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# INTERNATIONAL CONFLICT AS A CENTRAL ENVIRONMENTAL DESCRIPTOR IN A LONG-RANGE FORECASTING MODEL

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13. ABSTRACT

International conflict is defined as "negative" interactions between nations, that is, hostile actions taken by one nation toward another nation. Those interactions include a continuum of conflict types ranging from verbal accusations to military action. Thus international conflict is not restricted to military encounters. The index of conflict that has been developed is intended to indicate the proportion of conflictual interaction within nation pairs or dyads. The index attempts to place conflict interaction in perspective by accounting for both positive and negative interaction between nations.

The regression model that will be used to forecast international conflict contains five exogenous (externally determined) and four endogenous (internally determined) predictors. Exogenous predictors include geographic proximity/contiguity, number of treaties, defense as a percent of GNP, social distance, and level of interaction. Endogenous predictors are previous levels of conflict between dyad members, military power base, alignment, and internal instability.

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| Internal instability | | | | | | |
| Power | | | | | | |
| Alignment | | | | | | |
| Dyadic interaction | | | | | | |
| Economic interdependence | | | | | | |

# INTERNATIONAL CONFLICT
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## I. THE DEPENDENT VARIABLE

Any forecast of the future political environment must include provisions for projecting the occurrence of international conflict. This is especially true for our present study of Europe; twice in this century the continent has been ravaged by war.

Pioneering work on conflict has been done by Wright[1] and Richardson[2] and more recently by Singer and Small.[3] Richardson measured the intensity of conflict by the number of war dead. Singer and Small improved upon this approach by adding the total number of violent conflicts in which a nation became involved. Similarly, Wright concerned himself with "the legal condition which equally permits two or more hostile groups to carry on a conflict by armed force."[4] All four men accumulated vast amounts of data for numerous variables in the hope of uncovering relationships that would reveal the genesis of violent conflict. The bulk of conflict literature has taken this approach; it has focused on war or lesser forms of violent conflict. Consequently, international conflict has become synonymous with armed combat.

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1 Quincy Wright, A Study of War (2nd ed.; Chicago: The University of Chicago Press, 1965).

2 Lewis Rithardson, Statistics of Deadly Quarrels (Chicago, 1960).

3 J. David Singer and M. Small, The Wages of War 1816-1965 - A Statistical Handbook (New York, 1972). Also J. David Singer, "The Correlates of War Project: Interim Report and Rationale," World Politics, XXIV (January 1972).

4 Wright, A Study of War.

Yet a war model that deals only with the extreme form of conflict is already an anachronism. The establishment of integrative economic and military federations and the introduction of nuclear deterrents all promote a non-war environment. Furthermore, a relatively tranquil period has prevailed in Europe since WWII, culminating in the recent East-West detente. Thus a war-oriented paradigm may be inappropriate for the present study.

In the broadest sense, then, conflict has begun to include other forms of interaction--economic, diplomatic or social, as well as military. In certain cases a measure of economic confrontations is more appropriate than military encounters in determining the "true" level of conflict. Japanese-U.S. relations are a case in point. A long-range forecast of military conflict for this dyad would no doubt indicate a low probability. Economic conflict, however, is very likely to increase over time. Thus the absence of military conflict does not mean that conflict does not exist nor does it imply that the occurrence of war should be underplayed. It simply means that various forms of conflict should be known to the decisionmakers who must formulate viable long-run policy. Consequently, we favor a model that will consider war as a subset of many conflict types.

In our working definition, conflict is a response provoked by disagreement. While an observer may not be able to detect disagreement or fully understand it, he can witness the response to disagreement. Analysts of international conflict are in a similar position. They observe conflict responses (events) of interacting countries. Although events obviously include positive or cooperative acts, we are presently concerned only with negative actions taken by one country toward another. These conflict events represent responses that cover a variety of issues and intensities. The importance of event analysis is that it is a foundation upon which conflict can be conceptualized as something other than war.

International conflict can be viewed as a continuum with mild verbal conflict at one extreme and military or violent conflict at the other. This is conceptually and operationally the most expedient construct and will be the approach taken here.

There is evidence, however, that suggests conflict may not be singular, but rather multidimensional. Rummel's research indicates the existence of "three independent continua of foreign conflict behavior:... a war dimension; a nonviolent foreign conflict behavior, diplomatic dimension; and an actively hostile, belligerent dimension."[5] Weede's conclusions are similar.[6] If conflict is in fact multidimensional, events could not simply be placed on a single conflict continuum but should first be located on the proper individual continuum, then further pinpointed within it.

Whether Rummel's findings are relevant to our study is questionable. He dealt with aggregate conflict by examining sample countries against the rest of the world. Yet conflict in the present study is entirely dyadic. Consequently, the research designs are totally different and Rummel's conclusions may not be applicable.

Unidimensionality of conflict will be assumed here primarily for operational simplicity. A unidimensional concept requires the acceptance of two assumptions. First, the various conflict events must be manifestations of the same concept and, second, they must represent different intensities. These assumptions provide the basis for a monotonic framework

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5 R.J. Rummel, "Dimensions of Conflict Behavior Within and Between Nations," Conflict Behavior and Linkage Politics, ed. by J. Wilkenfeld (New York: David McKay Co., Inc., 1973), p. 83.

6 Erich Weede, "Conflict Behavior of Nation States," Journal of Peace Research, No. 3 (1970), pp. 229-35.

that comprises heterogeneous types of conflict. That is, a conflict continuum can be developed utilizing event data. At the lower end fall smaller-scale disruptions or ordinary interstate interactions that are limited and marginal in impact. Between the two poles fall conflict relations of increasing intensity and magnitude.[7] At the upper extremes fall military or violent conflict.

A similar structure can be established for cooperative events and the development of a cooperative continuum. Taken together, the continua can be joined to produce a measure of dyadic conflict mediated by cooperation. Corson[8] and Azar[9] have used such measures to examine dyadic conflict. Corson's design is of heuristic interest, but is of limited value here because he concentrates on bloc (i.e., East-West) conflict.

Azar's work is more relevant to our present needs. He develops a thirteen point scale that ranges from most positive (unification to form one nation) to most negative (all-out war) to describe dyadic events. Essentially, the scale consists of judgmentally determined weights of intensity for cooperative and conflict events. For instance, Category 13--Nation A engages in all-out war with Nation B--is more intense than Category 11--Nation A initiates subversive activities in Nation B--and is weighted accordingly. This scale is then transformed into a two-dimensional

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7 Leo A. Hazlewood, "Externalizing Systemic Stresses: Internal Conflict as Adaptive Behavior," Conflict Behavior and Linkage Politics, ed. by J. Wilkenfeld (New York: David McKay Co., Inc., 1973), p. 160.

8 Walter H. Corson, "Conflict and Cooperation in East-West Relations: Measurements and Explanation" (paper prepared for the Sixty-Sixth Annual Meeting of the American Political Science Association, Los Angeles, Cal., Sept. 8-12, 1970).

