A VECTOR ANALYTIC APPROACH TO INTERNATIONAL SYSTEMS CONFLICT

By

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This dissertation is dedicated
to my Parents whose
confidence was a constant source of inspiration.

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The purposes of the doctoral dissertation A Vector Analytic Approach to International Systems Conflict are to (1) critique the additive methodology that generally governs the application of events data to the study of patterns of international conflict and cooperation, (2) present and test weighting schemes that take into account the different capabilities of dyadic actors and the varying impacts that diverse types of events exercise on the disposition of international politics, and (3) present an alternative method of analysis of these data based upon the application of vector algebra in a system analytic context.

The dissertation's central contention is that the additive methodology, which simply sums the number of events in which each of a region's dyads participates during some specified period of time, forces the analyst to make the unrealistic assumptions that events are perfectly scalable and unidirectional. Furthermore, the additive methodology is criticized for its inability to differentiate between different internal distributions of dyadic behavior which may yield similar aggregated scores yet allow the existence of dissimilar systemic configurations (e.g., bipolar, multipolar) to go undetected.

When we speak of conflict, we generally focus upon who directs how much conflict at whom. Vector algebra is presented as a more realistic and sensitive method of analysis because vectors describe these constructs of magnitude and direction. This alternative method is also sensitive to changes in a system's internal distribution of behavior thereby overcoming the previously noted serious weakness of the additive approach. Finally, the vector analytic approach does not require the researcher to make the problematic scalability and directionality assumptions noted above.

The additive and vector analytic approaches are compared by using each of them (with and without the previously mentioned weighting schemes) to describe the patterns of international conflict in the Middle East from 1951-1968 inclusive and in Europe from 1955-1970 between the members of the North Atlantic Treaty Organization and the Warsaw Pact. The accuracy of the methods' respective predictions to extra-systemic behavior is the criterion against which their utility will be evaluated.

The findings of the research are generally encouraging. In the Middle East and in Europe, the vector analytic technique has demonstrated itself to be very sensitive to patterns of conflict and cooperation that go undetected by the additive approach. The same observation may also be made with respect to the weighting schemes which take into account the impacts of different dyads and events.

INTRODUCTION

In The Origins of Modern Science, Herbert Butterfield (1959: 1) has argued that:

> Of all the forms of mental activity, the most difficult to induce even in the minds of the young, who may be presumed not to have lost their flexibility, is the art of handling the same bunch of data as before, but placing them in a new system of relations with one another by giving them a different framework, all of which virtually means putting on a different kind of thinking cap for the moment.

The principal purpose of this dissertation is to suggest that it is time for us to don a new thinking cap for our analyses of international conflict. The dissertation questions many of the assumptions and computational practices of one of the leading methodologies currently used to analyze patterns of international behavior and presents in its place a different methodology which employs a multidimensional, vector algebraic perspective.

I will compare the two methods and their respective findings with respect to the criteria of theoretical validity, accurate empirical explanation, and prediction of particular types of international systemic behavior. I will further employ events data to operationalize patterns of international conflict, because they have been defined as most appropriate for this task (Kegley, 1972:5-6), and as I shall argue, their formulation closely parallels the manner in which we come to understand the disposition of the international arena and what transpires in it.

CHAPTER I

EVENTS DATA AND THE ADDITIVE METHOD OF ANALYZING INTERNATIONAL CONFLICT

It has been recently noted (Jones and Singer, 1972:3-4) that:

> Whether we seek to understand the past or anticipate the future, we need something more than vague recollections or a vivid imagination. We need evidence. Without evidence, there is little basis for selecting among contending (and often, equally plausible) models and explanations of the international politics we have experienced.

In response to this need, many of the recent studies that have attempted to explain patterns of international conflict and cooperation have developed the genre of machine-readable time series data known as events data [1]. These events data are the non-routine, political, purposive, and boundaried (Kegley, 1972:7-10) "record of who did what to and/or with whom" (Burrowes and Muzzio, 1972:211). In other words, they are the newsworthy record (Kegley, 1975:94-97) of nation's attempts to realize their respective foreign (and domestic) policy goals by interacting with various international actors.

Events data are particularly appropriate for the analysis of patterns of international conflict. Howard Shapiro and Michael O'Leary (1974:1) have noted that the events movement primarily concerns itself with the Morgenthau power politics paradigm by measuring nations' peace and conflict. Furthermore, if we accept conflict as "a situation in which two or more parties direct their energies at each other in order to achieve goals that can only be gained at each other's expense" (Rummel, 1973:67), we observe that the use of events data shares a

common focus with the definition of conflict on purposive interactions and national goals. Rudolf Rummel, Raymond Mack and Richard Snyder independently furnish additional justification for using events data for the study of international conflict by observing that "the key to identifying a conflict situation . . . may be to look for the actions which those involved in the conflict are directing at each other." Moreover, "since conflictual behaviors are those designed to . . . control another party or other parties (Mack and Snyder, 1957:218), one should be able to measure such conflict behavior in terms of specific acts (e.g., assassination, threats) or occurrences reflecting an aggregation of such acts (e.g., revolution and war)" (Rummel, 1973:67).

Despite the relative newness of the events data movement [2], the adoption of the discrete foreign policy act as the unit of analysis of international behavior lies within well established philosophical and theoretical traditions. G.H. Mead's The Philosophy of the Act (1938), A. Schnetz' "Choosing Among Projects of Action" (1951), W. Riker's "Events and Situations" (1957), E.A. Shils' and T. Parsons' seminal Toward a General Theory of Action (1962), and N. Rescher's The Logic of Decision and Action (1967) all emphasized the act in the scientific analysis of behavior. Other traditional roots of the events data movement include: (1) methodological roots in the systematic study of written and verbal communications (i.e., content analysis) (George, 1960); (2) data reduction for data generated in simulated environments (Zinnes, 1966); and (3) the categorization of behavior of small groups (i.e., sociometrical and small group research) (Bales, 1950).

As noted above, any attempt to understand our environment and select among contending theories of international politics requires the

development of a data base that is empirically verifiable and not solely grounded in intuitive process. Thus, I will use events data as the data bases in this dissertation primarily because: they may help generate middle range theories of international behavior as a function of their systematic (i.e., scientific) method of observing non-random behavior; they can be easily replicated; and finally, "while there are great heaps of facts (yet) little has been screened and coded by visible, consistent, verifiable, and systematic efforts" (Singer, 1968:2).

There are many examples of how events data have been employed in the analysis of international conflict and cooperation. Robert Burrowes and Douglas Muzzio (1972) use such data to analyze the behavior of the antagonists in the Middle East during the almost two and one-half years preceding the eruption of the June, 1967, Six Day War. Charles McClelland (1968) evaluates the amount of East-West conflict between 1955 and 1963 with respect to the Berlin question by summing the number of conflictual East to West and West to East events on a yearly basis. In "Status Discrepancy and Violence in the International System: An Empirical Analysis," Maurice East uses events data "to provide an overall, aggregate measure of the amount of violence in the international system at a given time" (1972:306). In another substantively oriented article, Barbara Fitzsimmons (1969) discovers an events "crisis profile" that suggests an operational definition of a crisis based upon the <u>proportion of events in each of the categories</u>. Finally, Gary Hoggard (1969) determines different periods of Israeli behavior towards its Arab neighbors by grouping events cumulatively.

These five articles which represent many of the analyses utilizing events data all employ the same analytical technique--what I shall

henceforth call the additive technique. This method is well described by Burrowes and Muzzio (1972:212):

> The streams of targeted conflict and cooperation were created by summing the unweighted frequencies of occurrence of eight conflict and eight cooperation indicators for four intervals. This process yielded 32 four-week scores on each targeted stream of total conflict or total cooperation during the period of January, 1965, to early June, 1967.

Maurice East similarly describes the various formulations of the additive technqiue in his article on status and discrepancy (1972:306):

> A measure of the amount of conflict based on a frequency count of the number of separate conflicts which began or were going on in a given year . . .

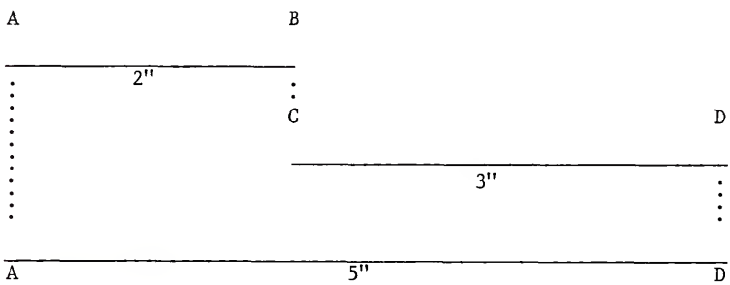
But as used by these analysts, the additive method is quite problematic, because the validity and reliability of its results depend upon certain assumptions such as the unidimensionality of systemic behavior, the unidirectionality of behavior, a perfect scalability of events, and equal impact of different actors and actions. These and other preconceived notions of behavior may or may not correspond to the realities of the patterns of international cooperative and conflictual behavior.

A major problematic assumption of the additive technique is that all events are perfectly scalable. This assumption allows acts of conflict to be added together like so many pieces of fruit. In other words, it assumes that two units of conflict from nation A to nation B (e.g., an informal protest and formal protest) plus three units of conflict from nation B to nation A (e.g., denunciation in the United Nations, recalling the ambassador from nation A, and a military invasion) equal five units of conflict between the two nations. To graphically illustrate this important assumption, let us assume that two acts of conflict and three acts of conflict are represented by two and three inch lines respectively [3]. This is, in fact, the representation of conflict made

in all the enumerative-type histories that plot the levels of conflict over a period of time, because the plots are really histograms which stack one uniform unit of conflict on top of another within each period of time.

The assumption of perfect scalability implies two conditions: (1) that the conflict scores are additive in the same dimension (i.e., unidirectionality); and (2) that the aggregate sum of conflict activity is exactly equal to the sum of the component units of conflict. The following illustrations demonstrate these conditions:

Perfect Scalability



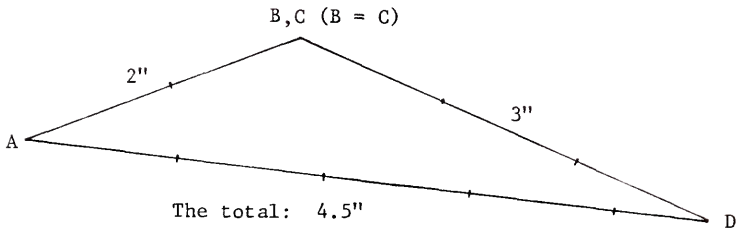
In the above example, the following two conditions are met:

1. Angle ACD = 180° (i.e., $\overline{CD}$ continues in the same direction as $\overline{AB}$)
2. $\Sigma(\overline{AB} + \overline{CD}) = 5 = \overline{AB} + \overline{CD}$

In the case of perfect scalability, the resulting line $\overline{AD}$ of 5 units of conflict represents the maximum amount of total systemic conflict between nations A and B. In the case of imperfect scalability represented below, we will see that 2 + 3 can equal less than 5 (Bernard, 1957).

Imperfect Scalability

Not Unidirectional (ACD $\neq$ 180°)



The theoretical foundation upon which the assertion that all conflict acts may be added in the same direction similarly appears to lie on tenuous grounds. If it is true that different conflict acts are performed for different purposes and convey different messages (Zinnes, 1968), then the contention that they all tend to have the same impact on international politics must be questioned. An example of what is meant by this unidirectional condition might serve to clarify. In Nationalism and Social Communication, Karl Deutsch (1966) uses the frequency and intensity of communication flows to delineate nations. He asserts that as people in some areas increase the communications between themselves, they will come to understand each other better and integrate their lifestyles in complementary manners. In short, Deutsch maintains that increased social communication results in increased affect between peoples until they become welded into a nation. This same general thesis has been advanced by the interaction school of social psychology. George Homans (1950) suggests in The Human Group that increased activity between

people may result in increased interaction which in turn may result in increased affect. However, it cannot be assumed that interaction and affect are always and necessarily positively related. On the individual level, it is possible that as we learn more about an individual, we may become increasingly aware of respective incompatibilities and differences which may result in antagonism and hostility [4]. At the international level, Richardson's analysis (1960) of the dynamics of arms races demonstrates a case in which increased international communication resulted not in increased affect but rather in the outbreak of war. Thus, relating this line of reasoning to the realm of international conflict would not necessarily lead to the absolute contention that two plus three acts of undifferentiated conflict equals five units of conflict. On the contrary, the above illustration of the absence of unidirectionality demonstrates a case in which the conflict does not lie in the same direction, but causes instead two plus three to equal less than five.

If, in fact, acts of conflict are not perfectly scalable, we are presented with a serious theoretical problem. In comparing the results of summing two plus three units of conflict under conditions of perfect and imperfect scalability, we observe the results of the former to be greater in magnitude than those of the latter. Actually, we observe that the result of addition under the condition of perfect scalability is the upper limit for addition where the units are perfectly scalable. This observation implies that the additive technique may bias its analysis of undifferentiated conflict (and also, cooperation) through over-estimation. If the over-estimation were uniform across actors, actions, and time, the descriptive and predictive capabilities of the technique

would not be decreased. However, inasmuch as the summations of these acts may not always travel in the same direction (i.e., angle ACD $\neq$ 180°), the bias cannot be considered uniform. These problems open the additive technique's findings to criticisms of possible distortion.

The problems generated by the additive method are not limited exclusively to its problematic assumptions. Complete analyses of behavior should focus upon the distribution of intra-systemic conflict between the dyads (Shapiro and O'Leary, 1974:18) as well as the changing distributions of the types of events performed by the actors of a system over periods of time [5]. The term "system" is employed here as an analytical device and should not be confused with a geographical region. A system as described by W. Ross Ashby (1960), Anatole Rapoport (1968a), and Charles McClelland (1965) refers to a set of concepts and their operational variables that are identified by a researcher as illustrating and explaining some research problem at hand. Charles McClelland (1965:258) and others (Katzar, et al., 1978) argue therefore that the boundaries and components of a researcher's system are analytically and arbitrarily determined. Consequently, a "system of conflict" in this dissertation refers to the patterns of conflictual behavior and null behavior that occur between an arbitrarily specified group of nations in pursuit of their respective and often mutually exclusive foreign-policy goals during a specified time period. The above mentioned "group of nations" may be located in a geographical region, but should not be confused as constituting a system.

The additive approach used by Burrowes and Muzzio (1972) is unable to simultaneously examine the multiple dimensions of a system and produce a reliable measure of the distribution of intra-systemic

conflict for the system as a whole. Furthermore, the distributions of the types of events performed by the system's dyads may be obscured by the aggregate orientation of the additive approach. The still unresolved debate regarding the relationships between systemic structure, the distribution of power among the individual participants, and the absence or presence of international conflict [6] illustrates the inability of the additive frame of reference to differentiate between the contending theories (e.g., bipolar distributions of power are more or less stable and/or conflictual than multipolar configurations). Therefore, the limitations of the method serve to detract from its utility.

To illustrate this point, let us imagine a region consisting of nations A, B, and C. At any point in time, all of the conflict (or cooperation) scores of each nation towards the others can be expressed in the following 3x3 matrix:

Target nation

Initiator nation

Nation	A	B	C
A	X		
B		X	
C			X

In this context of <u>dyadic</u> interaction between nation-states, the diagonal cells of the above matrix are meaningless and have therefore been eliminated. This leaves six possible dyads [7] upon which attention must be focused: A to B, A to C, B to A, B to C, C to A, and C to B. Let us now imagine seven successive time periods (t_1, t_2, . . ., t_7) with

seven different hypothetical distributions of the same overall conflict score as seen below:

	Time						
	t_1	t_2	t_3	t_4	t_5	t_6	t_7
Dyad							
A to B	20	10	10	7	5	4	4
A to C	0	10	0	3	5	4	3
B to A	0	0	10	7	5	4	4
B to C	0	0	0	0	0	4	3
C to A	0	0	0	3	5	4	3
C to B	0	0	0	0	0	0	3
Additive Conflict Score	20	20	20	20	20	20	20

These seven time periods demonstrate seven different distributions of conflict, each having different characteristics of conflict [8]. However, the periodic (i.e., t_n) additive frequency summations deal only with the total number of acts and not the internal distribution of the acts. As can be seen in the preceding table, the conflict score of 20 in each of the seven time periods does not reflect the changing internal distributions of conflict. The researcher may then be forced to conclude that a system is stable (i.e., that the disposition of its dimensions is unchanging), when in fact it is not. While he may direct his attention to the relations between certain dyads in turn, the additive approach lacks the capability to simultaneously examine the

changing distributions of behavior in the n dimensions of the system and therefore obscures information.

The same problem may also exist regarding the distribution of different types of events within a system over time. Notwithstanding the findings of Rosenau and Ramsey (1975) that action weights consistently fail to provide information that differs from unweighted analyses (an assertion I shall address later), Rummel points out that conflicts and consequently the acts representing them may vary in intensity. He further asserts that ". . . the scholar defines a conceptual framework of international relations which places these actions in relation to each other . . . and weights them in their prominence for practicing and understanding International Politics" (emphasis added) (1973:65). In addition, Hopmann (1972:222), Shapiro and O'Leary (1974:8; 13), Gamson and Modigliani (1971), and Kegley, Salmore and Rosen (1974) all argue that because events differ as to who performs them and in terms of their intensity, purpose, and credibility, they should not be considered similar.

For instance, if we observe a single dyad known as X in the hypothetical example below, we may note that its constant conflict score of 20 units at each point in time is insensitive to an escalation [9] of conflict.

Time

DYAD	t_1	t_2	t_3
X	20 informal protests	20 condemnations	20 border skirmishes

If the effect of this insensitivity is increased by the fact that international regions with many nations may contain hundreds of dyads (e.g., 25 Latin American nations generate 300 dayds), the loss of information due to the additive technique's exclusive attention to aggregate levels of conflict is at best monstrous [10].

Much of the current literature utilizing events data to analyze patterns of international conflict has other shortcomings that are independent of the problems generated by the additive method. Many students of international politics have lamented the general neglect by many analysts to take into account the differential impacts certain dyads might potentially have upon overall systemic conflict at any point in time by virtue of nations' different levels of material wealth (i.e., capabilities) and motivations [11]. For instance, the superior levels of American and Soviet wealth, as well as the tremendous stake each actor has in the Middle East, might make any conflict between them more extensive and thus more destabilizing for both regional and international peace than say, a conflict between Syria and Lebanon.

But just as different nations ought to be analyzed with due consideration given to their respective capabilities and national motivation, the events that occur between them ought to be analyzed differentially with respect to the intensity of conflict in each (Converse, 1968). In other words, the omission of such weights implies that an informal protest or accusation is as conflictual as a large scale troop mobilization or military engagement. Charles McClelland (1970:9) mentions this omission problem when he notes that:

> . . . in measuring a variable, we ignore the effect of the actor on the context of the act . . . does a denunciation indicate the same degree of influence attempts for one nation as it does another? Or do the denunciations of one nation indicate different degrees of influence attempts depending on the content or on the issue?

The omission of action weights and dyad weights potentially constitutes a major inadequacy in many studies. An example from the Burrowes and Muzzio additive analysis (1972:213) ought to illustrate this point. Let us observe the time period between 24 October 1966 and 20 November 1966. During these four weeks, Israel sent 28 conflict acts to its four Arab adversaries while they directed 45 acts of conflict to Israel, resulting in that period's conflict score of 28 + 45 = 73. This additive score may be misleading because it implies that these 73 conflict acts represent a period of greater conflict than some other time period with a score less than 73. The score does not take into account the fact that most of the events under consideration transpired between Israel and militarily inferior Jordan and that many of the acts between Israel and Jordan's allies were of a verbal nature. Had only 50 acts occurred, the period's conflict score would have been correspondingly less by the Burrowes and Muzzio method, even if the majority of those acts had transpired between Israel and a more equally matched military power such as Egypt. The same would hold true if the acts had been actively military rather than verbal. In short, one large scale military engagement between Israel and Egypt may be more conflictual than several informal protests between Israel and Jordan or Syria. The conflict scores produced by Burrowes' and Muzzio's additive method do not reflect such differential conditions and therefore seem to lack face validity.

In this first chapter, I have discussed the underlying assumptions of the additive method and some of the problems which have attended its application in various studies. In the next chapter, an alternative method of calculating levels of international conflict will be presented along with suggested weighting schemes to operationalize the differential impacts of dyads and actions.

Notes

[1] A number of researchers have employed events data to examine a range of substantive issues in International Politics. Among these individuals, Charles McClelland, Patrick McGowan, James Rosenau, Edward Azar, Robert Burrowes, and Jonathan Wilkenfeld constitute only a partial list. Their works along with those of numerous other researchers will be referred to in this dissertation.

[2] Although the theoretical foundation for events data was established in the 1930's with Mead's The Philosophy of the Act (1938), events data were not used in international political research until the early 1960's. This trend is observed in the table below:

Trends in Events Data Utilization (Peterson, 1975:265)

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
N of Studies Utilizing Events Data	0	0	1	5	2	4	2	6	8	7	4	17
N of Different Researchers Using Events Data for the First Time	0	0	1	5	3	1	0	2	5	7	3	13

[3] The use of one inch lines to represent individual acts of conflict assumes that all conflictual actions can be weighted equally. I argue in later sections that different events entail different motivations, convey different messages and may affect the international system in different manners. Therefore, I assert that different events should be weighted differentially.

[4] Numerous organization theorists have analyzed the impact of small group, face to face relationships in the organizational context. For an excellent summary of the (positive and negative) dynamics of small groups, see George Berkley (1978:94-100).

[5] For instance, in Chapter VI, I employ a data set specifying a 30 category continuum of cooperative and conflictual activity. Between 1958 and 1959, the distributions of events across the continuum are not highly correlated ($r = .47$). Even during the height of the cold war (i.e., 1955-56) East/West event-type stability is low ($r = .36$).

[6] This debate has been masterfully presented by Joseph Nogee in "Polarity: An Ambiguous Concept" which was presented at the 1973 Convention of the American Political Science Association in New Orleans. Briefly, the article describes the positions of Kenneth Waltz, Deutsch, and Singer who differ in their evaluation of whether bipolar or multipolar distributions of power are more inherently stable. Deutsch and Singer acknowledge the greater stability of the latter configuration.

[7] Given n nations, the number of possible dyads = $n(n-1)$. This excludes the cells along the diagonal of the matrix.

[8] A number of theoreticians have discussed the relationship between the distribution of conflict and systemic stability. See Deutsch and Singer (1969), Waltz (1969) and Spanier (1975).

The reader should note that a zero in this stable indicates <u>no interaction</u> rather than low conflict between the components of a dyad. Their interpretation is based upon the assertion that all interaction contains some degree of conflict.

[9] This example assumes that condemnations and border skirmishes are, in turn, more conflictual than informal protests as they may be employed after the failure of informal protests to achieve their goal. This interpretation is consistent with the escalation ladder of events postulated by Herman Kahn.

[10] This problem may indicate an incompatibility between the comparative foreign policy orientation use of events and the systemic orientation of this dissertation.

[11] Many students of international policies have stressed the symbiotic relationship between material wealth and the type of foreign policy pursued. Qualitative discusseions are offered by S. Spiegel (1972), Spanier (1975), and James Rosenau (1966), to mention only a few. Quantitative studies have been presented by Jack Sawyer (1967) and J. Kean and P. McGowan (1973).

CHAPTER II

AN ALTERNATIVE MODEL OF ANALYSIS BASED ON VECTOR ALGEBRA

In contrast to the additive method, the alternate vector approach constitutes a revised means of conceptualizing and measuring levels of international conflict. This vector analytic method emphasizes two major points: (1) the importance of the frequency of the dyadic acts which indicate the amount of friendship or emnity between any two nations; and (2) the contention that the total amount of conflict or cooperation in a system at any point in time is a mathematical function of the sum of the total amounts of each behavior existing between all the component dyads at that time.

The frequency of interactions between international actors is an important key to understanding patterns of international behavior. As noted above, nations generate foreign policy events to achieve their respective policy goals and/or maintain those goals that have been realized in the context of continuously changing domestic and international environments. To the extent that nations are motivated to achieve their foreign policy goals, which may differ in terms of quantity, scope, and flexibility, they participate in the international arena. For example, the periods of Soviet industrialization under Joseph Stalin and the Chinese Cultural Revolution were periods during which these nations' principal emphasis was directed toward domestic priorities. Consequently, the quantity, scope and extension of their

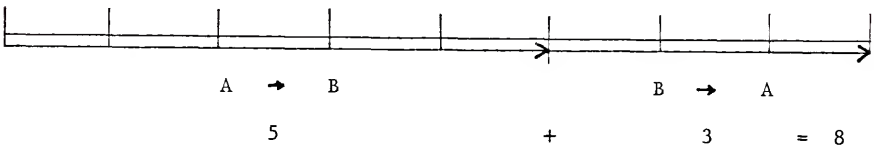
foreign policies declined significantly from previous levels to almost insolationist postures. The completion of these internal programs led to the Soviet Union's and China's return to the pursuit of foreign policy goals and hence the increase in the frequency of their international interactions [1]. Therefore, this analysis assumes that the extent of international participation by international actors is indicated by the frequency of their interactions.

The contention that the total amount of conflict or cooperation in a system at any point in time is a function of the sum of the total amounts existing between all the components at that time is based upon a systems analytic conceptualization of behavior. W. Ross Ashby (1960) and Anatol Rapoport (1968a) have both noted that aggregate systemic behavior is a function of the sum of its parts. Similarly, physics and engineering analyses of stress on physical systems define systemic stress as a function of stress on the system's individual components (Beer and Johnson, 1962:16).

