INFORMATION TO USERS

This manuscript has been reproduced from the microfilm master. UMI films the text directly from the original or copy submitted. Thus, some thesis and dissertation copies are in typewriter face, while others may be from any type of computer printer.

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleedthrough, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send UMI a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

Oversize materials (e.g., maps, drawings, charts) are reproduced by sectioning the original, beginning at the upper left-hand corner and continuing from left to right in equal sections with small overlaps. Each original is also photographed in one exposure and is included in reduced form at the back of the book.

Photographs included in the original manuscript have been reproduced xerographically in this copy. Higher quality 6” x 9” black and white photographic prints are available for any photographs or illustrations appearing in this copy for an additional charge. Contact UMI directly to order.
RICE UNIVERSITY

Expected Utility Calculation and Alliance Reliability

by

Xiaoling Ji

A THESIS SUBMITTED
IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE

Master of Arts

APPROVED. THESIS COMMITTEE:

T. Clifton Morgan, Chairman
Professor of Political Science

Richard J. Stall
Professor of Political Science

Sherry Bennett
Assistant Professor of Political Science

Houston, Texas

May, 1999
ABSTRACT

Expected Utility Calculation and Alliance Reliability

by

Xiaoling Ji

The existing studies on determinants of alliance reliability focus exclusively on alliance types and alliance attributes. One big weakness of this approach is that it depicts the decision making of upholding or disregarding alliance commitments as largely externally determined, and thus downplays the role of individual states. The present study assumes that states are rational utility maximiers and contends that the decision of whether or not to uphold alliance commitments is determined by the utility calculations at the time when an alliance is formed and the time when an ally is called upon. An ally will assist its defense pact partner under attack only when the expected costs of upholding commitment are lower than the expectations held at the time of alliance formation. Empirical testing, however, fails to lend strong support for the expectation. A discussion of the performance of the model leads to some interesting conclusions about the existing literature and possible future studies.
ACKNOWLEDGEMENTS

First and foremost, I want to thank Dr. Morgan for his guidance during my thesis research process and my graduate study at Rice. He is definitely the best professor I have ever met in my life, and I really enjoyed being his student.

I am grateful to Dr. Stoll for his many wonderful ideas on how to develop strong arguments, and to Dr. Bennett for her valuable comments and suggestions. Without their help, I would not have been able to complete this research.

Special thanks to Sean Bolks for letting me use his data set, and for his help all along my graduate study, which goes back to how to use SAS in my first year. Bernadette and Jeff have proofread my thesis and made it look much better. Their help is deeply appreciated.

I would like to thank my parents and my sister for always being there for me. Their support means so much to me. Finally, I thank my husband, Weiyu, for his understanding, encouragement and love.
# TABLE OF CONTENTS

1. Introduction .................................................. 1  
2. Literature Review ........................................... 5  
3. Theoretical Perspective ...................................... 15  
4. Research Design .............................................. 21  
5. Results and Analysis ......................................... 30  
6. Conclusions .................................................... 39  

*Notes* .................................................................... 42  
*Bibliography* ...................................................... 43  
*Appendix* ............................................................ 45
LIST OF TABLES

1. Estimated Coefficients for a Model of Alliance Reliability 32

2. Probabilities of Honoring Alliance Commitment Based on the Estimated Coefficients in Table 1. 35
I. INTRODUCTION

The study of alliances has received a great deal of attention among international relations scholars, especially those working in the subfield of conflict. This interest in alliances is due largely to their influence on conflict. Several empirical studies (Singer and Small 1966a, Siverson and King 1979, among others) conclude that alliances at least contribute to the expansion of war, if not to its onset. In other words, countries get pulled into ongoing wars by their alliances which obligate signatories to assist each other. The finding that many bilateral wars expand into multilateral wars suggests that at least some countries bound by alliances do uphold their commitments.

The consensus of previous studies on alliance reliability, however, is that while some allied nations assist each other in conflicts, many allies are not reliable (Singer and Small 1966a, Holsti, Hopmann, and Sullivan 1973, Sabrosky 1980, etc.). The assessment of alliance reliability largely depends on the specific conceptualization and operationalization of alliance reliability utilized. Those studies that code a country as reliable only if it fights alongside its allies typically find that alliance reliability is low. When the definition of alliance reliability is associated with the
specific *casus foederis* of alliance treaties. Allies are found to be reliable in most cases.

When a country signs an alliance pact, it sends a signal that it is aware of its obligations. It is therefore plausible to expect that the country will uphold its commitment. Empirically, however, this is not always the case. Thus we are led to the question that is the focus of this study: under what conditions do countries honor their alliance commitments?

This is an important question to address for several reasons. First, as Singer, Bremer and Stucky (1972) and Kegley and Raymond (1990) point out, understanding alliance reliability will contribute to a better understanding of when wars occur. If decisions to fight are influenced by expectations of third parties' behavior, reducing uncertainty around these expectations would lead to better decisions.

Second, a better knowledge of alliance reliability will contribute to our understanding of the future world: as Falk (1970) puts it, "trends in loyalty patterns are one of the most important determinants of the future quality of world legal order" (cited in Kegley and Raymond 1990, p. 245). Finally, a discussion of the conditions under which countries honor their alliance commitments will also increase our understanding of foreign policy decision making in
general. We can model alliance reliability, the honoring of sanctions or adherence to any kind of treaties or international regimes as the same basic foreign policy decisions.

Most existing studies on determinants of alliance reliability focus on the impact of alliance types and alliance attributes—the power distribution within an alliance, the length of an alliance in existence, etc. (Singer and Small 1966a, Sabrosky 1980, Siverson and King 1980). These factors demonstrate some empirical power: they explain some variance in alliance reliability. However, if differences in alliance type and alliance attributes explain alliance reliability, we should see members of the same alliance behaving in the same fashion. Unfortunately this is usually not the case. What we typically see is that when one member of an alliance is attacked, some—but not all—of its partners come to its assistance. For example, Sabrosky (1980) operationalizes alliance reliability as only two members of a given alliance fight alongside each other against an enemy, and finds that reliability is as low as 27%.