9 Edward E. Azar, et al., "The Problem of Source Coverage in the Use of International Events Data" (unpublished paper, University of North Carolina, Chapel Hill, 1973).

conflict-cooperative space. Diagrammatically, this is illustrated in Figure 1. If the country dyad's relationship is primarily a cooperative one, then the aggregation of their cooperative and conflict events will fall in region I. If the relationship is conflict-prone, it will fall in region II.

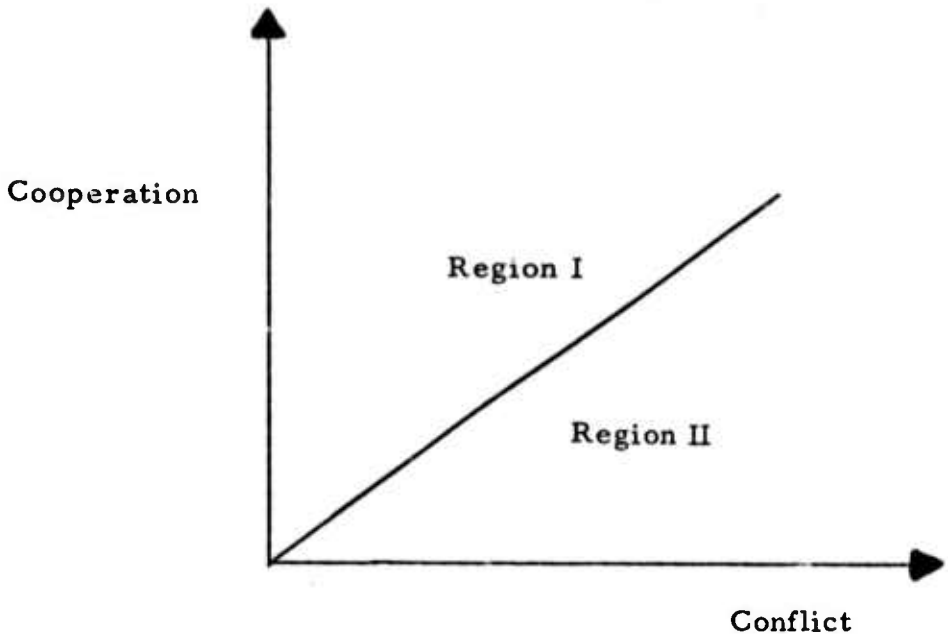


Figure 1.

We have now defined what we mean by conflict. In the following sections, we will discuss event analysis and the scaling of events. Ultimately we will combine these concepts and methods into an operational measure of conflict.

## II. OPERATIONALIZATION

### A. EVENT ANALYSIS

> For more than a generation, academic journalism and communication research have been accumulating systematic findings about the mass media. We have now the benefit of a body of knowledge, much of it based on statistical analyses, about the characteristics of public communication. There is a growing body of reliable knowledge about the flow of the news and about communication behavior. International communication is an important aspect of this expanding field of knowledge, albeit there is a lag in the study of international political behavior from the perspective of the communication approach. There is no question, however, that such an approach can be taken to the analysis of the way in which the countries of the world act toward one another.[10]

The quotation refers to the role of interaction analysis in international relations. Here we are specifically interested in a subset of interaction analysis called event analysis. "An event is defined as an activity undertaken by an actor in the political system in order to affect the behavior of the recipient of the act."[11] Reports of these events can be obtained

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10 Charles A. McClelland and Gary D. Hoggard, "Conflict Patterns in the Interactions Among Nations," International Politics and Foreign Policy, ed. by James N. Rosenau (London: Collier-Macmillan Ltd., 1969) p. 711. For a good discussion of communications theory see John W. Burton, Conflict and Communication (London, 1969).

11 For a good, concise explanation of event analysis and its uses, see Mark Wynn and Mary F. Smith, "The International and Domestic Event Coding System: INDECS," RM 303 (Arlington, Va.: C.A.C.I., 1973). For a more in-depth discussion of event analysis and transaction analysis, see Charles A. McClelland, "International Interaction Analysis: Basic Research and Some Practical Applications," Technical Report #2, World Event/Interaction Survey (ARPA, 1968).

from the media (usually newspapers and journals). The event codings generally have four components: an actor (initiator of action), target (recipient of action), issue area and event type. Thus, "the U.S. issues a verbal warning to the North Vietnamese to cease infiltrating South Vietnam" is an event in the formal sense.

The event file that we will use is the World Event/Interaction Survey (WEIS). Data for the file are extracted primarily from the New York Times (NYT). Events are then coded according to the above-mentioned criteria and stored in a computer data bank. The WEIS file is the best dyadic events collection available; but it covers only the period 1966-1973 and its contents must be accepted with reservations.

Since NYT is the principle source, only those items that it deems "fit to print" are entered. That is, only events that are of interest to the readers and editors are considered. The NYT covers more events than any single source, but because it is a single source it omits many important events.[12] The shortcoming of the WEIS file due to event omission is further compounded by the exclusion of certain actors. The coding procedure for WEIS only recognizes certain governmentally approved respondents.[13]

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[12] Edward Azar, et al., "The Problem of Source Coverage in the Use of International Event Data," International Studies Quarterly (September 1972). See also Edward Azar, Richard Brody, and Charles McClelland, "International Events Interaction Analysis: Some Research Considerations," International Studies Series, Vol. 1, No. 02-001 (Beverly Hills: Sage Publication, 1972); Philip M. Burgess and Raymond W. Lauton, "Indicators of International Behavior: An Assessment of Events Data Research," International Studies Series, Vol. 1, No. 02-010 (Beverly Hills: Sage Publications, 1972).

[13] The scope of WEIS is specific. the reported event must be (1) a single and discrete event-interaction, i.e., a specific action or statement; (2) international (a national boundary is crossed); (3) official governmental--reported by and concerning official government sources such

This excludes many important non-governmental actors such as the Red Cross and multinational corporations.[14]

## B. EVENT SCALING

Another problem in event analysis is that of accurately representing the intensity of interactions between nations. The task of weighting events has critical implications for a measure of dyadic conflict or cooperation that attempts to discern the intensity as well as frequency of activity. Clearly, physical conflict events such as border skirmishes or full scale war imply a higher level of conflict than do verbal protests, accusations and threats. By weighting, we assign numerical values to events in such a way that larger values are given to events of greater intensity.

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as: a) an executive officer of high rank (President, Premier, Minister); b) an executive agency (defense department secretary and spokesman); c) persons acting in an official role (negotiators, ambassadors, representatives); d) a party related to a nation's international relations in military, guerrilla actions and demonstrations (Israeli forces, Swedish protestors, Pathet Lao guerrillas); e) an international body and its official heads, committees, representatives; f) an official government news service, radio publication (Tass, Al Ahram, Neues Deutschland) For a complete discussion of WEIS coding procedures see Trysha Truesdell, "World Event/Interaction Survey (WEIS) History and Codebook," (Arlington, Va.: C.A.C.I., 1973). (Unpublished paper.)

14 Furthermore, certain external and internal behavior is not represented in WEIS. These include: (1) nongovernmental, unofficial acts (informal access) that are ignored for pragmatic reasons; (2) routine transaction flows (e.g., exchange of goods and services); (3) international administrative activity carried on in the low, middle levels of bureaucracy such as day-to-day business of embassies, consulates and agencies. For further discussion of the weaknesses of event analysis see Charles A. McClelland, "Some Effects on Theory from the International Event Analysis Movement," International Studies Series, Vol. 1, No. 02-001(Beverly Hills: Sage Publications, 1972), pp. 37-39.