The revisions of the additive technique incorporate several methods: (1) the assumption of a metric system of spatial coordinates; (2) a system analytic reconceptualization of international conflict; (3) weighting schemes for the relative strengths of the dyads involved in international activity as well as each act's degree of conflict; and (4) the utilization of vector algebra to measure levels of international conflict. Each of the above incorporations will be treated in turn.

A Metric System of Spatial Coordinates

As previously explained, the additive approach calculates levels of international conflict by perfectly scaling the number of events in a straight line. If we imagine nation A sending five units of conflict to nation B while receiving three units of conflict in return, the additive approach would represent the following situation:



The vector analytic technique will be described in detail later in this chapter. For the time being, it is sufficient to note that a vector exists in at least two and as many as n dimensions. For the sake of simplicity, let us now examine the concept of a metric spatial coordinate system in two dimensional space using our previous example (i.e., A sends five units of conflict to B while B sends three units of conflict to A). Metric and non-metric coordinate systems are illustrated in Figure 1.

In Figure 1, angle BQA is orthognal (i.e., 90°). As we shall see later, this permits us to employ the Pythagorean theory ($C^2 = A^2 + B^2$) to determine the level of international conflict based on the system analytic axiom that n forces (vectors) on a system can be described by a resultant force vector. The assumption of orthognality allows us to determine the amount of conflict (represented by vector C) between A and B as demonstrated below:

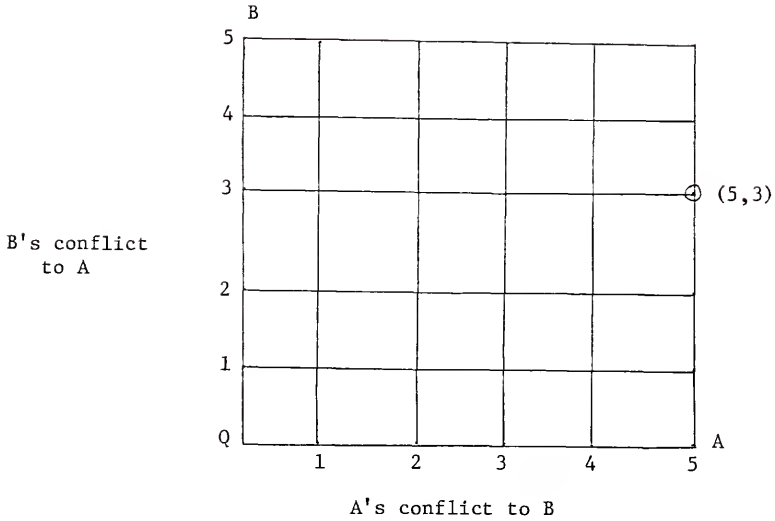
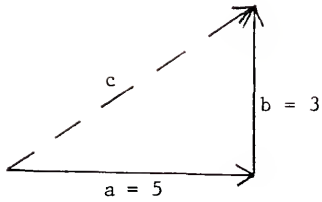


FIGURE 1

METRIC COORDINATE SYSTEM



Such that

$$c^2 = 5^2 + 3^2 = 34$$

Therefore

$$c = \sqrt{34} = 5.85$$

In Figures 2 and 3, we observe two variations of non-metric coordinate systems. We note that the coordinate (5,3) does not occupy the same point in space with relation to the origin (0,0) and consequently shows different distances. Furthermore, the coordinate (5,3) is closer to the origin in Figure 2 (when the axes form an obtuse [greater than 90°] angle) than it is in Figure 1. Finally, the same coordinate is further from the origin in Figure 3 (when the axes are acute [less than 90°]) than it is in either Figure 1 or 2.

The axes QB and QA represent the foreign policy outputs of nations B and A respectively. Any nation's foreign policy is either independent of other nations' foreign policies, or it is not. If it is completely independent, the angle between the axes (which represents its foreign policy output toward nation X and input from nation X) will be orthogonal (90°). If one foreign policy output is dependent upon another, the angle between them will be acute (less than 90°). But since an orthogonal relationship represents the case of independence, the non-metric system illustrated in Figure 2 as an obtuse relationship can be eliminated as nonsensical. Therefore for the purposes of this

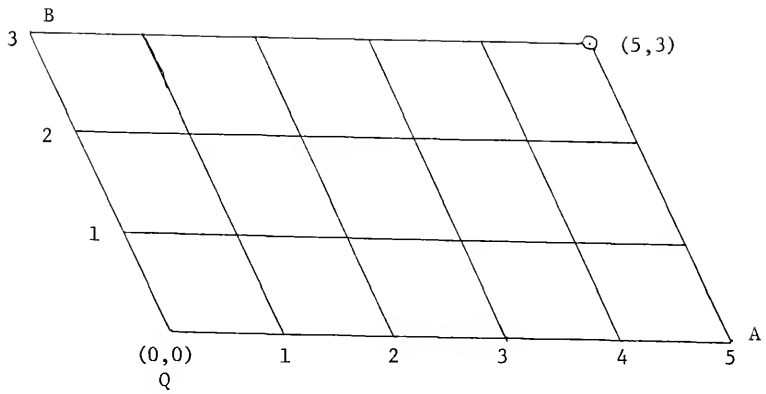


FIGURE 2

NON-METRIC COORDINATE SYSTEM: OBTUSE ANGLE

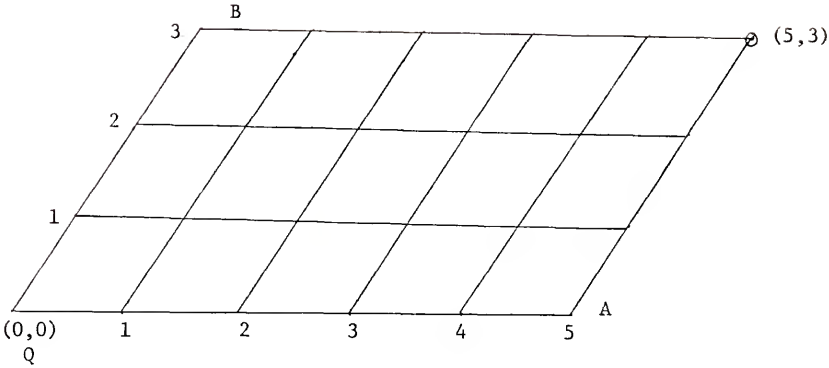


FIGURE 3

NON-METRIC COORDINATE SYSTEM: ACTUE ANGLE

dissertation, it will not be necessary to consider the obtuse non-metric coordinate system.

I will adopt the metric (orthogonal), rather than the acute, coordinate system based on the following reasoning. First, the concept of national sovereignty by definition implies that every nation is independent of all others and is therefore responsible for and has an independent right to the pursuit of its own policy goals [2]. This contention is supported by Sawyer and Guetzkow (1965:480) who observed that "International conflict appears to result in large part from objective incompatibility of goals among states." Second, political relationships vary over time. In other words, the occurrence of rapid or unpredictable shifts in the essential variables or parameters of a system demonstrate that the relations between nations can and do move in new directions that are not highly associated with past relations [3]. Finally as Rummel argues, the adoption of an acute non-metric system would be non-parsimonious in that it would necessitate the creation of a methodology to determine the constantly changing size of the acute angle over time between the nations of each dyad (1973:96). In addition, a method of relating the individual angles to aggregate systemic behavior would also have to be devised. Such an orientation is beyond the scope of this dissertation and furthermore should not be developed until researchers consider the metric coordinate system as an invalid way of operationalizing the multidimensional network of international behavior [4].

System Analytic Reconceptualization of Conflict

According to Robert Axelrod (1970:5), a central cause of conflict is the "incompatibility of the goals of two or more actors." Axelrod notes that:

> . . . two extreme situations [of behavior] can be visualized: the first has total conflict of interest. The kind of situation that has total conflict of interest is an interaction in which whatever one participant wins the other must lose . . . [such as in] . . . zero-sum games. They have no room for cooperation and have complete conflict of interest. In the opposite type of situation, which can be called a partnership game, both participants can attain their most preferred outcome at the same time. Partnership games have no conflict of interest because there is no reason for the participants not to cooperate fully with each other. (1970:5) [5]

In other words, Axelrod posits that all conflict of interest can be measured along a continuum with zero conflict of interest and total conflict of interest as the two extremes. If we imagine a continuum upon which all international events can be located to evaluate their degrees of conflict, the two extremes would be the complete absence or presence of conflict between any two nations with respect to a given event (i.e., perfect cooperation and total conflict). The use of the continuum assumes that the nations of the dyad do in fact interact. If the nations do not interact, then a score of zero (0) is assigned, meaning that the dyad contributes no conflictual activity to the international system of conflict. When the nations of a dyad do interact and have no incompatibility of goals, then their action will be cooperative and contribute little conflictual activity to the system. However, while perfect cooperation (which is never achieved) and non-interaction similarly add no conflict to a system, they must still be considered two distinct analytical categories: one of measurable behavior and

one of behavior which takes on a null value. The extremes of this continuum exist independently of the cause(s) of the conflict (Axelrod, 1970:7) and without regard for the type of issue being considered by the two actors.

Many analysts contend that conflict is the central theme running through all genres of international political behavior. Kegley, Salmore and Rosen (1974:328) argue that when the unit of analysis is the directed dyad, conflict and cooperation are negatively related, thus lying at opposite ends of a common dimension. Elsewhere, they suggest that all factors (i.e., dimensions) of international behavior are greater or lesser degrees of conflict (1973:7) and that "conflict pervades if not dominates interstate behavior" (1974:319). Rudolf Rummel (1973) indirectly supports this thesis in "Dimensions of Conflict Behavior Within and Between Nations" when he includes a "Diplomatic" factor along with "War" and "Belligerency" factors as dimensions of conflict behavior [6]. Nazli Choucri and Robert North (1972:239) conclude in their study of peace systems in the Netherlands and Scandinavia that "peace systems are not devoid of conflict. Conflict emerges whenever individuals, groups, or nations come into contact." Finally, David Easton and Bachrach and Baratz have independently noted that conflict lies at the heart of politics. Easton (1965:48) observes that "conflicts over demands constitute the flesh and blood of <u>all</u> (emphasis added) political systems, from the smallest to the largest and from the simplest to the most complex" while the latter analysts write (1963) that the very existence of power requires a conflict of interest between the participants.

The contention that all foreign policy events can be expressed in terms of conflict rests not only upon the assumption that conflict is

central to all types of international politics [7], but also that cooperation and conflict exist in the same dimension and can therefore be expressed in the same terms. This second assumption likens the terms of cooperation and conflict to the terms "hot" and "cold", each of which is defined as an absence of the other (Dedring, 1976:19) [8].

On the other hand, this unidimensional cooperation-conflict assumption has been criticized by a number of prominent analysts. Numerous researchers have used such analytic techniques as factor analysis [9], radex theory [10], and hierarchical clustering [11] to identify multiple dimensions of international behavior. Kegley, Salmore, and Rosen (1974:316) note that Kegley identifies "Affect" (ostensibly including cooperation and conflict) and a neutral dimension called "Participation" to account for 52.5% of the variance of international behavior. The remaining high percentage of unexplained variance would certainly leave open the possibility that additional dimensions exist. Furthermore, McClelland and Hogard discover six independent dimensions (explaining 78.4% of the variance) of international behavior, and McGowan identifies eight such dimensions (accounting for 85.2% of the variance). These findings lend additional credibility to those who describe the structure of international behavior as multidimensional.

Despite the plausibility of the multidimensionality thesis, however, I shall employ the unidimensionality assumption because it is particularly suited to the nature of my analysis and subject matter. First of all, the identification of verbal conflict, military force, diplomatic conflict, non-military force, and espionage as independent dimensions (McClelland and Hoggard, 1969:720) of international behavior lacks intuitive appeal because of each of these behavioral types is

generally intended to realize modifications of behavior which are opposed by the target nation. In addition, as Kegley, Salmore and Rosen (1974:328) observe, the researchers who posit the multidimensionality thesis all use the monad rather than the directed dyad (which is the unit of analysis in this study) as the unit of analysis. They also note however that when the directed dyad is used, there is statistical evidence that supports the unidimensionality of conflict and cooperation assumption. Furthermore, Shapiro and O'Leary give additional justification for the unidimensionality assumption in the Middle East and East-West systems when they write that despite the general rule of multi-issue interactions in international policies, there are important exceptions to this rule:

> We are well aware that . . . some important components of international relations are best characterized as a unidimensional struggle for power and peace . . . the early post-war relationships between the United States and the Soviet Union are [an] example; the conflict between Israel and its Arab neighbors has certainly been another (at least into the early 1970's). So it's not surprising that some of the most impressive events data research has been based on studies so limited in their time or geographical scope--such as the American-Russian interactions during crises and the Middle East conflict--that the assumption of unidimensional, single-issue interactions can reasonably be supposed to have validity. (1974:5)

Rummel (1972:88-89), arguing in support of unidimensionality, insists upon the "logic" of cooperation-conflict dimension:

> . . . conflict and cooperation have a logical and sociological relationship to each other. Logically, many types of conflict behavior cannot occur unless there is cooperation to begin with. For example, boycotts cannot occur if there is no trade or transaction; diplomatic relations cannot be severed if there are no such relations; and a state visit cannot be cancelled if not (a) visit had been planned to begin with [12].

This sociological relationship Rummel refers to not only further underscores the correlative relationship between conflict and cooperation

but serves to suggest that a conflictual relationship is not inherently evil or necessarily disasterous [13]. Louis Coser (1956:85), also, illustrates these ideas:

> The absence of conflict cannot be taken as an index of the . . . stability of a relationship. Stable relationships may be characterized by conflicting relationships. Closeness gives rise to frequent occasions for conflict, but if the participants feel that their relationships are tenuous, they might avoid conflict, fearing that it might endanger the continuance of the relation. When close relationships are characterized by frequent conflicts rather than the accumulation of hostile and ambivalent feelings, we may be justified, given that such conflicts are not likely to concern basic consensus, in taking these frequent conflicts as an index of the stability of these relationships.

In the final analysis, the validity of the unidimensional assumption is an empirical question whose answer will lie in its ability to generate accurate descriptions of international behavior with the additive or vector approach. Upon examining the Middle East and NATO-Warsaw Pact findings, we will be able to determine the assumption's validity.

In order to adopt a systems approach to the study of international conflict, two assumptions must be made. The first is that between n nations, the total amount of conflict is equal to the sum of the standardized levels of conflict between all of the possible dyads. Charles McClelland (1965:258) expresses this focus in "Systems Theory and Human Conflict" where he describes the strategy of systems theory as ". . . conceiving of many kinds of phenomena in terms of working relations among their parts and then labeling them <u>systems</u> according to what part of the 'problem' is most relevant." But in order to understand these "working relationships," it is first necessary to analyze and explain the importance of the most fundamental unit of international politics--the dyad.

The dyad, which is simply a pair of international actors, has been supported by many theorists as the fundamental unit of analysis in international politics, a term which by its very definition implies the presence of more than one actor. Rummel regrets the fact that much of the aggregate analysis, theory, and research of international politics focuses on the characteristics and behavior (e.g., trade, power, motivation, etc.) of the nation itself and not on the nation in relation to some other one (1972:78-79). He cites Kaplan (1964:323) to argue that this "monadic lock-in" is misleading and often produces distorted and inaccurate analyses of the disposition and dynamics in the international arena, because nations' policies and behaviors shift depending on the nations' respective motivations and objectives. These shifts consequently alter differentially the salience of relevant variables in the relations between two countries. Kegley, Salmore, and Rosen (1974), Rummel (1972:80), Azar, Brody and McClelland (1972), and Deutsch and Singer (1969) have reached similar conclusions regarding the preference of dyadic over monadic analysis.

The second assumption of a systems approach posits that the dynamic succession of system states in the international system is not random. Rather, the states are highly structured, situationally determined responses to stimuli from the national and international environments, as well as intra-systemic interations [14]. Kenneth Boulding (1962:19) convincingly argues that systems analysis is the most appropriate tool for analyzing international conflict because:

> . . . all real conflict takes place in time and consists of a succession of states . . . in which some regularities . . . [based upon certain continuing laws that govern the system] . . . can usually be detected.

This same direction of analysis is also pursued by Rudolf Rummel (1972: 73-74) who contends that behavior in the international arena, far from being random, is instead a "highly correlated, ordered, and patterned" structure of action [15]. Thus, although the behavior of nations may often "appear unpredictable, unlawful, and irrational at the individual level," Rummel asserts (1972:73-74) that "at the aggregate level many actions are structured."

The systems analytic approach to international conflict has been proposed and developed by many students of international politics who generally employ the approach as a ". . . guide to where and how to go about looking for answers to problems whose complexity of actions and responses is the rule" (McClelland, 1965:258). Additional support for the application of systems analysis to investigations of international behavior derives from the approach's focal attention to relations between inputs (acts to) and outputs (acts from), system-subsystem linkages, boundaries, processes, and responses to strain [16]. Illustrative of this idea is Boulding's (1962:20) attention to systemic adaptation as a means of maintaining systemic equilibrium and avoiding system breakdown, a point at which the laws of the system change [17].

The Application of Dyad and Action Weights to Events

Dyad Weights

In order to analyze patterns of international conflict, it has been noted that the potentially differential impacts each nation can exert in the international arena by virtue of differential levels of capability and motivation cannot be overlooked. Such a perspective

suggests that the utilization of a dyadic weighting scheme might prove itself fruitful.

Therefore, in order to differentiate the dyads according to how much impact each might have on the overall level of systemic conflict, I will devise a weighting scheme based upon each nation's level of gross military expenditures. Military expenditures provide a good focus, because they reflect a nation's prestige, probability of engaging in war or violent conflict (Newcombe, 1970:11-27), technical capability (Bouthoul, 1972:30-54) and its potential impact in the international arena. Modelski (1974) argues that the level of military expenditures provides a measure of a nation's military power and therefore its world order-keeping resources (i.e., its ability to influence another nation). He also presents military expenditures as the only way of bringing the many facets of mobilized military strength (e.g., weapons systems, manpower, state of military technology, etc.) under a common demoninator.

The important impact of military expenditures on the level of international conflict has also been empirically demonstrated by others worthy of inclusion here. Choucri and North (1975) show a relationship between military expenditures and violent international behavior between the pre-World War I European powers. George et al. (1971) argue that increased spending improves the probability of a nation achieving its foreign policy goals by increasing the number of available options at its disposal. Similarly, the level of international conflict has been shown to increase (Keim, 1971) and decrease (Touval, 1966) with increases and decreases in military spending.

I will base my calculation of the dyad weights on the proportion of money spent by the nations of each dyad in relation to the total

amount spent by all nations in the system. The lowest dyad's proportion will then be divided into the proportions of the other dyads to index the weights at one (1.0), thereby noting the relative impacts of each dyad in terms of the least influential dyad. Because capabilities, motivations, and policy orientations of international actors need not be and often are not stable over periods of time, I do not assume that the dyadic weights calculated for the first years of the analysis will remain valid. Therefore, the weights must be re-evaluated for all the dyads. This will be done on a yearly basis and should enable the analysis of international conflict to accurately reflect the changing impacts of the actors on the disposition of the system [18].

At this point, a note of caution regarding the validity of the impact weighting scheme as described above: It is possible that while the Burrowes and Muzzio additive method's lack of such a weighting scheme (which implicitly assumes that all dyads should be equally weighted), distorts the conflict scores, the weighting scheme that I have adopted, while intuitively pleasing, may introduce even more distortion than is already present. As the systemic conflict scores are partially computed by multiplying the dyadic impact weight times a conflictual intensity of each particular event and then summing each product within a specified time period, any distortion that exists in the weighting scheme may cause an error of multiplicative proportions in the results.

To detect the introduction of such distortion, it will be necessary to observe the ability of the weighted vector scores to predict some event outside the system of conflict more accurately than the unweighted scores. In the next chapter of this dissertation, I shall demonstrate how these weighted scores can be used to predict such

activities which lie outside the system, such as war [19], economic cooperation, and other types of non-event transactions.

Action Weights

Just as some dyads may have more impact upon systemic conflict than others, so do some types of acts have more impact than other types (Rummel, 1972:72; Choucri and North, 1972:222; Shapiro and O'Leary, 1974:9). It has already been argued that a military engagement between the nations of a dyad is more conflictual than an exchange of informal protests. Furthermore, since the amount of conflict between two nations is a function of how far apart their goals are, then it seems correct to assume that nations direct different types of foreign policy acts (in terms of their intensity) to each other depending upon the degree of incompatibility of their respective foreign policies [20]. It also stands to reason that two allies in perfect accord with respect to some issue will not seek to implement their policies by going to war; just as two traditional enemies will not attempt to realize a merger between themselves.

In response to these arguments, I will employ the following modified 10-point ordered-metric (i.e., equal interval) scale [21] for measuring international conflict in the Middle East and a 30-point ordered-metric scale (to be discussed fully in Chapter III) for evaluating the extent of NATO-Warsaw Pact conflict. For now, however, let us briefly examine the shorter of these scales and see how action weights are to be employed in this analysis.

10-Point Ordered-Metric Action Weighting Scale

(1) Nations A and B merge to form a new nation.

(2) Nations A and B establish a regional organization among themselves.

(3) Nation A extends economic aid to nation B.

(4) Nations A and B conclude a friendship agreement among themselves.

(5) Nation A supports the internal and external policies of nation B.

(6) Nations A and B communicate regarding issues of mutual concern.

(7) Nations A and B experience limited political difficulties.

(8) Nation A directs a protest to nation B.

(9) Nation A directs a threat of war to nation B.

(10) If borders are contiguous, nation A moves mobilized troops to the border of nation B.

or

(10) If borders are not contiguous, nation A directs protests to nation B and them mobilizes its troops after having explicitly threatened.

Those familiar with the original version of this scale will notice that the last two points: "Nations A and B engage in limited war" and "Nations A and B engage in all out war" have been omitted. This has been done to reserve a point (i.e., violent conflict, including war) outside the Middle East system of conflict so that the validity of the weighting schemes as well as the vector analytic method itself can be evaluated. There are several considerations that allow the exclusion of violent behavior from the Middle East system of conflict. Firstly, there is some question as to whether it is a systemic variable or parameter [22]. In many cases, such behavior may be interpreted as indicative of a desire on the part of at least one of the combatants to restructure the system (i.e., rules of behavior and relationships between the dyads). In the case of the Middle East specifically, the frequent

Arab and Israeli recourses to war have demonstrated the actors' lack of faith in the diplomatic and non-violent systemic equilibrium maintaining mechanisms to resolve their incompatible interests. Furthermore, according to official Arab pronouncements, these wars have been fought for the purposes of annihilating Israel, a goal which indicates a lack of adhesion to the international principles of national sovereignty, self-determination, and territorial integrity. Secondly, Rummel and Fitzsimmons, Hoggard, McClelland, et al., offer empirical reasons for excluding, or at least limiting, the impact of war on analytical systems of conflict. Rummel (1973:97) notes that war is not highly related to international conflict because many types of non-violent conflictual behavior operate independently of war. Furthermore, Fitzsimmons, Hoggard, McClelland et al. (1969:21) instruct coders for the World Event Interaction Survey (W.E.I.S.) project that on-going wars should be excluded from data collection "because military engagements become aggregated and transactional in nature, losing their event/interaction character." Finally, inasmuch as systems are heuristic tools of analyses, the individual analyst may draw the boundaries of the "systems according to what part of the 'problem' is most relevant" (McClelland, 1965:258).

The validity of this intensity weighting scheme must also be subject to empirical verification. Therefore, this scheme can be verified by the same methods that were employed to evaluate the dyadic impact weighting scheme. In other words, I shall attempt to use weighted conflict scores derived from the scale presented above to predict the occurrence of aggregated behavioral patterns lying outside the system of conflict. The prediction can be accomplished more accurately than both the additive (weighted and unweighted) and unweighted vector analytic approaches [23].

The ordered metric nature of the previously presented scale of foreign policy acts allows these acts to be scaled somewhere between zero and ten depending upon the intensity of conflict within a dyad. Therefore, this scale now permits us to improve upon the simple additive frequency model of international behavior inasmuch as we can standardize each act and thus reflect who is involved and what type of act occurs. This standardization allows us to express all events in relation to a common denominator [24]. It is calculated by multiplying each systemic event by the conflictual impact of the dyad involved and then multiplying the total by the weight associated with the type of act that occurred.

Let us again return to the Burrowes and Muzzio analysis (1972) of Middle East conflict to illustrate the simultaneous application of the dyad and action weights to the data. These authors would score both the movement of Egyptian troops to the Israeli border and an informal protest made by Israel to Jordan as equal to "one". But by the proposed standardization techniques, the conflict scores of the acts are quite different, as can be seen in Table 1. It does seem more valid to posit that the first act has more than twice the conflictual impact upon Middle East intra-regional behavior than the second. Thus, Table 1 brings the accuracy of Burrowes' and Muzzio's treatment of their impacts as being equal into question.

Once a method of standardizing individual foreign policy acts has been developed, it is necessary to derive a means of measuring the aggregate levels of systemic conflict. Such a new technique is needed because of the additive model's apparent insensitivity to the distribution of conflict among a region's nations and the direction of conflict.

TABLE 1

THE APPLICATION OF DYAD AND ACTION WEIGHTS TO TWO EVENTS

Act	# of Acts	Dyad Weight [25]	Type of Act	Score
Egypt moves troops to Israeli border	1	5.9	10	59.0
Israel makes protest to Jordon	1	3.4	8	27.2

The Application of Vector Algebra to the Study of International Conflict

Vector algebra provides a means by which conflict scores can be calculated, while at the same time focusing on the problematic considerations of the internal distributions and directions of the acts. Furthermore, vector algebra allows us to perform a variety of novel manipulations on the systemic conflict vector that offer new insights and directions of research into this area of investigation.