An emphasis on alliance type and alliance attributes also downplays the role of individual states, since the decision making of whether or not to honor alliance commitment is treated as largely externally determined. This study assumes that countries are rational
utility maximizers. Following Smith's (1995) proposition that the study of alliance reliability cannot be separated from that of alliance formation, it argues that the decision is determined by a utility calculation at $T_0$ (when an alliance is formed) as well as a utility calculation at $T_1$ (after one member is attacked). When two or more countries contemplate forming an alliance at time $T_0$, they each have some expectations about how costly it will be to uphold their commitments. Only if the expected utility of joining--given expectations about costs--is greater than the expected utility of remaining unallied, will an alliance form. When an enemy attacks one member (Y) at some future time $T_1$, X will again calculate the expected costs of assisting Y, since conditions might have changed. As long as the expectations of the costs of honoring the alliance commitment at time $T_1$ fall within the expectations held at $T_0$, the commitment is likely to be met. Otherwise, no alliance would have been formed at $T_0$.

The remainder of the present study is organized as follows. Section Two reviews the relevant literature. The theory is developed in Section Three. The empirical testing and the results are discussed in Sections Four and Five, respectively. Finally in Section Six, conclusions are drawn and future research possibilities are discussed.
II. LITERATURE REVIEW

Most early studies on alliances do not address explicitly the question of alliance reliability. They generally focus on the correlation between alliances and war. The findings of these studies indirectly contribute to our understanding of alliance reliability. However, the first systematic study along this line is by Singer and Small (1966a). They look at the relationship between alliance pact membership and war involvement during the period of 1815 to 1945. The existence of alliances turns out to be a good predictor of war involvement: allied countries are found to be more likely to assist each other and less likely to attack each other than unallied countries. Despite the fact that they look at a different time period and use different data sets, Siverson and King (1979) also find that countries bound by alliances behave differently from those not bound by alliances. They conclude that nations with allies are more likely to participate in wars than nations without allies. Kim's (1991) study of third party participation in wars comes to a similar conclusion. He addresses two questions. One that is relevant here is whether nations join a war to support their friends (i.e., allies) or to oppose their foes. An examination of 57 interstate wars between 1816 and 1968 leads him to conclude that "a nation is more inclined to join a war when a
friend or ally is in the war rather than when an adversary is in the war" (p. 676).

Clearly, this evidence lends support to the notion of alliance reliability. We observe that bilateral wars expand through alliances. This is possible only if at least some allies honor their commitments. What is unclear, however, is exactly how reliable allies are. In aggregate, they behave differently from unallied countries. What about the variance across allies? The answer to this question depends primarily on what is meant by saying that "an ally is reliable" or that "a country honors its alliance commitment". Depending on the definitions employed, we get very different answers.

Holsti, Hopmann, and Sullivan (1973) find that allies are highly reliable. Their study looks at alliance effectiveness, or "the extent to which nations in an alliance honor the alliance if it is invoked" (p. 59). After taking into consideration ideology, regime stability, distance, alliance size, goal ambiguity and the number of goals, they still find that, in most cases, alliance commitments are honored when specific casus foederis is invoked. Even the lowest reliability rate is 80%. This rate is much higher than those reported in other studies.

For example, Singer and Small's (1966b) examination of war performance of allied nations in the total system between 1815 and 1945
indicates that when one alliance member is involved in a war, its partners are more likely to remain neutral (91%) than offer assistance (5%) or fight against it (4%). Siverson and King's (1979) study on alliance and war expansion also comes to the conclusion that allies are not particularly reliable. Of 308 alliance partnerships between 1815 and 1965, 233 (75.6%) did not join their embattled partners, and only 75 (24.4%) came to the assistance of their allies.¹

Sabrosky (1980) provides an explanation for these conflicting findings. He suggests that the low alliance reliability found by Singer and Small (1966b) is a function of their restrictive definition of alliance reliability. Assuming that countries belonging to an alliance pact all have "the same opportunity" to participate in any war involving one of their members, they examine the behavior of each alliance partner for each war. Holsti, Hopmann, and Sullivan's (1973) study, on the other hand, is argued to "overstate" alliance reliability, because given their criterion that reliability depends on the casus foederis of an alliance pact, a country could be coded as reliable without having to fight on the side of its embattled partners. Apparently, for Sabrosky alliance commitment is upheld only if a country fights alongside its ally, regardless of what is actually stated in the alliance treaty in question.
As a somewhat eclectic solution, Sabrosky follows Singer and Small on the one hand by adopting a broad war-performance opportunity—"the involvement of an alliance partner in any interstate war under any circumstances during the time that its alliance was in force" (p. 166). and on the other hand follows Holsti, Hopmann, and Sullivan by using alliances as the unit of analysis. Each alliance has one war performance opportunity in a war. According to his operationalization, an alliance is said to honor its commitment if 1) at least two of the alliance partners fight alongside one another against a third party, and 2) none of the signatories may fight against any of their alliance partners (p. 168). From an examination of 50 wars involving at least one sovereign state between 1816 and 1965, Sabrosky concludes that allies are more likely to abstain from their commitments (61%) than fight alongside (27%) or against (12%) their partners.