In the present study we are contemplating two alternate scaling schemes. The first merely assigns a value to each event type. The specific scale we are considering is that developed by Calhoun.[15] Through expert judgment and quantitative techniques he has created a scale (Table 1) for the major WEIS (and some non-WEIS) event classes. As the scale stands, it is a one-dimensional continuum consisting of positive and negative events. For reasons that will become clear later, we will modify the scale by transforming it into a two-dimensional space. The adaption will produce a conflict-cooperation space as in Figure 2. Conflict ranges in intensity from 1.07 (reduce) to 4.44 (force), and cooperation from .108 (comment) to 4.674 (cooperate). Neutral events fall at zero.

Many students of event analysis disagree with such a detailed scaling method.[16] They argue that differences among closely related events are not discernable and that the various biases of the data base make the distinction meaningless. In the scaling scheme we are considering, three distinct levels of conflict can be generally agreed upon that roughly correspond with Rummel's three dimensions.[17] In Table 1, column 3, these levels are delineated as hostile, diplomatic, and war. A similar configuration can be constructed for positive interaction. (Such a breakdown,

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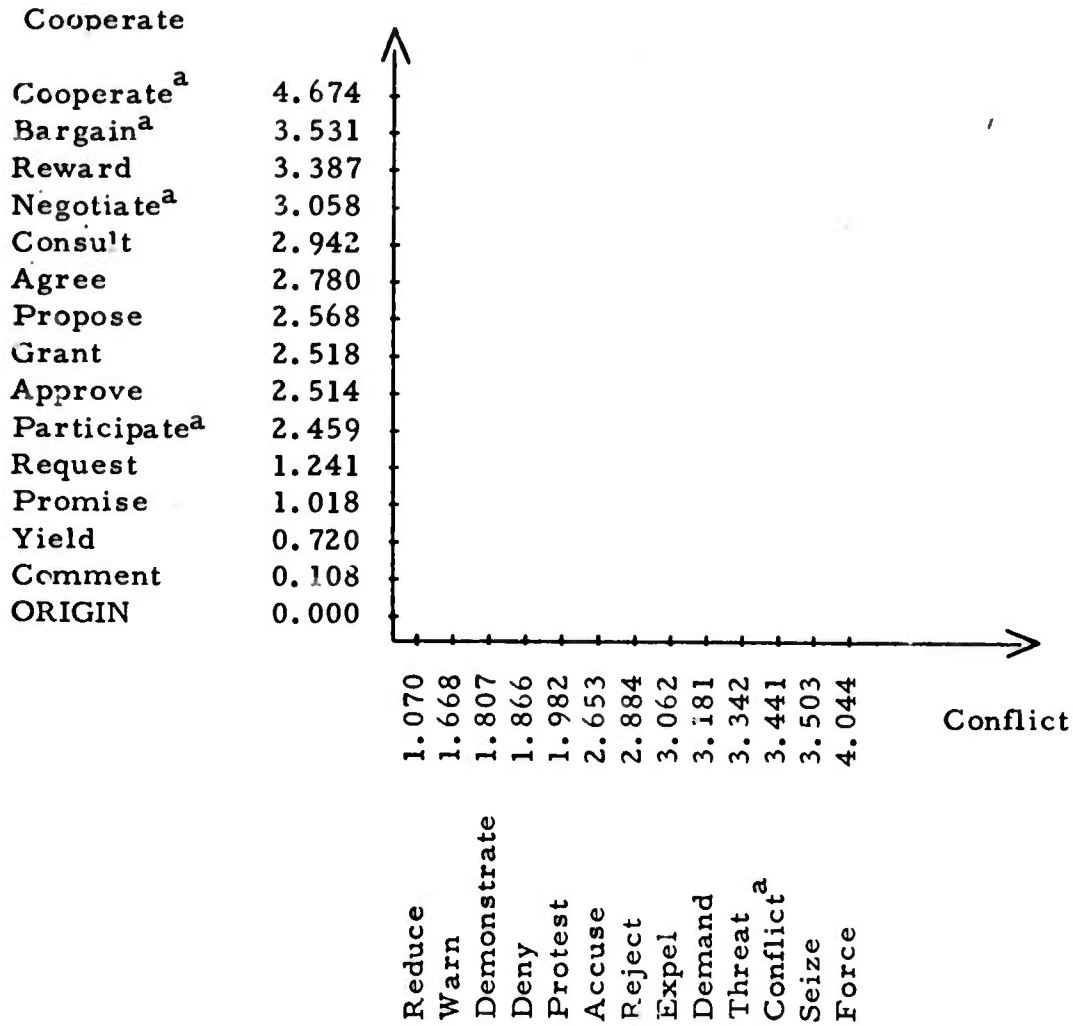
15 Herbert Calhoun, "The Measurement and Scaling of Event Data Using the Semantic Differential," (paper presented at the 2nd Annual Meeting of WPSA, Albuquerque, New Mexico, April 7-10, 1971). For an illustration of the use of Calhoun's scale, see John H. Sigler, "Cooperation and Conflict in the United States-Soviet-Chinese Relations, 1966-71: A Quantitative Analysis," Peace Research Society Papers, XIX, (Cambridge, 1971).

16 McClelland, "Some Effects on Theory from the International Events Movement," p. 40.

17 Rummel, "Dimensions of Conflict Behavior Within and Between Nations."




[a] A non-WEIS category.

Figure 2.

TABLE 1

| Calhoun Scale | | Scale for Combined Event Classes (Tentative) |
|---|---|---|
| Concept | Value | |
| Cooperate[a] | 4.674 | |
| Bargain[a] | 3.531 | |
| Reward | 3.387 | |
| Negotiate[a] | 3.058 | |
| Consult | 2.942 | |
| Agree | 2.780 | |
| Propose | 2.568 | |
| Grant | 2.518 | |
| Approve | 2.514 | |
| Participate[a] | 2.459 | |
| Request | 1.241 | |
| Promise | 1.018 | |
| Yield | 0.720 | |
| Comment | 0.108 | |
| Origin | 0.000 | |
| Reduce | -1.070 | |
| Warn | -1.668 | |
| Demonstrate | -1.807 | Hostile |
| Deny | -1.866 | |
| Protest | -1.982 | |
| Accuse | -2.653 | |
| Reject | -2.884 | Diplomatic |
| Expel | -3.062 | |
| Demand | -3.181 | |
| Threat | -3.342 | |
| Conflict[a] | -3.441 | War |
| Seize | -3.503 | |
| Force | -4.044 | |

[a] Non-WEIS Events.

however, has not yet been achieved. Consequently this column is left blank.) The various event types can then be lumped into these three categories and assigned category weights. A simple approach might be to weight hostile 1, diplomatic 2, and war 3.