An intellectual heritage for the application of vector algebra to the social sciences and, specifically, to international politics was established two decades ago in the works of Arthur Bentley who suggested that the study of human affairs should be thought of in terms of social space. Bentley's conceptualization (1954) of the social space defined dimensions, movements, and locations of behavior as well as spatial relationships between actors in terms of human characteristics and behavior. Similarly, Talcott Parsons' theory of action (1951) presents the concept of social space together with his pattern variables as dimensions of this space. Drawing on the theoretical works of Bentley and and Parsons, Quincy Wright presents international politics as an <u>analytic field</u>, that is social space à la Bentley. Wright argues that:

> The analytic field approach to the study of international relations . . . implies that each international organization, national government, association, individual, or other 'system of action,' or 'decision-maker' may be located in a multi-dimensional field . . . which may be defined by coordinates. [These] coordinates measure the political, economic, psychological, social, [etc.] continuum influencing choices, decisions, and actions important for international relations. (1964:543)

The importance of this assertion of the multidimensionality (of actors) of international politics is twofold. First, it suggests the invalidity

of a unidimensional (i.e., unidirectional) conceptualization of the international system which has previously been identified as a necessary assumption for the application of an additive methodology. Second, it also suggests that vector algebra may be used to measure multidimensional systems and that its usage can therefore be justified on theoretical and practical grounds.

More recently, Kenneth Boulding and Rudolf Rummel independently argue in favor of the validity and applicability of vector algebra to the analysis of international politics and actually employ the method of analysis as part of their research methodologies. Boulding writes in Conflict and Defense (1962:20) that vectors represent "the . . . [magnitude of conflict] of the system and the direction of systemic movement" over successive period of time. In "U.S. Foreign Relations: Conflict, Cooperation, and Atribute Distances," Rudolf Rummel (1970: 84) tests six explanatory hypotheses of U.S. foreign policy behavior by proposing that "the relative behavior of one nation to another is a linear function of the distance vectors between them on the dimensions of attribute space." He goes on to contend that the relative dyad behavior is a resolution of the weighted attribute distance vectors. These distances are the forces that determine the behavior of one nation toward another.

Vectors describe magnitude and direction with respect to some point. Since the term conflict in the international context focuses on the magnitude and direction of dyadic and ultimately international conflict, the system state of zero conflict (i.e., the point of absolute agreement of n nations with respect to some issue) will be the point of reference in this vector analytic scheme. In other words,

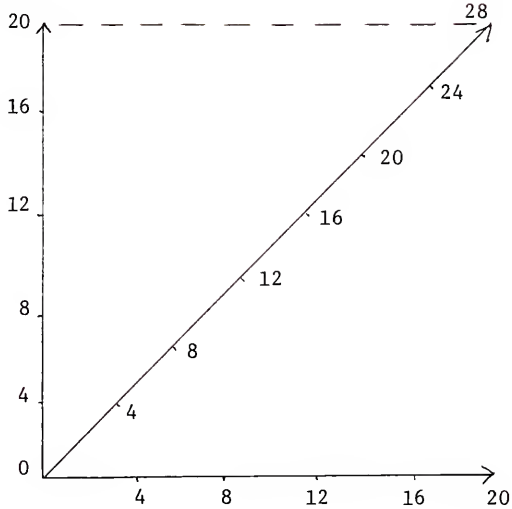
this reference point is the system state with zero distance (and therefore no conflict) between the foreign policies of n nations and is therefore known as the zero vector $\overrightarrow{(0)}$.

Let us examine the method of vector analysis, first with respect to simple dyadic conflict and then on the aggregate level. In this explanatory examination, I will assume for the sake of simplicity that at any point in time, the maximum amount of conflict that any nation may direct at another is equal to 20 [26]. It should be observed, however, that this simplifing assumption in no way diminishes the applicability of vector algebra to the study of international conflict.

There are four dyadic system states which merit our attention (see Figure 4). The first is the previously explained zero conflict reference vector (a point). The second system state is that in which nation A directs all 20 units of conflict to nation B, although B sends no conflict acts to A. The third state sees nation B sending all 20 units of conflict to A while receiving zero conflict in return. The fourth and final state is one in which both nations A and B direct maximum amounts (i.e., 20 units each) to each other. Vector analysis would illustrate the magnitudes and directions of conflict of these four system states as seen in Figure 4. While it seems reasonable to assert that two nations sending 20 units of conflict to each other (State 4) is a more conflictual system state than any of the other three, it has already been shown that we cannot simply add the two conflict scores of 20 plus 20 to equal 40 without being compelled to make several of the unlikely assumptions already criticized. The formula for calculating the magnitude (i.e., length) of a vector allows us to calculate the conflict score of State 4 while remaining

State 3
(0,20)
Unidirectional dyadic conflict where A sends 0 conflict to B, and B sends 20 units to A.

State 4
(20,20)
Perfect (i.e., total) conflict where both A and B direct 20 units of conflict to each other.



State 1
(0,0)
No dyadic conflict as neither A nor B exchange any units of conflict

State 2
(20,0)
Unidirectional dyadic conflict where A sends 20 units of conflict to B, and B sends 0 units to A.

FIGURE 4

FOUR POSSIBLE SYSTEM STATES

sensitive to the absence of perfect scalability: The magnitude of any vector C is calculable using the following formula:

$$\|\vec{C}_t\| = \sqrt{X^2 + Y^2} \qquad [27]$$

where

: $\vec{C}_t$ is the conflict vector at time period t.

: $\| \ \|$ is the symbol for magnitude of a vector.

: X is the amount of conflict Nation A sends to B.

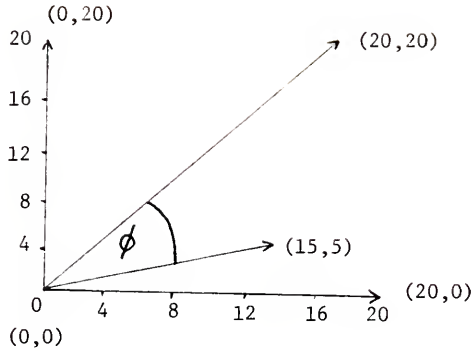
: Y is the amount of conflict Nation B sends to A.

Therefore, the conflict vector for nations A and B at State 4 would be computed as follows:

$$\|\vec{C}\| = \sqrt{20^2 + 20^2} = \sqrt{400 + 400} = \sqrt{800} = 28.2$$

In other words, 28.2 represents the total amount of conflict possible at any period of time for the A-B dyad. It is interesting to note that in this case, as in all similar applications of vector analysis, two conflict scores of 20 each are equal to less than 40. However, since State 4 is the system state of perfect dyadic conflict and as such represents the extreme point in our conflict continuum, we must focus on intermediate states of dyadic conflict; that is, cases in which states send partial and different amounts of conflict to each other.

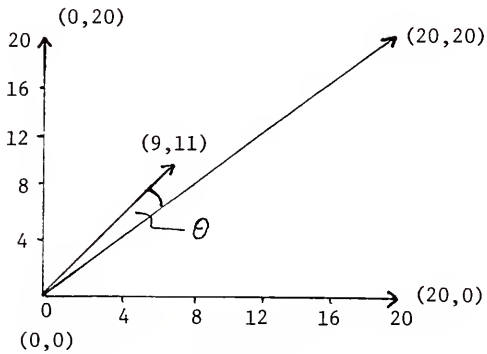
For instance, let us consider two such states of dyadic conflict. In the first, A sends 15 units of conflict to B, while B returns only 5 units to A. In the second case, conflict is more evenly distributed with A sending 9 units to B, while B returns 11 units of conflict to A. The two cases are represented in Figure 5. The computations show that although the total amounts of conflict in each dyad add to 20, the vectors' magnitudes are not equal. In fact, case one's conflict score



$$\|\vec{\text{Case 1}}\| = \sqrt{15^2 + 5^2} = 15.8$$

$$\angle \phi = 26°$$

Case 1: Hypothetical State of Dyadic Conflict



$$\|\vec{\text{Case 2}}\| = \sqrt{9^2 + 11^2} = 14.2$$

$$\angle \phi = 3.5°$$

Case 2: Hypothetical Case of Dyadic Conflict

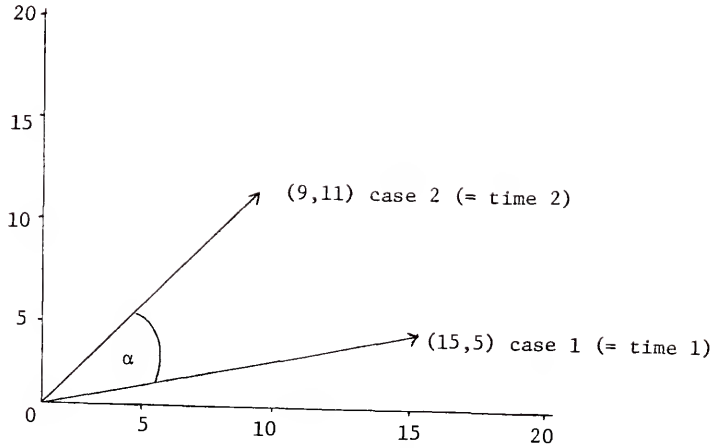
FIGURE 5

TWO EXAMPLES OF DYADIC CONFLICT

is slightly larger than the conflict score of the second case. The reason that the score of the first case reveals more conflict than that of the second is quite significant and will be treated in a future point in this paper [28].

The reader will notice that angles have been specified between the perfect dyadic conflict vector and the actual dyadic vectors in each case. This shows another way in which vector analysis can be employed to provide novel insights into the study of international behavior. Briefly, the angle represents the extent of one-sidedness of conflict within the dyad. When each nation in the dyad directs similar amounts of conflict to the other nation, their dyad's actual conflict vector coincides exactly with the vector of perfect dyadic conflict. In other words, the conflictual relations between the nations comprising the dyad are perfectly reciprocal. When such reciprocity exists, the angle between the perfect and actual conflict vectors equals zero. Case two shows a state of dyadic conflict which is almost perfectly reciprocal: the actual vector deviates on 5.7° from the perfect conflict vector, because A and B are sending nearly equal amounts of conflict to each other. Case one's actual vector on the other hand deviates 26.6°, illustrating the one-sided nature of conflict between A and B.

If cases one and two are allowed to represent two successive periods of time, another advantage of conceptualizing international behavior in terms of vectors becomes apparent. Let us graphically represent our hypothetical one dyad system in Figure 6 to illustrate how vector algebra can be applied to describe systemic stability. One notes that the angle (alpha) specified between the vectors describing the hypothetical system of conflict during time periods one and two extends



$\alpha = 32.2°$

FIGURE 6

THE APPLICATION OF VECTOR ALGEBRA TO
THE MEASUREMENT OF SYSTEMIC STABILITY

32.3° in a counter clockwise direction. If, during the successive periods of time, the vector C = (15,5) described the system, then the vector for time period 2 would have been superimposed on time period 1 and the angle between them would be zero. In other words, a perfectly stable system, (i.e., one whose essential variables remain constant) can be described as one whose angle between the vectors describing its state during successive time periods equals zero. Increasingly unstable systems are characterized by larger angles between the vectors.

In the simple two-dimensional graph below, one can easily measure these angles with a protractor. However, this dissertation will examine systems with 15 (Middle East) and 82 (NATO-Warsaw Pact) dyads respectively so the angles between these system states represented by these multidimensional vectors must be calculated mathematically. The formula for this calculation is:

$$\cos \alpha = \frac{\vec{C}_1 \cdot \vec{C}_2}{\|\vec{C}_1\| \cdot \|\vec{C}_2\|}$$

where

$\cos \alpha$ is the cosine of the angle between the vectors $\vec{C}_1$ and $\vec{C}_2$ which describe the conflict system during time periods one and two respectively [29];

$\vec{C}_1 \cdot \vec{C}_2$ is the dot product of the vectors $\vec{C}_1$ and $\vec{C}_2$. It is calculated by

$$\sum_{i=1}^{n} [(\vec{C}_{1i})(\vec{C}_{2i})]$$

and

$\|\vec{C}_1\| \cdot \|\vec{C}_2\|$ is the product of the magnitudes of $\vec{C}_1$ and $\vec{C}_2$.

Actually, the calculation of the cosine of the angle between the above noted vectors is preferable to calculating the angle between them, because the cosine is equivalent to the Pearson correlation coefficient (r) between the individual components of the two system states. This will allow us to define a stable system as one which is highly correlated with the preceding system state.

This type of operationalization of systemic stability does not presuppose a positive relationship between conflict and instability. If we interpret a stable system as one in which all the actors are familiar with the "rules of the game," then periods of prolonged conflict can be viewed as very stable, because these "rules" are well established, prescribed patterns of behavior and can be used to predict likely responses to specific behavioral stimuli. To illustrate this point, let us recall that during the height of the United States' involvement in Indochina, a hostile act from a military adversary directed at the U.S. was generally responded to in kind. In the wake of the American withdrawal from Indochina, America's former military adversaries were not certain of American incentives, motivations, and credibility of threat to respond militarily to hostile actions. In this context, I would suggest that the Mayaguez incident was a manifestation of Cambodia's uncertainty regarding the extent of future U.S. motivation to become militarily involved in the region. This situation of uncertainty gave rise to inaccurate perceptions and evaluations of U.S. policy and allowed a conflictual interaction to occur despite the region's decreases in the extent and severity of armed conflict.

Returning now to the two hypothetical system states (15,5) and (9,11) and employing the formula noted above to calculate the cosine of the angle between them, we find that cos α equals the products of the first dimensions of each vector (in this case, $15 \cdot 9$) added to the product of the second dimensions of each vector (in this case, $5 \cdot 11$). This total ($135 + 55 = 190$) is divided by the product of the magnitudes of each vector [i,e., $(15.8) \cdot (14.2) = 224.4$] to give us an answer of .85. If the system state had been described by a vector with the dimensions (3,6) rather than (9,11) at time t_2, the cosine of the angle α between the vectors describing times t_1 (15,5) and t_2 (3,6) would have been derived as follows:

$$\cos \alpha = \frac{(15 \cdot 3) + (5 \cdot 6)}{(\sqrt{15^2 + 5^2})(\sqrt{3^2 + 6^2})}$$

$$= \frac{75}{(15.8)(6.7)}$$

$$= \frac{75}{105.9}$$

$$= .71$$

The lower Pearson correlation coefficient of .71 in this sample modification in our hypothetical example demonstrates that the system state (3,6) is a more radical change than (9,11) from the previous system state of (15,5).

Notes

[1] The frequency level of a dyad's interactions may be cooperative and/or conflictual. Frequency is neither inherently cooperative or conflictual.

[2] The operationalization of this definition is apparent in the U.N. General Assembly where each nation's vote is weighted equally regardless of the nation's wealth, size, bloc affiliation, etc.

[3] For instance between 1938 and 1941, the relations between Nazi Germany and Soviet Russia were characterized in turn by conflict, cooperation, and finally conflict. After the war, the Soviet Union's relations with East Germany became cooperative. Another example of such a shift is the rapproachment between the United States and the People's Republic of China.

[4] In Chapter VIII, the mathematical structure of such a methodology is outlined. Briefly, the method utilizes a cosine adjustment to take into account the level of interdependence between nations.

[5] Also see K. Boulding (1962:18) who discusses the relationship between conflict of interest and conflict in the context of zero-sum games.

[6] Although Rummel separates the dimensions of international behavior via factor analysis and identifies "diplomacy," "belligerency," and "war," respective examples of each (i.e., diplomatic: expulsion of a nation's diplomat; war: threats, accusations, and mobilizations; and belligerency: sanctions) suggest that a certain incompatibility of behavior/ends transcends the factor labels.

[7] This Hobbesian view of the inevitability and centrality of conflict, and thus, the need for each nation to balance power, is a fundamental contention of the "Realist" school of International Politics as exemplified by the works of Hans Morgenthau.

[8] This view has been stressed emphatically by Kenneth Boulding (1974) in his Presidential Address "The Learning of Peace," delivered at the International Studies Association (ISA) 1974 convention, by J. David Singer in many of his writings, by Alan and Hanna Newcombe (1972) and also by Bruce M. Russett (1972:9-17). All these peace and conflict researchers are aware of and sympathetic to the more far-reaching notion of "positive peace."

[9] See the works of Rummel (1969), McClelland and Hoggard (1969), and McGowan (1970).

[10] See Kegley (1973) for a thorough explanation of radex theory.

[11] See Kegley, Salmore and Rosen (1974) who use the hierarchical technique.

[12] Rummel's quotation implies that this cooperation-conflict relationship is negative since heightened conflict implies a reduction of pre-existing cooperative activity.

[13] We will see later that a long term conflictual relationship can (a) serve to stabilize a potentially explosive situation by defining acceptable patterns of behavior and (b) generate higher levels of cooperation between other nations.

[14] This view is consistent with the comparative foreign policy/linkage approach utilized by McGowan, Rosenau and Hermann.

[15] Rummel's characterization of nations' behavior outputs as highly correlated, ordered and patterned may serve to weaken the argument for orthognality already discussed. At this point, however, its continued inclusion is justified if one takes a long term perspective on nations' interactions in which case their activities are normally distributed around some "median" event. Richardson (1960) provides some additional support for this view when he notes that wars of varying intensity may be considered random phenomena described by a Poisson distribution. Furthermore, the orthognality assumption is made by a number of factor analysis and regression analysis practitioners as a necessary simplifying assumption about our complex universe. Without this assumption, the interdependence of reality would prevent us from making any generalizations. Finally, the extent to which Rummel's description is accurate is an empirical question whose answer will ultimately depend upon the quality of the findings of the methodology which employes it (i.e., the assumption).

[16] Other advocates of a systems analytic approach to the sutdy of international behavior include Boulding (1962), Michael Haas (1970), C. McClelland (1965), and K. Deutsch (1974).

[17] Also see Ashby's (1960) discussion concerning the movement of a system to a new field and Rosenau's "Foreign Policy as Adaptive Behavior."

[18] See note 25 for an example of how the dyad weights are calculated.

[19] The justifications for excluding war from the system of conflict will be presented in Chapter IV.

[20] Purposiveness, the idea that events are generated by actors to help them pursue their respective foreign policy goals, is a fundamental criterion for defining an event.

[21] This scale is a modified version of the Azar, Brody, McClelland (1972) 13-point scale.

The reader will note that point #9 on the original scale "Nation A increases its military capabilities" is inadequate for dyadic events analysis, because one cannot know for sure if a nation is arming

itself in response to any particular adversary. This is especially true of Israeli responses in the Middle East: it's impossible to know if Israel arms herself in response to Egypt, Jordan, Syria, etc.

The tenth step "A encounters domestic political-military violence" has also been omitted because it does not identify a target.

The eleventh step "Nation A initiates subversion in Nation B" was eliminated because it is difficult if not impossible to substantiate an allegation of a nation's involvement in such activities.

Steps 9 and 10, as they appear in this proposal, represent my original replacements for the points I have omitted. Their validity must and will be subject to empirical verification.

Furthermore, since the assumption has been made that all international behavior falls upon a continuum with the most cooperative extreme being 0-conflict, I assume that a point of 0-conflict (which is an ideal case and never occurs in reality) can be analytically posited. Consequently, this action weighting scale is employed as a ratio-interval scale. For further information concerning the use of ordinal data as interval data, see Simon (1957) for a discussion about the successful use of ordinal data in causal modelling. Also, see Leik and Gove (1959) and Costner and Leik (1964). For a refutation of this use of ordinal data, see Wilson (1971).

[22] Ashby (1960) distinguishes between endogenous variables (i.e., systemic) and exogenous parameters. If war is viewed as a condition that must be avoided or a condition that will radically alter the structure of the system, it seems most appropriate to consider it as a parameter.

[23] In later chapters, we will see that accuracy is determined by how highly correlated are systemic and parametric descriptions. The assumption is made that systemic and parametic behavior (e.g., non-violent and violent behavior) are highly correlated.

[24] The index is the weakest dyad's least conflictual event.

[25] A hypothetical example of the method of calculating dyad weights is illustrated below. The data are extracted from McGowan and O'Leary (1971). For the sake of simplicity, all the Middle East actors are not included in this example. Therefore, the weights obtained are only applicable to this example.

Nation	Military Expenditures (1968) in US 1970 millions of dollars
Israel	$672
Egypt	666
Jordan	105
Syria	137
	$1580 (sum)

Nation	Israel	Egypt	Jordon	Syria
Israel	X	$\frac{672+666}{1580} = .88$	$\frac{672+105}{1580} = .49$	$\frac{672+137}{1580} = .51$
Egypt		X	$\frac{666+105}{1580} = .49$	$\frac{666+137}{1580} = .51$
Jordan			X	$\frac{105+137}{1580} = .15$
Syria				X

Final Dyadic Weights

a. Israel-Egypt dyad = .88/.15 = 5.9

b. Israel-Syria dyad = .51/.15 = 3.4

c. Egypt-Syria dyad = .51/.15 = 3.4

d. Israel-Jordan dyad = .49/.15 = 3.3

e. Egypt-Jordan dyad = .49/.15 = 3.3

f. Jordan-Syria dyad = .15/.15 = 1.0

[26] In this example, the maximum amount of conflict that can be sent is equal to the maximum amount that can be exchanged between the two richest and most highly motivated actors, assuming that their weights are equal.

[27] This formula posits the orthognality of dimensions.

[28] The impact of event distribution upon additive and vector score is visually demonstrated in the table and graph below.

A Conflict to B	B Conflict to A	Additive Score (A+B)	Vector Score $(\sqrt{A^2 + B^2})$	$(A+B) - \sqrt{A^2 + B^2}$
0	20	20	20	0
1	19	20	19.02	.98
2	18	20	18.11	1.89
3	17	20	17.26	2.76
4	16	20	16.49	3.51
5	15	20	15.81	4.19
6	14	20	15.23	4.77
7	13	20	14.76	5.24
8	12	20	14.42	5.58
9	11	20	14.21	5.79
10	10	20	14.14	5.86
11	9	20	14.21	5.79
12	8	20	14.42	5.58
13	7	20	14.76	5.24
14	6	20	15.23	4.77
15	5	20	15.81	4.19
16	4	20	16.49	3.51
17	3	20	17.26	2.76
18	2	20	18.11	1.89
19	1	20	19.02	.98
20	0	20	20	0

In other words, as a system's conflict becomes more evenly distributed among the dyads, the vector score diverges more from the additive score. Furthermore, such evenly distributed conflict generates vector scores which are lowest vis-à-vis the additive score. Such a finding not only suggests the potential fruitfulness of the vector analytic perspective, but in a substantive view, also validates the assertions made by those who argue that multipolar distributions of conflict are less conflictual than bipolar configurations in which the conflict is distributed among fewer international actors (i.e., see the arguments of Deutsch and Singer regarding the critical attention ratio (1969), and John Spanier's (1975) work on tripolarity). An illustration of this substantive debate as well as the applicability of the vector analytic perspective to a multidimensional perspective is provided below.

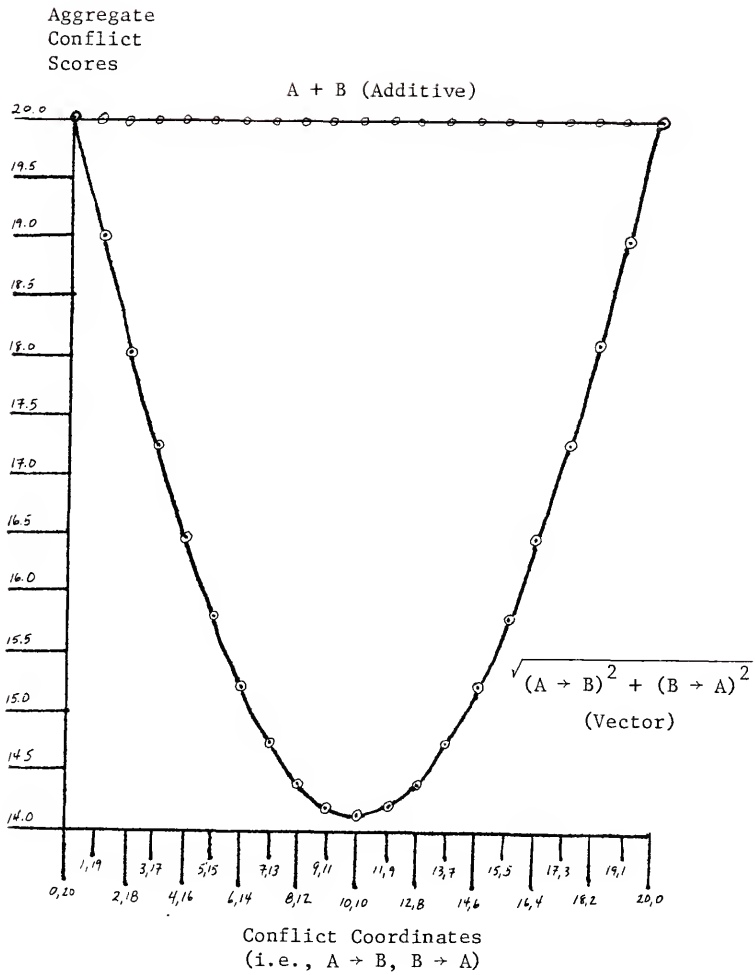
Let us examine a system of seven hypothetical distributions of conflict observed at successive times, t_1 to t_7. We see that the magnitude of aggregated conflict depends upon the magnitudes of its component dyads. The formula for calculating total systemic conflict at any point in time is presented below:

$$\|\vec{C}_t\| = \sqrt{\sum_{i=1}^{n} (\vec{C}_i)^2}$$

In the following example for instance, at time period t_7, the magnitude of the systemic conflict vector equals:

$$\sqrt{4^2 + 3^2 + 4^2 + 3^2 + 3^2 + 3^2} = 8.25 = \|\vec{C}_7\|$$

While the additive totals reflect no change in the levels of systemic conflict, the magnitudes of the systemic conflict vectors below at each time suggest that some distributions (i.e., equal) of conflict are less conflictual than others.