It is clear from the above review that researchers' definitions of alliance reliability strongly condition their findings of how reliable allies are. Further definitional considerations concern what is actually required by a specific alliance treaty or agreement. First, most studies "expect" allies to fight with each other against a third country, but the truth is that only defense pacts obligate allies to assist their partners already under attack. Second, different defense
pacts may have different stipulations as to when an ally is expected to offer assistance. Holsti, Hopmann, and Sullivan's (1973) study is an exception. It examines alliance treaties existing between 1815 and 1939 and identifies the specific casus foederis instead of assuming that all alliances belonging to a type are the same. In this sense, the study probably presents a more accurate picture of alliance reliability.

The consensus from all these studies is that allied countries are more likely to participate in wars than unallied ones, but at the same time not all allies uphold their alliance commitments all the time. A logical question that follows from these findings is what accounts for alliance reliability. In other words, what determines which allies will uphold their commitments when called upon. This is the other question that studies of alliance reliability try to answer, and the focus of this study. Prior studies give several answers to this question.

First, a number of studies have come to the conclusion that alliance reliability primarily depends on the type of alliance pact. Countries bound by defense pacts are more likely to fight alongside their partners than those bound by non-aggression pacts or entente. This is supported by Singer and Small (1966a, 1966b), Siverson and King (1979), and Sabrosky (1980). Siverson and King (1980) develop their 1979 study, and specifically address the variance between alliance
members in terms of their reliability. They also conclude that countries are more likely to join their allies in a war when they are bound by a defense pact than by the other two types of alliance pacts. The only dissent comes from Werner and Lemke (1997). They try to determine the factors that affect actual war alignment, with the existence of a defense pact being one of the explanatory variables. The results are mixed: the effects of a defense pact are conditional upon regime type. Defense pacts do not affect democracies' war alignment, but do make a difference when it comes to autocracies. Overall, it still appears that countries bound by defense pacts are more likely to fight alongside their allies than those bound by the other two types of alliance pact. This is not a very surprising finding, though, because this is what a defense pact is all about.

Second, alliance attributes may explain the variance in alliance reliability. The factor that attracts most attention is power distribution within an alliance. but how this actually affects alliance reliability remains an unsolved question. Singer and Small (1966b) find that monadically, the more alliance pacts a country is in with major powers, the more likely it will honor its commitment. Siverson and King (1980) find the opposite: countries are more likely to join their embattled allies when the latter are minor powers. Dyadically, or
multi-adically, alliances composed of entirely major powers or minor powers are more reliable than mixed alliances. according to Sabrosky (1980).

The exact effects on alliance reliability of the age of an alliance remains an issue of controversy as well. Singer and Small (1966b) suggest that the longer a country stays in any alliance, the more likely it will honor its commitment. On the other hand, Siverson and King (1980) come to a different conclusion: countries in relatively new alliances are more likely to join their allies in a war. It is not very clear from the two studies why there are these conflicting findings.

Holsti, Hopmann, and Sullivan (1973) also test the effects of some other alliance and national attributes: ideological homogeneity or heterogeneity of the alliance, national stability, geographical dispersion of an alliance, and the number and ambiguity of alliance objectives. None of these appears to have a significant impact on alliance reliability. Finally, Siverson and King (1980) find that several other alliance attributes affect reliability. Countries are more likely to honor their commitment if many of their allies have participated in the war, if they are bound by a number of alliances, and if they have fewer alliance partners.
To sum up, prior studies on determinants of alliance reliability all fit Kegley and Raymond's (1990) characterization that most of these efforts focus on the type of alliance pact and the relationship between signatory countries. Though it has produced some results, this line of thinking is not without problems. These studies are able to account for variances between alliance types, but left variances within an alliance type or within an alliance across members unexplained. In other words, if all that matters are alliance type and alliance attributes, countries belonging to the same alliance pact should behave the same. When one member is attacked, either all or none of its partners are expected to offer assistance. This, however, is not always the case. Even when the definition of alliance reliability is substantially relaxed in Sabrosky (1980), when only two members of an alliance are "required" to fight alongside each other against a third party, the reliability rate remains as low as 27%. The other problem with this focus on alliance attributes is that it downplays the role of each individual state. The decision to honor or disregard an alliance commitment seems to be determined externally by the kind of alliance a country gets in: who the partners are, the power relationship among the members, etc. Furthermore, it is unclear from existing studies why countries would choose to ignore their commitments after having formed
an alliance in the first place—a puzzling choice if losing credibility in the international world is costly.

Smith (1995) develops a game-theoretic model of alliance behavior which incorporates the three central questions of alliance research: the relationship between alliance and the occurrence of war, the motivations for the formation of alliances, and the reliability of alliances. The study concludes that an explanation for alliance reliability cannot be separated from an examination of alliance formation.

Several theories have been developed to explain alliance formation. In the realist view, states form alliances in the anarchic world as attempts to aggregate capability against external threats (Lalman and Newman 1990). Morrow (1991) and Morgan and Palmer (1995) both suggest that alliance formation represents a trade-off between security and autonomy (in Morrow's terminology), or between proaction and preservaction (in Morgan and Palmer's terminology). This is especially clear in asymmetric alliances: the weak state gains security from forming an alliance with a major power, while the major power enjoys influence over its partner. Bennett's (1997) empirical examination of alliance duration has found some support for each of these theories. Whatever form of benefits a country gains from an
alliance, the theory to be developed here assumes that states behave as if they are rational utility maximizers; therefore an alliance will be formed only if the countries involved see the utility of joining the alliance as greater than remaining unallied. This calculation later affects the decision of whether or not to honor the alliance commitment. The theory is fully developed in the next section.
III. THEORETICAL PERSPECTIVE

As noted above, we want to know when countries choose to honor their alliance commitments and when they choose not to. To understand this question, we need to consider the conditions under which an alliance is formed in the first place and the conditions under which a state challenges another that has allies. Figure 1 presents a schematic diagram that will guide the discussion.