We favor a weighting scheme that weights increasingly severe conflict by more than incremental amounts, that is, exponential rather than linear weighting. If we use the above example, for instance, hostile would be $B^1$, diplomatic $B^2$, and war $B^3$, where B is some base value. Our preference for B is e (2.71828). This would facilitate calculations since natural logarithm tables already exist and a larger base (say 10) might greatly over-weight successive events.

## C. OPERATIONALIZATION

The purpose of this section is to construct a measure of dyadic conflict using both positive and negative events. An example of event data for this purpose is given below in Table 2. Positive and negative events for a

TABLE 2

| Year | Events | |
|---|---|---|
| | + | - |
| 1 | 5 | 6 |
| 2 | 2 | 4 |
| 3 | 3 | 5 |
| 4 | 5 | 2 |
| 5 | 5 | 4 |
| 6 | 6 | 5 |
| 7 | 7 | 3 |
| 8 | 6 | 4 |
| 9 | 4 | 4 |
| 10 | 7 | 3 |

country dyad over a ten-year period are listed. In Figure 3, the difference between the total number of both types is plotted (that is, positive-negative). The plot would seem to suggest that the relationship has become more positive, or, we would say, less conflictive.[18]

Gross event counts of this kind may be misleading, however, because individual event types are not considered. This point is illustrated by examining USSR-Czechoslovakian and USSR-U.S. relations as recorded in the WEIS file. For the time period covered, there are 108 negative events for the former and 788 for the latter. This would imply that USSR-U.S. relations are much more conflictive than USSR-Czechoslovakian relations. However, all we can glean from the event data is that the USSR and U.S. interact more than the USSR and Czechoslovakia. The intensity or level of conflict is not discernible.

Azar[19] has developed a measure of violence that appears applicable to our model. In Figure 4, the horizontal axis represents the severity of conflict and the vertical axis represents the intensity of positive interaction. The numerical value for each event will be determined from a weighting scale similar to the one in Table 3. The coordinates of the end point of vector R consist of the weighted sums of positive and negative events. For example, assume that countries A and B in Table 3 have positive and negative events for year 1 as shown in column 3. Using Calhoun's scale, the resulting vector configuration would be as indicated in Figure 5. Positive events

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[18] For a more complete discussion of this approach, see T. J. Rubin and G. A. Hill, "Experiments in the Scaling and Weighting of International Event Data," RM 302 (Arlington, Va.: C.A.C.I., January 1973).

[19] Edward E. Azar, "Towards the Development of an Early Warning Model of International Violence," Studies in Conflict and Peace Report, No. 13 (Dept. of Political Science, Univ. of North Carolina, Chapel Hill, December 1972). (Mimeographed.)

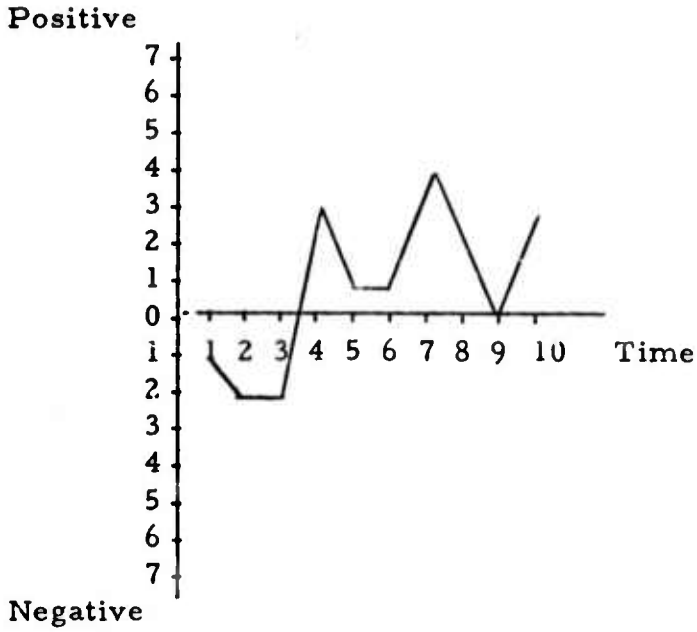
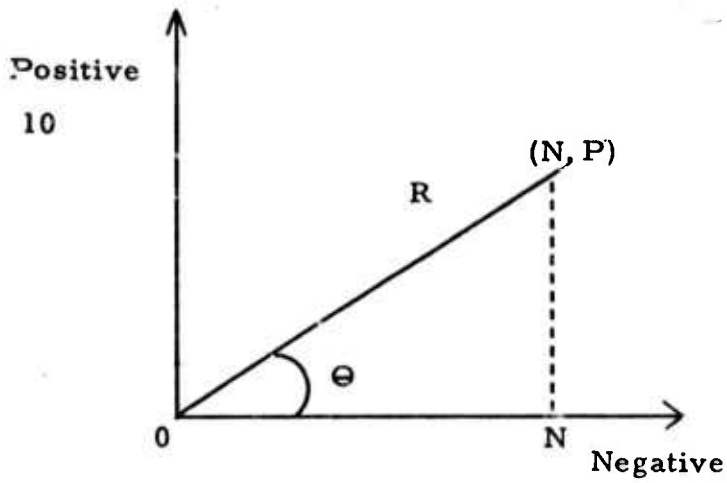



Figure 3.




N = Weighted sum of negative events.

P = Weighted sum of positive events.

$$\cos \Theta = \frac{N}{R}$$

Figure 4.

TABLE 3

HYPOTHETICAL BREAKDOWN OF EVENTS FOR YEAR 1

FOR COUNTRY DYAD A-B

| | Weights (Calhoun) | Frequency for Year 1 |
|---|---|---|
| Cooperate[a] | 4.674 | |
| Bargain[a] | 3.531 | |
| Reward | 3.387 | |
| Negotiate[a] | 3.058 | |
| Consult | 2.942 | |
| Agree | 2.780 | |
| Propose | 2.568 | |
| Grant | 2.518 | |
| Approve | 2.514 | |
| Participate[a] | 2.459 | |
| Request | 1.241 | 2 |
| Promise | 1.018 | 1 |
| Yield | 0.720 | |
| Comment | 0.108 | 2 |
| ORIGIN | 0.000 | |
| Reduce | 1.070 | |
| Warn | 1.668 | |
| Demonstrate | 1.807 | |
| Deny | 1.866 | |
| Protest | 1.982 | |
| Accuse | 2.653 | 1 |
| Reject | 2.884 | |
| Expel | 3.062 | 1 |
| Demand | 3.181 | |
| Threat | 3.342 | 2 |
| Conflict[a] | 3.441 | |
| Seize | 3.503 | 2 |
| Force | 4.044 | |

[a] A non-WEIS category.

