studied by a number of scholars (e.g., Sahin and Linz 1995; Tarrow 1994; Davenport 1999).

In a classical argument, de Tocqueville (1856/1955, 182) points out that 'revolutions do not always come when things are going from bad to worse ... Usually the most dangerous time for a bad government is when it

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[1]Krain and Myers (1997) find that democracies are less prone to civil war than autocracies, but do not account for semi-democracies and only provide a bivariate analysis.

attempts to reform itself.' Huntington (1991) finds that political violence is frequently coupled with democratization. Such changes are unlikely to occur without serious conflict, especially in countries where different ethnic minorities share the same territory (Horowitz 1993). Communal groups in liberalizing autocracies have substantial opportunities for mobilization, but such states usually lack the institutional resources to reach the kinds of accommodation that is typical of established democracy (Gurr 1993, 165). The collapse of authoritarianism followed by ineffectual efforts to establish democracy creates an interim period of relative anarchy during which ethno-national or ideological leaders may organize rebellion rather than wait for democracy.

Theoretically, consolidation can occur anywhere on the spectrum of regime types, ranging from autocracy to democracy. Autocratic regimes, like their democratic counterparts, can be consolidated or unconsolidated. Indeed, consolidated autocracies also exhibit self-enforcing rules and institutions that prevent protest and other activities aimed against the state. It may take some time before repression is effective. Semi-democracies may also become consolidated. One can imagine a monarchy or some other political system that is neither a democracy nor an autocracy with a high degree of consolidation. If the central idea of an inverted-U relationship between regime type and civil war holds, however, the inconsistent and contradictory nature of these regimes should prevent them from becoming consolidated.

Political institutions can also be deconsolidated. Political change, either in the form of democratization or autocratization, can be associated with political instability. Political change leads to a delegitimization of the regime inducing dissatisfied groups to take up the struggle against the state. Autocratization that results in the deconsolidation of political institutions also implies increasing levels of repression (Zanger 2000: 225–26). Repression by a regime without well-developed political institutions is likely to promote civil violence (Lichbach 1987; 1995; Moore 1998).

The initial high level of uncertainty and unrest caused by a regime change will gradually diminish, as protesters give up their aspirations or find ways to obtain part of what they want within the new regime. In the case of democratizations, new and more democratic institutions are allowed to take root and promote a more peaceful resolution of domestic conflict. As time passes, democratic values and institutions become more entrenched, and the likelihood of regime failure decreases. Conversely, the pattern works in parallel for autocratization. After a while, regime change

per se has no destabilizing effect and is therefore no longer a factor in generating political violence.

3.2.3 One Explanation or Two?

The hazard of civil war is higher in intermediate regimes as well as in regimes just emerging from a political transition, than in well-established democracies or autocracies. Are these two findings one and the same? Semi-democracies might be more prone to civil war because they on average have more recently undergone a political change. Gurr (1974: 1500) finds that the average persistence of the highly coherent polities – democracies and autocracies – exceeds that of 'anocracies' or polities with mixed authority patterns. Below, we corroborate this finding with newer data. The implication of this is that we cannot readily determine whether a high risk of civil war is due to level or change. The two factors unquestionably overlap to some extent. Does an inherent inconsistency of semi-democracies account entirely for their greater frequency of civil war? Or, vice versa, does the fact that semi-democracies are on average younger polities, fully explain why they are more prone to conflict? Or do both level and change affect the risk of civil war?

We cannot satisfactorily answer these questions without including both political change and level of democracy in our analyses. If both factors are relevant, we would expect to see evidence of an inverted U even when controlling for time since regime change. By controlling for both variables, we can assess whether one or the other or both are significant.

3.3 Hypotheses

In an attempt to distinguish between level and change as the cause of civil conflict, we posit the following hypotheses.

Hypothesis 3.1 *Semi-democracies are more likely to experience civil war than either democracies or autocracies.*

Hypothesis 3.2 *Institutionally consistent democracies and stark autocracies are equally unlikely to experience civil war.*

Hypothesis 3.3 *Countries that have undergone a political transition are more likely to experience civil war than countries whose political system has remained stable. Thus, the likelihood of civil war in sem-democracies remain higher in oterh regime types, even a long time after a regime change*

Hypothesis 3.4 *The two relationships described in H1 and H3 are both valid and reinforce each other.*

Hypothesis 3.1 reflects the inverted U relationship between level of democracy and domestic violence and hypothesis 3.3 that regime change leads to a heightened risk of civil war in the short run. Both have found support in previous work. Hypothesis 3.2 states that the inverted U is symmetric, as demonstrated by Muller & Weede (1990), and in contrast to Krain and Myers (1997). Hypothesis 3.4 accounts for the possibility that hypotheses 3.1 and 3.3 are complementary. A rejection of hypothesis 3.4 would mean that either hypothesis 3.1 or 3.3 is a sufficient explanation of the probability of civil war.

3.4   Research Design

3.4.1   The Cox Regression Model

Comparable studies in this field have made use of data sets where the country-years are units of observation (e.g. Auvinen 1997; Ellingsen 2000; Zanger 2000). However, if regime change causes civil war, we expect conflict to follow shortly after regime change. The relevant time frame ranges from a few days to a few years. To model civil war as a consequence of regime change we have to relate the conflict to regime information up to the last day before the civil war breaks out. A country-year approach is unsuitable to our need to model swift changes, since events following each other in the same year appear as simultaneous. The Correlates of War Project's civil war data are coded by date. The Polity IIId data set also contains precisely dated regime changes, to the extent that such dating was possible. The availability of such precise information also allows us to control for diffusion of international war or of an ongoing civil war in a neighboring country.

As argued in Chapter 5 (p. 135) with respect to interstate war, the country-year structure has other disadvantages, of a more statistical nature.[2] Country-years do not constitute independent observations. If a civil war continues over several years, the subsequent country-years at war will be highly dependent on the first year for that country. Removing (censoring) country-years with continuing civil war may ameliorate this problem. But correspondingly, consecutive years of peace in a country are just as

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[2] Chapter 5 is concerned with the dyad-year structure, but most of their arguments apply equally to country-years.

dependent on the first year of peace. If we censor continuing war, we should also censor continuing peace, but then nothing would remain of the country-year structure. If we do not censor at all, we have a poor basis for estimating the statistical significance of the parameter estimates.

Analytical techniques for country-year data also assume a constant baseline probability of civil war, regardless of other variables. One could imagine the amount of civil war in the system of states to fluctuate over time, following global political, ideological, and economic variations. If this fluctuation is correlated with trends in the independent variables, this is a potential problem. Raknerud and Hegre (1997) formulated a Cox regression model to solve these problems.[3] Here we modify their model to apply it to civil war. The main idea of Cox regression is the assumption that the hazard of civil war $\lambda_c(t)$ for country c can be factored into a parametric function of (time-dependent) risk factors and a non-parametric function of time itself, the baseline hazard:

$$\lambda_c(t) = \alpha(t) \exp\left[\sum_{k=1}^{p} \beta_k X_k^c(t)\right] \tag{3.1}$$

$\alpha(t)$, the baseline hazard, is an arbitrary function reflecting unobserved variables at the system level. The baseline hazard will account for any time trend in the data. $X_k^c(t)$ is a (possibly time-dependent) explanatory variable for country c; β_k is the corresponding regression coefficient; and p is the number of explanatory variables. All legitimate variables are known prior to t – they must be a part of the history up until immediately before that point t. Note that t here is calendar time – the number of days since a specific date. This differs from the common use of survival models, where t is time at risk – in this context, the number of days since last civil war or since the country entered the study.[4]

To execute an analysis with this model, we need a data file constructed in the following way: For each t_w– i.e. each day a civil war breaks out somewhere – we take a 'snap-shot' of the international system; i.e., we note for all countries that are system members and not already at war, the values of the explanatory variables on that particular day. For each such day of observation t_w, the data file contains one row for each country with the values for the variables on this particular day. Where we do not have

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[3]Cox (1972) proposed the Cox regression model; good descriptions can be found in McCullagh (1989) and Collett (1994).

[4]For instance, the analysis in Gates et al. (2003) is a more standard application of survival models, where t is the time at risk of polity breakdown.

data on a daily basis, e.g. for the Ethnic Heterogeneity and Development variables, we entered the value for the year in which the event occurred.[5] The Cox regression model compares the country that did erupt in war at t_w to all countries that were at risk of doing so. Thus, all information for the time between different war outbreaks is ignored (except when estimating the baseline hazard).

Thus, civil war may be modeled as a function of events that are as recent as the day before the outbreak, in contrast to what takes place in a country-year framework. Since all that happens between the outbreaks of war is ignored, dependence between units caused by consecutive years of peace is not a problem. Finally, possible confounding time-trends in the probability of civil war are taken care of by the non-parametric baseline hazard function.

The parameter β_k can be interpreted in terms of a relative probability of civil war. Assume that country i and j have the same values on all explanatory variables, except for $X_k(t)$. Then, from (3.1), the ratio between the hazard of civil war of country i and country j becomes

$$\frac{\lambda_i(t)}{\lambda_j(t)} = \exp\left(\beta_k\left(X_k^i(t) - X_k^j(t)\right)\right) \tag{3.2}$$

Hence we have

$$\ln\frac{\lambda_i(t)}{\lambda_j(t)} = \beta_k\left(X_k^i(t) - X_k^j(t)\right) \tag{3.3}$$

$\lambda(t)\Delta t$ is approximately the probability of a transition (from peace to war) in the 'small' time interval $(t, t + \Delta t)$. In the ratios above, the time interval Δt cancels out and the parameter is the log of the relative probability, or the relative risk, between two countries that differ by one unit on the variable and are otherwise identical.

3.4.2   Time Frame

Our core analysis with all the variables makes use of data for the period 1946–92. A more limited analysis with fewer variables is carried out for the entire Correlates of War time-span 1816–1992.

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[5] Ideally, these variables should also have been coded on a day-to-day basis. This is not a substantial problem, however, since their values usually do not change dramatically over short time periods.

3.4.3 The Dependent Variable

The dependent variable is the outbreak of civil war as recorded in the Correlates of War Project (Singer and Small 1994). Appendix A (p. 263) provides a list of the conflicts included in the analysis. Civil war is defined as an internal war where: '(a) military action was involved, (b) the national government at the time was actively involved, (c) effective resistance (as measured by the ratio of fatalities of the weaker to the stronger forces) occurred on both sides and (d) at least 1,000 battle deaths resulted' (Singer and Small 1994, part 3). The Correlates of War Project does not distinguish between different conflicts within the same country – if a civil war breaks out while a there is another going on in a different region of the country, this is not reflected in the data set. The outbreaks of civil war include a number of internationalized civil wars, but in our study the participation of intervening countries is not counted as civil war in their countries.

The criteria for coding the start of a Correlates of War civil war are potentially problematic. As a conflict must have 1,000 battle deaths to be counted as a civil war, the coders have dated the start of a civil war to the year in which it reached this threshold. Thus, the early months or even years of some wars would not count.[6] Most wars escalate quickly from the first shots to the peak level of severity. However, we cannot exclude the possibility that some civil wars have broken out before the regime change that we have coded as the most recent one. The definition of the start day is important to the study of civil war. If there is a period of low-level domestic turmoil before the recorded start date of the civil war, the political system may be undermined during this period. This is unlikely to affect a large number of civil wars.

3.4.4 Regime Type and Regime Change

For regime type, we use the Polity IIId data set (McLaughlin et al. 1998) which covers our spatial and temporal domain. The Democracy–Autocracy index used by Jaggers and Gurr (1995) and others is our measure of democracy. This index ranges from –10 (most autocratic) to 10 (most democratic). We add the square of this variable to allow modeling of the inverted U-curve relationship between level of democracy and conflict.[7]

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[6] We have not found precise coding criteria for war starting dates. Our source here is a personal communication from Melvin Small, June 16, 1998.

[7] A square term is the simplest model of a curvilinear pattern. We also fitted models with democracy as a 7-category and 21-category variable, as well as a model with a cubic term. All these suggested very similar relationships between the level of democracy and

To model the relationship between time since regime change and the risk of civil war, we defined *Proximity of Regime Change* as $x = \exp(-\text{days since regime change}/\alpha)$, where α is some chosen divisor. This exponential function has the value 1 when the regime change is close in time, and is close to zero when the change happened a long time ago. It reflects the assumption that the effect of regime change on the probability of civil war is decreasing at a constant rate.

A weakness of the Polity data set is that an on-going civil war or other political violence in the country may be reflected in the coding of regime characteristics; notably in the indicators that characterize regulation and competitiveness of participation. A country with extensive political violence is unlikely to be coded as a full democracy, or as a full autocracy. There may be an overrepresentation of political violence in the regimes coded as being intermediate. This may confound our results somewhat, since civil war as defined in the Correlates of War project may break out after some time with lower-level violence. We return to this question in the analysis section.

The Polity III data set (Gurr, Jaggers and Moore 1989; Jaggers and Gurr 1995) codes regime change only annually. This made it difficult to pinpoint a regime change relative to the outbreak of civil war. In Polity IIId the regime change is recorded to the exact day wherever possible. When a regime change occurred in the same year as the outbreak of a civil war, the new data set enabled us to code the regime score for the day before the civil war outbreak. With these data we were also able to count the number of days since the last regime change (if any such change had occurred) for all countries for each time-point with outbreak of civil war (t_w). A regime change is defined as a change in an existing state greater than or equal to two in the Polity Democracy–Autocracy index, or as the creation of a new state.[8] Given a range of twenty, this definition of regime change is very inclusive, in order to capture all political changes that might be related to civil war.

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the risk of civil war. According to likelihood ratio tests, however, none performed better than the models reported in Tables 3.2 and 3.3.

   [8]If the country just entered or left a period of transition (coded in Polity as –66, –77, or –88), the event is *not* coded as a regime change, regardless of what kind of regime the country had before the transition period.

3.4.5 Control Variables

While it is not our aim to model an inclusive theory of civil war, we make no pretense that level of democracy and political change constitute a complete explanation. We therefore identify a number of control variables – *Development, Ethnic Heterogeneity, Proximity of Independence*, and *International War in Country* – whose omission may bias the results for regime change variable. The remaining control variables – *Proximity of Civil War* and *Neighboring Civil Wa*r – are included to model how the hazard of civil war depends on earlier events in the country and the neighborhood. With these controls, we may assume that the units of observations are independent, conditionally on the explanatory variables (cf. Chapter 5).

Civil war occurs more frequently in poor, under-developed countries (Hauge and Ellingsen 1998). Referring to modernization theory, Hibbs (1973, 21–23) in a study of mass political violence around 1960, relates the decline in internal violence to the reduced class conflict in affluent societies. This renders negotiated outcomes and conciliation more acceptable to all groups in society. However, since class conflicts increase in the early stage of industrialization of traditional, agrarian societies, the relationship between level of development and political violence may be curvilinear. For the poorest countries, development may actually stimulate violence. Hibbs does find evidence for a moderate curvilinear pattern: the level of political violence only decreases over a certain level of development. Similar results are found in Collier and Hoeffler (1998).

To control for the level of development, we include in our model energy consumption per capita (measured as coal-ton equivalents). The variable is log-transformed since we expect the impact of a unit increase to be larger for a country with a low level on the variable than for a country with a high level. Log-transforming also reduces the skewness of the variable. We enter the square term of this variable to capture the curvilinear pattern found by Hibbs (1973). We expect negative estimates for both these variables. This would indicate that the risk of civil war is increasing with increasing development for the poorest countries and decreasing for the more developed ones. The data were taken from the Correlates of War's National Capabilities data set (Singer and Small 1993).

Civil war seems to occur more frequently in countries having substantial ethnic, linguistic, or religious minority or minorities (Ellingsen 2000; Vanhanen 1999). For our purposes, to measure heterogeneity, we use the variable $1 - s^2$, where s is the share of the population in the country that belongs to the largest group. We created independent variables for linguis-

tic, religious, and ethnic heterogeneity based on the data set assembled by Ellingsen (2000).

The probability of civil war also depends on the country's conflict history. Hibbs (1973, 163) found internal war (but not collective protest) to be strongly influenced by earlier internal war. We expect, however, that time heals old wounds, and have constructed a variable along the lines of the Proximity to Regime Change variable: *Proximity to Civil War* = exp(– Time in days since the last civil war ended/α). If the country had never had a civil war, the variable is assigned a 0.[9]

War against another state may also engender war within. An international war may provide an opportunity for dissident groups to attack a weakened regime, or the other country's government may incite a revolt. On the other hand, international war may also reduce the probability of civil war as potentially conflicting groups come together against a common enemy. We remain agnostic as to the direction of this relationship. To test it, we include a dichotomous variable 'International War in Country' which is coded as 1 if the country was involved in an interstate war (as defined in the Correlates of War Interstate War data set) the day before the day of observation.

Likewise, civil war may spread from one country to its neighboring countries. The variable *Civil War in Neighboring Country* has the value 1 if there was a civil war going on in a neighboring country the day before the day of observation.

Finally, we have added a variable called *Proximity of Independence* which equals exp(–Time in days since day of independence/α). Political institutions in new states are assumed to be less consolidated, which might have implications for their regime type, as well as for their modes of conflict resolution. Since the declaration of independence is coded as all countries' first regime change, this variable is correlated with Proximity of Regime Change, but not very highly (see Appendix A for the correlation matrix for the independent variables). We may expect a newly independent country to have many changes of governments that are not regime changes in the sense

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[9] A half-life of 16 years means a reduction of the initial effect to 1/8 after 48 years, and to 0.015 after 100 years. We have no data for the countries' conflict history before 1816. This is potentially problematic, since a possible civil war in a country in 1815 is assumed to have a considerable impact on the risk of civil war for most of the 19th century. Without data for the preceding years, the country is assigned a 0 until we know that it has experienced a civil war. The result of this data problem is a systematic underestimation of the variable as a whole, such that the temporal dependence is not fully accounted for the first 50 years of our analysis. This problem is negligible after the 1860s.

defined here. Another aspect of the unsettled character of new nations is that their borders (for instance, if they are inherited colonial borders) may be in dispute and out of alignment with ethnic or religious dividing lines. This could lead to interstate war, but also to a war of secession, which would be classified as a civil war in the Correlates of War data set. We include this variable to distinguish between these effects and the effects of the regime change.

We allowed the Proximity of Independence, Proximity of Civil War, and Proximity of Regime Change variables to have independent values for α. We ran the basic model (reported in Table 3.2 below) for all possible combinations of a range of values in this interval.[10] The combination of a half-life of 1 year for Proximity of Independence, 16 years for Proximity of Civil War, and 1 year for the Proximity of Regime Change variables maximized the likelihood function for the period 1946–92. The corresponding values for the 1816–1992 period were half a year and 16 years.[11] To ensure comparability, we employed the set of half-life parameters that optimized the 1946–92 period and the 1816–1992 period too. A half-life of one year implies that the contribution to the hazard function is halved in one year, is reduced to 1/32 (or 0.03) in five years, and to 0.001 in 10 years. Coding the 'proximity to' variables for a country for a given date requires that we know the history of the country for some previousyears. The Polity data set goes back to 1800 and always allows us to know at least 16 years of regime history. Since the half-life parameter assumes that the effect of any regime change is reduced to a minuscule fraction of its original impact after 16 years, the Proximity of Regime Change variable is adequately coded.

3.5   Analysis

3.5.1   Level of Democracy and Political Change

We first test whether intermediate regimes have a shorter expected duration than democracies and autocracies. We computed the Kaplan-Meier estimate of median survival time for polities belonging to the three regime

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[10] To be interpretable as dynamic effects, the half-life times were restricted to values between 0.5 and 16 years. These values were α=263.5 (0.5 years), α=526.9 (1 year), α=1053.9 (2 years), α=2107.8 (4 years), α=4215.6 (8 years), and α=8431.1 (16 years).

[11] For the long period, we obtained even higher likelihood values when trying half-life times shorter than 0.5 year and longer than 16 years. This was not the case for the short period.

Regime Type	Median Life-time (years)	95% Confidence Interval	N
Autocracies	7.9	$(6.7; 9.0)$	445
Semi-Democracies	5.8	$(4.9; 6.6)$	452
Democracies	10.0	$(7.9; 12.1)$	232
Note: An 'autocracy' is defined as a polity with a score in the range –6 to 10 on the Polity Democracy–Autocracy index. A 'democracy' is a polity within the 6–10 interval, and a 'semi-democracy' is in the range –5 to 5.			

Table 3.1: Kaplan-Meier Estimate of the Median Life for Different Regime Categories, 1800–1992

types. Survival time for a polity is defined as the time from one regime change to another, where a regime change is defined as a change greater than or equal to two in the Polity Democracy-Autocracy index, or as the creation of a new state. Table 3.1 shows that semi-democracies have a significantly shorter median survival time than democracies and autocracies. On average, less time has passed since the last regime change in the average semi-democracy than in the other regime categories. Semi-democracies form the least stable type of regime. This result corroborates the point made by Gurr (1974).

Autocracies are estimated to have a shorter median life-time than democracies, but this difference is not statistically significant. Gates et al. (2003) provide a much more elaborate and extensive investigation of the duration of different regime types. There, we find democracies to be significantly more durable than autocracies, and both of these to be more stable than semi-democracies. This also holds when controlling for development, the political composition of the neighborhood, and changes in regime transition rate over time.

We then tested Hypotheses 3.1–3.4. The results are presented in Tables 3.2 and 3.3. We conducted parallel analyses of the Correlates of War civil war data for the period 1946–92 with all explanatory variables, and for 1816–1992 without Ethnic Heterogeneity and Development. We only included the days with outbreak of civil war where we had data for all variables for the country that experienced the civil war outbreak.[12] The number of countries and the number of outbreaks of civil war that contribute to the different analyses are reported in the bottom lines of the tables. These figures vary with the availability of data for each model.

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[12] A complete list of the civil wars is given in Appendix A (p. 263).

Explanatory variables	$\widehat{\beta}$	s.e.	p-value	$\exp\left(\widehat{\beta}\right)$
Proximity of Regime Change	1.27	0.47	0.004	3.55
Democracy	-0.002	0.021	.92	1.00
Democracy Squared	-0.012	0.0051	0.009	0.99
Proximity of Civil War	1.16	0.97	0.078	3.19
Proximity of Independence	1.51	0.97	0.060	4.55
International War in Country	0.86	0.59	0.075	2.36
Neighboring Civil War	0.097	0.33	0.38	1.10
Development	-0.48	0.16	0.001	0.62
Development Squared	-0.066	0.036	0.031	0.94
Ethnic Heterogeneity	0.80	0.39	0.019	2.22
Log Likelihood$_{null\ model}$	-292.17			
Log Likelihood$_{model}$	-254.76			
Likelihood ratio index	0.13			
Number of Countries	152			
Number of Events	63			

Note: the exponential of the parameter estimate, $\exp\left(\widehat{\beta}\right)$, is the estimated risk of civil war relative to the baseline hazard if all other explanatory variables are zero (cf. equation 3.3). If some of the variables are non-zero, $\exp\left(\widehat{\beta}\right)$ is the hazard relative to other countries with similar values for all the other risk factors. The Log Likelihood Ratio Index is computed as $1 - (LL_{model} / LL_{nullmodel})$ (Greene, 1997: 891). For the Democracy variable, the p-value refers to a two-tailed test; $\beta \neq 0$. For Democracy Squared, Development, and Development Squared, $\beta < 0$ is tested. For the rest of the variables, $\beta > 0$ is tested. All estimates are in the expected direction.

Table 3.2: Risk of Civil War by Level of Democracy and Proximity of Regime Change, 1946–1992

Explanatory variables	$\widehat{\beta}$	s.e.	p-value	$\exp\left(\widehat{\beta}\right)$
Proximity of Regime Change	0.98	0.37	0.004	2.68
Democracy	−0.010	0.019	0.29	0.99
Democracy Squared	−0.013	0.0027	< 0.0005	0.99
Proximity of Civil War	1.66	0.25	< 0.0005	5.27
Proximity of Independence	1.86	0.68	0.003	6.41
International War in Country	0.24	0.42	0.28	1.28
Neighboring Civil War	0.27	0.27	0.16	1.31
Log Likelihood$_{null\ model}$	−535.69			
Log Likelihood$_{model}$	−484.82			
Likelihood ratio index	0.095			
Number of Countries	169			
Number of Events	129			
Note: See note to Table 3.2				

Table 3.3: Risk of Civil War by Level of Democracy and Proximity of Regime Change, 1816–1992

The estimates for 'Democracy' and 'Democracy Squared' reflect an inverted U shaped relationship between democracy and civil war. The coefficient for the 'Democracy' variable is virtually 0. In other words, the estimated parabola is symmetrical with the apex at 0 (the intermediate regime), and regimes at the very low end of Polity's Democracy–Autocracy scale are estimated to be as unlikely to experience civil war as regimes at the very high end. This is consistent with Hypothesis 2 – coherent democracies and stark autocracies are equally unlikely to experience civil war. Intermediate regimes are estimated to be 4 times as civil war-prone as a coherent democracy. The estimates for 'Proximity of Regime Change' variable are positive, large and clearly significant. For both periods, the estimates show clearly that the risk of civil war is high after a regime change. Translated into relative risk, the partial effect of regime changes on the hazard of civil war for the 1946–92 period was estimated to be 3.55 times the baseline the day after the regime change, to 1.89 times the baseline after one year and to 1.02 times the baseline after six years.[13]

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[13]To obtain this estimated relative hazard one year after the regime change, we first compute the value for Proximity to Regime Change: $exp(-365 \text{ days}/527) = exp(-0.692) = 0.50$. This value is multiplied by the estimated Beta: $0.50*1.27 = 0.62$, which is this variable's contribution to the linear expression. The exponential of this is $exp(0.62) = 1.89$, which gives the hazard relative to observations that have not experi-

Both Democracy Squared and Proximity of Regime Change are statistically significant. This is in support of Hypothesis 3.4 – both level of democracy (Hypothesis 3.1) and regime change (Hypothesis 3.3) are necessary to provide a full model of the relationship between regime type and the risk of civil war. In Figure **3.1**, the estimated risk of civil war relative to the baseline is plotted (along the vertical axis) as a function of the level of democracy (the horizontal axis) and the time passed since the latest regime change. The figure shows how the maximum impact of level differences and change are roughly equal when regarded separately. A regime change implies both a change (a deconsolidation) and a change in level. The combined effect can also be read out of the figure. For instance, the change from an old autocracy to a new semi-democracy increases the risk of civil war almost nine times relative to the risk before the regime change.
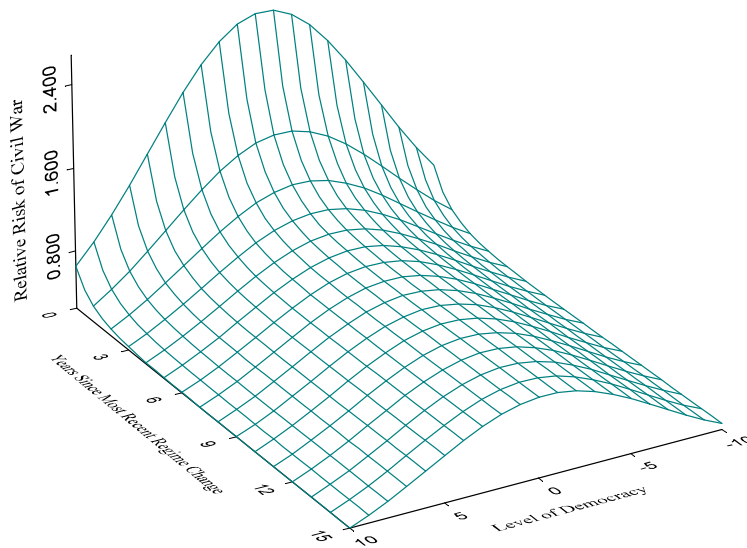
Figure 3.1: Relative risk of Civil War as a Function of Democracy and Time since Most Recent Regime Change, 1816–1992

enced regime changes in a long time, but are equal in all other respects.

In a Cox regression, all parameter estimates are interpreted relative to
the baseline. The baseline hazard $\lambda(t)$ is the non-stationary probability of
civil war in a short interval for countries where all covariates equal zero,
i.e. countries with democracy score 0 that have had no regime changes nor
civil wars for the last forty years, are not involved in international wars nor
have had neighbors with civil wars, and that have Development = 0. In
Figure 3.1, the baseline case is found at the 'front end' of the figure, at the
apex of the parabola.
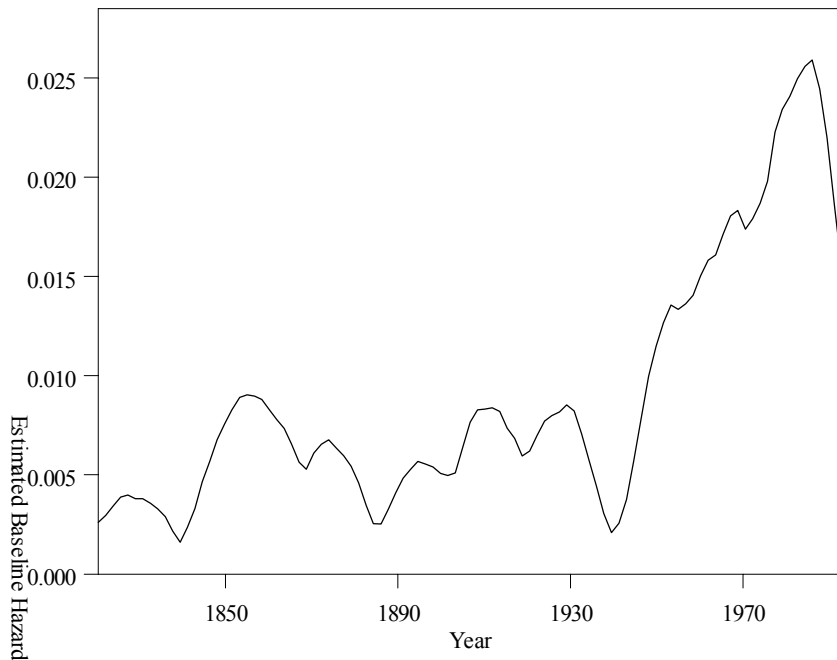
Figure 3.2: Estimated Baseline Hazard of Civil War, 1820–1992

In Figure **3.2** the estimated baseline hazard – the probability of an
outbreak of civil war during one year for the baseline case – is plotted for the
1816–1992 period (Table 3.3).[14] In contrast to the common use of survival
analysis, the time variable (the x-axis in the figure) is calendar time. This

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[14]The baseline was estimated using the procedure described in Collett
(1994:95ff).

allows us to get a rough picture of trends in the probability of civil war after
the explanatory variables have been accounted for. The increase in the
baseline hazard after World War II demonstrates that assuming a constant
baseline probability of civil war is not tenable. As discussed in Chapter
5 (p. 138) statistical models that require the assumption of a constant
baseline probability (e.g., logistic regression) are problematic when there
are trends both in the explanatory variables (as evident in the level of
democracy variable) and in the baseline probability. In some cases, the
problem may lead to spurious results. The Cox regression model employed
here avoids these problems.Using the more precisely dated Polity IIId data
helps us address a question we have discussed earlier regarding the sequence
of events. However, even with Polity IIId, there is a danger that the events
may be reversed, so that the civil war precedes regime change rather than
vice versa. To test to what extent the estimates for Proximity of Regime
Change are influenced by such individual observations, we ran the model
reported in Table 3.2 including only observations occurring more than 60
days after a regime change. The Proximity of Regime Change variable
was still significant with a p-value of 0.035 (one-tailed test). A drop in
significance is to be expected when removing the five outbreaks of civil war
with the highest value for Proximity of Regime Change. Consequently, we
think our results are quite robust to the problem of a reversed sequence of
events.

A reversal of the sequence of events creates another potential problem
as well. In such cases, the values we use for the level of democracy at the
time of the war will be incorrect. To make sure that the analysis is not
sensitive to this, we ran the model in Table 2a for all observations taking
place less than one year after a regime change, using the democracy score
before the change. Although only 18 outbreaks of civil war remained in
this analysis, the estimate for Democracy Squared was still less than zero
(p-value: 0.065).

3.5.2   The Effect of the Control variables

Some of the control variables contribute significantly to the model. For
the 1946–92 period, the Development variable and its square term have
highly significant effects on the probability of civil war. For the 1946–92
period, values under –5 (7 kgs coal-equivalent) are rare. Bhutan in 1946 is
the definitively least developed country with a score of –6.7. The estimated
relative risk of civil war increases with development up to somewhere above
–4 (e.g., Paraguay or Thailand in 1950, or Mali and Uganda in 1990). When

the level of development passes –3 (Bhutan or Haiti around 1990), the rel-
ative risk starts decreasing and is halved when reaching –0.5 (e.g., Costa
Rica in 1990). The industrialized countries in Europe and North America
have values around 2 (7.4 coal-ton equivalents) on our Development vari-
able. For such values, the estimated relative risk is one eighth of that of
the most conflict-prone level of development. The curvilinear relationship
is consistent with the findings of Hibbs (1973).

The Proximity of Independence variable is highly significant for the
long period. For the 1946–92 period, the estimated *p*-value is 0.060. Eth-
nic Heterogeneity does increase the probability of civil war: it is roughly
twice as high in countries where the largest ethnic group includes half the
population as in countries where 95% of the population belongs to it.[15]
This result is significant at the 0.05 level. For both periods, we find that
countries that recently had a civil war have a predisposition for new vio-
lence. For instance, when exactly one year has passed since the previous
conflict, the country is estimated to have a 1.8 times higher hazard of civil
war than the baseline for the 1946–92 period. The parameter estimate is
clearly significant, and even more so in the longer period than in the shorter
period.

We found only weak support for the idea that countries involved in an
international war have a higher probability of civil war (p=0.090 for the
1946–92 period being the strongest estimate). This weak result reflects the
ambiguous findings of the literature on the internal-external conflict nexus
(Heldt 1997; Levy 1989). An international war may be seen as an opportu-
nity for dissenting groups to rebel, but also as a means for the government
to unite the country against an external enemy. The Neighboring Civil War
variable is even less significant. We find no clear evidence for the hypoth-
esized diffusion of civil war. Civil war does occur more frequently in some
parts of the world than in others, but this is due to the clustering of other
factors in the model; mainly development and regime type.

3.5.3   Direction and Magnitude of Regime Change

We have established that the relative risk of civil war is altered as a result
of a regime change, but which type of shift has most effect, that is, toward
democratization or autocratization? And is a large change more dangerous
than a small one? The implications of our earlier results are not straight-

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[15] This figure is calculated by computing the heterogeneity index for the cases: $1 - 0.5^2 = 0.75$, and $1 - 0.95^2 = 0.0975$. The risk of the first relative to the second is the exponential of the difference between the two: $\exp(0.79 * (0.75 - 0.0975)) = 1.92$

forward for the issue of direction and magnitude of regime change. Tables
3.2 and 3.3 demonstrate that a new regime increases the risk of civil war
when controlling for the level of democracy, but the model assumes that all
types of regime change have the same impact on the probability of conflict.
This is not necessarily the case.

To explore this issue, we divided the Proximity of Regime Change vari-
able into five proximity variables : *Small/Large Democratization, Small/
Large Autocratization*, and *Other Regime Change.* A large change is de-
fined as an increase or a decrease of six units or more, and a small change
is defined as two to five units. For instance, if the most recent shift was
toward a much lower level of democracy (i.e. 6 or more units on the scale),
the *Proximity of Large Autocratization* variable was set to exp(–Days Since
Regime Change/α), and the others were set to 0. Throughout, we assume
that the parameter α in the formula for the 'Proximity of Regime Changes'
is independent of the initial risk, such that the half-life of the impact on
the risk of civil war is the same for all regime change types. We also as-
sume that the impact of a specific type of regime change is independent
of the level of democracy *before* the change.[16] A small democratization
transforming an autocracy is assumed to have the same effect as a small
democratization in an intermediate regime after the effect of changing from
one level to another has been controlled for.

The next two tables reports the results of replacing the simple regime
change variable in Tables 3.2 and 3.3 with the sub-divided variable. In
Table 3.5, Proximity of Other Regime Change is the only variable which is
not positive and significantly larger than zero. This is not surprising, since
most of those 'other' changes are minor or accounted for by the Proximity
of Independence variable. In Table 3.4, Proximity of Large Democrati-
zation is also not significant. Of the remaining variables, Large Autoc-
ratization seems to be the one associated with the largest change in risk
of civil war. However, in both analyses the four parameter estimates are
not significantly different from each other. Thus, when controlling for the
regime type toward which the regime change leads, there is no significant
difference between the effects of democratization and autocratization.[17] As

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[16]This is consistent with our interest in assessing the relative effects of regime level
and political change.

[17]We also estimated a model with three regime change categories; Proximity of De-
mocratization, Proximity of Autocratization, and Proximity of Other Regime Change.
The estimates for the 1946–92 period was 1.84 for Democratization and 1.49 for Autoc-
ratization. The corresponding figures for the 1816–1992 period were 1.14 and 1.52. The
merging of categories reduced the estimated standard deviations, but not sufficiently to

Explanatory variables	$\widehat{\beta}$	s.e.	p-value	$\exp\left(\widehat{\beta}\right)$
Proximity of Small Democr.	1.54	0.67	0.011	4.66
Proximity of Large Democr.	1.22	0.95	0.10	3.39
Proximity of Small Autocr.	1.22	0.73	0.048	3.39
Proximity of Large Autocr.	2.63	0.74	< 0.0005	13.9
Proximity of Other Reg. Ch.	0.29	0.62	0.32	1.33
Democracy	0.0016	0.024	0.47	1.002
Democracy Squared	-0.012	0.0051	0.011	0.99
Proximity of Civil War	1.14	0.34	0.001	3.13
Proximity of Independence	2.52	1.06	0.009	12.4
International War in Country	0.85	0.53	0.11	2.35
Neighboring Civil War	0.16	0.33	0.31	1.18
Development	-0.48	0.16	0.001	0.62
Development Squared	-0.066	0.036	0.032	0.94
Ethnic Heterogeneity	0.80	0.40	0.022	2.23
Log Likelihood$_{null\ model}$	-292.17			
Log Likelihood$_{model}$	-252.00			
Likelihood ratio index	0.14			
Number of Countries	152			
Number of Events	63			
Note: See note to Table 3.2				

Table 3.4: Risk of Civil War by Level of Democracy and Subdivided Proximity of Regime Change Variable, 1946–1992

before, the contribution of regime change to the hazard function is greater for the short period than for the long period. A comparison with Tables 3.2 and 3.3 shows that the estimates for Democracy and Democracy Squared remain virtually unchanged.

Because gaining independence is coded as 'Other Regime Change', there is a high correlation between Proximity of Other Regime Change and Proximity of Independence (cf. the VCE matrix in Appendix A). The estimates for Proximity of Independence are substantially higher in Tables 3.4/3.5 than in Tables 3.2/3.3 This is a result of the separation between the different categories of regime change. The parameter estimates for the other control variables are unchanged, as is the estimate for Democracy Squared. Distinguishing between the different directions or magnitudes of

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assert that autocratizations are more dangerous than democratizations.

Explanatory variables	$\widehat{\beta}$	s.e.	p-value	$\exp\left(\widehat{\beta}\right)$
Proximity of Small Democr.	1.04	0.61	0.044	2.84
Proximity of Large Democr.	1.37	0.71	0.028	3.93
Proximity of Small Autocr.	1.44	0.57	0.006	4.21
Proximity of Large Autocr.	1.91	0.84	0.012	6.73
Proximity of Other Reg. Cha.	0.12	0.46	0.40	1.13
Democracy	−0.010	0.020	0.29	0.99
Democracy Squared	−0.013	0.0027	< 0.0005	0.99
Proximity of Civil War	1.61	0.25	< 0.0005	5.00
Proximity of Independence	2.52	0.56	< 0.0005	12.4
International War in Country	0.25	0.41	0.27	1.28
Neighboring Civil War	0.30	0.27	0.14	1.35
Log Likelihood$_{null\ model}$	−535.67			
Log Likelihood$_{model}$	−482.00			
Likelihood ratio index	0.10			
Number of Countries	169			
Number of Events	129			
Note: See note to Table 3.2				

Table 3.5: Risk of Civil War by Level of Democracy and Subdivided Proximity of Regime Change Variable, 1816–1992

regime changes adds very little information to the overall model. Figure **3.3** portrays the combined effect of a regime change and an altered level of democracy on the risk of civil war. The relative risk of civil war is plotted as a function of the democracy scores before and exactly two years after the regime change. The darker the shade, the higher is the estimated risk. In the 'valley' along the main diagonal, from the lower left to upper right corner of the figure, are countries that have had no regime changes. For them, the inverted U relationship at the front end of Figure **3.3** describes the relative risk of civil war. Just to the right of this valley are polities that have experienced small democratizations. Farther right are those with large democratizations. The figure demonstrates our estimate that the risk of civil war is increased the most by changes that lead to a semi-democracy, in particular if the shift is a large autocratization (the darkest area, to the left of the valley).[18]

The example of South Korea illustrates how to interpret the figure.

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[18]The difference between parameter estimates for autocratizations and democratizations were not statistically significant, however.
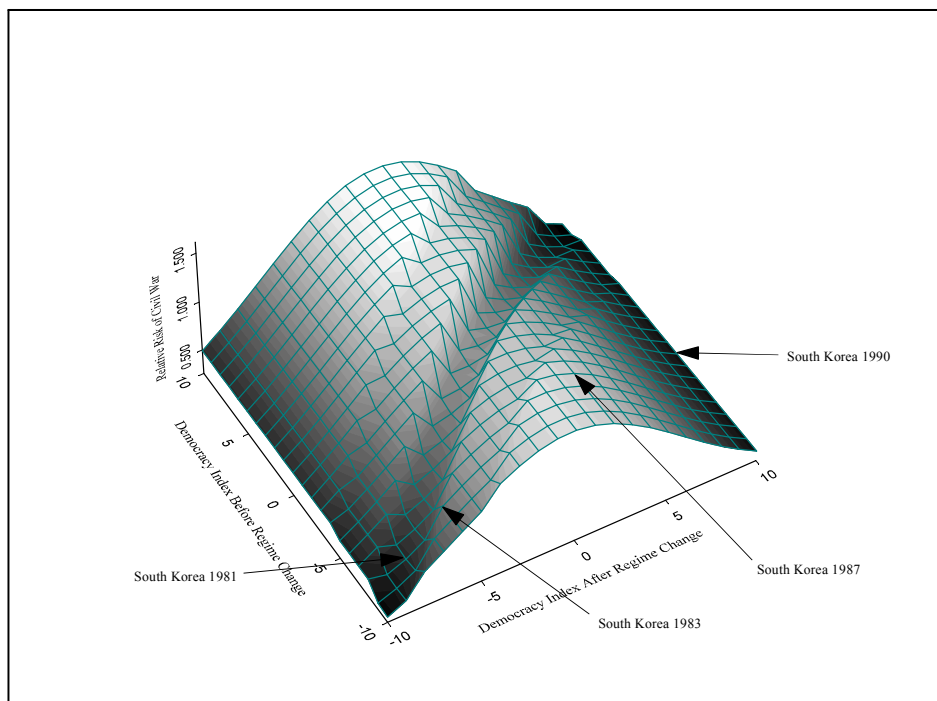
Figure 3.3: Relative Risk of Civil War as a Function of Democracy Index before or after Regime Change, 1816–1992

Until March 1981, Polity IIId reports South Korea as an autocracy, with a democracy–autocracy score of -8. Apart from a couple of minor alterations, the regime had existed for more than eight years. For our purposes, we treat a polity of this age as equal to one that has existed for an infinite number of years. We indicate that location in the figure as South Korea 1981. The estimated risk of civil war was then .47 relative to the baseline. On March 4, 1981, a small democratization took South KOrea to the location labeled South Korea 1983, with an estima6ted risk of civil war of .87 relative to the baseline two years after the change. In 1985, democratization from -6 to -2 moved the location to South Korea 1987. The relative risk of civil war two years later is estimated to be 1.3. Finally, for February 26, 1988, Polity IIId reports South Korea changed from -2 to $+10$. This large democratization moved the country to the location labeled South Korea 1990, with the risk of civil war reduced to .45 relative to the baseline.

3.6 A Democratic Civil Peace?

Our analysis clearly confirms that he U-curve defines the relationship between democracy and civil war (Hypothesis 3.1): Regimes that score in the middle range on the Polity Democracy–Autocracy index have a significantly higher probability of civil war than either democracies or autocracies. As expected, we found no significant difference between the risk of civil war in harsh autocracies and in strong democracies (Hypothesis 3.2). We have also shown that in the short run regime change clearly and strongly increases the probability of civil war (Hypothesis 3.3), using the same control variables for the longer and the shorter period. However, regime change cannot serve as an explanation for the higher level of civil war in intermediate regimes. The two factors are partly overlapping, yet complementary. The 'Democracy Squared' variable which models the inverted-U relationship between level of democracy and the risk of civil war was clearly significant even when controlling for the time passed since the most recent regime change (which supports Hypothesis 3.4).

The hypotheses were supported in an analysis of the long time-frame of the entire Correlates of War Period (1816–1992), controlling for Proximity of Independence, Proximity of Civil War, Proximity of International War, and Civil War in a Neighboring Country. They also hold for the post-World War II period (1946–92) with additional controls for Economic Development and Ethnic Heterogeneity. The relationships are tested using a more appropriate statistical model than in previous studies, with more reliable estimates for statistical significance.

The direction of change has no discernible influence on the probability of civil war. This is not the same as saying that democratization is as dangerous as autocratization. The short-term effects are the same. But the long-term effects are different. As shown above and noted by Gurr (1974), countries that have moved towards the middle category are the ones most likely to experience further regime change. Table 3.1 demonstrates that political stability increases as the Democracy–Autocracy index scores approach both ends of the scale. Among countries that have moved towards the the analysis in Gates et al. (2003a) indicates that autocracies are somewhat less stable than democracies, and are more likely to experience further change, which exposes them to the more risky middle position. The most reliable path to stable domestic peace in the long run is to democratize as much as possible. A change in that direction ensures the strongest ratchet effect in terms of the consolidating political institutions and makes it less likely that the country will slide back into a state in which it is more

prone to civil war.

Eventually, then, countries are more likely to end up at the democratic end of the scale. Thus, the conflict-generating effect of democratizing when moving from autocracy to semi-democracy produces violence only in the short run. In the long run these states, too, will attain civil peace. However, if semi-democracies tend to run through a succession of transitions in and around the middle zone, it will take a long time before there is a net decrease in violence. To fully assess the long-term impact of democratization, it would be necessary to study whether sequences of regime changes and civil war form certain patterns.

Does the third wave of democracy reduce the specter of violent domestic conflict? The effect of political change is heavily dependent on the point of departure. In the short run, a democratizing country will also have to live through the unsettling effect of change. But if we focus on countries which are at least half-way toward complete democracy, the prospects for domestic peace are promising. There is a democratic civil peace. It may be achieved in the short run in some countries. In the long run most states, possibly all, may reach this state of affairs, when we take into account the higher survival rate of democracies, which makes it less likely that they will once again move through the double danger zone of intermediate regime and political change. While totalitarian states may achieve a domestic peace of sorts, which may perhaps be characterized as the peace of a zoo, a democratic civil peace is likely not only to be more just, but also more durable.

Chapter 4

Peace and Democracy: Three Levels of Analysis

This chapter was written with Nils Petter Gleditsch and was originally published as Gleditsch and Hegre (1997).

Abstract

The question of peace and regime type can be examined at the dyadic level, at the nation level, and at the system level. At the dyadic level it is well established that democracies rarely if ever fight each other. At the nation level, the broad consensus is that there is no significant relationship between democracy and war participation, but this conclusion remains controversial. At the system level, there is little research; most authors have taken for granted that the answer can be inferred from the findings at the dyadic level or at the nation level. This chapter shows that if the conventional wisdom holds at the dyadic and nation levels, the probability of war in a politically mixed dyad must be higher than the probability of war between two non-democracies, and that the relationship between democracy and war at the system level must be parabolic. Thus, increasing democratization initially produces more war, and the reduction of war starts only at a higher level of democratization.

4.1 Democracy and Peace

4.1.1 Three questions

In this chapter we investigate the relationship between democracy and peace at three levels of analysis:

- *Dyadic:* Do democracies usually keep peace among themselves?

- *National:* Do do democracies more frequently maintain peace overall?

- *Systemic:* Is an international system with a high proportion of democratic states more peaceful?

The prevailing opinion appears to answer these three questions yes, no, and yes. The first question has been extensively researched, with clear results. The second question has also been analyzed a great deal, with conflicting results and with the prevailing opinion leaning in the direction of a no, but now shifting in the direction of a perhaps. The third question has rarely been subjected to empirical investigation, but it is commonly assumed that it can be answered by a simple deduction from one of the two other levels. The most common conclusion is that if democracies don't fight each other, an increasing number of democracies in the system will produce a more peaceful system. Others have argued that if democracies are as warprone as non-democracies, it makes no difference at the system level if the number of democracies increases. Both of these system-level statements cannot be true at the same time, so there must be something wrong either with the deductions or with the empirical regularities.

In this chapter we first confirm the democratic peace at the dyadic level and the lack of a clear relationship at the nation level, using several measures of conflict. Next we show that given the conventional wisdom – that democracies hardly ever fight each other and that democracies overall participate in war as much as other countries – it follows logically that the probability of war in a politically mixed dyad must be higher than the probability of war between two non-democracies and that the relationship between peace and democracy at the systems level must be bell-shaped (i.e. parabolic). Finally, we look briefly at the empirical evidence at the system level. Although democracy is clearly relevant for subnational conflict, we do not examine those effects here.[1]

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[1] In Chapter 3 we find a bell-shaped relationship between the degree of democracy and violent domestic conflict (also see Muller and Weede 1990, Ellingsen and Gleditsch

4.2 Research Design

4.2.1 Spatial and temporal domain

Our empirical study is based on the data on militarized disputes and interstate war in the Correlates of War (COW) data set, data on post-Cold War armed conflicts from the Uppsala University data set, and data on political system characteristics from the Polity III data set. To the COW data on interstate wars we have added data for 1993-94 from the Uppsala data in order to cover the entire Polity time-span,[2] 1816-1994, in the study of interstate war. Following the COW criteria for membership in the interstate system (Small and Singer (1982, 39-43, summarized in Gleditsch 1995a, 304-305) we have added the new UN member Andorra as a system member in 1993.

4.2.2 The dependent variable

In the COW project, an interstate war is defined as a violent conflict between two or more members of the international system involving more than 1,000 annual battle-deaths (Small and Singer 1982; Singer and Small 1994). Our two other data sets have a lower threshold on violence: The militarized interstate disputes data for the 1816-92 period (Singer and Small 1994) include all interstate conflicts with use or threat of force. The Uppsala data (Wallensteen and Sollenberg 1996) include all armed conflicts with more than 25 dead in a given year.[3]

4.2.3 Democracy

We use the most recently corrected version of the Polity III data set generated by Ted Gurr and associates (Gurr, Jaggers and Moore 1990; Jaggers and Gurr 1995), the only such data set to cover the full spatial and tempo-

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1996). Democracies have less domestic violence, presumably because they permit the expression of opposition in peaceful ways. Dictatorships also have less violence because they repress any opposition before it can organize. The in-between countries are the most violence-prone.

[2]There were no new international wars in these two years, but the Armenian-Azerbaijan war continued.

[3]The Uppsala conflicts have been updated until 1995, but we can only go as far as the Polity have been updated, i.e. to 1994. The data are published by conflict, and we have coded all countries at opposite sides in a war as being opponents. The Uppsala data require that at least one government is among the contending parties. Wherever another government is listed on the opposing side, we have coded the conflict as international.

ral domain of the COW data.[4] Polity includes 172 current and historical
countries. In terms of units of analysis, the overlap between the Polity and
COW data is very high (Gleditsch 1995a, 306). However, the Polity set of
countries is a little smaller than COW's. Thus, some of the country-years
and dyad-years included here have no Polity data at all. For simplicity,
we have merged this category with the Polity codes of interruption, in-
terregnum, transition, and missing data (Gurr, Jaggers and Moore 1989,
6-8).

For the measurement of democracy, we first compute for each country-
year the difference between the Polity III indices of 'institutionalized democ-
racy' and 'institutionalized autocracy'. If DEMOC-AUTOC is 3 or higher,
we define the country as democratic. By using the difference between the
two scales, we avoid categorizing ambiguous regimes as democracies. Prime
examples of countries with a high score on both indices are Japan 1868–1944
(DEMOC=5, AUTOC=4) and Germany 1908–17 (5, 3).

The DEMOC and AUTOC indexes in Polity are additive indexes rang-
ing from 0 to 10. Combining them (DEMOC-AUTOC) yields an additive
index ranging from –10 to 10, combining assessments of the competitiveness
of political participation (–2 to 3), regulation of political participation (-2
to 0), competitiveness of executive recruitment (–2 to 2), openness of exec-
utive recruitment (–1 to 1), and constraints on the chief executive (–3 to 4).
The cut-off at 3 is fairly arbitrary, but is set so as to give roughly the same
proportion of democracies as in previous studies with a cut-off of 6 on the
democracy scale alone. Our democracy index may be validated intuitively
by considering values for a few selected countries: The USA exceeds 3 for
the entire time-span, Russia is coded with a 4 in 1917, but did not reach
this level again until 1991; Germany achieves it during the Weimar Repub-
lic (1919-32) and again from 1949, while France is classified as a democracy
in the periods 1848-50 and 1877-1939, and from 1946 onwards.

4.3   Do Democracies Maintain Peace With Each Other?

The evidence from previous studies is straightforward: There are few if
any wars between democracies. Some disagreement remains as to whether

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[4]The corrected version of the dataset is available by anonymous ftp from
<isere@colorado.edu>. Relative to the version published in Jaggers and Gurr (1995),
the new version has corrected a small summation error in the scores for the democracy
and the autocracy scores and a few other errors which barely affect the statistical results.

the relationship is merely very strong (e.g. Weede 1992, 382) or virtually without exception (Rummel 1983, 1995; Ray 1993).

Table 4.1 summarizes the evidence for the entire 179-year period. The data indicate that the relative frequency of war between two democracies is about two fifths of the relative frequency of war between two non-democracies. Mixed dyads have an even higher relative frequency of war than non-democratic dyads.[5]

Although this is a strong and highly significant relationship, it is by no means perfect. Table 4.2 lists the exceptions. The anomalous cases of war between democracies comprise 30 dyad-years. No less than 24 of these are made up by Finland vs. various Western democracies in World War II. These cases could be interpreted as a case of 'derived war', resulting from the change of sides of a major actor (the Soviet Union) in a three-way contest. It would not be unreasonable to modify the theory of the democratic peace so as to incorporate such major shifts in a multipolar war as one of the circumstances under which small democracies might unwittingly find themselves at war with other democracies. However, it seems more appropriate to dismiss them as a weakness in our measurement of dyadic war data, since there was no war action at all, even where there was a formal declaration of war.[6]

Two anomalous dyad-years occur because the time-variable in Polity is too coarse. The 1971 Bangladesh War between India and Pakistan was preceded by a state of emergency in Pakistan. Similarly, the Turko-Cypriot

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[5] Two objections may be raised against our use of chi-square tests in Table 4.1: (1) The observed counts of war are not independent, since wars continuing over several years are counted as several observations. We admit to the validity of this objection, and discuss it in a later section. Table 4.4 and 4.5 present figures where this dependency has been reduced and even eliminated. (2) The number of observations has been inflated by dividing time into short spans (years) and thus securing significant results. This objection, however, is not valid, as long as there is no dependency between units counted as in war. The number of onsets of dyadic conflict/war (see Table 4.4 and 4.5) would not change if we had chosen the dyad-month as unit of measurement. Further, since $\chi^2 = S_{ij}$ $((observed\ count_{ij} - expected\ count_{ij})/expected\ count_{ij})$ and since the expected counts for non-war are very much higher than those for war, the non-war cells hardly contribute at all to the statistic.

[6] The United States resisted Soviet pressure to declare war on Finland, so the US-Finland dyads are particularly inappropriate as war dyads. The senior author has dealt more extensively with the case of Finland elsewhere (Gleditsch 1993), as has Ray (1993, 271). The discussion in Spiro (1994, 61-62) is somewhat misleading. He charges Finland with having 'pursued an alliance with fascists and ... declared war on democracies' (it was, of course, England which declared war on Finland). Spiro also counts England's attack on German shipping in a Finnish harbor as an attack on Finland, more than four months before England declared war on Finland.

	Type of Relationship				
	At war with each other	Allied in war[a]	Other[b]	Total	No. of dyad-years
Two Democ.	0.05	0.51	99.44	100.00	$62,581$
One Democ.	0.17	0.18	99.65	100.00	$219,563$
No Democ.	0.12	0.12	99.76	100.00	$227,537$
Missing or Transition	0.61	0.74	98.65	100.00	$39,693$
All dyad-years	0.17	0.23	99.60	100.00	
No of dyad-yrs	916	$1,268$	$547,094$		$549,374$
χ^2	54.9	396.9			
p	$1.2 * 10^{-12}$	$4.2 * 10^{-87}$			

Note: Interstate wars from the Correlates of War project, updated to 1994. Democracy defined as 3 or higher on the difference between the democracy and autocracy indices in the corrected Polity III data. Each dyad is counted separately for each year. The number of dyads in the system increases from 253 in 1816 to 17,020 in 1994. The χ^2 tests at the end of the first two rows refer to the two 2 x 3 tables which emerge when the other rows are merged and the missing/transition column eliminated.

[a] 'Allied in War' means that the two countries in the dyad are at war and on the same side of the war.

[b] 'Other' includes all dyads where neither country is at war or where only one country as at war (with someone else).

Table 4.1: Percentage of Dyad Years in War, 1816-1994

Country 1	Country 2	War	Years	Anomalous Dyad-years
Spain	USA	Spanish-American	1898	1
Lithuania	Poland	Lithuanian-Polish	1919	1
Finland	Australia Canada New Zealand South Africa United Kingdom USA	World War II	1941-44	24
Israel	Syria	Palestine	1948	1
India	Pakistan	Second Kashmir	1965	1
India	Pakistan	Bangladesh	1971	1
Cyprus	Turkey	Turko-Cypriot	1974	1
Total				30
Note: Data as in Table 4.1. Countries 1 and 2 are listed in alphabetical order.				

Table 4.2: Anomalous Cases: War between Democracies, 1816–1994

war in 1974 was preceded by a Greek Cypriot military coup, instigated by a military regime in Greece. Five days later Turkey responded by an invasion, which divided the island and, ironically, brought down the Greek colonels' regime. Thus these dyad-years should be classified as wars between a democracy and a non-democracy. These anomalies occur because regime changes in Polity are coded by year rather than by date.

Of the remaining four anomalous dyad-years, the Lithuanian-Polish war of 1919 was considered too small to be included in earlier versions of the COW set of interstate wars[7] and therefore has not turned up in earlier lists (e.g. Gleditsch 1993, 313). It is included in the newest version of the COW data set, but as a marginal war (1,000 battle deaths) between two brand new democracies. As Lithuania's constitution was not adopted until 1922 (*The Baltic States* 1991, 180), one might question the Polity coding of Lithuania as a democracy from 1918 (cf. also Weart 1994). Coding Spain as a democracy in 1898 has been questioned by Ray (1993). Coding Syria in 1948 and Pakistan in 1965 as democracies is also debatable. None of these four deviant cases concern stable or established democracies.

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[7]In Small and Singer (1982, 338) the Lithuanian Polish War is listed as a war excluded because it did not meet the battle casualties threshold, but with different dates (1920-27). For 1919 they also list (p. 337) a Polish-Ukrainian War, excluded for the same reason.