Figure 1
For simplicity, the game starts with country X. It is clear that the same game can be constructed for Y: obviously X and Y are making the same calculation at the same time. In stage 1, X decides whether to form an alliance with Y or not. In the next stage, Y's enemy E either attacks Y or not. If E attacks, X makes a choice between assisting Y and staying aloof.

When X decides whether or not to ally with Y at $T_0$, X looks prospectively at what might happen down the road and calculates the expected utility of forming the potential alliance. Let $E_{0}(B)$ stand for the benefits X expects to gain from an alliance at $T_0$, and $E_{0}(C)$ X's estimate of the expected costs of an alliance. Assuming that X is a rational utility maximizer, this study argues that X will form an alliance with Y if and only if the expected utility of forming an alliance at $T_0$ is greater than the expected utility of not forming an alliance; i.e., if and only if

$$EU_{u}(ally) = E_{u}(B) - E_{u}(C) > EU_{u}(\neg ally)$$ (i)

The benefits of an alliance may take a number of different forms: security, influence or public goods such as trade (Gowa, 1994). The costs of an alliance mainly consist of 1) the costs of fighting alongside embattled Y or the costs of losing credibility if X chooses not to assist Y, and 2) the costs of Y not upholding its commitment to
X if X is attacked. This theory does not specify exactly what kind of benefits and costs are involved. Instead, to simplify the picture, in discussing the expected utility of an alliance, this study focuses on X's costs of fighting alongside Y against any E, holding constant the benefits of the alliance to X, the cost of losing credibility if X does not assist Y, and the cost to X if Y does not honor its alliance commitment when X is attacked.

The question now is whether X will assist Y later at $T_1$. The formation of the alliance in the first place suggests that equation (i) holds, and we would therefore expect X to uphold its alliance commitment if E attacks Y—if everything else remains the same. After an attack occurs at $T_1$, X has a better understanding of the expected costs of fighting alongside Y. X will again calculate the expected costs of getting involved in Y's conflict with E, because the conditions at $T_1$ may be very different from those at $T_0$. As a rational utility maximizer, X will honor its commitment if and only if

$$EU_{i}(\text{ally}) = E_{i}(B) - E_{i}(C) > EU_{i}(\sim \text{ally})$$  \hspace{1cm} (ii)

Assuming the expected benefits remain unchanged, if $E_i(C) < E_0(C)$, or if X's expected costs of fighting alongside Y at $T_1$ are less than its estimate of costs at $T_0$, it is very likely that X will honor its
commitment. Because the expected utility of being in the alliance is still higher than that of not forming the alliance in the first place.

On the other hand, if $E_1(C) > E_0(C)$, i.e., if X's expectations at $T_1$ of the cost of fighting alongside Y exceed those held at $T_0$, the expected utility of remaining in the alliance becomes smaller. The more $E_1(C)$ exceeds $E_0(C)$, the smaller the expected utility of remaining in the alliance. When this becomes lower than the expected utility of remaining unallied, X will not assist Y, because it is simply not worth it. Had X expected or foreseen this at $T_0$, no alliance would have been formed in the first place. The discussion so far leads to the following hypothesis.

**Hypothesis 1:** For a country X, the more the expected costs of joining its embattled ally Y at $T_1$ exceeds the costs expected at $T_0$, the less likely X will honor its alliance commitment, everything else being equal.

The theory expresses the costs to X of fighting alongside Y against E as a function of E's type and how much Y can withstand E's attack and thus contribute to the fight. Getting involved in a conflict with a strong and nasty E is more costly to X than with a weak E. At the same time, the more Y can contribute to the fight, the less X needs to do, and thus the less costly it is for X to get involved. Therefore we expect the following to happen.
Hypothesis 1.1. The more powerful E is, the less likely X will assist Y.
Hypothesis 1.2. The more X expects Y to contribute to the fight, the more likely X will offer assistance to Y.

X's expectation of a challenge on Y by an enemy and thus the costs of fighting alongside Y may change after the alliance is formed for a number of reasons. There might be changes in X's or E's leadership, which alters the expectation of a challenge and the costs associated with upholding alliance commitment; there might also be changes in the expected benefits from the alliance, etc. It is not the purpose of this study to determine the kinds of change that may occur after an alliance is formed. Instead, it is assumed that an alliance lasting for a very long time will be characterized by more changes in the expected utility of remaining in the alliance than a relatively young alliance. The changes may go in both directions—either up or down. If the expectations of a challenge go down, it becomes less likely X will be called upon. What we usually observe are therefore cases where expectations of the costs go up. When this happens, X might want to terminate the alliance, because the expected utility of maintaining the alliance may be lower than that of not maintaining it. However, since alliances are rarely re-evaluated, an alliance may continue to exist after all the changes in expectations, even if
neither X or Y wants to maintain it.² What we thus expect to see is the following.

Hypothesis 2: The longer an alliance has been in existence, the more likely its members will become less reliable.

Hypotheses 1 and 2 are subjected to an empirical test. The next section discusses the operationalization and measurement of variables.
IV. RESEARCH DESIGN

The current study looks at alliance reliability during militarized interstate disputes. The Correlates of War (COW) project identifies three types of alliance pact: defense pact, non-aggression pact, and entente. Even though most studies do differentiate these different types of alliance pact, they assume that allies should fight alongside each other—the only exception being Holsti, Hopmann, and Sullivan (1973). The fact, however, is that only a defense pact requires a signatory to intervene on behalf of its ally under attack, and this is all it requires. It does not obligate a country to join its allies in initiating conflicts, while the other two alliance types do not even require assisting allies already under attack.

The data therefore include only cases where the target of an attack is a member of at least one defense pact. The question is under what conditions its allies will offer assistance when it is attacked. Non-aggression pacts are not considered here, because it is impossible to identify cases where a country could fight its alliance partner but refrains from doing so. In other words, if two countries bound by a non-aggression pact never fight with each other, should this be treated as one case or many cases of commitment being honored? Ententes are not
addressed here either, due to the lack of sources to identify all cases of consultations or cooperation between allies.