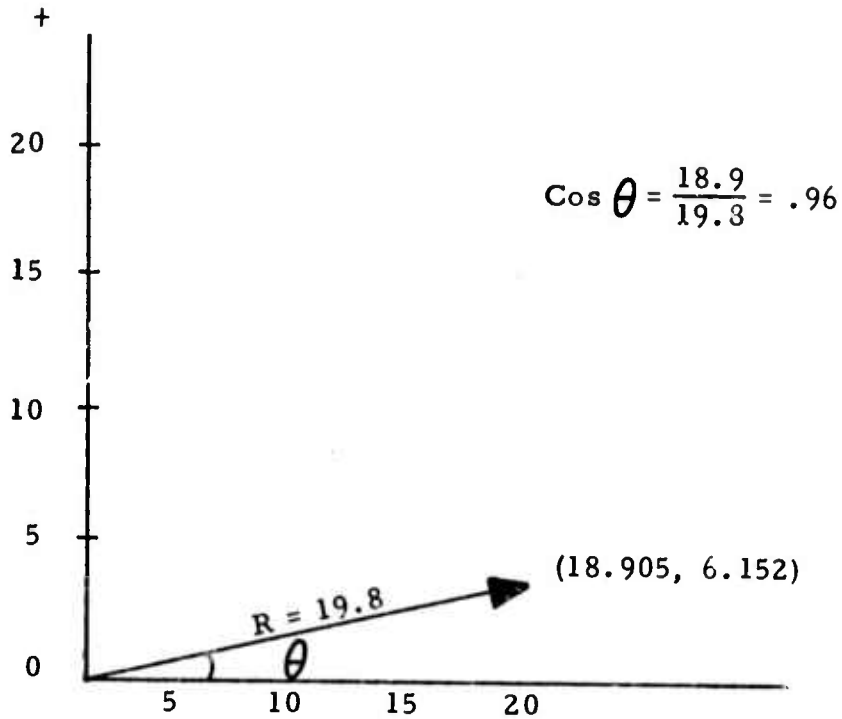



Figure 5.

have a weighted sum of 6.15 while negative events have a sum of 18.9.

The cosine of angle $\theta$ (i.e., N/R) can be used as a conflict index.[20] The length of R varies with the total number and intensity of events. Roughly, then, the cosine of $\theta$ corresponds to the percent of total weighted events that are negative. The function has the additional property of convenient boundaries. As $\theta$ varies from ninety to zero degrees, cos $\theta$ varies from zero to one. This conflict index will, therefore, vary from 0 to 1 depending on the relative number (and intensity) of conflict events to total weighted events.

This index should not be confused with the conflict scale previously mentioned (Table 1). The conflict scale in Table 1 merely assigns weights to conflict events, while the index developed in Figure 5 measures the amount

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[20] Azar uses a different weighting scale and the tangent of angle $\theta$.

of conflict from these weighted events. These two sections have defined and operationalized conflict. The following section will discuss causal variables and their linkages to conflict.

## III. STRUCTURE OF THE CONFLICT MODEL

The search for causes of international conflict has identified a wide variety of social, economic, and political variables that are believed to affect the behavior of nations. Among these are psychological factors that influence the perceptions and behavior of individual decisionmakers, the attributes of individual societies, the similarities and differences between nations and the nature of interaction between them, and the characteristics of the international system itself. The model which has been developed for the Long-Range Environmental Forecasting (LREF) project combines variables from several of these categories in an attempt to forecast the level of conflict between nation dyads. In keeping with the integrated approach to forecasting, these predictors include variables that are both exogenous and endogenous to our system. In the following system, a brief description of each predictor and its linkage to conflict will be presented.

### A. OTHER CENTRAL ENVIRONMENTAL DESCRIPTORS

#### 1. Previous Levels of Foreign Conflict

There is considerable evidence that indicates a strong link between a nation's past and present conflict behavior. Wright and Pichardson reveal the importance of past wars in determining the likelihood of future violence among countries.[21] Wilkenfeld and Zinnes extend the investigation to verbal hostility and conclude that a nation's foreign conflict during a given year is positively related to its level of verbal and physical

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[21] Wright, A Study of War; Richardson, Statistics of Deadly Quarrels.

conflict during the previous year.[22] Phillips' study of dyadic conflict concludes that two nations' future dealings with one another are essentially extensions of the chain of interaction sequences preceding them.[23] These analyses suggest that the magnitude of conflict behavior between members of a dyad is in part a function of their previous experiences. The nature of the ongoing interaction between two nations is thus an important determinant of the way they will interact at a given point in time. This implies that the history of conflict between members of a dyad is a predictor of their propensity to engage in future conflict.

2. Internal Instability

Simmel, Wright, and Rosecrance are among the many theorists who argue that the domestic and foreign conflict of nations are closely interrelated.[24] They reason that a nation's leader faced with domestic instability will attempt to increase national unity and the stability of his political position by diverting attention to foreign affairs. Thus involvement in international conflict can be expected to follow periods in which nations experience serious internal stress.

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22 Dina Zinnes and Jonathan Wilkenfeld, "An Analysis of Foreign Conflict Behavior of Nations," in Comparative Foreign Policy: Theoretical Essays, ed. by Wolfram Hanrieder (New York: David McKay Co., Inc., 1971), pp. 167-213.

23 Warren Phillips, "A Mathematical Theory of Conflict Dynamics," The Dimensionality of Nations Project, Research Report No. 39 (Department of Political Science, University of Hawaii, Honolulu, June 1970).

24 George Simmel, Conflict and the Web of Group-Affiliations, (Blencoe, Ill.: Free Press, 1955); Wright, A Study of War; Richard Rosecrance, Action and Reaction in World Politics: International Systems in Perspective, (Boston: Little, Brown and Co., 1963).

Early quantitative research into the relationship between domestic and foreign conflict cast doubt upon the validity of this argument. Rummel's factor analyses of variables relating to both levels of conflict yielded no significant relationship between the two domains.[25] Tanter and Burrowes offered further support for Rummel's findings, concluding that the two forms of conflict tend to operate independently of each other.[26] However, Rummel's findings have been qualified by Wilkenfeld, who found a clear relationship between domestic and foreign conflict when he controlled for type of governmental structure and introduced time lags.[27] Specifically, Wilkenfeld concluded that nations with centrist[28] governments tend to become involved in international conflict in some time period subsequent to that in which they experienced internal instability. Nations with personalist governments, on the other hand, tend to have internal instability and international conflict in the same time period. Wilkenfeld found no clear relationship between international conflict and internal instability for polyarchic nations. Furthermore, for extremely high levels of internal instability, he found that the relationship between instability and conflict appears to become negative for all

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25 Rummel, "Dimensions of Conflict Behavior Within and Between Nations."

26 Raymond Tanter, "Dimensions of Conflict Behavior Within and Between Nations, 1958-1960," Journal of Conflict Resolution, 10 (March 1966), 41-64; Robert Burrowes and Bertram Spector, "The Strength and Direction of Relationships Between Domestic and External Conflict and Cooperation: Syria 1961-67," in Conflict Behavior and Linkage Politics, ed. by J. Wilkenfeld (New York: David McKay Co., Inc., 1973).

27 Jonathan Wilkenfeld, "Domestic and Foreign Conflict," in Conflict Behavior and Linkage Politics, ed. by J. Wilkenfeld (New York: David McKay Co., Inc., 1973).

28 For a definition of these government types see Arthur Banks and Robert B. Textor, A Cross Polity Survey (Mass.: MIT Press, 1963).

government types. This seems to be a logical conclusion since a nation experiencing high levels of internal conflict will reallocate its military resources to promote domestic stability.