Obviously, one should be careful about reclassifying deviant cases without re-examining other cases. Temporal mismatches and fictitious dyadic opposition in multipolar wars may occur among non-democracies and politically mixed dyads as well. Moreover, correcting for temporal mismatch may conceivably yield new wars between democracies. But even in the absence of such systematic reconsideration, Table 4.1 confirms the very strong dyadic relationship between democracy and peace, and it is – given our caveats about the data – consistent with the idea of a near-perfect relationship.

Although democracies rarely if ever fight each other, they are more frequently allied in war. An average pair of two democracies is allied in war more than four times as frequently as the average pair of two non-democracies. Democracies have a higher propensity for alliance-building generally, but particularly with other democracies.

How far can we lower the violence threshold while retaining the strong dyadic relationship between democracy and peace? Weede (1992, 380), using data with a threshold of 100 dead, found no military conflict between democracies between 1962 and 1974. Likewise, there are no major military interventions (i.e. claiming more than 100 lives) between democracies in the data set generated by Tillema (1991). If we look at all the interventions in this data set, the relationship is no longer perfect. But there are few such interventions between democracies and 'almost all were symbolic and short-term uses of armed force' with little loss of life (Kegley and Hermann 1996, 319). Studies using militarized interstate disputes (Gochman and Maoz 1984) find some conflict between democracies (Maoz and Russett 1992, Table 2, p. 254) but not for the highest category of MIDs ('war disputes') and fewer than for other combinations of regime types.[8]

Apart from the higher risk of coding error in the MID data, it is unreasonable to expect joint democracy to eliminate all militarized conflict down to the level of force found e.g. in the Cod Wars. The theory of the democratic peace does not assume that joint democracy will eliminate all conflict and we should expect some conflicts to develop military overtones – but also that the nonviolent norms of democracies will intervene to prevent further escalation.

In the second line of Table 4.3 we test the dyadic relationship for the

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[8]Many of the MIDs between democracies are fisheries disputes (e.g. the Cod Wars between Iceland and its neighbors). In such conflicts, the threat or use of force is usually acted out between the government on one side and a private fishing vessel on the other. The inter-governmental interaction is generally limited to diplomatic exchanges and it is questionable whether such conflicts have any place in a dataset on interstate disputes.

	Type of Armed Conflict		
	Interstate War 1816-1994	Armed Conflict 1816-1994	Militarized Disputes 1816-1994
Two Democracies	0.05	0.01	0.38
One Democracy	0.17	0.05	0.87
No Democracies	0.12	0.06	0.68
Missing or Transition	0.61	0.02	1.51
Total	0.17	0.04	0.78
No. of Conflict Dyad-Years	916	36	4,078
All Dyad-years	549,374	91,666	515,334
χ^2	54.9	396.5	154.8
p	$1.2 * 10^{-12}$	0.023	$5.7 * 10^{-35}$
Note: The column for interstate wars is repated from Table 4.1 for purposes of comparison. The data on armed conflict are from Wallensteen and Sollenberg (1996). The column for militarized disputes is from Singer and Small (1994). Democracy is defined as 3 or higher on the difference between the democracy and autocracy indices in the corrected Polity III data set. Each dyad is counted separately for each year.			

Table 4.3: Percentage of Dyad-years in Conflict

Uppsala conflict data for the post-Cold War period (1989-94).[9] For this data set, more inclusive than the COW data but not as inclusive as the MID data, we find a single case of armed conflict between two democracies (India and Pakistan in 1989), and little difference between nondemocratic pairs and the mixed dyads. This is, in a sense, a stronger finding than the one in Table 4.1, since the violence threshold is lower. On the other

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[9]The first line, for interstate war, is repeated from Table 4.1 for purposes of comparison. The data on Armed conflict are from Wallensteen and Sollenberg (1996). Finally, the line for Militarized Interstate Disputes is from Singer and Small (1994). Democracy is defined as 3 or higher on the difference between the democracy and autocracy indices in the corrected Polity III dataset. Each dyad is counted separately for each year.

hand, the time-span for the Uppsala data is much shorter than for the
COW data. The third line of the table tests the dyadic relationship on the
disputes data, where we also find the least conflict for double democratic
dyads, although the relationship is not nearly as strong as for interstate
war. Thus, both these data sets provide supporting evidence for the dyadic
democratic peace.

Just as we have asked whether the dyadic democratic peace holds at
lower levels of violence, we may ask if the relationship varies with differing
levels of democracy. If we lower the threshold of democracy minus autoc-
racy to zero, the ratio of war incidence among democracies to that among
non-democracies increases from 2/5 to over 2/3. Conversely, if we raise
the level of democracy minus autocracy from 3 to 8, we eliminate all war
between democracies except Finland vs. the Western democracies in 1944.
This is another case of temporal mismatch between Polity and COW, since
Finland's change to a high level of democracy occurred after the end of the
war. Thus, at this level of democracy, the correlation may be perfect.

Empirical findings such as those in Tables 4.1 and 4.3 have frequently
been questioned on the basis that the dyad-years do not represent inde-
pendent observations. If two countries are at war in year t, the chances
are much better that they will remain at war in year $(t + 1)$ than that two
new countries will go to war. Similarly, once a conflict has broken out be-
tween countries a and b, there is a higher probability that the conflict will
spread to country c (particularly if this is a neighboring or allied country)
than for an entirely new conflict to start between c and d. We may call
these two forms of dependency between the units dependence on the past
and simultaneous dependence. In order to eliminate this problem, Bremer
(1992) limits his investigation to the dyad-years which occur on the first
day of a war. He argues (1992, 320) that 'the question of how wars be-
gin is fundamentally different from the questions of why wars grow in size,
duration, or severity.' But this is not a question which can be settled a
priori. During a war, decision-makers are constantly forced to re-examine
its costs, and a decision to stay in a war rather than give up or withdraw
from conquest may be a result of the same forces which made war break out
in the first place. Bremer's approach has the disadvantage of reducing long
wars with many participants to a single dyadic observation – or at most a
few, if several countries enter the war on the first day. Thus, World War
II is reduced to one dyad-year, Poland-Germany in 1939. Another problem
with Bremer's work is that his censoring is inconsistent: he eliminates de-
pendent cases of war but not dependent cases of peace. His analysis lumps

dyads continuing at war and dyads in the process of joining an on-going war with dyads at peace.

In Chapter 5, this problem is tackled in a radically different way, by modelling the interstate dyad as a continuous process (cf. also Beck and Tucker 1996). This leads to results which also confirm the democratic peace, while seeing it in connection with war diffusion and recurrence. Here, we choose a simpler approach, by comparing the results obtained in Tables 4.1 and 4.3 with the results of an analysis where we have eliminated the unit dependency for war (but not for peace). The assumption is that if we find the same relationship for the incidence of war and the onset of war, our confidence in the results will increase. In Tables 4.4 and 4.5 we have crosstabulated democracy with onsets of dyadic war and onsets of war. The second half of the table corresponds to Bremer's radical reduction of conflict dyads to new conflicts only, while the first half of the table is a less drastic solution, where all new conflict dyads are counted in their first year. Although the frequency of dyadic war onsets is naturally lower than the dyadic incidence of war and the frequency of war onsets even lower, Tables 4.4[10] and 4.5 confirms that war occurs much more rarely in jointly democratic dyads. The number of anomalous cases is reduced, mainly because the Finnish war dyads in 1941-44 are eliminated.

The dyadic relationship between democracy and peace has been subjected to various tests of third variables (Maoz and Russett 1992; Oneal et al. 1996; Bremer 1992, 1993; Gleditsch 1995a); no evidence has been found for considering the relationship spurious. Indeed, if the relationship between democracy and peace were perfect, tests for spuriousness would be superfluous – unless a control variable were proposed which in itself had a perfect relationship to the dependent as well as the independent variable. Even if the relationship is just 'very strong' rather than perfect, the search for single third variables seems unpromising.

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[10]Note to Table 4.4: Conflict Data and Democracy Data as in Tables 4.1 and 4.3. Each dyad is counted separately for each year, but conflicts are counted only in their first year for that dyad. In order to determine which dyad armed conflicts and which armed conflicts were new in 1989, we consulted a list of armed conflicts in 1988 from the same project. The 1988 list is more inclusive (no lower threshold on violence), so it cannot be used to extend the time series, but with some caution it can be used to determine which cases of incidence in 1989 were also onsets. In order to avoid exaggerated accuracy, we have limited the conflict frequencies to two significant digits. But to facilitate horizontal comparison, we have added a plus or a minus sign to indicate if the unrounded figure is high or lower.

	Type of Armed Conflict		
	Interstate War 1816-1994	Armed Conflict 1989-1994	Militarized Disputes 1816-1994
Two Democracies	0.02	0.00	0.32
One Democracy	0.06+	0.06	0.66
No Democracies	0.06−	0.08	0.57
Missing Reg. Data or Reg. Transition	0.08	0.01	0.33
Total	0.06	0.03	0.50
No. of Conflict Dyad-Years	331	31	$2,730$
All Dyad-years	$549,374$	$91,666$	$515,334$
χ^2	27.5	28.2	24.8
p	< 0.00001	< 0.00001	0.00002

Note: Conflict Data and Democracy Data as in Tables 4.1 and 4.3. Each dyad is counted separately for each year, but conflicts are counted only in their first year for that dyad. In order to determine which dyad armed conflicts and which armed conflicts were new in 1989, we consulted a list of armed conflicts in 1988 from the same project. The 1988 list is more inclusive (no lower threshold on violence), so it cannot be used to extend the time series, but with some caution it can be used to determine which cases of incidence in 1989 were also onsets. In order to avoid exaggerated accuracy, we have limited the conflict frequencies to two significant digits. But to facilitate horizontal comparison, we have added a plus or a minus sign to indicate if the unrounded figure is higher or lower.

Table 4.4: Percentage of Dyad-years with Onset of New Dyadic Conflict

	Type of Armed Conflict		
	Interstate War 1816-1994	Armed Conflict 1989-1994	Militarized Disputes 1816-1994
Two Democracies	0.01	0.00	0.28
One Democracy	0.02	0.00+	0.48
No Democracies	0.03	0.08	0.43
Missing Reg. Data or Reg. Transition	0.03	0.00+	0.23
Total	0.02	0.00+	0.37
No. of Conflict Dyad-Years	118	3	$2,033$
All Dyad-years	$549,374$	$91,666$	$515,334$
χ^2	27.5	15.6	
p	< 0.00001	0.0014	0.72
Note: Data as in Table 4.4, but dyadic conflict is counted only for the first year of the conflict. In order to determine the starting date of the Mauritania–Senegal conflict, we used Keesing's Contemporary Archives (1989, 36579f).			

Table 4.5: Percentage of Dyad-years with Onset of New Conflict

4.4 Are Democracies More Peaceful?

There has been much more controversy around the proposition that democratic countries are less warlike. Some of this controversy is no doubt due to confusion as to the meaning of 'warlike'. We take as our starting-point whether or not democracies participate in war more frequently than others. The point that democracies are no less prone to participate in war than other polities was made in an influential article by Small and Singer (1976). Most of those who have addressed this topic in the decade since the debate was reopened with the seminal articles by Doyle (1983ab) and Rummel (1983), have drawn the same conclusion. Rummel is a major deviant, but the empirical evidence in his 1983 article has been questioned because of its limited empirical base. More recently Rummel (1995, 459)

	Type of Armed Conflict		
	Interstate War 1816-1994	Armed Conflict 1989-1994	Militarized Disputes 1816-1994
Democracy	5.4	4.8	33.6
Non-Democracy	5.3	4.5	32.9
Missing Reg. Data or Reg. Transition	6.6	1.8	22.8
No. of Conflict Country-Years	639	43	3,632
All Country-years	5.5	4.2	32.1
χ^2	0.04	0.03	0.61
p	0.85	0.86	0.43
Note: Conflict data and democracy data as in Tables 4.1 and 4.3.			

Table 4.6: Percentage of Country-years with Ongoing Conflict

has complained, with some justification, that he was not alone in finding democracies to be more peaceful. For instance, Haas (1965, 319) found 'a slight but consistent tendency for democratic countries to have less foreign conflict than undemocratic political systems', based on conflict data from the end of the 1950s and political variables in *A Cross-Polity Survey* (Banks and Textor 1963). Ray (1995) and Benoit (1996) are also revisionists on this issue. Although Rousseau et al. (1996, 526) found the previous evidence in support of the conventional wisdom at the nation level 'actually quite thin', they themselves also concluded that the evidence for the dyadic thesis was much stronger. The bulk of the large-n studies agree with Chan (1984) who found that 'relatively free' countries participated in war just as much as the 'less free' – 6.7% vs. 6.1% respectively of all country-years between 1816 and 1980.[11]

Tables 4.6–4.8 give our nation-level results for the corrected Polity III data using the three indicators of conflict. The same problem of dependency between units occurs at the nation level. Therefore, we have computed data for the incidence of conflict as well as for the two forms of onset.

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[11] For extra-systemic wars (i.e. colonial and imperial wars), democratic countries were at war significantly more frequently. However, this figure exaggerates the relative war participation of democracies since nondemocratic opponents in colonial wars are not counted as separate actors.

	Type of Armed Conflict		
	Interstate War 1816-1994	Armed Conflict 1989-1994	Militarized Disputes 1816-1994
Democracy	2.1	3.9	28.0
Non-Democracy	2.3	2.8	26.3
Missing Reg. Data or Reg. Transition	2.6	1.2	16.9
No. of Conflict Country-Years	266	31	2,928
All Country-years	2.3	3.0	25.9
χ^2	0.78	0.85	3.45
p	0.38	0.36	0.06
Note: Conflict data and democracy data as in Tables 4.1 and 4.3.			

Table 4.7: Percentage of Country-years with Onset of New Dyadic Conflict

The frequency of participation in war or militarized interstate disputes (whether measured by incidence or onset) is not very different between democracies and non-democracies. However, in an analysis dividing the war data up by time-periods, not reproduced here, we found that during the Cold War, democracies participated significantly less frequently in war than non-democracies. This pattern appears to continue into the post-Cold War period.

It might be suspected that the 'no relationship' finding was dependent on the cut-off for the level of democracy. Perhaps a positive relationship between democracy and peace would emerge if the requirement for democracy was more stringent? This idea was tested with a negative outcome. At least for the period as a whole, there is no clear trend in the war participation of democracies relative to non-democracies when the level of democracy is varied systematically.

Rummel (1995, 461) has shown that democratic countries suffer much smaller losses in war than nondemocratic countries, from 0.24% of the population in democratic countries killed per year in war in this century to 0.56% for totalitarian countries (using COW data).[12] He argues that study-

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[12]Rummel (1995) also found that the negative relationship between democracy and relative human losses in war held up when controlling for level of economic development or capability, although not for the value 'high' on either of the control variables.

	Type of Armed Conflict		
	Interstate War 1816-1994	Armed Conflict 1816-1994	Militarized Disputes 1816-1994
Democracy	1.1	0.7	24.6
Non-Democracy	1.8	1.0	26.0
Missing Reg. Data or Reg. Transition	1.6	0.6	14.5
No. of Conflict Country-Years	182	8	2,718
All Country-years	1.6	0.8	24.0
χ^2	5.92	0.33	2.20
p	0.02	0.56	0.14
Note: Conflict data and democracy data as in Tables 4.1 and 4.3.			

Table 4.8: Percentage of Country-years with Onset of New Conflict

ing the frequency of war means asking the wrong question: Countries with extremely small losses may be counted as being at war because they form part of a coalition and have more than 1,000 troops involved, even if they suffered negligible losses (Small and Singer 1982, 67). And even for participants who do qualify for the threshold losses, Rummel argues that it is unreasonable to equate country-years of major actors in World War II with minor border skirmishes.

Rummel's (1995) finding about democracies suffering less violence in war is, of course, also compatible with an argument that democracies are stronger in war and that they are technologically more advanced and better able to deploy force at great distance, so that most of the fighting occurs on the opponent's territory. These data are even compatible with Galtung's notion (1996, 56) that democracies are more self-righteous, and therefore more belligerent. Stam (1996) shows that democracies tend to win the wars they participate in, and Singer (1991) has suggested that there has been a process of displacement in the later stages of the Cold War: War was reduced in the central system – not just among democracies, but among industrial and post-industrial nations generally. In the periphery, war not only continued but was accelerated by major power rivalries. If Singer's argument were valid (and we tend towards skepticism!) it would be consistent with lower war losses in democracies. There is a great deal of other

evidence that democracies value human life more highly, notably the absence in democracies of genocide (Rummel 1994) and famine (Sen 1994) and the lower incidence of civil war (Ellingsen and Gleditsch 1996). But we cannot conclude from figures on war losses alone that democracies are more peaceful in their foreign behavior, although Rummel has indeed shown that their populations are on the average less negatively affected by war. How to properly test an argument relating war severity to peacefulness, remains unclear. It would probably require data about who kills whom and where, and such data have not yet been compiled.

One fairly simply explanation for the high overall participation of democracies in war is the tendency for democracies to ally in war. Some of the war participation of the allied states is fairly limited, as with Belgium and the Netherlands, which are listed as full-fledged combatants in the Korean War even though their casualties were only about 100 each (Small and Singer 1982, 92). This is seen clearly when we compare data on incidence of conflict (Table 4.6) with those on onset of new conflict (Table 4.8). While democracies have a slightly higher incidence of war, they have fewer onsets of new conflict. The latter measure of war participation does not include countries brought into the war through their alliances except those that enter it on the first day. This finding corresponds to the lower frequency of onsets of war in mixed dyads relative to nondemocratic dyads (cf. Table 4.5).

Yet another way of reconciling the lack of war between democracies with the high war participation of democracies is to argue that democracies are unlikely to initiate war. Rummel (1979, 292-293) did not posit a correlation between freedom and the frequency of involvement in war since free states by their very example represented a subversive challenge to authoritarian and totalitarian systems. Therefore, libertarian states would have to engage in defensive and reactive violence against attempts from non-libertarian states to change the status quo.

This idea was tested by Small and Singer (1976, 66) who found that in the nineteen wars in which democracies participated, they initiated (or were on the side of the initiator) in 58%. This result should have been adjusted for the number of democracies in the system, but this involved more work collecting democracy data than they were prepared to undertake at the time. Since at all times there were more non-democracies than democracies, non-democracies should be expected to initiate more wars. When the opposite is found, it looks as if democracies are even more prone to initiate wars than Small and Singer's results indicate.

Start Year	War	Initiator(s) (Dem. Level)	Target(s) (Dem. level)
1846	*Mexican-American*	*USA* (10)	*Mexico*(*m.d.*)
1856	*Anglo-Persian*	*UK* (3)	Persia (−10)
1879	*Pacific*	*Chile* (3)	*Bolivia* (−7)
1884	*Sino-French*	*France* (7)	China (−6)
1893	*Franco-Thai*	*France* (7)	Thailand (−10)
1897	*Greco-Turkish*	*Greece* (10)	Ottoman Empire (−10)
1898	*Spanish-American*	*USA* (10)	*Spain* (4)
1900	*Boxer Rebellion*	*USA* (10)	*China* (−6)
		UK (7)	
		France (8)	
		Russia (−10)	
		Japan (1)	
1909	*Spanish-Moroccan*	*Spain* (6)	Morocco (−6)
1912	*First Balkan*	*Serbia* (4)	*Turkey* (−1)
		*Greece*** (10)	
		*Bulgaria*** (−9)	
1913	Second Balkan	Bulgaria (*m.d.*)	Serbia (4)
			Greece (10)
1914	World War I	Austria-Hungary (−4)	Serbia (4)
1919	Russo-Polish	Russia (−1)	Poland (8)
1919	*Lithuanian-Polish*	*Poland* (8)	*Lithuania* (4)
1919	*Hungarian-Allies*	*Czhechoslovakia* (7)	*Hungary* ()
		Rumania (−4)	
1919	*Franco-Turkish*	*France* (8)	m.d.Turkey (*m.d.*)
1939	Russo-Finish	USSR (−9)	Finland (4)
1948	*Palestine*	*Syria* (5)	m.d.*Israel* (*m.d.*)
		Iraq (−4)	
		Egypt (1)	
		Lebanon (2)	
		Jordan (−10)	

m.d.: Missing data.

** Greece and Bulgaria not coded by COW as initiators,

but as participating on the initiator's side from the first day of the war

Table 4.9: Democracy and the Initiation of War, 1816–1994, part I

Tables 4.9 and 4.10 list all wars in the period 1816-1994 involving democracies from the start of the war.[13]   The table includes 30 of the 75 interstate wars in the Small-Singer data set. 22 of these, or 73%, were initiated by a democracy. To determine war initiation is a difficult coding task, since it depends on identifying the country which crosses the decisive borderline in a process of escalation. In some cases, the threshold is obvious, as when Germany attacked Poland in 1939. In other cases, with a protracted process of escalation in many small steps, identifying the initiator may require an arbitrary cut-off. Moreover, the possibility of preventive war muddies the waters. If A intends to attack B and B strikes first to prevent it, B will be the initiator in Small and Singer's terms, but in discussing nations' peacefulness, it may be just as reasonable (or unreasonable) to identify the other party as the aggressor.

When the Small and Singer (1976) list of initiators is examined more closely, such problems come out quite clearly. Looking at some of the wars initiated by democracies, we find several protracted high-tension disputes (India vs. Pakistan in the Second Kashmir War in 1965; Israel vs. its neighbors in the 1956 and 1967 wars and Syria vs. Israel in 1948) where mutual thoughts of preemption must have been so pervasive that the coding of war initiation becomes highly suspect. In three other wars (USA vs. Vietnam in 1965; India vs. Pakistan over what became Bangladesh in 1971; Turkey vs. Cyprus in 1974; and Armenia vs. Azerbaijan in 1991) an interstate war was initiated only after violence has already started, in the form of civil war, government massacre, or a coup d'etat. Thus, all the

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[13]Note to Tables 4.9 and 4.10: The tables include all interstate wars in the Correlates of War dataset involving at least one democracy from the start. Small and Singer (1982) have coded the initiator variable only up to 1980. For the remaining years, we have used Singer's update of the war data to 1992 (Singer and Small 1994), the Wallensteen and Sollenberg (1996) data on wars in 1993-94 and our own coding of the initiator. Three wars had to be eliminated from the COW list when the present table was compiled. In the Israeli-Egyptian War (1969-70) and the Vietnamese-Cambodian War (1975-80) no initiator is named. The war called Roman Republic (1849), according to the COW dataset, was initiated by France, which was not one of the original parties (Two Sicilies vs. Austria-Hungary). This makes no sense, so this war has also been left out. Of these three, only the first involved a democracy. Note that the two world wars have also been excluded. Although they involved several democracies, the two original initiator and victim (Austria-Hungary vs. Serbia in World War I and Germany vs. Poland in World War II) were not democracies when the wars broke out. The same goes for the Crimean war, the First Balkan War, and the Korean War. Wars in bold print are those initiated by democracies. - Democracy scores are from Polity III.

In the 1969 Israeli-Egyptian War, Israel (9) and Egypt (–7) participated, but COW has no information on initiation.

Start Year	War	Initiator(s) (Dem. Level)	Target(s) (Dem. level)
1956	*Sinai*	*Israel* (10)	*Egypt* (−7)
1962	Sino-Indian	China (−8)	India (9)
1965	Vietnamese	*USA* (10)	*North Vietnam* (−8)
1965	*Second Kashmir*	*India* (9)	*Pakistan* (3)
1967	*Six Day*	*Israel* (9)	*Egypt* (−7)
			Jordan (9)
			Syria (−8)
1971	*Bangladesh*	*India* (9)	*Pakistan* (3)
1973	Yom Kippur	Egypt (−7)	Israel (−7)
		Jordan (−10)	
		Saudi Arabia (−10)	
1974	*Turco-Cypriot*	*Turkey* (9)	*Cyprus* (10)
1982	Falklands	Argentina (−8)	UK (10)
1991	*Armenia-Azerbaijan*	*Armenia* (7)	*Azerbaijan* (−1)

Table 4.10: Democracy and the Initiation of War, 1816–1994, part II

eight wars initiated by democracies in the post-World War II period seem
rather irrelevant to determining the peacefulness of democracies. We have
not analyzed earlier wars initiated by democracies in similar detail, but
the data from the post-1945 period along cast considerable doubt upon the
notion that democracies are as warprone as non-democracies. At least in
the modern era, democracies would appear to initiate violence very rarely,
except in protracted conflicts; but if violence has started in some form, they
are not averse to intervening or to escalate the dispute to the point where it
can be settled by superior force. The prior existence of violence may serve
as a justification for the intervention of democracies.

The six most violent interstate wars in the entire COW period – World
War I (1914), World War II (1939), the Sino-Japanese War (1937), the
Korean War (1950), the Vietnam War (1965), and the Iran-Iraq War (1980)
– were all initiated by non-democracies, although mostly with other non-
democracies as the initial victims. When democracies became involved,
as they did in four of these wars, they joined the target rather than the
initiator. This adds force to the contention that if democracies participate
at all, they tend to be on the reactive side, at least in major wars.

This is not tantamount to saying that democracies are more peaceful. Such a statement would require a more detailed analysis of the patterns of escalation and consideration of a wider set of wars. For instance, many extra-systemic wars have been initiated by democracies engaged in colonial conquest. Secondly, in the post-World War II period there appear to have been many more military interventions abroad conducted by democratic (Western) countries than by the Soviet Union and its allies. Some interventions have been justified with reference to stopping domestic violence or promoting democracy, while others are more commonly interpreted as power politics. Thirdly, major powers, including large democracies, may fight war through proxies.

Finally, what about controls for third variables? That task is much more urgent at the nation level than at the dyadic level, since we are not dealing with a perfect or near-perfect relationship. Many of the third variables controlled for at the dyadic level , for instance those tested by Bremer (1992), could be translated to the nation level. But few if any studies control for third variables in a convincing manner.[14]

4.5 Connecting the Levels Logically

Although the relationship between the dyadic level and the nation level has been the subject of some debate, there has been little research at the system level, and very little discussion about the links to the other levels. Most have taken it for granted that the systemic relationship could be deduced from the dyadic level (Singer and Wildavsky, 1993, 251) or from the nation level (Small and Singer 1976). In one of the few studies to address directly the logical connections between two levels, Starr (1992, 44) argues that a greater number of democracies produces a larger number of democratic dyads, and that this in turn lowers the level of violence in the system. But this is not so obvious. A greater share of democracies also means a larger number of mixed dyads, with a higher probability of war. So what is the net effect on war in the system?

Obviously, if all countries become democratic, interstate war will hardly occur any more. In other words, given complete democratization, a yes to the dyadic question logically implies a yes to the system-level question, while the nation-level question becomes irrelevant. But what about links between the levels at lower levels of democratization? As long as the democracies are in a minority among the countries, double democracies will be

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[14]A partial exception is Schjølset (1996).

an even smaller minority among the dyads, and it will take only a slightly higher incidence of war between democracies and non-democracies to compensate for the lack of war between democracies. If an increase in the incidence of democracy over time is accompanied by an increasing rate of war between democracies and non-democracies, a system with a higher proportion of democracies need not be more peaceful. Quincy Wright's notion (1965[1942], 266) that 'the greater the number of sheep, the better hunting for the wolves', is consistent with this idea. The greater the number of democracies, the greater the value of war to the despots.

However, the perspective changes when the democracies become a majority. To see the problem, we may ask what happens when there is just one non-democracy left. If a war occurs, the single non-democracy must be at war. To maintain the equal war participation of democracies and non-democracies, that single non-democracy must be at war with all the democracies in the course of the year. This does not seem highly plausible, although one might conceivably imagine a United Nations of all countries except one going to war to rid the world of the last vestige of authoritarianism. The Gulf War of 1991 points in this direction. Iraq fought a coalition of no less than 29 countries (Wallensteen and Sollenberg 1996, 360), backed by a series of UN resolutions. Of course, only a minority of these countries deployed any force to speak of, several of them were far from democratic, and democracy in Iraq was not a stated objective of the war.

The relationship between the levels becomes clearer when we formulate it formally. Assuming a very simple model where the political character of the regime is the only factor, we will show how parameters for the different levels are interrelated.[15] The argument is easily generalized for more than these three categories, but the formulae quickly become very complex.

4.5.1   Dyadic versus nation level

In the development of a model, we will assume throughout that no country can start a war against more than one other country in a given time interval. If this interval is short, this is a fairly realistic assumption. If the interval is as long as a year, it holds for 75 of the 118 'new wars'.

First consider the simple case that war probability is independent of regime type. If there are N countries, the probability of outbreak of war in

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[15]Expressions 4.1 and 4.2 below are reprinted as they appeared in the original publication of the chapter, despite the fact that they are not fully consistent with the basic laws of probability. This error is corrected in Appendix B. The Appendix shows that all conclusions arrived at here are valid despite the error.

a dyad in the course of a year is π_{dyad}, and the probability of a randomly chosen country getting involved a war in a year is π_{nation}, the relation between the probabilities for the two levels is

$$\pi_{dyad} \quad = \quad \frac{\pi_{nation}}{N-1} \tag{4.1}$$

$$\pi_{nation} \quad = \quad \pi_{dyad}\,(N-1) \tag{4.2}$$

If we view π_{nation} as constant, π_{dyad} is proportional to $1/N$. Conversely, if we look upon π_{dyad} as constant, π_{nation} is proportional to N. And, since $0 <= \pi_{nation} <= 1, 0 <= \pi_{dyad} <= 1/(N-1)$. This means that π_{dyad} is not a primitive parameter, but has to decrease with increasing N! This is confirmed by empirical analysis: In the period 1954–94 the relative frequency of national onsets of war is about one third of what it was in the period 1851–1953. At the same time, the relative frequency of dyadic onsets of war is less than one tenth. That the reduction at the dyadic level is three times larger than at the nation level is explained by formula (4.1): The reduction at the dyadic level is due to the increase from an average of 48 countries in the first period to 111 in the second. The relationship between the probabilities at these two levels of analysis is thus expected to change from

$$\pi_{dyad} = \frac{\pi_{nation}}{48-1} \text{ to } \pi'_{dyad} = \frac{\pi_{nation}}{111-1}.$$

Quantitative studies based on dyad-years in this field routinely assume that π_{dyad} is constant (conditional on the independent variables), and thus run the risk of generating spurious results: Since the international system is steadily increasing in size over time and the share of democracies is also increasing over time, the effect of increasing N can be falsely attributed to increasing democratization.

Maoz & Russett (1992, 1993) use a subset of the population of dyads which they call 'politically relevant' (i.e. dyads that are either contiguous or include one or two major powers). This limitation results in a reduction of their number of dyad-years by nearly 88%. Because this reduction of the units of analysis involves a loss of 26% of the disputes in the data set on militarized interstate disputes and 20% of the conflicts in the International Crisis Behavior set (Brecher, Wilkenfeld and Moser, 1988), we are skeptical of this procedure. Moreover, it seems unfortunate to reduce the units on the basis of variables which are potentially highly relevant for the analysis. But, unintentionally, this reduction also alters the relation between π_{dyad}

and π_{nation}, and reduces the danger of spurious correlation. We will return to this point later.

We will now extend (4.2) to formulate the relation between the two levels given the countries' distribution on a dichotomous variable, such as democracy or non-democracy, and given dyadic probabilities for the different resulting dyads. If the probability of war outbreak is dependent on regime type, the relation between the two levels will be dependent on the distribution of democracies and non-democracies. We will write the share of democracies as d. Then there are Nd democracies and $N(1-d)$ non-democracies. There are $Nd\dfrac{(Nd-1)}{2}$ dyads consisting of two democracies, $N(1-d)\dfrac{(N(1-d)-1)}{2}$ dyads consisting of two non-democracies, and $N^2 d(1-d)$ politically mixed dyads.

The probability of a war outbreak in a randomly chosen democracy is then the expected number of democracies $E(D)$ in war outbreaks in a given year divided by the number of democracies. $E(D) = 2E(DD) + E(ND)$, since an outbreak of war in a double democratic dyad will involve two democracies and an outbreak of war in a mixed dyad will involve one democracy (as long as the assumption holds that no country starts a war against more than one opponent in a given year). We may now express the nation-level probability π_D of a democracy entering a war in terms of N, d and the probabilities of war outbreak in dyads with different regime combinations π_{DD}, and π_{ND}:

$$
\begin{aligned}
\pi_D &= \frac{E(D)}{Nd} = \frac{2E(DD) + E(ND)}{Nd} \\
&= \frac{2\left(Nd\dfrac{(Nd-1)}{2}\right)\pi_{DD} + N^2 d(1-d)\pi_{ND}}{Nd} \\
&= (Nd-1)\pi_{DD} + N(1-d)\pi_{ND} \qquad (4.3)
\end{aligned}
$$

In the same way,
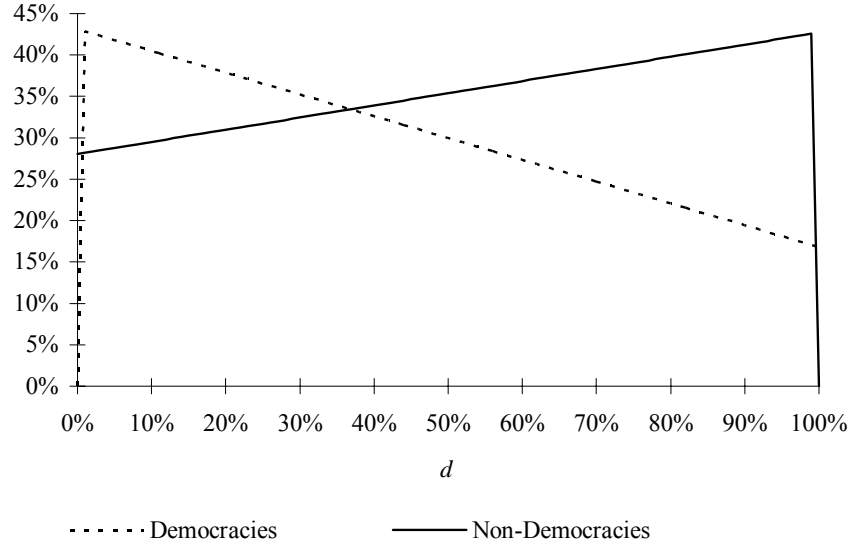
Figure 4.1: Expected share of democracies and non-democracies in onset of new dispute in a year as a function of d, given the sample values for N, π_{ND}, π_{NN}, and π_{DD}

$$\begin{aligned}
\pi_N &= \frac{E(N)}{N(1-d)} = \frac{2E(NN) + E(ND)}{N(1-d)} \\
&= \frac{2\left(N(1-d)\frac{(N(1-d)-1)}{2}\right)\pi_{NN} + N^2 d(1-d)\pi_{ND}}{N(1-d)} \\
&= (N(1-d)-1)\pi_{NN} + N(1-d)\pi_{ND} \qquad (4.4)
\end{aligned}$$

As in (4.2), the relation between the nation and the dyadic probabilities are proportional to N.

To illustrate our point, we have selected a set of 30 countries which have been members of the international system for most of the 1853–1992 period. The observed frequencies for 'new disputes' (corresponding to Table 4b) for this set are: $\pi_{DD} = 0.0063$, $\pi_{ND} = 0.0158$ and $\pi_{NN} = 0.0105$. The average system size, N, was 27.7 countries, varying from 21 to 30. Based on these

parameters π_D and π_N are plotted as functions of d in Figure 4.1.[16]

For these particular parameters, where : $\pi_{ND} > \pi_{NN} > \pi_{DD}$, π_D decreases with increasing d and π_N increases with increasing d.

4.5.2   Dyadic vs. system level

At the system level we are most interested in the proportion of the system's countries in war outbreak in a year. For a start, we assume that the probability of war between two democracies π_{DD} is zero. Then the frequency of war is a function of π_{ND}, π_{NN}, d, and N, the number of countries in the system. Clearly if $\pi_{ND} < \pi_{NN}$ the replacement of a dyad of two non-democracies by a mixed dyad of one democracy and one non-democracy must involve a decrease in the frequency of war. Therefore, as long as π_{ND} $< \pi_{NN}$ (as we have found empirically to be the case for the onset of new interstate war and for all measures of armed conflict at a lower threshold of violence), the frequency of war declines monotonically with increasing d. In other words, the more democracies in the system, the less war.

On the other hand, if $\pi_{ND} > \pi_{NN}$ (as we have found empirically to be the case for the incidence of war, for the onset of new dyadic interstate war, and for all measures of militarized disputes), the system-level relationship is more complex. Imagine that we have no democracies in the system at all. In that case, the frequency of war in the system is a function only of the probability of war among non-democracies. If we introduce one democracy, the frequency of war must go up, because $(N-1)$ dyads now become politically mixed (democracy/ non-democracy) with a higher probability of war, while there are as yet no double democracies where the probability of war is zero. On the other hand, if all countries but one are democratic, increasing democratization must decrease the frequency of war in the system, because the last $(N-1)$ remaining mixed dyads are replaced by double democracies.

This reasoning is confirmed by deriving π_{nation}, the weighted average

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[16]Note to Figure 4.1: Data as in Table 4.1, for a subset of 30 countries.

of π_D and π_N, from expressions (4.3) and (4.4):

$$
\begin{aligned}
\pi_{nation} &= \frac{E\left(D\right) + E\left(N\right)}{N} \\
&= \frac{2E\left(DD\right) + 2E\left(ND\right) + 2E\left(NN\right)}{N} \\
&= \frac{2}{N} \left(\begin{array}{l} 2\left(Nd\frac{(Nd-1)}{2}\right)\pi_{DD} + \frac{2}{2}N^2 d\left(1-d\right)\pi_{ND} \\ +2\left(N\left(1-d\right)\frac{(N(1-d)-1)}{2}\right)\pi_{NN} \end{array} \right) \\
&= d\left(Nd-1\right)\pi_{DD} + 2Nd\left(1-d\right)\pi_{ND} + \\
&\quad \left(d-1\right)\left(N\left(1-d\right)-1\right)\pi_{NN}
\end{aligned} \tag{4.5}
$$

We see that if $\pi_{DD} = 0$ and $d = 1$, π_{nation} has to be zero. The formula can also be expressed as

$$
\begin{aligned}
\pi_{nation} &= Nd^2\left(\pi_{DD} - 2\pi_{ND} + \pi_{NN}\right) \\
&\quad +d\left(-\pi_{DD} + 2N\pi_{ND} + \left(1-2N\right)\pi_{NN}\right) + \pi_{NN}\left(N-1\right)
\end{aligned} \tag{4.6}
$$

As a function of d, this expression is quadratic. In other words, if the 'conventional wisdom' holds about the dyadic and the nation-level regularities, it follows logically that there must be a parabola-shaped relationship between the degree of democratization and the frequency of war at the system level. Thus, with increasing democratization over time, we should expect the frequency of war to increase initially, and only decline when reaching a break-point. The derivative of (4.6 with respect to d is the rate of change of π_{nation} when d increases:

$$
\begin{aligned}
&\frac{\partial \pi_{nation}\left(d\right)}{\partial d} \\
&= 2dN\left(\pi_{DD} - 2\pi_{ND} + \pi_{NN}\right) \\
&\quad +\left(-\pi_{DD} + 2N\pi_{ND} + \left(1-2N\right)\pi_{NN}\right)
\end{aligned} \tag{4.7}
$$

The maximizer of $\pi_{nation}(d)$ is the value of d for which (4.7) equals zero (given values for the other parameters). In the special and not very realistic case of $\pi_{NN} = 0$ and $\pi_{DD} = 0$ (i.e. no war among similar regimes), the frequency of war peaks for $d = 0.5$, at which point half the dyads are mixed; hence any further democratization must replace a mixed dyad
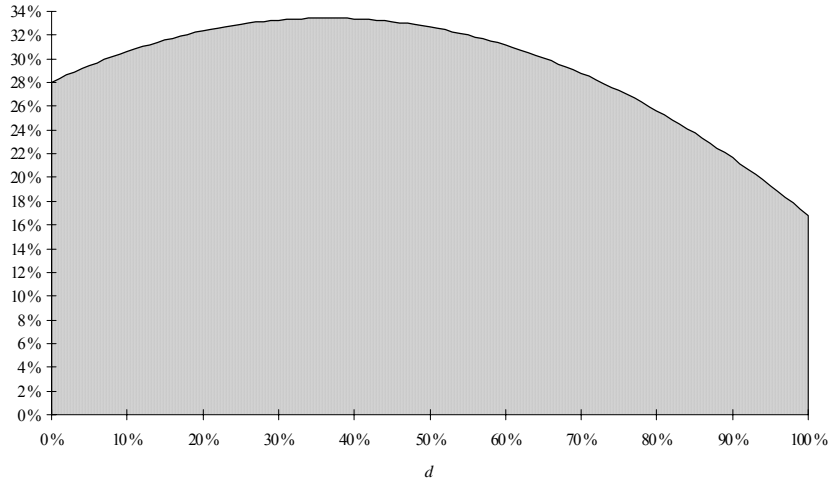
Figure 4.2: Expected Share of Countries in Onset of New Dispute in a Year as a Function of d, Given the Sample Values for N, π_{ND}, π_{NN}, and π_{DD}

with a pure dyad of one sort or the other. For our numerical example, the maximizer is $d = 0.36$.

These points are illustrated in Figure 4.2, where we have plotted π_{nation} as a function of d in a our subset of countries, using expression (4.6).[17] If the observed frequencies are representative, initial democratization in the international system is followed by a slightly increasing frequency of war until 36% are democratized, and then it starts to decline.

It can be derived from (4.7) that the maximizer of $\pi_{nation}(d)$ is independent of N when we assume that the dyadic probabilities π_{ND}, π_{NN} and π_{DD} are constants. In other words, the expected frequency of war at the system level peaks for the same share of democracies regardless of the size of the system. But as argued in the previous section, the assumption of constant dyadic probabilities is untenable: both π_{nation} and π_{dyad} are dependent on the size of the system. The relationship between the levels is inextricably tied to the size of the system, making strict empirical testing of our argument difficult.

The fact that N has been constantly expanding in the time-frame covered, probably does not alter the relationship between the levels shown here, although we have not worked out the formal relationship. In the absence of

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[17]Note to Figure 4.2: Data as in Table 4.1, for a subset of 30 countries.

Period	Average N	d (%)	Observed π_{nation} (%)	Predicted π_{nation} (%)
$1853 - 1887$	27.8	22.2	24.1	32.6
$1888 - 1922$	27.6	32.2	29.8	33.4
$1923 - 1957$	25.8	43.3	22.6	33.2
$1958 - 1992$	29.7	63.4	14.9	30.4
$1853 - 1992$	27.7	40.6	22.7	33.4

Table 4.11: Observed and Predicted Probabilities of MIDs at the Nation Level in a Set of 30 Countries

such an extended formula, it is thus necessary to limit the analysis in some way as to keep N roughly constant if we want to test our propositions. We might do this by applying some variation of the 'politically relevant dyads'. In Chapter 5, we propose a flexible version of this procedure where the 'irrelevant' dyads are weighted down instead of being deleted. Another way to bypass the problem is to confine the empirical analysis to a region which is expanding only moderately (such as Europe), or to a fixed set of countries as in our numerical example.[18] In Table 4.11 the 140-year time-span has been divided into four periods of 35 years each. The share of democracies d and the observed share of nation-years with onset of new militarized interstate dispute has been computed for each period. In the final column we report the π_{nation} predicted by expression (4.5), given the observed proportions at the dyadic level. These predicted figures correspond with Figure 4.2.

Although double democratic dyads have a considerably lower proportion of dyad-years with new disputes (0.0063 vs. 0.0105 and 0.0158), the predicted probabilities at the nation level are almost similar. At 63% democratization the democratic peace still has only a limited effect at the system level (cf. Figure 4.2). The observed proportions are considerably lower than the expected. This is due to violations of the assumption that no country can start a war against more than one other country in the given time interval, i.e. in a year. If a country starts two separate disputes with two other countries in a year, this is counted as two dyadic disputes and three nation level disputes, not four as assumed. Secondly, the parabola is much steeper than predicted. This is because the dyadic probabilities are not constant over time: militarized disputes are less frequent for all regime

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[18]We conducted an analysis similar to the one reported in Table 4.11 for all European countries, with similar results.

types after World War II. The observed frequencies indicate a much lower level of MIDs at recent high levels of democracy.

This analysis may also shed some new light on the debate between Mansfield and Snyder (1995, 1996) and Enterline (1996), Weede (1996), and Wolf (1996) on democratization and the danger of war. Mansfield and Snyder argue that the process of political change in general, and democratization in particular, creates instabilities which increases war participation.[19] Mansfield and Snyder's argument is strictly at the nation level. Enterline and others have argued that their data do not support their argument. From our analysis it is clear that the war participation of a given country depends on the political mix of surrounding countries. For a non-democracy, increasing the number of democracies increases war participation. For a democracy, the effect is the opposite. The studies done to date are underspecified and fail to distinguish two different effects of democratization, the effect of the process of change for the country itself and the effect of a changing political environment.

4.6   Spreading Democracy, Spreading Peace?

If the simple dyadic-to-system level argument had been true, the increasing democratization reported in many studies, and particularly the 'third wave' of democratization since 1974, should provide considerable cause for optimism – leaving aside the issue of short-term instabilities associated with the democratization process. However, as noted above, the conventional wisdom at the dyadic and the nation levels leads to the conclusion that the relationship between democratization and the frequency of war at the system level, ceteris paribus, should be parabolic. In tracing the historical pattern from the birth of modern democracy, we should expect it to be accompanied, then, by a relative increase in the frequency of interstate war before the effect of democratization starts working in the opposite direction. The absolute number of democratic countries has never been higher, and even though there has been a vast increase in independent states (from 23 in the COW data set in 1816 to 186 in 1994) the fraction of independent states under democratic rule is also approaching an all-time high. Since colonies and other dependent territories can rarely be classified as democratic, the increase in relative democratization is even greater than what we

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[19]Many current armed conflicts, such as those in the former Yugoslavia and in the Caucasus - can be related to on-going democratization, or attempts at democratization, even if few of the warring parties yet make the threshold for democracy used here.

find when we consider only independent states. As the democratic groups of countries passed above 50%, more than 25% of all randomly selected pairs will have ruled out war among themselves. At this level, we might reasonably hope that it should have consequences for the level of violence in the system as a whole.

In Figure 4.3 the relative number of democracies and the incidence of war (measured by the fraction of country-years at war to all country-years) are plotted in the same graph.[20] No clear monotonic relationship emerges: Democratization shows a long-term increase, while the amount of interstate war appears to increase and then to decline after World War II. The peak of war activity around 1940 followed a long and drastic decline in the level of democracy in the 1920s and 1930s. Earlier periods of war accompany periods of democratization. All of this is broadly consistent with the hypothesized curvilinear pattern, if we fix the turning-point at about 1910-20.

A similar approach is taken in Figure 4.4, where the two variables are plotted on separate axes.[21] Here the frequency of war in the system (measured by the percentage of country-years at war) is plotted against the degree of democracy (measured by the percentage of country-years accounted for by democratic countries) for each of six time-periods. The first five time-periods each cover 35 years, while the final period covers just the post-Cold War era. Figure 4.4 shows that for the first 100 years, the world becomes more democratic and also more warprone. After the world wars it has become more democratic and more peaceful. However, in examining the changes between neighbouring periods, we find too little war in the third period and too little democracy in the fifth for the pattern to be completely consistent with our theoretical expectations. Nevertheless, the curve as a whole may (with some imagination) be characterized as parabolic, where increasing democratization, as expected, is first associated with more war, then with less.

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[20] Note to Figure 4.3: Data as in Table 4.1. War data accumulated by country and by decades. Countries in transition or without codes in Polity have been excluded. Plotting the war data on an annual basis, not shown here, gives the same overall impression, but in a somewhat more erratic fashion. We could also have measured systemic war by the frequency of dyadic war, but the trend would be very similar.

[21] Note to Figure 4.4: Data as in Table 4.1 and Figure 4.3. The periods are: I: Post-Congress of Vienna (1816-1850), II: Italian and German Unification (1851-1884); III: World War I (1885-1918); IV: World War II (1919-1953); V: The Cold War (1954-1986); and VI: Post-Cold War (1987-1994). The initial division, up until the end of the Cold War, was arbitrarily made into five periods of 35 years each, and the labels have been added afterwards as an indication that they seem to make some substantive sense.

Figure 4.3: Relative Number of Democracies in the World and Incidence of War, 1816-1994 (%)
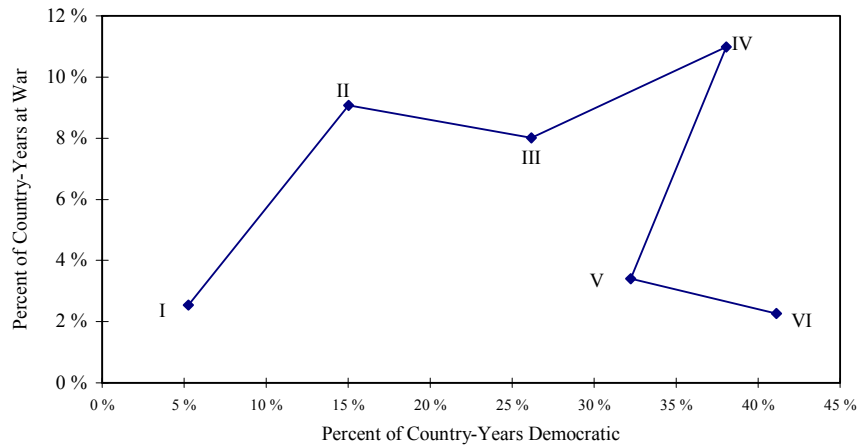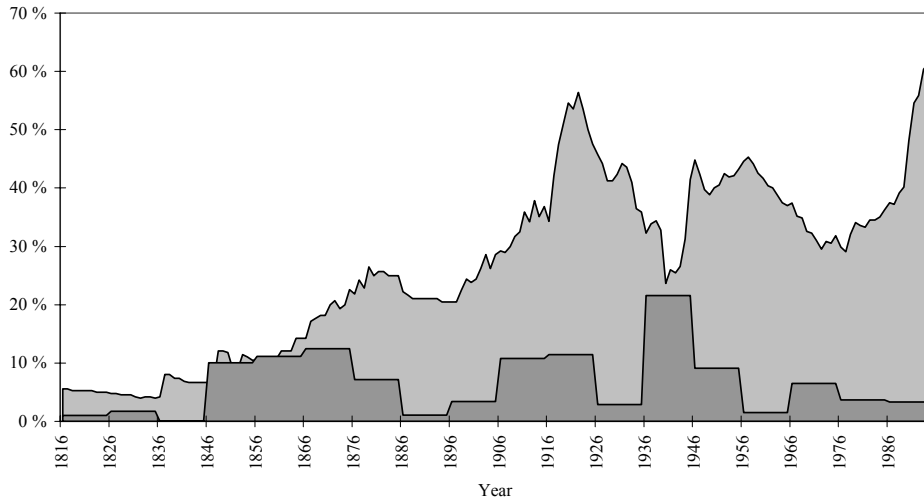
Figure 4.4: Degree of Democratization by War Incidence at the System Level, 1816-1994 (%)

While it is difficult to predict theoretically where the breakpoint might occur, we can simulate it. If we assume π_{ND} and π_{NN} to be constant over time and to be equal to the frequency of war in mixed and pure non-democracy dyads over the entire time period, and use the actual figures for d (the fraction of democracies), we get a predicted pattern of war which peaks in the late 1920s and generally declines from then on. Since war peaked only twenty years later and the late 1920s were in fact quite a peaceful period, this might seem to be wide of the mark. But if we regard the two world wars as essentially one conflict (not an unreasonable assumption in view of the fact that the actors and conflict lines were largely the same, at least in Europe) the mid-point of that conflict lies somewhere in the late 1920s and early 1930s.

It is tempting to suggest that some kind of system shift has occurred, perhaps at the end of the long European conflict known as the two world wars, or perhaps at the end of the Cold War. This shift could be related to democratization having reached such a high level – at least in certain regions – that there is a lack of opportunities for war. The level of democracy in Europe is now higher than ever before. Since Europe has accounted for so much of the world's war in the previous periods (Gleditsch 1995b), this could explain the recent decline in interstate war.

In one of the few studies at the system level[22] Maoz and Abdolali (1989) tested regime type (democratic, anocratic, autocratic) against the occurrence of militarized interstate disputes 1816-1976. This study is not so relevant here, since it posits a positive relationship between democracy and peace at the nation level as well as the dyadic level. Obviously, then, a simple monotonic relationship must follow at the system-level although it would appear that these authors, too, think that the system-level hypothesis is a 'logical extension' of the dyadic-level hypothesis alone. The tests reported in the empirical part of the article generally reflect the same lack of attention to possible curvilinear relationships. They first report that the proportion of double democracies is positively related to system conflict (Maoz and Abdolali, 1989: 26), and that this held even when corrected for autocorrelation (p. 27), but that the proportion of double democracies had a negative effect on the number of wars, although only a small proportion of the variance was accounted for (p. 27). When broken down into two sub-periods, the relationship between degree of democracy and conflict was

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[22]Another important study at the system level (Maoz 1996) deals more with systemic changes and its causes than with consequences of regime type measured at the system level.

found to be different in the 19th and the 20th century. This is reminiscent of the famous early findings by Singer and associates of differences between the 19th and the 20th century with regard to the influence of alliances and capability distribution.[23] Such findings are highly unsatisfactory because 'century' is not a theoretical category. When the difference between centuries is interpreted as a question of crossing a threshold of democratization in the international system, the shift in the relationship to war becomes theoretically meaningful, but the shift is unlikely to follow the calendar quite so neatly.

What about controls for third variables at the system level? The issue has hardly been touched in the literature. Clearly, the empirical pattern found in Figures 4.3 and 4.4 might be very different if we had incorporated the influence of other variables. 'The shrinking world' might be one such variable, measured for instance by the time it takes to travel between two randomly picked members of the interstate system. Since there is more war between neighboring and proximate states (Bremer 1992; Gleditsch 1995a), we might expect a higher frequency of war as countries come closer to each other in terms of the time and cost expended in interaction. This might outweigh the effect of democratization or it might influence the relative size of the probabilities π_{ND} and π_{NN} and move the breakpoint at which democratization starts to produce peace at the system level. Once again, we might take all of Bremer's third-variable tests and translate them to the system level. To date, there is little theoretical or empirical research of this kind.[24]

4.7   Summary

The evidence for the democratic peace is overwhelming at the dyadic level. Double democracy is virtually a sufficient condition for non-war in the dyad.

At the nation level, the evidence is mixed. Our own empirical evidence confirms most previous studies in suggesting that over the period covered by the COW project, democratic states are about as prone to participate

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[23] Singer and Small (1968) found that a high number of alliances tended to be associated with peace at the system level in the nineteenth century, but with war in the twentieth century. And Singer, Bremer, and Stuckey (1972) found a balance-of-power model of peace to fit the 19th century, while a power preponderance model seemed more suitable for the 20th century.

[24] For a first attempt, see McLaughlin (1996), who finds more support for a linear than a curvilinear relationship between democracy and peace at the systemic level, but cautions that at this stage of her research inference is difficult.

in war as other states. Democracies have fewer battle fatalities, but it is not obvious what this implies for their peacefulness. The war participation of democracies is inflated by their tendency to ally in war. And finally, the question of war initiation is marred by problems of interpretation, and the possibility that democracies are less aggressive cannot be ruled out.

At the system level, the question has not been explored much in previous studies. For most of the period under study, democratization was associated with increasing violence between states, whereas more recently democratization co-occurs with decreasing violence. This is in line with our theoretical argument based on the dyadic and nation-level relationships. We surmise that the world, or at least certain regions, may now have passed through a system shift in crossing a threshold value for democratization.

If this (admittedly somewhat speculative) conclusion is correct, further democratization should continue to lower the probability of war, at least in regions where democracy is at a reasonably high level. As noted, democracies tend to win the wars they participate in (Stam, 1996) and unsuccessful conduct of a war is frequently punished with a violent regime change (Bueno de Mesquita, Siverson, and Woller 1992). Losers seem more likely to imitate the winner, so the net outcome will probably be further democratization. The experience of the two world wars and the end of the Cold War confirms this expectation. Although in the short term participation in war is likely to undermine democracy (for instance through restrictions on freedom of speech or the postponing of elections), war would seem to promote more democracy in the longer run; and – at least above a certain level – more democracy in turn leads to a reduction of war. Thus, the optimism of the democratic-peace literature would seem warranted in the long run, but on the basis of a somewhat more complex reasoning than ordinarily assumed. Of course, if the idea gains currency that war may be pursued as a deliberate strategy of democratization, the world could be in for a transitory unpeaceful period.

Chapter 5

The Hazard of War: Reassessing the Evidence for the Democratic Peace

This chapter was written jointly with Arvid Raknerud, and was originally published as Raknerud & Hegre (1997).

Abstract

In this chapter, we re-examine the statistical evidence for the democratic peace at the dyadic level. We also investigate the seeming paradox that democracies are engaged in war as often as autocracies at the nation level. From the extensive literature on democracy and peace we have selected as our point of departure two influential contributions by Stuart Bremer and Zeev Maoz & Bruce Russett, which both analyze the relation between democracy and peace at the dyadic level. Several problematic aspects of their analyses are addressed; in particular problems with dependence between observational units caused by continuing war and peace, and by diffusion effects. We show that the increasing number of countries in the international system causes their assumption of a stationary probability of war at the dyadic level to be violated. It is argued that these problems cannot be solved adequately within the traditional dyad-year framework. Instead it is proposed to model observations on the interstate dyad as a process in continuous time, using Cox regression. An extensive model is developed that controls for contiguity, power status, alliances, sta-

bility, diffusion of war, and recurrence effects. A concept of relevance is introduced to account for the dependence of the dyadic probability of war on the size of the international system. The democratic peace is supported in our basic model. In a refined model, we find that democracies' tendency to join each other in wars is much more marked than their avoidance of mutual fighting. This explains why democracies are as war-prone as autocracies.

5.1   The 'Democratic Peace'

This chapter re-examines the statistical evidence for the *democratic peace* – the hypothesis that interstate dyads (i.e. pairs of states) consisting of two democracies are almost never at war. The hypothesis is often attributed to Kant's *Zum Ewigen Frieden* (Doyle, 1986). It is supported by a large number of empirical studies (see Chapter 4 for an overview), and has been championed as 'as close as anything we have to an empirical law in international relations' (Levy, 1988, p. 662).

However, there is a caveat: at the nation level, empirical studies indicate that democracies are engaged in war as frequently as autocracies. This has the important implication that politically mixed dyads, i.e. dyads consisting of one democracy and one non-democracy, must have a higher probability of war than double autocratic dyads. The latter observation is theoretically troubling for the 'democratic peace'. For instance, Maoz & Russett (1993, p. 625) assume that the norms of behavior that characterize relations between democracies will be dominated by the autocracies' norms for international behavior in relations between a democracy and an autocracy. From this we would expect that politically mixed dyads will have the same probability of war as autocratic dyads, not a higher probability.

An explanation of the paradox is suggested in Chapter 4 (p. 113): democracies rarely start wars, but they join wars much more frequently than autocracies. The two World Wars and the 1991 Gulf war are examples of several democracies joining an alliance against a smaller number of autocracies after the fighting has started.

Even though the democratic peace has been assessed by a large number of studies, both empirically and theoretically, it remains controversial. Some of its antagonists claim that the empirical support for the democratic peace is inconclusive due to the inadequacy of the statistical methods used to test it. However, we think the situation can be improved by careful statistical modeling.

5.2 Studies of the Democratic Peace Hypothesis

As our starting-point we have selected two influential articles from the extensive literature on democracy and peace: Bremer (1992a) and Maoz & Russett (1993). 'Dangerous Dyads' by Bremer is a pioneering work and presents several major improvements compared to the previous literature. Bremer stressed the interstate *dyad* as the appropriate unit of analysis, in contrast to such earlier work as Small & Singer (1976), Chan (1984) and Weede (1984). He used the full spatial and temporal domain of the Correlates of war (COW) project from 1816 and forwards and recognized the need for multivariate analysis. Several scholars have used a similar approach later, notably Maoz & Russett (1993), Barbieri (1996), and Oneal et al. (1996). Although their specific choice of statistical model may differ (e.g. Bremer uses a Poisson model, whereas Maoz & Russett use logistic regression) the basic idea is the same: the dyad-year is the observational unit and the response variable (conflict status) is related to a set of explanatory variables through a regression model. All of these authors find clear empirical support for the democratic peace hypothesis. In the following we refer to this as the *dyad-year* tradition.