The classification of alliance pacts into defense, non-aggression, and entente pacts is a very rough one. Different defense pacts actually have very different stipulations as to when a signatory should come to the side of its embattled allies.³ For example, Article 5 of the North Atlantic Treaty states:

The parties agree that an armed attack against one or more of them in Europe or North America shall be considered an attack against them all, and consequently agree that, if such an armed attack occurs, each of them, in exercise of the right of individual or collective self-defense recognized by Art. 51 of the UN Charter, will assist the party or parties so attacked by taking forthwith, individually and in concert with the other parties, such actions it deems necessary, including the use of armed force, to restore and maintain the security of the North Atlantic area. Any such armed attack, and all measures taken as a result thereof, shall immediately be reported to the Security Council. Such measures shall be terminated when the Security Council has taken the measures necessary to restore and maintain international peace and security" (Degenhardt 1981, p. 166).

As another example, the defense pact between Czechoslovakia and the Soviet Union signed in 1935 stated specifically that the Soviet Union would support Czechoslovakia against any attack only if France offered support first (Dupuy and Dupuy 1993, p. 1135). To examine each defense pact treaty/agreement as Holsti, Hopmann, and Sullivan (1973) did is beyond the scope of this study. However, if this issue is not addressed, there may be a lot of bias in the data set. If there is a
case of the United States being attacked in Asia, for instance, the fact that the U.S. is a NATO member leads us to expect that other NATO members would intervene, even though the NATO treaty does not say this. We would then have at most 19 cases of countries not honoring their alliance commitments. Since the U.S. is also a member of the Rio pact, there can be as many as 41 cases of unreliable allies. In order to minimize this kind of bias, the present study only considers militarized interstate disputes between 1816 and 1945, because during that period there were very few regional defense pacts with a large number of members.

Cases in Militarized Interstate Disputes (MID) data set that satisfy two conditions simultaneously are considered: (1) disputes in which the initiator's hostility level $\geq 4.4$ and (2) the target of an attack has at least one defense pact partner. For (2), the COW alliance data set is used. War-time defense pacts are excluded from consideration, because these are signed specifically for countries assisting others already under attack.

Altogether 89 militarized disputes are identified. A full account of the coding procedures for case selection is provided in the Appendix. These 89 disputes give rise to 164 cases, each case being a dyad composed of a country under attack and its defense pact partner.
**Dependent Variable**

The dependent variable is a dichotomy tapping the concept of alliance reliability. The variable is coded 1 if an ally joins its partner that has been attacked (if it is coded in MID data set as one side of a given dispute) and 0 otherwise. A logistic model is used in the analysis.

**Independent variables**

The theoretical development in the previous section reveals that the key independent variable captures changes in X’s expected costs of fighting alongside Y against E, which is a function of the extent to which Y can withstand E’s attack and thus contribute to the fight against E, and of the type of E. The former is operationalized as the change in Y’s threat level at \( T_1 \) from \( T_0 \), and the latter the capabilities of E.

**Changes in Y’s threat level from \( T_0 \) to \( T_1 \)**

Scarborough and Bueno de Mesquita (1988, p. 88) argue that “the costs of aligning with a non-threatened state are lower than an already threatened nation.” In keeping with this notion, this study argues that threat level is associated with costs, and that the costs of fighting
alongside a state facing low threat are smaller than the costs of fighting alongside a state facing high threat.

This study employs Bolks' (1998) threat index, with some revision. The index takes four factors into consideration: the geography of the opponent, the capability of the opponent, the existence of rivalry, and baseline hostility. The second and the fourth factors overlap with Scarborough and Bueno de Mesquita's (1988) operationalization of credible and serious threat. A useful feature of Bolks' index is that the hostility scores cover six years instead of focusing on the current year only, thus reflecting a general trend: they are "aggregated within each year and across the previous five years and the current year" (p. 12). In addition, the hostility score takes into consideration the militarized disputes a country experienced in the past six years as well as the opponents' hostility levels. If a country has been involved in militarized disputes reaching the level of full wars in recent years, it may not have enough power left to face an attack at T_i. This means higher costs to its allies if the latter choose to uphold their commitments.

However, for the index to be applicable here, some revision is necessary. Bolks' index focuses more on the power of the opponent and does not make a distinction between the initiator and the target of a
dispute. As a result, Britain, for example, faced a high average threat level (17.3) during the last twenty years of the 19th century, even though it was the most powerful country in the world at the time. By comparison, the average threat level during the same period for Portugal was only 0.7. The reason was simply that Britain was involved in more militarized disputes. In this case, major powers' threat levels are biased because these states are more "proaction-seeking", to use Morgan and Palmer's terminology.

The power of the country under attack is thus an important reflection of its threat level as well. Suppose, during a given year, Britain and Portugal happen to be facing the same threat level, according to Bolks' coding rule. One can imagine, however, that the likelihood that one country can withstand an attack is very different. It depends to a great extent on how powerful it is. Britain is probably better able to sustain attacks, given its power. Bolks' threat level is therefore divided by the capabilities of the country in question to get a revised threat level. The Composite Index of National Capability (CINC) score is used to measure capabilities.

The change in Y's threat level from $T_0$ to $T_1$ is calculated. The expectation is that if the threat level at $T_1$ is higher than that at $T_0$, it is less likely that Y can withstand the attack. Accordingly,
intervention will be more costly to X, and it becomes less likely that X will join Y.

Capabilities of Y's enemy E

The more powerful E is, probably the nastier the conflict, and thus the more costly it is for X to intervene on Y's behalf. Everything else being equal, high costs of fighting with Y against E mean a low expected utility of remaining in the alliance. The CINC score is used to measure E's capabilities.