3. Power, Alignment, and Dyadic Interaction

The relationship between military power and the propensity of nations to become involved in foreign conflict has also attracted wide scholarly, as well as lay, attention. Singer notes that major powers tend to become involved in international military conflict more often than weaker nations.[29] Rummel reached a similar conclusion when he observed that bloc prominence, a variable very closely related to power, correlates rather strongly with all forms of foreign conflict of nations.[30] In short, both theorists suggest that there exists a positive linkage between absolute levels of power and levels of foreign conflict; the more powerful the members of a particular dyad, the higher the level of conflict we should expect between them.

This notion is not intuitively obvious, however, until one considers the conclusions reached by Galtung. He notes that powerful nations tend to participate more frequently in all forms of interaction in the international system;[31] and since some portion of this interaction is of a conflictual nature, major powers will be more involved in conflict as a

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29 Singer, "The Correlates of War Project," pp. 243-270.

30 Rudolph Rummel, "The Relationship Between National Attributes and Foreign Conflict Behavior," in Quantitative International Politics, ed. by J. D. Singer (New York: The Free Press, 1968).

31 Johan Galtung, "A Structural Theory of Aggression," Journal of Peace Research, No. 2 (1964), pp. 15-38.

function of their higher level of international activity. A revised hypothesis linking dyadic conflict to the level of military power possessed by the members of that dyad, then, suggests that the relationship between power and conflict is mediated by the level of dyadic interaction. The greater the level of combined military power in a dyad, the higher their level of participation in the international system; hence their expected level of conflict is higher. That is,

$$C_{ij} = f(I_{ij}) = g(P_{ij})$$

where:

$C_{ij}$ = the level of conflict between nations i and j

$I_{ij}$ = the level of overall interaction between nations i and j, and

$P_{ij}$ = combined military power base of nations i and j

At the same time, other theorists have linked military power to foreign conflict in other manners. Organski, for example, points out that when nations become similar in power and status, they are drawn into more competitive situations and are thus more prone to become involved in conflict with each other.[32] Consequently, the difference in power bases of two nations should relate in a negative manner to the level of dyadic conflict they experience. We do not intend to imply that only those nations with similar levels of military power are likely to become involved in conflict with each other; but we do regard the case of conflict between a very powerful nation and a rather weak nation as a special case of the Organski hypothesis. Specifically, we think this linkage is mediated by the level of alignment between those nations. Thus when a small nation

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[32] A. F. Organski, World Politics (New York: Alfred A. Knopf, 1966).

begins to decrease its alignment ties to the large nation, the more powerful nation tends to utilize military, economic, and diplomatic pressure to preserve the status quo. That is, conflict is viewed as a joint function of the power difference between nations and the difference in the level of their alignment from the last time frame to the present.

We suggest that the difference in power between two nations is inversely linked to the level of conflict between them. That is, as the level of their military power bases becomes more nearly similar, they are more likely to experience conflict. This relationship is modified by the level of their alignment at time t relative to the level of their alignment at time t-1. Nations with great differences in their power bases are likely to become involved in conflict when they are less aligned than when they were more aligned in the last time frame. This mediated relationship can be expressed by the function

$$C_{ij} = h\left( \left| P_i - P_j \right| \quad (Align_{ijt-1} - Align_{ijt}) \right)$$

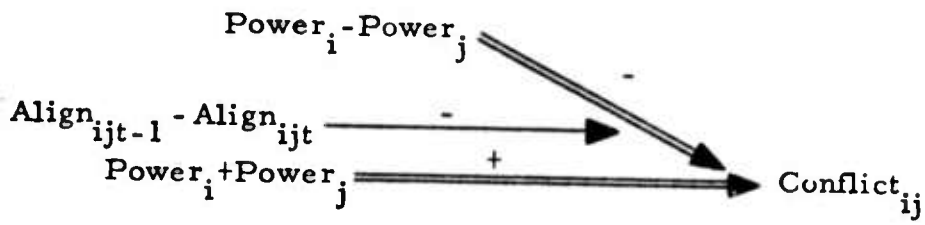
where:

$C_{ij}$ = the level of conflict between the members of the dyad,

$\left| P_i - P_j \right|$ = the absolute value of the difference in military power between them, and

$(Align_{ijt-1} - Align_{ijt})$ is an inverse measure of the degree of alignment between the two nations at time t relative to the degree of their alignment at time t-1.

The functional relationship hypothesizes that conflict will be inversely related to the difference in two nations' military power bases, except when those nations become less aligned from time t-1 to time t. These relationships may be diagrammatically expressed as follows.




4. Economic Interdependence

Although we feel that economic interdependence between dyad members has an important bearing on their mutual relations, the specific nature of the relationship between this variable and international conflict remains unclear. Many scholars have equated trade and interdependence with integration, suggesting that economic interaction indicates a high level of cooperation between nations.[33] Others argue that interdependence can create a number of potential conflict situations which may lead to increased hostility in the long run.[34] Consequently we propose to test two competing hypotheses relating conflict to economic interdependence, the first positing a positive relationship and the latter a negative relationship between them. Additional mediating factors may be added if empirical study reveals that the relationship is heavily influenced by other variables.

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33 See Hayward Alker and Donald Puchala, "Trends in Economic Partnership in the North Atlantic Area, 1928-1963," in Quantitative International Politics, ed. by J.D. Singer (New York: The Free Press, 1967); Richard Chadwick and Karl Deutsch, "International Trade and Economic Integration: Further Developments in Trade Matrix Analysis," Comparative Political Studies (April 1973).

34 Andrew M. Scott, The Functioning of the International Political System (New York: The Macmillan Co., 1967).

## B. EXOGENOUS PREDICTORS OF CONFLICT

### 1. Geographic Proximity/Contiguity

Studies of the causes of war have found that geographic relationships between nations are an important determinant of their conflict behavior. Lewis Richardson emphasized this, concluding that states become involved in wars in proportion to the number of states with which they have common frontiers.[35] Singer, Denton, and Weede tested similar hypotheses relating contiguity to war.[36] Rummel used both geographic distance and contiguity as predictors of conflict between nation pairs and discovered some relationship between these factors and both verbal and physical conflict.[37] The rationale underlying these conclusions is that geographically proximate nations, particularly those sharing common boundaries, tend to be faced with large numbers of potential conflict situations and are thus frequently drawn into conflict.

Therefore, we hypothesize a positive relationship between proximity/contiguity and the amount of conflict within dyads. Geographic proximity can be measured by using airline or steamship indices of the spatial distance between nation pairs. These crude distance measures will be supplemented by a dichotomous index of contiguity indicating the existence or

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35 Lewis Richardson, Statistics of Deadly Quarrels (Pittsburg: Boxwood Press, 1960).

36 Singer, "The Correlates of War Project," pp. 243-270; Frank Denton, "Some Regularities in International Conflict 1820-1949" (Santa Monica, California: RAND Corporation, 1965); Weede, "Conflict Behavior of Nation-States."

37 Rudolph Rummel, "Field Theory and Indicators of International Behavior," Research Report No. 29, The Dimensionality of Nations Project (July 1969).

non-existence of a common land boundary between dyad members. A value of 1 for this variable indicates that the members share a common boundary, while the number 0 indicates that they do not share a common boundary.