Aggregate
Conflict
Scores
A + B (Additive)
20.0
19.5
19.0
18.5
18.0
17.5
17.0
16.5
16.0
15.5
15.0
14.5
14.0
$\sqrt{(A \rightarrow B)^2 + (B \rightarrow A)^2}$
(Vector)
0,20
1,19
2,18
3,17
4,16
5,15
6,14
7,13
8,12
9,11
10,10
11,9
12,8
13,7
14,6
15,5
16,4
17,3
18,2
19,1
20,0
Conflict Coordinates
(i.e., A → B, B → A)

Additive and Vector Conflict Scores of Hypothetical Distributions of Conflict over Time

Dyad	Time t_1	t_2	t_3	t_4	t_5	t_6	t_7
A to B	20	10	10	7	5	4	4
A to C	0	10	0	3	5	4	3
B to A	0	0	10	7	5	4	4
A to C	0	0	0	0	0	4	3
C to A	0	0	0	3	5	4	3
C to B	0	0	0	0	0	0	3
Additive Conflict Score	20	20	20	20	20	20	20
$\|\|\vec{C}_t\|\|$	20	14.2	14.2	10.8	10	8.95	8.25

[29] Kegley (1972) uses a similar approach. He calculates systemic stability using the cosine of the angle between factor analytically derived oblique dimensions.

CHAPTER III

THE DATA

Data for the Dyadic Weighting Scheme

The military expenditure data used to weight the capabilities of the Middle Eastern and European dyads to successfully pursue their respective foreign policy objectives have been selected from the military expenditure data of the Stockholm International Peace Research Institute (SIPRI) [1]. Although the SIPRI estimates are not the only military expenditure figures available to the researcher (the U.S. Arms Control and Disarmament Agency [ACDA] and the British International Institute of Strategic Studies [IISS] also annually record the levels of national military expenditures), they were chosen for several reasons. First, the data were more easily accessible for the Middle East and Europe as well as more complete than the ACDA and IISS data sets. Second, unlike the ACDA which applies the U.S. Gross National Product deflator to make price corrections for the Warsaw Pact expenditure data, SIPRI makes no such correction because the deflator it uses for all countries (i.e., consumer price indices) shows virtually no change in these nations over long periods of time. Furthermore, the application of the United States' G.N.P. deflator by the ACDA implies that inflation in Eastern Europe and the Middle East are comparable to inflation in the U.S. This supposition simply is not supported by the data (SIPRI, 1973a:214-227). Third, since the Soviet Union and the

Eastern European nations do not include military research and development in their military expenditure figures, the ACDA adds one half (50%) of their outlays on scientific research and development to the military budget. Since there is no way to verify the validity of these adjustments and rather than engage in speculation, SIPRI accepts the reported figures as they stand (SIPRI, 1973a:214-227). Fourth, the IISS Military Balance figures may not accurately reflect the Western European nations' motivations and capabilities since the figures omit their payments for military aid, the maintenance of troops in West Germany, and contributions to NATO. Finally, in spite of the foregoing adjustments and selection criteria, the SIPRI data were selected because they are highly correlated with the ACDA and IISS figures. The Pearson correlation coefficient (r) between the SIPRI and ACDA 1961-1973 military expenditures estimates of the Warsaw Pact nations is .97 [2]. The SIPRI and IISS 1970 military expenditure figures for 25 randomly selected nations also correlate highly (r = .998) [3]. These high correlation coefficients demonstrate that the standardized dyad weights would be highly related regardless of the data source utilized.

At this point, it is again necessary to note that the validity of the standardized dyad impact weighting schemes for the Middle East and NATO-Warsaw Pact Europe may contain high degrees of error and consequently must be subjected to empirical verification. In the first place, it should be obvious from the preceding that all nations do not employ similar accounting procedures to determine their levels of military expenditures. Even discounting the possibly devastating impacts on the validity of the data of governmental secrecy and/or misrepresentation of military expenditure levels, dissimilar accounting procedures

might possibly introduce unacceptable amounts of distortion into the relationships determining the annual dyad weights. In addition, the weighting scheme involving the nations of Eastern Europe could be distorted due to the fact that missing data [4] on military expenditures forced SIPRI to make several estimations. Furthermore, different nations neither experience equal rates of inflation nor direct equal amounts of funds to non-combat functions such as military pensions, salaries, and social services. Therefore, it is imperative that the validity of these weights must be empirically demonstrated by allowing the researcher to make more accurate predictions of events lying outside the system of conflict than is possible using a weighting scheme which regards the impacts of different dyads as being equal. In the next chapter, I will explain in detail the method by which the validity of the proposed weighting schemes will be tested.

The Action Category Weighting Schemes

In Chapter II, I suggested that one should weight different types of international interactions, because all such events are not equally conflictual. A modified ordered metric weighting scale was presented as the scale that would be used to weight the conflictual extent of Middle East event interactions. At this point, I would like to expand the discussion of this weighting scheme as well as present and discuss the ordered metric weighting scheme to be employed for the NATO-Warsaw Pact events.

Barry Blechman's Middle East data set categorizes rather than orders all events. In other words, each event in Blechman's data is classified into one of 22 nominal categories [5] whose numbers cannot

be used in the assignment of action weights. The previously presented 10-point scale was used to assign an action weight to each of the nominal categories. The nominal categories and their respective action weights appear below:

Conversion of Blechman Action Categories
to Ordered Metric Weights

WEIS	Action Category		
1	surrender, yield	1	
2	comment	6	
3	consult	6	
4	approve	5	
5	promise	4.3	
6	grant	3.5	
7	reward	3	
8	agree	4	
9	request	4.7	
10	propose	4.7	
11	reject	8.2	
12	accuse	8.4	
13	protest	8	
14	deny	8	
15	demand	8.6	
16	warn	8.8	
17	threaten	9	
18	non military demonstration	9.5	
19	reduce relationship, mil. demon.	10	A mobilizes troops to B's border
20	expel	10.25	
21	seize	10.5	
22	military engagement	No weight--outside the system [6]	

These weights were determined by observing all cases in which one could say that WEIS categories were explicitly noted on the modified

Azar scale and assign the weights to the WEIS categories. This step is illustrated below:

WEIS Category		Ordered Metric Weight	
7	reward	3	A gives aid to B
8	agree	4	A signs friendship pact with B
4	approve	5	A supports policies of B
2,3	comment, consult	6	A and B communicate
13	protest	8	A protests to B
17	threaten	9	A threatens war to B
19	military demonstration	10	A mobilizes troops to B's border

With this initial interval framework to work with, I assigned weights to the remaining WEIS action categories depending on their apparent relation [7] to the above fixed points. For instance, the acts of protesting (WEIS, 13) the threatening (WEIS, 17) are assigned weights of 8 and 9 respectively. However, WEIS categories 11 (reject), 12 (accuse), 14 (deny), 15 (demand) and 16 (warn) are actions that seem at least as conflictual as a protest but not as conflictual as a threat. A warning seems closer to a threat than a demand, and hence these scores were assigned the values 8.8 and 8.6 respectively. All the fractional weights were assigned in this manner.

Several modifications in this scale are worthy of comment. No weights have been assigned to WEIS category 22, because it was defined as being outside the system of conflict as previously discussed in Chapter II. The first WEIS action category (surrender, yield) has been assigned a weight of 1.0 although in Azar's original presentation of the ordered metric scale, he defines 1.0 as the merging of two

nations to form a new nation. This assignment was based on the fact that the act of surrendering (regardless of the enmity felt by the former combatants toward each other) implies that the best interests of the defeated lie in surrender rather than in continued resistance to the apparent victor. An example of this point can be drawn from the perceptions of the German generals toward the ends of each world war that continued opposition was not worth the vast destruction of life and property which would inevitably result. In this sense, there was no distance between the interests of the combatants who wished to end the war albeit for different reasons. Such an assignment does not preclude, however, the subsequent occurrence of hostility between the two adversaries as was the case with Germany after its defeat in World War I.

One final consideration regarding a point on the scale itself must be reviewed. Azar's original scale presented an eleventh point (A and B engage in limited war) but this action was considered as force and defined as lying outside the system of conflict. The twenty-first WEIS action category (seize) need not involve violence and has thus been given a weight of 10.5 since it seems to be more conflictual than a troop mobilization.

The enormous methodological problems and implications of my modifications of Azar's scale and arbitrary assignment of weights based on intuition cannot be taken lightly. Nevertheless, the assignments were based on judgmental analysis as were Azar's original assignments (which were later empirically verified by inter-coder reliability tests). Furthermore, the assignments offered herein do not differ in either methodology or results from the analysis of Odell (1975) who also sought to translate the WEIS categories into interval action weights [8].

In any event, the weights presented in this chapter are hypothetical measures that should help describe international politics. Whether and to the extent that they do remain empirical questions whose answers lie in the results of the weights' applications to the additive and vector conflict scores.

The following equal interval scale (Moses, et al., 1967) was developed independently of the Azar scale, although the generating method is similar in that trained judges ordered hypothetical interstate actions without reference to specific nations in terms of their relative levels of conflict. This scale, which runs "from events of great cooperation to events of great conflict" (Hopmann and Hughes, 1974:2) will be used to measure the extent of conflict in European dyadic interactions.

Equal Interval Scale of Dyadic Interactions

1. Member Nations A, B . . .n of an international organization agree to allow the executive of the organization to tax them in order to raise funds.

2. Member Nations A, B . . .n create an international executive organization which can make decisions with the approval of a majority of the legislatures of the member nations.

3. Nation A engages in joint military maneuvers with Nation B, but identity of each national unit is preserved.

4. International organization of member Nations A, B . . .n controls production of some non-military materials in Nations A, B . . .n.

5. Nation A's legislature votes funds to support an international military organization.

6. Nations A, B . . .n create and join a mutual defense organization in which aid is not automatic in case of an attack.

7. Nations A, B . . .n form new governmental agencies concerned with international and internal security.

8. Nation A extends military aid to Nation B.

9. Nations A and B conclude a cultural exchange treaty.

10. Nation A agrees to attend an international meeting with Nation B.

11. Nation A invites Nation B to an international meeting.

12. Nation A initiates universal military training.

13. Nation A increases the size of its armed forces.

14. Nation A extends military aid to an enemy of Nation B.

15. Nation A imposes selective tariff increases which are aimed at Nation B.

16. Nation A halts the flow of refugees from Nation A into lands under the control of Nation B.

17. Nation A makes an oral protest to the ambassador of Nation B concerning a specific action of Nation B.

18. Nation A holds maneuvers near its frontier with Nation B.

19. Nation A threatens Nation B that it (Nation A) will take a particular issue it has with Nation B to an international body.

20. Nation A calls military staff conference on short notice.

21. Nation A initiates subversion in Nation B.

22. Nation A places a partial censorship on all outgoing communications.

23. Nation A moves its troops toward its frontier with Nation B in transportation units.

24. Nation A confines its military units to their barrack areas until further notice.

25. Nation A militarizes its transportation systems.

26. Nation A moves a large number of its troops from one post to another, both posts being within Nation A.

27. Nation A stops Nation B's ships at sea.

28. Nation A makes frontier intrusions which are not clearly attacks against Nation B.

29. Nation A begins a general offensive against Nation B.

30. Nation A executes prisoners of war of Nation B.

The last three points on the scale, numbers 28-30, involve violence and are therefore defined as lying outside this non-violent system of conflict.

Again it should be noted that the extent to which this weighting scheme helps us distinguish periods of intense and low conflict remains an empirical questions which will be discussed in following chapters. Now let us direct our attention toward the Middle Eastern and European data sets which are to furnish the data for the evaluation of the vector technique and the weighting scales.

The Events Data Sets

This dissertation utilizes events data from Barry M. Blechman's Arab/Israeli Event Interaction (1971) and P. Terrence Hopmann's and Barry B. Hughes' Dyadic and Multilateral Events Data (1974). These two studies in particular were chosen because not only do they cover long periods of time, but they also have high numbers of events. The Blechman Middle East data set contains approximately 8,000 events which were reported in the New York Times Index from 1 July 1949 through 30 June 1969 [9]. The nations which generated these events were Israel, Egypt, Syria, Lebanon, Jordan, and Iraq. The Hopmann and Hughes data set consists of approximately 10,000 dyadic and multilateral events [10] collected from the interactions of 31 countries [11]. Of these nations, only the NATO and Warsaw Pact members between 1955 and 1970 inclusive were included in this study.

The 190 dyads generated by the twenty NATO and Warsaw Pact nations presented a vector with so many dimensions that there were computational difficulties [12]. Therefore, for the sake of parsimony and assuming

that the patterns of intra-bloc relations would be less consistently related to an analysis of European conflict than to an analysis of inter-bloc interactions, I omitted the 91 intra-NATO and 15 intra-Warsaw Pact dyads from the analysis. The remaining 84 dyads, each with one western and one eastern component, produce a more manageable number of dyads which are more consistent with the research question at hand.

The events were abstracted from the index of Keesing's Contemporary Archives for the period from January, 1955 through December, 1970. The fact that these data sets cover at least 20 years makes it possible to employ longitudinal statistical techniques to explore the levels of conflict and patterns of interaction in the Middle East and between the NATO and Warsaw Pact signatories [13].

Furthermore, the two data sets in both studies focus upon discrete actions directed between discrete national actors and offer acceptable reliability coefficients [14].

The Reasons for Employing Events Data

Events data are not without their critics, and it is therefore necessary to acquaint the reader with a few problems surrounding their usage. Problems with the reliability (i.e., data reproducibility) between coders and projects; validity (i.e., to what extent events data are meaningful operational measures of indicators of international behavior); source coverage (i.e., systemic, ethnocentric, and biases toward the sensational); the unresolved debate regarding whether single or multiple source coverage is superior; and the difficulty in the exact location of conceptual and temporal boundaries of an event are only a

few of the considerations that make the interpretation of the findings of event data problematic (Azar, 1970; Kegley, 1972:5-6). The validity and impacts of these criticisms on the findings of this dissertation will be discussed in detail in the chapters dealing with the actual applications of the vector technique to the Middle East and European data sets and in the final conclusions.

But these difficulties notwithstanding, I have selected events data to provide the data bases of this study for the practical and philosophical reasons identified in the opening pages of Chapter I as well as the following: In the first place, events data provide an indicator of international conflictual activity that most closely parallels the manner in which we come to form our cognitive images of the actions and the disposition of the international arena. William Riker (1957) contends that while reality is a continuous stream of actions, man must impose analytical boundaries to order this stream into a series of discrete events so that reality can be more easily grasped and understood. The international arena is far too complex for any analyst to be able to determine, assess, and understand. Therefore, we understand international realities by creating simplified, analytic models which identify major variables, actors, motivations, and processes (Spanier, 1975). Such a methodology allows one to break reality into its component parts and then focus upon the most salient components. Events data, inasmuch as they can be represented as "subjectively differentiated and discrete portions(s) of motion or action as determined by the observer" (Burgess and Lawton, 1972:10) closely approximate the way one analyses international politics in general and therefore present themselves as a logical unit of analysis for this study.

In addition to such epistemological considerations, recent analyses and comparisons of various indicators of international behavior by Wittkopf and Bradley (1974), Charles Kegley (1972), Rummel (1972:80), and others [15] suggest that events data are highly sensitive to the conflict dimension of international behavior.

Also, the fact that events data are abstracted from newspapers provides additional justification for employing these data. McClelland (1968b:43-48) argues that the press is the most capable data source in terms of reliability and breadth of coverage due to its multiple information sources and accurate verification techniques. He and Hoggard (1969) also argue that newspapers provide the major pipeline between regimes and respective populaces through which opinions are formed, policies are explained and justified, and feedback returned to the policy makers. Therefore, this feedback has a direct bearing on the formulation of much international behavior inasmuch as it serves to inform policy makers about domestic and international responses to their policies, while simultaneously providing these leaders with information concerning the foreign policy goals, behavior, and variables of other international actors. The actual action-based orientation of events data then does not compel the researcher to presuppose knowledge of decision makers' perceptions and ulterior motives which are difficult data to secure, open to wide ranges of interpretation, and at best difficult to empirically verify.

Finally, the development of quantitative research in international politics has been hindered by the dearth of systematically collected data (Kegley, 1972:3-6) that (1) can be subject to empirical replication; (2) allows prediction of international systemic behavior which is

the basis of policy evaluation and decision making; and (3) allows theorists to choose between contending and often equally plausible explanations of the dynamics of international behavior (Jones and Singer, 1972:3-4). Events data are one of the few sources of data available to researchers of this field whose generation is rigorously and systematically prescribed.

Notes

[1] The raw data used to calculate the dyadic weights appear in the Appendix.

[2] b = 1.19

[3] b = 1.05

[4] The following table (SIPRI, 1973a:213-227) shows Warsaw Pact defense expenditures for Bulgaria, Czechoslovakia, East Germany, Hungary and Poland in millions of U.S. dollars. The starred numbers are estimates:

	1955	1956	1957	1958	1959
Bulgaria	135*	135*	133	149	141
Czechoslovakia	1000*	1071	1094	1047	1035
D.R. Germany	280*	315*	390*	487	640*
Hungary	90*	100*	110	130*	144
Poland	792	754	634	704	898

[5] The categories employed correspond to those used in the World Event Interaction Survey (WEIS). For the complete text of these categories, see Appendix E.

[6] All violent conflicts (e.g., war, border shelling, execution of war prisoners, etc.) are included in Category 22. However, no attempt has been made to weight the different levels of violence.

[7] Obviously, the assignment of weights is based upon interpretation and therefore subject to the criticism of arbitrariness. This criticism is granted although such interpretation is no more arbitrary than the assignment of 1.0 to every event based upon the implicit assumption that the intensity of all events should be weighted equally. In other words, two interpretations of event intensity are compared.

Which interpretation is superior is an empirical question whose answer will be based upon the findings of tests to be described in Chapter IV.

[8]

Weinstein-Azar Interpretation			Odell-Azar Interpretation
1 yield in the least conflictual activity	1	011 surrender; 012 yield; 013 admit wrong;	X
7	2	Comment	X
6	3	Consult	6
5	4	Approve	5
4.3	5	Promise	5
3.5	6	Grant	6
3	7	Reward	X
4	8	Agree	6
4.7	9	Request	6
4.7	10	Propose	6
8.2	11	Reject	8
8.4	12	Accuse	8
8	13	Protest	8
8	14	Deny	8
8.6	15	Demand	8
8.8	16	Warn	8
9	17	Threaten	8
9.5	18	A nonmilitary demonstration	8
10	19	Reduce relations	8
10.25	20	Expel	8
10.5	21	Seize	8

The contention that the above scales do not differ in results is based upon their high (r = .92) correlation. We will see in the next chapters that highly correlated weighting schemes produce similar descriptions of systemic activity.

[9] "Arab," Palestinian and Third Party events have been excluded from the analysis. Arab and Palestinian events are transnational. Apart from the assumptions of Arab homogeneity and uniform commitment to the Palestinian cause which are difficult to prove, the actors are too diffuse to treat in an international context in the strictest sense of the definition. Third party actors are extraregional and beyond the scope of this analysis.

[10] Multinational events such as treaties have been disaggregated into their dyadic components. Therefore, one agreement between nations A, B, C and D produces six events (AB, AC, AD, BC, BD, CD).

[11] Austria, Belgium, Canada, Denmark, France, Greece, West Germany, Iceland, Italy, Luxembourg, Netherlands, Norway, Portugal, Sweden, Switzerland, Turkey, United Kingdom, United States, Albania, Bulgaria, People's Republic of China, Czechoslovakia, East Germany,

Hungary, North Korea, Mongolia, Poland, Rumania, Soviet Union, North Vietnam, and Yugoslavia.

The nations above underscored once are members of NATO. Double underscores signify Warsaw Pact members. Albania is not included because of its withdrawal from the Pact in 1968.

[12] The Soviet Union and the United States have been excluded from the NATO-Warsaw Pact system of conflict in order to reserve a point outside the system and for other reasons to be presented in the next chapter.

[13] The European analysis begins in 1955 to coincide with the entry of West Germany into NATO and the Eastern response to the formation of the Warsaw Pact.

[14] The reliability coefficients of the Middle East and NATO-Warsaw Pact data sets are .74 and .88 respectively.

[15] Others suggesting the applicability of events data to the study of conflict are Odell (1975), Wilkenfeld (1972) and McGowan (1970).

CHAPTER IV

EVALUATION OF THE VECTOR ANALYTIC TECHNIQUE

Before the vector analytic technique can be employed to describe the patterns of international behavior and investigate the substantive issues of international politics, it is necessary to demonstrate that the technique's conflict scores are in fact valid, sensitive, and reliable indicators of international behavior. To do this, the vector analytic approach must first show that it produces descriptions of international behavior that are different than those produced by the additive technique. Then, these descriptions of the patterns of events in each system of conflict and the predictions of the occurrences of certain types of international behavior that lie outside [1] the system of conflict must be made more accurately [2] and more consistently [3] than the predictions of the additive approach.

As the descriptions of these systems generated by the vector (and additive) technique are weighted for the different impacts of the dyads involved in events and also for the types of events that the dyads produce, the utility of the weighting schemes must also be subject to empirical verification. Similarly, the criterion for evaluating the dyad and action-type weighting schemes will be their ability to consistently demonstrate more accurate descriptions and predictions of systemic and extra-systemic patterns of international behavior than the unweighted scores (which assume that all behavior and dyads have equal impacts on systems of conflict).

In order to illustrate the superiority of the descriptions and predictions derived from the weighted vector scores, I shall test a series of predictions concerning patterns of international behavior in the Middle East and between the North Atlantic Treaty Organization (NATO) and Warsaw Pact nations. Substantively, in Chapter V, I will evaluate predictions dealing with the occurrence of violent behavior and especially the 1956 and 1967 Middle East wars. In Chapter VI, NATO-Warsaw Pact détente will be of substantive concern.

In the cases of the Middle East and the NATO-Warsaw Pact, eight sets of annual conflict scores for the years under considerations will be derived from (1) the additive method with no dyad or action-type weights; (2) the additive method weighted only for the impacts of the dyads; (3) the additive method weighted only for the action-types; (4) the additive method jointly weighted for dyadic and action-type impacts; (5) the vector technique with no dyad or action weights; (6) the vector technique weighted only for dyads; (7) the vector technique weighted only for action types; and (8) the vector technique jointly weighted for dyadic and action-type impacts.

These eight descriptions of the Middle East and NATO-Warsaw Pact systems of conflict will be used in a variety of tests to determine the value of applying vector algebra and the weighting schemes to the study of international conflict. In these tests, I will (1) correlate the four additive systemic descriptions with themselves and correlate the four vector descriptions; (2) correlate each of the four unweighted and weighted additive systemic descriptions with its vector generated counterpart; (3) evaluate the techniques' and weighting schemes' sensitivities in demonstrating the impacts of particularly conflictual

or cooperative years on the systems of conflict; (4) use the cosine of the angle between the four vector analytic techniques' descriptions of annual intra-systemic changes in the distribution of systemic conflict to demonstrate the technique's applicability to the study of international stability; and (5) determine which combination of technique and weighting schemes can most accurately predict the occurrence of extra-systemic (i.e., violently conflictual [4]) behavior. The findings of the first four tests will be presented in Chapters V and VI and will cover the Middle East and European systems of conflict respectively. Chapter VII will present the predictions to Middle East extra-systemic conflict and NATO-Warsaw/U.S.-U.S.S.R. *détente*. Finally, Chapter VIII will present a summary of the findings and conclusions.

With respect to the individual tests, the reader will remember that one of the central hypotheses of this dissertation is the argument that since the capabilities of actors and the conflictual intensities of their interactions exercise differential impacts on the patterns of international behavior, one could expect that systemic descriptions weighted for different dyadic and action-type impacts would diverge from the unweighted descriptions of these behavioral patterns. Furthermore, the weighted conflict scores should provide different descriptions than the unweighted scores regardless of whether they were generated by the additive or vector techniques. Therefore, by inter-correlating the four (i.e., unweighted, dyad-weighted, action-weighted, jointly weighted) descriptions with others generated by the same analytic technique, we can employ the squared correlation coefficient (r^2) to gain an idea of the extent to which the weighted descriptions illustrate patterns

of behavior which are different than the unweighted scores. If, for example, the correlation between the additive unweighted and the additive dyad and action-type weighted descriptions of Middle East conflict is high, then it can be argued that these weights fail to offer a different description than the unweighted scores. On the other hand, one could infer from a low correlation that the two descriptions are sensitive to different things and that the weights might therefore offer an important insight into the system of conflict under investigation. Finally, I will identify the technique which is most affected by the weighting schemes (i.e., has the lowest intra-technique correlations) and discuss the reasons for this relationship.

The second test's inter-correlations between the additive and vector scores (e.g., unweighted additive scores with unweighted vector scores, etc.) enables us to determine the extent to which the additive and vector techniques describe the same patterns of behavior when we control for the various weighting schemes. In other words, one would expect low correlations between the fully weighted additive and vector descriptions if the vector technique, as I have herein hypothesized, is more sensitive to the fluctuations of international conflict behavior than the additive technique and consequently produces different descriptions of systemic behavior.