The age of an alliance

This variable is coded as the number of months an alliance has been in existence by the time an E attacks Y at $T_1$.

Control variables

Conflict of interest

In a number of cases, a certain country is allied to both parties of a dispute. Conceptually, this is very different from cases where a country is allied with only one of the belligerents. In the former case, the country in question needs to decide 1) whether to get involved or not, and 2) which side to assist. The expectation is that
it will probably remain impartial, because fighting alongside one party against the other involves one case of honoring one's commitment and one case of violating it. Doing nothing, on the other hand, simply means that the country abstains from honoring its responsibility. To capture this difference, a dummy variable is created, coded 1 if the country is allied with both the initiator and the target of a militarized dispute, and 0 if there is no conflict of interest.

The length of a dispute

To decide whether to join one's embattled partner or not takes time. A very short dispute lasting a couple of days probably does not give a state enough time to make a decision, nor enough time to mobilize its troops once it decides to participate. The length of a dispute is thus included as a control variable. The unit of measure for this variable is the number of days a dispute lasts. In cases where the exact start and end dates of a dispute are not available, if the start date and the end date are in the same month, the cases are excluded; otherwise, the 15th of the month is used. In certain cases, a defense pact terminates before a dispute actually ends, the number of days between the start of the dispute and the end of the treaty is therefore treated as the length of the dispute.
Allies engaged in another militarized dispute

One important side effect of considering only the pre-1945 period is that a large number of the disputes occurred during the two World Wars. Those are two special periods in the sense that a large number of countries are involved in wars, especially the European countries. If a country is fighting its own war, it is less likely that the country can still afford to offer assistance to its embattled alliance partners. A dummy variable is therefore introduced, coded 1 if a country is involved in a conflict for over two weeks during the full year prior to the start of the current dispute between its defense alliance partner and a third country, which continues through the entire period of the dispute. Two weeks is chosen in an attempt to ensure that the dispute is extensive enough that there are some costs associated with it and thus a country may not want or be able to get involved in another dispute very soon.
V. RESULTS AND ANALYSIS

Descriptively, of the 164 cases identified in this study, alliance commitment is honored in only seven cases, which is 4.3%. This rate is much lower than the alliance reliability rates concluded in most existing studies in the literature: 24.4% in Siverson and King (1979), 27% in Sabrosky, and 80-90% in Holsti, Hopmann, and Sullivan (1973). There are, however, several points that need to be taken into consideration.

First, the actual reliability rate is a little bit higher, because in some of the excluded disputes alliance commitments are honored. MID data set # 154 is a case in point. Austria-Hungary attacked Hesse Electoral and Germany. Two of Hesse Electoral's and Germany's allies fought alongside them. As the unit of analysis is the dyad, there is no way to decide which country these allies were assisting, and it makes no sense to treat them as assisting both countries, because that would inflate the number of cases of alliance being honored.

Second, the definition of alliance reliability adopted in this study is very different conceptually from those utilized in other studies. Unlike most studies that "expect" countries to assist their allies even when the latter are the initiators of disputes, the focus
here is on the target of an attack and whether its allies offer assistance—defense pacts do not require military intervention on behalf of a partner that initiates an attack, according to the COW definition.

Last, as argued in the above section, the existing studies only consider wars. An examination of at the behavior of war initiators’ allies helps inflate the alliance reliability rate. Since initiators of wars usually are the winners, it is easier for them to attract their allies. In addition, since wars usually last longer than other militarized disputes, allies are more likely to join in later, as found in this study. A second look at the data set used here shows that there are 15 wars out of the 89 interstate militarized disputes identified. These 15 wars give rise to 23 cases, of which defense pact allies honor their commitments in four cases (17.4%), which is not very different from the results found by Singer and Small (1966a). Siverson and King (1979) and Sabrosky (1980), bearing in mind that those studies also included cases when allies join their partners that initiate a conflict.

The results of the empirical testing of the model are presented in Tables 1 and 2. Table 1 presents the estimated coefficients for the model.
Table 1. Estimated Coefficients for a Model of Alliance Reliability

<table>
<thead>
<tr>
<th></th>
<th>β</th>
<th>SE</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-4.5645</td>
<td>1.1226</td>
<td>0.0000</td>
</tr>
<tr>
<td>Change in threat level</td>
<td>-1.1E-05</td>
<td>7.861e-05</td>
<td>0.8880</td>
</tr>
<tr>
<td>Enemy power</td>
<td>2.4983</td>
<td>6.1399</td>
<td>0.6841</td>
</tr>
<tr>
<td>Age of an alliance</td>
<td>-7.5E-05</td>
<td>0.0028</td>
<td>0.9868</td>
</tr>
<tr>
<td>Conflict of interest</td>
<td>0.5911</td>
<td>1.1756</td>
<td>0.2528</td>
</tr>
<tr>
<td>Length of a dispute</td>
<td>0.0029</td>
<td>0.0009</td>
<td>0.0010</td>
</tr>
<tr>
<td>Engagement in another dispute</td>
<td>0.8006</td>
<td>0.9868</td>
<td>0.4172</td>
</tr>
</tbody>
</table>

Number of Cases: 164  
Cox & Snell R²: 0.071
Generally speaking, the performance of the model is rather unsatisfactory.

Of the three independent variables derived from the theory, two of them have coefficients in the expected direction, but neither is statistically significant. The theory expects a negative relationship between changes in X's expectations of the costs of fighting alongside Y and the likelihood that X will assist Y. It is found that if the threat level that Y faces at $T_1$ is greater than the threat level at $T_0$, X is less likely to assist Y. However, the relationship remains statistically insignificant.