5.3 Problems with the Dyad-Year Tradition

Spiro (1994) has claimed that the empirical evidence for the democratic peace is insignificant: the low nominal *p*-values reported in the literature are biased downwards because the models require that the dyad-years constitute independent observations, whereas they are actually highly dependent. In this section we scrutinize the methodological shortcomings of the dyad-year tradition and point at specific improvements; some of which can be handled within the dyad-year framework itself, whereas others transcend it.

The interstate dyad is the most elementary unit that can have war as a characteristic. Any interstate war (in the sense of the COW project) that involves more than two nations can be seen as a more or less complex cluster of interstate dyad wars, possibly with causal relationships between them. In what follows, we define 'dyad war' as any pair of states that fight on opposite sides in an interstate war – whether the two are the only participants or take part in a wider war. For example, the war between Poland and Germany and the Japanese-US wars are two of the many dyad wars that together form World War II.

5.3.1   Dependency between Units and Inconsistent Censoring

In the dyad-year tradition, the basic idea is to count the number of dyad-years in war and peace. It is assumed that all dyad-years are independent (when we condition on the explanatory variables). If this is tenable, the war status of the dyad-years are conditionally independent random variables. Bremer points out two problems with this assumption. Firstly, when a dyad is at war for more than one year, the counts of 'war' in the subsequent years are dependent on the first. Secondly, once an interstate war has started, other states may join it. Hence one dyad war can cause other dyad wars, and the latter will be dependent on the first.

At this point, Bremer and Maoz & Russett diverge. Bremer chooses to remove all the subsequent dyad wars (the 'joiners') from the data set and count only the initiating dyad war, relying on Small & Singer's coding of whether countries are joining a war or are starting a new war. Furthermore, if a dyad war continues over several years, only the first year is counted, and subsequent dyad-years at war are removed from the data set. By these criteria, World War II is reduced to a single war dyad: Poland-Germany in 1939. In statistical terms, this is a deliberate censoring. Apart from trying to reduce the problem of dependence, Bremer sets forth a second rationale for censoring: 'the question of why wars begin is fundamentally different from the questions of why wars grow in size, duration, and severity' (p. 320) and his concern in 'Dangerous Dyads' is with the first matter only.

The estimation of the statistical models of dyad war consists essentially in comparing the features of the dyads that did experience war (in a given year) with the dyads that – ex ante – could have experienced war (in that year); we will refer to the latter set of dyads as the *risk set*. When Bremer discusses the problem of dependent dyads his concern is restricted to the class of dyad wars. But the problem of dependence concerns the other dyads in the risk set as well.

To see this, we first note that the risk set consists of two types: dyads that risk *starting* (an independent) war, and dyads that risk *joining* an existing interstate war. In Bremer's approach, the latter dyads have zero probability of being counted as 'war' and hence should not contribute to the estimation of the model; they are not a part of the *actual* risk set. Therefore, to be consistent, not only dyads actually joining a war but also dyads that *risk* joining a war should be removed. To take one example: Assume that a new dyad war breaks out. During the following years the original dyad war may have been joined by other dyad wars that, when

taken together, form a single interstate war. The latter dyad wars will be censored because they are considered to be dependent on the first (e.g. all dyad wars in World War II except Poland-Germany). There could also be dyads that did not erupt in war (e.g. United Kingdom-Sweden) but, which, if they had done so, would have been censored. Accordingly, they are not a part of the *actual* risk set and should be removed. One may argue that after the outbreak of the Poland-Germany war and until the end of World War II, no dyad was at risk of starting an independent war and hence that the risk set was empty in this period. In practice it will be difficult, or even impossible, to determine ex ante whether a (potential) dyad war would be dependent on ongoing wars. And even ex post, for actual war outbreaks, the censoring criteria may be more or less arbitrary – for instance, what are the *general criteria* for reducing the Japan-US war to the Poland-Germany war during World War II?

Not only will an ongoing war lead to dependent counts of 'war', but a continuing peace will lead to dependent counts of 'peace' as well. If we are to censor continuing wars, why should we not censor continuing peace? Maoz & Russett (1993, p. 631), are aware of this problem, and choose to count *all* dyad-years at war, even if the responses are clearly dependent. They realize that the root of the problem is that the 'true' model is one of dependent response, no matter whether that response is 'war' or 'peace'. It is difficult to assess how this dependence will bias the estimates, but it will certainly lead to deflated p-values when testing statistical hypothesis. This situation is similar to distributing a questionnaire to a sample of N individuals *twice* and treating the responses as coming from $2N$ different individuals. Our answer to these problems is to model war origination and war-joining *simultaneously* – as causally related events in a statistical event history model.

The problems with the dyad-year tradition fundamentally derive from statistical dependence: a war in one dyad may alter the probability of war in other dyads. To some extent these problems can be handled within the framework of the dyad-year approach. One option is to include explanatory variables containing information about ongoing wars. In general we may condition on all relevant historical information, i.e. information known prior to year t, and this would fit naturally into the dyad-year framework. This is also recognized by Beck & Tucker (1996), who propose modelling the probability of outbrak of war as a function of the duration of peace. They also address the problem of cross-sectional dependencies betweeen units. Contrary to their suggestion we do not consider these dependencies

as due to latent variables. Instead we propose a model where inter-dyad dependencies is a part of the statistical model itself and is treated as *diffusion of war* effects.

If two wars are dependent and start in the same year (as when the United Kingdom declared war on Germany two days after Hitler's attack on Poland in September 1939), their dependence is a greater problem to the dyad-year approach. Since the start and end of wars are identified by date in the Correlates of War data, we suggest using a continuous time model. Of course, all time measures are discrete, but with a finer scale a continuous time model becomes more realistic. In 'continuous' time, the history contains all information up until *day t*. We will then be able to observe the succession of war outbreaks accurately and the problem of dependence through causality can be more adequately accounted for.[1] In the case of Britain's war with Germany, it will be possible to have explanatory variables that record that another dyad war was going on, and that Britain was directly affected by it through its defense pact with Poland.

In a continuous time model, the dyadic observations at t could become *conditionally* independent – and thus amenable to statistical analysis – and still remain highly interrelated (through dependence on a common history). Furthermore, information about ongoing wars as well as other circumstantial evidence relevant for classifying a war as starting or joining can be incorporated into the empirical model. This obviates the need to classify a dyad war as one type or the other a priori.

Some of the time-dependent variables are measured by year. In these cases, we follow common practice in event history analysis and treat them as step functions, i.e. constant through the year. This does not invalidate our argument for a continuous time model. The reason is that, by using a coarser grid, with e.g. the year as (a discrete) time unit, we are unable to make use of relevant information. On the other hand, when treating variables observed annually as constant through the year, no information is lost; the available information may just be less than desirable.

5.3.2   Untenable Assumptions of Stationarity

Our final critisism of the dyad-year tradition relates to the assumption of *stationarity*: for a dyad with a set of explanatory variables at fixed values,

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[1]However, this doesn't hold if a state declares war against several states on the same day, which is an example of a 'tie' – a truly simultaneous event. Our 'solution' to the ties problem is discussed in Appendix C.

the probability of war is assumed not to depend on *time*. Bremer (1992b) criticizes this assumption in the context of joining a war: the relation between the probability of war and the explanatory variables may change over time due to time-dependent unobserved (latent) variables. These variables may reflect what we could loosely term 'the general degree of tension' in the international system. A negative trend in the probability of war has been posited, e.g. by Rosecrance (1986) and Mueller (1989). Another, and fundamentally different, reason why the assumption of stationarity should be abandoned is the increase in the size of the international system of states (from 32 in 1840 to 182 by 1992). As shown in Section 4.5.1 (p. 119), this does indeed have stochastic consequences: Let N be the number of states in the international system. Since each state enters $N-1$ dyads, the number of interstate exposures for a given state increases with N. If the war probabilities in each dyad-year are constant, the probability of war on the nation level approaches one as N increases.[2] The important implication for statistical modeling is that probabilities at the *dyadic level* must depend on the size of the system. Failure to incorporate an explicit system dependence yields estimated probabilities of war at the nation level that become absurd when N increases. Furthermore, there is a high risk of spurious correlation if we should include explanatory variables that are correlated with the (unmodeled) time-trend. Note that regime type *could* be such a variable, since the fraction of double democracy dyads has increased over time (see Figure 4.3, p. 128) and hence will be correlated with the trend. We may wonder, then, whether the significant negative relationship between double democracy dyads and war reported in the literature is a substantial finding or merely an artifact of the double democracy variable being a proxy for a general negative trend in dyadic war probabilities.

From a priori considerations most dyads have very low or zero probability of war and it is plausible to assume that the emergence of a new independent state will affect only a few 'relevant' states, rather than all existing ones. We do not know of any general criteria for sorting out zero-risk dyads, but it is easy to find criteria which sort out dyads with low risk – or *low-relevance dyads* as we will call them. Maoz & Russett (1993) apply such low-relevance criteria in their analysis when they exclude what they call 'politically irrelevant' dyads. This exclusion can, however, be justified only if 'irrelevant' dyads have a negligible probability of war. Unfortunately, this is far from being the case: In excluding three quarters of the

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[2]This problem is also noted by Gates & McLaughlin (1996), but they offer no solution to it.

dyad-years Maoz & Russett loose as many as one quarter of the conflicts.[3]
In this chapter we refine the approach of Maoz & Russett in several ways.
In particular, we do not exclude the 'irrelevant' dyads but instead treat
them as a separate class of *low-relevance dyads*, where each member has
a non-stationary probability of war depending on the size of the interna-
tional system. A thorough discussion and motivation for these concepts are
deferred to Section 5.5.

5.4   An Alternative Model

We have demonstrated that even the most solid contributions to the empir-
ical literature on the outbreak of war suffer from serious inadequacies and
inconsistencies. We have also suggested some essential features of an 'ideal'
model: (i) observations on dyads should be recorded on the finest possible
time-scale to keep track of the succession of events, (ii) the war probabil-
ities of low-relevance dyads should depend on the number of states in the
international system, and (iii) the model should allow for non-stationarity
due to changes in latent variables at the system level. In Section 5.5 and
5.6 we will formulate a Cox regression model that addresses these three
concerns. In this section we present the general idea of Cox regression,
and relate the parameters of the model to logistic regression to facilitate
comparison with the existing literature.[4]

In Cox regression, the dependent variable is the transition between
'states of nature' – the transition from peace to dispute (or vice versa)
being of this type. A central concept is the *hazard function*, $\lambda(t)$, which is
closely related to the concept of transition probability: $\lambda(t)\Delta t$ is approx-
imately the probability of a transition in the 'small' time interval $(t, \Delta t)$
given that the subject under study is at risk of transition at t. In our case,
the subjects under study are all the different interstate dyads, and t is cal-
endar time. We study the transition from peace to war; a dyad that risks
transition has a non-zero probability of war– i.e. it is a system member[5]
and not already at war. The main idea of Cox regression is the assumption

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[3]See Gates & McLaughlin (1996) for exact figures. They propose and analyse a wider
set of politically relevant dyads. This is only a marginal improvement over Maoz &
Russett, however, since their data set still excludes 18% of the interstate wars.

[4]Cox regression is a feature of many statistical packages, although we know of non that
is able to handle our time-dependent explanatory variables. The model was proposed by
Cox (1972); good introductory dexcriptions can be found in McCullagh & Nelder (1989)
and Collett (1990).

[5]That is, the dyad is formed by two states that are both system members at time t.

that the hazard of war $\lambda_d(t)$ for dyad d can be factorized into a parametric function of (time-dependent) variables and a non-parametric function of time itself (the baseline hazard):

$$\lambda_d(t) = \alpha(t) \exp\left(\sum_{j=1}^{p} \beta_j X_j^d(t)\right) \quad (5.1)$$

In 5.1 $\alpha(t)$ is the baseline hazard: an arbitrary function of calendar time reflecting unobserved variables at the system level. $X_j^d(t)$ is a (possibly time-dependent) explanatory variable for dyad d; β_j is the corresponding regression coefficient; and p is the number of explanatory variables. All legitimate explanatory variables are known prior to t – they must be a part of the history up until immediately before t.

Estimating this model involves (i) estimation of the regression coefficients β_j and (ii) estimation of the baseline hazard of war $\alpha(t)$. These two tasks are quite different, since the latter is an unknown function – not a parameter. However, for the specific purpose of inference about the democratic peace, we are mainly interested in the 'structural' parameters β. Inferences about β can efficiently be made by conditioning on the time-points of outbreaks of war, $\{t_1, t_2, ..., t_n\}$. This means that we can consider $\{t_1, t_2, ..., t_n\}$ as fixed rather than stochastic, without losing any information about the parameters.

Given that there is an outbreak of war at time t_w, the probability that this war outbreak will happen in dyad d is:

$$\Pr\left(\text{war in a dyad } d | \text{a war breaks out at } t_w\right) \quad (5.2)$$

$$= \frac{\exp\left(\sum_{j=1}^{p} \beta_j X_j^d(t)\right)}{\sum_{i \notin R_{t_w}} \exp\left(\sum_{j=1}^{p} \beta_j X_j^d(t)\right)}$$

where R_{t_w} is the *risk set* at t_w: the set of dyads that are at peace immediately before t_w. The parameters can be interpreted in terms of a *relative* probability of war. Assume that dyad i and j have the same values on all explanatory variables, except for $X_k(t)$. Then, from (5.1), the ratio between the hazard of dispute of dyad i and dyad j becomes

$$\frac{\lambda_i(t)}{\lambda_j(t)} = \exp\left(\beta_k\left(X_k^i(t) - X_k^j(t)\right)\right) \quad (5.3)$$

Hence we have

$$\ln\left(\frac{\lambda_i\left(t\right)}{\lambda_j\left(t\right)}\right) = \beta_k\left(X_k^i\left(t\right) - X_k^j\left(t\right)\right)$$

We may therefore interpret the parameter β_k as follows: β_k is the log of the relative risk between two dyads which are identical, except for the variable $X_k\left(t\right)$ which differs with one unit. This interpretation may be compared to the interpretation of the parameters in the logistic model. Let $p^i\left(t\right)$ be the probability of dispute in year t assigned by the logistic model for dyad i:

$$p^i\left(t\right) = \frac{1}{1 + \exp\left(-\widetilde{\beta}_0 - \sum\limits_{j=1}^{p}\widetilde{\beta}_j X_j^i\left(t\right)\right)}$$

Then, for the two dyads of the previous example, it follows by a standard deduction that

$$\ln\left(\frac{p^i\left(t\right)}{p^j\left(t\right)} \times \frac{1 - p^j\left(t\right)}{1 - p^i\left(t\right)}\right) = \widetilde{\beta}_k$$

i.e. $\widetilde{\beta}_k$ is the *log-odds* ratio between dyad i and j – not the log-relative risk. However, the probabilities of $p^i\left(t\right)$ dispute and $p^j\left(t\right)$ are typically both very small . Hence the term $\dfrac{1 - p^j\left(t\right)}{1 - p^i\left(t\right)} \approx 1$ and the log-relative risk is almost identical to the log-odds ratio. The conclusion is that, for rare events like disputes, the parameters of the Cox model and the logistic model have almost identical interpretations.

To perform an analysis with this model, we need a data file constructed in the following way: For each t_w – i.e. each day a dyad war breaks out somewhere – we take a 'snapshot' of the international system; we note, for all dyads that are system members and not already at war, the values of the explanatory variables at that particular day. As is seen from expression (5.2), the dyad that *did* erupt in war at t_w is compared to all dyads that were at risk of doing so. Thus, all information for the time *between* different t_w's is ignored. From the combined information about all outbreaks in the period under study, we can estimate and hence the relative hazard 5.3.

5.5   High-Relevance and Low-Relevance Dyads

Maoz & Russett (1992, 1993) distinguish between 'politically relevant' and 'politically irrelevant' dyads. We prefer to use the terms high-relevance and

low-relevance dyads. The aim of the classification is to sort out a set of dyads with no observed intra-dyad relationship. In particular, the number of high-relevance dyads for each state should be fairly stable over time.

We have argued (in Section 5.3.2) that the probability of war for the group of low-relevance dyads should be modelled as a decreasing function of the size of the system. This is mainly derived from the inadequacy of our explanatory variables to automatically sort out dyads with zero (or negligible) probability of war. If this were possible, the high-relevance/low-relevance classification would be superflous; all information about relevance would be contained in the explanatory variables and no additional classification would be required. In particular, an increasing share of the dyads would have explanatory variables implying zero (or negligible) probability of war when the number of states increases. Modelling war probabilities of low-relevance dyads as a decreasing function of system size is only a 'second best' solution to the non-stationarity problem. Before discussing our exact operationalization of 'relevance', we will motivate the concept further by a more formal argument.

Let a be a state, N_t the number of states in the international system at time t, and m_{at} the number of states 'politically relevant' to a at t. Finally, assume for a moment that all explanatory variables are identical for all low-relevance dyads, with corresponding hazard function equal to $\widetilde{\lambda}(t)$. Then, from (5.1), the probability $p_a(t)$ (at the nation level) that state a will become at war in at least one low-relevance dyad is: $p_a(t) = 1 - \left(1 - \widetilde{\lambda}(t)\right)^{N_t - m_{at} - 1} \longrightarrow 1$ as $N_t \longrightarrow \infty$. The annoying thing about this result is not that war becomes more likely at the system level (it is indeed plausible that the probability of war increases somewhere in the system), but that each state's probability tends to one.[6] A good model should allow $p_a(t)$ to be stable even when N_t increases: the mere increase in interaction opportunities does not make war unavoidable for all states. Of course, this stabilization could be achieved by letting the baseline hazard $\alpha(t)$ decrease. But this is not reasonable, since it would imply that the probability of war in the relevant dyads, e.g. between Iran and Iraq, also would decrease. To achieve the desired stabilization, it is better to divide the baseline hazard $\alpha(t)$ by N_t if the dyad is a low-relevance dyad. To see the stabilizing effect,

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[6] For a further discussion of the relationship between war probabilities at different *levels*, see Chapter 4.

note that in this case

$$p_a(t) = 1 - \left(1 - \frac{\widetilde{\lambda}(t)}{N_t}\right)^{N_t - m_{at} - 1} \approx \widetilde{\lambda}(t)$$

when N_t is large. This implies that the hazard function $\widetilde{\lambda}(t)$ can be interpreted as the probability that a will get into war in *at least* one low-relevance dyad. To take an example, consider the low-relevance dyads that include a specific country, such as Norway. We argue that it is more reasonable to assume that the probability of Norway's getting into war in at least one of these low-relevance dyads is independent of the size of the group, than to assume that the creation of 100 new island-states in the Pacific will 'double' the probability just because the number of interaction opportunities is doubled.

The stabilizing effect of dividing the hazard function of low-relevance dyads by N_t is maintained even if we allow heterogeneity among them. Then, if d is a low-relevance dyad, its hazard of war becomes

$$\lambda_d(t) = \frac{\alpha(t)}{N_t} \exp\left(\sum_{j=1}^{p} \beta_j X_j^d(t)\right)$$

This formulation is mathematically equivalent to

$$\lambda_d(t) = \alpha(t) \exp\left(\sum_{j=1}^{p} \beta_j X_j^d(t) - \ln N_t\right)$$

and hence fits nicely into the general framework of Cox regression, with $-\ln N_t$ as an explanatory variable and 1 as the corresponding regression coefficient. We replace $-\ln N_t$ by $-\gamma \ln N_t$ where γ is an unknown regression parameter. This enables us to test the hypothesis that $\gamma = 1$: an estimate significantly less than 1 indicates that an increasing proportion of the wars have taken place in the low-relevance dyads.

γ can be seen as a *relevance adjustment* parameter; the higher γ, the less weight is given to the low-relevance dyads when estimating the model. $\gamma = 0$ and $\gamma = \infty$ are the extreme cases: The first corresponds to no adjustment at all; Bremer chooses this approach. The second case, $\gamma = \infty$, is the line taken by Maoz & Russett and is equivalent to removing non-relevance dyads from the sample altogether.

We have tried to motivate a discrimination between dyads based on

an intuitive understanding of 'relevance' and have shown that a failure to
discriminate leads to absurd war probabilities at the nation level. Unfortunately, in practice discrimination must be based on a restrictive set of
variables and it is difficult to motivate any particular definition. Partly
following Maoz & Russett's exclusion criteria, we classify a dyad as *low-relevance* when the component states are not neighbors by land or by sea,
they are not allied, and neither are major powers. Since we are also going
to model diffusion effects, we will in addition require that there is *no third
country at war* with one country in the dyad and *contiguous to or allied
to* the other (more about this and other variables below). This means that
during great, multination wars a considerably higher number of dyads are
considered 'relevant' than in times of relative peace.

5.6 Explanatory Variables

In Section 5.3 we noted that there is a need for different types of explanatory
variables in a realistic null model for testing the democratic peace: The first
set consists of the relatively stable characteristics of the dyad. We will call
these explanatory variables dyad *attributes* (see Russett, 1993, pp. 25–30
for a discussion of most of these factors). Secondly, another type of variables
are included in order to model the dynamics of war and war escalation,
termed *diffusion variables*. Thirdly, we introduce variables characterizing
intra-dyad stability and finally, regime variables.[7] Below follows a brief
presentation of the variables. More detailed coding information is found in
Appendix C.

5.6.1 Dyad Attributes

Contiguity Although often neglected or taken for granted in quantitative studies, contiguity is the most obvious dyad attribute affecting the
hazard of war. Contiguous countries have adjacent territories and thus
the largest conflict potential, whether in terms of disputes over natural resources, migrations across the borders, or other forms of friction. Another
aspect is that minor powers lack the means to wage war over long distances
and thus only fight neighbors or major powers (Boulding, 1962; Gleditsch,
1995). Countries can be contiguous through their main territory or through

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[7]This echoes Bremer's (1992b) distinction between *situational factors*, *national attributes*, and *systemic condititions*, although systemic conditions are not included in this
analysis.

dependent territories. Here we will consider only the first category, since countries with dependent territories in most cases are major powers and thus assumed to be in some contact with all countries in the system. A dyad is considered contiguous if the countries are contiguous by land or have less than 150 miles of sea between them. We also have used contiguity to define low relevance (see Section 5.5).

Major Powers in Dyad   There is wide agreement that major powers are more likely to be involved in war than minor powers. By definition, the major powers have the means to and interest in interacting with a large proportion of the states in the system. We have coded each dyad as consisting of zero, one or two major powers. If a dyad consists of two major powers it is automatically a high-relevance dyad (see Section 5.5).

Alliances   One would expect dyads related to each other through alliances to have a lower probability of war, *ceteris paribus*. Bremer (1992a) confirms this. We distinguish between the COW project's three types of alliances (Singer & Small, 1966, p. 5): *defense pacts*, *neutrality and non-aggression pacts*, and *ententes*. We expect both defense pacts and ententes to reduce the probability of war, although defense pacts may have stronger effect than ententes. In the interest of parsimony, we have merged these two categories.[8] Alliances are primarily intended to protect the signatories from outside enemies. Thus they are extremely important in the war diffusion process.

5.6.2   Diffusion of War

As argued, we do not want to make a priori ad hoc distinctions among the dyad wars between initiators and joiners. Moreover, we want to investigate whether democracies and autocracies have diverging war-joining behavior. Thus, we will define a set of *diffusion variables*, which model the diffusion process as it is intuitively understood. Our definitions of the diffusion variables can be viewed as extensions of those defined by Siverson & Starr (1990).

   In our dyadic framework, diffusion of war implies that an ongoing war somewhere outside a dyad ab triggers a war in that dyad. Like Siverson &

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[8]We ran the analysis with all three categories, and confirmed that defence pacts and ententes work in the same direction (slthough, surprisingly, ententes turned out to have the stronges effect). Similarly, the two categories both had a positive impact on the probability of war diffusion (see Section 5.6.2).
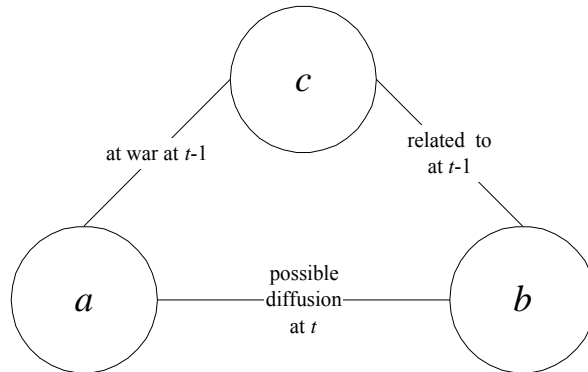
Figure 5.1: Visualization of the War Diffusion Variable

Starr, we will restrict this to wars involving at least one of the states, say a, in ab. Diffusion is defined as the event that a war breaks out in ab, where a is already at war with a third country c – in our terminology, a becomes part of another dyad war ab in addition to ac.

In all situations where there is a possibility of diffusion to the dyad ab under study, country a is at war with (at least) one other country c. Accordingly, we term the diffusion variables *War with Third Country*, abbreviated WTC. WTC is a classification of the dyad by the answer to the question: what is the relation between b and c? The definition of the WTC categories is summed up in Table 5.1. See also Figure 5.1.

As an illustration of these coding rules, consider the Germany-Belgium dyad during WW I: From 3 August 1914 a third country c (France) was at war with a (Germany) and contiguous to b (Belgium). Dyads like these are coded 1 on WTC 1. Then let us return to the Germany-UK dyad in 1939: From 1 September 1939 a third country c (Poland) was at war with a (Germany) and allied in a Defense pact with b (UK). This is coded 1 on WTC 2. The first three WTC categories are deduced from the dyadic relations described in Section 5.6.1.

The last category, WTC 4, is a generalization of the diffusion situation: for the dyad ab there exists a country c at war with a, but not contiguous to or allied to or in war with b; i.e. there is no observed relationship between b and c. This category is meant to account for a general effect of war in the system: to what degree will a war between two countries spread to the dyads that these countries form part of?

We have used the first three diffusion categories to define relevance: A

Category	Definition
WTC 1	a at war with c and b contiguous to c
WTC 2	a at war with c and b allied with c in a Defence pact or an Entente
WTC 3	a at war with c and b allied with c in a Neutrality/Non-aggression pact
WTC 4	a at war with c but not WTC1–WTC3
The categories WTC 1, WTC 2, and WTC 3 are not disjoint. If a is at war with more than one state c, or if c is related to a by more than one criterion, the dyads may be coded as members of more than one of the three categories. However, a dyad is coded as member of the fourth (and general) category only if it is not a member of any of the other three.	

Table 5.1: War With Third Country

dyad will be classified as high-relevance if it fulfills any of these criteria. A non-contiguous, non-allied dyad of minor powers, for instance, changes status from low-relevance to high-relevance from the moment a war onset changes one of the diffusion variables. We define WTC 4 as *not* implying high-relevance. There is no known interaction between a and c, and hence, we cannot infer that there is interaction between a and b either.

5.6.3   Intra-Dyad Stability

Another hypothesis relevant for modeling the hazard of war is that political stability in each of the constituent countries of a dyad and in the relation between them will decrease the probability of violent conflict. We include a simple time-dependent measure of stability in our model: The time (in days) passed since the last of the following events: (i) one of the states in the dyad became a system member either for the first time or after an occupation, or (ii) a war between them ended.

We assume that immediately after a war has ended or a new dyad has been created, the probability of war is high. However, the effect will decrease as time passes. To model this, we computed a decaying function of the number of days in peace. Our Time in Peace variable thus reads: $\exp\left(-\frac{Days\ in\ peace}{3,162}\right)$. When dividing the number of days in peace by 3,162 this variable's partial effect on the hazard is being halved every sixth year.[9]

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[9]Our decay rate implies that the effect or a previous war is reduced to one-sixteenth of the effect of the first month after 24 years.

This choice builds on the recognition that 'disputes occurring more than a generation apart may be only remotely related to the previous dispute's outcome' (Hensel, 1994, p. 290). We assume that, ceteris paribus, the probability of war in a dyad will be higher if the dyad has formerly been at war, as demonstrated empirically by Hensel (1994). The *Time in Peace* variable is therefore supplemented by a dichotomous variable called *Past War*, denoting whether the peace period started with the end of a war.[10]

Until recently, democracy has been confined to a limited number of old, established nations. Thus, double democracy dyads have in general a higher degree of stability than other dyads. If stability has an effect on the hazard of war, there is a danger of spurious correlation. However, our model will control for this. The model presented in this chapter is also approperiate for testing more elaborate hypotheses related to stability – cf. for instance the hypotheses presented in Maoz (1989).

5.6.4 Regime Variables

As a measure of regime type, we use a version of Polity III (Jaggers & Gurr, 1995; Gurr, Jaggers & Moore, 1990). For the sake of simplicity, we follow Bremer and Maoz & Russett in dichotomizing the regime variable.[11] We define a country as democratic if it scores 6 or higher on the Polity 'Institutionalized Democracy' index, following Gleditsch (1995) and others.

In our dyadic framework, the dichotomous regime variable yields three categories for a dyad: 'Two Democracies', 'Two Autocracies', or a 'Politically Mixed Dyad'. We define the mixed dyad as the baseline dyad, such that the 'effect' of the other two categories must be interpreted as relative to the mixed dyads.

In some situations, it does not make sense to code regime characteristics. In Polity, countries have in these cases received codes for polity interruption, interregnum, or transition. For simplicity, we have grouped these cases

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[10] Our approach does not entirely follow the literature on enduring rivalries (e.g. Goertz & Diehl, 1992; 1993). In our model only the most recent conflict is assumed to have an effect, not the conflict preceding it or the fact that two countries have been at loggerheads over the past 50 years. We have chosen this approach partly because we do not think there is an intrinsic difference between having had one or several conflicts, and partly because our purpose is only to model a realistic background for testing hypotheses about democracy and peace.

[11] Maoz & Russett also make use of a continuous measure of democracy in the dyad; JOINREG. This measure is not very useful since it measures similarity in regimes (that is, the degree to which they obtain the same score on the REG index; not similarity in institutional structure), more than it measures the degree of democratization in the dyad.

together with cases where data are lacking altogether in Polity (e.g. small states that are COW system members but not Polity members). If a dyad contains at least one country with missing data, it has been coded as a fourth regime category: 'Missing Regime Data'. 23 % of our observations fell in this category.

For our purpose, a big disadvantage of this data set is that it is coded on an annual basis, with many temporal mismatches as a result. For instance, Norway is implicitly coded as occupied from 1 January 1940. When attacked by Germany 9 April the same year and subsequently occupied, using Polity III actually yields a war between an autocracy and an occupied country. To avoid such problems, we use a redesigned version of the data set; Polity IIId, which codes regime changes by day where possible (McLaughlin et al., 1998).[12] Polity IIId allows us to assign regime category at the day of war outbreak. The data set correctly records, for instance, that Norway was a democracy when attacked by Germany in 1940.

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[12] In the version of Polity IIId available at the time of writing, only the regime changes indentified in Polity III have been re-dated. Moving from country-years as units of analysis to 'polities' – periods with no change in a state's regime characteristica, makes it possible – and necessary – to treat polities with a duration much shorter than a year. Since Polity II and III wanted to characterize the regime of all states for given *years*, such short-lived polities created a dilemma: Should they choose the polity at the beginning of the year, the one in the middle, or the one at the end? Consequently, short-lived polities are not always registered in Polity II and III. With the new design, this problem can be solved in future updates of Polity. In our context, the military coup d'état which overturned the elected government in Cyprus in 1974 is a well-known and important case. The coup was followed by the Turkish invasion only five days later. This is thus errouneously coded as a war between two democracies. Waiting for a systematic recoding of these cases, we have not made any changes to the Polity IIId data set, and have retained the Turkish-Cypriot war as a war between two democracies.

It is often impossible to assign an exact date for regime changes: the transition may be gradual, or it may be difficult to choose which one of a series of distinct events signals that a new polity has been established. In Polity IIId, all regime changes have been assigned a code for the level of precision of the dating. When the date assigned was chosen among more than one candidate, we have used the Polity IIId date. Gradual changes are more problematic. We identiified all 42 changes from one of our regime categories to another where the level of precision was 'within the year' or 'within the month' (cf. McLaughlin et al., 1998). Nine of those coincided with an interstate war somewhere in the system, but only two got involved in new dyadic wars during the period of trasition/uncertain coding: Belgium changed from 'occupied' to democracy at some time during 1915, and the Philippines changed from autocracy (with a democracy score of 4) to democracy (6) during 1950. When Bulgaria entered WWI in October 1915, we coded Belgium as still occupied. Somewhat arbitrarily, we assigned 1 January 1950 as day of change for the Philippines. Its participation in the Korean war was thus coded as a democratic participation.

Variable (X)	$\widehat{\beta}_{\backslash x'}$	s.e	p-value	$\exp\left(\widehat{\beta}_{\backslash x'}\right)$	High/Low relevance ratio
Two democracies	-0.84	0.34	0.01	0.43	
Two autocracies	-0.40	0.14	0.005	0.67	
Missing regime data	-0.03	0.17	0.86	0.97	
Non-contiguous	-0.65	0.17	< 0.001	0.52	36.8
Two major powers	0.74	0.21	< 0.001	2.09	40.3
One major power	0.67	0.13	< 0.001	1.95	
Time in peace	0.80	0.23	< 0.001	2.23	
Past war	0.84	0.15	< 0.001	2.31	
Defense pact	-0.93	0.23	< 0.001	0.39	7.6
Non-aggression pact	-0.53	0.40	0.17	0.58	11.3
Entente	-1.75	0.49	< 0.001	0.17	3.3
WTC 1 (contiguous)	1.80	0.15	0.001	5.98	115.1
WTC 2 (defence pact)	3.06	0.17	0.001	21.32	410.0
WTC 3 (neutr. pact)	0.25	0.25	0.33	0.78	15.1
WTC 4 (general)	1.94	0.28	< 0.001	6.95	
γ	0.59	0.06	< 0.001		
$-\log\ likelihood$	1723.5				

For each variable X, $\exp\left(\widehat{\beta}_{\backslash x'}\right)$ is, *ceteris paribus*, the hazard of war for a dyad in category $'x'$ relative to a dyad in thereference category, provided that both have equal relevance. γ is the relevance-adjustment parameter (see Section 5.5)

Table 5.2: Risk of War by Dyad Regime Type, 1840–1992

5.7   Results

The model was estimated by means of a maximum likelihood algorithm implemented as a GAUSS program. The results are shown in Table 5.2.

The first (numerical) column of Table **??** contains the parameter estimates, the second column the estimated standard deviations, whereas the third column shows the p-values when testing whether the parameters are zero. These tests are based on the t-statistic (with variance estimates equal to the diagonal of the inverse Hessian). In the fourth column we have calculated $\exp\left(\widehat{\beta}_{\backslash x'}\right)$, where $\widehat{\beta}_{\backslash x'}$ for categorical variables is the parameter corresponding to category 'x'' of the variable X. For the baseline case, $\beta_{\backslash x'} = 0$ *a priori* (and therefore not stated in the table). This is

an identifying restriction only, implying that all parameters must be interpreted relative to the reference category (cf. Section 5.4). Of course, for continuous variables $\beta_{\cdot x'}$ is simply the linear coefficient of X.

For explanatory variables X which *are not* involved in the definition of relevance, the hazard of war changes by the factor $\exp\left(\widehat{\beta}_{\cdot x'}\right)$ when X goes from the reference category to the category 'x'. For *Regime*, for instance, the reference category is the politically mixed dyad, so $\exp\left(\beta_{Two\ democracies}\right)$ is the relative risk between, ceteris paribus, a double democratic dyad and a mixed dyad.

For explanatory variables which *are* a defining characteristics of a relevant dyad, the situation is more complex. For example, the reference category of *Contiguity* is 'Contiguous' so $\exp\left(\beta_{Non-Contiguous}\right)$ is the ratio of the hazards of war of a non-contiguous and a contiguous dyad *provided both dyads are relevant*. However, going from contiguous to non-contiguous could mean going from a high-relevance to a low-relevance dyad. In that case, the ratio of the hazards of war (the relative risk) is

$$\exp\left(\beta_{Non-Contiguous} - \gamma \ln N_t\right)$$

which depends on the number of states N_t in the international system. This is the rationale for the last column in Table 5.2, where for the special case $N = 150$ states we have computed the estimated relative risk between any high-relevance and any low-relevance dyad characterized by (i) the variable is either in the reference category or in category 'x' and (ii) they are equal with respect to all other explanatory variables.[13]

When all categorical variables are in their reference categories and the model's only continuous explanatory variable, *Time in Peace*, is zero, the hazard of war is $\alpha\left(t\right)$ – the baseline hazard.

5.7.1   Regime Type and War Diffusion

Our analysis seems to confirm the evidence for the democratic peace at the dyadic level: A dyad consisting of two democracies has an estimated probability of war which is, ceteris paribus, less than one half of a politically mixed dyad. The statistical significance of this finding is quite high (the *p*-value is 0.01). Moreover, the democratic peace cannot be explained

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[13] For the variable *Contiguity*, since the baseline dyad here is high-relevance, this ratio is $\exp\left(-\beta_{Non-Contiguous} + \gamma \ln N_t\right)$. For all other variables the ratio is $\exp\left(\widehat{\beta}_{\cdot x'} + \gamma \ln N_t\right)$. Note that, when calculating the ratio in Table 5.2, the high-relevance dyad is always in the nominator.

by virtue of democracies' being non-contiguous, or to their having long histories of peace among them, or by their alliance patterns. The parameter estimate for the regime category 'Two autocracies' is also negative and clearly significant, thus, paradoxically, providing some evidence for an *autocratic peace* as well.

Our results show that war has a strong tendency to spread. If a state a engages in war with another state c, and b is a neighbor of c, the probability of war between a and b increases six times relative to the reference category 'No war with third country'. The (partial) effects of defense pacts and ententes are even stronger: The danger of war between a and b increases by an estimated factor of 21 if a gets into war with a state c which is allied to b. We also find strong evidence that if a is already at war somewhere in the system, this increases the probability of war in ab even if b have no known relation to the country at war with a (WTC 4).

Bremer (1992a) finds that dyads consisting of at least one democracy had a lower probability of war than the double autocratic dyads. Since he does not distinguish between dyads consisting of one or two democracies and because the double democratic dyads are a minority in this merged group, our finding – that the politically mixed dyads are the most 'dangerous' – seems inconsistent with Bremer's result. The probable explanation for this discrepancy is that Bremer only analyses *war onset*, i.e. outbreak of a new war, while discarding dyad wars emerging from diffusion (see Chapter 4, p. 4.4ff). We can obtain regime parameters that are comparable to Bremer's by allowing interactions between *Regime* and *War Diffusion.* Let 'x' denote any of the three regime categories 'Two democracies', 'Two autocracies', or 'Missing regime data'. We divide 'x' into two sub-categories, where the one sub-category is '(Regime type) 'x' when there is no risk of war diffusion' (i.e. an outbreak of dyad war will be a war onset), and the other is '(Regime type) 'x' when there is risk of war diffusion'. In the latter case, the dyad is coded 1 on at least one of the four WTC categories. We may now ask: Is the effect of regime the same in both situations? The parameter estimates for the new regime variables are presented in Table 5.3. (The changes in the other parameter estimates are negligible, so we do not report them.)

The democratic peace in a non-diffusion situation is strenghtened in terms of estimated relative risk compared to the estimate in Table 5.2 (0.29 versus 0.43). As expected from the increase in the number of parameters, the p-value is higher, although still yelding a significant result at the 0.05 level. The estimate for double autocracies is close to zero and insignificant.

Variable (X)	Category ('x')	$\widehat{\beta}_{'x'}$	s.e.	p-value	$\exp\left(\widehat{\beta}_{'x'}\right)$
Regime –	Two democracies	-1.23	0.60	0.04	0.29
no war with	Two autocracies	-0.17	0.24	0.48	0.84
third country	Missing regime data	-0.31	0.32	0.33	0.73
Regime –	Two democracies	-0.60	0.41	0.14	0.55
war with	Two autocracies	-0.51	0.16	0.001	0.60
third country	Missing regime data	0.07	0.19	0.71	1.07
$-\log\ likelih.$		1720.8			

Table 5.3: Risk of War by Dyad Regime Type, with Interaction between Regime and War Diffusion, 1840–1992 (Control variables not shown)

Consequently, we are unable to reproduce Bremer's result; that the double autocratic dyads are the 'most dangerous'. Our extensive discussion of the methodological problems in 'Dangerous Dyads' provides at least two possible explanations: Firstly, Bremer's finding may partly be a spurious effect caused by correlation between the increasing share of democracies and the increasing size of the international system (see Section 5.3.2). Secondly, his p-values are likely to be biased because of serious problems with inter-dyad dependencies.

Table 5.3 shows that the 'autocratic peace' indicated by the results in Table 5.2 is entirely a diffusion phenomenon: the politically mixed dyads (the reference category) have the highest hazard of war only when there is a risk of war diffusion. The result is clearly significant (p-value=0.001). Can the explanation of this phenomenon be that democracies have a higher tendency to join wars, as suggested at p. 113? If a war starts in an autocratic or politically mixed dyad, and other democracies join in the fight against the autocracy in that dyad, this will increase the number of politically mixed dyads at war, but not the number of autocratic dyads. The two world wars, the Korean war, and the 1991 Gulf war all exhibit this pattern.

Within the framework of our diffusion variable *War with third country*, this situation can be modelled as follows: Consider the dyad ab. If there is a third country c at war with a, and the reasoning above is correct, we would expect the probability of war in ab to depend on whether b and c are democracies, autocracies or a politically mixed dyad. To test this hypothesis, we defined two new WTC categories: a at war with c and both b and c democratic (WTC 5), and a at war with c and both b and c autocratic (WTC 6). Since WTC 5 or WTC 6 implies (at least one of)

the categories WTC 1-WTC 4, the WTC 5 (WTC 6) parameter must be interpreted as an additional diffusion effect for the dyad *ab* in the case that *bc* is double democratic (double autocratic). For example, if *bc* is an allied (WTC 2) and double democratic dyad (WTC 5), the change in the hazard of war relative to a non-diffusion situation is $\exp\left(\beta'_{WTC\ 2'} + \beta'_{WTC\ 5'}\right)$. The results of our third model are presented in Table 5.2.

The estimates for the WTC 5 and WTC 6 parameters are high and extremely significant – the log-likelihood has increased with 55 points compared to Table 5.3. If some country *a* is at war with a democracy *c*, the probability of war between *a* and another democratic country *b* is nine times higher than if *b* were an autocracy! This result is hardly surprising, though. We know that democracies have sided with each other in multination wars like World Wars I and II, the Korean War, and the Gulf War. The tendency for autocracies to join autocracies is also substantial: The probability of war in the dyad *ab*, given that *a* is already at war with some third country *c*, is three times higher if *b* and *c* are both autocracies than if *bc* is a politically mixed dyad. The effect of regime is negligible in these situations; if *a* is at war with *c*, what matters is the regime characteristic of *bc* not that of *ab*.

In *non-diffusion* situations, dyads consisting of two democracies have an estimated 59% lower probability of war than the politically mixed dyad, whereas double autocratic dyads have a 13% higher probability. However, contrary to Table 5.3, neither of these estimates are statistically significant. We have no good explanation for the rather substantial change in the estimate of 'Two democracies – *no* WTC' (from -1.23 to -0.88) when including WTC 5 and WTC 6. But a close examination of the variance-covariance matrix reveals that this is due to a complicated correlation pattern between several parameters.

5.7.2   Control variables

From Table 5.4, column 4, we see that contiguous dyads have an estimated probability of war which is approximately twice as high as non-contiguous high-relevance dyads, and the effect is clearly significant. A similar effect is found for 'Two major powers'. When interpreting *Time in Peace*, note that values close to 1 on this variable correspond to a short time in peace, whereas values close to 0 correspond to long peaceful coexistence (cf. Section 5.6.3) The positive parameter estimate confirms that the longer the dyads have experienced peaceful coexistence, the lower the probability of war. Dyads that have coexisted peacefully as system members less than

Variable (X)	$\widehat{\beta}_{\iota x'}$	s.e.	p-value	$\exp\left(\widehat{\beta}_{\iota x'}\right)$	High/ Low relevance ratio
No WTC – Two dem.	−1.88	0.60	0.14	0.41	
No WTC – Two autoc.	0.12	0.25	0.63	1.13	
No WTC – M. reg. data	−0.02	0.33	0.95	1.02	
WTC – Two dem.	0.03	0.43	0.94	1.03	
WTC – Two autoc.	0.05	0.21	0.81	1.05	
WTC – M. regime data	0.71	0.22	0.001	2.03	
Non-contiguous	−0.88	0.18	< 0.001	0.41	31.0
Two major powers	0.72	0.22	< 0.001	2.05	26.4
One major power	0.64	0.14	< 0.001	1.90	
Time in peace	0.84	0.23	< 0.001	2.32	
Past war	0.97	0.15	< 0.001	2.64	
Defence pact	−0.82	0.22	< 0.001	0.44	5.7
Non-aggression pact	−0.63	0.40	0.74	0.53	6.9
Entente	−1.49	0.51	< 0.001	0.23	2.9
WTC 1 (contiguous)	1.37	0.17	0.001	3.94	50.7
WTC 2 (defence pact)	2.68	0.18	0.001	14.59	187.8
WTC 3 (neutrality pact)	−0.09	0.27	0.74	0.91	11.8
WTC 4 (general)	1.27	0.30	< 0.001	3.56	
WTC 5 (b and c democratic)	2.23	0.20	< 0.001	9.30	
WTC 6 (b and c autocratic)	1.06	0.15	< 0.001	2.89	
γ	0.51	0.06	< 0.001	1.67	
$-\log likelihood$	1665.7				

For each variable X, $\exp\left(\widehat{\beta}_{\iota x'}\right)$ is, ceteris paribus, the hazard of war for a dyad in category $'x'$ relative to a dyad in the reference category, provided that both have equal relevance. γ is the relevance-adjustment parameter (see Section 5.5)

Table 5.4: Risk of War by Dyad Regime Type and Regime Type Effects On War-Joining, 1840–1992

one year, are estimated to have twice as high a hazard of war as dyads with peaceful relations for at least 40 years. If the peace period was preceded by a war between the two states, we get another doubling of the hazard of war.

Bremer and Maoz & Russett both concluded that alliances reduce the probability of war in the dyad, but they did not distinguish between the different types. As expected, we find that states joining together in a defense pact have a significantly lower probability of fighting each other. Somewhat surprisingly, signatories in ententes have an even stronger tendency to keep peace between themselves. We have no good explanation for this effect – perhaps this is a type of alliance most often signed between countries that have no obvious clash of interests, and in times of relative peace.

The third class of alliance is fundamentally different: Signing a non-aggression pact actually implies that there are conflicting interests among the signatories, and is frequently only a device for 'buying time' in the diplomatic game leading up to war – the 1939 Molotov–Ribbentrop pact being a prime example.

Our distinction between high-relevance and low-relevance dyads is, indeed, justified. The estimate of γ (the relevance-adjustment parameter) is 0.51. The parameter is sharply identified; the standard deviation is only 0.06. $\widehat{\gamma}$ is significantly different from 0 – but also from 1 (cf. Section 5.5): the estimate indicates that the probability of war in a low-relevance dyad decreases by a factor close to $\dfrac{1}{\sqrt{N_t}}$ rather than to $\dfrac{1}{N_t}$. As can be seen in the right-hand column of Table 5.2, the adjustment is substantial: Contiguous dyads have a 31 times higher hazard of war than non-relevance dyads in a system of 150 states. Since $\gamma > 0$, the probability of war in a dyad randomly chosen from the set of all low-relevance dyads decreases as the number of dyads increases. However, since $\gamma < 1$ an increasing share of all ongoing wars seems to be in the low-relevance dyads. In this sense, our operationalization of the concept of relevance is not entirely satisfactory.

To examine how robust our findings are regarding the low-relevance/high-relevance classification of dyads, we re-estimated the model with $\gamma = 0$, i.e. no discrimination between low-relevance and high-relevance dyads. Neither parameter estimate changed much (hence we do not report them). As anticipated, the democratic peace is strengthened when we do not control for relevance, but the change in estimate (from -0.88 to -0.95) is small. The most dramatic effect of not adjusting for relevance is a 45 point decrease in the log-likelihood function, a drastic worsening of the fit of the model.

5.7.3   The Baseline Hazard

Figure 5.2 shows the estimated hazard function of the baseline dyad, which (at t) consist of two states that are (i) contiguous (and therefore high-relevance), (ii) one state is a democracy and the other an autocracy, (iii) they are not allied, (iv) there is no major power in the dyad, (v) they are old system members with no history of past war, and (vi) neither is at war with a third country (at t).

Most notable are the three peaks corresponding to the Seven Weeks War, and World Wars I and II. Figure 5.2 also confirms that the probability of war is highly time-dependent, even when we control for our explanatory variables. There is also some evidence of a negative trend in the baseline hazard. This could be interpreted as a confirmation of the 'obsolescence of war' (Mueller, 1989). But one should be very careful when interpreting the baseline hazard, which depends critically on the model specification, in particular the choice of relevance criteria and the modelling of war diffusion. For example, a trend would occur if our relevance criteria are inadequate and unable to remove the negative trend in dyadic war probabilities generated by the increase in the number of states (cf. the discussion in Section 5.3.2). What might repudiate the latter hypothesis, though, is that the trend in Figure 5.2 seems to vanish after World War II, when the increase in the number of states was most dramatic.

5.8   Discussion

The results in Table 5.4 show that the regime variable is not significant at the 5% level either in the diffusion or the non-diffusion situation. A closer examination of the data reveals that there are four instances of war onset between democracies in our data set, and at least two of these are debatable (see Section 4.3, and Ray, 1993). The Turkish invasion of Cyprus in 1974 accounts for two of the four cases, although this is clearly a mis-coding since Cyprus suffered a Greek-instigated coup d'etat just prior to the Turkish invasion. The remaining two are the Spanish-American war in 1898, and the Lithuanian-Polish war in 1919–20. Removing dubious cases of wars between democracies would obviously strengthen the democratic peace finding. Of course, these anomalous cases of war have received much closer attention than other possible anomalies. But it seems highly unlikely that an investigation would throw into doubt as large a share of the 40 cases of war onset between autocracies as the case is for double democratic dyads.

The motivation for modeling war diffusion in the first place was to
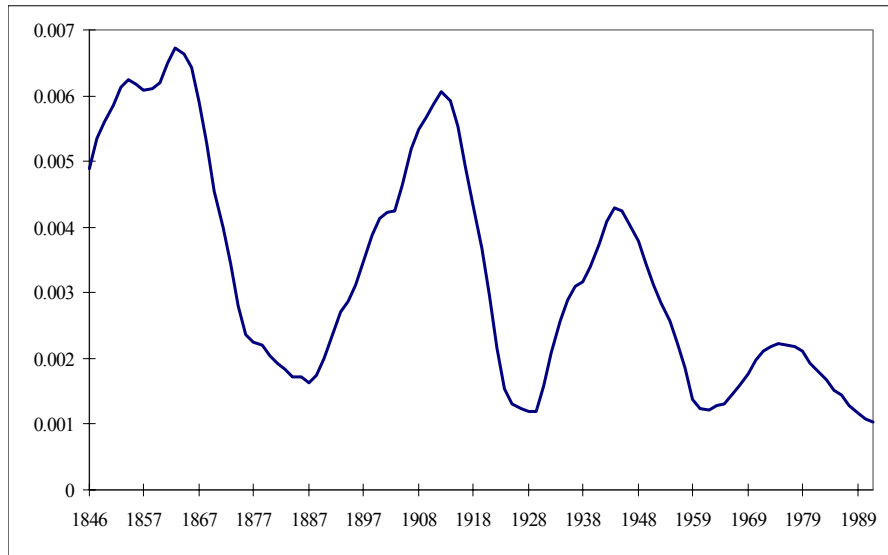
Figure 5.2: The Baseline Hazard, 1846–1991: The estimated annual probability of outbreak of dyad war for the baseline dyad

account for dependence between units when testing statistical hypotheses about the democratic peace. Our diffusion variables enabled us to study inter-dyad interactions, not only relations within the dyad, and, as a spin-off, we have been able to improve on Siverson & Starr's (1990) model of war diffusion. More importantly, we have discovered a distinct contrast between the war-joining behavior of democracies and autocracies: democracies tend to join democracies in their wars, whereas – although to a much lesser extent – autocracies tend to join other autocracies.

Democracies' war-joining can be seen as an integrated part of the democratic peace: If an interstate war starts in a mixed dyad, and democracies have a strong tendency to participate on the same side in the conflict, this will create few dyad wars between democracies. It also explains why democracies may be as war prone as autocracies; the democratic peace means that democracies keep peace among themselves, not that they are peaceful. These features of the relations between democracies make them distinct from other regime types. Of course, the nature of these relations are not only due do their sharing a political system. The group of democracies are also heavily interdependent (see Keohane & Nye, 1977).

The only trace of an autocratic peace we find, is the tendency of au-

tocracies to join each other in wars: The difference between the politically mixed and the double autocratic dyads found in Table 5.2 is a mere artifact of the regime types' war-joining behavior.

In view of our results, what are the most likely implications on the system level of a democratizing world? Our results indicate that there will be a decreasing frequency of war onsets, but that the wars that do start may evolve into multination wars. This prediction also fits well into the literature on increased interdependence.

5.9   Conclusion

This chapter has identified methodological weaknesses in the empirical studies of the democratic peace, as exemplified by Bremer (1992a) and Maoz & Russett (1993). We have proposed a more suitable approach, in particular emphasizing the importance of modeling inter-dyad dependencies due to diffusion of war.

In our first analysis, we replicated the findings of Maoz & Russett (1993, p. 632); that dyads consisting of two democracies have a significantly lower probability of war than other dyads, when controlling for contiguity, alliances, power status, time of peaceful coexistence in the dyad, past wars, and war diffusion. To model war diffusion, we coded for all dyads ab whether there existed a third country c that was at war with one of them, a, and related to the other, b, in some way: either contiguous to, or allied with, or just present in the international system at the same time. Our results show that war diffusion is extremely important for the probability of outbreak of war in a dyad.

We also confirmed the finding in Chapter 4 (Tables 4.4 and 4.5) that dyads consisting of two autocracies have a significantly lower probability of war than politically mixed dyads. We found this result paradoxical because there is nothing in the theoretical explanations for the democratic peace that implies that there should be any difference between the mixed and the double autocratic dyads.

In order to resolve this paradox, we refined the model focusing on war diffusion. Firstly, we distinguished between regime type in a situation where there is no risk of war diffusion, and regime type when there is such a risk. The first case corresponds closely to a situation where an outbreak of war would mean 'war onset' in the sense of Bremer (pp. 320–321). Secondly, we introduced a further decomposition of the war diffusion variables. In addition to coding whether bc was contiguous, allied, or coexisting, we

entered information on the combination of regimes in this dyad; are b and c two democracies, two autocracies, or politically mixed?

These refinements altered the results dramatically: We found that (i) democracies have a much stronger tendency to join other democracies in their wars, than to join autocracies, (ii) autocracies have a stronger tendency to join other autocracies that to join democracies, (iii) in a diffusion situation the regime category of the dyad plays no role, and (iv) in a non-diffusion situation we can still identify a democratic peace (most 'war onsets' between democracies found in the data are anomalous cases).

The most distinct difference between democracies and autocracies becomes visible when studying war diffusion: democracies tend to join democracies in their wars, whereas – although to a much lesser extent – autocracies tend to join other autocracies. This suggests a reinterpretation of the democratic peace: In times of war, the democratic peace is manifest as a tendency of democracies to collaborate; and hence characterizes the dyad's relationship to the outside world (i.e. to other dyads) rather than the relations within the dyad itself. Consequently we have identified two aspects of the democratic peace: (i) a tendency that democracies do not start new wars against each other and (ii) a strong inclination towards collaboration in times of war. The latter phenomenon explains why democracies are as war prone as autocracies.

Chapter 6

Size Asymmetry, Trade, and Conflict

This chapter is under publication as Hegre (2004a).

Abstract

The chapter investigates the claim that symmetrical dependence on trade between two states is required for the trade bond to reduce the probability of interstate conflict. It argues that asymmetry is most fruitfully conceived of in terms of size asymmetry. Since the most commonly used measures of interdependence, the trade-to-production and trade-to-total-trade ratio, are themselves correlated with size asymmetry, theoretical and empirical analyses tend to produce ambiguous or counter-intiuitive results that are hard to distinguish from other factors that are related to size asymmetries such as differences in military power. The chapter suggests an alternative measure – trade efficiency – which models the extent to which individual economic entities within two countries trade with each other. The relationship between the different conceptions of interdependence is explored in an expected utility model of trade, distribution of resources, and conflict. For the particular pacifying mechanisms of trade studied here, the model supports the view that trade reduces the incentives for conflict, but that this effect is most clearly seen in relatively symmetric dyads. The hypotheses derived from the theoretical model are largely supported in a statistical analysis of directed dyads in the 1950-92 period.

6.1   Introduction

According to the liberal peace hypothesis,[1] increased trade between Germany and France has contributed to improve their security relationship after World War II, as the fear of disruption in their trade relationship constrains their conflict behavior toward each other. But is this argument equally valid for the relationship between Germany and Luxembourg? The relationship between a pair of countries (a dyad) like this is highly asymmetrical: The potential market for Luxembourg's goods in Germany is much larger than the potential market for German goods in Luxembourg (see Polachek, Robst & Chang, 1999), and German military power dwarfs that of Luxembourg. This asymmetry is likely to have implications for the relationship between trade and conflict. Trade may increase the risks of conflict if a the powerful partner in an asymmetric relationship employs the weaker partner's dependence to obtain political concessions, or the trade relationship may be inconsequential for the security relationship (see Barbieri, 1996, 2002; Gartzke and Li, 2003; Hirschman 1945/1980, Russett and Oneal, 2001; and Wagner, 1998, for various positions in this debate).

This chapter investigates these implications. The next section presents the main arguments. I then formulate an expected-utility model where trade between two states reduces the incentives for war of conquest through two mechanisms: the trade losses add to the costs of war, and trade provides an alternative way to get access to resources located in the other country. I will refer to these as the 'trade-losses' and 'alternative-access' mechanisms. The model also accounts for asymmetries in military power.

The theoretical argument and the empirical testing of it are formulated in terms of directed dyads, since asymmetry implies that the smaller state faces entirely different incentives than the larger state. Hence, I will disaggregate the dyad into the two 'directed dyads' – how state A relates to state B *and* how state B relates to state A.

Finally, I test the arguments empirically using a statistical method to estimate the risk of militarized conflict. Since the theoretical model is cast in terms of directed dyads, I use a directed dyads setup to do this. I use

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[1] The empirical relationship between trade and conflict is fairly well established. A series of recent empirical studies have found statistical evidence for the 'peace through trade proposition' (e.g., Oneal & Russett, 1997, 1999; Polachek, Robst, and Chang, 1999; Chapter 8). A few studies find no relationship, or maybe even evidence for the opposite (Barbieri, 1996; Beck et al., 1998). See McMillan (1997), Russett & Oneal (2001), Schneider, Barbieri, and Gleditsch (2003), and Mansfield and Pollins (2003) for reviews of this literature.

a variant of the Cox regression model to analyze the directed dyads data, since this model can handle some temporal dependence problems that are peculiar to this setup. I find the empirical observations to fit with the theoretical model. These results largely confirm the finding that trade reduces militarized conflict (e.g., Oneal & Russett, 1997, 1999), but add more nuance and details to it and allow a finer theoretical understanding of this relationship.