The third test will utilize the standard deviation of each of the standardized eight descriptions of the Middle East and European-bloc systems of conflict. It has been argued that the vector analytic approach, when weighted for the differential impacts of dyads and action-types should be a more sensitive indicator of the patterns of international behavior for a variety of reasons [5]. If the weighted vector

analytic technique is in fact more sensitive to extremely high aggregated levels of conflictual behavior between international dyads, then one could expect that this technique would more emphatically identify the occurrence of violent behavior than the additive approach, especially with the employment of weighting schemes.

For the Middle East, the periods of 1953-56 and 1967-68 saw all the Arab nations of the region involved in violent conflict against Israel. Consequently, the conflict scores of these periods should stand out from the conflict scores of the other time periods. In other words, these conflict scores should lie further from the mean ($\bar{X}$) of the conflict scores for the entire time period under consideration than any of the remaining (less conflictual) scores. This distance from the mean can be operationalized in terms of the number of standard deviations (σ) a conflict score lies from said mean. The utilization of standard deviations will allow a statistical interpretation of the sensitivity of conflict scores generated by the additive and vector analytic techniques based on the empirical rule. This empirical rule describes the distribution of observations in a normal distribution such that 67% of the points (i.e., scores) will lie between plus and minus one standard deviation ($\pm 1\sigma$) from the mean, 95% will lie between $\pm 2\sigma$ from the mean; and 99% will lie between $\pm 3\sigma$ from the mean. In other words, wars of attrition and the violent periods that may precede them, such as those fought in the Middle East in 1956 and 1967, by nature of their terrible expense, are much more conflictual than the levels of conflict otherwise experienced between the region's dyads. Therefore, periods of high systemic conflict occur less frequently, perhaps less than 5% of the time [6]. Therefore, such conflictual points will be expected to

lie at least 1.746 standard deviations [7] from the conflict scores generated by any combination of analytic technique and weighting scheme. Therefore, after standardizing the mean conflict score at 0, the fully weighted level of conflict in 1967 ought to exceed this arbitrary criterion, reconfirming our intuitive understanding of the intensity of the non-violent conflict leading to the 1967 Six Day War as a violent period of conflict in the Middle East relative to the previous high levels of systemic conflict. This mean ($\overline{X} = 0$) plus 1.746 standard deviation criterion will be applied to each of the eight sets of conflict scores generated by the unweighted and weighted additive and vector analytic approaches. According to my hypothesis, the weighted vector scores, being more sensitive to conflict, will more easily meet the established criterion during periods of high conflict (such as 1953-56 and 1967-68) than the additive scores or those scores produced using the unweighted vector.

In evaluating the relative sensitivities of the two analytic techniques and weighting schemes in the detection of increasing levels of détente between NATO (excluding the U.S.) and Warsaw Pact (excluding the U.S.S.R.) dyads, the same general method will be used to establish a minimum distance (in terms of standard deviations) from the mean of the standardized conflict scores. However, this evaluation of détente will differ from the evaluation of conflict in a significant way. Significant low conflict behavior (i.e., cooperation) indicative of détente is defined as that lying more than one standard deviation from the mean in the direction of zero-conflict (i.e., $\overline{X} - 1\sigma$). Only one standard deviation was selected as the criterion in this search for détente. This less rigorous one standard deviation criterion is

based on the proposition that one should not expect a number of dyads composed of adversaries to enthusiastically embrace peace as easily and readily as they embrace conflictual behavior. Therefore, the criterion for significant behavior has been relaxed from 1.746 standard deviations to only one standard deviation which means that significant cooperation occurs approximately 15% of the time. Figure 7 offers an illustration of the criterion of significant conflict and cooperation for a given set of conflict scores.

The fourth test's comparisons of the cosines of the angles between each of the eight systemic description's annual dyadic conflict distributions, like the aim of the third test, should permit me to identify new directions in the Middle East and European systems of conflict. In other words, watershed occurrences, such as the formation of the United Arab Republic should be identifiable as significant increases in the size of the angle between the vectors describing the system states at times t and t-1. Higher angles between such vectors describe system states with lower correlations [8]. Again, it should be noted that high positive correlations are not indicative of cooperation, but merely denote the continued similarity of a system at time t with the system at time t-1 (i.e., correlation r between the system states at times t and t-1).

Finally, the correlations of each of the eight sets of conflict scores with behavioral occurrences lying outside the system of conflict are predictions based on the assumption that certain types of behavior occur simultaneously with, or as a result of, certain types of events. It is important that these occurrences lie outside the system of conflict so that the formulation of conflict scores is not influenced by

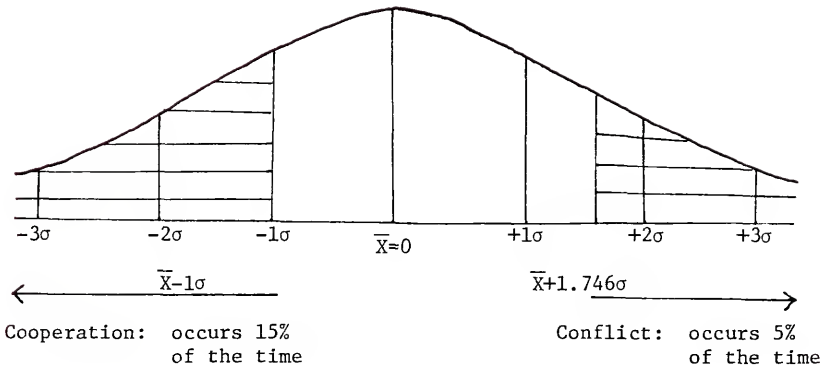


FIGURE 7

CRITERIA OF SIGNIFICANT CONFLICT AND COOPERATION

the behavior patterns these conflict scores are supposed to predict. Behavior is defined as lying outside the system of conflict if (1) it is not an event (i.e., it is not non-routine, political, purposive, etc.); (2) it is part of another system of conflict whose regional actors are not defined as variables (members) of the system under current investigation; or (3) it is analytically distinct from systemic behavior [9]. Returning to the assumption underlying the utilization of correlative techniques to predict the occurrences of extra-systemic events from the eight sets of conflict scores, it is hypothesized that in the Middle East, extra-systemic behavior such as war and violent behavior (e.g., executions of war prisoners, frontier intrusions, bombings, etc.) [10] occurs concommitantly with highly conflictual non-violent events such as troop mobilizations, the cancellations of negotiations, the expulsion of one nation's diplomats by another nation, and that these two types of behavior are highly correlated (Kegley, 1971:364). Furthermore, the weighted vector scores should be more highly associated with such extra-systemic behavior than the weighted and unweighted additive as well as the unweighted vector analytic conflict scores. With respect to the NATO-Warsaw Pact European system of conflict, it is posited that the weighted vector conflict scores will be highly correlated with the aggregate levels of Soviet-American non-violent conflict. In other words, I am suggesting as the Soviets and Americans came to enjoy less conflictual relations in the late 1960's, their respective bloc members should also have experienced less conflictual relations.

Notes

[1] Points lying outside the system (i.e., parametric variables in Ashby's perspective) of conflict are assumed to be analytically distinct from those points lying inside the system (i.e., systemic variables). In other words, violent conflict behavior is being treated as independent of non-violent conflictual behavior in the Middle East. In Chapter VI, Soviet - American détente is posited as behavior which is independent of the interactions that transpire between the other members of NATO and the Warsaw Pact. Additional discussion regarding the independence of such behavior will be found in Chapters V and VI.

[2] A "true" description of systemic behavior is impossible to construct. Furthermore, it would be impossible to identify one as such even if it existed. Therefore, accuracy cannot be determined precisely. Nevertheless, if the additive and vector descriptions of international activity are significantly different and one is consistently more sensitive to important events/periods, then it will be judged as more accurate. In other words, if only one technique demonstrates sharp increases in Middle East conflict in 1967, it would appear to reflect more accurately the occurrence of war than the other.

[3] Consistency will be determined by which technique's descriptions are more highly correlated with the events lying outside the system of conflict.

[4] Violent conflict behavior is action category 22 in Blechman's data set.

[5] The vector technique has been hypothesized as more sensitive than the additive technique, because it doesn't make the unidirectional/unidimensional assumption and also doesn't over-estimate conflict scores by simply aggregating the component scores as if they were perfectly scalable.

[6] Two tail distribution, 5% of the points in each tail.

[7] Since $n \leq 30$, a t-distribution must be obtained.

[8] The cosine of the angle between two vectors is equal to the correlation between their respective components. Two vectors which are not highly correlated have large angles between them since they move in very different directions. For instance, observe how the angle between vectors increases as the correlation coefficient decreases.

angle	correlation coefficient (r)
89°	.017
75°	.259
33°	.832
1°	.999

[9] Refer to the discussion in Chapter III concerning criteria and justifications for defining extra-systemic behavior.

[10] See Note [6] in Chapter III.

CHAPTER V

PRESENTATION AND ANAYLSIS OF MIDDLE EAST CONFLICT DATA

Before presenting the tables and graphs to evaluate the additive and vector analytic techniques for the analysis of the patterns of international behavior, it is first necessary to familiarize the reader with the principal events that occurred in the Middle East from 1951 to 1968.

Presented below is a chronology of noteworthy events that occurred in this region during the years under investigation [1]. It includes event interactions between the actors in the system--Israel, Egypt, Jordan, Lebanon, Iraq and Syria. Also included are important events with non-system actors and domestic occurrences. Although these latter inclusions are not taken into account in the quantitative analysis, they allow the reader to develop a more in-depth understanding of the system and place it within a larger international context.

Chronology of Middle East Events 1951-1958

1951

The U.N. Mixed Armistice Commission breaks down as small-scale guerilla fighting breaks out on the Israeli-Jordanian border.

The U.N. Security Council adopts a resolution calling on Israel to halt the Hulek border zone drainage project that allegedly set off border clashes between Israel and Syria. Israeli aerial attacks on Syria were also denounced.

The U.N. Palestine Conciliation Conference with Israeli and Arab delegates opens in Paris.

Israel says it will sign non-aggression pacts with each of its four Arab neighbors, but warns that negotiations should not continue if Arabs will not meet in the same room with Israeli delegates.

Citing the "rigid positions" on both sides, the U.N. Palestine Counciliation Commission ends mediation efforts between Israel and the Arab states.

1952

Jordan signs a collective security pact with other Arab League countries.

Egyptial Col. Gamal Abdul Nasser becomes Premier in a new organization of the government, replacing Premier Naguib. Nasser had served as Premier for two days in February following Premier Naguib's brief ouster.

1953

Blockade of Israeli shipping expanded to include all goods going to and coming from Israel. This action leaves Israel with only one port of Elath in the Gulf of Aqaba in the Straits of Tiran.

Egypt subjects Israeli ships to Egyptian boarding and searches in Straits of Tiran.

1954

A Syrian army revolt ousts President Shishekly. Former President Hishim Atassi succeeds him February 28.

Israel attends a meeting of the Israel-Jordan Mixed Armistice Commission, thus ending a seven-month boycott.

Jordan protests Israel's unilateral diversion of the Jordan River.

1955

Iraq signs a mutual defense treaty (Baghdad Pact) with Turkey despite Egyptian protests.

U.N. efforts to initiate negotiations between Egypt and Israel over the dispute in the Gaza Strip break down.

Egypt and Syria sign a mutual defense treaty, triggering Israeli requests for an Israeli-American security pact.

The five Baghdad Pact countries announce the establishment of a permanent political military and economic organization, the Middle East Treaty Organization, to be based in Baghdad. Members are Britian, Iran, Iraq, Pakistan, and Turkey.

In light of recent clashes between Israeli forces and the Syrian Army, Egyptian Premier Nasser warns Israel that further aggression may prompt a full Egyptian-Syrian military response.

Egypt and Syria unify their military power by placing troops under one commander, the Egyptian Minister of War.

1956

Lebanon and Syria agree on a bilateral defense pact.

Jordan rejected a bid by Egypt, Syria and Saudia Arabia to replace British subsidizing of Jordan's defense forces.

Ending a two-year period of relative quiet on their border, Jordan stages raids on Israel.

Egypt and Syria agree to unite their defenses against Israel.

Israel and Egypt agree to a U.N. cease-fire.

Jordan and Egypt announce plans to unify their armies.

Lebanon and Jordan agree to coordinate their defense plans.

Jordan and Syria sign a military agreement.

Egypt takes over complete control of the Suez Canal.

Lebanon calls for talks between Syria, Jordan, Egypt and Lebanon to mobilize forces in retaliation against Israeli reprisal raids.

In the face of increasing clashes between Israel and Jordan, Britian warns Israel that it will stand by its 1948 mutual defense treaty with Jordan.

Egypt, Syria and Jordan sign an agreement to place their armed forces under the joint command of an Egyptian general.

Aerial warfare breaks out between Israel and Egypt. Egypt warns Britian and France that it will also fight to keep the Suez Canal. This provokes a British-French ultimatum warning that troops will be sent to the Suez unless Egyptian and Israeli troops withdraw 10 miles from the canal and cease fighting by a designated time. Egyptian President Nasser rejects the ultimatum.

Israel ends its Sinai campaign.

Egypt demands reparations from Israel for war damages.

1957

Israel sets a prior condition for complete withdrawal of its troops from Egypt: Egyptian assurances that the Gaza Strip and Sharm el Sheikh will not be used for hostile actions.

The last Israeli forces withdraw from Egyptian territory.

As the situation in the Middle East appears to be worsening, Israeli Foreign Minister Golda Meir flies to Washington to confer with U.S. officials. In contravention of U.N. resolutions, Egypt March 14 sent civil administrators into Gaza and on March 15 announced that Israel would not be permitted to use the Suez Canal. Saudi Arabia halted Israeli use of the Gulf of Aqaba March 15.

Syria attacks Jordan.

A rift arises in Jordanian-Egyptian relations as Jordan charges that an Egyptian military attache is plotting against Jordanian officials. His recall is requested. Egypt complies.

In the most violent encounter since November, Syria and Israel battle for almost 10 hours before a fourth U.N. intervention halts the fighting.

Egypt says it will help defend Syria if necessary. Lebanon echoes that sentiment October 11.

1958

Israel and Jordan agree that the 1948 agreement calling for demilitarization of Mt. Scopus should be followed.

Egypt and Syria merge into the United Arab Republic. Citizens of the two countries approve the merger, nearly unanimously, in plebiscites February 21.

Iraq and Jordan form the Arab Federation with Iraqi King Faisal II serving as head of the two-state federal union. King Hussein retains sovereignty in Jordan. The federation is approved February 17 by the Iraqi parliament and by the Jordanian parliament February 18.

As a state of seige continues in Lebanon, the U.N. Security Council meets to discuss Lebanon's complaint that the U.A.R. has caused the continuing anti-government rioting that started May 10.

Heavy fighting breaks out again in Lebanon.

Lebanon orders the departure of six U.A.R. diplomats accused of inciting the Lebanese revolt and financing the fighting.

The government of Iraq is overthrown by revolutionaries who kill King Faisal and Premier as Said, seize Baghdad and proclaim a republic. Brig. Gen. Abdul Karim el-Kassim is named Premier. In reaction to the coup, King Hussein of Jordan announces his assumption of power as head of the Arab Federation of Iraq and Jordan. Hussein and Lebanese President Chamoun each appeal for U.S. military assistance because of the Iraqi coup.

President Eisenhower dispatches 5,000 Marines to Lebanon.

The U.A.R. and the new Iraqi regime sign a mutual defense treaty.

Jordan severs relations with the U.A.R. due to its recognition of the new Iraqi regime.

Iraq and the U.A.R. set up committees to work out closer cooperation between those countries in political, economic, military and educational fields.

Jordan announces the formal dismemberment of the Arab Union of Jordan and Iraq, in light of the new regime in Iraq.

1959

Jordan's King Hussein protests Syria's closing of their common border.

Jordan and the U.A.R. agree to resume diplomatic relations, an action coupled with the reopening of the Syrian-Jordanian border.

The Arab League, meeting in Bhamdun, Lebanon, supports reinforcement of the boycott of Israel.

After four days of talks, U.A.R. President Nasser and Saudi Arabian King Saud agree to resume relations with Britian and to seek to end Communist penetration in Iraq.

1960

Jordanian Foreign Minister Musa Nasir says that Arab states are "completely united" on a "declaration of war" against Israel if Israel attempts to divert the Jordan River to irrigate the Negev desert.

It is disclosed that at the February 28 meeting of the Arab League, Jordan rejected a U.A.R. proposal to establish a "Palestine entity."

Jordan and Iraq agree to resume diplomatic ties in December. Relations had been cut off in July, 1958, following the Iraqi revolution.

1961

Following a coup September 28 by dissident Syrian army units, the revolutionary command sets up a civilian government for Syria and announces independence from the U.A.R. Jordan recognizes the new Syrian government.

President Nasser announces in Cairo that the U.A.R. has broken ties with Jordan for their recognition of new Syrian government.

1962

Iraqi Premier Kassim and Syrian President Kodsi endorse close Iraqi-Syrian cooperation.

Syrian army leaders oust the new Syrian government which was elected after the break with Egypt in the fall of 1961. The Syrian army leaders declare their intentions to work closely with Egypt and Iraq.

Syrian President Kodsi, ousted by an army coup March 28, is reported returned to office. Kodsi tells Syrians April 14 that he will seek a union of "liberated Arab states, beginning with Egypt."

Syria asks the Arab League to condemn the U.A.R. for alleged interference in Syrian internal affairs.

1963

Street demonstrations break out in Jordan in support of Jordan's joining the new U.A.R. deferation.

U.A.R. President Nasser renounces an agreement to unite Egypt, Syria and Iraq and denounces the Syrian Baath Party.

Iraq and Syria, in agreement on ending disputes over Arab unity, urge U.A.R. President Nasser to join them in improving inter-Arab unity.

The Arab League meets to consider a unified stance in support of Syria against Israel as fighting breaks out near the Sea of Galilee. Iraqi forces are placed "at the disposal of" Syria. U.A.R. troops are on alert for possible support of Syria.

U.N. Secretary General U Thant announces Israeli and Syrian acceptance of a cease-fire.

Israeli and Jordanian troops clash in Jerusalem before the U.N. truce observers persuade both sides to agree to a cease-fire.

Iraq and Syria agree to seek "full economic unity" and to jointly work to strengthen their defenses.

Iraq's President Arif announces that his forces have overthrown Iraq's civilian Baathist government. Arif becomes president and chief of staff of the army. The new government announces November 21 that it will seek to fulfill the April agreement between Iraq, Syria and Egypt on the formation of a union and offers November 22 to settle differences with "the Kurds, our brothers."

1964

Syria's Revolutionary Council cancels its military treaty with Iraq.

Iraq and the U.A.R. sign an agreement providing for joint command of their troops in time of war.

After seven days of talks, chiefs of state of 13 Arab nations issue a final communique urging immediate Arab efforts on water projects to cut off the Jordan River from Israel in an effort to thwart Israeli plans to dam the Jordan for irrigation purposes.

1965

At the conclusion of four days of talks in Cairo, premiers of 13 Arab nations issue a communique disclosing common policy toward nations henceforth recognizing Israel or aiding in her "aggressive military efforts."

The Lebanese parliament approves construction of a pumping station on the Wazzani River aimed at diverting the Jordan River from Israel.

Syria declares that the only Palestinian solution is the elimination of Israel. Syrian President Amin el-Hafez terms the Arab unified military command ineffectual.

Syrian President Hafez accuses other Arab nations of planning to leave Syria alone to face Israel in a showdown over diversion of the Jordan River.

Jordanian King Hussein lays the first stone of the Mokheiba Dam. The dam is part of an Arab effort to divert the Jordan River from Israel.

Jordanian King Hussein warns against excessive Egyptian interference in "Syrian affairs," saying Jordan will not allow the Syria-Jordan border to be closed. Hussein also says that his country would attack Israel if war developed between Israel and Syria.

Syria and the U.A.R. sign a mutual defense treaty which provides for joint command of their armed forces.

Syrian Chief of State Attassi calls on Jordanians and Palestine Arabs to overthrow Jordan's King Hussein and offers them arms.

Syria impounds the assets of the Western-owned Iraq Petroleum Company over claims to back royalties and higher pipeline transit fees. When the company rejects Syrian demands of doubled transit fees and export fees, the company's oil pipeline is closed.

1967

The U.A.R. alerts its military forces because of mounting tension with Israel. Syria also announces that its military forces are ready for action.

The U.N. Emergency Force in the Middle East pulls out, ending a 10-year commitment for peacekeeping in that area. The withdrawal had been requested by the U.A.R.

The U.A.R. closes the Strait of Tiran to Israeli ships and to ships carrying strategic cargo bound for Israel.

The United States and Israel each issue strong warnings against the U.A.R.'s blockade of the Strait of Tiran, entrance to the Gulf of Aqaba.

Following the explosion of a bomb on the Jordan-Syria border, Jordan orders the shutting down of the Syrian embassy and the departure of Syria's ambassador to Jordan.

The U.A.R. has reportedly mined the Strait of Tiran and the Gulf of Aqaba.

Egyptian and Israeli troops open fire on the Gaza Strip.

Jordan and the U.A.R. sign a mutual defense pact.

Arabs and Israelis fight in the Egyptian section of the Sinai Peninsula and in Jerusalem. Israel destroys Egyptian, Syrian and Jordanian air forces in surprise early morning attacks. After 36 hours of battle, Israelis capture the Jordanian sector of Jerusalem.

The U.N. Security Council adopts a resolution calling for an immediate cease-fire in the Middle East. Israel announces it will accept the cease-fire if the Arab states do. The cease-fire is accepted by Jordan June 7, the U.A.R. June 8 and Syria June 9-10.

Israel and Syria sign a cease-fire agreement.

Israel announces that it will not withdraw to the 1949 armistice boundaries and calls for direct negotiations between Israel and Arab nations.

Israel proclaims the unification of all of Jerusalem under Israeli rule.

U.N. Secretary General U Thant asks Israel and the U.A.R. to accept U.N. supervision of the cease-fire in the Suez Canal zone. The U.A.R. agrees July 10 and Israel accepts July 11.

Israel and the U.A.R. agree to a U.N. proposal to halt for one month navigation through the Suez Canal.

Arab heads of state, meeting in Khartoum, agree to seek a nonmilitary solution to the tensions with Israel.

Israel announces it will move settlers into occupied Syria and the captured Jordanian sector of Jerusalem.

Israeli Foreign Minister Eban suggests the economic cooperation of Israel, Lebanon, and Jordan, the dimilitarization of the Sinai, and the establishment of a "universal status" for the "holy places" of Jerusalem.

Jordan's King Hussein tells an American television audience that his country is ready to recognize Israel's right to existence.

1968

Israel expropriates a section of the former Jordanian sector of Jerusalem, promising compensation for the private land owners.

Significant fighting between Jordan and Israel erupts along their common border.

Continuing to reject direct negotiations with Israel, the U.A.R. nonetheless indicates its willingness to implement the British proposal adopted by the United Nations on November 22, 1967.

U.A.R. President Nasser says his country is "fully prepared to support and arm the Palestine resistance movement" in its terrorist activity against Israel. Iraq April 13 announces the formation of a committee to raise funds for the Arab guerillas.

Reportedly easing its position on a Middle East settlement, the U.A.R. says it will agree to a demilitarization of the Sinai Peninsula, will lift demands for the return of Arab refugees to their homeland, will agree to internationalizing the Gaza Strip and will grant Israeli cargoes access throughout the Suez Canal and Israeli vessels through the Strait of Tiran.

Israeli Foreign Minister Abba Eban offers a nine-point peace plan at the United Nations. The proposal calls for Israeli withdrawal from occupied territory following the establishment of "permanent" boundaries between the Arab states and Israel. The U.A.R. rejects the plan October 9, but agrees October 10 to accept a timetable worked out by U.N. special representative Jarring for implementing the British peace proposal adopted by the Security Council November 22, 1967.

After night-long shelling between Egypt and Israel, Egyptial oil refineries at Port Suez are afire.

Jordanian and Israeli troops clash in heavy battle. The next day Israeli planes counter a pre-dawn artillery attack along the Jordan border. On December 4, Israeli bombers strike back against Iraqi shelling along the Israeli-Jordan border.

Jordan's King Hussein sends messages to the U.A.R. and Lebanon calling for unified action to liberate Arab lands.

The eight raw unweighted and weighted additive and vector descriptions of annual non-violent conflict in the Middle East from 1951-1968 are presented in Table 2.

The Z scores [2] of the raw Middle East conflict scores are presented in Table 3.

Test I: Intra-Technique Correlations

This first test examines the intercorrelations of each technique's unweighted, singly weighted (i.e., weighted only for dyads or actions), and jointly weighted dyad and action type conflict scores. In other words, by correlating the conflict scores generated by the unweighted additive technique with first the additive scores weighted only for dyads and then those weighted only for the action type, it will be possible to obtain some idea of the extent to which each of these weighting schemes furnishes different descriptions of patterns of Middle East conflict. I will also employ this same intra-technique correlational analysis with the conflict scores generated using the vector technique. If the weighted conflict scores for the dyads and the conflictual intensity of the actions they generate do provide the researcher with different information regarding the patterns of international conflict, then the correlations within each technique should be moderate [3]. However, if the weighting schemes either separately or together offer little additional insight into the behavior under consideration, the correlations between the weighted and unweighted scores will be high.