X's expectation of E's type affects X's expected utility of forming the alliance, and thus X's decision of whether to assist Y or not. Contrary to the theory, it appears that the more powerful E is, the more likely X will offer assistance to Y, though the relationship is not significant.

The longer an alliance exists, the less reliable its members should be, and this is revealed by the negative relationship between the two. Unfortunately, here again the results remain insignificant.

The coefficient that is in the correct direction and statistically significant is that of the length of a dispute. Deciding whether or not to assist one's ally and mobilizing troops take time.
thus we expect that allies are more likely to honor their commitments in militarized disputes lasting a relatively long time. Empirically this expectation is supported, which suggests that the longer a militarized conflict lasts, the more likely allies are going to offer assistance. Of course, it may be that the participation of allies prolongs the conflict.

A country allied with both parties of a militarized dispute faces a situation different from a country allied with only one party of a conflict. In the former case, assisting the target of the attack is likely to alienate the other ally. However, the results actually indicate a positive but insignificant relationship between the two: in other words, it seems that a country is more likely to assist its ally if it is attacked by another of its allies.

The pre-1945 period is a very unique one in the sense that a lot of militarized disputes occurred during the two world wars, and many countries--especially European countries--were involved. If an ally is engaged in its own conflict, it may not be able to offer assistance to its embattled partners. Empirically, however, this relationship does not hold.

The probability of a country upholding its alliance commitment is presented in Table 2.
Table 2. Probabilities of Honoring Alliance Commitment Based on the Estimated Coefficients in Table 1.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in threat level</td>
<td>maximum</td>
<td>0.53%</td>
</tr>
<tr>
<td>Enemy power</td>
<td>minimum</td>
<td></td>
</tr>
<tr>
<td>Age of an alliance</td>
<td>minimum</td>
<td></td>
</tr>
<tr>
<td>Conflict of interest</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Length of a dispute</td>
<td>minimum</td>
<td></td>
</tr>
<tr>
<td>Engagement in another dispute</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change in threat level</td>
<td>mean</td>
<td>1.79%</td>
</tr>
<tr>
<td>Enemy power</td>
<td>mean</td>
<td></td>
</tr>
<tr>
<td>Age of an alliance</td>
<td>mean</td>
<td></td>
</tr>
<tr>
<td>Conflict of interest</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Length of a dispute</td>
<td>mean</td>
<td></td>
</tr>
<tr>
<td>Engagement in another dispute</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change in threat level</td>
<td>mean</td>
<td>6.83%</td>
</tr>
<tr>
<td>Enemy power</td>
<td>mean</td>
<td></td>
</tr>
<tr>
<td>Age of an alliance</td>
<td>mean</td>
<td></td>
</tr>
<tr>
<td>Conflict of interest</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Length of a dispute</td>
<td>mean</td>
<td></td>
</tr>
<tr>
<td>Engagement in another dispute</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change in threat level</td>
<td>minimum</td>
<td>94.99%</td>
</tr>
<tr>
<td>Enemy power</td>
<td>maximum</td>
<td></td>
</tr>
<tr>
<td>Age of an alliance</td>
<td>maximum</td>
<td></td>
</tr>
<tr>
<td>Conflict of interest</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Length of a dispute</td>
<td>maximum</td>
<td></td>
</tr>
<tr>
<td>Engagement in another dispute</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>
Substantively, when 1) changes in threat level is set at its maximum value, there is no conflict of interest, 3) an ally is engaged in another dispute, and 4) the length of a dispute, the age of an alliance and enemy power are set at their minimum values, the probability of an ally assisting its embattled partner is as low as 0.53%. When changes in threat level, length of a dispute, length of an alliance and enemy power are set at mean values, the probability does not increase very much. Finally, when 1) changes in threat level is set at its minimum value, 2) there is a conflict of interest, 3) an ally is not engaged in another dispute, and 4) the length of a dispute, the age of an alliance and enemy power are set at their maximum values, the probability rises to 94.99%.

Several factors may explain why the model does not perform as expected. The number of cases is relatively small and there is not much variance in the dependent variable. The skewed distribution of the dependent variable definitely affects the empirical results, making it almost impossible to achieve statistically significant results.

In addition, many other variables might need to be included as controls, especially the location of a dispute. If, for instance, Argentina attacks Britain in Falkland Islands, it is unlikely that Britain's allies in Europe will try to send troops to South America to
fight on its behalf, though they may provide other kinds of assistance. This, interestingly, suggests another important question to ask: what actions does a country need to take to be considered as reliable? Of the seven cases identified in this study, the lowest hostility level exhibited by the ally is a show of force. Many other types of assistance, such as supplying weapons, are not reflected in the MID data set. For example, the MID data set does not show that Mongolia was involved in the Soviet Union's war against Germany, but, according to Dupuy and Dupuy (1993, p. 1146), "Mongolia gave full support to the Soviet Union though it declared neutrality". Similarly, in the Falkland War in the 1980s, the U.S. provided intelligence to Britain, an act that would not be considered as honoring its commitment according to the criteria of alliance reliability utilized by existing studies.

There may also be some specification problems in data coding, due to the constraints of available data. The MID data set codes the highest hostility level only, so the country coded as the initiator of the dispute may not be the country that actually makes the threat or initiates an attack in the first place. This means that we might be looking in the opposite direction in some cases. For instance, MID data set codes Russia and Ethiopia as the initiators of the Russo-Japan war and Ethiopia-Italy war respectively, though most military historians
treat them as the targets (Dupuy and Dupuy 1993). This results in two cases of alliance commitments being disregarded: since neither Japan's ally Britain nor Italy's ally Albania offered assistance. A better assessment of the effects of these coding differences could be made if all cases with conflicting coding are identified and their effects on the prediction of the model are examined. Though the author attempted to look up such the cases from studies of military history, only some of the cases are listed in those works.