6.2 Trade, Size Asymmetry, and Conflict

Discussing the implications of 'trade asymmetry' for the effect of 'increased trade' requires a clear definition of these concepts. The most common conceptualization of 'increased trade' in the literature is 'trade dependence'. In a directed dyad setup, this is the value of the bilateral trade between countries A and B divided by GDP for the actor country A. This concept is problematic in this context for two reasons: First, the measure itself is a function of size asymmetry. On average, small countries have smaller trade flows than large ones since international trade has to compensate for less 'within-country' trade (see Deardorff, 1998: 9; Frankel & Romer, 1999: 381–382).[2] Country A's trade dependence on B will therefore tend to be smaller if B is smaller (since the numerator – bilateral trade – is the same). In dyads that are asymmetric in terms of size, the large country therefore tends to have a low trade dependence on the smaller one, and vice versa. Moreover, changes to trade policy or in transportation costs are not directly reflected in the 'trade dependence' measure – the effect of such changes are also dependent on asymmetry.

An alternative conceptualization is 'trade share', or the value of the bilateral trade between A and B divided by A's overall trade. However, since there is a strong relationship between a country's GDP and its trade volume, this measure has the same disadvantages.

In order to be able to distinguish between the effects of trade volumes and size asymmetry, I therefore suggest an alternative conceptualization, 'trade efficiency', which is proportional to the extent to which individual economic units within the countries trade with each other (see Snidal, 1991b). Any changes to trade policy such as changes in tariffs directly affect this measure, and the measure is by definition unrelated to asymmetry. The effect of changes to trade policy on 'trade dependence' or 'trade share',

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[2]Some countries (e.g., Singapore) have very high trade volumes relative to their production. However, a large portion of this trade is immediately re-exported.

on the other hand, is dependent on asymmetry.

Asymmetry is most conveniently thought of as differences in the size of the two countries' economies.[3] In the theoretical and empirical models developed below, the asymmetry measure I use is state A's share of the two countries' total GDP. This is more consistent with previous studies of trade asymmetry and conflict than is immediately apparent. Polachek, Robst & Chang (1999) define trade asymmetry explicitly in terms of differences in the two countries' GDP. Other scholars use measures that are closely related to size asymmetry: Barbieri (1996) defines symmetry in terms of the trade shares: $Symmetry_{ij} = 1 - |Trade\,Share_i - Trade\,Share_j|$. However, since the trade shares are dependent on size asymmetry, this measure is to a large extent a function of size asymmetry. Another problem is that $Symmetry_{ij}$ becomes larger the larger $Trade\,Share_i$ is for a given ratio of the two trade shares.[4] The same problems apply to Gartzke & Li (2003) who measure trade asymmetry as the absolute value of the difference between the bilateral trade-to-GDP ratios:

$$Asymmetry_{ij} = |Trade\ Dependence_i - Trade\ Dependence_j|$$

Oneal & Russett (1997) account for asymmetry in their non-directed dyad analysis by including the higher trade-to-GDP ratio along with the lower ratio. This formulation is functionally equivalent to Gartzke & Li's asymmetry measure, and hence has the same problems.[5]

In the expected-utility model presented in the next section, these relationships and their implications for the interpretation of the empirical results are derived explicitly. The model also accounts for how asymme-

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[3]Asymmetries may also be due to differences in the extent to which two countries' markets or production is substitutable, or in partner or commodity concentration, or in the extent to which the countries produce manufactured goods or primary commodities (Galtung, 1971). I do not investigate such asymmetries here, but note that such asymmetries (e.g., partner concentration) are positively correlated with size asymmetry.

[4]Consider a dyad where the bilateral trade makes up 0.40 and 0.50 of the two countries' total trade, respectively – both are heavily dependent on each other. Barbieri's symmetry measure is then 0.90. Then take a situation where the bilateral trade as a share of total trade is 0.01 and 0.10 – two countries that are not very dependent on other, but the bilateral trade for one of the countries forms a share of the total trade 10 times greater than for the other. In this case, the symmetry measure will be 0.91 – more symmetric than the first case!

[5]In Gartzke and Li's model, the probability p of war is modeled as a function of the lower trade dependence D_L and asymmetry $|D_H - D_L| = (D_H - D_L)$ since $D_H > D_L$: $p = f(\beta_1 D_L + \beta_2 |D_H - D_L|) = f(\beta_1 D_L + \beta_2 D_H - \beta_2 D_L) = f((\beta_1 - \beta_2) D_L + \beta_2 D_H)$, which is equivalent with Oneal & Russett's model.

tries in *military* power affect the relationship between trade and conflict. Military power is crucially dependent on the size of the economy, such that asymmetries in military power are highly correlated with size asymmetry. To keep the discussion simple, I will treat power asymmetry as synonymous with size asymmetry.

Why would one expect size asymmetry to affect the relationship between trade efficiency and conflict within a pair of states? The theoretical model and the empirical analysis below show that changes in trade flows decrease the risk of conflict the most for countries of equal size. There are several reasons for this. Referring to the trade-losses mechanism, Oneal & Russett (1997) and others argue that the least trade-dependent country in the dyad's calculation is what matters. Hence, trade has the largest impact when it is important to *both* countries in the dyad. The model shows that this is the case only if they are of roughly similar size. The impact of asymmetry in the alternative-access mechanism is slightly less straightforward. A country is not likely to attempt conquest of a country that is considerably larger and more powerful than itself, since it is likely to be defeated. This is offset by the fact that the prize is more valuable the larger it is (as is the alternative trading relationship). Even when overwhelming power implies a short and non-costly war, and a high probability of success, a country is not likely to attempt conquest of very insignificant territories if there are some fixed costs involved in warfare (such as the risk of retaliation from third parties). The net effect of these factors is not certain. In the model below, trade also reduces the incentives for wars of conquest the most for symmetric dyads, in part because the value of the trade that provides the alternative access then is largest.

Hence, analyzed as *trade efficiency*, the effect of trade between two states on the incentives for conflictive behavior is strongest in dyads of equal size. Analyzed as *trade dependence*, however, the effect of trade on these incentives increases the larger the potential initiator is to the potential target. The cases of Germany, France, and Luxembourg provide an illustration. The German economy before the reunification in 1990 was roughly the size of France's and 100 times that of Luxembourg. Let us assume that the initial bilateral trade flows with Germany were equal to 10% of France's GDP and 10% of Luxembourg's – both countries' 'trade dependence' on Germany is 0.10. Let us further assume that changes in 'trade efficiency' – i.e. changes in the countries' trade policies or technological improvements – cause the value of both trade flows to increase by a factor of two. This would increase France's and Luxembourg's 'trade depen-

dence' from 10% to 20%. The German 'trade dependence' would increase from 10% to 20% in the case of France and from 0.1% to 0.2% in the case of Luxembourg. In the 'trade efficiency' conceptualization, these increases are of similar size in both dyads, and would affect German cost-benefit calculations concerning militarized conflict more strongly in its relations with France than in those with Luxembourg. This is partly because the German-French bilateral trade is more important for Germany than the German-Luxembourg trade, and partly to the assumption that the relative military symmetry between France and Germany implies a long and costly conflict, in terms of both destruction and of trade losses. Moreover, the effect of such an increase in trade efficiency would be stronger for France's calculations than for Luxembourg's, because the extreme power asymmetry between Germany and Luxembourg would lead to a short war with almost certain defeat for Luxembourg. Hence, the amount of trade between Luxembourg and Germany does not make much of a difference for Luxembourg's utility calculations.

When using the 'trade dependence' conceptualization, these two increases are *not* of similar size. Increasing German trade dependence on France from 10% to 20% is then equivalent to increasing trade with Luxembourg from 0.1% to 10.1%. According to the model, such an increase would affect German calculations much more strongly in its relations with Luxembourg than in those with France. This is because the benefits of this trade relationship would be much more valuable to Germany relative to what it possibly could gain from a militarized conflict with Luxembourg. Since France is so much larger than Luxembourg, on the other hand, it is still conceivable that the utility of a successful militarized action might outweigh the trade costs even after this increase in trade.[6]

Failing to handle these two issues inhibits a proper understanding and testing of how the effect of trade on conflict is contingent on asymmetries. Moreover, it raises a spurious-results concern: if trade/GDP is impossible to disentangle from size asymmetry, to what extent is the finding that trade reduces conflict really due to size asymmetry? All in all, studying the relationship between 'trade efficiency' and the incentives for conflict provides more direct and relevant knowledge concerning the effect of changes in trade policy or technological changes for the trade and conflict relationship than does the 'trade dependence' variable.

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[6]The argument is equivalent to a discussion of the relative merits of 'difference indicators' and 'ratio indicators' (see Hegre, 2002 for a more detailed discussion).

6.3 The Model

Dorussen (1999) proposes a model that explores the relationship between trade, power, and the incentives for militarized conflict simultaneously.[7] The model shows how the incentives for attempting conquest of resources in other countries are reduced by increased trade openness in the system, and how it varies with the number of countries. The model is extended in Dorussen & Hegre (2003). Here, I reformulate and simplify the model to address the incentives for two countries as a function of the distribution of resources between them and of the trade openness between them.[8] I also add a parameter modeling how much of the trade between the two countries is lost during the war, which allows me to explore simultaneously the effects of trade losses (see Barbieri & Levy, 1999; Anderton & Carter, 2001; Li & Sacko, 2002) and of the incentives for conquest (see Rosecrance, 1986).

The model is an expected utility model. To keep it simple, it disregards strategic interaction, and assumes that states always go to war if they have an incentive to, that there is no first-strike advantage, and that negotiated solutions to the conflict are unavailable (see Fearon, 1995; Powell, 1996). It still allows focusing on the main arguments: that the relationship between trade and conflict is dependent on size asymmetry, that the trade-to-production ratio measure is impossible to disentangle from size asymmetry. Finally, the model facilitates the introduction of the 'trade efficiency' concept.

6.3.1 Model of Production and Trade

In the model, two countries split a territory between them such that country 1 controls a share s of (identical) production units located at the territory and country 2 controls the remainder $1-s$. A country's income (and utility) of production is proportional to s. In addition, there are economies of scale. The economies-of-scale part of the model is based on Snidal (1991b: 714–715), who assumes that cooperation between any pair of these identical units yields identical net benefits. Assuming constant returns to scale at the level of the units, the total benefit of cooperation between the two

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[7] His model, in turn, draws on Snidal (1991) and Wagner (2000).

[8] In Dorussen's model, there are N countries of equal size r. His model focuses on only one of these countries, which controls $\frac{r}{N}$ of the resources, while the remainder control $\frac{(N-1)r}{N}$. I normalize the size of the system to $Nr = 1$, and define the size of country 1 to be s and the size of country 2 to be $1 - s$.

groups of units is proportional to the number of cooperating dyads the two groups form, or to the product of the number of units in each group. Hence, domestic production is equal to the number of production units plus a term which is proportional to the number of domestic units that can be paired: $P_1 = s + \theta s^2$ and $P_2 = (1 - s) + \theta (1 - s)^2, \theta > 0.$[9] Trade enters the model simply by allowing the countries to benefit from additional economies of scale: Trade allows units to cooperate with units in the other country. s units in country 1 may then interact with $1 - s$ units in country 2, such that the *utility* of the trade flow between the two states is proportional to the product of the shares of resources: $T \backsim s (1 - s)$. Recall that the gravity model of trade (Linneman, 1966; Deardorff, 1998) predicts that the volume of trade between two countries is proportional to the product of their domestic production.[10] This implies that the utility of the trade flow is proportional to its volume.

Snidal (1991b: 714), furthermore, argues that the nominal gain from cooperation is split equally even when the states are of different size. This follows from the assumption of constant returns to scale. A state made up of s units interacts with the $(1 - s)$ units forming another state. The benefit from cooperation (or trade) is $s (1 - s)$ to both states, independently of the magnitude of s. I will define a *trade efficiency* parameter e as the proportionality factor between the utility of trade to each of the countries and the product of their sizes $s (1 - s)$.[11]

$$T = es (1 - s) \tag{6.1}$$

Just as θ models the extent to which there are economies of scale due to domestic interactions, the trade efficiency parameter e models the extent

---

[9] Henceforth, I will restrict the discussion to the expected utility of State 1, since the asymmetry in the model is completely represented by the s term. Expressions for State 2 corresponding to those for State 1 can be derived by substituting $(1 - s)$ for s and s for $(1 - s)$ in the expressions below.

[10] Deardorff (1998) notes how the gravity model is consistent with several other models of trade. Although the trade model presented here is fairly rudimentary, it resembles other trade models in the sense that they also model economies of scale: The exchange of goods allows a more efficient allocation of production.

[11] Obviously, the gains from trade are not necessarily split equally. For instance, A may be more dependent on imports from B than vice versa. In the absence of information on elasticities of supply and demand, however, the assumption of equal division of gains seems a reasonable approximation. It is not critical to the results discussed below. When assuming that the benefits from trade are split proportionally to the states' relative size, trade efficiency has the strongest effect on the incentives for conflict for $0.5 < s < 0.75$. Other conclusions from the model are unchanged.

to which there are additional economies of scale resulting from trade. e is normally smaller than θ, since it is also a direct function of factors that facilitate or hinder trade – factors such as available transportation technology, tariff barriers, and access to sea. Altering any of these factors has a direct effect on e – the degree to which any two individual production units in the two countries interact with each other. Note that the parameter by definition is uncorrelated with size asymmetry.

Equation (6.1) shows that trade between two countries is most important in absolute terms when they are of equal size. The intuition is simple: In a free-trade world where two states interact independently of international borders, the largest amount of cross-border interactions occur when they are of equal size. If one state is very large relative to another, most interactions occur within that state. Then, the cross-border interactions are more important to the small state, but the amount of cross-border interaction is small relative to total interaction and production.

6.3.2 The Utility of Peaceful Production and of War

Total utility per period of peace is the sum of the utilities of production and of trade:

$$P_1 + T_1 = s + \theta s^2 + es(1 - s) = s(1 + \theta s + e(1 - s)). \qquad (6.2)$$

Production and trade continue in perpetuity. However, the actors are likely to prefer gains now to similar gains later: Future payoffs are perceived to be more uncertain (the payoff stream may end for some unforeseen reason), and actors are likely to be impatient. Hence, the gains are discounted over time. This is incorporated into the model by the discount factor δ (see Dorussen, 1999: 446). Assuming an infinite time horizon, the discounted benefit of peaceful trade and production is

$$I_1 = \frac{P_1 + T_1}{1 - \delta} = \frac{s(1 + \theta s + e(1 - s))}{1 - \delta}.$$

Dorussen (1999: 457–458) also develops an expression for the utility of war. In the simplest version of this model, the state winning a war gains control over all resources, such that the per-period production after victory in war is $P_V = 1 + \theta$. The defeated state loses all, such that per-period income after war is $P_D = 0$. Trade is not relevant after a war since all production is controlled by one state. Total income after a war is therefore P_V and P_D. Dorussen's model operates with two cost terms: First, all gains

from production and trade are spent for the war effort during the conflict, which may last several periods (Dorussen, 1999: 446). Second, a constant per-period cost c runs on top of that. The cost term is expressed relative to total per-period production in the two countries, and may exceed 1. The probability of victory to State 1 and defeat to State 2 in a given period is denoted as p_1, the probability of victory to State 2 and defeat to State 1 is p_2, and the probability of stalemate is p_0. Given this, the expected utility of war is

$$W_1 = \frac{p_1\left(I_V\right) + p_2\left(I_D\right) - c_1}{\left(1 - p_0\right)\left(1 - \delta\right)^2} = \frac{p_1\left(1 + \theta\right) - c_1}{\left(1 - p_0\right)\left(1 - \delta\right)^2} \tag{6.3}$$

The utility of war W_1 to State 1 is increasing in the probability p_1 of that state winning the war. It is decreasing in the per-period cost of war c – State 1 is more likely to prefer war to peace if the war entails small costs. If $p_1 < c_1$, the utility of war is negative and will never be preferred to peaceful production and trade. If $p_1 > c_1$, W_1 is positive, and decreasing in the probability p_0 of running into a stalemate. Finally, the expected payoff of war is increasing in δ: War is more useful the more patient is the actor, since the long-term gains from gaining control over the other territory is more likely to outweigh the short-term costs and losses of production and trade during the war the more the actor values the future relative to the present.[12]

The three probabilities p_1, p_2, and p_0 may be derived from a standard ratio-form contest success function, abbreviated CSF (see Hirshleifer, 2000: 775). The standard CSF assigns a probability p of victory and a probability $1-p$ of defeat to the fighting efforts of the two sides.[13] I extend this model to also yield a probability of stalemate by assuming that each period consists of two battles: one battle where the two possible outcomes are victory for side 1 (defeat to side 2) or victory for neither, and a second battle where the two possible outcomes are victory for side 2 (defeat to side 1) or victory for neither. Assuming a particular value for the decisiveness parameter, and that the two sides have equal battle effectiveness and spend the same share of resources in the contest, the three probabilities are expressed in terms of the asymmetry parameter s as

$$p_1 = s^2 \tag{6.4}$$

$$p_2 = \left(1 - s\right)^2 \tag{6.5}$$

---

[12] Powell (1999: 72) also notes that patient states are more likely to have incentives for conflict.

[13] A version of the standard CSF is used in Hegre (2002) and Dorussen & Hegre (2003).

$$p_0 = 2s\,(1 - s) \tag{6.6}$$

The complete derivation of the probabilities is given in Appendix D.1.[14]

Total costs of war are assumed to be equal in both states and proportional to the combined size of the countries.[15]

The probabilities of victory and stalemate derived above model both that a large state is more likely to win a military contest and that contests between two states of equal size are more likely to be stalemated. Stalemated contests last longer, and with a constant per-period cost of war, will be more costly. The cost parameter c_1 represents per-period costs such as war destruction and expenses related to mobilization and troops deployment in the two states, as well as reputation costs domestically and internationally and the fear of third-party involvement. To model both the 'trade-losses' and 'alternative-access' mechanisms,[16] the per-period cost consists of two components: A variable γ represents the destruction of production in the two states. γ is equal for both states. The other component τ represents the fraction of the trade between the two states that is lost during the war. τ is also equal for both states, since they split the gains from trade equally. Total per-period cost of war is then $c_1 = \gamma + \tau T_1$. Substituting from (6.1) yields the cost function

$$c_1 = \gamma + \tau e s\,(1 - s) \tag{6.7}$$

Substituting the expressions for the probabilities of the three outcomes (6.4), (6.5), and (6.6) into (6.3), and for the war costs (6.7) into (6.3),

---

[14] The CSF is derived from production P only. It would be more realistic to use $P + T$ instead of P only, but for low λ this works as an approximation.

[15] The costs of war here are independent of the asymmetry in the dyad. An alternative model would be to model the costs of war as proportional to the number of pairs of fighting units, e.g. $c = \zeta s\,(1 - s)$, and to express the threshold derived below in terms of this per-fighting pair cost ζ. There are certain disadvantages to this alternative, however. First, the total cost of conflict is already modeled as a function of size asymmetry through the outcome probabilities, since symmetrical dyads have the longest conflicts. Second, the model chosen may later be extended to model the per-period cost as an outcome of an allocation decision for the two states' fighting efforts.

[16] Other mechanisms through which trade might reduce conflict have also been suggested, e.g. Morrow's (1999) and Gartzke, Li & Boehmer's (2001) argument that trade provides states with means to send costly signals short of war, which reduces the probability of war due to informational asymmetry. Since the signals are most costly to both countries when they are of similar size, this mechanism should work best for symmetric dyads, too.

yields

$$W_1 = \frac{s^2 (1 + \theta) - \tau e s (1 - s) - \gamma}{(1 - p_0) (1 - \delta)^2}$$

For notational convenience, I will henceforth replace the per-period probability of a conflict ending $(1 - p_0)$ with $p_E = (1 - p_0) = (1 - 2s (1 - s))$. The utility of war is then $W_1 = \frac{s - \tau e s (1-s) - \gamma}{p_E (1-\delta)^2}$. p_E is a parabola which approaches 1 as s approaches 0 or 1, and has its minimum of $\frac{1}{2}$ for $s = \frac{1}{2}$.

The state will prefer war to peace if the discounted expected utility of war W_1 exceeds the discounted income from production and trade with the initial distribution of resources I_1. It is useful to express this criterion as thresholds for the cost of war for State 1. If the per-period cost of war is higher than this threshold, the state will prefer peaceful production and trade to war, and the state will not have an incentive to attempt conquest of the other.

The model captures two mechanisms through which trade affects conflict: If the two states trade freely, the utility of conquest is relatively smaller, since I_1 is increasing in trade efficiency e and W_1 is not. I will refer to this as the utility of conquest mechanism below. The other mechanism is the trade losses mechanism: the more the two states trade, the more they lose if trade is hampered by war.

Below, I derive the threshold in terms of γ (equation 6.8). I will discuss the γ threshold both when $\tau = 0$ and when $\tau > 0$. This allows us to assess whether the loss-of-trade mechanism depends on size asymmetry in the same way as the utility of conquest mechanism.

$$
\begin{aligned}
W_1 \quad &> \quad I_1 \\
\Leftrightarrow \quad & \frac{s^2 (1 + \theta) - \tau e s (1 - s) - \gamma}{p_E (1 - \delta)^2} > \frac{s (1 + \theta s + e (1 - s))}{1 - \delta} \\
\Leftrightarrow \quad & \begin{aligned}\gamma < &-e s (1 - s) (\tau + p_E (1 - \delta)) \\ &+ s (s (1 + \theta) - p_E (1 - \delta) (1 + s\theta)) \equiv \underline{\gamma}_1\end{aligned}
\end{aligned}
\qquad (6.8)
$$

The first-order partial derivative of $\underline{\gamma}_1$ with respect to e is

$$\frac{\partial \underline{\gamma}_1}{\partial e} = -s (1 - s) (\tau + p_E (1 - \delta)) \qquad (6.9)$$

If $\tau = 0$, this simplifies to $\frac{\partial \underline{\gamma}_1}{\partial e} = -s (1 - s) p_E (1 - \delta)$. The differentia-

tion of this threshold allows stating a set of propositions of the effect of size asymmetry, trade efficiency, and the trade-loss parameter on the incentives for militarized conflict.

6.4 Propositions

In this section, I derive a set of propositions stating how the threshold $\underline{\gamma_1}$ varies with the degree of symmetry. We do not have any information on the actual magnitude of the per-period costs of war, γ.[17] However, it is straightforward to assume that the probability that a given unobserved value γ^* is below the threshold $\underline{\gamma_1}$ is larger the higher is the threshold. Hence, the probability of war onset predicted from the model is increasing monotonically in the threshold $\underline{\gamma_1}$. This allows me to test the propositions empirically in a later section: changes in trade levels and degrees of symmetry that decrease the threshold also decrease the probability of war. Throughout, I restrict the attention to state 1.

6.4.1 The Relationship in Terms of 'Trade efficiency'

Figure 6.1 plots the derivative of the cost threshold with respect to e as a function of s for a situation where no trade is lost during the conflict ($\tau = 0$, thin line) and for a situation where half of the trade is lost in each period ($\tau = 0.5$, thick line). The plot shows that increasing trade efficiency always reduces the incentives for conflict for State 1 – the derivative is always negative. This is not surprising, of course, since the model assumes that all trade is lost as a result of the war, and that trade by assumption is an alternative way to get hold of resources in the other country needed for own production. The only exception to this is when State 1 is extremely small relative to State 2 ($s \rightarrow 0$) or when it is extremely large ($s \rightarrow 1$), when there is no effect of trade. The thin line in Figure 6.1 represents the importance of symmetry in the alternative-access mechanism. The alternative access to resources offered by trade alters the incentives for war as much in symmetric as in moderately asymmetric dyads. For very asymmetric dyads, trade becomes less important relative to the military considerations. The area between the thin and the thick line shows the impact of the fact that trade volumes are highest in symmetric dyads –

---

[17]Although they are probably increasing in the distance between the two states, the degree to which they are industrialized, and the degree to which they are democratized. These factors will be controlled for in the empirical analysis reported below.

Figure 6.1: The effect of trade efficiency on minimum cost threshold, $\frac{\partial e_1}{\partial s}$, by size asymmetry ($s$) and degree of trade losses during war (τ). $\delta = 0.5$

trade clearly reduces the incentives most in symmetric dyads.

The derivative with respect to e (6.9) shows that the effect of trade efficiency is proportional to the expression for the gains from trade, $es\,(1-s)$, independent of τ. Symmetric trade relationships deter conflict most because they have the largest nominal value. Power symmetry only magnifies the importance of trade symmetry. In the model, wars are expected to be the longest and most costly for $s = \frac{1}{2}$ (the per-period probability of ending the conflict p_E is lowest for this s). Symmetric dyads then will expect to lose more from trade reductions per period of war, and will have to suffer these losses for more periods, than will asymmetric dyads.

Proposition 6.1 *The $\underline{\gamma_1}$ threshold is decreasing in e:* $\frac{\partial \underline{\gamma_1}}{\partial e} < 0$ *for all relevant s, τ, and δ.*

Proposition 6.2 *The $\underline{\gamma_1}$ threshold is decreasing most strongly in e when $s = \frac{1}{2}$ for all relevant τ and δ.*

Proposition 6.3 *The $\underline{\gamma_1}$ threshold is decreasing in e only for moderately symmetric dyads: $\frac{\partial \gamma_1}{\partial e} \to 0$ when $s \to 1$ and when $s \to 0$ for all relevant τ and δ.*

Propositions 6.1–6.3 state that this holds for all relevant values for s, τ and δ. Appendix D.2.1 derives (6.9) and proves the propositions.

6.4.2 The Relationship in Terms of 'Trade Dependence'

Most studies follow Oneal & Russett (1997, 1999) and assess the effect of trade on conflict in terms of a country's 'trade dependence': the volume of the trade flow divided by the country's GDP. This may be expressed in terms of the model above: GDP is proportional to the utility of production and trade (Expression 6.2): $GDP_A = \lambda_1 I_1 = \lambda_1 s (1 + \theta s + e (1 - s))$. Above, I argued that the volume of the trade flow is proportional to the utility of trade: $Trade = \lambda_2 T_1 = \lambda_2 es (1 - s)$. Let $\eta = \lambda_2 / \lambda_1$ be the joint proportionality factor. η is always positive, and is likely to be larger than 1. We can then represent trade dependence D_1 as

$$D_1 = \frac{T_1}{I_1} = \frac{\eta e (1 - s)}{1 + \theta s + e (1 - s)} \Leftrightarrow e = \frac{(1 + \theta s) D_1}{(1 - s) (\eta - D_1)} \qquad (6.10)$$

The bilateral trade is by definition relatively less important the larger is State 1 relative to State 2: for fixed e, D_1 is decreasing in the state's size s if there are economies of scale in production. Empirically, trade dependence is negatively correlated with s.[18] This shows that it is not possible to interpret trade dependence independently of asymmetry, and that the effect of trade dependence is likely to vary differently with asymmetry than the trace efficiency parameter. To explore this, I will derive the equivalents to Propositions 6.1, 6.2, and 6.3 in terms of D_1.

The $\underline{c_1}$ threshold may be expressed in terms of D_1 by substituting $(1 + \theta s) \frac{D_1}{(1-s)(\eta - D_1)}$ (see expression 6.10) for e in (6.8):

---

[18] In the data set used below, the correlation is $r = 0.28$.

$$
\begin{aligned}
W_1 \;\; &> \;\; I_1 \\
&\Leftrightarrow \gamma_1 < -\left(1 + \theta s\right) \frac{D_1}{(\eta - D_1)} \left(\tau + p_E \left(1 - \delta\right)\right) \\
&\quad + s^2 \left(1 - p_E \left(1 - \delta\right)\right) \equiv \underline{\gamma}_1
\end{aligned}
\tag{6.11}
$$

The derivative of $\underline{\gamma}_1$ with respect to D_1 is

$$
\frac{\partial \underline{\gamma}_1}{\partial D_1} = -\left(1 + \theta s\right) \frac{\eta}{\left(\eta - D_1\right)^2} \left(\tau + p_E \left(1 - \delta\right)\right)
\tag{6.12}
$$

Figure 6.2 plots the derivative of the cost threshold with respect to the trade-to-production ratio as a function of s.[19] The relationship is dependent on the economies-of-scale parameter θ. For relatively large θ (the thick line), D_1 moderately decreases the incentives for conflict when the actor state is very small relative to the opponent. The effect increases monotonically as s becomes larger. If θ is small (the thin line), the effect of increasing D_1 is strongest for asymmetric dyads, and moderate for symmetric dyads. Hence, a very different relationship emerges between trade, size asymmetry, and conflict when assessing it in terms of trade dependence rather than trade efficiency. In some cases (when economies of scale are large), increasing trade dependence reduces the incentives for conflict for State 1 *more* the larger it is relative to State 2. Within the utility of conquest mechanism, the intuition for this is simply that a trade-to-production ratio for State 1 of a given magnitude represents much larger gains from trade relative to the potential utility of conquest the larger the state is relative to State 2, since a small State 2 is not much to conquer. Note from (6.10) that trade dependence of a given magnitude implies a higher trade efficiency the larger is s: If State 1 is large relative to State 2 and the trade-to-production ratio is high, each of the cross-border unit interactions must be very intense. Hence, in terms of the trade-losses mechanism, it is natural that increasing trade dependence decreases the incentives for conflict more the larger is the state relative to the opponent.

When θ is large, however, the relationship between the effect of trade and size asymmetry is much more ambiguous. In contrast to the 'trade efficiency' measure, we cannot conclude firmly that the effect of 'trade dependence' is dependent on the degree of asymmetry.

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[19]τ was set to 0.5. Altering τ only shifts the curves upwards (if decreased) or downwards (if increased) without changing their shapes.
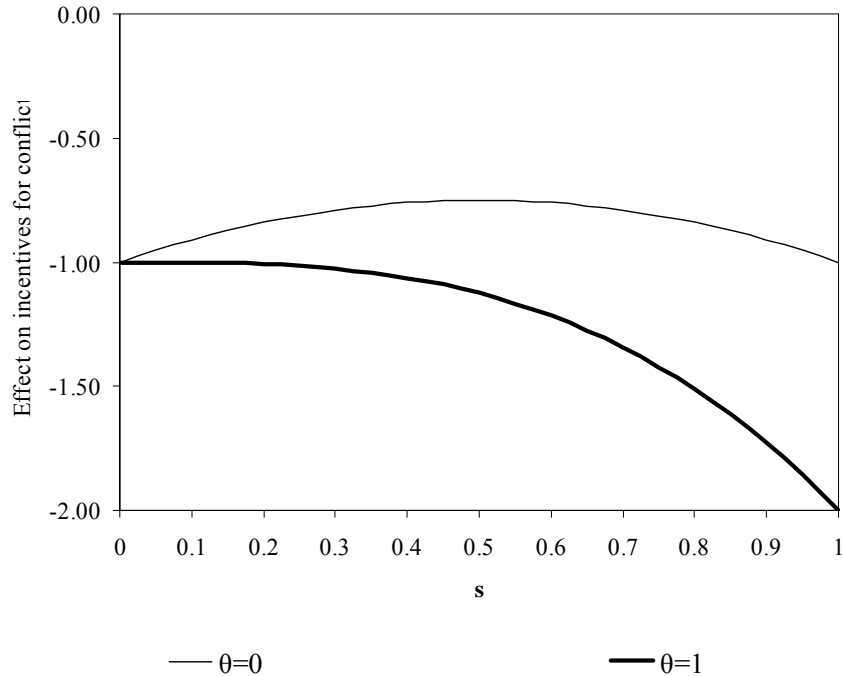
Figure 6.2: The effect of trade dependence on minimum cost threshold, $\frac{\partial \gamma_1}{\partial D_1}$, by size asymmetry ($s$) and θ. $D_1 = 0.1; \delta = 0.5; \tau = 0.5; \ \eta = 1$

Trade efficiency and trade dependence are just different ways of assessing the importance of trade, one focusing on transaction intensities and the other on the importance of trade relative to the economy. The analysis shows, however, that the trade-to-production ratio is by construction inseparable from size asymmetry. This has implications for the theoretical understanding of the relationship between trade and conflict that we cannot ignore, and has equally important implications for the empirical testing of this relationship, as will be demonstrated below.

Propositions 6.4–6.6 state that the relationship depicted in Figure 6.2 holds for all relevant combinations of s, τ, and δ. The propositions are proved in the online Appendix.

Proposition 6.4 *The γ_1 threshold is decreasing in D_1:* $\frac{\partial \gamma_1}{\partial D_1} < 0$ *for all relevant D_1, s, τ, δ, η, and θ.*

Proposition 6.5 *When $\theta = 1$, the $\underline{\gamma_1}$ threshold is decreasing most strongly in D_1 when $s = 1$ for all relevant $\underline{D_1}$, τ, δ, and η.*

Proposition 6.6 *When $\theta = 0$, the $\underline{\gamma_1}$ threshold has a maximum or a minimum in D_1 when $s = \frac{1}{2}$ for all relevant D_1, τ, δ, and η.*

6.4.3   The Relationship in Terms of 'Trade Share'

Barbieri (1996) and Chapter 8 use the trade share – the value of the bilateral trade flow divided by the value of the country's total trade – to evaluate the relationship between trade and conflict. In the two-country model described above, trade share B_1 is by definition $\frac{1}{2}$ (see equation 6.1). To make the measure more interesting, we may assume that there is a world outside the two states which produces G. State 1's trade efficiency with the outside world is E such as the utility of trade with third parties is $T_1^W = EsG$, and its total trade volume is $\lambda_2 \left(T_1 + T_1^W \right)$. State 1's trade share is then

$$
\begin{aligned}
B_1 \quad &= \quad \frac{\lambda_2 T_1}{\lambda_2 \left(T_1 + T_1^W \right)} = \frac{es\left(1 - s\right)}{es\left(1 - s\right) + EsG} = \frac{e\left(1 - s\right)}{e\left(1 - s\right) + EG} \\
&\Longleftrightarrow \quad e = EG \frac{B_1}{\left(1 - s\right)\left(1 - B_1\right)}
\end{aligned}
$$

Substituting into (6.8),

$$
\begin{aligned}
W_1 \quad &> \quad I_1 \\
&\Leftrightarrow \quad \gamma < -EG \frac{B_1}{\left(1 - B_1\right)} s\left(\tau + p_E\left(1 - \delta\right)\right) + s^2 \left(1 - p_E\left(1 - \delta\right)\right) \equiv \underline{\gamma_1}
\end{aligned}
$$

The first-order partial derivative of γ with respect to B_1 is

$$
\frac{\partial \underline{\gamma_1}}{\partial B_1} = -EGs \frac{\left(\tau + p_E\left(1 - \delta\right)\right)}{\left(B_1 - 1\right)^2}
$$

The relationship between the trade-to-total-trade B_1 and size asymmetry varies with the ratio B_1 itself. Figure 6.3 plots the cost threshold as a function of s for two sample values: $B_1 = 0.1$ and $B_1 = 0.5$. The figure shows that the cost threshold decreases with increasing s even more strongly than trade-to-production ratio D_1 does. That is quite natural, since as long as B_1 is relatively small (say, up to 0.2), the trade-to-production and trade-to-total-trade ratios are roughly proportional. Since these measures capture almost the same concept, I will focus the empirical analysis on the
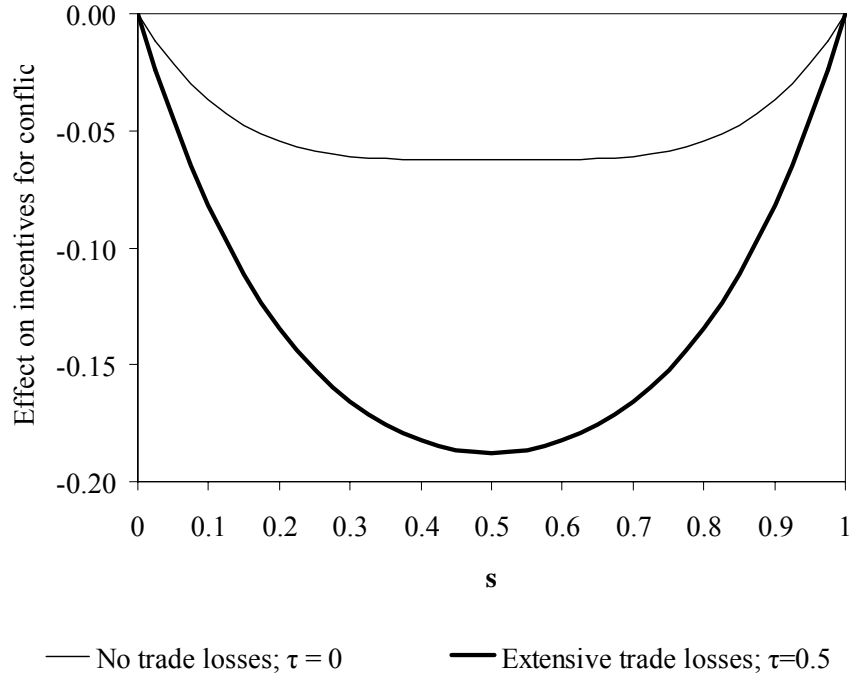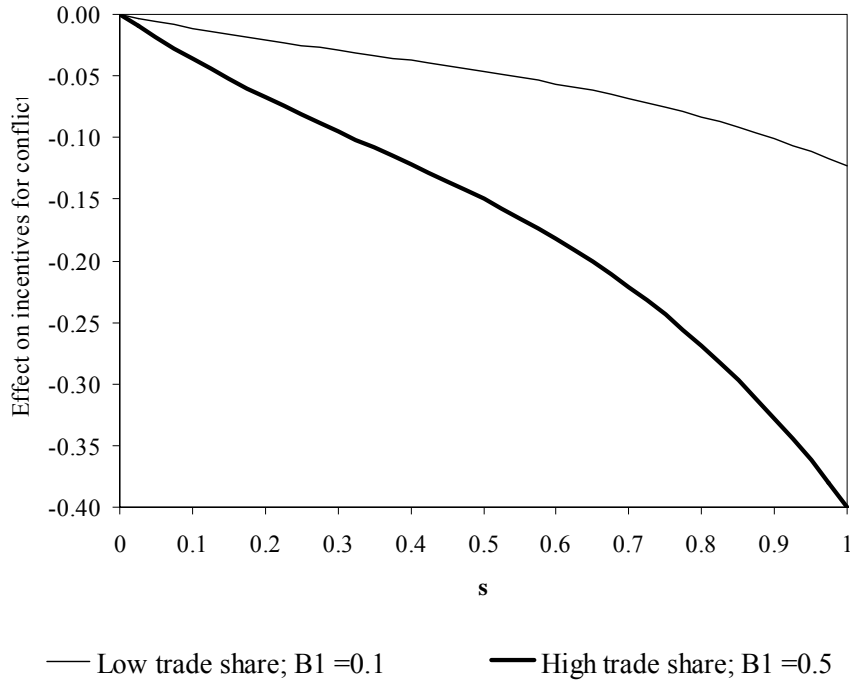
Figure 6.3: The effect of trade share on minimum cost threshold, $\frac{\partial \gamma_1}{\partial B_1}$, by size asymmetry ($s$) and trade share ($B_1$). $\tau = 0.5$, $\delta = 0.5$, and $EG = 0.1$

trade-to-production ratio.

6.5 Statistical Model

6.5.1 Directed Dyads

The dependent variable in the directed-dyad analysis of militarized conflict is the carrying out of a militarized action towards another country that leads to at least one casualty – a 'fatal militarized action'.[20] Actions that lead to battle deaths are more clear-cut examples of militarized actions

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[20] Ideally, the dependent variable should be the carrying out of an action that was *expected* to lead to fatalities, since the outcome of an action is unknown when the decision to act is made. Such expectations are unobservable, of course, such that the observation of actual 'fatal militarized actions' is the best approximation.

and probably require making a much more difficult decision than those not involving fatalities (i.e., threats and displays of force). Moreover, there is reason to suspect that militarized disputes between rich democracies are over-reported in the MID data set (see Gasiorowski, 1986: 29). The variable is constructed from a subset of the Militarized Interstate Disputes (MID) compiled by the Correlates of War Project (Jones et al., 1996). I use the dyadic version of the data set compiled by Maoz (1999), which eliminates a number of anomalies that appear when using the original MID data set in a dyadic analysis.

In the models derived above, it matters which of the two states in the dyad initiates the violence. To test the hypotheses formulated, it is necessary to distinguish between the actor initiating the action and the target of the action.[21] Recent studies (e.g., Beck & Baum, 2000; Bennett & Stam, 2000) model this by sampling each dyad twice for each year: once for actions directed from country A toward country B, and once for actions in the opposite direction. The model thus estimates the probability that a specified state (called the actor when observed at time t) directs a 'fatal action' towards another specified state (called the target). This directed action may be a reciprocation of a recent similar action (at time $t - \epsilon$), so that the target at $t - \epsilon$ is the reciprocating actor at t. I used the ROLEA and ROLEB fields in Maoz (1999), which provide information on whether state A or state B in the dyad was the primary initiator (or joining on the initiator side), or the target.

Bennett & Stam (2000) note that a reciprocation obviously is dependent on the initiation act. In a directed dyad-year setup, one is forced to code the initiation and reciprocation as occurring within the same year, which means they are assumed to occur simultaneously. Bennett & Stam propose to solve this by looking only at initiation, and to remove a directed dyad $A \rightarrow B$ from the sample if B already has initiated a dispute with A. This does not solve all the dependence between units in a directed dyad setup, however, since the factors that determine the probability of A initiating a dispute toward B are closely related to the factors that determine the probability that B initiates against A. Hence, if we know that A did not initiate against B in a given year, we have reason to update the probability that B will initiate against A – observations of no initiation are also dependent, not

---

[21] The standard setup (Oneal & Russett, 1997) which makes use of the 'weak-link assumption' (Dixon, 1994) does not allow a sufficient distinction between the two actors. The use of the weak-link assumption in multivariate empirical studies probably leads to an underestimation of the effect of some variables. Bennett & Stam (2000) discuss other aspects of the choice between analyzing directed or non-directed dyads.

only observations of initiation. This dependence between the initiation and reciprocation cannot be modeled by 'peace year splines' (Beck, Katz, and Tucker, 1998), which may model only how one dispute is dependent on disputes in previous *years*, since the reciprocation typically finds place in the same year. This problem can be solved only in a model that allows an infinitely fine-grained time unit.

6.5.2 Cox Regression

Raknerud & Hegre (1997) used Cox (1972) regression to model the outbreak of interstate war while accounting for such fine-grained temporal dependence between units of observation. The details of the model may be found in that chapter. Cox regression models the hazard $h(t)$ of a transition – from peace to the directing of a 'fatal action' towards a target in this application. $h(t)\Delta t$ is approximately the probability of a transition in the 'small' time interval $(t, t + \Delta t)$. The hazard function is factorized into a parametric function of time-dependent explanatory variables and a non-parametric baseline hazard function $\alpha(t)$ of time itself.

The innovation in Raknerud & Hegre (1997) is to use calendar time in the survival model – the time-varying baseline hazard is the probability of transition at day t. Thus, the baseline hazard accounts for system-wide historical fluctuations in the probability of interstate conflict. Moreover, this setup means that the values for the explanatory variables are coded once for all dyads for each time or day a militarized action is being taken in the system. Nothing is observed for days where there is no militarized action. This allows the modeling of the swift succession of events such as state A's initiation of hostilities towards B, and B's response to these, without having to construct dyad-day data sets. In a dyad-year model, it is not possible to model explicitly the dependence between the actions of an initiator and a target in a militarized conflict in this way, since the time unit is fixed and too large to allow coding the correct sequencing of events. The Cox regression model also solves another problem with time dependence (Raknerud & Hegre, 1997; see also Beck, Katz, and Tucker, 1998) since series of consecutive peace observations are disregarded in the parametric part of the model.

Three distinct aspects of temporal dependence are modeled as separate variables in the analysis reported below: the extent to which the occurrence of militarized disputes is dependent on how long the two states have been in existence, the extent to which such occurrences are dependent on previous conflicts in the dyad, and the extent to which reciprocations are dependent

on the initiations. Details on these variables are given in the next section.

The results presented below are estimated using a crude form for retrospective sampling (King & Zeng, 2001), where 5% of the non-dispute observations were sampled and entered into the estimation with a weight of 20.[22]

6.5.3 Operationalizing the Variables in the Model

s :   The share of resources for the actor state s was operationalized as the GDP of that country divided by the sum of the two countries' GDP: $s = \frac{\text{GDP actor}}{(\text{GDP actor + GDP target})}$. The data for GDP were taken from Penn World Tables Mark 5.6 (Summers & Heston, 1991).[23]   Figures for current US dollars were obtained by multiplication of the POP and CGDP variables. The variable was lagged by one year, such that 1950 data were used for observations in 1951.

e :   In the model, the e variable measures the extent to which similarly-

sized production units in the dyad trade with each other. e is proportional to the predicted volume from the gravity model of trade, which may be expressed as

$$\text{Dyadic trade} = \frac{e}{(\text{GDP actor + GDP target})} (\text{GDP target}) (\text{GDP actor}) \tag{6.13}$$

, where e is a function of trade-impeding factors such as distance, tariffs, etc, and (GDP actor + GDP target) is the size of the dyad. This means the measure may be constructed from the trade-to-GDP ratio $\frac{\text{Dyadic trade}}{\text{GDP actor}}$, since (6.13) may be reformulated as

$$e = \frac{(\text{Dyadic trade})}{(\text{GDP actor})} \frac{(\text{GDP actor + GDP target})}{(\text{GDP target})}$$

e is therefore coded as the trade-to-production ratio multiplied with $\frac{(\text{GDP actor + GDP target})}{(\text{GDP target})}$.

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[22]Even with this sampling, the data set has 500,000 observations. Since Cox regression is a computationally intense method, larger data sets than this become very cumbersome to work with.

[23]The data are available from http://pwt.econ.upenn.edu/.

D_1 : D_1 is the trade-to-GDP ratio. The trade data were taken from Gleditsch (2002).[24] This data set is in a dyad-year format, and improves the International Monetary Fund (1997) *Direction of Trade* data set by replacing missing observations with estimates based on related observations. Gleditsch's data set reports both imports from A to B and exports from A to B, and the same two entities in the opposite direction. I summed the four figures for each observation and divided by 2 to get the average imports and exports in each dyad. The trade figures are in current US dollars. The variable was lagged by one year.

6.5.4 Control Variables

Modeling Temporal Dependence To model how militarized actions depend on previous actions, the history of the dyad was coded in three variables. All variables are defined as decaying functions of time since the previous event of that type: $\text{Proximity(event)} = 2^{-t/\alpha}$ where α is the half-life parameter and t is the number of days since the event. This function has the value 1 if the event is very recent, 0 if the event is very distant, and is 0.5 if $t = \alpha$. The 'Proximity of independence' variable is a function of the time elapsed since the youngest state gained its independence. α was set to 2,192, implying a half-life of 6 years. The 'Proximity of hostile action by actor towards target' variable is a function of the time elapsed since the last fatal military action by the actor state towards the target. For instance, February 11, 1990, 1,851 days had passed since Pakistan carried out a military action towards India. α was set to 2,192, again assuming a half-life of 6 years. Finally, the directed dyad setup introduces time dependence beyond that found in non-directed dyad setups. This problem may be solved in the continuous-time Cox regression model. The initiating side is assumed to move first, and the target side afterwards. If the MID data set codes the dispute to start at time t, the initiator is coded as starting hostilities at t, and the target at $t + \varepsilon$ where ε is a small positive number. To denote whether any hostile act has been targeted toward a country a at time $t + \varepsilon$, I include a variable called 'Proximity of hostile action by target towards actor'. This variable is a function of the time elapsed since the last fatal military action by the target state towards the actor. This variable models the reciprocation of military actions. α was set to 14, implying a half-life of 2 weeks.

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[24]The data are available from http://k-gleditsch.socsci.gla.ac.uk/projects.html.

Democracy actor and target   The Polity democracy index (Jaggers & Gurr, 1995) ranges from 0 (non-democratic) to 10 (democratic). The data were taken from the Polity IIId data set (McLaughlin et al., 1998) to ensure that the coded regime type is the one in effect at the day of the dispute action. The Polity scores were coded for the actor and for the target. The interaction between actor and target democracy scores was also included in the models to capture the dyadic nature of the democratic peace hypothesis. Both the Democracy Actor and the Democracy Target variables were centered to minimize collinearity between these and the interaction term.

Development actor and target   Bremer (1992), Hegre (2000), and Peceny, Beer, and Sanchez-Terry (2002) found high development, measured as GDP per capita, to be associated with a lower probability of conflict. To control for this, the actor's and target's GDP per capita were included. The Penn World Tables RGDPCH variable was used to code GDP per capita for the actor and the target. This variable reports real GDP per capita in US dollars calculated using the Chain index with 1985 as base year. The variables are lagged by one year.

Contiguity   The directed dyad was coded as contiguous if the two states share a land border or have less than 25 nautical miles of water between them. Contiguity through colonies was not included.

Distance   This variable is the distance between the capitals of the two states.

Dyad size   Dyad size was defined as $\ln(GDP \text{ actor } + GDP \text{ target})$. The variable replaces the major/minor power variable routinely included in comparable models (e.g., Oneal & Russett, 1997; Bennett & Stam, 2000).

6.6   Results

Tables 6.1 and 6.2 report the results from estimating the Cox regression model. Model I (Table 6.1) includes only the control variables. The set of regime type estimates are consistent with the democratic peace hypothesis: the interaction term between Democracy Actor and Democracy Target is negative and clearly significant. Both Democracy Actor and Democracy

Target are negative (although not statistically significant).[25] The development indicators, Actor's and Target's GDP per capita, are negative and significant (see Hegre, 2000). The coefficient for Distance is negative and statistically significant: The longer the distance between two states, the lower the risk of militarized conflict. This holds even when the model includes Contiguity, which is positive and equally significant. Dyad size is positive and significant: the larger the two states are, the more likely they are to get into conflict. This variable partly captures the difference in conflict behavior between major and minor powers, but also accounts for the fact that large minor powers have a larger interaction capacity than small minor powers, such that conflicts between them are more likely to escalate beyond the 1-battle-death threshold. Most of these results are consistent with what is found in Bennett & Stam (2000: 682–683) and in dyad-year analyses of interstate conflict, although differences in operationalizations inhibit a precise comparison.

Variable	Model I	
	$\widehat{\beta}$	s.e.
Democracy Actor	−0.014	0.016
Democracy Target	−0.0078	0.015
Democracy Int.	−0.017	0.0030***
GDP/cap. Actor	−0.26	0.069***
GDP/cap. Target	−0.24	0.070***
Distance	−0.61	0.063***
Contiguity	2.37	0.20***
Dyad Size	0.34	0.045***
Prx(independence)	0.21	0.28
Prx(actor action)	3.38	0.17***
Prx(target action)	7.45	0.90***
Log likelihood	−3123.49	
No. of failures	438	
LL null model	−4462.24	
* : $p < 0.10$,** : $p < 0.05$,*** : $p < 0.01$ (robust standard errors)		

Table 6.1: Cox regression results: Risk of fatal militarized disputes, 1951–1992, Control Variables

[25] Democracy Actor and Democracy Target are negative and significant if the control for the Actor's and Target's GDP per caput is omitted. This is not strange given the high correlation between democracy and development (see Burkhart and Lewis-Beck, 1994).

The temporal dependence controls have signs in the expected direction: Proximity of Independence is positive although not significant: New states are not significantly more prone to interstate conflicts than established states. Proximity of actor action is positive and clearly significant: Hostile actions are much more frequently targeted towards previous enemies in militarized conflicts than towards states that never have been enemies (see also Raknerud and Hegre, 1997 and Beck, Katz, and Tucker, 1998). Likewise, the Proximity of Target Action variable is positive and significant: A state A is much more likely to use military force against another state B if B has recently used force against A – in fact, militarized disputes rarely

Variable	Model II		Model III	
	$\widehat{\beta}$	s.e.	$\widehat{\beta}$	s.e.
s	−0.035	0.20	−0.23	0.22
s^2	−2.20	0.69***	−2.40	0.73**
e	−66.0	20.7***		
es	−1.85	6.3		
es^2	310.5	89.7***		
D_1			−60.0	19.7***
$D_1 s$			−75.7	52.8*
$D_1 s^2$			111.49	95.8
Democracy Actor	−0.0090	0.016	−0.0093	0.016
Democracy Target	−0.0023	0.015	−0.0015	0.015
Democracy Int.	−0.014	0.0032***	−0.014	0.0032***
GDP/cap. Actor	−0.26	0.073***	−0.26	0.073***
GDP/cap. Target	−0.24	0.076***	−0.24	0.076***
Distance	−0.68	0.060***	−0.68	0.060***
Contiguity	2.30	0.19***	2.31	0.19***
Dyad Size	0.41	0.049***	0.41	0.049***
Prx(independence)	0.31	0.28	0.30	0.28
Prx(actor action)	3.18	0.18***	3.17	0.18***
Prx(target action)	7.72	0.51***	7.72	0.72***
Log likelihood	−3109.59		−3110.28	
No. of failures	438		438	
LL null model	−4462.24		−4462.24	
* : $p < 0.10$,** : $p < 0.05$,*** : $p < 0.01$ (robust standard errors)				

Table 6.2: Cox regression results: Risk of fatal militarized disputes, 1951–1992, All Variables

escalate to a level where lives are lost without the target state reciprocating the violence.

The table does not report the N of the analyses, only that the data set contains 438 'failures' or initiation of fatal militarized actions. The significance levels obtained in a survival analysis are primarily dependent on this figure, rather than the total number of dyads or the total time of observation or the product of these (see Collett, 1994: 254–265).

On the background of these control variables, I tested hypotheses based on the propositions derived from the model. Propositions 6.2 and 6.3 indicate that it is not sufficient to control for s and s^2 – the model needs an interaction term between e and both of these. Likewise, Propositions 6.5 and 6.6 suggest that an interaction term between D_1 and s is necessary, and possibly also the interaction between D_1 and s^2. The models in Table 6.2 report the results from estimating a model with the control variables and the e and s terms (Model II), or the D_1 and s terms (Model III).

First note that the estimates for the control variables are virtually unchanged in Models II and III. Still, the addition of the five terms for trade and asymmetry significantly improves the fit of the model: The log likelihood drops from -3123.49 to -3109.59 and -3110.28, respectively. According to the likelihood ratio chi-squared statistic, this improvement is significant at the .0001 level. Note that both s^2 and es^2 are clearly significant – removing any of these terms would considerably reduce the goodness-of-fit of the model.[26]

It is not very fruitful to interpret the individual estimates for s and e, because of the square and interaction terms. Moreover, even when centering the main terms, there is extensive collinearity in Model II. The estimates for e and es^2 are correlated by $r = 0.986$ (see Appendix D.3). Although this collinearity is likely to render the estimation inefficient, it is possible to interpret these five estimates as long as they are treated together. To facilitate this, the estimated risks of interstate conflict relative to the baseline estimated in Model II are plotted as functions of s for sample values for e in Figure 6.4. The corresponding plots for sample values for D_1 given in Model III are found in Figure 6.5.[27]

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[26] The e variable is strongly right-skewed. To ascertain that the results are not due to outliers, I estimated the model without the upper percentile and without the upper decile on this variable. The estimates for e and es^2 were significant at the 0.01 level in both of these estimations. The s^2 variable was not significant when the upper decile was removed from the sample.

[27] The sample values are zero trade and trade efficiency and trade dependence values close to the 90th percentiles.

In both figures, the dotted lines plot the estimated risk (relative to a baseline) of fatal militarized actions towards a target with which it has no trade relationship as functions of asymmetry.[28] The results are roughly consistent with the expectations from the model given a low discount factor (see Figure 6.1), and with the preponderance-of-power school.[29] The estimated risks of war in the no-trade case are similar in both models and both figures, since only the trade indicator distinguishes these two models.

The solid line in Figure 6.4 plots the risk of action against a potential target which is a trading partner. The solid line is below the dotted line for most values of s. This is consistent with Proposition 6.1. The higher the trade efficiency variable e between a potential actor and a potential target, the lower is the estimated risk that the actor will initiate hostilities, as reflected in the negative and significant estimate for the main term e in Model II. The figure also supports Proposition 6.2: the difference in log relative risk – the distance between the solid and dotted lines – is largest for $s \approx 0.5$, as predicted by the model. Proposition 6.3, too, is clearly supported: The conflict-reducing effect of trade is zero both for actors that are very small relative to the opponent ($s \to 0$) and for actors that are very large relative to the opponent ($s \to 1$).

Figure 6.5 allows evaluating Propositions 6.4–6.6: Proposition 6.4 states that also the trade dependence indicator D_1 is negatively related to the relative risk of conflict. This is confirmed: Except when s is close to zero, the solid 'Much trade' line is well below the dotted 'no trade' line in the figure.

Propositions 6.5 and 6.6 do not indicate an unambiguous relationship between 'trade dependence' and size asymmetry. The results provide some support for Proposition 6.5: the estimated effect of D_1 is largest for actors that are large relative to the potential target, and smallest for actors that

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[28] The baseline has zero trade and the mean value for s.

[29] Bennett and Stam (2000) also find a clear negative relationship between the 'balance of forces' and conflict. They define balance of forces as the CINC score (Singer, Bremer, and Stuckey, 1972) for the larger country divided by the sum of the two countries' CINC scores. Their result implies that the larger the largest country, the less conflict in the dyad. In the directed dyads analysis, they find the non-directed measure of balance of power to be negative and strongly significant, implying that conflict is least likely in dyads characterized by high power asymmetry. They also enter a variable defined as the initiator's CINC score divided by the sum of the two countries' CINC scores. The directed measure is positive, but fails to meet the 0.05% threshold of significance. This implies that a country is more likely to initiate disputes the more powerful it is relative to the other state in the dyad. They do not discuss the net effect of the two variables, but their study seems to be largely in accordance with what is found here.
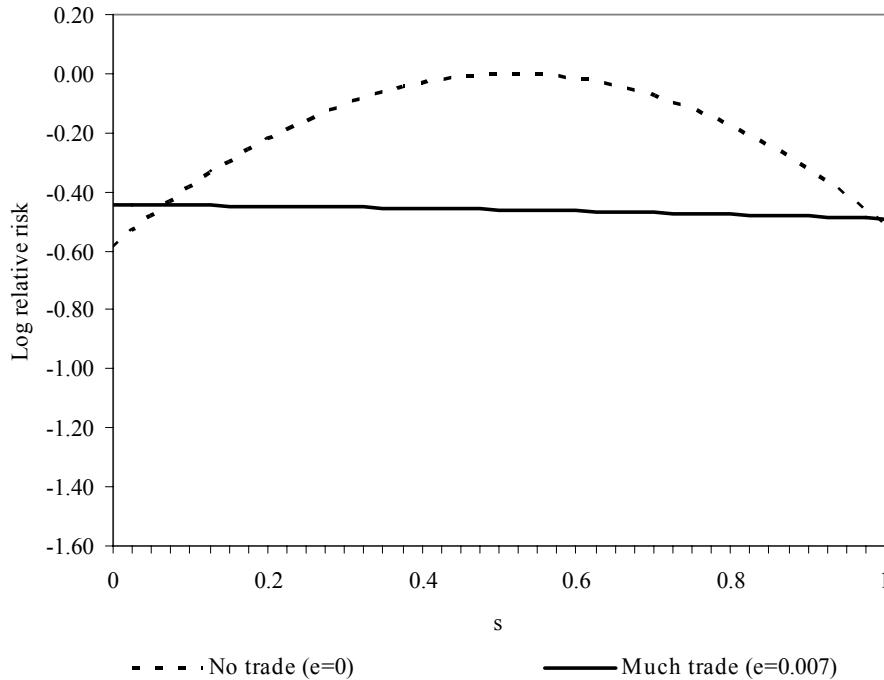
Figure 6.4: Estimated relationship between e, s, and the risk of fatal dispute (Model II)

are small relative to the potential target. The distance between the solid and dotted lines is largest for large s. However, possibly reflecting the ambiguity in the expected-utility model, in Model III, the $D_1 s^2$ term is not significant, and the $D_1 s$ term is only barely significant.[30] In any case, these results show that analyzing the relationship in terms of trade efficiency or trade dependence makes a large difference, and indicates that the concept of trade efficiency is more useful for investigating the effect of asymmetry.