TABLE 2

MIDDLE EAST NON-VIOLENT CONFLICT SCORES (ROUNDED TO THE NEAREST INTEGER)

Year	Additive with No Weights	Additive with Dyad Wts. Only	Additive With Action Wts. Only	Additive With Dyad & Action Wts.	Vector With No Weights	Vector with Dyad Wts. Only	Vector with Action Wts. Only	Vector With Dyad & Action Wts.
1951	128	461	916	3299	33	110	259	867
1952	72	236	523	1661	16	50	131	382
1953	191	507	1453	3908	46	118	369	979
1954	253	707	1994	5599	82	227	682	1892
1955	252	1469	1789	10532	76	545	607	440
1956	349	1245	2401	8437	77	358	625	2923
1957	171	811	1524	5902	49	252	403	205
1958	89	248	685	1879	27	74	220	488
1959	74	223	563	1767	21	78	174	652
1960	71	261	563	1992	20	77	165	641
1961	24	96	188	774	7	29	61	265
1962	46	127	358	1003	18	48	149	393
1963	62	139	490	1747	20	66	166	540
1964	51	187	371	1375	14	54	104	391
1965	50	193	389	1485	14	51	112	406
1966	125	471	911	3364	31	113	261	918
1967	424	2339	3185	17354	103	653	854	5414
1968	249	1324	1925	10144	82	477	688	3880
$\overline{X}$	148.9	613.6	1123.8	4567.9	40.9	187.8	335.0	1204.2
σ	54.3	106.9	847.8	4448.4	29.9	192.7	247.4	1439.6

TABLE 3

MIDDLE EAST DATA
Z SCORES OF STANDARDIZED MIDDLE EAST NON-VIOLENT CONFLICT

Year	Additive No Weights	Additive Dyad Wts. Only	Additive Action Wts. Only	Additive Dyad & Action Wts.	Vector No Wts.	Vector Dyad Wts. Only	Vector Action Wts. Only	Vector Dyad & Action Wts.
1951	-.19	-.25	-.25	-.29	-.27	-.41	-.31	-.42
1952	-.67	-.62	-.71	-.66	-.84	-.72	-.83	-.72
1953	.37	-.18	.39	-.15	.17	-.37	.14	-.35
1954	.91	.16	1.03	.24	1.37	.21	1.41	.23
1955	.91	1.41	.79	1.34	1.17	1.86	1.1	1.82
1956	1.74	1.04	1.51	.87	1.20	.89	1.18	.88
1957	.20	.33	.48	.30	.43	.34	.28	.33
1958	-.53	-.60	-.52	-.61	-.47	-.60	-.47	-.65
1959	-.66	-.64	-.67	-.63	-.67	-.57	-.66	-.55
1960	-.68	-.58	-.67	-.58	-.71	-.58	-.69	-.56
1961	-1.09	-.85	-1.11	-.86	-1.14	-.83	-1.12	-.80
1962	-.9	-.80	-.91	-.80	-.77	-.73	-.76	-.72
1963	-.76	-.78	-.75	-.64	-.71	-.64	-.69	-.62
1964	-.86	-.70	-.89	-.72	-.91	-.70	-.94	-.72
1965	-.87	-.69	-.86	-.70	-.91	-.71	-.91	-.71
1966	-.21	-.24	-.25	-.27	-.34	-.39	-.31	-.38
1967	2.4	2.83	2.43	2.88	2.06	2.42	2.1	2.45
1968	.87	1.17	.95	1.26	1.37	1.51	1.43	1.48

Tables 4 and 5 illustrate the additive and vector analytic intra-technique correlations.

The correlations in these tables suggest that the action weighted scores do not offer descriptions of international behavior that substantially differ from those offered by either unweighted analytic technique. The additive and vector scores which are weighted for dyadic impacts are also highly correlated with the unweighted scores (.94 and .92 respectively) although not to the extent of the action weighted scores. Nevertheless, these coefficients also suggest that the dyad weighted descriptions of both techniques are very similar to the unweighted descriptions. This latter interpretation also pertains to the jointly weighted scores whose correlations are apparently affected most by the impacts of the dyad weights.

However, these correlations between the unweighted and weighted scores within each technique should not be construed as conclusive proof that the application of weighted schemes cannot be useful in the interpretation of patterns of conflict in the Middle East. The general similarity of descriptions suggested by the correlations between the unweighted and fully weighted conflict scores in the additive and vector techniques ($r = .93$ and .92 respectively) may cause one to overlook the fact that the amounts of variance that remain to be explained (13% and 15%) are hardly negligible for an understanding of the complexities of social phenomena.

If we refer to Table 2, we note that the scores of the unweighted additive analysis demonstrate that the level of systemic conflict increases dramatically in 1953 over the score of the previous year. In 1954, the conflict rises again and remains virtually unchanged through

TABLE 4

MIDDLE EAST ADDITIVE CONFLICT SCORES

r/r^2	No Wts.	Dyad Wts. Only	Action Wts. Only	Dyad and Action Wts.
No Weights	1.00/1.00	.94/.88	.995/.99	.93/.87
Dyad Wts. Only		1.00/1.00	.94/.88	.997/.99
Action Wts. Only			1.00/1.00	.94/.88
Dyad and Action Wts.				1.00/1.00

Average $r = .957$; $r^2 = .915$ (excluding diagonal)

TABLE 5

MIDDLE EAST VECTOR CONFLICT SCORES

$r/_{r^2}$	No Wts.	Dyad Wts. Only	Action Wts. Only	Dyad and Action Wts.
No Weights	1.00/1.00	.92/.85	.995/.99	.92/.85
Dyad Wts. Only		1.00/1.00	.921/.85	.999/.999
Action Wts. Only			1.00/1.00	.923/.85
Dyad and Action Wts.				1.00/1.00

Average $r = .946$; $r^2 = .897$ (excluding diagonal)

1955, but increases in 1956 predicting the September-October war. Then in 1957, it drops to the pre-1954 level of conflict, consequently beginning what appears as a 10-year period (1957-1966) of relative systemic peace.

While these unweighted aggregated scores provide certain general descriptions of systemic activity, information about the actors involved and the types of conflictual acts are omitted. But by examining the annual dyad, action, and dyad and action weighted scores, this additional information can be brought into the picture to provide a more detailed description of the conflictual behavior in the Middle East. This is especially the case during periods of high conflict as can be seen in Figures 8 and 9 on the following pages. These graphs demonstrate that while the unweighted and fully (i.e., dyad and action) weighted scores determined by the additive and vector techniques [4] do in fact describe similar (i.e., highly correalted) patterns of systemic behavior, there is generally more divergence between the data points in 1953-1956 and 1967-1968 [5]. As I will explain in the following section, these divergences are generated by the differential impacts of the most highly weighted (i.e., powerful) actors during periods of high conflict.

Let us now examine the annual descriptions of the Middle East (see Figures 8 and 9) where the added information gained from the analysis of dyad and action weights as well as the untenability of the unidimensionality assumption are illustrated.

The four sets of descriptions for each analytic technique remain fairly consistent for 1951 and 1952, but in 1953 we see a noticeable divergence. The unweighted and action weighted scores in the additive

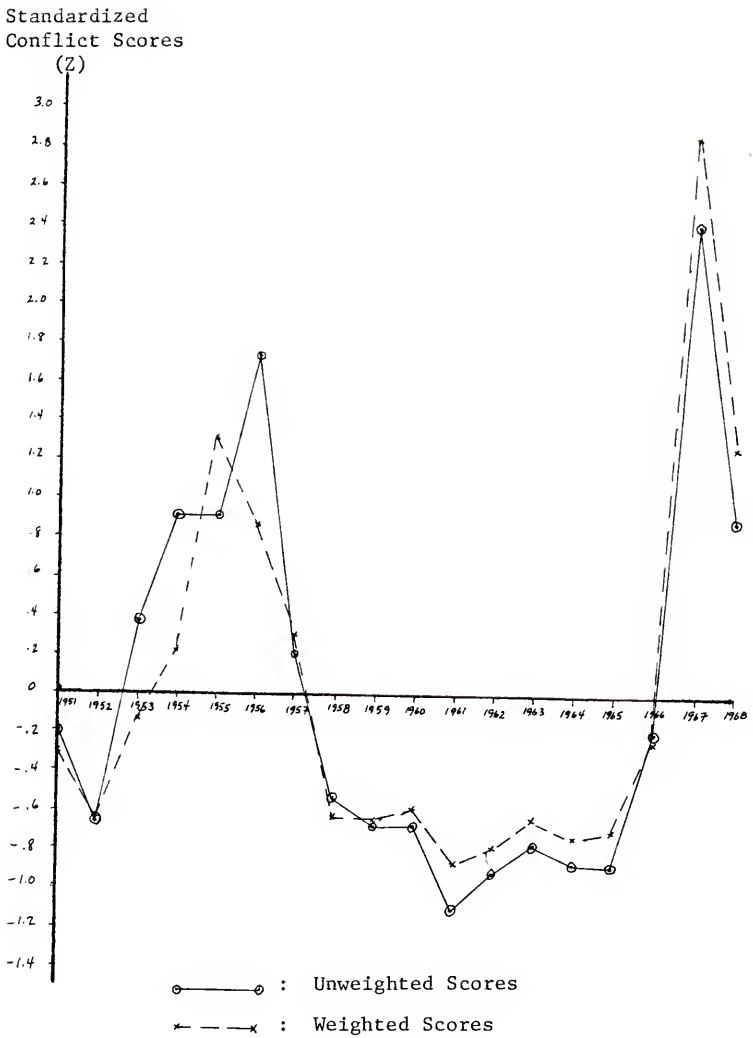


FIGURE 8

STANDARDIZED MIDDLE EAST CONFLICT SCORES:
ADDITIVE TECHNIQUE, 1951-1968

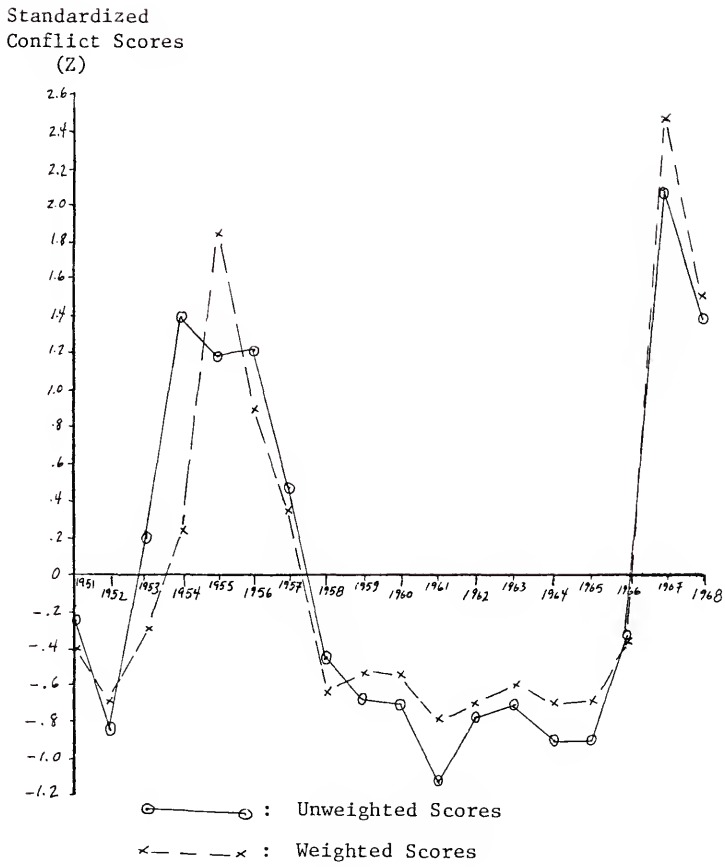


FIGURE 9

STANDARDIZED MIDDLE EAST CONFLICT SCORES:
VECTOR TECHNIQUE, 1951-1968

analysis are quite similar (.37 and .39). However, the scores weighted for dyads and for both dyads and action category are not nearly as conflictual (-.18 and -.15). This same pattern also appears with the vector scores. The unweighted and action weighted scores are similar (.17 and .14) and the dyad and fully weighted scores are less conflictual (-.37 and -.31 respectively). If we refer to the data on Table 2, there can be no doubt that the Middle East system of conflict became increasingly conflictual in 1953. All eight conflict scores for the year noticeably move in the direction of conflict (e.g., 1952 dyad weighted additive score -.62 to 1953 score of -.18). Also, the proportion of conflictual acts to the total number of cooperative and conflictual acts in the system rose from .16 in 1952 to .71 in 1953 [6]. However, our picture of systemic conflict must be modified to some extent when we look at the dyads involved in this regional conflict.

The following Table 6 presents the distribution of events between the 15 systemic dyads from 1951 to 1956. It demonstrates a significant rise in the number of events from 72 to 191 between 1952 and 1953. Thirty-two of the additional 119 events transpired between Israel and Egypt, the most heavily weighted systemic dyad. Their interactions were generally conflictual in nature [7]. This increase in conflictual activity by the system's most powerful dyad was generated by the continuation of Egypt's blockade of Israeli shipping and repeated Egyptian boardings of Israeli ships in the Straits of Tiran. However, 86 of the additional 119 events occurred between Israel and Jordan, a dyad with approximately one-half the impact on the system of conflict given its dyad weights for 1952 and 1953. When one considers that 33%

TABLE 6

EVENT DISTRIBUTIONS (WEIGHT OF DYAD)*

Dyad	1951	1952	1953	1954	1955	1956
Is-Eg 1	20 (5.9)	17 (5.5)	49 (4.5)	70 (5.3)	169 (7.5)	151 (5.3)
Is-Jord 2	24 (3.6)	17 (2.8)	103 (2.1)	137 (1.9)	40 (2.0)	73 (1.8)
Is-Syr 3	75 (3.1)	23 (2.3)	21 (1.8)	26 (1.8)	27 (1.6)	39 (1.8)
Is-Leb 4	5 (2.6)	4 (1.8)	13 (1.3)	10 (1.1)	5 (1.3)	6 (1.3)
Is-Iraq 5	1 (3.4)	7 (2.9)	4 (2.7)	8 (2.6)	1 (2.6)	13 (2.4)
Eg-Jord 6			1 (4.3)		1 (7.6)	14 (5.0)
Eg-Syr 7	1 (4.3)	1 (4.9)			3 (7.3)	11 (5.0)
Eg-Leb 8					3 (6.9)	2 (4.5)
Eg-Iraq 9		1 (5.3)			2 (7.3)	2 (5.7)
Jord-Syr 10		2 (2.0)		1 (1.8)		13 (1.4)
Jord-Leb 11				1 (1.4)		5 (1.0)
Jord-Iraq 12						11 (2.1)
Syr-Leb 13						5 (1.0)
Syr-Iraq 14	2 (1.7)				1 (2.5)	2 (2.1)
Leb-Iraq 15						2 (1.6)
Total N of Events	128	72	191	253	252	349

* blank entries = 0

of the events of the Israel-Jordan dyad were cooperative (and assigned low weights) in 1953 (i.e., 34/103) [8] in addition to this dyad's low weight and high level of systemic activity, it is understandable that the dyad and jointly weighted scores are less conflictual than the unweighted scores which depend only on the aggregated number of events.

Referring to the Z scores, we again note that both techniques' unweighted and especially the action-only weighted scores suggest more than the dyad and fully weighted scores do that the Middle East system of conflict became much more conflictual in 1954. This is explicable in part by the fact that the proportion of conflictual acts that occurred between Arabs and Israelis in 1954 increased over that of the previous year from .7 to .8. The increase in the proportion of conflictual events as well as the absolute number of events in 1954 would certainly increase the techniques' estimates of systemic conflict, especially when the action weights are multiplicatively introduced into the calculations of the conflict scores.

Nevertheless, the relatively low scores of the dyadic and jointly weighted scores must be explained. A partial explanation comes from the general reduction of dyad weights in the systemic dyads. While the 1953 to 1954 Israel-Egypt dyad weight changed from 4.5 to 5.3, the percentages of events that occurred between this important dyad (26%, 28%) we well as the proportion of conflictual events to the total number of Egyptian-Israeli events remained fairly constant between 1953 and 1954 (22% and 21%). Simultaneously, the weights of the Israel-Jordan dyad which accounted for 55% of the additional 62 events in 1954 declined from 2.1 to 1.9. The decline of the Israel-Lebanon and Israel-Iraq

dyads further supported this trend toward the reduced impacts of the system's other dyads in 1954 and hence contributed to the comparatively lower estimates of systemic conflict. With respect to the action and dyad weighted scores, we shall see later in this chapter than a geometric multiplier effect exists when heavily weighted dyads are participating in highly conflictual events. For now, it is sufficient to say that the generation of so many of the conflictual acts by dyads with low weights serves to moderate what otherwise would be descriptions of high conflict.

The year 1955 demonstrates how the inclusion of dyad and action weights in an analysis can yield additional information that is missed when one considers only the (unweighted) aggregate number of events. An analyst interpreting the annual event frequences or the Z scores of the descriptions of conflict would be forced to conclude that the same amount of conflict existed in the Middle East region from 1954 through 1955. A perusal of the 1954-1955 Z scores however shows vast divergences in the weighted scores of the additive and especially the vector conflict scores. By focusing only on the aggregate number of events and omitting the information gained by employing dyad and action weights, an analyst can lose much information. In 1952-1954, it was noted that low jointly weighted conflict scores were partially the result of low proportions of events occurring between heavily weighted dyads. But in 1955, we see a substantial increase in the weight of the Egypt-Israel dyad (1954 = 5.3; 1955 = 7.5). This increased dyad weight resulted from the end of the British arms ban to the Arab nations which occurred late in 1954. Egypt most enthusiastically capitalized on this availability of new arms to the Arabs. And this event coupled with the already high

and relatively constant [9]) level of Israeli weapons expenditures served to increase that dyad's weight relative to those of the other systemic dyads. Given this high dyad weight, the fact that such a large percentage of the total number of systemic events was generated by the Egypt-Israel dyad (i.e., 169/252 = 69%) insures that the dyad weighted scores describe the 1955 level of systemic conflict as very high.

Furthermore, the system of conflict changed dramatically in 1955. The proportion of cooperative events jumped from .19 in 1954 to .39 the next year. This increase in cooperative activity, while the total number of acts in 1954 and 1955 were almost equal (253, 252) accounts for the higher action weighted conflict scores in 1954 than in 1955. The concommitant rises in the levels of behavior at each end of the conflict continuum (i.e., low conflict as cooperation and high conflict) demonstrate that conflict can generate cooperation. Since the association is positive rather than negative, they are not on opposite extremes of the same dimension. While the increased proportion of cooperative activity was partially due to a moderation of Israeli conflict toward its newly armed (and more dangerous) adversaries, the point is that this sort of analysis would necessarily be omitted from any unweighted description of systemic activity.

In fact, the disposition of the system of conflict in 1955 appears to differ from that of the preceding years given the sudden increase in cooperative behavior, the increased weight of the Egyptian-Israeli dyad, and the concentration of acts generated by this powerful dyad. When we look at the cosines of the angles between the systemic vectors later in this chapter, we shall observe quantitative evidence of the changing distribution of events (i.e., more cooperative intra-Arab and more

conflictual Arab-Israeli behavior) that accompanied the emergence of the Egyptian-Israeli dyad to primacy in the Middle East arena and the impact of the increased dyad weight on the level of systemic conflict. For the time being, let me again reiterate the analytical importance of including information about dyads and actions in an analysis of international behavior.

The outbreak of the Arab-Israeli war on 30 October 1956 marked the culmination of the mounting hostilities that accompanied Nasser's harrassment of Israeli shipping and Egypt's nationalization of the British and French owned Suez Canal in the earlier part of the year. The unweighted additive figures for 1956 would lead us to believe that 1956 was a significantly more conflictual year in the Middle East than 1955. However, the weighted additive scores do not unanimously corroborate this interpretation. The dyad weighted and fully weighted scores suggest 1955 was a more conflictual year in the Middle East than 1956, while the action weighted scores support the view obtained by the unweighted scores. This same pattern of explanation is generally apparent with the vector analytic scores. Although the greater conflictual nature of 1956 is less noticeable in the unweighted and action weighted scores than in the additive analysis, the greater conflict of 1955 is more significant in the dyad and fully weighted scores.

These observations raise several important questions: (1) why does 1956 fail to appear unambiguously as the most highly conflictual year of the decade given the occurrence of a war (and all the presumed prefatory and concommitant conflict associated with war) in the year? (2) why specifically do the unweighted and action weighted additive conflict scores appear as more conflictual in 1956 than in the previous

year, while the jointly applied dyad and action weights are less than the 1955 figures? and (3) why do the unweighted and action weighted vector scores fail to clearly differentiate 1955 and 1956 while the dyad and fully weighted scores are so divergent? This final question will be extensively dealt with in later sections of this chapter. For the time being, let us turn our attention to the first two questions.

With respect to the questions of why the dyad and fully weighted additive scores describe 1956 as less conflictual than 1955, several possible answers may be considered. First, these conflict scores only incorporate non-violent conflict. Therefore, war, which has been defined as existing outside the system, is excluded. Second, I have noted that the Israeli seizure of the Suez Canal which sparked the inception of hostilities was encouraged by the English and French governments who immediately became militarily engaged in support of Israel. Consequently, much of the non-violent Arab conflict was directed at its more dangerous European adversaries in the United Nations [10] and consequently is excluded from the study. Third, in 1956 the strength of the Egypt-Israeli dyad had declined to 5.3 from the previous year's weight of 7.5. At the same time, the proportion of dyads weighted higher than 2.0 decreased from 1955 to 1956 from .71 to .59. In other words, while many nations were involved in the conflictual activities that preceded the war, many of the dyads had low weights. These conditions will result in descriptions of systemic conflict that are lower for dyad and fully weighted score than for unweighted and action weighted scores for reasons I have previously discussed. Finally, the unweighted additive score's failure to simultaneously analyze shifting internal distributions of cooperative and conflictual acts may cause a

researcher to overlook the intra-Arab cooperative alliance building and mending of fences that preceded the war. As a result, many of the 1956 events recorded in the data set are cooperative rather than conflictual. In fact, one might argue that the deterioration of Arab-Israeli relations (which was rapidly approaching a climax in 1955 and early 1956 with Nasser's nationalization of the Suez Canal) generated the highest amount of regional cooperation in the entire study [11]. With this high amount of systemic cooperation, it is less surprising that the fully weighted scores are less conflictual in 1956 than in the previous year.

These considerations are important because of their ramifications. Based on this analysis, 1956 was not as conflictual as 1955 when the different strengths of and distribution of types of activity among the participants are considered. On the other hand, given the definition of war as one event, and the exclusion of the events between the Arabs and England and France concerning the Middle East, plus the omission of the dialogue at the U.N., the validity of the results may be questioned. Nevertheless, I have demonstrated that additional information about international behavior is obtained when one considers dyad and action weights with either of the analytic techniques.

Test II: Inter-Technique Correlations

Table 7 consists of the correlations of the unweighted and weighted additive scores of Middle East conflictual behavior with their vector analytic counterparts. The purpose of this test as previously stated is to assess the extent to which the additive and vector analytic techniques measure the same phenomena when the influences of the different

TABLE 7

INTER-TECHNIQUE MIDDLE EAST CONFLICT SCORE CORRELATIONS

X	Y	r_{xy}	r^2
unweighted additive	unweighted vector	.969	.94
additive-dyad weights	vector-dyad weights	.981	.96
additive-action weights	vector-action weights	.975	.95
additive-dyad and action weights	vector-dyad and action weights	.980	.96

weights are controlled. A high correlation would allow one to argue that the two techniques, in fact, measure the same phenomena.

The figures presented in Table 7 indicate that the two techniques produce very similar descriptions of conflictual behavior in the Middle East. Even the lowest correlation (between the unweighted additive and vector analytic descriptions), allows the explanation of 94% of the variance of one description with knowledge of the other.

These high correlations provide a basis for serious criticism of the vector technique: if it is unable to provide descriptions of international behavior which are different than those obtained using the additive method, its superior sensitivity cannot be demonstrated. Furthermore, if vector descriptions do not diverge from additive scores, then there is no reason to engage in the laborious and more difficult calculations involved in the former.

Figure 10 demonstrates the relationship between the fully weighted scores of the additive (x - axis) and vector (y - axis) techniques [12]. These plotted points serve to raise an interesting question regarding whether the illustrated relationship is linear or curvilinear. If the relationship is linear, then the line of best fit (A) suggests that the years 1955 and 1968 are outliers. On the other hand, the curvilinear relationship suggested by line B would label 1967, the year of highest Middle Eastern conflict, an outlier [13].

Unfortunately, the appearance of only six years in the positive-positive quadrant of Figure 10 does not provide us with enough empirical information to choose one of these alternatives in light of the fact that the linear [14] ($r = .98$) and logarithmically transformed [15] ($r = .985$) relationships both offer very high degrees of fit and thus

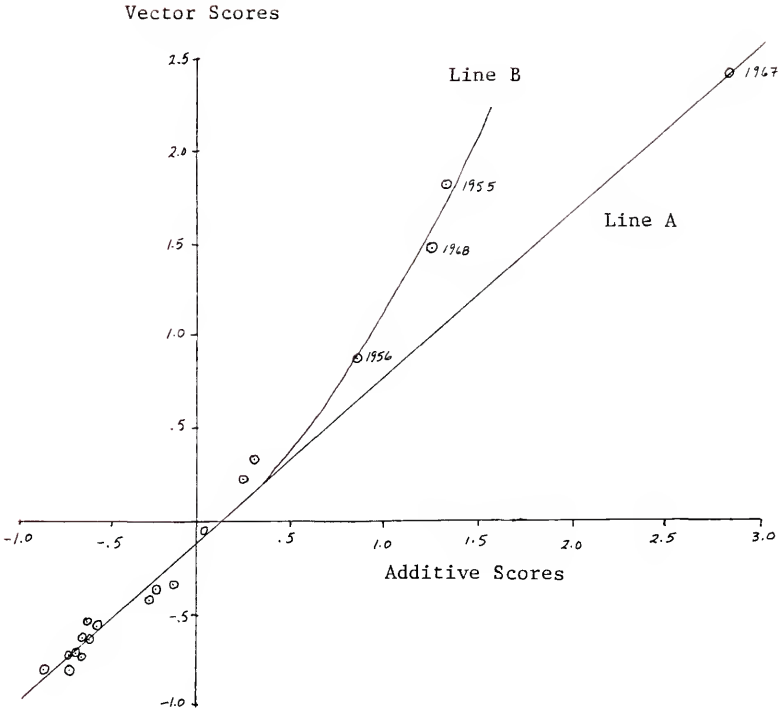


FIGURE 10

DYAD AND ACTION WEIGHTED MIDDLE EAST CONFLICT SCORES

plausibility of explanation. Therefore, this section must end having raised more questions that it has answered and suggesting to the reader that the answers to these questions will not be forthcoming until additional years of high levels of systemic conflict in the Middle East are analyzed.