Finally, this study only looks at cases during the pre-1945 period, when many disputes occurred during the two world wars. Even though a dummy variable has been introduced as an attempt to control the possible effects of the time period chosen, by examining whether an ally is involved in another militarized dispute at about the same time—since the most European countries were involved in the wars, this may not be enough. The variable looks at whether an ally in question gets involved in a militarized conflict in the period from a year prior to the current attack to the end of the dispute, but there might be cases where countries do not want to offer assistance to their partners even though they are not involved in any war, because they face high threat level and may be attacked at any time.
VI. CONCLUSIONS

Studies on alliances and war have shown that allied countries are more likely to come to each other's assistance than unallied countries. An examination of the behavior of allies suggests that some but not all of them honor their alliance commitments. The extent to which countries honor their alliance commitments largely depends on one's definition of alliance reliability. Thus, the conclusion drawn by Kegley and Raymond (1990, p. 63) that "although alliance members tend to stand in together in wartime rather than fight one another, they are most likely to stand aside when a partner becomes embroiled in the armed conflict" is a hasty one. Many studies "expect" countries to do what is not stipulated in the alliance agreement or treaty! When Holsti, Hopmann, and Sullivan (1973) look at whether countries do what they are obligated to by alliance treaties or agreements, the reliability rate turns out to be very high.

This study attempts to examine conditions under which a country will uphold its alliance commitment when its defense pact ally is under attack. Previous studies focus almost exclusively on alliance attributes and alliance type. They have been able to account for some variance in alliance reliability, but, at the same time, fail to explain any variance across members of an alliance. Nor can they
explain why countries would form alliances but not honor them, in a world in which being unreliable is costly. Following Smith (1995), this study argues that an examination of alliance reliability cannot be separated from an understanding of alliance formation. The theory developed here suggests that country \( X \) will form an alliance with \( Y \) if and only if the utility \( X \) expects to gain from the potential alliance are greater than the utility of not forming an alliance. This calculation affects the later decision of whether or not to uphold the commitment: country \( X \) will assist \( Y \) if the expected costs at \( T_1 \) of intervening on \( Y \)'s behalf are less than the expectations \( X \) held when the alliance is formed at \( T_0 \). In addition, it is expected that the longer an alliance has been in existence, the less reliable will be its members.

Empirically the duration of a dispute is found to affect alliance reliability. There is a positive and significant relationship between the length of a dispute and the likelihood that \( X \) will uphold its commitment. This suggests that one reason that many allies do not come to their partner(s)' aid might be that the dispute finishes before they can make the decision and mobilize their troops.

Despite the rather poor empirical performance, the theoretical arguments presented here are believed to be on the right track. This
study develops a very simple expected utility model. If we assume that states act rationally to maximize expected utility when making foreign policy decisions, such as the decision of whether or not to initiate a war, we should assume states to make similar strategic calculations when deciding whether or not to honor their alliance commitments.

The above section contains several possible explanations for why the empirical results are very different from those expected. To really address the issue of conditions under which allies uphold commitments required by a defense pact, a more general model needs to be developed, tracing a militarized dispute to the very beginning, when a threat is made by Y's enemy E toward Y. If X makes a credible counter-threat, E probably will not initiate a conflict. These kind of situations are not captured in the current study, yet in such a case we can say that X is honoring its commitment to a certain extent. The very likelihood that X will honor its commitment thus makes actually-honored commitments more difficult to observe. Coupled with a careful definition of alliance reliability like the one adopted by Holsti, Hopmann, and Sullivan (1973), a general model beginning with an examination of threat making will definitely produce more promising results.
NOTES

1. This is slightly different from the findings reported in Siverson and King (1980), where allies join their partners 23.1% of the time and remain aloof 76.9% of the time.

2. For example, Russia and France formed a defense pact alliance in January 1894. The alliance did not officially terminate until in December 1918. However, it is apparent that the alliance ended after the Russian Revolution in 1917. France, together with some other European countries, initiated several disputes against the Soviet Union in 1918.

3. This point was brought to the author's attention by Dr. Stoll.

4. Many studies look only at war, but the definition of war is arbitrary—there have to be 1000 battle-related deaths for a dispute to be called a war. Defense pacts does not specify how many deaths are needed before the ally of the target of an attack can offer assistance. Therefore all cases of use of force are considered in this study.

5. As Bolks (1998, p. 10) explains, the initiator faces threat just as the target does, because they may face "a reciprocated violence of some type".

6. Sabrosky's (1980) terminology is used here.
BIBLIOGRAPHY


APPENDIX

The MID data set (version 2.1) identifies altogether 2043 militarized interstate disputes between 1815 and 1992.

This study considers only disputes where at least one belligerent's hostility level is equal to or greater than 4, and this gives me 1501 disputes.

Furthermore, I identify disputes that occur prior to 1945, where the target of an attack (the hostility level equal to or greater than 4) has a defense pact partner. 98 disputes satisfy these criteria.

Of these 98 disputes, four cases (ID # 154, 337, 1825 and 3341) excluded because in those cases one country attacks two countries at the same time. It is not clear if the two are allied and one side is offering assistance.

Disputes # 88, 261 and 1251 are special cases because the ally of the target of an attack actually fights alongside the attacker against the target. This is even worse than not assisting one's alliance partner. These are also excluded.

Of the remaining 91 pre-1945 disputes, two cases are dropped due to missing data. One independent variable is the length of the dispute. In case # 1263, the dispute finished within one month, but no starting and ending date are given, and there is no way to pick a date non-arbitrarily. For case # 374, there is no threat data for the time when the alliance was formed.

Altogether 89 disputes are included in the empirical test. The unit of analysis is the dyad: the country under attack and its defense alliance partner. These 89 disputes produce 164 dyads.