2. Number of Treaties

Earlier we hypothesized that the history of conflict between nations is a predictor of their subsequent conflict behavior. Similarly, it can be argued that previous experiences of mutual agreement and cooperation will reduce the potential for international conflict. The number of treaties between members of each dyad is used here as an indicator of their history of cooperation. Treaties have an important impact upon dyadic relations in that they establish a precedent of peaceful agreement that can counteract future hostility. They serve as a means for nations to create mutual constraints and lasting guidelines for problem solving that may prevent the occurrence of the more violent forms of conflict. It should be clear that the number of treaties between dyad members will be a long-lagged predictor in the conflict model (probably a five-or ten-year moving average). The data will include all United Nations Registered Treaties recorded up to 1972, and are intended to represent the history of cooperation between dyad members in the long-run forecasts. Though a more accurate predictor of conflict during a given time period may be the number of treaties existing during that same period, it is unrealistic to attempt predittions of the signing of future treaties. Thus we hypothesize that there exists a negative relationship between the number of past treaties between dyad members and their propensity to become involved in conflict with one another.

3. Defense as a Percent of GNP

Defense expenditures as a percent of GNP are used here as an index of

the degree to which nations are preoccupied with military affairs and defense-related matters. Haas found a strong positive relationship between this variable and the tendency of nations to engage in physical warfare.[38] Weede used the defense/GNP ratio as an indicator of the degree of militarization, and concluded that more militarized nations tend to become involved in more verbal and physical conflict.[39] These conclusions suggest that nations that allocate a large percentage of their resources to defense tend to be more aggressive in their relations with other nations and, therefore, have a greater propensity to become involved in conflict than nations little concerned with military affairs.

The most expedient means to operationalize this variable is to take the sum of the percents of GNP spent on defense for both countries in the dyad. A percent ranges from zero to one and therefore the sum of two percents will range from zero to two. We would expect that as the sum approaches its upper bound, conflict will increase and as the sum approaches zero, conflict will decline. This measure should not present any difficulties since military expenditures will be predicted by one of the descriptors.

It is important to recognize the conceptual distinction between defense/GNP ratio and the power descriptor, which is also a predictor variable in the conflict model. The power measure developed for the Long-Range Environmental Forecasting project indicates the gross level of power resources available to a particular nation. In contrast, this variable reveals the importance a nation attaches to defense relative to other areas of expenditure,

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38 Michel Haas, "Societal Development and International Conflict," in Conflict Behavior and Linkage Politics, ed. by J. Wilkenfeld (New York: David McKay Co., Inc., 1973).

39 Weede, "Conflict Behavior of Nation-States."

and thus suggests how "military minded" the country is.

4. Social Distance and Level of Interaction

Historians contend that a major cause of past conflict is the tendency for groups which differ greatly in their social characteristics to perceive one another as a threat to their value systems and cultural integrity. Wright was a major proponent of the notion that among the many causes of violent conflict are the similarities and differences between nations in their socio-cultural characteristics.[40] Several studies have adopted the term "social distance" to refer to the amount of difference between societies in their ethnic/linguistic characteristics, religious composition, lifestyle, philosophical outlook, and other socio-cultural attributes.[41] Generally, these studies hypothesize a positive relationship between social distance and conflict, but often find only a weak association between these domains. We would add that the level of interaction between dyad members mediates this relationship. Frequent interaction between nations that are different on many socio-cultural dimensions may "politicize" these differences and exacerbate mutual hostility. In contrast, socially distant nations that seldom interact have little reason to perceive one another as a threat.[42]

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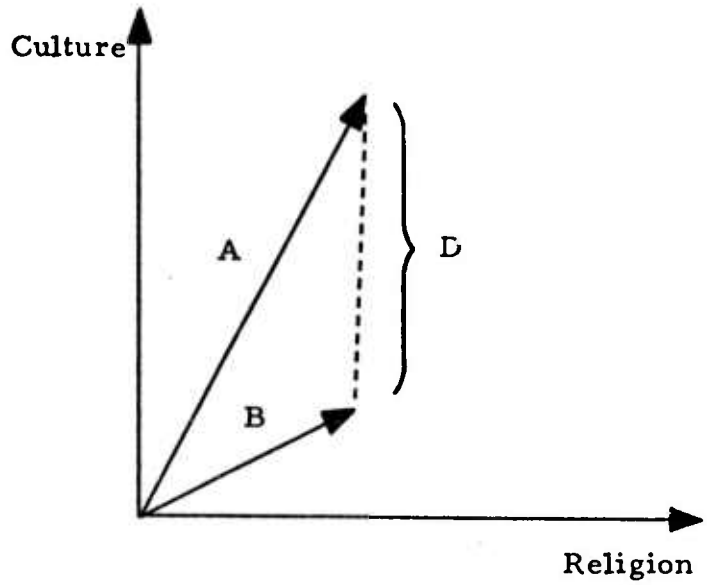
40 Wright, A Study of War.

41 Richard Van Atta, "Field Theory and National-International Linkages," Conflict Behavior and Linkage Politics, ed. by J. Wilkenfeld (New York: David McKay Co., Inc., 1973); R. J. Rummel, "A Social Field Theory of Foreign Conflict Behavior," Peace Research Society Papers 4 (1965).

42 Alternatively, interaction may reduce the dissimilarity between socially distant actors and consequently decrease the likelihood of conflict between them.

Social distance can most easily be viewed in the context of an attribute space. In the diagram below the social distance between two countries A and B is determined from the two-dimensional (religion-culture) attribute space. The country vectors (A and B) indicate a unique point in the space determined by cultural and religious factors and the distance (D) between these points is the measure of social distance. An increase in D would be interpreted as a divergence of national attributes. We would hypothesize that greater values of D are associated with conflict.

The illustration included here uses only two attributes, but a similar design can be constructed for all necessary attributes merely by increasing the number of dimensions in the space to equal the number of attributes. This makes the attribute space N-dimensional (when N is the number of attributes).




## C. METHODOLOGICAL CONSIDERATIONS

The conflict model will take the form of a multivariable linear equation. It will be a general equation to describe conflict for the entire study area.

Our primary empirical tool will be regression analysis. To achieve the generality that we desire, our data will consist of both cross-sectional and time-series inputs. We have not yet closely examined the available data, but our preliminary searches have indicated a scarcity of information on Eastern Europe. This may necessitate the exclusion of certain countries. A better approach would be to concentrate only on selected important dyads since this would also reduce the total number of dyads to a reasonable volume. (There are 27 countries in the study area, producing a total of 351 possible dyads.)