The results obtained here are consistent with those in Hegre (2000), which measures the amount of trade in the dyad by using the residual from a gravity model estimation of trade for the actual country year. Although not identical to the e measure used here, the measures are related. That

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[30] It is possible to omit these two terms from the model specification without much loss in goodness-of-fit, in which case we would conclude that the trade relationship between 'trade dependence' and conflict is independent of asymmetry.
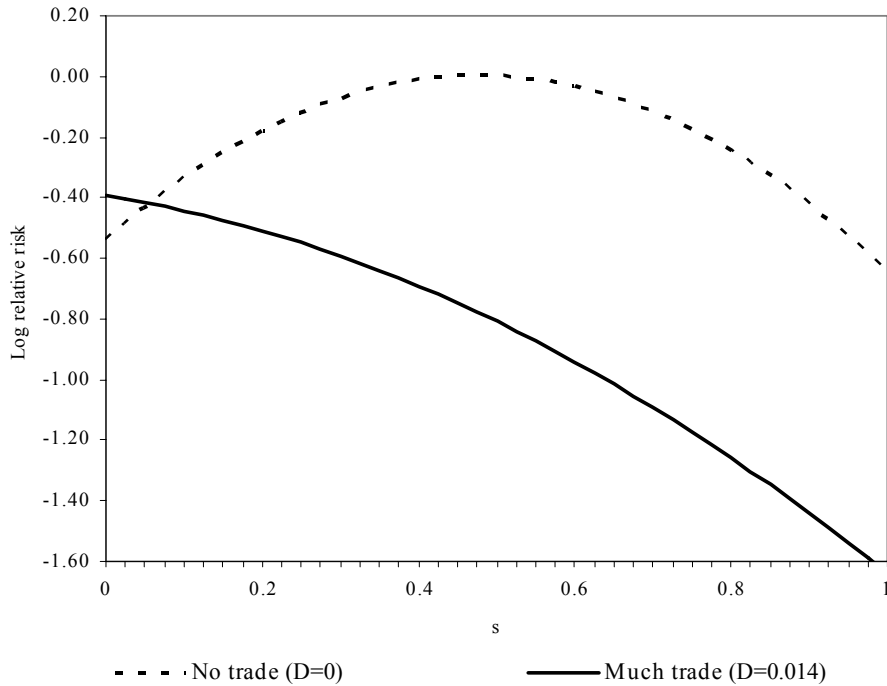
Figure 6.5: Estimated relationship between s, D_1, and the risk of fatal dispute (Model III)

study finds a negative relationship between the gravity model measure of trade and conflict for economically developed dyads, but does not address issues of asymmetry. The analysis also supports the results obtained for undirected dyads by Oneal & Russett (1997, 1999) and others who operationalize interdependence as 'trade dependence'.[31]

As for the impact of asymmetry on the conflict-reducing effect of trade, no previous studies have been able to separate the effect of size asymmetry from that of interdependence. The results presented here are accordingly not directly comparable to the other studies, and tend to disagree with the roughly comparable empirical studies: Barbieri's (1996) analysis indicates

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[31] Although Bennett and Stam (2000) find that trade dependence significantly decreases the probability of conflict in a non-directed dyad analysis, they fail to find that in their directed dyads analysis. Target dependence is closest to having a significant parameter estimate. It is difficult to say why this is so. The results obtained in Models II and III imply that this result is not bound to disappear in a directed dyad analysis.

that moderately asymmetric dyads are the least conflict-prone, whereas the highly asymmetric and the completely symmetric dyads have the highest probabilities of dispute involvement. Her unit of analysis, however, is the undirected country dyad, and the study's operationalization of asymmetry is quite different from the one used here and has some serious shortcomings.

Polachek, Robst, and Chang (1999: 416–418) find clear evidence for level of exports and imports to reduce the amount of conflict, and also find that the larger the target is, the more an increased level of exports decreases the amount of conflict directed at it. The results obtained above, then, are in contradiction to theirs. Their empirical analysis has important limitations, however. First, it is conducted on a limited and distant time period, and covers a limited set of countries. Moreover, it is uncertain whether the COPDAB net conflict variable is sufficiently distinct from the trade variable: to what extent are agreements related to trade between two countries coded as cooperative acts in the data set, and what is the weight of such cooperative acts in the net measure relative to more distinctly conflictive events? Finally, their analysis does not control for differences in economic and military size.

6.7 Conclusion

This chapter confirms theoretically and empirically the claim that trade between two states reduces the probability of interstate conflict most for *symmetric* dyads. I have argued that this question requires a careful definition of 'asymmetry' and of 'increased trade' and necessitates a distinction between the effect of trade asymmetry and of asymmetry in military power. I have defined both aspects of asymmetry in terms of the size of the countries' economies since this is unrelated to any measure of interdependence but still related to other possible conceptions of asymmetry.

To disentangle trade, size asymmetry, and military power, I reformulated an expected utility model (Dorussen, 1999) that allows treating relationships of power and of trade simultaneously. The model allows a clearer understanding of the relationships between trade, size asymmetry, and militarized conflict, and suggests how the question is most appropriately tested empirically. As a side benefit, it also allows a formal comparison of different concepts of trade interdependence.

The model demonstrates how the standard measures of interdependence – the trade-to-production and trade-to-total-trade ratios – are difficult to distinguish from size asymmetry itself. Hence, I propose a new measure of

trade interdependence which is both independent of size asymmetry, and, by extension of that independence, directly and independently affected by changes such as tariff reductions or improvements in transport technology. In conventional measures of 'trade dependence' and 'trade share' – the trade-to-production and trade-to-total-trade ratios – the effects of such changes are dependent on the degree of symmetry in the dyad. The measure proposed – 'trade efficiency' – is defined as proportional to the extent to which each productive sub-unit in the two states trade with each other. The measure is closely related to the gravity model of trade's prediction of trade flows between two countries. The model shows, in addition to the proposition that trade reduces conflict, that trade measured as 'trade efficiency' reduces the incentives for conflict most strongly in symmetric dyads, and should have negligible effect in extremely asymmetric dyads. This is because the nominal gains from as well as the value of a trade relationship tend to be largest for two states of roughly equal size. The expectations from the model are confirmed in the empirical analysis.

The model also shows that we are in a much weaker position to draw firm conclusions regarding how asymmetry affects the relationship between interdependence and conflict when we conceptualize interdependence as 'trade dependence' or as 'trade share'. Under some conditions, increasing 'trade dependence' or 'trade share' reduces a state's incentives for conflict more the larger it is relative to the potential target. This is counter-intuitive, and is simply due to the fact that the bilateral trade-to-production or trade-to-total-trade ratios are functions of the asymmetry itself. Under other conditions, asymmetry has a different impact on the trade-and-conflict relationship. This expectation from the model is also supported by the empirical analysis. These results suggest that it is more fruitful to study interdependence seen as 'trade efficiency' than as 'trade dependence', at least when the objective is to assess how the effect of trade depends on asymmetry.

The theoretical and empirical analyses have not identified any conditions under which asymmetric trade relationships might lead to increased conflict between states. The analysis clearly supports the general finding that high levels of trade are associated with low probabilities of conflict. Still, it suggests some limits on the degree to which trade promotes peace in the international system. Breaking down barriers to trade has only a negligible impact on the probability of conflict in relations between states of very different size. On the other hand, the empirical analysis reported here indicates that conflicts are most likely in symmetric dyads (also see

Oneal & Russett, 1997; Bennett & Stam, 2000). Trade is thus reducing conflict most for the most conflict-prone dyads.

The analysis has not covered all conceivable aspects of asymmetric relationships between states. It is conceivable that accounting for differences in export partner or commodity concentration, or differences in the extent to which states are exporting manufactured goods, would yield different conclusions. Still, the analysis offers some guidance as to how to most efficiently investigate these other aspects of trade asymmetry.

Part III

Development and the Liberal Peace

Chapter 7

Disentangling Democracy, Development, and Internal Armed Conflict

Abstract

> The chapter explores the relationship between development, democracy and civil war. I argue that we should expect the relationship between democracy and civil war to be contingent on development: Poor democracies are unstable and hence should be less efficient as institutions for conflict resolution, democratic institutions may require more resources than autocratic ones to contain insurgencies, and increased development brings with it a pressure for constitutional changes in autocracies that may turn violent. To test this, I estimate a set of Cox regression models, using three different measures of democracy, and three operationalizations of development: GNP per capita, percent literacy in the population, and the value of minerals exports as a share of total exports. I find strong evidence that democracy is correlated with civil peace only for developed countries, and for countries with high levels of literacy. Conversely, I find that the risk of civil war decreases with development only for democratic countries. This has implications for some recent theories of the determinants of armed conflict.

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7.1   Introduction

Democracy is often described as a system for peaceful resolution of political conflict. Democratic political systems are supposed to allow all parties to a conflict to be heard, decisions are made on the basis of rules all parties to the conflict agree to, open debates and a free press ensures that the decision-making is transparent, and the losing party in contentious issues is willing to comply with the outcome because the democratic constitution guarantees that the party may prevail in the future. And indeed, the democracies in the West have avoided lapsing into bloody armed conflicts in the past 50 years.[1] Still, cross-national statistical studies of the relationship between democracy and civil war are not able to reach a consensus on whether this relationship has been a regularity in the last 40-50 years. A number of studies (Chapter 3; Muller & Weede, 1990; Ellingsen, 2000; Fearon & Laitin, 2003, Reynal-Querol, 2002; Urdal, 2002) find an 'inverted-U' relationship between level of democracy and the probability of civil war: 'consistent' democracies and autocracies have a low probability of civil war, whereas 'inconsistent regimes' or 'anocracies' – political systems that combine autocratic and democratic features[2] – are estimated to have a higher risk of civil war. In Chapter 3, we find this 'inverted-U' relationship to hold when controlling for the stability of the political system.

Other studies, however (notably Collier & Hoeffler, 2002; Elbadawi & Sambanis, 2002) do not find a robust relationship between type of political system and the risk of civil war. Collier & Hoeffler takes this as support of the argument that opportunities for rebellion are more important than the grievances that might motivate them. In the same vein, Fearon & Laitin (2003) argue that 'given the right environmental conditions, insurgencies can thrive on the basis of small numbers of rebels without strong, widespread, freely-granted popular support – hence even in democracies'.

And, even if the inverted-U regularity holds, this implies that autocracies are equally peaceful as democracies, presumably because they are able to suppress the opposition so that no rebel movement can be organized. This is not entirely inconsistent with the picture of democracy as a system for peaceful resolution of political conflict. However, the observation that autocracies are equally successful in maintaining a domestic peace as

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[1] Arguably with the exception of Northern Ireland and the Basque conflict.

[2] According to the definition in Gates et al. (2003a), inconsistent regimes may have an elected parliament, but very limited franchise (e.g., South Africa under apartheid), or an elected parliament with very limited power relative to an elected executive (e.g., Russia in the 1990s).

democracies, makes one question the importance of democracy in reducing the risk of civil war. Fearon & Laitin (2003) interpret this finding more as due to the poor capability of such inconsistent regimes than a measure of the efficacy of democracy for conflict resolution.

The source of the discrepancy may be related to how one controls for development. A closer look at which democracies have experienced armed conflict is illuminating. According to the Uppsala data set (Gleditsch et al., 2002), there were 30 armed conflicts in 18 democracies in the 1960–2000 period (democracy defined using the Gates et al. (2003a) measure, described below). Three of these occured in countries that had an income per capita over the average for democracies (The Northern Ireland conflict, the Algeria conflict in 1961 which is coded as taking place in France,[3] and the Cyprus conflict in 1974). There were 43 conflicts in 32 autocracies in the period, 11 of which took place in countries with income per capita higher than the autocratic average: Argentina 1970, Rumania 1989, Yugoslavia 1991 (two conflicts), Panama 1989, USSR 1988, Liberia 1980, Iraq 1982, Saudi Arabia 1979, Yemen A.R., 1986, and Tunisia 1980. As many as 21 of the armed conflicts – 70% – in democracies took place in countries with income under the 25% quartile for democracies. The corresponding figure for autocracies were 13, or 35%. This suggests that armed conflicts tend to occur disproportionally in low-income democracies and in middle and high-income autocracies.

This is not so surprising. The relationship between development and democracy is well established: Democracies are stable only if they are embedded in developed economies, but this does not apply to autocracies. In this paper, I argue that this relates to armed conflict in two ways: Wide-ranging changes in countries' political institutions are often accompanied by violence, such that institutions that are fundamentally stable are more likely to preserve a civil peace. Moreover, many of the same factors that explain stable democracy have been shown to explain the absence of armed conflict.

In this chapter, I test systematically the hypothesis that the impact of democracy on the risk of armed conflict is contingent on development. I find democracy to reduce the risk considerably, but only where the conditions for stable democracy are present: relatively high per capita income, high literacy rates, and (to a lesser extent) a diversified economy. Likewise, I

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[3]The income per capita variable is coded for France without colonies. Since the colonial conflict is included in France, the income variable should have measured the average income in France including colonies, too. This data weakness tends to bias the results in this paper against the main argument.

find development only to reduce the likelihood of conflict in democracies.

I will define more precisely what is meant by 'development', and proceed to explore the relationship between development, democracy, and civil war, decomposing 'development' into three components: education, income, and the structure of the economy (e.g., industrialization and the extent to which the economy is dependent on primary commodities). I will discuss a set of contributions to the literature on the relationships between development, democratization, and civil war in terms of this decomposition. Moreover, drawing on the literature originating with Lipset (1959) on the relationship between development and democratization, I will argue that the peace-conducive effect of democracy is contingent on aspects of development.

7.2 Are Poor Democracies Able to Avoid Civil War?

Sections 2.2.1 and 2.2.2 pointed out that there are strong relationships between development and democracy, and between development and civil war. This may imply that the relationship between democract and civil war may be contingent on development. Development may affect the relationship through three routes: Through its impact on democratic stability, to differences in the amount of resources required for efficient handling of violent conflicts in democracies and in autocracies, and through the increased pressure for democratization in more wealthy states.

First, changes in political institutions are powerfully associated with a heightened risk of civil war. Factors that increase or decrease the stability or duration of different political institutions hence indirectly increase or decrease the probability of civil war. At the same time, development affects the duration of different types of political institutions differently. Hence, we would expect that the relationship between the type of political institutions and the hazard of civil war to be contingent on the development variables.

As discussed in Section 2.2.1, a high level of income is associated with high democratic stability. If the breakdown of a democratic system is commonly associated with organized violence or situations with illegitimate and weak, non-institutionalized governments, this lack of stability is enough to make us expect that poor democracies are more prone to civil war than rich democracies, and even more dangerous than poor non-democracies. There are also other aspects of democracy that makes one suspect that poor democracies are more prone to civil war than rich democracies:

Just as in poor autocracies, the control of the state and of political po-

sitions is relatively more important in poor democracies than in rich countries, since there are fewer alternative economic opportunities. Moreover, if the democratic system is perceived to be likely to break down, security dilemma considerations may be important: Allowing particular groups to power will increase their opportunities for persecuting their opposition in the future. Both of these heightens the stakes of the political conflict, which both increases the probability of democratic breakdown and of the conflict turning into a civil war.

The stability and sustainability of different political institutions thus implies that there should be an interactive effect between democracy and development in their effect on armed conflict. Two other aspects may reinforce this: Fearon & Laitin (2003) argue that increases in per capita income decreases the likelihood of insurgencies partly because it strengthens the state's overall financial, administrative, police and military capabilities, and renders the territory more 'disciplined'. This may be particularly true in democracies: Maintaining order in an autocratic state is arguably comparatively inexpensive: Suspected members of the opposition may be arrested without trial. It is not even necessary to locate the precise members of the opposition group to deter its activities, as long as they perceive a sufficiently high probability of arrest or other forms of persecution. Democracies cannot legitimately use these measures. Conceivably, the lack of legitimate means of repression of the organization of opposition groups and the expression of their views can open up opportunities for rebellion, which only a powerful democratic state can contain.

As reviewed in Section 2.2.2, there is a clear, negative relationship between the level of average income and the risk of internal conflict. However, the research reviewed in Section 2.2.1 indicates that increased income only reduces the risk of institutional changes for non-democracies. As shown in Chapter 3, such changes are lead to organizes violence. Hence, even if there is no such difference in the costs of containing insurgencies, the net effect of increasing per capita income differs between democracies and autocracies, since the increased capabilities of autocracies due to increased wealth is counteracted by an increasing pressure for democratization (Davies, 1962; Lipset, 1959; Gates et al., 2003, Boix & Stokes, 2002), possibly delegitimizing and destabilizing the political system. If this pressure is sufficiently strong, one would not expect autocracies to become less prone to violent breakdown with increasing wealth – at least not to the same extent as democracies do.

The relationship between income and democratic civil war proneness

possibly depends on the structure of the economy. Autocracies with a high GDP per capita with income predominantly from natural resources – rentier states – have sufficient income to buy off or repress protests through absence of taxes, through elaborate patronage systems, and high military spending (Ross, 2001). In democracies with a high GDP per capita largely due to natural resource extraction, on the other hand, democracy is non-sustainable because the income is based on non-mobile capital (Boix & Garicano, 2002) or it may be used to strengthen the position of the incumbent, which will undermine democracy in the long run (Wantchekon, 2000). This implies that autocracies become less civil war-prone the more resource rich they are, whereas democracies become more civil war-prone the more resource rich they are.

7.2.1   Hypothesis to Test:

This discussion may be summarized in an empirically testable hypothesis:

Hypothesis 7.1 *Democracies have a lower probability of armed conflict than autocracies, but only if income is high, literacy rates are high, and/or the dependence on primary commodities is low*

An alternative formulation of this is that

Hypothesis 7.2 *Income, education, and independence of natural resources are negatively related to the probability of armed conflict, but more strongly the more democratic is the country*

In terms of parameter estimates, these hypotheses predict that the interaction term between democracy and development is negative in models with continuous or ordinal measures of democracy. In models with a categorical, trichotomous measure of democracy, the interaction term between autocracy and development should be positive, and the interaction term between demcoracy and development should be negative. In all the models, the estimates for the democracy and development main terms should both be negative.

Most previous studies have also entered a quadratic term of the democracy variable to test the 'inverted-U' hypothesis. The argument above makes no predictions for the how development should affect the inverted-U relationship between democracy and armed conflict. I will also estimate models with square terms or trichotomous democracy variables to

see whether the relationship between democracy and the hazard of armed conflict is non-linear.

To some extent, political instability is an intermediate variable in the argument above. Low-income democracies are unstable bercause they are poor, and this instability often leads to armed conflict. If development – income, literacy, or mineral dependence – is the more fundamental variable, we would expect the magnitude of the estimate for the instability variable to drop, possible to zero. This is likely to happen only if we include an interaction term between democracy and development, since development has different effects on the stability of democracies and autocracies. When controlling for development only without the interaction term, the divergent effects on stability cancel each other out, and the political instability variable becomes a more powerful predictor of armed conflict.

7.3   Research Design

The hypotheses are tested using a calendar-time Cox regression model as described in Chapter 5 and applied to civil war in Chapter 3.[4] The analysis in Chapter 3 is extended along several lines, in addition to adding the development-democracy interactions. Firstly, the dependent variable is based on the Uppsala data set, recently extended back to 1946 (Gleditsch et al., 2002). Secondly, the analysis addresses an endogeneity problem inherent in the Polity democracy index, and uses three alternative indicators of democracy to ensure that the results are robust to changes in the definition of democracy. Finally, the analysis controls for a wider set of control variables.

The probability of the outbreak of an armed conflict is likely to be dependent on how long time has passed since there was an armed conflict in the same country. In particular, spells of peace are likely to have a

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[4]The Cox regression model assumes that the effect of any covariate has a proportional and constant effect that is invariant to time (Box-Steffensmeier & Jones, 2001) – the baseline hazard of civil war is allowed to vary freely over time, but any difference between the baseline hazards of individual countries is due to the covariates only. I test whether this proportional hazard assumption is violated in all models presented below, and find it always to hold. (Incidentally, since logit or probit models are discrete-time survival models (Beck, Katz & Tucker, 1998), researchers using this model implicitly also make this assumption.). In the calendar-time Cox regression model, this means that the effect of variables is constant over calendar time – there is nothing to support the view that the democracy variables have changed their impact on the likelihood of armed conflict from 1960 to 2000. The tests reported here imply that this assumption is tenable.

positive duration dependence.[5]. To handle this, I enter a decaying function of the time passed since a previous conflict started into the model. In a decaying function, the value of the function is decreasing at a constant rate, implying that the hazard of armed conflict outbreak is very high just after one has ended, but that this heightened risk is reduced to some stable level after some time. The general form of the decaying function is $2^{-\frac{T}{\alpha}}$ where T is the time since the period started, and α is the half-life parameter – the time after which the value of the decaying function is reduced to one half. This function is also used for two other variables, described below. I ran some of the models presented below for several values for the half-life parameters α, and chose those that maximized the log likelihood of the model. I will refer to the decaying function variables as 'proximity of' variables below.

The Uppsala data set records all armed conflicts with at least 25 battle deaths per year. This threshold is in one respect lower than the threshold most often used in comparable studies – 1,000 battle deaths over the course of the conflict. If anything, this low threshold is likely to bias the results against the main argument of the paper, since the conflicts registered in developed democracies tend to be relatively minor.

The Uppsala data set also deviates from the data set used in Chapter 3 since it allows multiple conflicts in the same country. In India, for instance, there were up to eight parallell conflicts in the 1990s. This raises some problems for the handling of temporal dependence which is discussed below. To further assess the robustness of the results, I estimate the model using the stricter definition of armed conflict employed in Chapter 3. This dependent variable is based on the Correlates of War civil war data set (Singer & Small, 1994), and supplemented with a number of conflicts from the data set in Collier & Hoeffler (2002).

7.3.1   Core Variables

Income   The Income or GDP per capita variable was taken from World Bank (2002) for the 1960–1998 period. The variable is measured as the natural logarithm of income in constant 1995 US dollars.

Literacy   The Literacy variable was taken from World Bank (2002). Missing data points were imputed by means of Stata's imputation algorithm

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[5]See Chapter 5 and Beck, Katz, and Tucker (1998) for discussions of such temporal dependence in empirical studies of war outbreak.

(Stata Corporation, 2001:vol 2, pp. 69–73). The variables used in the imputation are reported in Appendix E.1.

Dependence on Mineral Exports The variable measures the value of fuel, ore and metals exports as a share of total merchandise exports. The data were taken from World Bank (2002). Missing data points were imputed by means of Stata's imputation algorithm (Stata Corporation, 2001:vol 2, pp. 69–73). The variables used in the imputation are also reported in Appendix E.1.

Collier & Hoeffler (2002) use the exports of all types of primary commodities as a share of GDP in their analysis. I prefer to exclude food and other agricultural products from the measure, since the remaining commoditiese – in particular, oil and minerals – are the ones identified by Ross (2001) to affect the level of autocracy in the country. Moreover, food and agricultural products are less frequently associated with conflict than minerals (Le Billon, 2001:573).[6]

I chose to divide by total merchandise exports rather than by GDP, since exports/GDP is correlated with the size of the economy – in general, small countries trade more relative to their GDP than large countries. Dividing mineral exports by total exports therefore gives a better picture of how important minerals is relative to the rest of the economy.

Regime type Most earlier studies have used the Polity democracy index (Jaggers & Gurr, 1995) and included the square term of the index to model the inverted-U relationship. However, the Polity index is problematic to use in studies of civil war and political violence, since the Polity project codes polities with factionalism and violence as imperfect democracies: To achieve the maximum democracy score, the Polity sub-indicators 'Regulation of participation' and 'competitiveness of participation' must be coded as 'regulated' and 'competitive', respectively (Jaggers & Gurr, 1995: 472). However, 'regulation' is coded as 'factional' if 'there are .... political groups which compete for political influence ... but competition among them is intense, hostile, and frequently violent' (Gurr, 1997: 12). Such polities are also likely to be coded as having 'Factional competition'. Hence, countries with wide-spread political violence are likely to be coded as not-perfect democracies by definition. This can potentially explain why some studies find an inverted-U shaped relationship between level of democracy and civil

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[6] An exception is drug crops, but these incomes rarely enter official statistics in any case.

war.

To solve this problem, I use only the XCONST component of the Polity data set. This indicator is highly correlated with the overall indicator (Gleditsch & Ward, 1997), but avoids the problem with 'factional participation'. I also estimate the models using a modified version of Vanhanen's (1997) Polyarchy measure. Vanhanen has collected data on 'Participation' – the share of the population actually voting in elections, and 'Competition' – the share of the votes for parties other than the largest party. He combines these two variables by multiplying them. This ensures that political systems with high participation but no competition (only one party) are not coded as democratic. However, Gates et al. (2003a) argue that the measure is somewhat biased in favor of political systems with extremely fragmented party systems. According to the measure, countries where the largest party only gets 25% of the votes is considered *twice* as democratic as a country where the largest party received 63% of the votes. This is not necessarily true. To reduce this bias, Gates et al. (2003a) suggest a modified version of the index developed in Gates et al.: If Competition is less than 30%, Participation is multiplied by (Competition/30%). With this modification, only political systems where the largest party receives more than 70% of the votes are penalized in the index for having low competition. Otherwise, the index uses the Participation component only. The measure is log-transformed to model that the marginal impact of one percent higher participation on level of democracy is diminishing.

Finally, I use the combined Polity-Polyarchy regime type indicator developed in Gates et al. (2003a): The indicator combines the Polity Executive constraints and Regulation of Executive sub-indicators with the (modified) Polyarchy index to classify political systems into four categories: Autocracies, Inconsistent regimes, Democracies, and Caesaristic Regimes. I merged the Caesaristic and Inconsistent regimes into one category labeled 'Inconsistent' to reduce the number of parameters.[7] A political system is coded as autocratic if the executive is recruited through ascription or designation, the executive is unconstrained or only 'moderately constrained' by competing institutions (1<=XCONST<=4), and less than 1.65% of the population participate in elections.[8] A political system is coded as demo-

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[7] All models reported in the paper were also estimated without merging these two categories. In none of the models were the hazard of civil war of the Caesaristic regimes significantly different from the Inconsistent baseline.

[8] More precisely, the adjusted Polyarchy index is lower than 1.65%. A system where 99% of the population vote, but the largest party obtains 99.5% of the votes is also under this threshold.

cratic if the executive is recruited through regulated, open elections, the executive is subject to at least substantial limiations ($5<=$XCONST$<=7$), and effective participation is over 12% of the population. A political system is coded as caesaristic if the executive is recruited by self-selection by the seizure of power. I also use an ordinal version of this indicator, where Autocracy is coded as -1, Inconsistent and Caesaristic as 0, and Democracy as 1. By setting the inconsistent/caesaristic category to zero, I ensure that this category is the baseline category in all analyses using the Gates et al. measure.

In all models, I used information the political system at a date six months before the date of observation to reduce endogeneity problems.

Interaction terms   I created interaction terms between GNP per capita, Literacy, and Mineral Exports, and the various regime type variables. To minimize collinearity, all variables entering interaction terms were centered around their means by subtracting the mean for each variable from each observation.

7.3.2   Control Variables

In addition to the variables listed here, I estimated models controlling for a number of additional variables that never were significant or too closely related to the variables above. These and the results from models including these are reported in Appendix E.1.

Growth   Growth is operationalized as the difference between ln(GNP per capita) in the year before the observation and ln(GNP per capita) two years before the observation. Data sources are the same as for GNP per capita.

Primary Commodity Exports/GDP   To supplement the Mineral exports/total exports variable, I enter a Primary commodity exports variable which includes all types of primary commodities and measure the dependence as a share of GDP. The variable was taken from Collier & Hoeffler, 2002.

Mountaineous Terrain   The variable measures the share of the country's terrain that is mountaineous. The variable was taken from Collier & Hoeffler, 2002.

Ethnic Dominance   The Ethnic dominance variable is a dichotomous indicator which is 1 if 45-90% of the population belongs to a single ethnic group. The variable was taken from Collier & Hoeffler, 2002.

Proximity of Regime Change   For each observation, I computed the time in days since the last regime change, operationalized as a change that leads from one of the four regime types described above, or since the country became independent. The time was transformed into the 'Proximity of' function by means of the decaying function $prc = 2^{-\frac{T_{rc}}{0.25}}$ where T_{rc} is the number of years since the last regime change in the country, and the halflife α is 0.25 years.

ln(Population)   Population is one of the most robust predictors of armed conflict. In small countries, a conflict with a given low intensity (measured as number of persons killed per capita) is not likely to reach the 25 battle deaths criterion. In a large country, a conflict with the same intensity has a greater chance of exceeding the threshold. Another way to put this is to think of people's motivations for inciting or contributing to an armed conflict are uniformly distributed among individuals. Only individuals with a motivation over a certain fractile of this distribution are likely to join a rebel group. With a uniform distribution, rebel groups of the required size is more likely to form the higher the number of individuals to recruit form. A similar argument might be made for the government's incentives to use force against any citizen.

Population data were taken from World Bank (2002). The variable was log-transformed to reduce the impact of very large countries.

Proximity of Armed Conflict   For each observation, I computed the time in days since the last armed conflict in the country started. The time was transformed into the 'Proximity function' by means of the formula $p_{ac} = 2^{(-\frac{T_{ac}}{2})}$ where T_{ac} is the number of years since the last conflict and the half-life is 2 years. If the country has had no armed conflict since 1946, the variable is coded as zero.

In Armed Conflict   The coding of the dependent variable allows multiple armed conflicts simultaneously (as in India and Myanmar, cf. Gleditsch et al. 2002: 630–631). The 'In Armed conflict' variable denotes whether a conflict is going on in the country at the time of observation.

Proximity of Armed Conflict * In Conflict Interaction   If a conflict is going on in a country, the Proximity of Armed conflict variable will be close to the maximum 1: An earlier outbreak of conflict is very recent or proximate. However, this is a situation which is different from the situation normally controlled for with a temporal dependence variable (e.g., as in Chapters 3, 5, and 6, or in Beck, Katz & Tucker, 1998); the fact that the risk of (renewed) armed conflict is dependent on how long time has elapsed since an armed conflict *ended* in the country. Multiple and overlapping conflicts in the same country are quite rare, and may even be impossible by construction in small countries: In such countries, there is only 'room for' one conflict at a time – rebel groups are likely to be sufficiently close to each other to merge or coordinate their actions, such that their activity would be coded as one conflict in the Uppsala data set. This also applies to new rebel groups joining the conflict, or the diffusion of the conflict to new geographical areas that are close to the original conflict. Hence, the probability of a second conflict is likely to be much lower than the probability of the first conflict, and we should expect the Proximity of Armed Conflict variable to have another estimate in in-conflict situations than in after-conflict situations. To account for this, I included the interaction between the Proximity of armed conflict and In conflict variables.

7.4   Results

7.4.1   Income as Indicator of Development

Tables 7.1 and 7.3 report the results from estimating a calendar-time Cox regression model of the hazard of armed conflict as a function of democracy, development measured as income (GDP per capita), and a set of control variables. To allow focusing on the variables of interest, the estimates for the control variables for Model 1 are reported in Table 7.2. These control variables were included in all of the models presented in the following tables, in addition to those presented. The estimates for the control variables are only negligibly different in the different models. The rationale for selecting just this subset is given in Appendix E.1. A robust estimator of variance (StataCorp 2001a:254–580) was used to produce estimates for standard errors.

Table 7.1 estimates the model using the Polity 'Executive Constraints' variable. Model 1 replicates the results in Collier & Hoeffler (2002): controlling for income, there is no significant relationship between regime type/executive constraints and the risk of armed conflict. The model in-

	Model 1	Model 2	Model 3
Indicator of democracy	Executive constraints	Executive constraints	Executive constraints
Explanatory Variable	$\widehat{\beta}$ (*s.e.*)	$\widehat{\beta}$ (*s.e.*)	$\widehat{\beta}$ (*s.e.*)
Democracy index	-0.013 (0.050)	-0.084** (0.047)	-0.091** (0.042)
$(\text{Democracy index})^2$	0.0048 (0.022)	-0.0041 (0.026)	
ln(GNP per capita)	-0.34*** (0.083)	-0.14 (0.11)	-0.32*** (0.069)
Democracy index* ln(GNP per capita)		-0.10*** (0.032)	-0.11*** (0.030)
$(\text{Democracy index})^2$* ln(GNP per capita)		-0.032** (0.016)	
$2\left(LL_{int} - LL_{\tilde{}int}\right)$ $(d.f.)$ χ^2 (*p*-value)		16.97 (2) (0.0002)	13.69 (1) (< 0.0005)
No. of countries	127	127	127
No. of conflicts	122	122	121
Time at risk (days)	$1,585,120$	$1,585,120$	$1,585,120$
p. h. a test $\chi^2, (d.f.)$ *p*-value	5.39 (11) 0.91	6.89 (13) 0.91	4.89 (11) 0.94
LL_o	-573.67	-573.67	-573.67
LL_{model}	-536.27	-527.78	-529.44
Robust standard errors in parentheses. * : $p < 0.10$, ** : $p < 0.05$,*** : $p < 0.01$ (one-sided tests)			

Table 7.1: Risk of Armed Conflict, Income as Indicator of development, All Conflicts

cludes the square term of the constraints variable to capture any inverted-U relationship. This lack of relationship between democracy and the probability of conflict is also replicated using the two other indicators of democracy. The estimate for the income variable, on the other hand, is negative and significant.

Models 2 and 3 test whether there is an interaction between development and democracy. Model 2 includes the square term for Executive constraints, whereas Model 3 excludes it. In both models, the estimates for the interaction terms are negative and significant. Model 3 is more parsimonious than Model 2, and the log likelihood drops only with 1.66 points relative to Model 2, so I will limit the discussion of the interpretation of the parameters to the model without the square term.[9] In Model 3, all the three terms of interest are negative and statistically significant as predicted by Hypotheses 1 and 2. The log likelihood increases from -536.27 to -529.44, which is significant at the .0001 level. This chi-square statistic for the change in log likelihood relative to a model without interaction term(s) is reported in the row labeled $2\left(LL_{int} - LL_{\sim int}\right)$ in this and all other tables, where LL_{int} is the constrained model and $LL_{\sim int}$ is the less constrained model.[10]

In an interaction model, the main term estimates should be interpreted as the effect of the term when the other variable is zero (Friedrich, 1982). Since all variables entering the interaction terms in this model are centered around their means, the interpretations of the main terms are the effect of each variable when the other is at the mean. For an average-income country, with GNP per capita at 1800 US dollars, an increase in executive constraints significantly reduces the risk of armed conflict. And at the average level of constraints (XCONST=3.9), increasing income significantly decreases the likelihood of conflict. The interaction term is also negative, implying that income and constraints reinforce each other: The higher is the income level in a country, the more does an increase in democracy reduce the risk of conflict. Vice versa, the more democratic is a country, the more does an increase in income reduce the probability of conlict.

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[9] A likelihood-ratio test fails to reject the hypothesis that democracy squared and the democracy squared-development interaction are both 0, with a *p*-value of 0.19. Interpreted together with the other estimates, the estimates reflect that countries with intermediate constraints on the executive have a risk of armed conflict close to those with low constraints for all values of GNP per capita rather than the inverted-U relationship found in other studies.In a plot corresponding to Figure 7.1 below, the estimated line for a polity with moderate constraints is just below and parallell to that for no constraints.

[10] The reported likelihood-ratio test statistics refer to estimation of identical models, but with ordinary (non-robust) variance estimates.

Explanatory Variable	$\widehat{\beta}$	(*s.e.*)
Growth$_{\text{previous year}}$	-2.31***	(0.47)
Mountaineous Terrain	0.0029	(0.0032)
Ethnic Dominance	0.16	(0.18)
Proximity of Regime Change	-0.20	(0.85)
ln(Population)	0.22***	(0.078)
Proximity of Armed Conflict	1.57***	(0.46)
In Armed Conflict	0.015	(0.40)
Proximity of A.C * In Armed Conflict	-1.29***	(0.74)
Robust standard errors in parentheses. * $: p < 0.10,$ ** $: p < 0.05,$*** $: p < 0.01$ (one-sided tests)		

Table 7.2: Risk of Armed Conflict, All Conflicts – estimates for control variables, Model 1

This relationship is illustrated in Figure 7.1, which plots the estimated risks of armed conflict relative to the baseline based on the estimates of Model 3, Table 7.1. The estimated risk is plotted as a function of GDP per capita for the two extreme levels of Executive constraints: The gray line represents a polity with no constraints (XCONST= 0), and the black line a polity where the executive or at par with or subordinated to another institutions (a legislature) (XCONST=7).[11] Corresponding lines for polities with constraints between these extremes would fall between the two plotted lines. The *y*-axis is the estimated risk relative to the baseline, which is a polity with mean constraints (XCONST just under 4) and mean GNP per capita (US$1797). The thin dotted and gray lines indicate 95% confidence intervals for the estimated lines.[12] The baseline risk (the risk of a coun-

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[11] 25% of the observations have the lowest level of constraints, and 29% have the highest level.

[12] The confidence interval lines are plotted using the formulae for conditional standard errors derived in Friedrich (1982:810, see also Franzese et al., 2002). The relevant part of the estimated linear component of the model is $\widehat{Z} = \widehat{\beta}_1 dem + \widehat{\beta}_2 dev + \widehat{\beta}_3 dem * dev$ (this is the estimated log relative risk when holding the other variables constant). The standard error for the *dem* estimate as a function of *dev* is then

$$s_{\left(\widehat{\beta}_1 + \widehat{\beta}_3 dev\right)} = \sqrt{var\left(\widehat{\beta}_1\right) + dev^2 var\left(\widehat{\beta}_3\right) + 2cov\left(\widehat{\beta}_1, \widehat{\beta}_3\right)}$$

. Using the estimated variance-covariance matrix, I plotted the confidence intervals as $\widehat{Z} \pm t_{.025} * s_{\left(\widehat{\beta}_1 + \widehat{\beta}_3 dev\right)}$.

	Model 4	Model 5	Model 6
Indicator of democracy	Gates et al. categorical	Gates et al. ordinal	Modified Polyarchy
Explanatory Variable	$\widehat{\beta}$ (s.e.)	$\widehat{\beta}$ (s.e.)	$\widehat{\beta}$ (s.e.)
Inconsistent (0)	(ref.cat.)	(ref.cat.)	(ref.cat.)
Autocracy (1)	0.24 (0.28)		
Democracy (2)	−0.085 (0.28)		
Democracy index		−0.16 (0.13)	−0.11** (0.064)
ln(GDP per capita)	−0.33*** (0.14)	−0.32*** (0.069)	−0.33*** (0.065)
Autocracy (cat.)* ln(GDP per capita)	0.36** (0.18)		
Democracy (cat.) * ln(GDP per capita)	−0.34** (0.18)	−0.35*** (0.086)	−0.15*** (0.044)
$LL_{int} - LL_{\tilde{}int}$ (d.f.) χ^2 (p-value)	16.13 (2) (0.0003)	16.12 (1) (0.0001)	12.52 (1) (0.0004)
No. of countries	127	127	127
No. of conflicts	122	122	135
Time at risk (days)	1,585,120	1,585,120	1,623,765
Test of prop. haz. ass. $\chi^2, (d.f.)$ p-value	13.92 (13) 0.38	10.11 (11) 0.52	7.67 (11) 0.74
LL_o	−573.67	−573.67	−638.33
LL_{m_3}	−527.96	−528.03	−589.41
$* : p < 0.10, ** : p < 0.05,$***$: p < 0.01$ (one-sided test)			

Table 7.3: Risk of Armed Conflict, Income as Indicator of development, All Conflicts
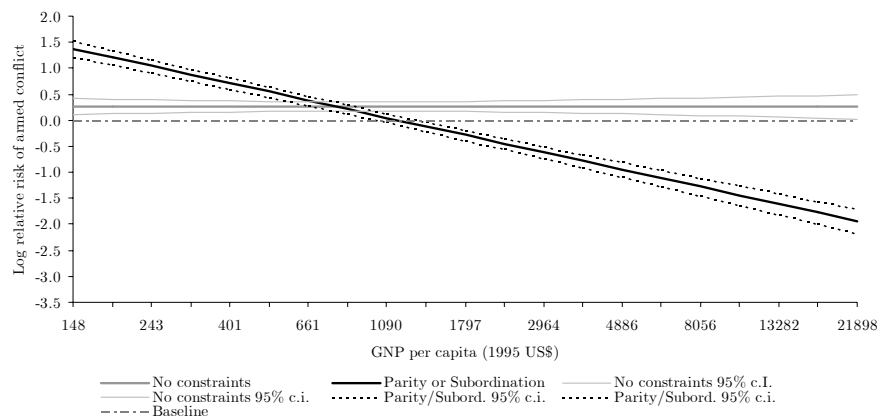
Figure 7.1: Estimated Relative Risk of Armed Conflict By Income and Executive Constraints (Model 3)

try with average income and average constraints) is represented by a gray dashed line.

The figure shows that increasing income only reduces the risk of armed conflict for high-constraints countries, according to these estimates. In countries with non-constrained executives, increasing income does not change the probability of conflict. Likewise, the figure shows that democracy reduces the risk of armed conflict only for high-income countries. For low-income countries, democracy appear even to *increase* the hazard of conflict.

The estimated lines for constrained and non-constrained polities cross at approximately 800 US\$ per capita, or the level of Zimbabwe and Honduras in the 1990s. A conditional test of significance can be read out of the figure: for values for Income higher than that where the upper confidence interval for high-constraints polities crosses the baseline, democracies have a significantly lower risk of armed conflict than the baseline. For this model, this happens around 1350 US\$, or the value of Morocco or Bulgaria in the 1990s. This value is close to the median for the world in the 1960-2000 period.

The estimates for the control variables in Tables 7.1 and 7.3 are consistent with other studies. Growth is negatively related to the probability of armed conflict onset. A country with 5% per capita growth is estimated to have approximately 11% lower risk of conflict than one with zero per-capita growth. The estimate for ln(Population) is positive and significant: Large

countries have more conflicts than small countries. The estimates for these two variables vary only little in Models 1–14. Mountaineous terrain and ethnic dominance are also positively related to conflict, but these results are not very robust.

Proximity of regime change is not significantly related to conflict in this model. This contrasts with the results in Chapter 3 and Fearon & Laitin (2003). The difference may be due to a stricter definition of regime change in this paper than in the other two papers, and a more inclusive dependent variable.[13] As will be seen in Section 7.4.4, institutional changes seem to be more robustly associated with civil wars than with the low-intensity conflicts analyzed in Models 1–12. Finally, the control for development and the development-democracy interaction may explain the difference: If low income largely accounts for political instability (but only in democracies), political instability is an intervening variable, and we would expect its importance to diminish when including the income variable and the interaction term.

As expected, the Proximity of armed conflict main term is positive and strongly significant: Armed conflicts are more likely just after another conflict has started. The Proximity – In conflict interaction term, on the other hand, is negative and smaller in magnitude than the main term, and also significant. The sum of these estimates are plotted as a function of time since conflict onset in Figure 7.2, for a country that has an armed conflict that lasts for five years. After a conflict has started in a country, the estimated probability of a (new) conflict is slightly higher than before the conflict started. As soon as the conflict ends, the probability increases, to a level higher than before the conflict. This heightened probability then gradually decays, with the additional risk being halved every second year.

Models 4–6 in Table 7.3 report the results when estimating the model for two other measures of democracy. In Model 4, Gates et al.'s tricotho-mous measure is used. The estimates indicate that the risk of armed conflict decreases with increasing income. The estimate for the Autocracy*Income term is positive, and that for the Democracy*Income is negative, as hypothesized. Both estimates are significant at the 5% level (one-sided tests). The regime type main term estimates are not significant, implying that regime type does not significantly affect the probability of conflict when income is

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[13]In this paper, regime change is defined as a change between any of the four Gates et al. regime types described in Section 7.3.1. In Chapter 3, change was defined as any institutional change that lead to a minimum of two points change in the Polity Democracy-Autocracy index. Fearon & Laitin (2003) set the threshold at three points change.
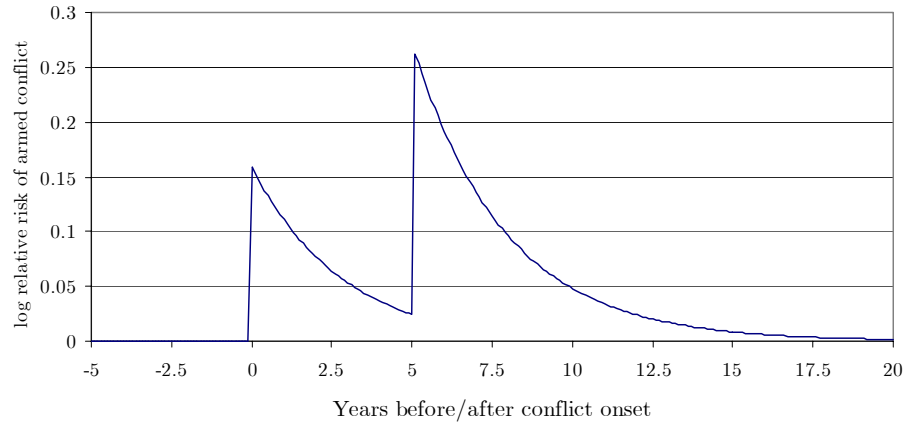
Figure 7.2: Estimated Risk of Armed Conflict as Function of Time Since Previous Conflict

at the mean. Since the estimates indicate that the line for the inconsistent regimes largely fall in the middle between autocracies and democracies, I used a recoded version of the model that assumes ordinality: Autocracies were given the value -1, inconsistent 0, and democracies $+1$. The results from estimating this Model 6 yield a clearer picture: The interaction term is now significant at the 0.01 level.

This model's estimated risks of armed conflict are plotted in Figure 7.3. As in the previous figure, democracies are represented with a black line and autocracies with a gray line. As above, increasing income decreases the probability of armed conflict more the more democratic is the country: For democracies, the curve is strongly downward-sloping. For autocracies, the level of income affects the probability of civil war only marginally. The curves cross at slightly higher income level, approximately at US$ 1,100. The estimated confidence intervals show that the results are less clear when using this measure of regime type than when using the Executive constraints variable: In this model, democracies are significantly less likely to experience armed conflicts when GNP per capita is higher than US$ 3,300, and significantly more likely under US$ 400.

Model 6 reports the estimates for the model including Vanhanen's Polyarchy measure of democracy. All the three terms are significant, and the
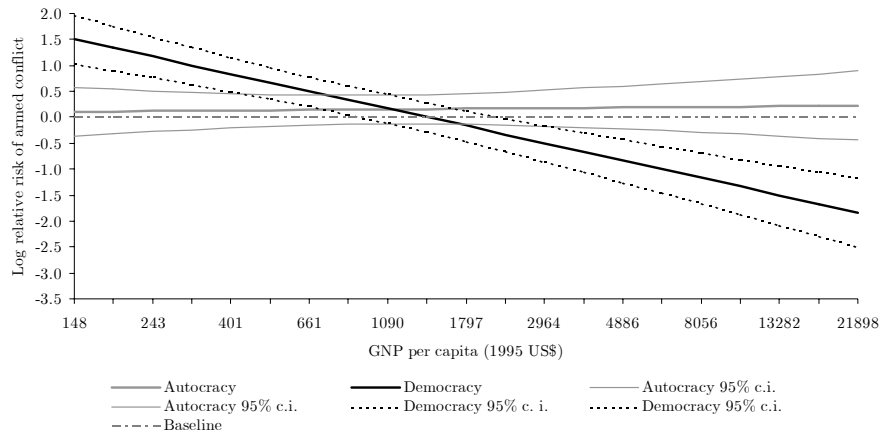
Figure 7.3: Estimated Relative Risk of Armed Conflict by Income and Ordinal Gates et al. Measure (Model 5)
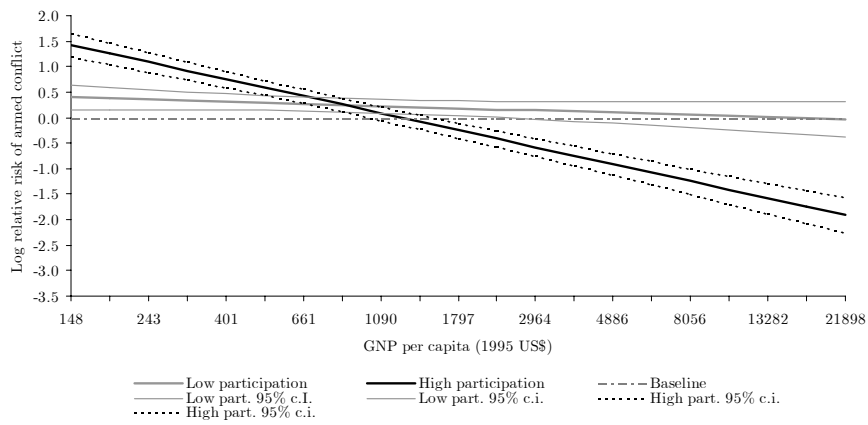
Figure 7.4: Estimated Hazard of Armed Conflict by GNP per capita and Polyarchy Score (Model 6)
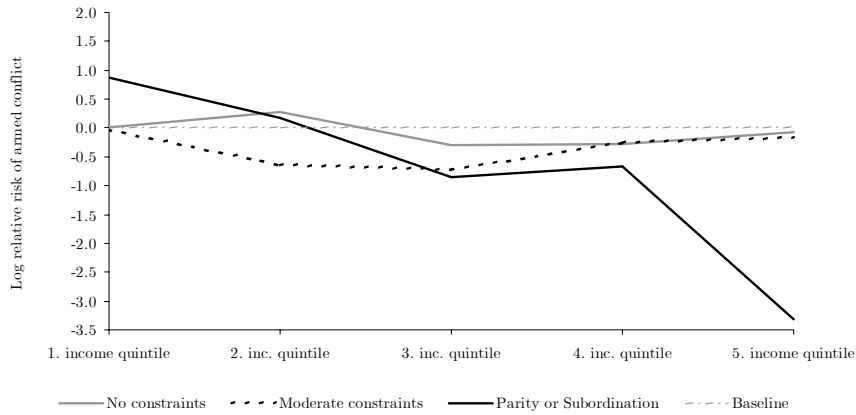
Figure 7.5: Estimated Relative Risk of Armed Conflict By Income and Executive Constraints, Categorical Indicators

interaction term is significant at the 0.01 level.[14] Figure 7.4 plots the estimated log relative risk of armed conflict as a function of GNP per capita for two values of Polyarchy: The gray line plots the function for a polity with 0 (effective) participation. 42% of the observations has this value. The black line refers to the 95% percentile which corresponds to an effective participation of 54%. The picture here is very similar to that in Figure 7.1 : The two lines cross each other at roughly the same income level as in Figure 7.1, and the confidence intervals are quite similar.

In all these models, the estimated differences in hazard of civil war are substantially important: A difference of 1 in log relative risk – the unit along the y axis – is equivalent to having a 2.7 times higher probability of civil war. Comparing the extreme observations (the 5- and 95-percentiles) in terms of income for democracies implies that low-income democracies are 15-20 times more likely to have civil war as high-income democracies. Low-income democracies have approximately a three times higher estimated risk of civil war than low-income autocracies, whereas high-income democracies are eight times less civil war-prone than high-income autocracies.

The estimate for the democracy square term in Model 4 indicates that the relationship between democracy, development, and the log relative risk of armed conflict may not be linear. To assess this, I recoded the Income

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[14]I also estimated a model including the square of Participation. The square terms were not statistically significant.

variable as a five-step categorical value, and the Executive Constraints variable as a trichotomous variable. The cut-off points for the Income variables were the quintiles. Controlling for the same factors, I then estimated the model with these terms and the interaction terms they form. The results are reported in Figure 7.5. As before, the most democratic countries are represented with a black line, the autocratic with a gray line, and the inconsistent with a black dotted line. The figure shows that the interaction effect is most marked for the highest Income quintile, where the 'Parity or Subordination' group has a clearly lower risk of armed conflict than any others. The democracies in the fourth quintile are more conflict-prone than the linear model implies.

7.4.2 Literacy

Table 7.4 presents the results from the corresponding model using Literacy as the indicator of development. In Model 7, Executive constraints is the democracy indicator. Both the main terms and the interaction term are negative and significant. The estimated risk of armed conflict relative to the baseline is plotted in Figure 7.6. The pattern is similar to that in Figure 7.1: The risk of armed conflict is decreasing in literacy for high-constrained regimes, but not for non-constrained regimes. The confidence intervals indicate that these results are even more clearly defined than in the income-constraints model. The two estimate lines cross each other at a literacy level of 52% – the level of Egypt and India. In this model, illiterate high-constraints countries are estimated to have a significantly higher risk of armed conflict than illiterate low-constraints countries. There are not many such democracies with low literacy rates – in the late 1990s, Benin and Nepal were the only examples. Other cases include Nigeria in the early 1960s and early 1980s, Uganda, Sudan, Somalia, and Burma in the 1960s, and India, Pakistan, and Bangladesh in the 1970s.[15] Countries with high literacy levels and low constraints include several Latin American countries and Spain and Portugal before democratization. Examples from the late 1990s are Congo, Swaziland, Vietnam, and some countries in the Middle East.

In Model 8, the Gates et al. categorical democracy variable was used as indicator of democracy. Here, too, the democracy, literacy and literacy-democracy interaction terms are negative and statistically significant.

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[15] All these examples have literacy levels under 36%, the value under which the confidence intervals do not overlap in Figure 7.6, and were coded as having an executive that was at par with or subordinate to a constraining body.

	Model 7	Model 8	Model 9
Indicator of democracy	Executive constraints	Gates et al. (categorical)	Modified Polyarchy
Explanatory Variable	$\widehat{\beta}$ (s.e.)	$\widehat{\beta}$ (s.e.)	$\widehat{\beta}$ (s.e.)
Inconsistent (0)	(ref.cat.)	(ref.cat.)	(ref.cat.)
Autocracy (1)		−0.18 (0.34)	
Democracy (2)		−0.20** (0.25)	
Democracy index	−0.070* (0.048)		−0.062 (0.070)
Literacy	−1.74*** (0.30)	−1.12*** (0.45)	−1.72*** (0.31)
Autocracy (categorical)* Literacy		0.13 (0.97)	
Democracy (categorical)* Literacy		−1.99*** (0.69)	
Democracy index* Literacy	−0.50*** (0.15)		−0.54*** (0.21)
$LL_{int} - LL_{\tilde{}int}$ (d.f.) χ^2 (p-value)	10.08 (1) (0.001)	6.52 (2) (0.038)	6.05 (1) (0.014)
No. of countries	126	126	126
No. of conflicts	118	118	131
Time at risk (days)	$1,546,607$	$1,546,607$	$1,585,117$
Test of prop. haz. ass. $\chi^2, (d.f.)$ p-value	8.31 (11) 0.69	11.08 (13) 0.60	8.14 (11) 0.70
LL_o	−554.80	−554.80	−619.32
LL_{m_3}	−515.75	−516.86	−576.97
Robust standard errors in parentheses $*: p < 0.10, \;\; **: p < 0.05,\; ***: p < 0.01$ (one-sided test).			

Table 7.4: Risk of Armed Conflict, Literacy as Indicator of development, All Conflicts
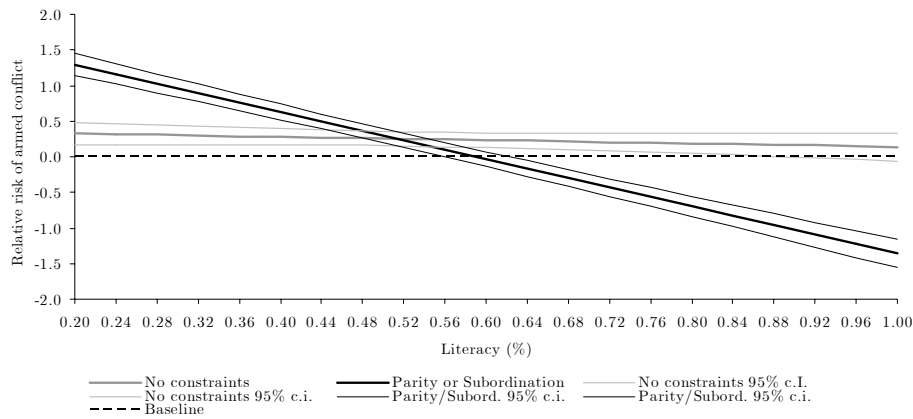
Figure 7.6: Estimated Hazard of Armed Conflict by Literacy and Executive Constraints (Model 7)

Model 9 was estimated using the modified Polyarchy variable. The estimates indicate a similar pattern as that of Models 7 and 8, and the estimates have the same level of significance.

7.4.3 Mineral Dependence

Table 7.5 presents the results from the corresponding models using exports of minerals (fuels, ores, and metals) as share of merchandise exports as the indicator of development. In all the models, the democracy indicator is negative and significant. Consistent with the results of Fearon & Laitin (2003), Reynal-Querol (2002), and (with some caveats) Elbadawi & Sambanis (2002), I do not find the minerals variable to be significant in any of the models. This contrasts the findings in Collier & Hoeffler (2002).[16] This is puzzling, given the good theoretical reasons and lots of case study evidence (cf. Ross, 2002) to expect there to be a relationship between

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[16]I also tried using mineral exports as share of GDP and all primary commodities exports (including agricultural goods) as share of GDP. This did not change the results substantially, neither in terms of statistical and substantive significance. I also tried estimating the models without the Proximity of regime change and growth variables that arguably are intervening variables in this model (cf. Ross, 2001, Auty, 2001), and tried including a square term for mineral exports (cf. Appendix E.1). This did not affect the results much either. Finally, omitting the interaction term does not render the Minerals main term any more significant.

mineral resources and conflict. The reason might be that the variable is too crudely measured to capture the hypothesized relationship. It fails to distinguish between natural resource revenues that favor rebel groups and thus increases the risk of armed conflict and revenues that favor the government and hence deters armed conflict. Moreover, in large countries, natural resource abundance may be so local that it only marginally affects the country's overall exports statistics, but still incites conflict locally that is registered when coding the dependent variable. Finally, in many cases the goods that are the source of conflicts are not included in official statistics because they are exported illicitly. This is particularly true of drugs, but also applies to diamonds (for the case of Sierra Leone, see Davies & Fofana, 2002).

The democracy-minerals interaction term is weakly significant only in Model 11 – the model using the Gates et al. measure. Although the estimates are not sharply defined, all models reflect the same general relationship as in Tables 7.1–7.4. The estimated risks of armed conflict from model 12 are plotted in Figure 7.7. As in the previous figures, the estimated risk for democracies is decreasing more strongly in development (e.g., in decreasing mineral dependence) than for autocracies. The difference in slopes is not statistically significant, however. Note that high mineral exports dependence is associated with low development, such that the figure is reversed along the horizontal axis.

In contrast to the previous tables, Model 11 replicates the 'inverted-U' results, and the estimate for the democracy main terms in Models 10 and 12 indicate a monotonically negative and significant relationship between democracy and the risk of conflict. The reason for the change in results from Model 1 is that the minerals variable fails to function properly as a control for development.