Test III: Evaluation of Technique and Weighting Scheme Sensitivity

I have already suggested that one might employ a probabilistic perspective to establish a threshold of "high" conflict. Briefly, I argued that Middle East conflict during the periods of war (mid-1950's and 1967-8) was unusually high. Therefore, scores describing these years of high conflict should lie further from the mean conflict score than scores describing the other less conflictual years. I established the threshold as $\overline{X} = 1.746\sigma$. Since the average amount of conflict is set equal to zero, Z scores are used and those which are positive signify years of greater than average conflict. A Z score of 1.746 is such a great distance from the mean that one can only expect 5% of all systemic conflict scores to equal or exceed it [16].

The standardized scores of the levels of Middle East conflict (Table 8) are reproduced here to facilitate the evaluation of the abilities of the analytic techniques and the weights to sensitively describe patterns of international behavior.

The figures in Table 8 do not allow me to definitively conclude, however, that either analytic technique with or without the weighting schemes is a more sensitive method of describing patterns of international conflict. Each of the eight descriptions of Middle East conflictual behavior identifies 1967 as well beyond the 1.746σ criterion

TABLE 8

STANDARDIZED (Z) MIDDLE EAST NON-VIOLENT CONFLICT SCORES

Year	Additive No Weights	Dyad Wts. Only	Additive Action Wts. Only	Additive Dyad and Action Wts.	Vector No Wts.	Vector Dyad Wts. Only	Vector Action Wts. Only	Vector Dyad and Action Wts.
1951	-.19	-.25	-.25	-.29	-.27	-.41	-.31	-.42
1952	-.67	-.62	-.71	-.66	-.81	-.72	-.83	-.72
1953	.37	-.18	.39	-.15	.17	-.37	.14	-.35
1954	.91	.16	1.03	.24	1.37	.21	1.41	.23
1955	.91	1.41	.79	1.34	1.17	1.86	1.1	1.82
1956	1.74	1.04	1.51	.87	1.20	.89	1.18	.88
1957	.20	.33	.48	.30	.43	.34	.28	.33
1958	-.53	-.60	-.52	-.61	-.47	-.60	-.47	-.65
1959	-.66	-.64	-.67	-.63	-.67	-.57	-.66	-.55
1960	-.68	-.58	-.67	-.58	-.71	-.58	-.69	-.56
1961	-1.09	-.85	-1.11	-.86	-1.14	-.83	-1.12	-.80
1962	-.9	-.80	-.91	-.80	-.77	-.73	-.76	-.72
1963	-.76	-.78	-.75	-.64	-.71	-.64	-.69	-.62
1964	-.86	-.70	-.89	-.72	-.91	-.70	-.94	-.72
1965	-.87	-.69	-.86	-.70	-.91	-.71	-.91	-.71
1966	-.21	-.24	-.25	-.27	-.34	-.39	-.31	-.38
1967	2.4	2.83	2.43	2.88	2.06	2.42	2.1	2.45

discussed above. In fact, since all of the 1967 scores lie more than 2σ from the mean, one can conclude that the conflictual activity in the Middle East system of conflict was so intense that such violent behavior should occur less than 3% of the time. The important point here is that the threats, denunciations, accusations, and related non-violent conflictual activity that occurred in 1967 were observed by all the descriptions regardless of analytic technique or weighting scheme employed.

Despite the similarity of the 1967 descriptions, there is some room for optimism regarding the vector technique's superior sensitivity. In a previous section, I argued that 1955 was a more conflictual year than 1956 in the Middle East system of conflict [17]. Given the conflictual extent of 1955, we notice that only do the dyad weighted and dyad and action weighted vector scores surpass the 1.746 criterion with 1.86 and 1.82 respectively. This finding allows me to offer a tentative suggestion that a multiplier effect is present in 1955 (i.e., strong nations in high degrees of conflict) and this most dramatically affects the vector technique.

But I do not believe that the unweighted additive description of 1956 Middle East conflict which is alone in meeting the 1.746 criterion allows one to attribute this same type of sensitivity to the additive approach. The fact that this score is unweighted means that the high percentage of cooperative acts in 1956 are treated the same way as conflictual acts and therefore serve to inflate the score. Furthermore, if we accept the vector technique to be as sensitive to the high level of conflict as the additive technique based on its treatment of the preceding year, then the failure of the unweighted 1956 vector

description to exceed 1.746σ further raises questions about the unweighted additive technique's interpretation of 1956 as highly conflictual. Finally, if the additive method were as sensitive as the vector technique, one would expect the dyad weighted and fully weighted (i.e., dyad and action) additive scores to exceed the 1.746 criterion as do the similarly-weighted vector counterparts. But they do not.

Test IV: Analysis of the Cosine of the Angle Between Systemic Conflict Vectors

One previously mentioned advantage of the application of vector algebra to the analysis of international behavior is that the cosines of the angles between the vectors that describe systemic conflict at given points of time allow the researcher to examine the distribution of patterns of conflict within the system. Additive analyses of international conflict have been criticized for focusing exclusively on the aggregate level of systemic conflict. While total levels of conflict are obviously important keys to understanding changes in systemic behavior, they may remain unchanged while intra-systemic shifts in the patterns of dyadic conflict are occurring. In fact, I have already noted that the unweighted additive analysis descriptions of 1954 and 1955 as years of equal levels of conflict may be misleading inasmuch as they obscure the increased proportion of cooperative acts in 1955. It also conceals a sudden shift to the pre-eminence of the Egypt-Israeli dyad with respect to its increased activity (67% of the total number of events in 1955 vs. 27% in 1954) and that dyad's increased system weight (from 5.3 to 7.5). Therefore, the unweighted additive approach lacks a framework for directing the researcher's attention to patterns of intra-systemic instability that may occur independently of

periods exhibiting noticeably large changes in the aggregate level of conflict.

The cosine of the angle between two vectors that describe a system at two points in time is equivalent to the Pearson correlation coefficient (r) between these system descriptions. High correlations denote a continuity in the dyad's relative levels of conflictual or cooperative behavior. Therefore, stability does not necessarily indicate cooperation since a highly conflictual system can remain stable if characterized by continuously similar patterns of behavior (i.e., consistent distributions of actors and actions) over a period of time. This correlative approach permits the post hoc identification and evaluation of the impact of systemic events and/or parametric stimuli which cause significant increases or decreases in the levels of conflict and/or changes in the (internal) distribution of conflict among the system's dyads. In other words, such events which substantially alter the levels of dyadic conflict and the distribution of dyadic conflictual activity from year to year should be reflected by a decrease in the correlation coefficients between the successive annual descriptions of the system. It should be noted, however, that these cosines can only indicate that something has affected the system. They cannot identify the cause. This interpretation is left to the analyst.

Presented in Table 9 are the cosines of the angles between the fully weighted systemic conflict vectors. The unweighted and singularly weighted vectors produce significantly similar correlations and have therefore been omitted from this presentation for the sake of parsimony.

Using these figures to discuss systemic stability necessitates the arbitrary selection of minimum criteria for levels of "moderate

TABLE 9

COSINES OF THE ANGLES BETWEEN DYAD AND ACTION WEIGHTED SYSTEMIC CONFLICT VECTORS

Year	Cos θ = r	r^2
1951-1952	.87	.76
1952-1953	.989	.81
1953-1954	.997	.99
1954-1955	.865	.75
1955-1956	.993	.99
1956-1957	.989	.98
1957-1958	.855	.73
1958-1959	.777	.60
1959-1960	.982	.96
1960-1961	.771	.59
1961-1962	.692	.48
1962-1963	.971	.94
1963-1964	.797	.64
1964-1965	.788	.62
1965-1966	.706	.50
1966-1967	.704	.50
1967-1968	.968	.94

stability" and "high stability." If we set these criteria so that the squared correlation coefficients (r^2) are .7 and .9 respectively, we observe the period of 1951-58 as a stable period, although the only prolonged period (i.e., more than one year) of high stability during the entire 18-year analysis occurs from 1955-57. Thus, we can infer from these figures that the pattern of Arab-Israeli conflict in the Middle East was consistent during the early 1950's and directly after the 1956 war (until 1958).

If we examine this eight-year period more closely, however, we can observe the value of the vector technique in the analysis of intra-systemic patterns of behavior. In my discussion in the section of Intra-Technique correlations (Test I), I identified 1955 as a year which was a major increase in the weight of the Egypt-Israel dyad and the proportion of events that transpired between these nations relative to the remaining 14 dyads. The reason for this shift appears to have been the abrogation of the English arms ban to Arabs at the end of 1954. Besides encouraging Egypt to increase the size and destructive capability of its arsenal, it encouraged Israel to attempt to ameliorate its deteriorating relations with this adversary (demonstrated by the previously mentioned marked increase in systemic cooperative behavior). The noticeable decline of the squared correlation coefficient in 1954-1955 to .75 demonstrates the dramatic reorientation of Egypt's struggle with Israel dominated the Middle East from 1955 through the 1956 war. During the following year, the weight of the Egypt-Israel dyad (6.5) was still the highest of the 15 dyadic weights, and that dyad's proportion of acts (.41) had only declined .02 from the previous year. In other words, the Middle Eastern system of conflict crystallized in

its 1955 state and remained very similar for three more years until 1958 when the system of conflict began to undergo significant internal change.

The years from 1958 to 1967 fail to show a prolonged period of stability. We observe 1961-62, 1965-66, and 1966-67 as the periods of greatest instability, when knowledge of the distribution of systemic conflict scores for the first year cannot explain more than 50% of the variance of the second year. During each of these time periods, significant events occurred to greatly change the magnitude and distribution of systemic conflict. In 1961, the disintegration of the Egyptian-Syrian U.A.R. occurred while Nasser found himself increasingly at odds with the conservative Arab regimes in Jordan and Iraq [18]. In 1965, an Arab summit achieved a reduction of inter-Arab strife and rekindled anti-Israeli hostility as the principal unifying force. Of course, the surprise attack by the Israelis in the 1967 Six Day War represented a parametric stimulus which generated a significant departure from the previous system state [19]. This departure is reflected by the relatively low squared correlation coefficient ($r^2 = .50$).

These figures show that extended periods of high conflict and mutual suspicion serve to solidify alliances and patterns of hostility; while periods of relative cooperation witness alliance shifting and even dissolution due to mutual recriminations and/or the reassertion of more parochial national priorities. This sytemic stability of 1952-1958 was characterized by high levels of Arab-Israeli conflict: Gamal Abdul Nasser's ascension to the Egyptian Presidency (1952), the imposition of Suez and Gulf of Aqaba blockades by Egypt against Israel,

forced boardings of Israeli ships, and general preparations for war. In the face of the impending war, new intra-Arab alliance commitments were made and existing ones strengthened [20] while Arab-Israeli accusations and counter-accusations proliferated. Thus inter-Arab solidarity coupled with high Arab-Israeli conflict maintained systemic stability for one year after the 1956 war, and also between 1967 and 1968.

The unravelling of the intra-Arab alliance and the reduction of anti-Israeli conflict during 1957-1967 were largely due to inter-Arab squabbling, their heightened attention to domestic problems neglected during and caused by the war, and their financial inability to mount another war. Thus Arabs were not only continuously hostile to Israel, but they were hostile to each other [21] as well. And the fact that this hostility among the Arab nations was an intermittent phenomenon partially resulted in the systemic instability (i.e., changing intra-systemic distributions of conflict) between 1958 and 1967.

These findings demonstrate the applicability of a vector analytic framework to describe patterns of intra-systemic behavioral stability. In this case, just because the additive and vector techniques describe low levels of aggregate conflict from 1958-1966, the reader should not be fooled into assuming that the region was "asleep."

A Concluding Note

We have seen in the analysis above that the unidimensionality assumption (i.e., that all systemic behavior can be expressed in

terms of varying degrees of conflict) results in problematic interpretations of systemic activity at the aggregate level of analysis. Briefly, I argued in Chapter II that an individual event could be placed on a low to high conflict continuum to evaluate its level of conflict. I then assumed that this treatment of individual events could be translated to the aggregate level. However, this assumption is apparently invalid, since at the aggregate level some dyads simultaneously generate cooperative and conflictual events, while the interactions of others may be almost exclusively cooperative or conflictual. Consequently, the aggregation of cooperation and conflict results in the loss of information about the patterns of each. For example, heightened Israeli conflict with Egypt prior to the 1967 war, motivated Egypt to ameliorate its relations with other Arab nations by initiating the cooperative events. The specification of all this behavior as conflict is misleading. Thus to exclude cooperation as an independent dimension of the analysis obscures information about international systems of behavior. This unidimensionality assumption should therefore be abandoned at this point.

Furthermore, we have seen that the findings of this chapter do not confirm the hypothesized superiority of the vector technique. In the first place, I argued that the vector scores would be more noticeably affected by the application of dyad and action weights than the additive technique. However, the high intra-technique correlations demonstrated that the weights did not affect the vector scores more significantly. Second, the inter-technique correlations,

which controlled for the impacts of the different weighting schemes on the analytic techniques, were high. In light of the more complex calculations and greater time necessary to generate vector scores, the discovery that the two techniques produce similar descriptions of systemic activity opens the vector technique to the criticisms that it is not worth the additional effort. On the other hand, the vector approach provides a methodology for assessing intra-systemic stability; and when weighted for dyadic and action intensity impact, it is able to identify 1955 as a highly conflictual year. Thus, even when the magnitude of vector descriptions are similar to their additive counterparts, vector algebra is still a valuable tool of analysis.

Therefore, at this point, one should certainly view the hypothesized superiority of the vector technique with skepticism.

Notes

[1] This chronology has been abstracted from The Middle East: U.S. Policy, Israel, Oil and the Arabs. Published in 1977 by Congressional Quarterly, it provides the most comprehensive coverage of events in the region found to date by the author.

[2] $Z = \frac{X_i - \overline{X}}{S}$ where X_i is each individual conflict score; $\overline{X}$ is the average of all X_i observations; and S is the standard deviation of the X_i observations.

[3] Since each technique is used to analyze the same data base, one should not expect their descriptions to be too divergent. Therefore, a moderate correlation is defined as one, which when squared explains less than 75% of the statistical variation of the relationship between thw two variables (weighting schemes) under consideration. In order to generate an r^2 of .75, r must equal .866.

[4] The independently weighted scores produce similar graphs. They have been excluded for the sake of parsimony and readability.

[5] The exceptions to this generalization are found on Figure 2 (Vector Scores) in 1956 and 1968. We will see in the latter sections of Chapter V that these smaller divergences between the unweighted and jointly weighted vector scores during these years of great conflict are due to the fact that the weights and distribution of conflict affect the vector scores more than the additive scores.

[6] Based upon my interpretation of Blechman's action categories, I have identified categories 1-10 as cooperative and 11-21 as conflictual. The part of Blechman's categories in question appears below. The entire categorization appears in Chapter III, pages 64-65.

Category	9 Request	--	Ask for information or assistance	Cooperation
	10 Propose	--	Offer proposal	
	11 Reject	--	Refuse, oppose	Conflict
	12 Accuse	--	Charge, criticize, blame, denounce	

[7] In 1952, 36% of the Israeli-Egyptian events were conflictual. In 1953, the percentage more than doubled to 78%.

[8] The 1952-1953 percentage of cooperation events between Israel and Jordan increased from 22 to 33.

[9] Egyptian and Israeli military expenditures (SIPRI, 1973b: 138-239) in U.S. and U.S. $ mn, at 1970 exchange rates.

	Egypt	Israel
1954	165.7	31.7
1955	249.8	34.0

[10] Egypt, Israel, England and France all brought their cases to the General Assembly.

[11] Fifteen percent of the total number of events in 1956 involved intra-Arab cooperation. This high level is unprecedented in the study. Forty-two percent of all intra-Arab events in 1956 were cooperative.

[12] The graph of fully weighted scores is generally similar to those without weights and those which are independently weighted.

[13] The ramifications raised by these alternatives are important. A linear relationship with such a high degree of fit makes the complicated vector approach appear unnecessary from the standpoints of increased information and parsimony. Furthermore, while the reconciliation of such conflictual years as 1955 and 1968 remains problematic (perhaps indicating the existence of heteroschedasticity in describing situations of high conflict), the contention that periods of high conflict are linearly related to periods of low conflict suggests that both techniques are equally applicable to the study of conflict. If, on the other hand, this relationship is in fact curvilinear, we must deal with another important consideration. In other words, if periods of low and high conflict are geometrically rather than arithmetically related, then the vector technique may indeed be a more accurate way of studying and describing patterns of high conflict for reasons I will discuss under the heading of Test IV.

[14] $b = .92$; $a = -.02$ (linear)

[15] $b = 1.05$; $a = -1.6$ (log transform)

[16] This assumes a normal distribution with two-tails ($p = .05$ each). In fact, the distribution of conflict scores is slightly skewed in the direction of low conflict.

Technique	Weights	$\leq -1\sigma$	$-1\sigma < Z < 0$	$0 < Z < 1\sigma$	$\geq 1\sigma$	$\geq 2\sigma$
Additive	None	1	10	5	1	1
	Dyad	0	12	2	3	1
	Action	1	11	3	2	1
	Dyad & Action	0	12	3	2	1
Vector	None	1	10	2	4	1
	Dyad	0	12	3	2	1
	Action	1	10	2	4	1
	Dyad & Action	0	12	3	2	1

[17] Some of the reasons for this contention are: (1) that much of the Arabs' hostility was directed at England and France rather than at Israel; (2) the violent activity (Category 22) synonymous with war is defined as existing outside the system of conflict and is not represented in these figures; and (3) a much greater amount of the activity in 1956 was cooperative (i.e., intra-Arab alliance building in preparation for war) than it was in 1955.

[18] Between 1961 and 1965, there was substantial intra-Arab conflict in the Middle East. Iraq and Syria endorsed the principle of mutual cooperation (and moved further away from Egypt) on 16 March 1962. In August, 1962, Syria accused the U.A.R. of interference in its internal politics. In 1963, Nasser denounced move to unit Egypt with Syria and Iraq, and Jordanians demonstrated in support of federation with Egypt.

[19] Significant intra-Arab conflict occurred in 1967. As few as two weeks before the outbreak of the June war, Jordan closed Syria's embassy and expelled its ambassador. During the last three months of 1966, King Hussein of Jordan criticized Egyptian interference in Syrian affairs, Syria called for the overthrow of King Hussein, and Syria impounded a Western owned Iraqi Petroleum Company.

[20] In the year before the 1956 War, alliances were made between Egypt and Syria (October 20, 1955) and strengthened on December 26 of that year when their military commands were unified. In 1956, defense pacts were announced between Syria and Jordan, Syria and Egypt, Jordan and Egypt, and Lebanon and Jordan.

[21] Between 1957 and 1967, there were numerous instances of intra-Arab conflict. On April 13, 1957, Syria attacked Jordan, and less than two months later, Egypt's military attaché was expelled from Jordan. The merger of Egypt and Syria (U.A.R.) in 1958 lasted only three years and ended amid great recriminations. Meanwhile (1958) Jordan severed relations with the U.A.R. and Iraq. In 1960, Jordan rejected a U.A.R. call for a Palestinian entity. In 1964, Iraq and Syria cancelled a military treaty and in 1965, Syria criticized other Arab nations for not standing with Syria against Israel.

CHAPTER VI

PRESENTATION AND ANALYSIS OF NATO-WARSAW PACT COOPERATIVE AND CONFLICTUAL DATA

In the analysis of the Middle East system of conflict, I showed that my initial assumption about the unidimensionality of cooperation and conflict was untenable in light of the data. Briefly, I observed individual dyads involved in cooperative and conflictual behavior. The addition of cooperation and conflict along the same dimension obscured the patterns of each type and behavior. Second, Arab dyads generated cooperative behavior such as alliance building in response to the deterioration (i.e., increasing conflict) of Arab-Israeli relations and third, conversely, intra-Arab non-violent conflict increased in the aftermath of the Arab-Israeli wars. Thus, if dyads simultaneously pursue cooperative and conflictual behavior, then the explanation of Middle East behavior solely in terms of conflict may result in an inadequate description of systemic behavior.

A second major finding in the previous chapter concerned the impacts of the dyadic and action weights on the additive and vector analytic techniques. The action weights failed to provide descriptions of systemic behavior that were substantially different than those obtained without the weights (although this generalization is slightly less true with respect to the vector technique's scores). I also showed that the dyad weighted scores consistently diverged from the

unweighted scores and that the dyad weights appear to have "caused" the lower correlations between the unweighted and jointly (i.e., dyad and action) weighted conflict scores.

Based on these findings, I have made two alterations to the content and thrust of the analysis of the NATO-Warsaw Pact data [1]. First of all, instead of assuming that cooperation and conflict lie on the same dimension, I will treat them as independent dimensions of international systemic behavior. This alteration should produce a more complete analysis of NATO-Warsaw Pact cooperation and thereby circumvent the problems associated with only examining conflict. Furthermore, the treatment of cooperation and conflict as independent dimensions is consistent with the findings of those who have factor analyzed the patterns of international behavior (Kegley, 1971:364; East and Gregg, 1967:265; Rummel, 1968a:211-250 and 1969a:413; Russett, 1967:199; and Wright, 1964:170) [2].

The structure of the data describing NATO-Warsaw Pact interactions provides some support for this two-dimensional view, as can be seen in Tables 10 and 11.

In Tables 10 and 11, we observe that the relationship between cooperation and conflict is at best moderate (i.e., r = .54 in the unweighted additive analysis) and usually quite low, with correlation coefficients ranging from -.15 to -.25. In order to argue that variables are located on a single dimension, they must be highly correlated in the negative direction. This negative correlation would mean that an increase in conflict would be accompanied by a decrease in cooperation and vice-versa. But although three of the correlations above are negative, they are so low that none is statistically significant. The

TABLE 10

CORRELATIONS BETWEEN UNWEIGHTED COOPERATION AND UNWEIGHTED CONFLICT [3]

Analytic Technique	r (Cooperation & Conflict)	r^2
Additive	.54	.29
Vector	-.25	.06

TABLE 11

CORRELATIONS BETWEEN JOINTLY WEIGHTED COOPERATION AND CONFLICT

Analytic Technique	Variable X	Variable Y	r	r^2
Additive	Cooperation	Conflict	-.15	.02
Vector	Cooperation	Conflict	-.24	.06

data suggest that the relationship between cooperation and conflict is consistent with the two dimension (i.e., independent) assumption. In fact, the only statistically significant [4] coefficient (r = .54) supports the view that conflict and cooperation may occur together and, therefore, cannot be opposite ends of the same dimension.

The second alteration in this analysis pertains to the number of weighted schemes I plan to employ. In Chapter V, the unweighted, singularly weighted, and jointly weighted additive and vector generated scores resulted in eight descriptions of behavior. The treatment of conflict and cooperation as independent dimensions would in turn double the number of analyses to sixteen. But given the need for parsimony, I will only present the unweighted and jointly weighted additive and vector descriptions of NATO-Warsaw Pact cooperation and conflict. Hence, this scheme will also result in eight descriptions of behavior [5].

But before I present the descriptions of NATO-Warsaw Pact cooperation and conflict from 1955 to 1970, it is important to familiarize the reader with the general kinds of events between the involved nations. What follows is a chronology of noteworthy [6] events.

Chronology: 1955-70

1955

Czechoslovakia ends state of war with Germany.

Soviet Union and seven East European nations announce formation of united military command if W. Germany rearms.

E. Germany announces 11-fold increase of tolls on roads to W. Berlin.

E. Germany arrests hundreds of alleged British spies.

W. Germany joins NATO.

Soviet Union, Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, and Romania sign mutual defense treaty at Warsaw.

France breaks trade relations with Romania.

First British naval vessels visit Polish ports since World War II.

Britain, France, Czechoslovakia, and Canada (and U.S., U.S.S.R.) meet to discuss peaceful uses of nuclear energy.

East and West Germany agree to enter all-German team in Olympic games.

1956

East Germany army integrated into Warsaw command.

West Germany grants permission for 160,000 Czechs of German descent to settle in West Germany.

Hungarian rebellion.

Britain and France agree to accept all Hungarian refugees.

1957

East Germany and Poland decrease the sizes of their armed forces.

British white paper shifts its dependence to nuclear weapons in case of an attack.

NATO members receive three types of missiles from U.S.

Soviet Union announces successful ICBM flight.

Soviet Union announces successful satellite launching.

U.S. announces first successful ICBM flight.

1958

U.S. announces first successful satellite launching.

West Germany signs trade and repatriation pact with Soviet Union.

NATO reduces exports of strategic goods to Eastern Europe.

NATO announces deployment of new short-range missile.

Soviet Union proposes end of Allied administration of West Berlin and demands that the city be demilitarized and opened as a free city. This demand is rejected by the Allies.

NATO pledges support of Allies in West Berlin.

1959

U.S. trucks detained by East Germany in East Berlin. Allied summit with Soviet Union regarding West Berlin fails.