The general form of the regression equation is as follows:

$$
\begin{aligned}
Y_{1_t}(i,j) = {} & \beta_0 + \gamma_{12}\Big\{\big|[(Y_{2_{t-1}}(i)(D_1(i))] + Y_{2_{t-1}}(j)(D_1(j))]\big| \\
& + \big|[Y_{2_t}(i)(D_2(i))] + [Y_{2_t}(j)(D_2(j))]\big|\Big\} + \gamma_{13}[Y_3(i) + Y_3(j)] \\
& + \gamma_{14}\Big\{\big|Y_{4_t}(i,j) - Y_{4_{t-1}}(i,j))(D_3)\,(\big|Y_3(i) - Y_3(j)\big|)\Big\} \\
& - \gamma_{15}\Big\{[\,|Y_3(i) - Y_3(j)|\,]\,[-(D_3 - 1)]\Big\} + \gamma_{11}Y_{1_{t-1}}(i,j) \\
& + \beta_{11}X_1(i,j) + \beta_{12}X_2(i,j) + \beta_{13}X_4(i,j) \\
& + \gamma_{16}\left(\frac{Y_5(i) + Y_5(j)}{Y_6(i) + Y_6(j)}\right) + \beta_{14}[(X_4(i,j))(D_4)] + \epsilon
\end{aligned}
$$

where:

$Y_{1_t}(i,j)$ = Conflict between countries i and j at time t

$Y_{2_t}(i)$ = Internal instability for country i at time t

$D_1(i)$ = Dummy variable to indicate centrist regime

Value of 1 if centrist

Value of 0 for all other

$D_2(i)$ = Dummy to indicate personalist regime

Value of 1 if personalist

Value of 0 for all other

$Y_3(i)$ = Military power of country i

$Y_{4_t}(i,j)$ = Dyadic alignment of i and j at time t

$Y_{4_t}(i,j) - Y_{4_{t-1}}(i,j)$ = Change in alignment of i and j from time t-1 to time t

$D_3$ = Dummy to indicate high level of alignment

Value of 1 for high alignments

Value of 0 for all other

$Y_5(i)$ = Military expenditure for country i

$Y_6(i)$ = GNP for country i

$\left| Y_3(i) - Y_3(j) \right|$ = Difference in military power

$Y_{1_{t-1}}(i,j)$ = Previous conflict level

$X_1(i,j)$ = Proximity (distance between capitals)

$X_2(i,j)$ = Contiguity

$X_3(i,j)$ = Number of treaties

$X_4(i,j)$ = Social distance

$\dfrac{Y_5(i) + Y_5(j)}{Y_6(i) + Y_6(j)}$ = Percent of GNP that is military expenditure

$D_4$ = Dummy to indicate level of interaction

Value of 1 for high level

Value of 0 for all other

$\epsilon$ = Error term.

The regression equation represents, in mathematical terms, the theoretical linkages between conflict as defined in Sections I and II and its predictors as defined in Section III. A description of the machinery of the regression equation will illustrate the workings of the model.

In our empirical estimation we will work with four dummy variables. These variables will be allowed to take only two values: zero and one. The first dummy variables encountered in the equation are those associated with internal stability (the expression associated with $\gamma_{12}$). Variables $Y_{2_t}$ and $Y_{2_{t-1}}$ indicate instability at time t and t-1 respectively. The theory outlined above suggests that the government type determines whether and when instability will lead to international conflict. Specifically, personalist politics tend to become involved in international conflict in the same time period that they experience internal unrest. On the other hand, centrist types become involved in international conflict after internal instability occurs. Dummy variables $D_1$ and $D_2$ will account for this differentiation. If, for instance, country i is centrist, $D_1(i)$ will be 1 and $D_2(i)$ will be 0. If i were personalist the reverse would hold. Because we are measuring dyadic conflict, the government type for two countries must be considered, and we use two sets of subscripts (i and j). An example will illustrate the process.

Assume country i is centrist and country j is personalist. Dummy variables $D_1(i)$ and $D_2(j)$ would therefore take the value of 1 while $D_1(j)$ and $D_2(i)$ would be 0. The expression would reduce to $\gamma_{12}(Y_{2_{t-1}}(i)+Y_{2_t}(j))$. That is, the value of internal instability for the country pair is the sum of i's instability at time t-1 (because i is centrist) and j's instability at t (since j is personalist). If both countries were personalist, then the expression would reduce to $\gamma_{12}(Y_{2_t}(i) + Y_{2_t}(j))$. Similarly, if the dyad

is strictly centrist then its expression would be $\gamma_{12}(Y_{2_{t-1}}(i) + Y_{2_{t-1}}(j))$.

International conflict behavior of polyarchic government is not thought to be influenced by internal instability. Consequently a polyarchic government type would cause both $D_1$ and $D_2$ to be equal to 0. Two possible situations arise here. If both countries are polyarchic, then the entire expression reduces to 0. If only one is polyarchic, then the expression reduces to $\gamma_{12}$ multiplied by the appropriate instability variable. Consider, for instance, a situation where i is polyarchic and j is centrist. $D_1(i)$, $D_2(i)$, and $D_2(j)$ would all be 0 and the expression would become $\gamma_{12}(Y_{2_{t-1}}(j))$. The stability expression is constructed so that only the levels of internal instability of centrist and personalist governments are considered. In effect, this procedure gives more weight to a situation in which neither of the countries are polyarchic than one in which only one country is polyarchic.

The next term in the regression equation involves the absolute level of power represented by the country pair. Higher values indicate a country pair that consists of great powers and, thus, more interaction and greater potential for conflict. We expect $\gamma_{13} > 0$.

The effects of military power difference and alignment on conflict are traced in the next two expressions (the expressions associated with $\gamma_{14}$ and $\gamma_{15}$). The equation is constructed so that only one of the expressions is operable for any country dyad. Dummy variable $D_3$ can take values of 1 or 0 depending on whether the country pair is aligned or unaligned. In the first expression ( $\gamma_{14}$), if the dyad is aligned then $D_3 = 1$ and power difference and change in alignment will have a multiplicative effect on conflict; as power difference and change in alignment become larger, their mutual effect on conflict increases. The non-alignment expression ( $\gamma_{15}$)

in this case will be 0 since $D_3 = 1$ means $[-(D_3 - 1)] = 0$ which forces the whole expression to become zero. If the country pair is unaligned, however, then the alignment expression ( $\gamma_{14}$) reduces to 0 and the unalignment term becomes a test of Organski's theory of the linkage between power difference and conflict. That is, as power difference becomes smaller, conflict increases.

The level of conflict in the present time period is expected to be positively related to conflict in the previous period. Therefore $\gamma_{11}$ should be positive. We expect the level of military spending to have a positive effect on conflict. Therefore $\gamma_{16}$ should also be positive.

All the remaining variables are exogenous to the system, that is, their levels are determined externally. We expect proximity (distance between capitals) and contiguity to produce positive coefficients. The variable, number of treaties, is intended to determine the effect on a dyad of a history of cooperation. We expect a negative relationship.

We also anticipate a negative coefficient for social distance. The social distance expression contains our last dummy variables. Theories linking the concept of social distance to conflict suggest that countries that are socially distant will not conflict if they do not interact. This variable, therefore, will not be considered if there is a low level of interaction, in which case $D_4 = 0$ and the expression reduces to 0. On the other hand, if the pair is interactive, $D_4 = 1$ and the social distance expression becomes $\beta_{14}[(X_4(i,j))]$.

The list of explanatory variables in our regression equation is obviously incomplete. Numerous other variables could be included and their addition would add to the accuracy of the model. However, the variables that we have chosen are the most important predictors according to conflict

theory. Additional variables contribute less and less to overall accuracy and add more and more complexity. The model as it now stands maintains a balance between accuracy and simplicity.