7.4.4 Civil War as Dependent Variable

Previous cross-country studies of the relationship between democracy, development, and civil war have used a more restrictive definition of the dependent variable. To show that the results found above also hold for more serious conflicts, I estimated a subset of Models 1–9 above using another dependent variable: civil wars with at least 1,000 killed in the course of the war, as defined by the Correlates of War data set (Singer & Small, 1994). The list of wars is based on those used in in Chapter 3 (see Appendix A.2),

	Model 10	Model 11	Model 12
Indicator of democracy	Executive Constraints	Gates et al. (categorical)	Vanhanen modified
Explanatory Variable	$\widehat{\beta}$ (s.e.)	$\widehat{\beta}$ (s.e.)	$\widehat{\beta}$ (s.e.)
Inconsistent (0)	(ref.cat.)	(ref.cat.)	(ref.cat.)
Autocracy (1)		−0.14 (0.27)	
Democracy (2)		−0.47** (0.30)	
Democracy index	−0.10** (0.052)		−0.17*** (0.070)
Minerals as share of merchandise exports	−0.24 (0.32)	0.61 (0.59)	−0.25 (0.30)
Autocracy* Minerals		−0.90 (0.72)	
Democracy * Minerals		−1.86*** (0.78)	
Democracy index * Minerals	−0.16 (0.14)		−0.20 (0.19)
$LL_{int} - LL_{\tilde{int}}$ (d.f.) χ^2 (p-value)	0.88 (1) (0.35)	4.64 (2) (0.098)	0.92 (1) (0.34)
No. of countries	126	126	126
No. of conflicts	115	115	128
Time at risk (days)	$1,495,203$	$1,495,203$	$1,532,333$
Test of prop. haz. ass. $\chi^2, (d.f.)$ p-value	11.45 (11) 0.41	11.26 (13) 0.59	8.98 (11) 0.62
LL_o	−537.34	−537.34	−601.36
LL_{mdl}	−511.79	−510.88	−570.20
$*: p < 0.10, \; **: p < 0.05,$ ***: $p < 0.01$ (one-sided test). Robust standard errors.			

Table 7.5: Risk of Armed Conflict, Mineral Exports as Indicator of development, All Conflicts
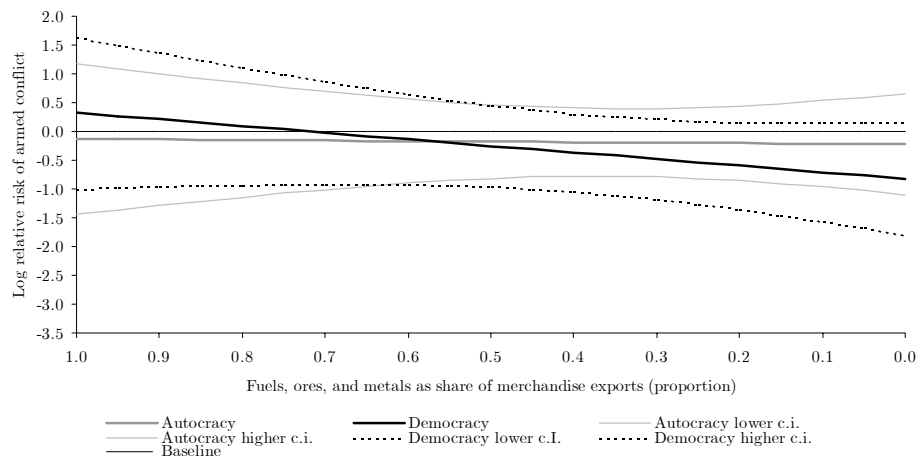
Figure 7.7: Estimated Relative Hazard of Armed Conflict by Mineral Exports and MIRPS Democracy Measure (Model 11)

but supplemented with a number of wars from Collier & Hoeffler (2002).[17]

The results are presented in Tables 7.6 and 7.7. Even though the number of conflicts in the sample is less than half than in the previous analyses, the resulting estimates for the interaction terms are nearly as significant as in the analyses of the less restrictive conflict definition. The substantial interpretation of the estimates are very similar to those presented above.

Moving to a more restrictive definition of conflict changes the estimates for the control variables, however. Firstly, the Collier & Hoeffler primary commodity exports variable is significant in analyses of civil war, and has therefore been retained as a control variable in these models. The growth variable, which was remarkably robust in Models 1–12, has a smaller impact in this analysis, and is statistically significant at the .05 level in only one of the models in Table 7.6. Conversely, the Proximity of Regime Change variable has a larger magnitude and statistially significant in one of the models. This seems to indicate that poor growth rates and economic collapses such as the recent one in Argentina seldom leads to more than relatively minor

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[17]These were: India, starting in January 1965; Iran, March 1974; Cyprus, July 1974; Iraq, July 1974; indonesia, June 1975; Angola, November 1975; Sierra Leone, August 1991; Algeria, May 1991; Liberia, January 1992; Afghanistan, May 1992; Russia, December 1994; Congo, Januar 1997; Sierra Leone, May 1997; Democratic Republic of Congo, May 1997.

	Model 2b	Model 6b	Model 8b	Model 9b
Indicators of development and demo-cracy	Income const., square term	Income Gates et al. ordinal	Income Poly-archy	Literacy con-straints
Expl. Variable	$\widehat{\beta}$ (s.e.)	$\widehat{\beta}$ (s.e.)	$\widehat{\beta}$ (s.e.)	$\widehat{\beta}$ (s.e.)
Dem. index	−0.081 (0.11)	−0.23 (0.26)	−0.098 (0.12)	−0.022 (0.072)
Democracy index squared	−0.064 (0.055)			
Development	0.11 (0.22)	−0.53*** (0.16)	−0.28** (0.12)	−1.58*** (0.67)
Democracy* Development	−0.12** (0.065)	−0.29*** (0.14)	−0.17*** (0.063)	−0.45** (0.24)
Dem. sq.* Development	−0.075** (0.035)			
$2\Delta LL$ (d.f.) χ^2 (p-value)	11.61 (2) (0.0030)	10.93 (1) (0.0009)	5.20 (1) (0.0226)	2.31 (1) (0.13)
No. of countries	127	127	127	126
No. of conflicts	45	45	50	45
Time at risk	1,520,233	1,520,233	1,550,928	1,508,245
p. h. ass. $\chi^2, (d.f.)$ p-value	10.66 (13) 0.64	8.35 (11) 0.68	7.79 (11) 0.73	7.01 (11) 0.80
LL_o	−212.93	−212.93	−237.42	−207.85
LL_{mdl}	−188.97	−191.31	−213.07	−187.78
Robust standard errors in parentheses. *: $p < 0.10$, **: $p < 0.05$, ***: $p < 0.01$ (one-sided tests)				

Table 7.6: Risk of Civil War, Various operationalizations of democracy and development, 1960–97

Expl. Variable	Model 2b $\widehat{\beta}$ (s.e.)	Model 6b $\widehat{\beta}$ (s.e.)	Model 8b $\widehat{\beta}$ (s.e.)	Model 9b $\widehat{\beta}$ (s.e.)
Growth$_{prev.year}$	−1.10 (1.54)	−1.11 (1.45)	−1.87** (1.09)	−0.45 (2.15)
Primary comm./ GDP	5.59*** (2.03)	5.53*** (2.04)	5.20*** (1.80)	6.72*** (2.1)
Primary comm./ GDP squared	−24.0** (10.6)	−23.9** (10.8)	−18.4*** (7.6)	−27.4*** (11.8)
Mountaineous Terrain	0.015 (0.0089)	0.017** (0.0090)	0.016** (0.0084)	0.014* (0.0098)
Ethnic Dominance	0.48 (0.38)	0.51* (0.36)	0.38 (0.35)	0.59* (0.43)
Proximity of Reg. Change	0.62 (0.78)	0.64 (0.79)	1.23** (0.68)	0.75 (0.82)
ln(Population)	0.36*** (0.014)	0.39*** (0.13)	0.39*** (0.12)	0.47*** (0.15)
Proximity of Armed Conflict	−0.22 (0.54)	−.31 (0.55)	0.087 (0.45)	−0.064 (0.53)
Robust standard errors in parentheses. *: $p < 0.10$, **: $p < 0.05$, ***: $p < 0.01$ (one-sided tests)				

Table 7.7: Risk of Civil War, 1960–97, Estimates for Control Variables

political violence. Institutional changes, on the other hand, tend to be followed by serious, large-scale conflicts if they lead to conflict, but seems less often to lead to minor political violence.

7.5 Conclusion

The relationships between democracy, development, and armed conflict are not independent of each other. This paper shows that empirically there is a strong and robust interaction between the two variables: Increasing the level of economic development reduces the risk of armed conflict only for democratic countries, and increasing the level of democracy only for developed countries.

    The results are very robust. I used three alternative operationalizations of both democracy and development: Polity's Exeutive Constraints variable, Vanhanen's Polyarchy and Gates et al.'s (2003) MIRPS variable as measures of democracy, and GNP per capita, percent literacy in the

population, and the value of minerals exports as a share of total exports as indicators of development. The contingent effect was modeled by means of multiplicative interaction terms. The model was also estimated on two different versions of the dependent variable: Armed conflicts from the Uppsala project including all conflicts with at least 25 dead per year, and a civil war data set largely based on the Correlates of War data.

I found strong and robust evidence that democracy is correlated with civil peace, but only for middle- and high-income countries. The same applies for countries with high levels of literacy. The relationship between democracy, primary commodity dependence, and civil war was not significant, but pulls in the same direction: democracies with low primary commodity dependence have a lower probability of civil war than autocracies and inconsistent regimes with low primary commodity dependence, but the opposite is the case for countries with high primary commodity dependence. The converse of this result is that development, measured as income or as literacy, reduces the probability of conflict, but only if the country has a democratic political system.

Recent studies explain the relationship between low levels of economic development and civil war as due to low opportunity costs for potential rebel recruits, and to governments with low capacity for countering insurgencies (Collier & Hoeffler, 2002; Fearon & Laitin, 2003). The results presented here calls for a qualification of these explanations: If development decreases the probability of civil war only for democratic countries, this must mean either that the risk-reducing effect of increased income in autocracies is countered by a risk-increasing effect, or that the effects of increasing opportunity costs and state capacity due to economic development are much stronger in democracies than in autocracies. One possible explanation for the first of these is increased pressure for democratization when autocracies become more developed, a pressure that may or may not turn violent (Huntington, 1968; Boix & Carigano, 2002). A possible explanation for the latter is that maintaining order in democracies requires much more resources than in autocracies, requiring well-functioning legal systems and efficient, non-partisan and non-corrupt law enforcement. Moreover, the literature on the determinants of democracy and democratic stability shows clearly that democracy is unstable in low-income countries. Democratic institutions that are perceived to be unstable are not likely to be efficient in maintaining domestic peace, and the breakdown of any political institutions are often accompanied by violence. Of course, many of the same factors that explain the stability of democracy also explain the absence of

civil war: The parallell to low opportunity costs for rebel recruits is that the value of having political offices is relatively larger. This increases the stakes of the political struggle, which again decreases the chances of stable democracy (Przeworski, 1991). Likewise, the availability of large rents from the extraction of natural resources both increase the incentives of fighting over the control for them and reduces the incentives for institutionalizing a system where power and hence also revenues are distributed widely.

Chapter 8

Development and the Liberal Peace: What Does It Take To Be a Trading State?

This chapter was originally published as Hegre (2000), also reprinted as Hegre (2003).

Abstract

This chapter investigates the liberal idea that trade between two states reduces the likelihood of militarized conflict between them. Richard Rosecrance's argument that industrial-technological developments have made peaceful trading strategies more efficient today is examined in connection with the empirical literature on trade and conflict. Development affects the utility calculations of states: Since the costs of seizing and holding a territory increase with increased development, and the relative utility of occupying the territory decreases, the chance that the expected utility of occupation will exceed the expected costs decreases with increased development. Likewise, since the utility of trade increases with increased development, then increased development also makes it more likely that the expected costs of breaking the trade bonds will exceed the gains to be expected from occupation. Consequently, the relationship between trade and conflict is contingent on the level of development. Using Cox regression, and introducing a new measure of interdependence based on a gravity model of trade, I demonstrate that there is a clear negative

relationship between trade and conflict. However, this relationship is basically restricted to dyads consisting of two developed dyads. Development itself is strongly associated with peaceful behavior. The results also suggest that the democratic peace requires a minimum level of development to be efficient.

8.1   Introduction

States that trade extensively with each other seldom fight wars with each other. This classic, liberal thesis is based on a twofold idea: First, trade between two states increases the economic costs of war between them. Second, a side-effect of trade is improved communication between the inhabitants of the trading states. This reduces the chances of misunderstanding and helps to build institutions for the peaceful resolution of conflict.

In recent years, the 'peace through interdependence' hypothesis have generated enormous interest among international relations scholars. A host of theoretical and empirical investigations have refined and strengthened the argument. However, even when explicitly using economic incentives to explain state behavior, very few studies have taken into account the more structural economic factors. An exception is Richard Rosecrance's *The Rise of the Trading State* (1986). Rosecrance is concerned with explaining why states choose trading-state strategies rather than military-political ones. Peaceful trading strategies enjoy greater efficacy today than before, he holds, and one of the reasons is industrial-technological development.

In this chapter, I connect Rosecrance's arguments to the empirical literature on trade and conflict, and go on to argue that the relationship between trade and conflict is contingent on the level of development. Within the empirical framework set out by Bremer (1992) and Maoz & Russett (1993), I will investigate the importance of socio-economic development for the relationship between trade and conflict, drawing mainly on Rosecrance's arguments. While concentrating on the importance of socio-economic development for the 'trade promotes peace' hypothesis, I will also touch upon its importance for the democratic peace.

Empirically, the models used by Oneal & Russett (1997; 1999) and Barbieri (1996a) will be my point of departure. However, I propose two major improvements compared to their models. First, I construct a new measure of interdependence based on the residuals from a gravity model of trade. In contrast to measures currently in use, the gravity model measure is independent of the relative size of the two countries in the dyad. In

addition, its distribution is symmetric rather than highly skewed, which makes for ease of interpretation. Secondly, I employ the Cox regression model put forward in Chapter 5. As shown there (and by Beck, Katz & Tucker, 1998), proper modeling of temporal dependence is essential if any valid conclusions are to be drawn concerning the relationship between interdependence and conflict. The statistical model used here allows precise modeling of such dependence.

In the next section, I look more closely into the idea that trade leads to peace, and elaborate on Rosecrance's argument that socio-economic development affects the relationship between trade and conflict. In Section 3, the statistical model and measurement issues are accounted for. The results from the Cox regression analysis are presented in Section 4. In the final Section, I conclude that there is a negative relationship between trade and conflict, but that this is, to a certain extent, restricted to dyads consisting of two developed dyads.

One may see the 'peace through interdependence' hypothesis as part of a more general 'liberal peace', where the democratic peace is another important factor. Since it is the citizens of the state who have to do the fighting and bear the economic burden of war, they will be likely to restrict their country's participation in war participation if they have the opportunity to influence its policies (cf. Kant, 1795/1991: 100). Even if the economy and the population of the country as a whole will suffer from war and from the loss of trade, more narrow groups may be much less affected by this. A democratic regime helps to prevent such narrow groups from forcing through policies that are detrimental to the majority of the population.

Consequently, the analyses reported here controls for regime type. The resuslts suggest that the democratic peace, too, requires a minimum level of development to be efficient.

8.2 Development, Trade, and Conflict

Classic liberals have argued that an increase in free trade will diminish the frequency of war. This is supposed to happen both through processes within the individual state that moved towards free trade and laissez-faire economies, and through changes in the relations between the trading states. Thus, the argument involves both the dyadic and the nation level.

Eméric Crucé (1590–1648) was among the first to note a dyadic argument for trade to promote peace – namely, that trade between two states

creates common interests (cf. Oneal & Russett, 1997: 268). In the words of Montesquieu, 'the natural effect of commerce is to bring about peace. Two nations which trade together, render themselves reciprocally dependent: if the one has an interest in buying the other has an interest in selling; and all unions are based upon mutual needs' (De l'esprit des lois, Book XX, ch. II, 1748, quoted in Hirschman, 1945/1980: 10). The underlying assumption is that war disrupts the trade bonds between the two states. Mutual dependence, then, acts as a form of economic deterrence: If the mutual dependence is sufficiently high, the expected costs of a war-induced cut in trade exceed the expected gain from a war.

At the nation (or monadic) level, Crucé argued that trade increased the prosperity and political power of the peaceful, productive members of society (Oneal & Russett, 1997: 268). Kant, Paine, Bentham, James Mill, and John Stuart Mill all argued for free trade, liberty for individuals and for republican or democratic government. These ideas were linked in the liberal opposition to mercantilism: Accumulating gold was seen by mercantilists as equivalent to increasing state power, since wars were financed largely through the state's gold reserves and through loans. All economic and individual interests were necessarily subordinated to the pursuit of state power. The liberal opposition to the traditional political systems then automatically meant an opposition to its economic doctrine: 'Mercantilism was seen to arise from the nature of aristocratic states, and therefore the political priority of liberals was to topple the interventionist, power-seeking state structures that were the legacy of the eighteenth century' (Buzan, 1984: 600).

Richard Rosecrance's (1986) argument is monadic as well: States are forced to make a choice between expanding territory or increasing trade as a basis for increasing wealth, power, and welfare. In a military-political strategy, increasing territory through conquest is seen as the primary means to increase wealth: 'The state with the greatest land mass would have the largest population, the greatest stock of natural resources, and presumably as well the largest wealth' (1986: 6–7). The alternative strategy for increasing wealth is to encourage international trade. However, as argued by the liberal theorists, these two strategies are antithetical. To a large extent, states have to choose one of the two.

The dyadic and monadic levels are interrelated. If two states change their general strategies (towards all states) from military-political to trading-state strategies, the relationship between them changes from military competition to a trading relationship. The likelihood of war between them will

decrease, then, independently of the cost-benefit calculations over the loss of the bilateral trade versus the gains from war. If only one state changes its orientation, the risk of conflict should also, at least on average, decrease to some degree.

A series of large-N empirical studies at the dyadic level have found a positive relationship between trade and peace (Kim, 1998; 1999; Oneal et al., 1996; 1997; 1999; Polachek, 1980; 1999; Russett, Oneal & Davis, 1998). Still, there are dissenting voices: Barbieri (1996a; 1996b) concludes that extensive trade bonds increase the likelihood of conflict rather than decreasing it, while Beck and colleagues (Beck, Katz & Tucker, 1998; Beck & Tucker, 1997) find no relationship between trade and conflict when controlling for temporal dependence.

However, the liberal peace hypothesis may depend in part on the structure of the economies of the states in question. Norman Angell's The Great Illusion (1910/1938), frequently considered the modern ancestor of interdependence theory, stresses how things have changed in the modern world. When nations fear their neighbors, this is 'based on the universal assumption that a nation, in order to find outlets for expanding population and increasing industry, is necessarily pushed to territorial expansion and the exercise of political force against others'. Angell '... attempts to show that ... [this assumption] belongs to a stage of development out of which we have passed' (1938:115). Modernization and industrialization have fundamentally changed the extent to which war is profitable.

Rosecrance (1986) argues that the incentives for states to choose between the trading world and the military-political one change with economic development.[1] The two worlds have always coexisted, but historical development has made the trading world increasingly more attractive to states. Rosecrance points out that development alters four variables that are crucial to the calculations of the leader of a state: it increases the potential gains from trade, the economic costs of war, and the political costs of war, as well as decreasing the utility of occupying territories relative to the pursuit of trade policies.

Firstly, development directly affects the possibility for and the gains from trade:

> Industrial and population growth strengthen interdependence and

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[1] Rosecrance's argument is to some extent systemic, since the spread of technology and industrialization is quicker than the initial development of it. However, sizeable differences persist in the level of development. Rosecrance's argument, then, applies at the nation-state and dyadic level as well.

> make it harder to achieve national objectives autonomously. When
> technology was rudimentary and population sparse, states had little
> contact with one another and did not generally get in each other's way.
> With the commercial and industrial revolutions, however, they were
> brought into closer proximity. As the Industrial Revolution demanded
> energy resources – great quantities of food, coal, iron, water power,
> and petroleum – the number of states that could be fully independent
> declined. (Rosecrance, 1986: 25)

Likewise, development furnishes states with access to better transport
and communications technology and infrastructure – within and between
states – which in turn increases both the volume and the utility of trade
by reducing the transaction costs.[2]

The choice between the trading world and the military-political world
is also related to how easy or difficult it is to conquer territory, and to
govern such territory once it has been taken. Rosecrance (1986: 32–38,
155–162) holds that the costs of war have increased enormously with the
industrialization of warfare. The price of producing one tank or one fighter
has become far higher, yet such items do not last correspondingly longer
in the battlefield (in confrontation with an opponent with the same tech-
nological level). In addition, the accelerating pace of technological change
renders weapons and units obsolete more and more quickly. Moreover,
modern weapons are more destructive, and sophisticated factories and elab-
orate infrastructure take more time to reconstruct if damaged. In addition,
Rosecrance argues, the political costs of warfare are higher in industrialized
societies.

Rosecrance also points out (p. 159) that development affects the costs
of holding the occupied territory by force and the likelihood of making this
profitable. Illegitimate governments will face stiffer opposition from the
population and have a hard time levying taxes from them. He argues that
these problems will increase, the higher the level of education is in the oc-
cupied territory.[3] Arguably, military force may secure the access to raw

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[2]This argument may also be found in the "new growth theory" in economics. If
there are economies of scale in the production of a good and a large market for it,
firms will specialize (see Ethier, 1995: 52–58). However, to run manufacturing plants
sufficiently large to benefit from economies of scale, firms need capital, skilled labor, and
a developed infrastructure. Thus, developed countries are in a better position to enjoy
the gains from trade due to economies of scale (cf. Krugman, 1981). Accordingly, it
may be hypothesized that the more developed countries will trade more, relative to their
GDP, than less developed ones.

[3]We might add to Rosecrance's argument that the more developed a country is, the

materials in the occupied territory as easily in a developed area as in an underdeveloped area. This is counter-balanced, however, by the reduction in transport costs brought about by development and technological improvements, making trade a relatively more attractive means of obtaining access to raw materials. Moreover, complex economies rely on the access to a broad range of raw materials. The occupation of a single country cannot ensure access to more than a few different goods, which decreases the utility of conquest for developed states compared to simpler economies.

On the other hand, Liberman (1993) argues that industrialized countries are more valuable prizes for an expansionist country. He also counters Rosecrance's contention that the political costs of occupation are higher in developed countries by pointing to the relative ease with which Nazi Germany could make the manufacturing sectors in the countries it had occupied – each of them fairly developed even by modern standards – contribute to its own war economy.

Likewise, advanced weapons may cause less collateral damage. This is most evident when a technologically superior power fights a lesser state (e.g., the USA vs Iraq), but may also apply to a war between two developed states. Economic development further means that states, through improved organization and a larger tax base, have more resources to spend on the military. This tends to reduce the relative costs of war.

Rosecrance's argument may be summarized by seeing how development affects the utility calculations of states. Since the costs of seizing and holding a territory increase with increased development, and the relative utility of occupying the territory decreases, the chance that the expected utility of occupation exceeds the expected costs will decrease with increased development. Likewise, since the utility of trade increases with increased development, then increased development also makes it more likely that the expected costs of breaking the trade bonds will exceed the gains to be expected from occupation.

We should, then, expect *the probability of interstate war and militarized disputes to decrease with increasing development.* Moreover, development strengthens the effect of interdependence – there is an interaction effect between the two variables. A certain level of development may even be a *prerequisite* for the liberal peace to work. Below, I will test empirically whether these expectations hold for the post-World War II period.

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easier it is for the inhabitants to take their assets with them when fleeing the country. If this is so, it is not certain that increased wealth in a society makes it a richer prize.

8.3   Research Design

The present study, like all the studies cited above, simply assume that trade causes peace, and not vice versa. How can this be justified? Realists stress the dominance of security issues over economic issues. Anticipating the costs of broken trade ties in wartime, a state will have an incentive to limit its trade with other states if it perceives the probability of war with them in the near future to be high. A rupture of international trade may also create losses beyond the loss of the gains from trade. The economy will have to readjust; it will lose productivity; and social problems may emerge from the ensuing unemployment. All in all, the country may be worse off than if the trade ties never had existed (see also Buzan, 1984: 620–621; Hirschman, 1945/1980: 26–29). In the realist view, the 'trade promotes peace' finding depends entirely on a faulty assumption concerning the direction of causation. Assuming the reverse flow of causation, comparable studies have found that the level of trade between states depends on alliance bonds between them (Morrow, Siverson & Tabares, 1998) or on war history (Gowa & Mansfield, 1993).

The question of direction of causation has been subjected to empirical tests. Polachek (1980) and Gasiorowski & Polachek (1982) conclude that past values for the trade variable are much better at predicting present values of cooperation and conflict than past values for the conflict variable are for predicting present values of trade. Kim (1998; 1999) reaches a similar conclusion. Reuveny & Kang (1996; 1998), on the other hand, find that the causal relationship between trade and conflict/cooperation is largely reciprocal.

The question of the direction of causation is not settled with these studies, and remains central. What is fairly well established, however, is that trade and conflict are inversely related. For my purposes – seeing how socio-economic development affects the relationship between trade and conflict – the direction of causation between trade and conflict is less important than the fact that there is a relationship between the two variables, and that this is likely to change with changing levels of development.

8.3.1   Temporal-Spatial Domain

This study covers the period 1950–92. The analysis is limited to an extension of Maoz & Russett's (1992) 'relevant dyads'. I have included all dyads whose members are either two major powers, allied, or contiguous, or have

inter-capital distance less than 3000 km.[4]

8.3.2 The Cox Regression Model

As in Chapter 5, I employ a variant of the Cox regression model to minimize the problems of dependence between observational units, inconsistent censoring, and the untenable assumption of stationarity. Readers are referred to Section 5.3 for details. The advantage of the Cox regression model is that it allows observations on dyads to be recorded on the finest possible time-scale to keep track of the succession of events. This allows inclusion of an exact variable for the duration of peace in the dyad. The main idea of Cox regression is the assumption that the hazard of war $\lambda_d(t)$ for dyad d can be factorized into a parametric function of (time-dependent) variables and a non-parametric function of time itself (the baseline hazard):

$$\lambda_d(t) = \alpha(t) \exp\left(\sum_{j=1}^{p} \beta_j X_j^d(t)\right) \tag{8.1}$$

In (8.1), $\alpha(t)$ is the baseline hazard: an arbitrary function reflecting unobserved variables at the system level. $X_j^d(t)$ is a (possibly time-dependent) explanatory variable for dyad d; β_j is the corresponding regression coefficient; and p is the number of explanatory variables. All legitimate explanatory variables are known prior to t – they must be a part of the history up until immediately before t. Given that there is an outbreak of dyad war at time t_w, the probability that this war outbreak will happen in dyad d is:

$$\Pr\left(\begin{array}{c}\text{war in a dyad } d \\ |\text{a war breaks out at } t_w\end{array}\right) = \frac{\exp\left(\sum_{j=1}^{p} \beta_j X_j^d(t)\right)}{\sum_{i \notin R_{t_w}} \exp\left(\sum_{j=1}^{p} \beta_j X_j^i(t)\right)} \tag{8.2}$$

where R_{t_w} is the *risk set* at t_w: the set of dyads that are at peace immediately before t_w. The parameters can be interpreted in terms of a *relative* probability of war.[5]

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[4] The inclusion of non-relevant dyads with inter-capital distance up to 3,000 km means a significantly larger spatial domain than the relevant dyads. Still, only a quarter of all dyads were included. The reasons for the limitation is purely technical. A dataset with 500,000 cases is much more manageable than one with 2,000,000.

[5] See p. 142 for a discussion of the interpretation of the parameter estimates.

8.3.3   Measuring Development

The analysis was run using two different indicators of economic development: Gross Domestic Product per capita, and energy consumption per capita. Both indicators were log-transformed, reflecting the view that the marginal effect of development on conflict behavior is diminishing. To create a dyadic measure I used the value for the poorer of the two countries in the dyad. This follows Oneal & Russett (1997: 275–276), who argue that the likelihood of conflict is primarily a function of the degree of political constraint experienced by the least constrained state in the dyad. They consequently use the trade dependence value for that state for which the dyadic trade poses the lowest economy dependence, on the basis of the 'weak-link assumption' (Dixon, 1994: 23).

Data on GDP per capita were taken from the RGDPCH variable from the Penn World Table (Mark 5.6) (see Summers & Heston, 1991). This variable measures real GDP per capita in constant dollars, calculated with the Chain index.

Data on energy consumption were taken from the Correlates of War Project data set on national capabilities, found on the EUGene home page.[6] Several missing cases were filled in by means of linear interpolation.

8.3.4   Measuring Interdependence

'Least Dependent' and 'Salience'

Barbieri (1996a) argues for the use of dyadic trade flow ($imports + exports$) between two states relative to total trade as a measure of one state's dependence on another. She combines the two partner-dependence figures into a measure of the size of a trading relationship called Salience, defined as $Salience_{ij} = \sqrt{Trade\ Share_i\ *\ Trade\ Share_j}$. Oneal & Russett (1997) suggest using the dyadic trade flow relative to Gross Domestic Product as a measure of one state's dependence on another. They use the value for the less dependent (the one with the lowest trade-to-GDP ratio) state as their dyadic measure. As for the development variable above, their choice is based on the weak-link assumption (Dixon, 1994). These two measures are highly correlated, and yield comparable results when my trade data set is used (see Hegre, 1998 for a comparison).

Both measures vary with the size of the country's economy.[7] A given amount of trade will be less significant for a country with a large GDP than

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[6] http://wizard.ucr.edu/cps/eugene/eugene.html.
[7] This problem is treated at more length in Chapter 6.

it will for a smaller country. This means that the level of dependence is also dependent on the size of economy. Moreover, when creating a dyadic measure, we need to note that the size of the smaller state's economy will set a ceiling on the larger country's dependence. When Oneal & Russett's 'weak link' formula is used, the larger country's dependence will, in most cases, be coded as the level of interdependence. The same thing will tend to happen with Barbieri's measure, although to a lesser degree. This is potentially problematic, since the interdependence measure will easily come to function as a proxy for country size. To see this problem, consider the USA: in the entire period studied here, it was by far the largest economy in the world. In all the dyads it forms part of (with USA–Japan, USA–Canada, and USA–Germany being the exceptions), the value for 'least dependent' is extremely low. The USA has made use of its military power in a large number of militarized disputes. Is this because it is economically independent, or because it is a military superpower? Disputes with the USA form a large portion of the MID data set. To what extent does this affect the study of the trade and conflict relationship?

Another problem with the two measures is that their distributions are extremely skewed to the right (cf. the summary statistics in Appendix F.2). This creates difficulties in interpreting the results from a generalized linear model analysis. To minimize this problem, I have log-transformed the Salience measure. Zeros have been handled by adding 0.02 to all values before calculating the logarithm.

Level of Interdependence as Deviation from 'Expected Trade'

The contamination of relative size in the interdependence variable is partly solved by entering a control for relative size in the model. Still, it would be useful to have a measure of interdependence which is independent of the sizes of the states in the dyad, absolutely as well as relative to each other. Following the lead given by Russett (1967: 123–125), we may obtain this by assessing how much trade we might 'expect' in the dyad, and then measuring the deviation of the observed trade level from this predicted level.

Once we have such a measure, the question of symmetry may be treated through a measure of relative capabilities or relative size. This is more appropriate, since it is extremely difficult to disentangle the contribution of military and political power preponderance from economic preponderance. With such a measure of interdependence, a measure of relative size, and the interaction term of these two variables, we may get more precise answers.

The Gravity Model

I will use an economic model of international trade as my point of departure in order to formulate a realistic zero model of trade in a dyad: How much trade is to be expected in the dyad if political factors are not accounted for? The gravity model is an old model of human interaction, employed extensively in geography and regional science.[8] One of the early users of this model to study trade flows was Linneman (1966), who has modeled trade in a dyad ij as $trade_{ij} = \dfrac{GNP_i * GNP_j}{dist_{ij}}$. $Dist_{ij}$ is usually measured as the geographical distance between the capitals of the states. The model reflects that, ceteris paribus, states trade more with states that have large GNPs than they do with smaller economies. Likewise, states trade more with neighboring states than with distant ones. To this model I will add contiguity, since large countries may share a long border with extensive trade opportunities although their capitals are located far from each other.

The multiplicative gravity model is rendered linear when taking the logarithms of all terms. The model may thus be formulated as

$$\ln(trade_{ij}) \quad = \quad \alpha + \beta_1 \ln(GNP_i) + \beta_2 \ln(GNP_j) \qquad (8.3)$$
$$+\beta_3 \ln(dist_{ij}) + \beta_4 contiguity + \varepsilon_{ij} \qquad (8.4)$$

I estimate this by means of separate OLS regressions for each year, as the dependent variable is at the interval level and probably assumes a normal distribution. The data on bilateral trade, distance, and GNP are described below. Since the gravity model was estimated separately for each year, trade and GDP figures in current dollars were used. A summary of the analyses is reported in Appendix F.1. The residuals from these estimations were used as my measure of interdependence.

Trade Data

Like Oneal & Russett (1997) I use the International Monetary Fund's Direction of Trade (1997) data. This source was supplemented with Faber & Nierop's World Export Data, 1948–83 (1989, subsequently called WED), which has more comprehensive information for non-IMF members. The IMF data set contains information on exports from state 1 to state 2 as

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[8]The gravity model was originally developed in geography. It has also been used to study other forms of international interaction (Gleditsch, 1968). Earlier uses of the gravity model to study the trade and conflict issue are found in Gowa & Mansfield (1993) and Pollins (1989). Also see Chapter 6.

well as imports to state 2 from 1. The WED data report exports only. There are considerable discrepancies between these three figures. To minimize errors, I calculated the average between the three figures where all were available and were reported as larger than 0.[9] If one of three figures were missing or reported to be 0, I calculated the average of the remaining two. If two were missing or 0, the third was used. Finally, if both sources reported 0 or missing data, I followed Oneal & Russett's example in treating this as an instance of negligible trade. The smallest unit in the IMF data set is $0.1 million. Any exports or imports less than $0.05 million would be rounded down to 0. Consequently, I recoded all cases reported as having zero trade to $0.02 million for the gravity model estimation, which is approximately the average of all the rounded-down figures. When computing the 'Salience' and 'Least Dependent' measures, I used the original coding of 0.

The information on trade level was lagged with one year, to minimize problems in assessing the direction of causality. Thus, for dispute outbreaks in 1950, the interdependence measures were calculated on the basis of the 1949 trade figures.

Gravity Model Measure of Interdependence

The residuals from the OLS estimation of the gravity model of trade were used as my measure of interdependence. This measure may be interpreted as the natural logarithm of the trade observed in the dyad, divided by the trade predicted from the gravity model. This measure is only weakly correlated with the other interdependence measures – $r = 0.26$ with Barbieri's 'Salience', $r = 0.22$ with Oneal & Russett's 'Least Dependent' measure, and $r = 0.63$ with the natural logarithm of 'Salience'. 'Salience' and 'Least Dependent' are correlated by $r = 0.65$ in my compilation of the data.

Trade-to-GDP ratio and Salience

To ensure comparability with previous studies, I also compiled Oneal & Russett's trade-to-GDP ratio and Barbieri's Salience measure on the basis of this trade data set. These variables were scaled to range from 0 to 100, and are to be interpreted as the value of the dyadic trade as a percentage of GDP.

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[9]The figures for imports were weighted down by the factor 0.96, the average exports/imports ratio in the DOT dataset. This discrepancy is due to the reporting of imports as c.i.f. and exports as f.o.b.

8.3.5   The Dependent Variable: Fatal Dispute

The dependent variable is a subset of the Militarized Interstate Disputes compiled by the Correlates of War Project (Jones, Bremer & Singer, 1996). Only disputes where at least one of the two states in the dyad experienced at least one fatality resulting from the dispute were included. Although limiting the number of disputes will in itself reduce the power of the analysis, I expect only a slight reduction in significance for the regime and interdependence variables.[10] Disputes with battle-deaths are more clear-cut examples of militarized disputes than those not involving fatalities. Moreover, there is reason to suspect that militarized disputes between rich democracies are over-reported in the MID data set. Hereafter, I will refer to outbreaks with battle-deaths as 'fatal disputes'.

8.3.6   Control Variables

Are there any variables that might confound the relationship between interdependence and militarized conflict? The set of control variables chosen here builds on the analysis in Chapter 5.

Contiguity   Contiguity is defined as sharing a land border or having less than 25 miles of sea between the two states. Contiguity through colonies is not counted as contiguity here. A contiguous dyad is defined as a high-relevance dyad.

Major Powers   By definition, major powers have the means to interact with a large proportion of the states in the system – as well as an interest in so doing. They are therefore expected to participate more in militarized disputes than other states. For the same reason, Oneal & Russett include dyads containing major powers in their set of 'relevant' dyads. I have coded each dyad as consisting of zero, one, or two major powers. The information on power status is taken from the Correlates of War Project (Small & Singer, 1982).

Dyads consisting of two major powers are defined as high-relevance dyads and included in the data set. Dyads consisting of only one major power, on the other hand, are not included – a different choice from that of Maoz & Russett (1992). The justification for this is that the number of

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[10]In a trial run with Oneal & Russett's (1997) dataset, I replace their dependent variable with mine. This in fact resulted in a higher level of significance for their interdependence variable, in spite of the loss of cases.

dyads containing one major power is dependent on the number of states in the system. It is, then, following the discussion on the relevance of dyads in Section 5.5, necessary to treat them together with the low-relevance dyads. The category 'One major power' distinguishes these dyads from the other low-relevance dyads.

Allies Dyads related through alliances have a lower probability of war, ceteris paribus (Bremer, 1992). I used an update[11] to 1992 of the COW alliance data set (Singer & Small, 1966; Small & Singer, 1969) to code this variable, and added some alliances from Oren (1990). The 'Non-aggression pact' category was excluded since this usually applies to potential enemies rather than between potential allies in war (see Table 5.2 for an empirical validation of this choice).

Brevity of Peace and War History The probability of peace between two states in the coming period is duration-dependent (Beck & Katz, 1997; Beck, Katz & Tucker, 1998; see Section 5.3): The longer the peace has lasted, the greater its chances of continuing. Time is needed to heal wounds and re-establish normal relations after an interstate conflict; moreover, the creation of new states is often followed by tensions in the first period due to uncertainties in definitions of borders, etc. The 'Brevity of Peace' variable is a function of the number of days since the current peace began – the time since the last fatal dispute in the dyad ended, or, if they have not had any wars, since the youngest state in the dyad achieved independence. Recall that all disputing dyads are excluded from the data set. The number of days in peace was transformed into a decaying function using the formula $\exp\left(-\frac{days\ in\ peace}{\alpha}\right)$. α was set to 3,162 to model the assumption that the hazard of a fatal dispute is halved every six years. The variable varies from 1 for observations of dyads just after the peace began to 0 for dyads that have had peace for a large number of years.

The variable was coded from the Correlates of War data sets on militarized disputes (Jones, Bremer & Singer, 1996) and on system membership (taken from the Peace Science Society website). When coding the variable, I made use of information from 1816 and onwards, unlike Beck, Katz & Tucker (1998), who only coded peace-years from 1950 onwards. This is not a trivial difference, as information on the alliance alignment of World

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[11]This dataset was obtained from the COW project in 1995 through personal communication with J. David Singer.

War II is ignored in their analysis, as is the entry of new states in the two decades before 1950 (India and Pakistan, among others).

If the peace was preceded by a fatal dispute between the states, we may expect the risk of new dispute to be higher than if the peace started with one of the countries gaining system membership. I have included a variable called 'Past Dispute' to distinguish the two types from each other.

Regime Type   As noted above, liberal economic and political theory have been interconnected ever since the 18th century. The 'trade promotes peace' hypothesis is closely related to another liberal tenet – that democracies do not fight each other (cf. Oneal & Russett, 1998; Russett, 1998) – and cannot be seen independently of this. It is necessary to control for the regime type combination in the dyad.

The regime type variable denotes whether the dyad consists of two democracies, two non-democracies, or one democracy and one non-democracy (here called 'politically mixed dyads'), or whether one or both countries have missing regime data or are coded as being in transition. Regime data were taken from Polity IIId (Gurr, Jaggers & Moore, 1989; Jaggers & Gurr, 1995; McLaughlin et al., 1998). A democracy is defined as a country that receives a score of 6 or higher on the Institutionalized Democracy index in Polity.

Oneal & Russett used the lower score of the two countries in the dyad as the corresponding control variable. I chose the categorical variable described above instead, for several reasons: First, in the politically mixed dyads we find higher war-proneness than in the non-democratic dyads (see Chapters 4 and 5; Beck & Jackman, 1998). Oneal & Russett's measure does not account for this. The bimodal distribution of the democracy variable allows this simplification without much loss of data. Finally, the 'Missing Regime Data' category allows the inclusion of dyads where information on regime type is missing, cases that are omitted by Oneal & Russett.

Size Asymmetry   Two measures of asymmetry were tested. The GDP ratio variable is based on the two countries' population and GDP. The variable is calculated by the following formula:

$$Size\ ratio = \ln\left(\sqrt{\frac{GDP_{Country\ 1}}{GDP_{Country\ 1}} * \frac{Population_{Country\ 1}}{Population_{Country\ 1}}}\right).$$

The objective of the formula is to average the two ratios. This averaged ratio is then log-transformed to avoid outliers. Data on GDP and Population were taken from the Penn World Tables (Mark 5.6) (see Summers & Heston, 1991).

I also made use of the traditional measure of asymmetry, the capability ratio or the ratio of the states' score on the COW military capabilities index (Singer, Bremer & Stuckey, 1972). This index gives equal weight to the states' total population, urban population, energy consumption, iron and steel production, military expenditures, and size of the armed forces. The source for this variable is the same as for Energy Consumption per capita.

GDP for the Gravity Model Data on GDP were taken from Penn World Table (Mark 5.6) (see Summers & Heston, 1991). For the gravity model, the current dollar value of GDP was used (the Penn CGDP variable). GDP was calculated by multiplying the GDP per capita variable by the population variable.

Distance for the Gravity Model Dyadic distance is defined as the beeline distance between the capitals of the two states. I used the data computed for Gleditsch (1995).

8.4   Results

8.4.1   Development, Interdependence, and Fatal Disputes

Results from the Cox regression estimation using the gravity model measure of interdependence are reported in Table 8.1. The column labeled Model Ia supports the conclusion of Oneal & Russett (1997).[12] The parameter estimate (found in the top row of each cell) for the interdependence variable is -0.13: Thus, dyads with high levels of trade relative to the prediction from the gravity model have a much lower risk of fatal disputes than dyads with a low trade level relative to the prediction. The estimated standard errors and p-values appear in the second and third rows in each cell. In contrast to Beck, Katz & Tucker (1998) and Oneal & Russett (1999), the parameter

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[12] In Hegre (1999) I report the results for the same model using Oneal & Russett's (non-transformed) measure of interdependence. The size and sign of the parameter estimate obtained there was close to what they found, but the standard error of the estimate was too large to dismiss a hypothesis of no relationship between interdependence and conflict.

	Model Ia	Model Ib	Model Ic
Expl. Variable	$\widehat{\beta}$ (s.e.)	$\widehat{\beta}$ (s.e.)	$\widehat{\beta}$ (s.e.)
Residual from gravity model	-0.13^{***} 0.038	-0.13^{***} 0.039	0.87^{***} 0.29
Development: GDP per cap.		-0.48^{***} 0.18	-0.70^{***} 0.16
Interdep.* development interaction			-0.14^{***} 0.040
Two democracies	-0.11 0.39	0.28 0.40	0.34 0.39
Two autocracies	0.14 0.24	0.019 0.26	-0.045 0.25
Missing Regime Data	-0.68 0.77	-0.91 0.78	-0.76 0.76
Contiguity	3.07^{***} 0.35	3.03^{***} 0.35	3.02^{***} 0.34
Alliance	0.013 0.25	0.06 0.25	0.007 0.25
One Major Power	-0.19 0.36	-0.14 0.37	-0.001 0.36
Two Major Powers	0.40 0.52	0.52 0.53	0.47 0.53
Size asymmetry	0.15^{*} 0.08	0.18^{**} 0.09	0.15^{*} 0.09
Brevity of Peace	3.13^{***} 0.33	2.75^{***} 0.39	2.60^{***} 0.36
Past Dispute	1.69^{***} 0.27	1.82^{***} 0.27	1.87^{***} 0.27
No. of disputes	103	103	103
No. of obs.	$266,094$	$266,094$	$266,094$
LL_{mdl}	-456.49	-451.58	-447.19
*: $p < 0.10$, **: $p < 0.05$,***: $p < 0.01$ (one-sided tests)			

Table 8.1: Estimated Effect on the Risk of Fatal Dispute, Gravity Model Measure of Interdependence, GDP per capita Measure of Development, 1950-92

estimate for interdependence is highly significant even when controlling for temporal dependence.

In column Ib, the development variable was added to the model. The estimates for interdependence and for development (GDP per capita) emerge as both negative and strongly significant. The probability of militarized conflict decreases with increasing trade and with increased development. The development variable clearly improves the model's goodness-of-fit, increasing log likelihood by 4.9.

However, I had expected the effect of interdependence to be strengthened by increased development. In column Ic, the interaction term between interdependence and development was added to the model. This improves the fit of the model considerably: Log likelihood is increased by 4.4 points, which is significantly different from 0 ($p = 0.003$). Development thus seems to be a crucial factor for the liberal peace.

The estimate has a negative sign, as hypothesized: the pacifying effect of trade increases with increased development. With the interaction term present, the estimate for interdependence is positive, implying that, in some circumstances, greater interdependence may increase the probability of fatal disputes. To ease the interpretation of results, the parameter estimates in column Ic are shown in Figure 8.1 for actual ranges for the two variables.[13] The vertical axis denotes the estimated risk of fatal disputes relative to a baseline dyad. The baseline dyad is here defined as a dyad with mean value for development and with 0 for interdependence. In the upper right-hand corner of the floor of the figure we find dyads consisting of two states that are rich (9.8 corresponds to the GDP per capita of the US in 1990; $18,000 per capita) and that have negligible trade bonds. This dyad is estimated to be 30% more war-prone than the baseline. The interdependence measure is the natural logarithm of the ratio between observed and expected trade. Multiplying trade by $e = 2.7$ is equivalent to increasing the interdependence measure by one unit. For the rich dyad, this reduces the risk of war by 40%.

In the lower left-hand corner we find a highly interdependent dyad where the poorer state is very poor (5.7 corresponds to $300 per capita, e.g., a dyad involving, say, Chad or Ethiopia in the mid-1980s). Interdependence for such a dyad is estimated to have the opposite effect: Increasing the interdependence by one unit raises the risk of dispute by 7%. Greater interdependence is estimated to increase the hazard of fatal dispute for dyads where the poorer state has a GDP per capita lower than $500. Mali

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[13]Note to Figure 8.1: The figure is based on the results in Column Ic in Table 8.1.
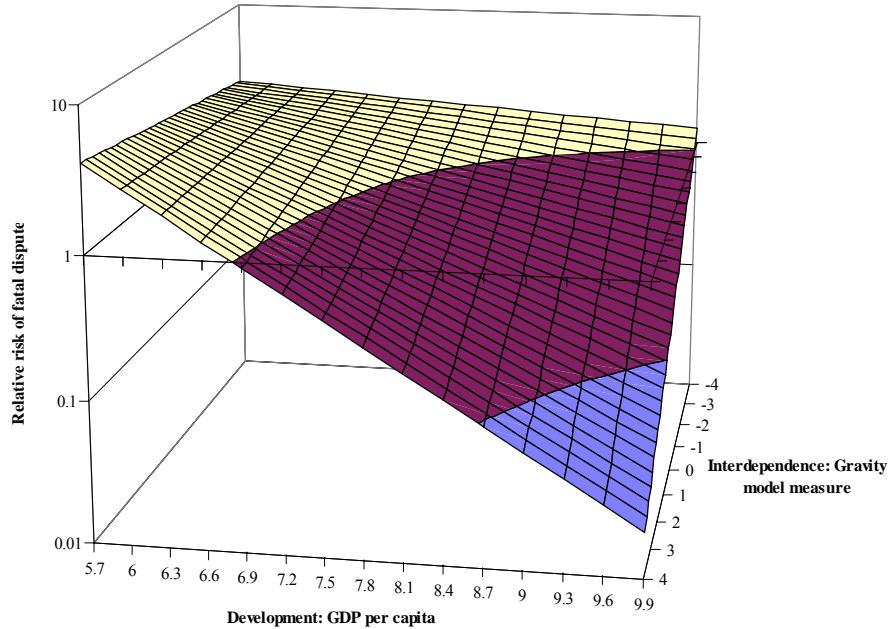
Figure 8.1: Estimated Relative Risk of Fatal Dispute as a Function of GM Measure of Interdependence and GDP per Capita, 1950–92

and Malawi were close to this figure in the early 1990s, and as much as 10% of the observations in the period 1950–92 were below this threshold. Figure 8.1 demonstrates clearly that interdependence is estimated to work best for developed economies, as the theoretical discussion implied. The development variable reduces the risk of dispute for the entire plotted range of values.

The development variable is estimated to be of great substantial importance. For a dyad with 0 on the interdependence variable (i.e. with a trade level equal to what the gravity model predicts), an increase in development by the factor $e = 2.7$ reduces the hazard of dispute to one half. The 10th percentile dyad in terms of GDP per capita is estimated to be 5.7 times more dispute-prone than the 90th percentile dyad. The 10th percentile is 6.2 or approximately $500 – roughly equal to the level of Mali or Malawi in the 1990s. The 90th percentile is approximately 8.7 or $6,000, corresponding to the level of Denmark or Sweden in the 1950s, or to Greece or South

Korea in the late 1980s (see Appendix F.2 for descriptive statistics).

In Table 8.2, the analysis is reproduced using the ln(Salience) measure of interdependence and Energy consumption per capita as indicator of development. The results are very similar to those of Table 8.1. Both trade and development reduce the probability of fatal militarized disputes. Since this analysis includes 50% more observations, the significance levels are generally lower. Interestingly, the *p*-value for ln(Salience) drops dramatically when we include the interaction term between interdependence and development (compare Models IIa and IIb with Model IIc).

Figure 8.2 plots the estimates in model IIc in the same way as Model Ic was plotted in Figure 8.1.[14] We see how the interaction between interdependence and development is even more marked in Model IIc. For a dyad with 2.0 as the lowest ln(Energy consumption per capita) – e.g. two Western European countries in the 1990s – an increase in trade by the factor $e = 2.7$ reduces the likelihood of fatal dispute by 60%. For a dyad with lowest ln(Energy consumption per capita) = –4.0 – the level of Chad or Ethiopia in the 1980s – this increase in the trade level is estimated to increase the risk of fatal dispute by 34%. The estimated effect of interdependence is peace-promoting only above –2.47, or the level of Bangladesh in 1992. More than one-fourth of the observations in the sample are under that threshold – 29 countries had lower values than this in 1992.

For an average interdependent dyad (with ln(Salience) = 5.5), the estimated effect of development is stronger in Model IIc than in Model Ic. In other words, increasing energy consumption per capita by the factor e = 2.7 decreases the risk of fatal dispute by more than 80%.

The characteristic feature of Cox regression is the non-parametric baseline hazard. Combined with my choice of calendar time as the time variable in the survival analysis, this implies that all comparisons are done cross-sectionally, not over time. The advantage of this is that the results are immune to spurious effects from factors that vary systematically over time (see Section 5.3.2). If current-dollar GDP/cap had been used as the measure of development, this would have yielded exactly the same parameter estimates as with constant-dollar figures. The difference between the two measures would be reflected only in the baseline hazard. The advantage of this for the present analysis is that we know that the effects of all variables are purely cross-sectional. Any trends in variables over time are disregarded. It is relative wealth and relative interdependence that makes the difference in the models estimated in Tables 8.1 and 8.2.

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[14] Figure 8.2 is based on the results in column IIc in Table 8.2

Expl. Variable	Model IIa $\widehat{\beta}$ (s.e.)	Model IIb $\widehat{\beta}$ (s.e.)	Model IIc $\widehat{\beta}$ (s.e.)
ln(Salience)	−0.13* 0.075	−0.11 0.077	−0.47*** 0.12
Development: GDP per cap.		−0.23*** 0.063	−0.64*** 0.11
Interdep.* development interaction			−0.19*** 0.042
Two democracies	−0.43 0.37	−0.19 0.37	−0.10 0.37
Two autocracies	−0.22 0.18	−0.35* 0.18	−0.32* 0.19
Missing Regime Data	−0.66 0.53	−0.91 0.53	−0.72 0.52
Contiguity	2.50*** 0.26	2.42*** 0.26	2.46*** 0.26
Alliance	−0.15 0.19	−0.23 0.20	−0.018 0.21
One Major Power	−0.027 0.26	0.06 0.26	0.30 0.28
Two Major Powers	1.05*** 0.39	1.24*** 0.40	1.56*** 0.41
Size asymmetry	0.079** 0.040	0.078* 0.041	0.076* 0.041
Brevity of Peace	2.94*** 0.28	2.61*** 0.30	2.49*** 0.30
Past Dispute	1.89*** 0.21	2.04*** 0.22	1.97*** 0.21
No. of disputes	149	149	149
No. of obs.	343, 148	343, 148	343, 148
LL_{mdl}	−757.85	−750.82	−742.02
*: $p < 0.10$, **: $p < 0.05$,***: $p < 0.01$ (one-sided tests)			

Table 8.2: Estimated Effect on the Risk of Fatal Dispute, ln(Salience) Measure of Interdependence, Energy Consumption per capita Measure of Development, 1950-92
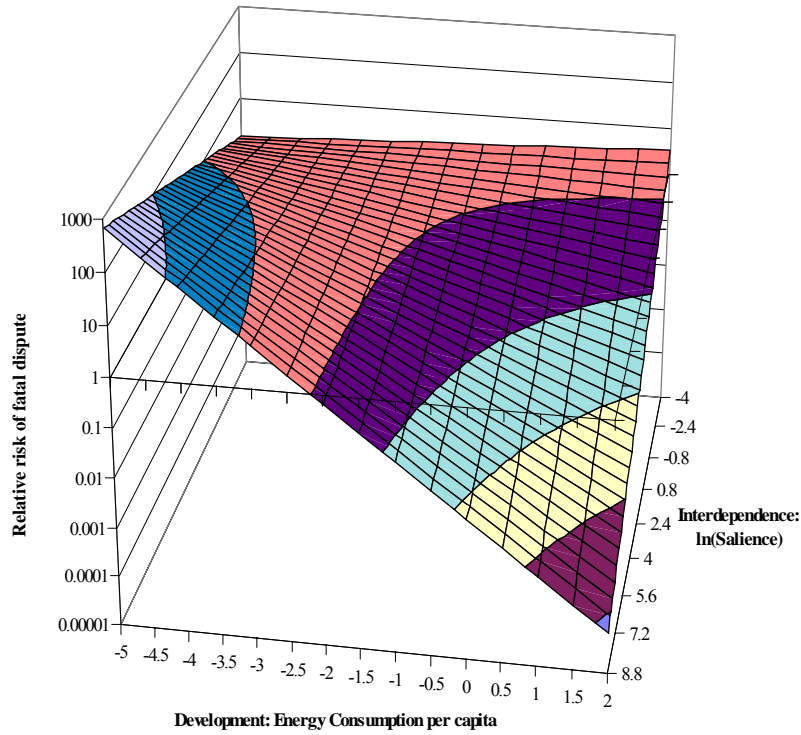
Figure 8.2: Estimated Relative Risk of Fatal Dispute as a Function of ln(Salience) and En-ergy Consumption per Capita, 1950–92

However, if we want to know whether the possible increase in average wealth and average interdependence has changed the world, the parameter estimates of the Cox regression model give no answer. To validate this, I estimated the data using exponential regression. This is equivalent to setting $\alpha(t) = 1$ in Equation 8.1. The parameter estimates emerging from that analysis were virtually unchanged from the results in Table 8.1 – indicating that the effect of development is not only cross-sectional, but also temporal. The results give reason to expect the interstate system to become more peaceful as its member-states become more developed.

8.4.2   Control Variable Puzzles – and What Happened to the Democratic Peace?

Among the control variables, only 'Contiguity', 'Brevity of Peace', and 'Past Dispute' are significant in all the reported models. They are, however, both strong and highly significant. The contiguous dyads have a hazard of dispute 10–20 times higher than the baseline. The 'Brevity of Peace' variable is as important for the hazard of dispute in a dyad as is 'Contiguity'. The parameter estimate indicates that the risk of dispute is approximately 10–20 times higher in the first year after a dispute than after some 40 years in peace. There is considerable support for the idea of temporal dependence in the data, further strengthened by the 'Past Dispute' variable. Not surprisingly, the analysis shows that whether the members of a dyad have been enemies in a dispute earlier is important for the risk of a new dispute: The estimated hazard is 5–7 times higher for such dyads. This comes in addition to the increase in risk modeled by the 'Brevity of Peace' variable. Half a year after a fatal dispute, Model Ic estimates the risk of fatal disputes to be 75 times higher than for a dyad that has never had a dispute and has coexisted peacefully for many years. The significance of these variables is substantial.

In Table 8.1, the GDP/ population size ratio was used as indicator of 'Size Asymmetry' since this variable led to the least reduction in the number of cases with data. In Table 8.2, I used the capability ratio, for the same reason. The variables for 'Size Asymmetry' are close to statistical significance in both Tables, but in the opposite direction of what has been found in comparable studies (e.g., Barbieri, 1996a; Oneal & Russett, 1997). The estimate for 'Two Major Powers' is positive but significant only in Table 8.2.

The regime variables never reach statistical significance, despite the many studies that have found support for the democratic peace (e.g., Bremer, 1992; Doyle, 1986; Maoz & Russett, 1993; Raknerud & Hegre, 1997). Likewise, the 'Alliance' and 'Major power' variables are insignificant.

The discrepancy between these results and previous studies is in part due to the 'Brevity of Peace' and 'Past Dispute' variables. When the models are estimated without them, 'Alliance' and 'Asymmetry' emerge with negative and significant estimates. It may be debated how the two variables should be interpreted. The principle of conditioning on all events that precede the event we analyze to avoid temporal dependence is a strong argument for including these variables. However, with 'Brevity of Peace' as the exception, the variables in the model are dyad attributes that change

slowly. When estimating the models without the development and the two history variables, we see that a contiguous, politically mixed dyad of two major powers is among the most likely to wage a first dispute. Using the peace history variable to predict later disputes may mean partly subsuming these explanations under this variable.

A closer look at the data can shed more light on the puzzle. For 55% of the dispute outbreaks in the data set we find that the two countries are previous enemies in disputes, as compared to 2.7% for the non-dispute observations. Contrary to what might be expected, the double democratic dyads in the data set have had past disputes more frequently than any other regime combinations: 5.6% in contrast to 1.8% for the double autocratic dyads and 2.9% for the politically mixed ones. One reason is that double democratic dyads on average have existed for a longer time; another reason may be the regime changes in Germany, Italy, and Japan after World War II. In 10 of the 12 double democratic disputes (83%) there had been a past war. This is high, but not that far from the baseline of 55%. A trivariate analysis of the relationship between Regime Type, Past War, and Dispute Outbreak shows that regime type does make less of a difference for dyads with a past war than for dyads with a peaceful history: For the former group, the probabilities for politically mixed dyads and double autocratic dyads are 2.5 and 5 times higher than for double democratic dyads, respectively. The corresponding figures for the latter group are 5 and 6.5. This change is sufficient for the parameter estimates to drop considerably in terms of statistical significance.

Still, the estimate for 'Two Democracies' is significant only when we remove the development variable in addition to the peace history variables. Might it be that the democratic peace also requires a certain level of economic development? This is suggested by Mousseau (1997; 1998), who finds the democratic peace to be restricted to the developed world. To test this, I added the interaction term between development and regime type to Model Ic. The results are presented in Table III.

The results in Table 8.3 give some support for the hypothesis of interaction between development and the democratic peace. Dyads consisting of two autocracies are estimated to be significantly different from the baseline. Figure 8.3 is presented to ease the interpretation of these estimates. Here, the estimated risks relative to the baseline are plotted as functions of development for the four categories of regime type combinations. The slope of the line representing 'Two autocracies' is clearly different from the others: For this category, increased development does less to reduce the

	Model IIIc	
Expl. Variable	$\widehat{\beta}$	*s.e.*
Gravity Model Measure	0.78**	0.30
Development:GDP per cap.	-1.07***	0.21
Interdep.* development interaction	-0.13***	0.043
Two democracies	0.36	2.16
Two autocracies	-4.99***	1.86
Missing Regime Data	1.59	8.15
Two democracies * Development	0.027	0.30
Two autocracies * Development	0.72	0.27
Missing Regime Data * Development	-0.42	1.31
Contiguity	2.96***	0.35
Alliance	0.030	0.26
One Major Power	0.064	0.37
Two Major Powers	0.58	0.54
Size asymmetry	0.14	0.09
Brevity of Peace	2.50***	0.37
Past Dispute	1.84***	0.28
No. of disputes	103	
No. of obs.	$266,094$	
LL_{mdl}	-443.95	
*: $p < 0.10$, **: $p < 0.05$,***: $p < 0.01$ (one-sided tests)		

Table 8.3: Estimated Effect on the Risk of Fatal Dispute, Model Including
Interaction Term Between Regime Type and Development, 1950–92
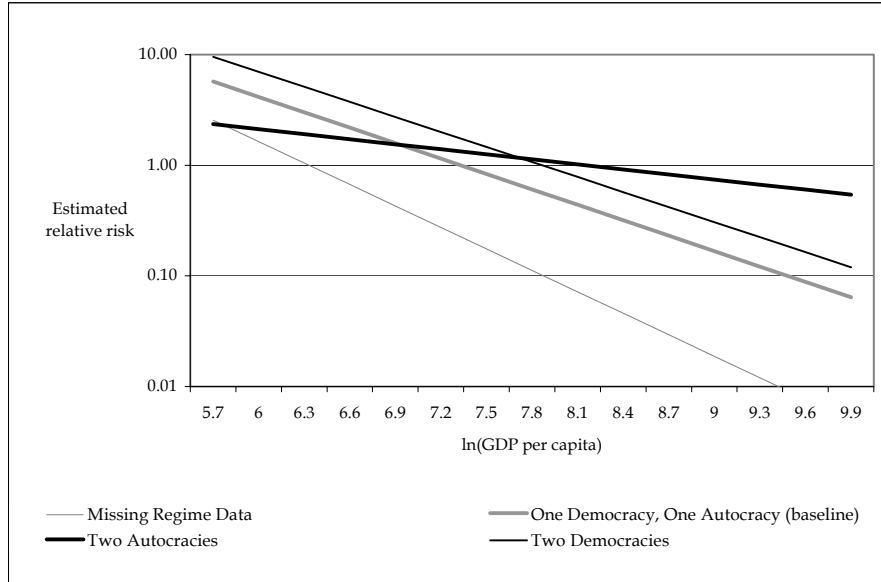
Figure 8.3: Estimated Relative Risk as a Function of Development for the Different Regime Categories, GM Measure Model 1950–92

risk of disputes. One interpretation of this result is that there is a monadic democratic peace for developed dyads: Dyads with at least one democracy are significantly less dispute-prone than are dyads with no democracies. For dyads that contain at least one underdeveloped country, the opposite is the case: Dyads with no democracies are significantly less prone to fatal disputes than are dyads with at least one democracy (recall that the development variable records the value for the less developed country of the dyad). It is not possible to tell from this model which of the two aspects is stronger – the developed democratic peace, or the 'underdeveloped' autocratic peace.

Estimating the model in Table 8.2 with corresponding interaction terms yielded comparable results, although the differences were less significant.

8.5 Conclusion

This chapter has investigated to what extent the positive association between trade and peace is contingent on the trading partners' levels of socio-

economic development. Does the level of development have any influence on how the importance of the trade between countries is inversely related to conflict between them? And, by extension, does the democratic peace require a certain amount of development, too?

These questions were investigated empirically at the dyadic level using Cox regression for a wide range of dyads for the period 1950–92. As a first step towards answering these questions, I introduced an alternative measure of interdependence that is not dependent on the difference in size between the states in the dyad. When this measure was used, the analysis supported the hypothesis that trade is inversely related to militarized conflict. To a somewhat lesser degree, the same conclusion may be drawn from an analysis using the natural logarithm of a measure of interdependence based on the share of the total trade formed by the bilateral trade (i.e., ln(Salience), cf. Barbieri, 1996a).

I then included indicators for socio-economic development and interaction terms between development and interdependence in the analysis. This demonstrated that development indeed is important for the 'peace through interdependence' hypothesis, as indicated by Rosecrance. For dyads containing one state that is less developed than Bangladesh, for instance, interdependence seems to have no peace-conducive effect at all. Interdependence may even have the opposite effect. Development on its own seems to be a considerably stronger factor for keeping peace (although development in one case was estimated to increase the hazard of fatal militarized disputes for extremely non-interdependent dyads).

The inclusion of the development variable obliterated the effect of regime type on the probability of fatal dispute. At first glance, the democratic peace seemed to be explained by the level of development. However, the inclusion of an interaction term between dyadic regime type and development demonstrated that development in the dyad decreased the risk of fatal dispute markedly more for dyads containing at least one democracy than for purely autocratic dyads.

To some extent, these results are at odds with earlier research. Maoz & Russett (1992: 257) concluded that 'the notion that democracies do not fight one another because they are rich is flatly rejected'. Oneal et al. (1996: 18) reported that '[d]yadic wealth is not included in the analyses we will report, however, because it never proved significant when [the interdependence measure] was in the equation'. However, a reanalysis of their model using their data (i.e., the data for Oneal & Russett, 1997) without the interaction term between development and interdependence, showed that GDP

per capita was positively related to conflict. When adding the interaction term to the model, however, the results were very similar to those reported here. The discrepancies between the findings are most likely due to this interaction term.

Two important caveats to the conclusion reached here should be noted: Firstly, the analysis presented here covers the years 1950–92. The major part of this period was characterized by the Cold War. Farber & Gowa (1995) warn against concluding that there is a 'democratic peace', since it may only be found in the post-1945 period – which coincides with the Cold War. This objection of course applies as much to the results in this analysis as to the studies of the democratic peace.

Secondly, the development measure uses the value for the least developed state, based on the 'weak-link assumption'. It is important to bear in mind that all dyads consisting of one developed and one underdeveloped state are counted as under-developed. Any disputes in such dyads are counted as being in 'less developed' dyads. If such disputes are over-represented in the world, this will be disguised by this analysis. Moreover, the structural factors described by Galtung (1971) may serve to perpetuate developmental inequalities in the world. In that case, it is not tenable to assume that development is exogenous to the model. The question of asymmetry of development is intrinsically connected to asymmetry of trade, as trade between a developed and an under-developed state is almost invariably asymmetric in the rich state's favor. Barbieri (1996a) has argued that asymmetric trade bonds do not hinder militarized conflicts – rather the opposite. The significant interaction between development and interdependence which I find may be consistent with this.

Part IV

Appendices and References

Appendix A

Appendix to Chapter 3

A.1 Correlation Matrix for Explanatory Variables, Pearson's R, 1946–92 Data

	Democracy	Dem. Sq.	Pr. of Reg. Ch.	Pr. of Small Dem.
Democracy sq.	0.37			
Pr. of Reg. Ch.	−0.05	−0.26		
Pr. of Small. Dem.	−0.03	−0.18	0.34	
Pr. of Large Dem.	0.16	−0.08	0.33	−0.03
Pr. of Small Aut.	−0.08	−0.12	0.29	−0.03
Pr. of Large Aut.	−0.11	−0.06	0.23	−0.03
Pr. of Oth. Ch.	−0.06	−0.11	0.68	−0.07
Pr. of Civ. War	−0.14	−0.23	0.08	0.04
Pr. of Indep.	0.03	−0.09	0.34	−0.03
Int'l War	0.00	−0.04	0.01	−0.02
Neighb. Civil War	−0.10	−0.15	0.14	0.06
Development	0.45	0.39	−0.21	−0.07
Dev. Sq.	−0.23	−0.09	0.08	0.04
Ethnic Het.	−0.09	−0.22	0.08	0.05

	Pr. of Large Dem.	Pr. of Small Aut.	Pr. of Large Aut.
Pr. of Small Aut.	−0.03		
Pr. of Large Aut.	−0.03	−0.02	
Pr. of Oth. Ch.	−0.07	−0.07	−0.05
Pr. of Civ. War	0.02	0.12	0.04
Pr. of Indep.	−0.03	0.00	−0.01
Int'l War	−0.01	0.05	0.02
Neighb. Civil War	0.05	0.03	−0.03
Development	−0.05	−0.12	−0.08
Dev. Sq.	0.01	0.10	0.01
Ethnic Het.	0.02	0.02	0.01

	Pr. of Oth. Ch.	Pr. of Civ. W.	Pr. of Indep.	Int'l War.
Pr. of Civ. War	−0.01			
Pr. of Indep.	0.48	−0.07		
Int'l War	−0.01	−0.01	−0.01	
Neighb. Civil War	0.11	0.07	0.05	0.06
Development	−0.12	−0.22	−0.12	0.01
Dev. Sq.	0.02	0.06	0.10	−0.01
Ethnic Het.	0.05	0.04	0.03	−0.05

	Neighb. Civil War	Develop- ment	Dev. Squared
Development	−0.14		
Dev. Sq.	0.03	−0.67	
Ethnic Het.	0.09	−0.19	0.15

The correlation matrix refers to all countries observed once for each outbreak of civil war (n = 8,262).

A.2 List of Civil Wars from the Correlates of War Data

COW No.	Country	Event Date	Dem. Index	Days since Regime Change	Pr. of Regime Change
329	Two Sicilies	07.02.1820	−10	1,644	0.04
325	Sardinia	03.10.1821	−10	1,895	0.03
230	Spain	12.01.1821	−4	699	0.27
640	Ottoman Empire	06.14.1826	−10	3,817	0.00
235	Portugal	07.01.1829	−3	2,217	0.01
220	France	07.25.1830	−1	69	0.88
70	Mexico	01.02.1832	−1	366	0.50
230	Spain	07.15.1834	−6	3,970	0.00
100	Colombia	07.15.1840	2	3,059	0.00
230	Spain	05.15.1847	−2	720	0.26
329	Two Sicilies	01.12.1848	−10	9,790	0.00
220	France	02.22.1848	−1	6,490	0.00
300	Austria-Hungary	03.13.1848	−6	9	0.98
220	France	01.01.1851	6	1,042	0.14
155	Chile	09.15.1851	−5	4,640	0.00
135	Peru	12.21.1853	−1	5,241	0.00
100	Colombia	04.17.1854	2	8,083	0.00
135	Peru	10.31.1856	−1	6,286	0.00
70	Mexico	02.15.1858	−3	3,665	0.00
101	Venezuela	02.01.1859	−5	6,605	0.00
710	China	01.01.1860	−6	21,914	0.00
100	Colombia	05.15.1860	2	10,303	0.00
2	United States	04.10.1861	8	2,506	0.01
160	Argentina	04.02.1863	−3	3,622	0.00
160	Argentina	12.15.1866	−3	4,975	0.00
101	Venezuela	01.11.1868	−5	9,871	0.00
160	Argentina	05.20.1870	−3	6,227	0.00
230	Spain	04.20.1872	1	401	0.47
160	Argentina	09.01.1874	−3	7,792	0.00
2	United States	02.01.1876	10	1,676	0.04
100	Colombia	11.15.1876	8	3,463	0.00
740	Japan	01.29.1877	1	3,313	0.00
160	Argentina	06.15.1880	−3	9,906	0.00

COW No.	Country	Event Date	Dem. Index	Days since Regime Change	Pr. of Regime Change
100	Colombia	11.15.1884	8	6,385	0.00
155	Chile	01.07.1891	5	920	0.17
140	Brazil	02.02.1893	−3	1,174	0.11
140	Brazil	09.06.1893	−3	1,390	0.07
135	Peru	10.15.1894	2	3,059	0.00
140	Brazil	10.01.1896	−3	823	0.21
100	Colombia	09.01.1899	−3	4,775	0.00
165	Uruguay	01.01.1904	−3	8,034	0.00
365	Russia	01.22.1905	−10	32,528	0.00
360	Rumania	03.15.1907	−6	2,448	0.01
600	Morocco	08.01.1907	−6	22,126	0.00
70	Mexico	11.20.1910	−9	10,945	0.00
600	Morocco	01.15.1911	−6	23,389	0.00
150	Paraguay	07.15.1911	−3	2,570	0.01
710	China	10.11.1911	−6	17,998	0.00
710	China	07.12.1913	2	488	0.40
365	Russia	12.09.1917	−1	44	0.92
375	Finland	01.28.1918	8	53	0.90
310	Hungary	03.25.1919	−7	3	0.99
91	Honduras	02.09.1924	5	1,318	0.08
700	Afghanistan	03.15.1924	−6	1,680	0.04
710	China	07.01.1926	−5	4,443	0.00
70	Mexico	08.31.1926	−3	791	0.22
700	Afghanistan	11.10.1928	−6	3,381	0.00
710	China	03.01.1929	−5	5,417	0.00
710	China	11.15.1930	−5	6,041	0.00
92	El Salvador	01.22.1932	−9	50	0.91
230	Spain	10.04.1934	7	1,029	0.14
230	Spain	07.18.1936	7	1,682	0.04
710	China	02.28.1947	−5	64	0.89
150	Paraguay	03.07.1947	−9	2,577	0.01
94	Costa Rica	03.12.1948	10	10,320	0.00
775	Burma	09.15.1948	8	255	0.62
100	Colombia	09.15.1949	−5	524	0.37
850	Indonesia	05.31.1950	3	155	0.75
840	Philippines	09.01.1950	5	62	0.89

COW No.	Country	Event Date	Dem. Index	Days since Regime Change	Pr. of Regime Change
145	Bolivia	04.09.1952	–5	5,805	0.00
850	Indonesia	09.20.1953	0	1,131	0.12
90	Guatemala	06.08.1954	2	1,275	0.09
160	Argentina	06.15.1955	–9	2,382	0.01
850	Indonesia	12.15.1956	0	2,313	0.01
660	Lebanon	05.09.1958	2	4,268	0.00
40	Cuba	06.15.1958	–9	1,095	0.13
645	Iraq	03.06.1959	–5	234	0.64
817	Rep. of Vietnam	01.01.1960	–3	1,528	0.06
812	Laos	10.15.1960	–1	288	0.58
615	Algeria	07.28.1962	–8	25	0.95
678	Yemen Arab Rep.	11.15.1962	0	56	0.90
625	Sudan	10.01.1963	–7	1,778	0.03
517	Rwanda	11.15.1963	–5	501	0.39
42	Dominican Republic	04.25.1965	–3	480	0.40
90	Guatemala	10.01.1966	3	208	0.67
710	China	01.15.1967	–9	259	0.61
475	Nigeria	07.06.1967	–7	536	0.36
775	Burma	01.01.1968	–7	1,645	0.04
663	Jordan	09.17.1970	–9	4,935	0.00
90	Guatemala	11.15.1970	1	258	0.61
770	Pakistan	03.25.1971	3	2,272	0.01
780	Sri Lanka	04.06.1971	8	313	0.55
516	Burundi	04.30.1972	–7	1,978	0.02
840	Philippines	10.01.1972	–9	7	0.99
552	Zimbabwe	12.28.1972	4	2,553	0.01
770	Pakistan	01.23.1973	3	2,942	0.00
660	Lebanon	04.13.1975	5	1,699	0.04
90	Guatemala	03.12.1978	–5	6	0.99
700	Afghanistan	06.01.1978	–7	1,779	0.03
630	Iran	09.03.1978	–10	8,582	0.00
93	Nicaragua	10.01.1978	–8	15,460	0.00
811	Kampuchea	01.08.1979	–7	1,013	0.15

COW No.	Country	Event Date	Dem. Index	Days since Regime Change	Pr. of Regime Change
92	El Salvador	07.01.1979	−6	860	0.20
541	Mozambique	10.21.1979	−8	1,579	0.05
475	Nigeria	12.18.1980	7	443	0.43
630	Iran	06.06.1981	−6	855	0.20
135	Peru	03.04.1982	7	583	0.33
93	Nicaragua	03.18.1982	−5	378	0.49
520	Somalia	04.21.1982	−7	4,564	0.00
775	Burma	02.01.1983	−8	945	0.17
780	Sri Lanka	07.25.1983	3	214	0.67
625	Sudan	11.17.1983	−7	4,418	0.00
475	Nigeria	02.02.1984	−7	32	0.94
100	Colombia	03.15.1984	8	3,507	0.00
750	India	01.01.1985	8	2,741	0.01
645	Iraq	01.01.1985	−9	1,995	0.02
680	Yemen Peoples Rep.	01.13.1986	−8	2,573	0.01
780	Sri Lanka	09.01.1987	3	1,713	0.04
516	Burundi	08.18.1988	−7	7,932	0.00
450	Liberia	12.01.1989	−6	1,976	0.02
360	Rumania	12.21.1989	−8	4,712	0.00
517	Rwanda	09.30.1990	−7	6,295	0.00
365	USSR	04.30.1991	0	321	0.54
345	Yugoslavia	05.01.1991	−1	465	0.41
640	Turkey	07.10.1991	10	607	0.32
516	Burundi	11.23.1991	−4	68	0.88
372	Georgia	12.25.1991	2	260	0.61
702	Tajikistan	05.01.1992	3	235	0.64
540	Angola	10.28.1992	−6	602	0.32

Appendix B

Appendix to Chapter 4

In this appendix, I correct an error in Chapter 4 and rederive the expression for the relationships between the levels of analysis. The notation has been changed from that used in Chapter 4.

B.1 When All Countries and Dyads Are Similar

There are N countries. In order to be at peace at the nation level, a country must be at peace will all other countries. Thus, the probability π_i^P that country i is at ('interstate') peace is the joint probability of its being at peace with all the other countries in the world. The joint probability is the product of the probabilities of the individual events:

$$\pi_i^P = \prod_{j \neq i} \pi_{ij}^P$$

(see Bhattacharyya & Johnson, 1977: Ch. 3) where π_{ij}^P is the probability of peace in dyad ij. Conversely, the probability of i being at war is

$$\pi_i^W = 1 - \pi_i^P = \prod_{j \neq i} \left(1 - \pi_{ij}^W \right)$$

It is more convenient to express the relations between the levels in terms of the probability of peace than the probability of war.[1] Simplifying as in Chapter 4 to a situation where all dyads have the same probability of being

---

[1]When expressing in terms of the probability of peace, it is not necessary to assume that no country can start a war against more than one other country in a given time interval.

at war (i.e., the war probability is independent of regime type):

$$\pi_i^P \;\; = \;\; \prod_{j\neq i}\pi_{ij}^P = \left(\pi_{ij}^P\right)^{N-1} = \left(1-\pi_{ij}^W\right)^{N-1}$$

$$\Leftrightarrow \;\; \ln\pi_i^P = (N-1)\ln\pi_{ij}^P$$

$$\pi_{ij}^P \;\; = \;\; \left(\pi_i^P\right)^{\frac{1}{N-1}} = \sqrt[(N-1)]{\pi_i^P}$$

$$\Leftrightarrow \;\; \ln\pi_{ij}^P = \frac{\ln\pi_j^P}{N-1}$$

These two expression should replace (4.1) and (4.2). Note that when expressed in logs, the correct relationship between the log peace probabilitites is the same as stated in the chapter for the war probabilities. Hence the first implication of the model is basically the same as above:

Proposition B.1 *If we view* $\ln\pi_i^P$ *as constant,* $\ln\pi_{ij}^P$ *is proportional to* $1/(N-1)$*. Conversely, if we look upon* $\ln\pi_{ij}^P$ *as constant,* $\ln\pi_i^P$ *is proportional to* $N-1$*. This means that* π_{ij}^P *is not a primitive parameter, but has to decrease with increasing N!*

B.2   When Democracies and Non-Democracies Differ

Assume there are M democracies and $N-M$ non-democracies, and that the dyadic probability of peace is π_{DD}^P for all democratic dyads, π_{ND}^P for all mixed dyads, and π_{NN}^P for the non-democratic dyads. The nation-level probability of peace π_D^P for a democracy is:

$$\pi_D^P \;\; = \;\; \prod_{j\neq i}\pi_{ij}^P = \left(\pi_{DD}^P\right)^{M-1}\left(\pi_{ND}^P\right)^{N-M}$$

$$\Leftrightarrow \;\; \ln\pi_D^P = (M-1)\ln\pi_{DD}^P + (N-M)\,\pi_{ND}^P$$

The nation-level probability of peace π_N^P for a non-democracy is:

$$\pi_N^P \;\; = \;\; \prod_{j\neq i}\pi_{ij}^P = \left(\pi_{ND}^P\right)^{M}\left(\pi_{NN}^P\right)^{N-M-1}$$

$$\Leftrightarrow \;\; \ln\pi_N^P = M\ln\pi_{ND}^P + (N-M-1)\,\pi_{NN}^P$$

The nation-level probabilities *of war*, $1 - \pi_D^P$ and $1 - \pi_D^P$, are plotted as a function of the share of democracies d for the sample values $N = 28$, $1 - \pi_{DD}^P = 0.0063$, $1 - \pi_{ND}^P = 0.0158$, and $1 - \pi_{NN}^P = 0.0105$ in Figure B.1. The relationship is very close to that depicted in Figure 4.1.
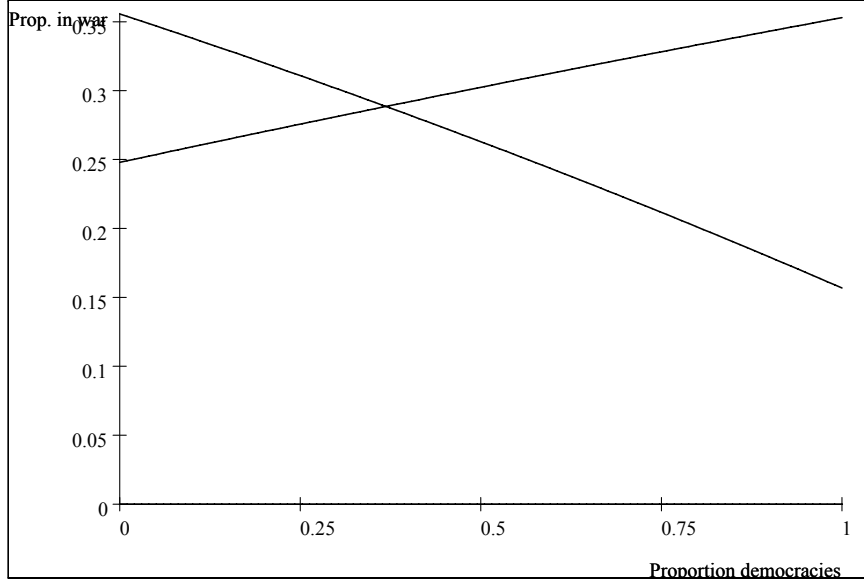
Figure B.1: (Corrected) Expected Share of Democracies and Non-Democracies in Onset of New Dispute in a Year as a Function of d

These two nation-level probabilities are aggregated into a system-level probability by calculating the weighted average (m is the proportion of democracies in the system):

$$
\begin{aligned}
\pi_i^P &= \frac{M\pi_D^P + (N - M)\pi_N^P}{N} \\
&= \frac{M\left(\left(\pi_{DD}^P\right)^{M-1}\left(\pi_{ND}^P\right)^{N-M}\right) + (N - M)\left(\left(\pi_{ND}^P\right)^M\left(\pi_{NN}^P\right)^{N-M-1}\right)}{N} \\
&= \frac{\left(\begin{array}{c} mN\left(\left(\pi_{DD}^P\right)^{mN-1}\left(\pi_{ND}^P\right)^{N(1-m)}\right) \\ +N(1-m)\left(\left(\pi_{ND}^P\right)^{mN}\left(\pi_{NN}^P\right)^{N(1-m)-1}\right) \end{array}\right)}{N}
\end{aligned}
$$

Figure B.2 shows the system-level probability of *war* as in Figure 4.2
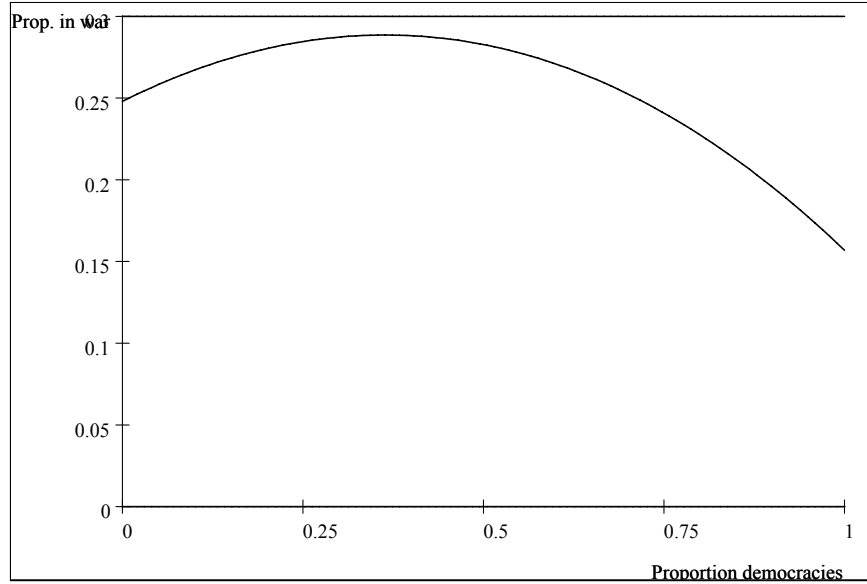
Figure B.2: (Corrected) Expected Share of Countries in Onset of New Disputes in a Year as a function of d

based on the new expression and the same sample values. The shape of the curve is unchanged, the maximum occurs at roughly the same proportion of democracies, but the estimated proportion of countries in war is slightly lower.

Appendix C

Appendix to Chapter 5

Sources and operationalizations for variables in Chapter 5.

Compilation of the Data-File

We have made use of the Correlates of War Project data on interstate wars as well as on system membership, contiguity, power status and alliances. The diffusion variables were derived from the start dates and end dates for war participation in the interstate war data set, and from the alliance and contiguity data sets. The intra-dyad stability variables were calculated from the dates for end of war participation in the interstate wars. To allow all dyads an 'exposure time' of at least 24 years, we analyze only war outbreaks during 1840–1992.

The war and regime data are coded by day, enabling us to code the diffusion and intra-dyad stability variables very precisely. Data on alliances specify the month of signing treaties. The other variables are coded by year in the original sources.

When compiling the datafile, all wars were identified, since these also identify the set of t_w's – times of which we need to know the values of the explanatory variables. The Cox regression model requires that all t's are unique – that no dyad wars start simultaneuously (i.e. ties). The Correlates of War data set is coded by day and as many as three quarters of the dyad wars form ties. We have solved this by first using the information on initiator in the data set to split the ties in a group containing an initiator country and a group without initiators. Within these groups, we have ordered the ties sequentially by a random procedure, and thus defined the dyad wars to follow each other within the same day – first the initiator dyad wars and then the non-initiator dyad wars. The diffusion variables was

coded as when the diffusion process takes place over several days. Another solution to the ties problem would be to treat them as simultaneous and independent events.

Then, for each t_w, we coded the values on the explanatory variables for each dyad in the risk set – i.e. the dyads that are system members at t and not already at war. 343 dyad wars and a risk set varying from 666 dyads in the first war outbreak in 1848 to 15,576 in 1991 yielded a data-file of 965,166 cases [1].

The Dependent Variable: Dyad War

As a basis for coding dyad wars we used the Correlates of War Project data set on interstate war. This includes all wars causing more than 1,000 battle deaths per year, see Section 5.3. Based on the project's coding of each country's participation we created a data set that included all pairs of countries that simultaneously were on opposite sides of a war. This transformation procedure yielded a total of 343 dyad wars in the period 1840–1992. Re-entries in the same interstate war were counted as new dyad wars, since there is some arbitrariness in Small & Singer's distinction between war re-entry and outbreak of a new war. For example, Small and Singer code the first Schleswig-Holstein war between Germany and Denmark in 1848-49 as starting 10 April 1848 and ending 26 August 1848. Then both participants re-entered what is coded as the same war on 25 March 1849. When Denmark and Germany resumed fighting after fifteen years of peace in 1864, COW has coded this as a new war. This war also had a break and a re-entry. Small & Singer may have good historical reasons for distinguishing between pausing a war and starting a new, but to avoid inconsistencies it seems better for our purpose to code each re-entry as a new dyad war. The Schleswig-Holstein wars thus make up four dyad wars in our data file.

The threshold for a participant in a war is low compared to the threshold for war itself: A country is counted as a participant if more than 1,000 of its troops were involved, or if the country lost more than 100 people on the battlefield. Because of this, an unknown number of our dyad-wars have a low number of casualties. We positively know that not only was there no fighting between Finland and the US in 1941–44, but the two countries were not even formally at war (Gleditsch, 1995, p. 552). However, the COW data set simply puts all participants in multicountry wars into two

---

[1]Note, however, that 965,166 is not the N in our analysis. All these cases (except the 343 dyad wars) contribute to the denominator in expression (5.2), Section 5.4.

opposing camps. Thus, the dyad wars are very heterogeneous. In addition, in transforming the data set, the distinction between the Correlates of War data set on Militarized Interstate Disputes (MIDs) and the war data set is misleading: Many MIDs that do not meet the threshold for the war data set because they involve too few casualties, consist of dyad wars with a higher number of casualties than the least bloody dyad wars derived from the war data set. This inconsistency has to be addressed at some point. The ideal solution would seem to be to code both the wars and the MIDs at the dyad level.

Major Powers

The COW project has coded the following countries as major powers: Austria-Hungary 1840–1918, France 1840–1940 and 1945–94, Germany 1840–1918 and 1925–45, Russia/USSR 1840–1917 and 1922–94, United Kingdom 1840–1994, Italy 1860–1943, Japan 1895–1945, United States 1899–1994, and China 1950–94.

Alliances

The Correlates of War Project lists three types of alliances (Singer & Small, 1966, p. 5):

- Defense pacts: where the signatories are obliged to intervene militarily on the side of any treaty partner that is attacked militarily

- Neutrality and non-aggression pacts: where the signatories are to remain neutral if any co-signatory is attacked

- Ententes: where the signatories are obliged to consult and/or cooperate in a crisis, including armed attack.

The COW Project has recorded the month and year of signing and ending alliances, but not the day. We have arbitrarily assigned the 15th of the month as the day of signing or leaving the alliance.

Appendix D

Appendix to Chapter 6

D.1 Derivation of Probabilities in Equations 6.4, 6.5, and 6.6.

Hirshleifer (2000) describes a standard Contest Success Function that relates the probabilities of the two outcomes *victory* and *defeat* in a contest (in a period) between two parties to parameters representing battle effectiveness (b_i), resources allocated to the contest (F_i), and the decisiveness of the contest. The model has to be extended to also allow for *stalemated* outcomes. This can be done by thinking of each period as containing two battles: One battle where the two possible outcomes are victory for side 1 (defeat for side 2) or victory for neither, another battle where the two possible outcomes are victory for side 2 (defeat for side 1) or victory/defeat for neither. The two probabilities of victory are obtained through the ratio-form CSF :

$$
\begin{aligned}
p_{v1} &= \frac{(b_1 F_1)^m}{(b_1 F_1)^m + (b_2 F_2)^m} \\
p_{s1} &= 1 - p_{v1}
\end{aligned}
$$

$$
\begin{aligned}
p_{v2} &= \frac{(b_2 F_2)^m}{(b_1 F_1)^m + (b_2 F_2)^m} \\
p_{s2} &= 1 - p_{v2}
\end{aligned}
$$

For simplicity, I assume that $b_1 = b_2 = 1$ and $m = 0.5$. F_i is assumed to be a fixed share f_i of each state's per-period resources: $F_i = f_i I_i$. I assume

that $f_1 = f_2 = f$. Substituting from the expressions for the distribution of resources between the two states, $F_1 = s$ and $F_2 = 1 - s$, yields the following four probabilities:

$$
\begin{aligned}
p_{v1} &= \frac{(fI_1)^m}{(fI_1)^m + (fI_2)^m} = \frac{(P_1)^m}{(P_1)^m + (P_2)^m} \\
&= \frac{(s^2)^{0.5}}{(s^2)^{0.5} + \left((1-s)^2\right)^{0.5}} \\
&= s \\
p_{s1} &= 1 - p_{v1} = 1 - s
\end{aligned}
$$

$$
\begin{aligned}
p_{v2} &= \frac{(fI_2)^m}{(fI_1)^m + (fI_2)^m} = \frac{(P_2)^m}{(P_1)^m + (P_2)^m} \\
&= \frac{\left((1-s)^2\right)^{0.5}}{(s^2)^{0.5} + \left((1-s)^2\right)^{0.5}} \\
&= 1 - s \\
p_{s2} &= 1 - p_{v1} = 1 - (1-s) = s
\end{aligned}
$$

These four probabilities are aggregated to three desired probabilities p_1, p_0 and $p_2 = 1 - p_1 - p_0$ in this way: State 1 wins if it wins battle 1 and achieves stalemate in the second. State 2 wins if it achieves stalemate in battle 2 and wins the second. The period ends in stalemate if the two states wins one battle each or noone wins either:

$$
p_1 = p_{v1} \times p_{s2} = s^2
$$

$$
p_2 = p_{v2} \times p_{s1} = (1-s)^2
$$

$$
\begin{aligned}
p_0 &= p_{v1} \times p_{v2} + p_{s1} \times p_{s2} \\
&= s(1-s) + s(1-s) \\
&= 2s(1-s)
\end{aligned}
$$

D.2 Propositions in Chapter 6

D.2.1 Proof of Propositions

Proposition D.1 *6.1. The $\underline{\gamma_1}$ threshold is decreasing in e: $\frac{\partial \gamma_1}{\partial e} < 0$ for all relevant s, τ, and δ.*

The first-order partial derivative of $\underline{\gamma_1}$ with respect to e is (equation 9 in the article). The proposition states that $\frac{\partial \gamma_1}{\partial e} < 0$ for all relevant s, τ, and δ, or tha

$$\frac{\partial \gamma_1}{\partial e} = -s\,(1-s)\,(\tau + p_E\,(1-\delta))$$

t $-\frac{\partial \gamma_1}{\partial e} > 0$. $-\frac{\partial \gamma_1}{\partial e}$ is the product of $s\,(1-s)$ and $(\tau + p_E\,(1-\delta)) = (\tau + (1 - 2s\,(1-s))\,(1-\delta))$, and is positive when both these terms are positive. Since $0 < s < 1$, $s\,(1-s)$ is always positive and less than $\frac{1}{2}$. δ and τ are also restricted to have values between 0 and 1. Hence, $(1-\delta)$ is always positive, $(1 - 2s\,(1-s))$ is always positive since $2s\,(1-s) < 1$, such that $(1-\delta)\,(1 - 2s\,(1-s))$ is always positive, and τ is always positive. This means that $(\tau + (1 - 2s\,(1-s))\,(1-\delta)) > 0$ for the relevant ranges, and also $s\,(1-s)\,(\tau + (1 - 2s\,(1-s))\,(1-\delta)) > 0$. This proves proposition 6.1.

Proposition D.2 *6.2. The $\underline{\gamma_1}$ threshold is decreasing most strongly in e when $s = \frac{1}{2}$ for all relevant τ and δ.*

Proposition 6.2 states that the $\underline{\gamma_1}$ threshold is decreasing most strongly in e when $s = \frac{1}{2}$ for all relevant combinations of s, τ, and δ. In other words, the derivative of $\underline{\gamma_1}$ with respect to e has a minimum for $s = \frac{1}{2}$. This is shown by differentiating (6.9) with respect to s, and solving the equation

$$\begin{aligned}
\frac{\partial^2 \underline{y_1}}{\partial e \partial s} &= 0 \\
\Leftrightarrow \quad \frac{\partial\left[-s\,(1-s)\,(\tau + (1 - 2s\,(1-s))\,(1-\delta))\right]}{\partial s} &= 0 \\
\Leftrightarrow \quad \tau\,(2s - 1) + \left(8s^3 - 12s^2 + 6s - 1\right)(1-\delta) &= 0
\end{aligned}$$

The only solution to this equation for $s, \tau, \delta \in [0, 1]$ is $s = \frac{1}{2}$.

Proposition D.3 *6.3. The $\underline{\gamma_1}$ threshold is decreasing in e only for moderately symmetric dyads: $\frac{\partial \gamma_1}{\partial e} \to 0$ when $s \to 1$ and when $s \to 0$ for all relevant τ and δ.*

Proposition 6.3 states that the $\underline{\gamma_1}$ threshold is decreasing in e only for moderately symmetric dyads: $\frac{\partial \underline{\gamma_1}}{\partial e} \to 0$ when $s \to 1$ and when $s \to 0$ for all relevant s, τ, and δ.

Substituting 0 and 1 for s in (6.9) demonstrates this:

$$\frac{\partial \underline{c_1}}{\partial e}^0 = -0\left(1 - 0\right)\left(\tau + \left(1 - 2\left(0\right)\left(1 - 0\right)\right)\left(1 - \delta\right)\right) = 0,$$

and

$$\frac{\partial \underline{c_1}}{\partial e}^1 = -1\left(1 - 1\right)\left(\tau + \left(1 - 2\left(1\right)\left(1 - 1\right)\right)\left(1 - \delta\right)\right) = 0$$

Proposition D.4 *6.4. The $\underline{\gamma_1}$ threshold is decreasing in D_1: $\frac{\partial \underline{\gamma_1}}{\partial D_1} < 0$ for all relevant D_1, s, τ, δ, η, and $\overline{\theta}$.*

Proposition 6.4 states that the $\underline{\gamma_1}$ threshold is decreasing in D_1: $\frac{\partial \underline{\gamma_1}}{\partial D_1} < 0$ for all relevant s, τ, and δ. The derivative of $\underline{\gamma_1}$ with respect to D_1 is

$$\frac{\partial \underline{\gamma_1}}{\partial D_1} = -\left(1 + \theta s\right)\frac{\eta}{\left(\eta - D_1\right)^2}\left(\tau + \left(1 - 2s\left(1 - s\right)\right)\left(1 - \delta\right)\right)$$

Both θ and η are always positive, as is $\left(\eta - D_1\right)^2$. Hence, $-\left(1 + \theta s\right)\frac{\eta}{\left(\eta - D_1\right)^2} < 0$. The proof of Proposition 1 showed that all the terms in the product

$$\left(\tau + \left(1 - 2s\left(1 - s\right)\right)\left(1 - \delta\right)\right)$$

are positive for the relevant ranges, such that

$$-\left(1 + \theta s\right)\frac{\eta}{\left(\eta - D_1\right)^2}\left(1 - 2s\left(1 - s\right)\right)\left(1 - \delta\right)$$

is always negative.

Proposition D.5 *6.2. When $\theta = 1$, the $\underline{\gamma_1}$ threshold is decreasing most strongly in D_1 when $s = 1$ for all relevant $\overline{D_1}$, τ, δ, and η.*

As for Proposition 6.2, this Proposition is shown by differentiating (6.12) with respect to s:

$$\frac{\partial^2 \gamma_1}{\partial D_1 \partial s} = \frac{\partial \left(-(1+\theta s) \frac{\eta}{(\eta-D_1)^2} (\tau + (1-2s(1-s))(1-\delta)) \right)}{\partial s}$$

$$= \frac{\eta}{(\eta - D_1)^2} \left(2(1-\delta)(1-2s) - \theta \left(\tau - (1-\delta) \left(4s - 6s^2 - 1 \right) \right) \right)$$

The proposition refers to the special case when $\theta = 1$

$$\frac{\partial^2 \gamma_1}{\partial D_1 \partial s} = \frac{\partial \left(-(1+s) \frac{\eta}{(\eta-D_1)^2} (\tau + (1-2s(1-s))(1-\delta)) \right)}{\partial s}$$

$$= \frac{\eta}{(\eta - D_1)^2} \left((1-\delta) \left(1 - 6s^2 \right) - \tau \right)$$

$\frac{\partial \gamma_1}{\partial D_1}$ has a stationary point when $\frac{\partial^2 \gamma_1}{\partial D_1 \partial s} = \frac{\eta}{(\eta-D_1)^2} \left((1-\delta) \left(1 - 6s^2 \right) - \tau \right) = 0 \Leftrightarrow s^2 = \frac{1-\delta-\tau}{6(1-\delta)}$

The negative solution is always outside the defined range $0 < s^2 < 1$. The positive solution is also outside the defined range whenever $\tau < -5(1-\delta)$. Since $0 \leqslant \tau < 1$ and $0 < \delta < 1$, this always holds. Hence, $\frac{\partial \gamma_1}{\partial D_1}$ does not have a stationary point within $0 < s < 1$. Within that range, $\frac{\partial^2 \gamma_1}{\partial D_1 \partial s} < 0$: The (negative) effect of trade is monotonically increasing in s.

Proposition D.6 *6.3. When $\theta = 0$, the $\underline{\gamma_1}$ threshold has a maximum or a minimum in D_1 when $s = \frac{1}{2}$ for all relevant D_1, τ, δ, and η.*

The proposition refers to the special case when $\theta = 0$:

$$\frac{\partial^2 \gamma_1}{\partial D_1 \partial s} = \frac{\partial \left(-\frac{\eta}{(\eta-D_1)^2} (\tau + 1 - 2s(1-s)(1-\delta)) \right)}{\partial s}$$

$$= \frac{\eta}{(\eta - D_1)^2} 2(1-\delta)(1-2s)$$

In this case, $\frac{\partial \gamma_1}{\partial D_1}$ has a stationary point when $\frac{\eta}{(\eta-D_1)^2} 2(1-\delta)(1-2s) = 0 \Leftrightarrow s = \frac{1}{2}$ for relevant values of η, D_1, and δ. This is may be a maximum or a minimum depending on the combination of values for D_1, η, τ, and δ.

D.3   Correlation Matrices

VCE (Correlation) Matrix for Model II, Table 6.2

	s	s^2	e	es	es^2
s	1.00				
s^2	.05	1.00			
e	.00	−.05	1.00		
es	−.25	−.03	−.21	1.00	
es^2	−.02	.03	−.986	.31	1.00
Dem A	−.08	−.01	−.03	.04	.02
Dem T	.03	−.10	.00	−.14	−.03
Dem Int	.05	.01	−.24	−.11	.19
Dev. A	−.29	.09	−.18	.11	.18
Dev. T	.34	.18	−.21	−.11	.18
Distance	−.03	.01	.13	.00	−.13
Cont	−.01	−.01	−.16	−.06	.11
Size	−.03	−.38	−.14	.04	.14
Pr(I)	.02	−.16	−.02	.08	.05
Pr(A)	.06	.18	.11	.05	−.07
Pr(T)	.00	−.26	−.24	.08	.24

	Dem A	Dem T	Dem Int	Dev. A	Dev. T
Dem A	1.00				
Dem T	.25	1.00			
Dem Int	.08	.09	1.00		
Dev. A	−.32	−.10	−.05	1.00	
Dev. T	−.05	−.28	.02	−.16	1.00
Distance	.05	.02	.04	.16	.19
Cont	.17	.14	.06	.15	.20
Size	−.20	−.13	.07	−.17	−.23
Pr(I)	−.16	.20	−.06	.11	.12
Pr(A)	−.11	−.07	.13	.05	.13
Pr(T)	.02	−.02	.00	.00	−.10

	Dist.	Cont	Size	Pr(I)	Pr(A)	Pr(T)
Dev. A						
Dev. T						
Distance	1.00					
Cont	.68	1.00				
Size	−.46	−.39	1.00			
Pr(I)	−.04	−.03	.24	1.00		
Pr(A)	.01	−.36	−.07	−.03	1.00	
Pr(T)	−.11	−.03	.20	.05	−.23	1.00

VCE (Correlation) Matrix for Model III, Table 6.2

	s	s^2	D_1	D_1s	D_1s^2	Dem A	Dem T
s	1.00						
s^2	.16	1.00					
D_1	.34	.11	1.00				
D_1s	.41	.30	.53	1.00			
D_2s^2	.18	.25	−.26	.68	1.00		
Dem A	−.08	−.01	−.04	.00	.03	1.00	
Dem T	−.01	−.11	−.04	−.02	.01	.25	1.00
Dem Int	−.11	−.07	−.29	−.24	−.03	.08	.08
Dev. A	−.31	.09	−.17	−.07	.06	−.32	−.10
Dev. T	.18	.10	−.23	−.21	−.04	−.05	−.28
Distance	.02	.03	.14	.09	−.02	.05	.01
Cont	−.13	−.08	−.21	−.16	−.02	.17	.13
Size	−.08	−.39	−.15	−.09	.03	−.21	−.13
Pr(I)	.05	−.12	.00	.06	.07	−.16	.20
Pr(A)	.14	.23	.15	.12	.02	−.11	.07
Pr(T)	−.06	−.27	−.23	−.09	.09	.02	−.02

	Dem Int	Dev. A	Dev. T	Dist.	Cont
Dem Int	1.00				
Dev. A	−.05	1.00			
Dev. T	.01	−.16	1.00		
Distance	.03	.16	.18	1.00	
Cont	.04	.14	.19	.68	1.00
Size	.07	−.17	−.23	−.46	−.39
Pr(I)	−.05	.12	.12	−.04	−.03
Pr(A)	.14	.05	.13	.01	−.36
Pr(T)	.01	−.10	−.11	−.03	.10

	Size	Pr(I)	Pr(A)	Pr(T)
Size	1.00			
Pr(I)	.24	1.00		
Pr(A)	−.07	−.03	1.00	
Pr(T)	.20	.05	−.23	1.00

Appendix E

Appendix to Chapter 7

E.1 The Control Model

I first estimated a model including all the control variables introduced in Section 7.3.2 in addition to the Executive Constraints and GDP per capita variable. In addition, I included some additional variables presented below to minimize omitted variable bias. The results from this estimation are presented in Model A1 in Tables E.1 and E.2. Among the control variables, only 'Growth', 'Proximity of Armed Conflict', and 'Ethnic Dominance' are statistically significant (one-sided tests), in addition to the 'Development-Democracy' interaction term.

'Diaspora' has a particularly high number of missing values, so omitting it will considerably increase the size of the sample, as done in Model A2. This increases the number of conflicts in the analysis from 48 to 73, and adds four variables to the list of signficant terms: 'Democracy', 'ln(Population)', 'Secondary Schooling', the 'Proximity of Armed Conflict – In Conflict' interaction term.

'Geographic Dispersion' and 'Income Inequality' are not close to significance, and have many missing values. These were excluded in Model A3. Although the number of conflicts in the analysis increases to 110, the estimates for the significant variables barely change. Note that the 'Development-Democracy' interaction term is significant in all three analyses, independent of controlling set and the number of cases in the sample.

The 'Mineral exports' variable is not significant, nor is its square term. I also tried other variants of this pair of variables, such as mineral exports as a share of GDP and all primary commodities as a share of GDP. None of these were significant when low-level armed conflicts was the dependent

variable.

I made three simplifications to Model A3 in the analyses presented in the main text: Since 'Mineral exports' and 'Literacy' are used as separate indicators of development in the analyses, I never enter them together with 'Income' and vice versa. Moreover, Model A3 has three indicators of ethnic composition. I use the variable that obtains the highest level of significance, 'Ethnic Dominance', and drop the rest. Finally, I drop 'Proximity of Independence' which is never signficant.

Proximity of Independence   For each observation, I computed the time in days since the country became independent. The time was transformed into the 'Proximity of' function by means of the formula $p_i = 2^{-\frac{T_i}{6}}$, where T_i is the number of years since independence, and the half-life parameter is seven years.

Diaspora   This variable was taken from Collier & Hoeffler. It measures the number of persons born in the country registered as resident in the U.S. by the U.S. Bureau of Census.

Ethnic Polarization   The Polarization measure, developed in Reynal-Querol (2002), measures the degree to which the population distribution over ethinic groups are polarized. The measure takes its largest value if there are two groups of equal size in the country. The variable was taken from Collier & Hoeffler (2002).

Ethnic Fractionalization   The Ethnic fractionalization variable measures the probability that two individuals randomly drawn from a country do not belong to the same ethnic group. The variable was taken from Collier & Hoeffler, 2002.

Income Inequality   I use the GINI index as a measure of income inequality. The variable was taken from World Bank (2002).

Secondary School Enrollment   The Secondary School Enrollment variable was taken from World Bank (2002). Missing data points were imputed by means of Stata's imputation algorithm (StataCorp, 2001b:69–73). This procedure and the variables used in the imputation are reported in Appendix 2.

Explanatory Variable	Model A1 $\widehat{\beta}$ (s.e.)	Model A2 $\widehat{\beta}$ (s.e.)	Model A3 $\widehat{\beta}$ (s.e.)
Democracy	−0.019 (0.064)	−0.081* (0.059)	−0.064* (0.048)
ln(GNP per capita)	−0.13 (0.20)	−0.063 (0.15)	−0.12 (0.11)
Democracy * ln(GNP per capita)	−0.19*** (0.040)	−0.12*** (0.041)	−0.11*** (0.028)
Growth$_{previous\ year}$	−2.94*** (1.10)	−2.76*** (0.83)	−2.78*** (0.64)
Mountaineous Terrain	−0.0049 (0.0075)	−0.0016 (0.0055)	0.0026 (0.0036)
Proximity of Regime Change	0.93 (0.95)	0.16 (0.98)	−0.062* (0.88)
Ethnic Fractionalization	0.42 (0.73)	0.73 (0.75)	0.53 (0.65)
Ethnic Dominance	0.63** (0.37)	0.28 (0.28)	0.30* (0.22)
Proximity of Independence	−2.93 (3.59)	−0.56 (0.97)	−0.71 (0.74)
ln(Population)	0.17 (0.099)	0.38*** (0.076)	0.30*** (0.067)
Minerals in Exports (%)	−0.99 (1.15)	−0.52 (0.85)	−0.22 (0.60)
Square of Minerals in Exports (%)	−2.26 (1.98)	−1.39 (1.56)	−0.64 (1.18)
Secondary Schooling	−0.012 (0.013)	−0.014* (0.0091)	−0.013** (0.0074)
Geographic Dispersion	0.27 (0.83)	−0.58 (0.57)	
Income Inequality (GINI index)	0.0028 (0.015)	−0.0053 (0.012)	
* : $p < 0.10$, ** : $p < 0.05$, *** : $p < 0.01$ (one-sided test)			

Table E.1: Risk of Armed Conflict By Categorical Democracy Measure and GNP per capita, All Conflicts

	Model A1	Model A2	Model A3
Explanatory Variable	$\widehat{\beta}$ (s.e.)	$\widehat{\beta}$ (s.e.)	$\widehat{\beta}$ (s.e.)
Diaspora	-2332 (1980)		
Polarization	0.68 (0.79)	0.44 (0.57)	0.015 (0.44)
Ethnic Dominance	0.53 (0.42)	0.28 (0.28)	0.30* (0.22)
Proximity of Armed Conflict	1.33** (0.78)	1.75*** (0.62)	1.06** (0.63)
In Armed Conflict	0.17 (0.60)	-0.20 (0.39)	0.017 (0.35)
Proximity of A.C * In Armed Conflict	-2.59 (1.44)	-2.31*** (0.90)	-1.62*** (0.91)
$2\,(LL_{int} - LL_{\sim int})$ (d.f.) χ^2 (p-value)	11.41 (1) (0.0007)	7.10 (1) (0.008)	11.16 (1) (0.0008)
No. of countries	71	82	124
No. of conflicts	48	73	110
Time at risk (days)	$682,140$	$997,517$	$1,429,204$
LL_o	-190.35	-314.78	-512.75
LL_{m_3}	-159.72	-275.62	-468.87
* : $p < 0.10$, ** : $p < 0.05$,*** : $p < 0.01$ (one-sided test)			

Table E.2: Risk of Armed Conflict By Categorial Democracy Measure and GNP per capita, All Conflicts (continued)

Geographical Dispersion of Population   The variable is a gini coefficient of geographic population distribution. A value of 1 indicates that the population is concentrated in one area, a value of 0 that all areas have equal population density. The variable was taken from Collier & Hoeffler, 2002.

E.2   Appendix 2. Imputation of Variables

The 'Literacy' and 'Mineral exports' variables have more missing values than the GDP per capita variable in the World Bank data set. To ameliorate this problem, I filled in missing variables by means of interpolation and imputation. The imputation algorithm does the following (StataCorp,

Secondary school enrollment (%)
Youth illiteracy rate, females 15-24 years (% of cohort)
Youth illiteracy rate, males 15-24 years (% of cohort)
Youth illiteracy rate, all 15-24 years (% of cohort)
Adult illiteracy rate, females 15- years (% of cohort)
Adult illiteracy rate, males 15- years (% of cohort)
Adult illiteracy rate, all 15- years (% of cohort)
Primary school enrollment (% gross)
Persistence to grade 5, all (% of cohort)
Secondary school enrollment, female (% gross)
Secondary school enrollment, male (% gross)
Tertiary school enrollment (% gross)
Tertiary school enrollment, male (% gross)
Tertiary school enrollment, female (% gross)
Mortality rate, infant (per 1,000 live births)
Life expectancy at birth, total (years)
Rural population (% of total population)
Urban population (% of total population)

Table E.3: Variables used in imputation of secondary school enrollment variable

2001b: 73): If an observation j is missing value for the imputed variable y, the algorithm runs a regression with y as the dependent variable and all x_i for which that observation is not missing values as regressors. All observations in the data set without missing values for y and x_i are used in this estimation. The missing observation y_j is replaced with the predicted value $\widehat{y}$ for j from this estimation. Observations where the value for y is not missing were not changed.

Before imputation, I filled in missing values by interpolation. I then selected a set of relevant variables from the World Bank World Development Indicators. Only variables that are theoretically related to the imputed variable and that did not miss to many values themselves were selected. The set of regressors used in the imputation of the variables are given in Tables E.3 and .E.4.

For the Secondary school enrollment variable, the number of observations with data for the 1960-2000 period was increased from 3,139 to 7,585. Since more data are missing for developing countries, the imputation caused the mean and median of the variable to decrease from 52 to 45 and from 50 to 42, respectively.

Minerals as share of merchandise exports (%)
Nontax revenue (% of GDP)
Nontax revenue (% of current revenue)
Taxes on int'l trade (% of current revenue)
Tax revenue (% of GDP)
Health, education, housing etc. expenditure
Land use, irrigated land (%)
Exports of goods and services (% of GDP)
Agriculture, value added (% of GDP)
Manufacturing, value added (% of GDP)
Mining and quarrying, value added (% of GDP)
Industry, value added (% of GDP)
Services, value added (% of GDP)
GDP per capita (constant US$)
Employment in agriculture (% of total empl.)
Employment in industry (% of total empl.)
Employment in services (% of total empl.)
Agricultural raw materials exp. (% of merch. exp.)
Food exports (% of merchandise exp.)
Manufactures exports (% of merch. exp.)
High-technology exports (% of manuf. exp.)

Table E.4: Variables used in imputation of minerals variable

In both imputations, some potential predictors that are highly correlated with GDP per capita were excluded, such as education expenditure data.

Appendix F

Appendix to Chapter 8

F.1 Results of Gravity Model Regressions

Year	Inter- cept	ln(GDP country 1)	ln(GDP country 2)	ln (Distance)	Con- tiguous
1949	5.760	0.264	0.125	−0.972	0.689
1950	5.398	0.251	0.128	−0.912	0.682
1951	5.359	0.272	0.140	−0.918	0.614
1952	5.075	0.281	0.168	−0.907	0.319
1953	4.965	0.287	0.177	−0.920	0.133
1954	5.559	0.250	0.160	−0.936	0.160
1955	5.792	0.251	0.149	−0.929	0.489
1956	6.431	0.240	0.124	−0.972	0.497
1957	6.944	0.225	0.130	−1.019	0.442
1958	7.178	0.222	0.113	−1.028	0.286
1959	7.360	0.232	0.120	−1.061	0.388
1960	2.146	0.460	0.388	−1.094	0.384
1961	2.108	0.458	0.390	−1.099	0.484
1962	2.326	0.452	0.396	−1.133	0.299
1963	2.427	0.455	0.396	−1.138	0.275
1964	2.502	0.456	0.377	−1.125	0.319
1965	1.879	0.467	0.375	−1.050	0.479
1966	1.459	0.481	0.392	−1.036	0.340
1967	1.603	0.478	0.399	−1.064	0.417
1968	1.619	0.494	0.399	−1.099	0.513
1969	1.622	0.495	0.408	−1.102	0.418
1970	−3.562	0.809	0.644	−1.096	0.513

Year	Inter-cept	ln(GDP country 1)	ln(GDP country 2)	ln (Distance)	Con-tiguous
1971	−1.972	0.736	0.515	−1.069	0.523
1972	−1.160	0.754	0.508	−1.195	0.567
1973	0.149	0.672	0.514	−1.245	0.347
1974	0.423	0.637	0.524	−1.234	0.375
1975	−0.425	0.666	0.600	−1.273	0.355
1976	−0.709	0.669	0.572	−1.220	0.344
1977	−2.540	0.783	0.644	−1.215	0.311
1978	−1.956	0.742	0.615	−1.211	0.299
1979	−0.921	0.687	0.622	−1.274	0.143
1980	−2.633	0.767	0.732	−1.303	0.313
1981	−2.484	0.722	0.682	−1.227	0.513
1982	−2.387	0.722	0.669	−1.245	0.507
1983	−2.731	0.718	0.706	−1.262	0.423
1984	−4.317	0.762	0.842	−1.304	0.407
1985	−6.898	0.967	0.895	−1.319	0.354
1986	−3.818	0.749	0.841	−1.352	0.266
1987	−0.177	0.647	0.572	−1.319	0.461
1988	1.250	0.557	0.499	−1.273	0.611
1989	3.313	0.462	0.395	−1.261	0.829
1990	6.926	0.307	0.219	−1.242	0.815
1991	7.354	0.204	0.184	−1.123	0.912
1992	8.520	0.198	0.161	−1.186	0.948

F.2 Descriptive Statistics

Gravity Model Measure

		Percentiles	
Smallest	−13.49976	1%	−5.132803
Largest	8.322582	5%	−3.254503
Obs	272279	10%	−2.431556
Sum of Wgt.	272279	25%	−1.168284
Mean	−.0539972	50%	.0854435
Std. Dev.	1.875232	75%	1.163495
Variance	3.516494	90%	2.140983
Skewness	−.4835237	95%	2.789507
Kurtosis	4.438289	99%	4.110505

Ln(Salience)

		Percentiles	
Smallest	−3.912023	1%	−3.912023
Largest	13.0083	5%	−3.912023
Obs	360302	10%	−3.912023
Sum of Wgt.	360302	25%	4.60537
Mean	5.451949	50%	7.696222
Std. Dev.	5.414913	75%	9.239902
Variance	29.32128	90%	10.32876
Skewness	−.9745797	95%	10.89859
Kurtosis	2.310397	99%	11.8671

Salience

		Percentiles	
Smallest	0.00	1%	0.00
Largest	44.61	5%	0.00
Obs	360302	10%	0.00
Sum of Wgt.	360302	25%	0.01
Mean	1.162876	50%	0.22
Std. Dev.	2.804268	75%	1.03
Variance	7.863919	90%	3.06
Skewness	5.985692	95%	5.41
Kurtosis	55.8359	99%	14.25

Least dependent

		Percentiles
Smallest	0.00	1%
Largest	16.86	5%
Obs	267617	10%
Sum of Wgt.	267617	25%
Mean	0.1634704	50%
Std. Dev.	0.5720738	75%
Variance	0.3272684	90%
Skewness	11.71647	95%
Kurtosis	211.803	99%

Lowest GDP per Capita

		Percentiles	
Smallest	5.3982	1%	5.7038
Largest	10.3725	5%	6.0355
Obs	307724	10%	6.1944
Sum of Wgt.	307724	25%	6.5681
Mean	7.332731	50%	7.2277
Std. Dev.	.9328675	75%	8.0024
Variance	.8702418	90%	8.674
Skewness	3472121	95%	9.0034
Kurtosis	2.236911	99%	9.3808

Lowest Energy Consumption per Capita

		Percentiles	
Smallest	5.3982	1%	5.7038
Largest	10.3725	5%	6.0355
Obs	307724	10%	6.1944
Sum of Wgt.	307724	25%	6.5681
Mean	7.332731	50%	7.2277
Std. Dev.	.9328675	75%	8.0024
Variance	.8702418	90%	8.674
Skewness	3472121	95%	9.0034
Kurtosis	2.236911	99%	9.3808

Interaction

GMM*GDP per Capita

		Percentiles	
Smallest	−104.6917	1%	−35.26076
Largest	60.04597	5%	−21.90557
Obs	266095	10%	−16.72092
Sum of Wgt.	266095	25%	−8.187718
Mean	.0768475	50%	.7304448
Std. Dev.	13.48074	75%	8.796741
Variance	181.7303	90%	16.33345
Skewness	−.4234311	95%	20.67033
Kurtosis	4.721182	99%	31.19423

*Interaction ln(Salience) ***

Energy Consumption per Capita

		Percentiles	
Smallest	−35.64909	1%	−30.25246
Largest	125.8497	5%	−27.54612
Obs	269676	10%	−26.16987
Sum of Wgt.	269676	25%	31.85857
Mean	43.32729	50%	56.43036
Std. Dev.	41.16765	75%	72.10283
Variance	1694.775	90%	85.03701
Skewness	−.7790376	95%	92.66002
Kurtosis	2.24846	99%	104.3834

Size Asymmetry: GDP and Population

		Percentiles	
Smallest	.000017	1%	.0218
Largest	9.6317	5%	.0983
Obs	274024	10%	.2094
Sum of Wgt.	274024	25%	.59
Mean	1.577872	50%	1.272
Std. Dev.	1.282645	75%	2.2553
Variance	1.645177	90%	3.4108
Skewness	1.183514	95%	4.0752
Kurtosis	4.419881	99%	5.6214

Size Asymmetry: Military Capabilities

		Percentiles	
Smallest	−12.09076	1%	−5.221356
Largest	11.29876	5%	−3.50323
Obs	409905	10%	−2.69711
Sum of Wgt.	409905	25%	−1.384296
Mean	.1457514	50%	.0886517
Std. Dev.	2.333733	75%	1.498618
Variance	5.446311	90%	3.086473
Skewness	.2406773	95%	4.1963
Kurtosis	3.562488	99%	6.298003

Time in Peace

		Percentiles	
Smallest	0	1%	$3.73e-08$
Largest	.9996802	5%	.0000202
Obs	439201	10%	.0012286
Sum of Wgt.	439201	25%	.0247409
Mean	.2379442	50%	.1314944
Std. Dev.	.2680182	75%	.3788672
Variance	.0718337	90%	.6847107
Skewness	1.171506	95%	.8243021
Kurtosis	.9558966	99%	.9558966

References

Amemiya, Takeshi, 1978. 'The Estimation of a Simultaneous Equation Generalized Probit Model', *Econometrica* 46: 1193–1205.

Amemiya, Takeshi, 1979. 'The Estimation of a Simultaneous Equation Generalized Tobit Model', *International Economic Review* 20(1): 169–181.

Anderson, James E., 1979. 'A Theoretical Foundation for the Gravity Equation', *American Economic Review* 69(1): 106–116.

Anderton, Charles H. & John R. Carter, 2001. 'The Impact of War on Trade: An Interrupted Time-Series Study', *Journal of Peace Research* 38(4): 445–457.

Angell, Norman, 1910. *The Great Illusion. A Study of the Relationship of Military Power in Nations to Their Economic and Social Advantage.* London: Heinemann.

Angell, Norman, 1938. *The Great Illusion – Now* . Harmondsworth: Penguin.

Auty, Richard, 2001. *Resource Abundance and Economic Development.* Oxford: Oxford University Press.

Auvinen, Juha, 1997. 'Political Conflict in Less Developed Countries, 1981-89.' *Journal of Peace Research* 34(2): 177-195.

Barro, Robert J., 1996. 'Democracy and Growth', *Journal of Economic Growth* 1(1): 1–27.

Banks, A. S., & R. B. Textor, 1963. *A Cross-Polity Survey.* Cambridge, MA: MIT Press.

Barbieri, Katherine, 1996a. 'Economic Interdependence: A Path to Peace or a Source of Interstate Conflict?', *Journal of Peace Research* 33(1): 29-49.

Barbieri, Katherine, 1996b. 'Explaining Discrepant Findings in the Trade-Conflict Literature', Paper presented at the Annual Meeting of the International Studies Association, San Diego, CA, April 16-21.

Barbieri, Katherine, 1999. 'Commerce and Conquest: A False Dichotomy' . Paper presented at the Annual Meeting of the Peace Science Society, Ann Arbor, MI, 8–10 October.

Barbieri, Katherine, 2002. *The Liberal Illusion. Does Trade Promote Peace?* Ann Arbor: University of Michigan Press.

Barbieri, Katherine & Jack S. Levy, 1999. 'Sleeping with the Enemy: The Impact of War on Trade', *Journal of Peace Research* 36(4): 463-479.

Beck, Nathaniel & Matthew Baum, 2000. 'Trade and Conflict in the Cold War Era: An Empirical Analysis Using Directed Dyads', Paper presented at the European Consortium on Political Research Joint Sessions of Workshops. Copenhagen, April 14–19.

Beck, Nathaniel & Simon Jackman, 1998. 'Beyond Linearity by Default: Generalized Additive Models', *American Journal of Political Science* 42(2): 596-627.

Beck, Nathaniel & Jonathan N. Katz, 1997. 'The Analysis of Binary Time-Series-Cross-Section Data and/or The Democratic Peace', Paper presented at the Annual Meeting of the Political Methodology Group, Columbus, Ohio, July, 1997.

Beck, Nathaniel; Jonathan N. Katz & Richard Tucker, 1998. 'Taking Time Seriously: Time-Series-Cross-Section Analysis with a Binary Dependent Variable', *American Journal of Political Science* 42(4): 1260–1288.

Beck, Nathaniel & Richard Tucker, 1996. 'Conflict in Space and Time: Time-Series-Cross-Section Analysis with a Binary Dependent Variable', Paper presented to the 1996 annual meeting of the American Political Science Association, San Fransisco, 29 August–1 September.

Beck, Nathaniel & Richard Tucker, 1997. 'Conflict in Time and Space', Cambridge, MA: Harvard University.

Bennett, D. Scott & Allan C. Stam III, 1998. *EUGene: Expected Utility Generation and Data Management Program.* http://wizard.ucr.edu/cps/eugene/eugene.html.

Bennett, D. Scott & Allan C. Stam III, 2000. 'Research Design and Estimator Choices in the Analysis of Interstate Dyads', *Journal of Conflict Resolution* 44(5): 653–685.

Benoit, Kenneth, 1996. 'Democracies Really are more Pacific (in General): Reexamining Regime Type and War Involvement', *Journal of Conflict Resolution* 40(4): 636-657.

Bhattacharyya, Gourti K. & Richard A. Johnson, 1977. *Statistical Concepts and Methods.* New York: Wiley.

Bienen, Henry, & Nicholas van de Walle, 1992. 'A Proportional Hazard Model of Leadership Duration', *Journal of Politics* 54 (August): 685–171.

Blainey, Geoffrey, 1988. *The Causes of War.* New York: The Free Press.

Boix, Carles & Luis Garicano, 2002. 'Democracy, Inequality and Country-Specific Wealth', Ms., The University of Chicago, January 14. URL: http://home.uchicago.edu/~cboix/Papers.html.

Boix, Carles & Susan Stokes, 2002. 'Endogenous Democratization', Ms. The University of Chicago, September 19. URL: http://home.uchicago.edu/~cboix/Papers.html.

Boswell, Terry & William J. Dixon, 1990. 'Dependency and Rebellion: A Cross-National Analysis', *American Sociological Review* 55(3):540–559.

Boulding, Kenneth E., 1962. *Conflict and Defense. A General Theory.* New York: Harper & Row.

Box-Steffensmeier, Janet M. & Christopher J. W. Zorn, 2001. 'Duration Models and Proportional Hazards in Political Science', *American Journal of Political Science* 45(4):972–988.

Bratton, Michael, and Nicholas van de Walle, 1996. *Democratic Experiments in Africa: Regime Transitions in Comparative Perspective.* Cambridge: Cambridge University Press.

Brecher, M., Wilkenfeld, J., & S. Moser 1988. *Crises in the Twentieth Century, vol. 1. Handbook of International Crises.* Oxford, etc.: Pergamon.

Bremer, Stuart, 1992a. 'Dangerous Dyads.: Conditions Affecting the Likelihood of Interstate War, 1816–1965', *Journal of Conflict Resolution* 36(2): 309–41.

Bremer, Stuart A., 1992b. 'Are Democracies Less Likely to Join Wars?', Paper presented to the 1992 Annual Meeting of the American Political Science Association, September 3–6.

Bremer, Stuart A., 1993. 'Democracy and Militarized Interstate Conflict, 1816-1965', *International Interactions* 18: 231-249.

Brooks, Stephen G, 1999. 'The Globalization of Production and the Changing Benefits of Conquest', *Journal of Conflict Resolution* 43: 646–670.

Bueno de Mesquita, Bruce; James D. Morrow, Randolph M. Siverson & Alastair Smith, 1999a. 'An Institutional Explanation of the Democratic Peace', *American Political Science Review* 93(December): 791-807.

Bueno de Mesquita, Bruce, James D. Morrow, Randolph M. Siverson & Alastair Smith, 1999b. 'Policy Failure and Political Survival: The Contribution of Political Institutions', *Journal of Conflict Resolution* 43: 147-61.

Bueno de Mesquita, Bruce, James D. Morrow, Randolph M. Siverson & Alastair Smith, 2000. 'Political Institutions, Political Survival, and Policy Success', In *Governing for Prosperity*, eds. Bruce Bueno de Mesquita & Hilton Root. New Haven: Yale University Press.

Bueno de Mesquita, Bruce, James D. Morrow, Randolph M. Siverson & Alastair Smith, 2002. 'Political Institutions, Policy Choice, and the Survival of Leaders', *British Journal of Political Science* 32: 559-90.

Bueno de Mesquita, Bruce, & Randolph M. Siverson, 1995. 'War and the Survival of Political Leaders: A Comparative Study of Regime Types and Political Accountability', *American Political Science Review* 89(December): 841-55.

Bueno de Mesquita, Bruce, & Randolph M. Siverson, & G. Woller, 1992. War and the Fate of Regimes: A Comparative Analysis. *American Political Science Review* 86: 638-646.

Burkhart, Ross E. & Michael S. Lewis-Beck, 1994. 'Comparative Democracy: The Economic Development Thesis', *American Political Science Review* 88(4): 903–910.

Buzan, Barry, 1984. 'Economic Structure and International Security: The Limits of the Liberal Case', *International Organization* 38(4): 597-624.

Casper, Gretchen, & Michelle M. Taylor, 1996. *Negotiating Democracy: Transitions from Authoritarian Rule.* Pittsburgh, PA: University of Pittsburgh Press.

Chan, Steve, 1984. 'Mirror, Mirror on the Wall... Are the Freer Countries more Pacific?', *Journal of Conflict Resolution* 28(4): 617-648.

Choucri, Nazli & Robert C. North, 1975. *Nations in Conflict: National Growth and International Violence.* San Fransisco, CA: W. H. Freeman and Company.

Choucri, Nazli & Robert C. North, 1989. 'Lateral Pressure in International Relations: Concept and Theory' , in Manus Midlarsky, ed., *Handbook of War Studies*. Ann Arbor, MI: Michigan University Press.

Christiansen, Lene Siljeholm, 2004. *Military Interventions and Democratization*. Draft for Cand.polit. Thesis, Norwegian University of Technology and Sciences, February.

Christiansen, Lene Siljeholm, Nils Petter Gleditsch & Håvard Hegre, 2004. 'Democratic *Jihad*?', paper under preparation for presentation to the annual convention of the International Studies Association, Montreal, March.

Cohen, Raymond, 1994. 'Pacific Unions: A Reappraisal of the Theory the "Democracies do not Go to War with Each Other"', *Review of International Studies*, 20(3): 207–223.

Collett, D., 1994. *Modelling Survival Data in Medical Research*. London, etc.: Chapman & Hall.

Collier, Paul, 2000. 'Doing Well Out of War: An Economic Perspective', in Mats Berdal & David M. Malone, eds, Greed & Grievance: *Economic Agendas in Civil Wars*. Boulder, CO: Lynne Rienner (91–111).

Collier, Paul; Lani Elliott, Håvard Hegre, Anke Hoeffler, Marta Reynal-Querol & Nicholas Sambanis, 2003. *Breaking the Conflict Trap: Civil War and Development Policy*. World Bank Policy Research Report. Oxford: Oxford University Press and Washington, DC: The World Bank.

Collier, Paul, & Anke Hoeffler, 1998. 'On Economic Causes of Civil War', *Oxford Economic Papers* 50(4): 563-573.

Collier, Paul & Anke Hoeffler, 2002. 'Greed and Grievance in Civil War', (March 13, 2002). *The Centre for the Study of African Economies Working Paper Series*. Working Paper 160. Available at http://www.bepress.com/csae/paper160/

Copeland, Dale C., 1996. 'Economic Interdependence and War: A Theory of Trade Expectations', *International Security* 20(4): 5-41.

Cox, David R., 1972. 'Regression Models and Life Tables (with Discussion)', *Journal of the Royal Statistical Society*, B 74: 187–220.

Dahl, Robert A., 1989. *Democracy and Its Critics*. New Haven, CT: Yale University Press.

Davenport, Christian, 1999. 'Human Rights and the Democratic Proposition', *Journal of Conflict Resolution* 43(1): 92–116.

Davies, James C., 1962. 'Toward a Theory of Revolution', *American Sociological Review* 27(1):5–19.

Davies, Victor A.B. & Abie Fofana, 2002. 'Diamonds, Crime and Civil War in Sierra Leone', Ms., The World Bank.

Dixon, William, 1994. 'Democracy and the Peaceful Settlement of International Conflict', *American Political Science Review* 88(1):14–32.

Diamond, Larry, 1994. 'Towards Democratic Consolidations', *Journal of Democracy* 5(1): 3-17.

Dixon, William J., 1994. 'Democracy and the Peaceful Settlement of International Conflict', *American Political Science Review* 88(1): 1-17.

Dorussen, Han, 1999. 'Balance of Power Revisited: A Multi-Country Model of Trade and Conflict', *Journal of Peace Research* 36(4): 443–462.

Dorussen, Han & Håvard Hegre, 2003. 'Extending the Multi-Country Model of Trade and Conflict', in Gerald Schneider, Katherine Barbieri, & Nils Petter Gleditsch, eds., *Globalization and Armed Conflict*. Boulder, CO: Rowman & Littlefield.

Doyle, Michael W., 1983a. Kant, Liberal Legacies, and Foreign Affairs, part 1. *Philosophy & Public Affairs* 12: 205-235

Doyle, Michael W., 1983b. Kant, Liberal Legacies, and Foreign Affairs, part 2. *Philosophy & Public Affairs* 12: 323-353.

Doyle, Michael W., 1986. 'Liberalism and World Politics', *American Political Science Review* 80(4): 1151-1169.

Doyle, Michael W. & Nicholas Sambanis, 2000. 'International Peacebuilding: A Theoretical and Quantitative Analysis', *American Political Science Review* 94(4):779–801.

Eckstein, Harry, 1973. 'Authority Patterns: A Structural Pattern for Inquiry', *American Political Science Review* 47(4): 1153.

Elbadawi, Ibrahim & Håvard Hegre, 2004. 'Globalization, Economic Shocks, and Armed Conflict', Paper presented to the 'Globalization, Territoriality and Conflict' conference, University of California, San Diego, January 16–18. URL: http://folk.uio.no/hahegre/papers.

Elbadawi, Ibrahim & Nicholas Sambanis, 2002. 'How Much War Will We See? Explaining the Prevalence of Civil War', *Journal of Conflict Resolution* 46(3):307–334.

Ellingsen, Tanja, 2000. 'Colorful Community or Ethnic Witches' Brew? Multiethnicity and Domestic Conflict During and After the Cold War', *Journal of Conflict Resolution* 44:2(228–49).

Ellingsen, Tanja, & Nils Petter Gleditsch, 1997. 'Democracy and Armed Conflict in the Third World', In *Causes of Conflict in Third World Countries*, ed. Ketil Volden & Dan Smith. Oslo: North-South Coalition & International Peace Research Institute, Oslo.

Enterline, Andrew J, 1996. 'Driving While Democratizing'. *International Security* 20: 183-196.

Ethier, Wilfred J., 1995. *Modern International Economics*. New York & London: Norton.

Faber, Jan & Tom Nierop, 1989. *World Export Data, 1948-83 (ICPSR 9116)*. Ann Arbor, MI: Inter-university Consortium for Political and Social Research.

Farber, Henry S. & Joanne Gowa, 1995. 'Polities and Peace', *International Security* 20(2): 123-146.

Fearon, James D., 1994. 'Domestic Political Audiences and the Escalation of International Disputes', *American Political Science Review* 88(3): 577-592.

Fearon, James D., 1995. 'Rationalist Explanations for War', *International Organization* 49(3): 379–414.

Fearon, James D. & David D. Laitin, 1999. 'Weak States, Rough Terrain, and Large-scale Ethnic Violence', Paper presented at the 1999 Annual Meetings of the American Political Science Association, Atlanta, GA, September.

Fearon, James D. & David Laitin, 2003. 'Ethnicity, Insurgency, and Civil War', *American Political Science Review* 97(1): 75-90.

Francisco, Ronald A, 1995. 'The Relationship between Coercion and Protest: An Empirical Evaluation in Three Coercive States', *Journal of Conflict Resolution* 39(2): 263-282.

Franzese, Robert J.; Cindy D. Kam & Amaney A. Jamal, 2002. 'Modeling and Interpreting Interactive Hypotheses in Regression Analysis: A

Brief Refresher and Some Practical Advice', Working paper, Department of Political Science, University of Michigan. Available at http://www-personal.umich.edu/ ~franzese/InteractionsPaper.pdf.

Freedom House, annual. *Freedom in the World: The Annual Survey of Political Rights and Civil Liberties.* New York: Freedom House.

Friedrich, Robert J., 1982. 'In Defense of Multiplicative Terms in Multiple Regression Equations', *American Journal of Political Science* 26(4): 797–833.

Galtung, Johan, 1971. 'A Structural Theory of Imperialism', *Journal of Peace Research* 8(2): 81-117.

Galtung, Johan, 1996. 'Democracy: Dictatorship = Peace: War?', ch. 4 in his *Peace by Peaceful Means. Peace and Conflict, Development, and Civilization.* London, etc: SAGE.

Gartzke, Erik, 1999. 'War Is In the Error Term', *International Organization* 53 (3): 567-.

Gartzke, Erik; Quan Li & Charles Boehmer, 2001. 'Investing in the Peace: Economic Interdependence and International Conflict', *International Organization* 55(2):391–438.

Gartzke, Erik & Quan Li, 2003. 'War, Peace, and the Invisible Hand: Positive Political Externalities of Economic Globalization', *International Studies Quarterly* 47(4): 561–586.

Gasiorowski, Mark J., 1986. 'Economic Interdependence and International Conflict: Some Cross-National Evidence', *International Studies Quarterly* 30(1): 23–38.

Gasiorowski, Mark J. & Solomon W. Polachek, 1982. 'Conflict and Interdependence: East-West Trade and Linkages in the Era of Detente', *Journal of Conflict Resolution* 26(4): 709-729.

Gates, Scott, 2002. 'Recruitment and Allegiance: The Microfoundations of Rebellion', J*ournal of Conflict Resolution* 46(1): 111—130.

Gates, Scott; Håvard Hegre, Mark Jones & Håvard Strand, 2003a. 'Institutional Inconsistency and Polity Duration', typescript, PRIO. URL: http://folk.uio.no/hahegre/Papers/Institutions.pdf.

Gates, Scott; Håvard Hegre, Mark Jones & Håvard Strand, 2003b. 'Democratic Waves? War, New States, and Global Patterns of Democracy,

1800–2000. Paper presented at the University of North Carolina, Chapel Hill, March.

Gates, Scott; Torbjørn L. Knutsen & Jonathan W. Moses, 1996. 'Democracy and Peace: A More Skeptical View', *Journal of Peace Research* 33(1): 1-10.

Gates, Scott & Sara McLaughlin, 1996. 'Rare Events, Relevant Dyads, and the Democratic Peace', paper presented to the 37th Annual Convention of the International Studies Association, San Diego, CA, 16–20 April.

Geddes, Barbara, 1999. 'What Do We Know About Democratization After Twenty Years?' *Annual Review of Political Science* 2: 115-44.

Gleditsch, Kristian S., 2000. 'Expanded Trade and GDP data version 1', http://k-gleditsch.socsci.gla.ac.uk/projects.html

Gleditsch, Kristian Skrede & Michael D. Ward, 1997. 'Double Take: A Re-Examination of Democracy and Autocracy in Modern Times', *Journal of Conflict Resolution* 41(3): 361-83.

Gleditsch, Nils Petter, 1968. 'The International Airline Network: A Test of the Zipf and Stouffer Hypotheses', *Peace Research Society, Papers* XI: 123–153.

Gleditsch, Nils Petter, 1992. 'Democracy and Peace', *Journal of Peace Research* 29(4): 369–376.

Gleditsch, Nils Petter, 1993. Democracy and Peace: Good News for Human Rights Advocates. In *Broadening the Frontiers of Human Rights: Essays in Honour of Asbjørn Eide,* edited by D. Gomien 283-306. Oslo: Scandinavian University Press/Oxford, etc.: Oxford University Press.

Gleditsch, Nils Petter, 1995a. 'Geography, Democracy, and Peace', *International Interactions* 20(1): 297-323.

Gleditsch, Nils Petter, 1995b. 'Democracy and the Future of the European Peace', *European Journal of International Relations* 1: 539-571.

Gleditsch, Nils Petter & Håvard Hegre, 1997. 'Peace and Democracy: Three Levels of Analysis', *Journal of Conflict Resolution* 41(2): 283-310.

Gleditsch, Nils Petter & Håvard Hegre, 1998. 'Hazardous States and Safe Neighborhoods: The Democratic Peace at the Nation-State Level' . Paper presented at the 39th Annual Convention of the International Studies Association, Minneapolis, MI, March 17-21.

Gleditsch, Nils Petter & Håvard Hegre, 2004. 'En globalisert verden – økt kaos eller varig fred?' [A Globalized World – More Chaos or Sustained Peace?]. Forthcoming in Jan Arild Snoen, ed. *Åpen verden: Et forsvar for globaliseringen.* Oslo: Civitas.

Gleditsch, Nils Petter, Peter Wallensteen, Mikael Eriksson, Margareta Sollenberg & Håvard Strand, 2002. 'Armed Conflict 1946–2001: A New data set', *Journal of Peace Research* 39(5):615–637.

Gochman, Charles S. & Zeev Maoz, 1984. 'Militarized Interstate Disputes, 1816–1976: Procedures, Patterns, and Insights', *Journal of Conflict Resolution* 28(4): 585–615.

Goertz, Gary & Paul F. Diehl, 1992. 'The Empirical Importance of Enduring Rivalries', *International Interactions* 18(2): 151–163.

Goertz, Gary & Paul F. Diehl, 1993. 'Enduring Rivalries: Theoretical Constructs and Empirical Patterns', *International Studies Quarterly* 37(2): 147–171.

Goertz, Gary & Paul F. Diehl, 1992. *Territorial Changes and International Conflict.* London: Routledge.

Gowa, Joanne, 1989. 'Bipolarity, Multipolarity, and Free Trade', *American Political Science Review* 83(4): 1245-1256.

Gowa, Joanne, 1994. *Allies, Adversaries, and International Trade.* Princeton, NJ: Princeton University Press.

Gowa, Joanne & Edward D. Mansfield, 1993. 'Power Politics and International Trade', *American Political Science Review* 87(2): 408-420.

Greene, William H., 1997. *Econometric Analysis*, 3rd ed. Engelwood Cliffs, NJ: Prentice-Hall.

Grieco, Joseph M., 1988. 'Realist Theory and the Problem of International Cooperation: Analysis with an Amended Prisoner's Dilemma Model', *Journal of Politics* 50(4): 600-624.

Gurr, Ted Robert, 1970 *Why Men Rebel.* Princeton, NJ: Princeton University Press.

Gurr, Ted Robert, 1974. 'Persistence and Change in Political Systems, 1800-1971', *American Political Science Review* 68(4): 1482-1504.

Gurr, Ted Robert, 1993. 'Why Minorities Rebel: A Global Analysis of Communal Mobilization and Conflict Since 1945', *International Political Science Review* 14(2): 161-201.

Gurr, Ted Robert, 1997. Polity II: Political Structures and Regime Change. 1800–1986. http://weber.ucsd.edu/~kgledits/Polity.html.

Gurr, Ted Robert, Keith Jaggers, & Will H. Moore, 1989. *Polity II Codebook*. Boulder, CO: University of Colorado. URL: http://www.colorado.edu/IBS/GAD/spacetime/data/Polity.html.

Gurr, T. R., K. Jaggers, & W. H. Moore, 1990. 'The Transformation of the Western State: The Growth of Democracy, Autocracy, and State Power Since 1800'. *Studies in Comparative International Development* 25: 73-108. [Also in *On Measuring Democracy. Its Consequences and Concomitants*, edited by A. Inkeles, 69-104. New Brunswick, NJ and London: Transaction, 1991.]

Haas, M, 1965. 'Societal Approaches to the Study of War'. *Journal of Peace Research* 2: 307-323.

Harsanyi, John C., 1986. 'Advances in Understanding Rational Behavior' , in Jon Elster, ed., *Rational Choice*. Oxford: Blackwell (82–107).

Hauge, Wenche, & Tanja Ellingsen, 1998. 'Beyond Environmental Scarcity: Causal Pathways to Conflict', *Journal of Peace Research* 35(3): 299–317.

Hegre, Håvard, 1998. 'Does Trade Promote Peace?',. Paper presented at the 32nd Annual Meeting of the Peace Science Society, East Brunswick, NJ, 16–18 October.

Hegre, Håvard, 1999. *The Limits of the Liberal Peace*. Cand. polit. thesis, Department of Political Science, University of Oslo. Available at: http://www.uio.no/~hahegre/publications.htm.

Hegre, Håvard, 2000. 'Development and the Liberal Peace: What does it Take to Be a Trading State?', *Journal of Peace Research* 37(1): 5–30.

Hegre, Håvard, 2002 'Trade Decreases Conflict More in Multi-Actor Systems: A Comment on Dorussen', *Journal of Peace Research* 39(1): 109–114.

Hegre, Håvard, 2003. 'Development and the Liberal Peace: What does it Take to Be a Trading State?', pp. 205–232 in Schneider, Barbieri & Gleditsch (2003).

Hegre, Håvard, 2004a. 'Size Asymmetry, Trade, and Militarized Conflict', *Journal of Conflict Resolution* 48(3): forthcoming.

Hegre, Håvard, 2004b. 'The Duration and Termination of Civil War', *Journal of Peace Research* 46(3): 243–252.

Hegre, Håvard; Tanja Ellingsen, Scott Gates & Nils Petter Gleditsch, 2001. 'Toward a Democratic Civil Peace? Democracy, Political Change, and Civil War, 1816-1992', *American Political Science Review* 95(1): 33-48.

Hegre, Håvard, Nils Petter Gleditsch & Ranveig Gissinger, 2003. 'Globalization and Internal Conflict', pp. 251–275 in Schneider, Barbieri & Gleditsch (2003).

Hegre, Håvard & Soo Yeon Kim, 2000. 'Conquest or Commerce? Statecraft in the Age of Interdependence',. Paper presented at the European Consortium on Political Research Joint Sessions of Workshops, Los Angeles, Copenhagen, 14-19 April.

Hegre, Håvard & Nicholas Sambanis, 2002. 'Sensitivity Analysis of the Empirical Literature on Civil War Onset'. Paper presented to the Annual Meeting of Peace Science Society, Tucson, AZ, November 1-3.

Hegre, Håvard & Todd Sandler, 2002. 'Economic Analysis of Civil Wars [Introduction to special issue]', *Defence and Peace Economics* 13(6): 429–433.

Heldt, Birger, 1997. 'The Dependent Variable of the Domestic-External Conflict Relationship: Anecdotes, Theories and Systematic Studies', *Journal of Peace Research* 34(1): 101-106.

Hensel, Paul R., 1994. 'One Thing Leads to Another: Recurrent Militarized Disputes in Latin America, 1816–1986', *Journal of Peace Research* 31(3): 281–297.

Hibbs, Douglas A, 1973. *Mass Political Violence. A Cross-National Causal Analysis.* New York: Wiley.

Hirschman, Albert O., 1945/1980. *National Power and the Structure of Foreign Trade.* Berkeley, CA, Los Angeles, CA & London: University of California Press.

Hirshleifer, Jack, 2000. 'The Macrotechnology of Conflict', *Journal of Conflict Resolution* 44(6): 773-792.

Hobbes, Thomas, 1651/1968. *Leviathan.* London: Penguin.

Hollis, Martin & Steve Smith, 1991. *Explaining and Understanding International Relations.* Oxford: Clarendon Press.

Holsti, Ole R., 1995. 'Theories of International Relations and Foreign Policy: Realism and its Challengers' , in Charles W. Kegley, jr., ed., *Controversies in International Relations Theory: Realism and the Neoliberal Challenge.* New York: St. Martin's (35–65).

Horowitz, Donald L., 1993. 'Democracy in Divided Societies', *Journal of Democracy* 4(4): 18-38.

Hovi, Jon, 1998. *Games, Threats and Treaties. Understanding Commitments in International Relations.* London & Washington, DC: Pinter.

Hovi, Jon & Bjørn Erik Rasch, 1996. *Samfunnsvitenskapelige analyseprinsipper.* Bergen: Fagbokforlaget.

Huntington, Samuel P., 1991. *The Third Wave: Democratization in the Late Twentieth Century.* Norman, OK & London: University of Oklahoma Press.

Inglehart, Ronald, 1989. *Culture Shift in Advanced Industrial Society.* Princeton: Princeton University Press.

International Monetary Fund, 1997. *Direction of Trade.* Washington, DC: International Monetary Fund. (ICPSR 7628. Inter-university Consortium for Political and Social Research, Ann Arbor, MI, distributor).

Jaggers, Keith, & Ted Robert Gurr, 1995. 'Transitions to Democracy: Tracking Democracy´s Third Wave with the Polity III Data', *Journal of Peace Research* 32(4): 469-482.

Jones, Daniel M.; Stuart A. Bremer & J. David Singer, 1996. 'Militarized Interstate Disputes, 1816-1992: Rationale, Coding Rules, and Empirical Patterns', *Conflict Management and Peace Science* 15(2): 163-213.

Kadera Kadera M., Crescenzi, Mark J. C., Shannon Megan L., 2003. 'Democratic Survival, Peace, and War in the International System', *American Journal of Political Science* 47(2): 234–247.

Kant, Immanuel, 1795/1991. 'Perpetual Peace: A Philosophical Sketch', in Hans Reiss, ed., *Kant: Political Writings.* Cambridge: Cambridge University Press (93–130).

Kegley, Charles, & Margaret Hermann, 1996. 'How Democracies Use Intervention: A Neglected Dimension in Studies of the Democratic Peace', *Journal of Peace Research* 33(3): 309-322.

Keohane, Robert O., 1984. *After Hegemony: Cooperation and Discord in the World Political Economy.* Princeton, NJ: Princeton University Press.

Keohane, Robert O. & Joseph S. Nye, jr., 1977. *Power and Interdependence. World Politics in Transition.* Boston & Toronto: Little, Brown.

Kim, Soo Yeon, 1998. *Ties that Bind: The Role of Trade in International Conflict Processes, 1950–1992* . Ph.D. Dissertation, Department of Political Science, Yale University.

Kim, Soo Yeon, 1999. 'Peace and Conflict among Trading States, 1950–1992' . Paper presented at the 40th Annual Meeting of the International Studies Association, Washington, DC, 16–20 February.

King, Gary & Langche Zeng, 2001. 'Logistic Regression in Rare Events Data', *Political Analysis* 9(2).

Krain, Matthew, & Marissa Edson Myers, 1997. 'Democracy and Civil War: A Note on the Democratic Peace Proposition', *International Interactions* 23(1): 109–118.

Krugman, Paul R., 1981. 'Trade, Accumulation, and Uneven Development', *Journal of Development Economics* 8: 149–161.

Le Billon, Philippe, 2001. 'The Political Ecology of War: Natural Resources and Armed Conflicts', *Political Geography* 20(3):561–584.

Levy, Jack S., 1989. 'The Diversionary Theory of War: A Critique', In *Handbook of War Studies*, ed. Manus I. Midlarsky. Ann Arbour, MI: University of Michigan Press.

Levy, Jack S., 1989. 'The Causes of War: A Review of Theories and Evidence', pp. 209-313 in Philip E. Tetlock, Jo L. Husbands, Robert Jervis, Paul C. Stern, & Charles Tilly, eds, *Behavior, Society, and Nuclear War, vol. 1.* New York, etc.: Oxford University Press.

Li, Quan & David Sacko, 2002. 'The (Ir)Relevance of Militarized Interstate Disputes for International Trade', *International Studies Quarterly* 46(1): 11-43.

Liberman, Peter, 1993. 'The Spoils of Conquest', *International Security* 18(2): 125–153.

Liberman, Peter, 1996. *Does Conquest Pay? The Exploitation of Occupied Industrial Societies.* Princeton, NJ: Princeton University Press.

Lichbach, Mark Irving, 1987. 'Deterrence or Escalation? The Puzzle of Aggregate Studies of Repression and Dissent', *Journal of Conflict Resolution* 31(2): 266–297.

Lichbach, Mark Irving, 1995. *The Rebel's Dilemma.* Ann Arbor, MI: University of Michigan Press.

Linneman, Hans, 1966. *An Econometric Study of International Trade Flows. Contributions to Economic Analysis.* Amsterdam: North-Holland.

Lipset, Seymour Martin, 1960. *Political Man. The Social Bases of Politics.* New York: Doubleday.

Lipset, Seymour M., 1959. 'Some Social Requisites of Democracy: Economic Development and Political Legitimacy', *American Political Science Review* 53(1): 69–106.

Londregan, John B. & Keith T. Poole, 1990. 'Poverty, The Coup Trap, and the Seizure of Executive Power', *World Politics* 42(1): 151-83.

Londregan, John B. & Keith T. Poole, 1996. 'Does High Income Promote Democracy?', *World Politics* 49(1): 1–30.

McCullagh, Peter, & John A. Nelder, 1989. *Generalized Linear Models.* 2nd ed. London: Chapman & Hall.

McLaughlin, S., 1996. 'Endogeneity and the Democratic Peace'. Paper presented to the Annual Meeting of the Peace Science Society (International), Houston, TX, 25-27 October 1996.

McLaughlin, Sara; Scott Gates, Ranveig Gissinger, Nils Petter Gleditsch & Håvard Hegre, 1997. 'The Timing of Polity Changes: Event Analysis and the Polity IIId Data. Working Paper, International Peace Research Institute, Oslo.

McLaughlin, Sara, Scott Gates, Håvard Hegre, Ranveig Gissinger & Nils Petter Gleditsch, 1998. 'Timing the Changes in Political Structures: A New Polity Database', *Journal of Conflict Resolution* 42(2): 231-242.

McMillan, Susan M., 1997. 'Interdependence and Conflict', *Mershon International Studies Review* 41(2): 33–58.

Maddala, G. S., 1983. *Limited Dependent and Qualitative Variables in Econometrics.* Cambridge: MIT Press.

Maddison, Angus, 1995. *Monitoring the World Economy 1820-1992.* Paris: Development Centre of the Organization for Economic Co-Operation and Development.

Mansfield, Edward D. & Brian M. Pollins, editors, 2003. *Economic Interdependence and International Conflict: New Perspectives on an Enduring Debate.* Ann Arbor: University of Michigan Press.

Mansfield, Edward D. & Jack Snyder, 1995. 'Democratization and the Danger of War', *International Security* 20: 5-38.

Mansfield, Edward D. & Jack Snyder, 1996. 'The Effects of Democratization on War', *International Security* 20: 196-207.

Mansfield, Edward D. & Jack Snyder, 2002. 'Democratic Transitions, Institutional Strength, and War', *International Organization* 56 (2): 297-

Maoz, Zeev 1996. *Domestic Sources of Global Change.* Ann Arbor, MI: University of Michigan Press.

Maoz, Zeev, 1999. 'Dyadic Militarized Interstate Disputes (DYMID1.1) data set–Version 1.1', codebook, Tel-Aviv University, August.

Maoz, Zeev & Nasri Abdolali, 1989. 'Regime Types and International Conflict, 1816-1976'. *Journal of Conflict Resolution* 33: 3-35.

Maoz, Zeev & Bruce M. Russett, 1992. 'Alliance, Contiguity, Wealth, and Political Stability: Is the Lack of Conflict among Democracies a Statistical Artifact?', *International Interactions* 18(3): 245-267.

Maoz, Zeev & Bruce M. Russett, 1993. 'Normative and Structural Causes of Democratic Peace, 1946-1986', *American Political Science Review* 87(3): 624-638.

Marshall, Monty G., & Keith Jaggers, 2000. *Polity IV Project: data set Users Manual.* URL: www.bsos.umd.edu/cidcm/inscr/polity.

Mearsheimer, John J., 1990. 'Back to the Future: Instability in Europe After the Cold War', *International Security* 15(1): 5-56.

Mearsheimer, John J., 1995. 'The False Promise of International Institutions', *International Security* 19(3): 5-49.

Mitchell, Sara McLaughlin; Scott Gates & Håvard Hegre, 1999. 'Evolution in Democracy-War Dynamics', *Journal of Conflict Resolution* 43 (6): 771–792.

Moore, Will H., 1998. 'Repression and Dissent: Substitution, Context, and Timing', *American Journal of Political Science* 42(3): 851-873.

Morrow, James D., 1999. 'How Could Trade Affect Conflict?', *Journal of Peace Research* 36(4): 481–489.

Morrow, James D.; Randolph M. Siverson & Tressa E. Tabares, 1998. 'The Political Determinants of International Trade: The Major Powers, 1907-90', *American Political Science Review* 92(3): 649-661.

Mosher, J. S., 2003. 'Relative Gains Concerns When the Number of States In the International System Increases', *Journal of Conflict Resolution* 47(5): 642–668.

Mott, William H., 1997. *The Economic Basis of Peace. Linkages Between Economic Growth and International Conflict.* Westport, CT & London: Greenwood.

Mousseau, Michael, 1997. 'Democracy, Economic Development, and Interstate Peace', Paper presented at the Annual Meeting of the Peace Science Society, Indianapolis, IN, November 21–23.

Mousseau, Michael, 1998. 'Democracy, Development, and Common Interests: An Analysis of UN Voting Patterns', Paper presented at the Annual Meeting of the Peace Science Society, East Brunswick, NJ,

Mousseau, Michael, 2000. 'Market Prosperity, Democratic Consolidation, and Democratic Peace', *Journal of Conflict Resolution* 44(4): 472-507.

Mousseau, Michael; Håvard Hegre & John Oneal, 2003. 'How the Wealth of Nations Conditions the Liberal Peace', *European Journal of International Relations* 9(2):277-314.

Mueller, John, 1989. *Retreat from Doomsday. The Obsolescence of Major Wars.* New York, NJ: Basic Books.

Muller, Edward N, 1985. 'Income Inequality, Regime Repressiveness, and Political Violence', *American Sociological Review* 50(1):47–61.

Muller, Edward N. & Erich Weede, 1990. 'Cross-National Variation in Political Violence: A Rational Action Approach', *Journal of Conflict Resolution* 34:624–51.

de Nardo, James, 1985. *Power in Numbers.* Princeton, NJ: Princeton University Press.

Nelson, Forrest & Lawrence Olson, 1978. 'Specification and Estimation of a Simultaneous Equation Model with Limited Dependent Variables', *International Economic Review* 19(3): 695-710.

Oneal, John R. & Bruce M. Russett, 1997. 'The Classical Liberals Were Right: Democracy, Interdependence, and Conflict, 1950-85', *International Studies Quarterly* 41(2): 267-294.

Oneal, John R. & Bruce M. Russett, 1998. 'The Kantian Peace: Assessing the Pacific Benefits of Democracy, Interdependence, and International

Organizations, 1885-1992', Paper presented at the Annual Meeting of the Peace Science Society, East Brunswick, NJ.

Oneal, John R. & Bruce M. Russett, 1999a. 'Assessing the Liberal Peace with Alternative Specifications: Trade Still Reduces Conflict', *Journal of Peace Research* 36(4): 423-442.

Oneal, John R. & Bruce M. Russett, 1999b. 'The Kantian Peace: The Pacific Benefits of Democracy, Interdependence, and International Organizations, 1885-1992', *World Politics* 52(1): 1-37.

Oneal, John R., Bruce M. Russett & Michael L. Berbaum, 2003. '*Causes* of Peace: Democracy, Interdependence, and International Organizations, 1885–1992', *International Studies Quarterly* 47(3): 371–394.

Oneal, John R.; Frances H. Oneal, Zeev Maoz & Bruce M. Russett, 1996. 'The Liberal Peace: Interdependence, Democracy, and International Conflict, 1950-85', *Journal of Peace Research* 33(1): 11-28.

Oren, Ido, 1990. 'The War Proneness of Alliances', *Journal of Conflict Resolution* 34(2): 208-233.

Organski, A.F.K. & Jacek Kugler, 1980. *The War Ledger*. Chicago: University of Chicago Press.

Peceny, Mark; Caroline C. Beer & Shannon Sanchez-Terry, 2002. 'Dictatorial Peace?' *American Political Science Review* 96(1):15–26.

Polachek, Solomon W., 1980. 'Conflict and Trade', *Journal of Conflict Resolution* 24(1): 55-78.

Polachek, Solomon W.; John Robst & Yuan-Ching Chang, 1999. 'Liberalism and Interdependence: Extending the Trade-Conflict Model', *Journal of Peace Research* 36(4): 405-422.

Pollins, Brian M., 1989a. 'Conflict, Cooperation, and Commere: The Effect of International Political Interactions on Bilateral Trade Flows', *American Journal of Political Science* 33(3): 737-761.

Pollins, Brian M., 1989b. 'Does Trade Still Follow the Flag?', *American Political Science Review* 83(2): 465-480.

Powell, Robert, 1991. 'Absolute and Relative Gains in International Relations Theory', *American Political Science Review* 85(4): 1303-1320.

Powell, Robert, 1996. 'Stability and the Distribution of Power', *World Politics* 48(2): 239–267.

Powell, Robert , 1999. *In the Shadow of Power. States and Strategies in International Politics.* Princeton, NJ: Princeton University Press.

Przeworski, Adam, 1991. *Democracy and the Market.* Cambridge & New York, NY: Cambridge University Press.

Przeworski, Adam; Michael E. Alvarez, José Antonio Cheibub, & Fernando Limongi., 2000. *Democracy and Development. Political Institutions and Well-Being in the World, 1950-1990.* Cambridge: Cambridge University Press.

Przeworski, Adam & Fernando Limongi, 1997. 'Modernization: Theory and Facts', *World Politics* 49:155–183.

Raknerud, Arvid & Håvard Hegre, 1997. 'The Hazard of War: Reassessing the Evidence for the Democratic Peace', *Journal of Peace Research* 34(4): 385-404.

Ray, James Lee, 1993. ' "Wars" Between Democracies: Rare or Non-Existent?', International Interactions, vol. 18, no. 3, February, pp. 251–276.

Ray, James Lee, 1995. *Democracy and International Conflict.* Columbus, SC: University of South Carolina Press.

Reed, William, 2000. 'A Unified Model of Conflict Onset and Escalation', *American Journal of Political Science* 44(1):84–93.

Reed, William, 2002. 'Selection Effects and World Politics Research', *International Interactions* 28(1): 1–3.

Reed, William, 2003. 'Information and Economic Interdependence', *Journal of Conflict Resolution* 47(1): 54–71.

Reiter, Dan & Allan C. Stam, 2002. *Democracies at War.* Princeton, NJ: Princeton University Press.

Reuveny, Rafael & Heejon Kang, 1996. 'International Trade, Political Conflict/Cooperation, and Granger Causality', *American Journal of Political Science* 40(3): 943-970.

Reuveny, Rafael & Heejon Kang, 1998. 'Bilateral Trade and Political Conflict/Cooperation: Do Goods Matter?', *Journal of Peace Research* 35(5): 581-602.

Rousseau, D. L., C. Gelpi, D. Reiter, & P. K. Huth, 1996. Assessing the Dyadic Nature of the Democratic Peace, 1918-88. *American Political Science Review.* 90:512-533.

Reynal-Querol, Marta, 2002. 'Ethnicity, Political Systems, and Civil Wars', *Journal of Conflict Resolution* 46(1):29–54.

Rosato, Sebastian, 2003. 'The Flawed Logic of Democratic Peace Theory', *American Political Science Review* 97(4): 585–602.

Rosecrance, Richard, 1986. *The Rise of the Trading State. Commerce and Conquest in the Modern World.* New York: Basic Books.

Rosecrance, Richard, 1996. 'The Rise of the Virtual State', *Foreign Affairs* 75(4): 45-61.

Rosecrance, Richard, 1999. *The Rise of the Virtual State. Wealth and Power in the Coming Century.* New York: Basic Books.

Ross, Michael, 2001. 'Does Oil Hinder Democracy?', *World Politics* 53(April):325–61.

Ross, Michael, 2002. 'How Does Natural Resource Wealth Influence Civil War? Evidence from 13 Case Studies', Ms., Department of Political Science, University of California, Los Angeles.

Rummel, R. J., 1979. *War, Power, Peace*, vol. 4 of *Understanding Conflict and War*. Beverly Hills, CA and London: SAGE.

Rummel, Rudolph J., 1983. 'Libertarianism and International Violence', *Journal of Conflict Resolution* 27(1): 27-71.

Rummel, Rudolph J., 1994. Focus On: Power, Genocide and Mass Murder. *Journal of Peace Research* 31: 1-10.

Rummel, Rudolph J., 1995. Democracies ARE More Peaceful than Other Countries. *European Journal of International Relations* 1: 457-479.

Russett, Bruce M., 1967. *International Regions and the International System: A Study in Political Ecology.* Chicago, IL: Rand McNally.

Russett, Bruce M., 1993. *Grasping the Democratic Peace. Principles for a Post-Cold War World.* Princeton, NJ: Princeton University Press.

Russett, Bruce M., 1998. 'A Neo-Kantian Perspective: Democracy, Interdependence, and International Organizations in Builiding Security Communities', in Emanuel Adler & Michael Barnett, eds, *Security Communities in Comparative Perspective.* Cambridge: Cambridge University Press.

Russett, Bruce M. & John R. Oneal, 2001. *Triangulating Peace. Democracy, Interdependence, and International Organizations.* New York, NY: Norton.

Russett, Bruce M.; John R. Oneal & David R. Davis, 1998. 'The Third Leg of the Kantian Tripod for Peace: International Organizations and Militarized Disputes, 1950–85', *International Organization* 52(3): 441-467.

Sachs, Jeffrey D. & Andrew Warner, 1995. 'Natural Resource Abundance and Economic Growth', *National Bureau of Economic Research Working Paper* 5398.

Sahin, Yossi, & Juan J. Linz, 1995. *Between States: Interim Governments and Democratic Transitions.* Cambridge: Cambridge University Press.

Sambanis, Nicholas, 2001. 'Do Ethnic and Non-Ethnic Civil Wars Have the Same Causes? A Theoretical and Empirical Inquiry (Part 1)', *Journal of Conflict Resolution* 45(3):259–282.

Sambanis, Nicholas, 2002. 'A Review of Recent Advances and Future Directions in the Quantitative Literature on Civil Wars', *Defence and Peace Economics* 13(3):215–243.

Sanhueza, Ricardo, 1999. 'The Hazard Rate of Political Regimes', *Public Choice* 98: 337–367.

Schjølset, Anita, 1996. *Are Some Democracies More Peaceful Than Others? A Suggestion for Extending the Democratic Peace Perspective.* Thesis for the Cand.polit. degree in Political Science, Norwegian University of Science and Technology, Trondheim.

Schneider, Gerald, Katherine Barbieri & Nils Petter Gleditsch, 2003. *Globalization and Armed Conflict.* Boulder, CO: Rowman & Littlefield.

Sen, A, 1994. Liberty and Poverty: Political Rights and Economics. *The New Republic* 210: 31-37.

Signorino, Curtis S., 1999. 'Strategic Interaction and the Statistical Analysis of International Conflict', *American Political Science Review* 93(2): 279–297.

Signorino, Curtis S., 2002. 'Strategy and Selection in International Relations', *International Interactions* 28(1): 93–115.

Signorino, Curtis S & K. Yilmaz, 2003. 'Strategic Misspecification in Regression Models', *American Journal of Political Science* 47(3): 551–566.

Singer, J. David, 1991. 'Peace in the Global System: Displacement, Interregnum, or Transformation', In *The Long Postwar Peace. Contending*

Explanations and Projections, edited by C. W. Kegley, Jr., 56-84. New York: HarperCollins.

Singer, J. David; Stuart A. Bremer & J. Stuckey, 1972. 'Capability Distribution, Uncertainty, and Major Power War, 1820-1965', pp. 19–48 in Bruce M. Russett, ed., *Peace, War, and Numbers.* Beverly Hills, CA: Sage.

Singer, J. David & Melvin Small, 1966. 'Formal Alliances, 1815-1939: A Quantitative Description', *Journal of Peace Research* 3(1): 1-32.

Singer, J. D., & M. Small, 1968. 'Alliance Aggregation and the Onset of War, 1815-1845', In *Quantitative International Politics* edited by J. D. Singer. New York: Free Press (247-286).

Singer, J. David, & Melvin Small, 1993. 'Correlates of War Project: National Material Capabilities Data, 1816–1985', Inter-University Consortium for Political and Social Research: Ann Arbor, MI, codebook and computer file, ICPSR no. 9903.

Singer, J. David, & Melvin Small, 1994. 'Correlates of War Project: International and Civil War Data, 1816–1992', Inter-university Consortium for Political and Social Research: Ann Arbor, MI, codebook and computer file, ICPSR no. 9905.

Singer, M., & A. Wildavsky, 1993. *The Real World Order. Zones of Peace/Zones of Turmoil.* Chatham, NJ: Chatham House.

Siverson, Randolph M. & Harvey Starr, 1990. 'Opportunity, Willingness, and the Diffusion of War', *American Political Science Review* 84(1): 47–67.

Skaperdas, Stergios & Constantinos Syropoulos, 1996. 'Competitive Trade with Conflict,' in Michelle R. Garfinkel & Stergios Skaperdas, eds., *The Political Economy of Conflict and Appropriation.* Cambridge: Cambridge University Press (73-96).

Skaperdas, Stergios, 2002. 'Warlord Competition', *Journal of Peace Research* 39(4):435–46.

Small, Melvin & J. David Singer, 1969. 'Formal Alliances, 1816-1965: An Extension of the Basic Data', *Journal of Peace Research* 6(3): 257-282.

Small, Melvin & J. David Singer, 1976. 'The War-Proneness of Democratic Regimes, 1816-1965', *Jerusalem Journal of International Relations* 1(4): 50-69.

Small, Melvin & J. David Singer, 1982. *Resort to Arms: International and Civil Wars, 1816-1980*. Beverly Hills, CA: Sage.

Snidal, Duncan, 1991a. 'International Cooperation Among Relative Gains Maximizers', *International Studies Quarterly* 35(4): 387-402.

Snidal, Duncan, 1991b. 'Relative Gains and the Pattern of International Cooperation', *American Political Science Review* 85(3): 701-726.

Snyder, Glenn H., 1984. 'The Security Dilemma in Alliance Politics', *World Politics* 36(4): 461-495.

Snyder, Jack, 2000. *From Voting to Violence: Democratization and Nationalist Conflict*. New York, NY: Norton.

de Soysa, Indra, 2000. 'The Resource Curse: Are Civil Wars Driven by Rapacity or Paucity?' In Mats Berdal & David Malone, eds, *Greed and Grievance: Economic Agendas in Civil Wars*. Boulder, CO: Lynne Rienner.

de Soysa, Indra, 2002. 'Paradise Is a Bazaar? Greed, Creed, and Governance in Civil War, 1989–99', *Journal of Peace Research* 39(4): 395–416.

Spiro, David E., 1994. 'The Insignificance of the Liberal Peace', *International Security* 19(2): 50–86.

Spiro, David E., 1995. 'The Liberal Peace – "And Yet It Squirms". Reply to Russett ', *International Security* 19(4): 177–180.

Stam, Alan, 1996. *Win, Lose or Draw: Domestic Politics and the Crucible of War*. Ann Arbor, MI: University of Michigan Press.

Starr, Harvey 1992a. 'Why Don't Democracies Fight One Another? Evaluating the Theory-Findings Feedback Loop'. *Jerusalem Journal of International Relations* 14: 41-59.

Starr, Harvey, 1992b. 'Democracy and War: Choice, Learning and Security Communities', *Journal of Peace Research* 29(2): 207–213.

StataCorp, 2001a. *Stata Statistical Software Reference Manual: Release 7.0. User's Guide*. College Station, TX: Stata Corporation.

StataCorp, 2001b. *Stata Statistical Software Reference Manual: Release 7.0. Reference H–P*. College Station, TX: Stata Corporation.

Summers, Robert & Alan Heston, 1991. 'The Penn World Table (Mark 5): An Expanded Set of International Comparisons, 1950-1988', *Quarterly Journal of Economics* 106(2): 327–368. [Version 5.6 of the data, released January 1995, available at http://datacentre.chass.utoronto.ca/pwt/.].

Tarrow, Sidney, 1994. *Power in Movement: Social Movements, Collective Action and Politics.* Cambridge, MA: Cambridge University Press.

Taylor, Charles Lewis, & David A. Jodice, 1983. *World Handbook of Political and Social Indicators.* 3. ed. New Haven, CT: Yale University Press.

The Baltic States: A Reference Book, 1991. Tallinn: Estonian Encyclopaedia Publishers; Riga: Latvian Encyclopaedia Publishers; Vilnius: Lithuanian Encyclopaedia Publishers.

Thompson, William R. & Richard Tucker, 1997. 'A Tale of Two Democratic Peace Critiques', *Journal of Conflict Resolution* 41(3): 428–454.

Tillema, H. K., 1991. *International Armed Conflict Since 1945. A Bibliographic Handbook of Wars and Military Interventions.* Boulder, CO etc.: Westview.

de Tocqueville, Alexis. 1856/1955. *The Old Régime and the French Revolution.* New York: Doubleday.

Toset, Hans Petter Wollebæk; Nils Petter Gleditsch & Håvard Hegre, 2000. 'Shared Rivers and Interstate Conflict', *Political Geography* 19(8):971–996.

Urdal, Henrik, 2002. 'The Devil in the Demographics. The Effect of Youth Bulges on Domestic Armed Conflict, 1950–2000', Typescript, International Peace Research Institute, Oslo.

Vanhanen, Tatu, 1997. *Prospects of Democracy: A Study of 172 Countries.* London & New York: Routledge.

Vanhanen, Tatu, 1999. 'Domestic Ethnic Conflict and Ethnic Nepotism', *Journal of Peace Research* 36(1): 55–79.

Vanhanen, Tatu, 2000. 'A New data set for Measuring Democracy, 1810–1998', *Journal of Peace Research* 37(2): 251–265.

Vasquez, John A., 1993. *The War Puzzle.* Cambridge: Cambridge University Press.

Viotti, Paul R. & Mark V. Kauppi, 1987. *International Relations Theory: Realism, Pluralism, Globalism.* New York & London: Macmillan.

Wagner, R. Harrison, 1998. 'Economic Interdependence, Bargaining Power, and Political Influence', *International Organization* 42(3): 461-483.

Wagner, R. Harrison, 2000. 'Bargaining and War', *American Journal of Political Science* 44(3): 469–484.

Wallensteen, P., & M. Sollenberg, 1996. 'The End of International War? Armed Conflict 1989-95', *Journal of Peace Research* 33: 353-370.

Wallerstein, Immanuel, 1974. 'The Rise and Future Demise of the World Capitalist System: Concepts for Comparative Analysis', *Comparative Studies in Society and History* 16(2): 387–415.

Waltz, Kenneth, 1979. *Theory of International Politics.* Reading, MA: Addison-Wesley.

Wantchekon, Leonard, 2000. 'Why do Resource Dependent Countries Have Authoritarian Governments', Ms., Yale University, February 6.

Ward, Michael D., & Kristian S. Gleditsch, 1998. 'Democratizing for Peace', *American Political Science Review* 92(1): 51–62.

Weart, Stephen 1994. 'Peace among Democratic and Oligarchic Republics', *Journal of Peace Research* 31: 299-316.

Weede, Erich, 1984. 'Democracy and War Involvement', *Journal of Conflict Resolution* 28(4): 649-664.

Weede, Erich, 1992. Some Simple Calculations on Democracy and War Involvement. *Journal of Peace Research* 29: 377-383.

Weede, Erich, 1995. 'Economic Policy and International Security Rent Seeking, Free Trade, and Democratic Peace', *European Journal of International Relations* 1(4): 519–537.

Weede, Erich, 1996. 'Democratization and the Danger of War', *International Security* 20: 180-183.

Weingast, Barry R., 1997. 'The Political Foundations of Democracy and the Rule of Law', *American Political Science Review* 91(2): 245-263.

Werner, Suzanne, 2000. 'The Effects of Political Similarity on the Onset of Militarized Disputes, 1816-1985', *Political Research Quarterly* 53(2): 343–374.

Wolf, R., 1996. Democratization and the Danger of War. *International Security* 20: 176-180.

World Bank, 1999a. *World Development Indicators 1999.* Washington, DC: Development Data Center, International Bank for Reconstruction and Development.

World Bank, 1999b. *World Development Indicators on CD-ROM.* Washington, DC: Development Data Center, International Bank for Reconstruction and Development.

World Bank, 2000a. *World Development Indicators 2000.* Washington, DC: Development Data Center, International Bank for Reconstruction and Development.

World Bank, 2000b. *World Development Indicators on CD-ROM.* Washington, DC: Development Data Center, International Bank for Reconstruction and Development.

World Bank, 2002. *World Development Indicators 2002.* Washington, DC: The World Bank.

Wright, Quincy, 1965. *A Study of War. Second Edition with a Commentary on War since 1942.* Chicago, IL and London: University of Chicago Press. [First edition published in 1942.]

Zacher, Mark W. & Richard A. Matthew, 1995. 'Liberal International Theory: Common Threads, Divergent Strands' , in Charles W. Kegley, jr., ed., *Controversies in International Relations Theory: Realism and the Neoliberal Challenge.* New York: St. Martin's (107–150).

Zanger, Sabine C., 2000. 'A Global Analysis of the Effect of Political Regime Changes on Life Integrity Violations, 1977–93', *Journal of Peace Research* 37(2): 213-233.