Italy receives ICBMs from U.S.

NATO unanimously declares to preserve freedom of West Berlin.

Warsaw Pact nations announce perceptions of a greater possibility of reducing world tensions.

East and West Germany advise U.S., U.S.S.R., France, and Britain about Berlin at Geneva summit. Khrushchev eventually withdraws ultimatum.

NATO withdraws 200 fighter-bombers from France who refuses further commitment pending resolution of trade problems with Europe.

Greece rejects 20-year non-aggression pact with Bulgaria.

Khrushchev announces that reciprocal concessions can lead to East-West "peaceful coexistence."

East-West Conference temporarily postponed due to certain disagreements.

1960

Integration of U.S.-French-British task force with nuclear weapons.

East and West limit movement in Berlin.

U-2 shot down, Soviet Union threatens rocket retaliation against U-2 bases, U.S. suspends U-2 flights.

NATO declares solidarity.

Khrushchev states that East-West war is not inevitable.

East German-West German trade pact signed.

East Germany restricts West German access to West Berlin; West Germany cancels trade pact; U.S., Britain, and France warn Soviet Union against restricting air space to West Berlin.

East Germany-West Germany trade pact signed.

1961

NATO decides to counter global as well as European threat of the Soviet Union.

Khrushchev cancels reduction of Soviet army and increases defense spending by 25%.

East European nations denounce West's administration of Berlin.

NATO intensifies consultations regarding Berlin.

Berlin border sealed.

Britain and France protest border sealing to East Germany.

DeGaulle espouses use of force if necessary to defend Berlin.

U.S.-Soviet tank confrontation across Berlin border.

1962

Bulgarian reconaissance plane crashes in Italy.

Seventeen nations meet to discuss test ban but no treaty is reached due to disagreement about inspection.

East Europe announces plans to further integrate their economies with Soviet economy.

East Germany (and Soviet Union) demand Berlin solution.

1963

France rejects British EEC membership.

West Berlin mayor Brandt cancels East Berlin talks.

U.S. proposes multilateral NATO nuclear force. Britain, West Germany and five other NATO signatories agree.

Partial nuclear test ban treaty.

France withdraws naval bases from NATO; refuses to ratify test ban.

U.S. promises in Germany to "risk (our) cities to defend yours" (West Berlin).

Canadian-Bulgarian wheat deal.

Canada calls for stronger NATO alliance.

West Germany and East Germany agree on Christmas passes to West Berlin for East Berliners.

1964

Warsaw Pact protests NATO force in Cyrpus.

Two U.S. planes shot down by Soviet Union over East Germany.

Khrushchev tells Soviet workers that the aim of communism is the "good life" rather than revolution.

Canada and Hungary establish diplomatic relations and sign a trade pact.

Britain and France denounce East Germany's frienship treaty with the Soviet Union.

Greece and Bulgaria drop mutual territorial claims.

Khrushchev deposed.

1965

France calls for NATO reorganization.

France experiences discord with West Germany; withdraws all representatives from EEC; protests reconnaisance of its nuclear facilities by the U.S.

France sets 1969 for its withdrawal from the integrated NATO force.

Soviet Union announces plans to strengthen Warsaw Pact members.

Announced that NATO planes carry nuclear weapons.

East-West Germany issue Berlin Christmas passes.

France ends boycott of EEC.

1966

France withdraws military from NATO: cuts military payments to NATO.

NATO (except France) reaffirms alliance and military integration.

East Germany proposes re-unification talks with West Germany.

West Germany accepts East Germany proposal.

French-Polish cultural and scientific cooperation agreement.

West Germany parliament suggests German re-unification with Soviet troops remaining.

Soviet Union calls for East-West conference.

East Germany cancels re-unification talks with West Germany.

Warsaw Pact invites NATO to discuss European cooperation and security.

NATO announces nuclear inventory of 7,000 warheads.

Soviet Union, United States, and 26 other European nations sign ban on space warfare.

NATO calls for reduced East-West tension.

First major East-West trade increase since World War II.

1967

Britain reduces defense budget and overseas troop commitments due to economic problems.

West German-Romanian trade pact.

East Germany parliament unanimously calls for negotations with West Germany.

Twenty-four European nations meet in Czechoslovakia to renounce use of force and pledge non-interference in each other's internal affairs.

West German-Czechoslovakian trade/consular pact.

French-Polish cooperation pact.

NATO criticizes French massive retaliation proposal as obsolete; establishes joint destroyer force.

1968

Britain increases troop and financial commitment to NATO.

DeGaulle visits Romania.

East Germany imposes travel restrictions to West Berlin on West Germany; France, Britain, and West Germany protest.

NATO calls for mutual and balanced reduction of force talks with Warsaw Pact.

Nuclear Non-Proliferation Treaty announced.

Warsaw Pact terms Czechoslovakian political liberalization "unacceptable"; holds military exercises on Czech border.

Czechoslovakian-Romanian friendship pact.

Czechoslovakia invaded by Soviet Union, East Germany, Bulgaria, Hungary, and Poland.

NATO announces that mutual and balanced reduction of force talks are endangered by Czech invasion.

Soviet Union warns West Germany to change its East Germany policy or "face the consequences"; U.S., France, and Britain threatened armed response; NATO warns Soviet Union against intervention in Europe.

Albania formally withdraws from Warsaw Pact.

NATO announces plans to increase its strength.

1969

East Germany bans West German travel to West Berlin; France and Britain protest to East Germany.

Soviet Union clashes with China.

NATO decides to approach mutual reduction of force talks with caution.

DeGaulle resigns Presidency after losing referendum.

Nixon announces visit to Romania, first Presidential visit to a communist nation since World War II; following the visit, Romania's president calls for the independence of national communist parties.

Canada drops nuclear role in the defense of Europe and withdraws its forces from Europe.

Czechoslovakia further restricts trade to West.

1970

West Germany and Poland hold talks and eventually sign cooperation pact.

Powers discuss Berlin; East Germany and West Germany confer.

NATO invites Warsaw to discuss mutual and balanced reduction of force; European Security Conference.

Soviet Union and West Germany renounce the use of force; Warsaw Pact endorses treaty.

New East-West German talks on normalizing relations; talks stall when East Germany demands reduced West German presence in Berlin.

German normalization talks resume.

NATO decides to increase its strength.

Polish-West German non-aggression pact.

East Germany imposes travel restrictions to West Berlin, then removes restrictions.

Tables 12-15 present the raw and standardized (Z) cooperation and conflict scores produced by the unweighted and weighted additive and vector analytic techniques. These scores describe the levels of cooperative and conflictual behavior of the 84 NATO-Warsaw Pact dyads from 1955-70. The same tests that I used to assess the validity and sensitivity of the techniques and weights in Chapter V will also be employed here.

TABLE 12

UNWEIGHTED RAW SCORES

Year	Cooperation Additive	Cooperation Vector	Conflict Additive	Conflict Vector
1955	2	1.4	5	2.2
1956	17	4.4	9	3.0
1957	11	4.1	7	3.0
1958	81	8.9	27	6.0
1959	6	2.4	7	2.6
1960	6	2.8	15	4.6
1961	1	1.0	11	3.9
1962	21	5.1	7	3.6
1963	18	5.1	9	3.3
1964	26	6.9	7	3.0
1965	18	5.3	6	2.8
1966	35	13	7	3.0
1967	17	4.6	3	1.7
1968	18	5.7	19	5.6
1969	19	7.7	7	3.6
1970	30	14.8	0	0
	$\overline{X} = 20.38$	$\overline{X} = 5.83$	$\overline{X} = 9$	$\overline{X} = 3.24$
	$\sigma = 18.74$	$\sigma = 3.81$	$\sigma = 6.54$	$\sigma = 1.43$
	Total Cooperation = 326		Total Conflict = 144	

Total N = 470

TABLE 13

UNWEIGHTED Z SCORES

	Cooperation		Conflict	
Year	Additive	Vector	Additive	Vector
1955	-.98	-1.15	-.61	-.73
1956	-.18	-.37	0.	-.17
1957	-.5	-.45	-.31	-.17
1958	3.23	.81	2.75	1.93
1959	-.77	-.9	-.61	-.45
1960	-.77	-.79	.92	.95
1961	-1.03	-1.26	.3	.46
1962	.03	-.18	-.31	.25
1963	-.13	-.18	0.	.04
1964	.3	.29	-.31	-.17
1965	-.13	-.13	-.46	-.31
1966	.78	1.89	-.31	-.17
1967	-.18	-.31	-.91	-1.08
1968	-.13	-.03	1.53	1.65
1969	-.07	.5	-.31	.25
1970	.51	2.36	-1.38	-2.27

TABLE 14

WEIGHTED RAW SCORES [5]

	Cooperation		Conflict	
Year	Additive	Vector	Additive	Vector
1955	139	130	739	476
1956	2423	690	931	499
1957	1027	491	3144	1653
1958	1218	236	3675	981
1959	260	159	910	704
1960	276	156	2712	1040
1961	62	62	1041	446
1962	975	261	1098	582
1963	930	273	1296	642
1964	788	256	507	360
1965	1088	339	309	143
1966	2261	994	578	286
1967	1014	297	77	48
1968	947	314	1064	599
1969	911	349	985	539
1970	1618	830	0	0
	$\overline{X} = 996$	$\overline{X} = 365$	$\overline{X} = 1192$	$\overline{X} = 562$
	$\sigma = 674$	$\sigma = 261$	$\sigma = 1066$	$\sigma = 410$

TABLE 15

WEIGHTED Z SCORES

	Cooperation		Conflict	
Year	Additive	Vector	Additive	Vector
1955	-1.27	-.9	-.42	-.21
1956	2.12	1.17	-.24	-.15
1957	.05	.35	1.83	2.66
1958	.33	-.49	2.33	1.02
1959	-1.09	-.79	-.26	.35
1960	-1.07	-.8	1.43	1.17
1961	-1.39	-1.16	-.14	-.28
1962	-.03	-. 4	-.09	.05
1963	-.10	-. 35	.10	.20
1964	-.31	-. 42	-.64	-.49
1965	.14	-. 10	-.83	-1.02
1966	1.88	2. 41	-.58	-.67
1967	.03	-. 33	-1.05	-1.25
1968	-.07	-. 20	-.12	.09
1969	-.13	-. 06	-.19	-.06
1970	.92	1. 78	-1.12	-1.37

Test I: Intra-Technique Correlations

In the previous chapter, I explained that despite divergences of system state descriptions in highly conflictual years, the weighting schemes were highly correlated (additive: .93 to .997; vector: .92 to .995) and thus offered less additional insight into and information about the patterns of international behavior than had been predicted. I also noted that, although one must probe beyond the aggregate view of the impact of the weighting schemes given by a correlation coefficient, high correlations and high r^2s mean that one can explain much of the variance of fully weighted conflict scores by knowing the unweighted scores.

Let us now consider the additive and vector intra-technique correlations in Tables 16 and 17 to determine the extent to which the weighting schemes generate different descriptions of NATO-Warsaw Pact behavior when applied to the different analytic techniques.

Tables 16 and 17 contain an important finding and at the same time raise several salient questions about the impacts of weighting schemes on the scores of the different analytic techniques. None of the four correlation coefficients shown in the two tables match the high correlations presented in the previous chapter. Weighting cooperation and conflict furnishes the researcher with a substantially different description of (and perhaps different insight into) the pattern of NATO-Warsaw Pact behavior than would be obtained without dyad and action weights. Furthermore, this finding appears in the scores computed by both analytic techniques. Therefore, we can conclude that the weights' impacts are not solely due to their application to a particular analytic technique.

TABLE 16

INTRA-TECHNIQUE CORRELATIONS
(UNWEIGHTED-WEIGHTED COOPERATION AND CONFLICT)
ADDITIVE TECHNIQUE

X	Y	r	r^2
Unweighted cooperation	Weighted cooperation	.457	.21
Unweighted conflict	Weighted conflict	.713	.51

TABLE 17

INTRA-TECHNIQUE CORRELATIONS
(UNWEIGHTED-WEIGHTED COOPERATION AND CONFLICT)
VECTOR TECHNIQUE

X	Y	r	r^2
Unweighted cooperation	Weighted cooperation	.774	.60
Unweighted conflict	Weighted conflict	.511	.26

In discussing the impacts of the weights on the Middle East conflict scores of the two techniques, I was unable to say that one technique was significantly more affected by the impacts of the weights than the other, because the intra-technique correlations were consistently high and generally equal. It is again difficult to assess whether one technique is more influenced by the weights, but for a different reason. The intra-additive technique correlation of unweighted and weighted cooperation is much lower than the correlation between the additive conflict scores. However, this pattern fails to reappear in the intra-vector technique correlations where the divergence between the unweighted and weighted conflict scores exceeds that of the cooperation scores. Therefore, I cannot conclude that the weights consistently affect one analytic technique and/or one mode of behavior (i.e., conflict/cooperation) more than the other.

Turning to the intra-vector technique correlations of unweighted and weighted cooperation and conflict (Figures 11 and 12 respectively), we notice that each graph has two years in which the unweighted and weighted descriptions of behavior diverge by more than one standard deviation (cooperation: 1956 and 1958; conflict: 1957 and 1968). And when we examine the distribution of NATO-Warsaw Pact cooperation in 1956 (Table 18), we begin to understand how the use of weighting schemes can result in descriptions of systemic behavior that are so different than non-weighted descriptions.

In 1956, England and France had higher levels of military expenditures than any other nation in this study [7]. Italy's levels of military expenditures were also relatively high [8]. Therefore, all the

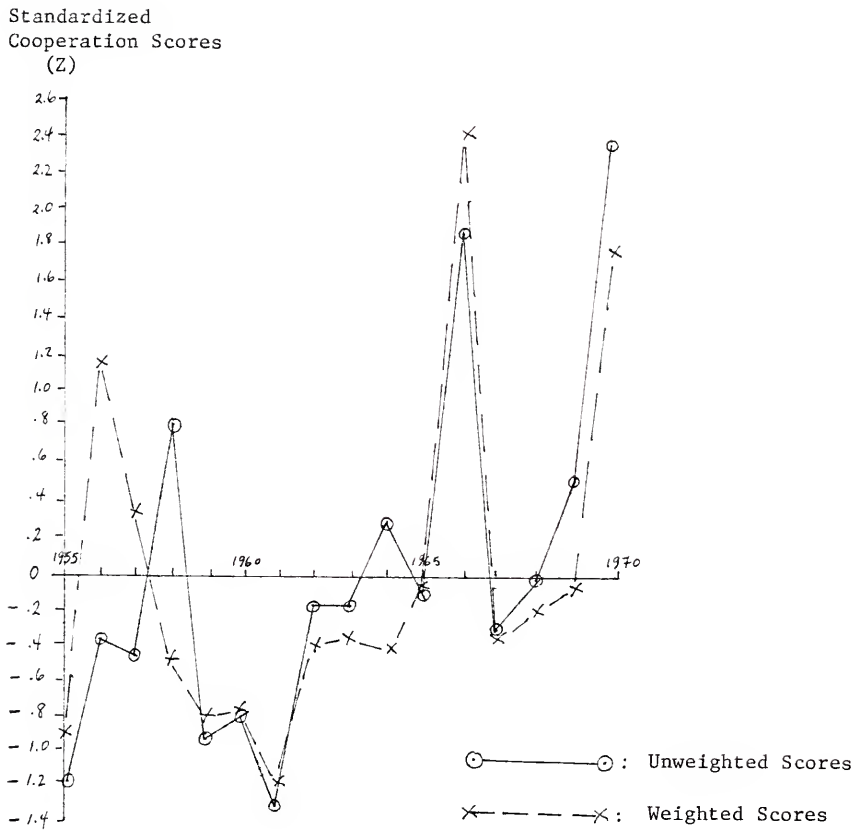


FIGURE 11

UNWEIGHTED VECTOR COOPERATION AND WEIGHTED VECTOR COOPERATION, 1955-1970

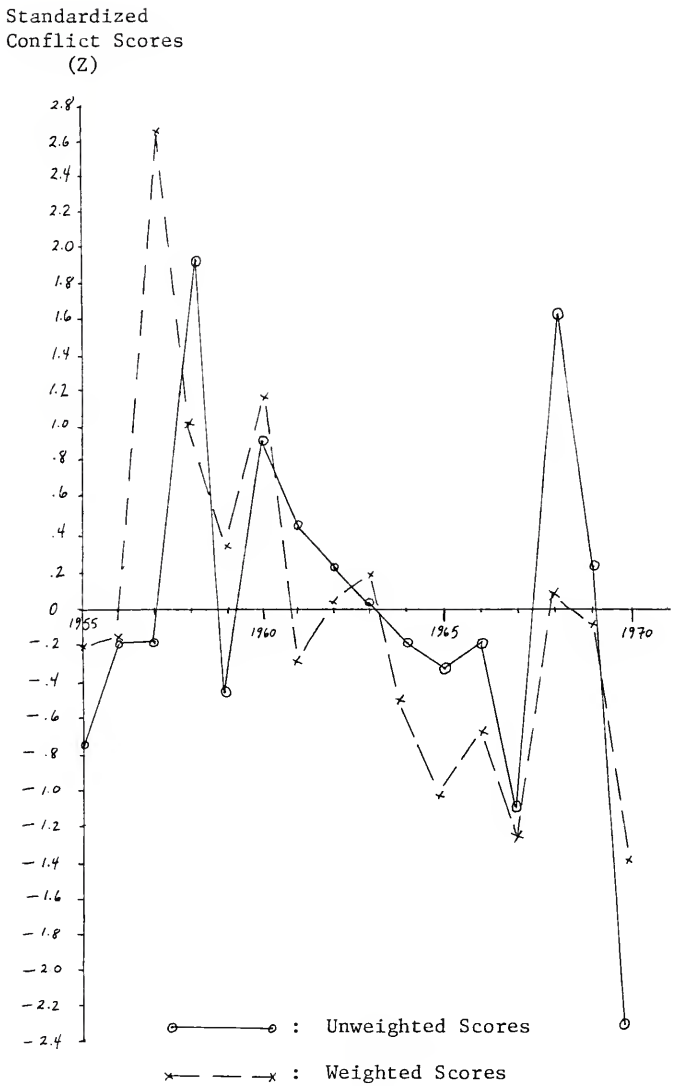


FIGURE 12

UNWEIGHTED VECTOR CONFLICT AND WEIGHTED VECTOR CONFLICT, 1955-1970

dyads in which these nations are members have high dyad weights (relative to the index, 1.0) as we see in Table 18.

Furthermore, ten of the year's 17 cooperative events are clustered in category 7 (Nations A and B form new governmental agencies concerned with internal and international security) which is the most cooperative (and therefore most highly weighted) action category appearing in the entire study. Thus, the multiplication of events in highly weighted (cooperative) categories occurring between nations with high dyadic weights generates the large difference between the weighted and unweighted descriptions of 1956. And this explains why the weighted level of cooperation is consistently higher.

As I mentioned above, in 1958 we see the opposite situation; that is, the unweighted cooperation score in each technique exceeds the weighted score. During this year, 77 of the system's 84 dyads had one event in category 11 (Nation A invites B to an international meeting). This category has the lowest action weight (1.0) of all the cooperative categories in the study. Furthermore, since the year's cooperation is distributed among so many of the 84 dyads and the dyad weights of the majority of active dyads are so low (see Table 19), the multiplicative interaction of dyad and action weights is substantially lower than in 1956. In other words, since the majority (78) of the 81 action weights used in 1958 are low (i.e., = 1.0) and since so many dyad weights are low, the summation of their products is small relative to the weighted descriptions' standardized mean of zero. On the other hand, the unweighted scores, which place a premium solely on the amount of activity rather than on the type of cooperative events or on the differential impacts of the actors, reflect the tremendous amount of activity with

TABLE 18

1956--COOPERATION

		Action Category				
		7 (Form new government agency)	8 (Extends military aid)	9 (Conclude Treaty)	10 (Agree)	11 (Invites)
		Action Weight [9]				
Dyad (Weight)		5	4	3	2	1
France-Bulgaria	(52)	1				1
France-Czechoslovakia	(61)	1				
France-Hungary	(52)	1				
France-Poland	(58)	1				
France-Rumania	(55)	1				
East Germany-West Germany	(31)		1			
Bulgaria-Italy	(16)	1				
Czechoslovakia-Italy	(25)	1				
Hungary-Italy	(15)	1				
Poland-Italy	(20)	1				
Rumania-Italy	(17)	1				
United Kingdom-Czechoslovakia	(74)				2	
United Kingdom-Hungary	(65)				1	
United Kingdom-Poland	(70)			1		
Hungary-Canada	(27)			1		
Total		10	1	2	3	1

TABLE 19

RANGE OF DYAD WEIGHTS--1958

1-15	16-25	26-50	More than 50
51%	31%	17%	1%
(n = 39)	(n = 24)	(n = 13)	(n = 1)

high Z scores. The number of cooperative events in 1958, 81, is more than twice as high as the next most active year, 1966, with 35 events.

Apart from 1956 and 1958, there are several other years (1957, 1964, and 1968) which slow large differences (ranging from .55s to 1.1s) between the techniques' unweighted and weighted cooperation scores. These differences are also due to the distribution of events among the dyads, the total amount of activity, and the weights discussed above. All of these years illustrate that a weighting scheme which takes dyad weights and action weights into account may indeed provide the researcher with a different perspective on sytemic behavior than is obtained when no weights are employed.

This observation also applies to conflict scores. In 1957 and 1968, the unweighted and weighted conflict scores of the additive and vector techniques are quite different. The weighted scores of each exceed the unweighted scores in 1957, and the unweighted scores exceed the weighted scores during the latter year. In particular, the weighted additive and vector 1957 conflict scores surpass the unweighted scores by 2.14 and 2.83 standard deviations respectively. Since 1957 is not a relatively conflictual year in terms of the total number of conflictual events (n = 7) [11], we would expect to find its high weighted score to be a result of highly weighted dyads generating highly conflictual events. Table 20 reveals this condition exactly.

The opposite situation (i.e., the unweighted scores exceeding the weighted scores) occurs in 1968 with divergences of 1.65s and 1.56s. Again, as we might expect, there are few heavily weighted dyads pursuing many highly conflictual events, and the distribution of conflict is diffused. In fact, as we see in Table 21, East Germany either initiated

TABLE 20

1957: DISTRIBUTION OF CONFLICTUAL EVENTS

		Action Category			
		14 (aids enemy)	17 (oral protest)	20 [12] (call military staff meeting)	27 [13] (stop ships)
		Action Weight			
Dyad (Weight)		3	6	9	16
Bulgaria - Greece	(5)	1			
East Germany - West Germany	(34)		1		
United Kingdom - Hungary	(63)	1		2	1
United Kingdom - Rumania	(66)			1	

TABLE 21

1968: DISTRIBUTION OF CONFLICTUAL EVENTS

		Action Category	
		13 (increases size of military)	17 (oral protest)
		Action Weight	
Dyad (Weight)		2	6
East Germany - France	(31)	1	
East Germany - Greece	(7)	1	
East Germany - West Germany	(31)	3	3
East Germany - Iceland	(5)	1	
East Germany - Italy	(16)	1	
East Germany - Luxembourg	(5)	1	
East Germany - Netherlands	(10)	1	
East Germany - Norway	(7)	1	
East Germany - Portugal	(7)	1	
East Germany - United Kingdom	(34)	1	
East Germany - Belgium	(9)	1	
East Germany - Canada	(15)	1	
East Germany - Denmark	(7)	1	

or received conflictual events from each of the fourteen NATO nations. This resulted from their imposition of travel restrictions to and from West Berlin and the subsequent protests from NATO nations, particularly West Germany. With the exception of three events in category 17 (A makes oral protest to ambassador of Nation B), the East German-NATO conflict never escalated beyond the relatively low level of cateogry 13 (Nation A increases the size of its armed forces).

Apart from East Germany's dyadic relationships with France, West Germany, and the United Kingdom, the weights of the remaining dyads are low due to the relatively small military budgets of nations like Greece, Luxembourg, and Norway. Therefore, the amount of activity (the n of conflict, 19, is the second highest in the study) in the absence of high multiplicative interaction of weights explains the divergence between the unweighted and weighted scores in 1968.

In addition to the divergences discussed in the scores of 1957 and 1968, the vector scores in Figure 12 exhibit a number of substantial divergences in 1958, 1959, 1961, 1965, and 1970. These same divergences are present though less noticeable in the descriptions of the additive conflict scores.

In this section, I have demonstrated the significant impacts that dyad and action weights can exhibit in cooperation and conflict scores of both analytic techniques. The weighted and unweighted descriptions are dissimilar enough to suggest different interpretations of systemic behavior.

Test II: Inter-Technique Correlations

In the previous section, I examined the impacts of the weighting schemes on the additive and vector analytic techniques. In this section, I examine the extent to which these analytic techniques provide different descriptions when the impacts of the different weighting schemes are controlled.

The inter-technique correlations of the unweighted and weighted additive and vector descriptions of NATO-Warsaw Pact behavior between 1955-70 are presented in Tables 22 and 23. The inter-technique correlations are generally high and suggest that both techniques describe patterns of international behavior in a similar way. The notable exception to these high correlations is the moderate relationship between the additive and vector unweighted descriptions of systemic cooperation. But leaving this moderate relationship aside for the moment, let us consider the three high inter-technique relationships.

In Chapter V, I demonstrated that since the correlation coefficient is an aggregate measure, it may obscure different descriptions of certain years behind a high coefficient and the presumption of a uniform distribution of the data around a line of best fit. Furthermore, I argued that the 6-14% of the unexplained variance between the additive and vector descriptions could not simply be overlooked in any attempt to understand a dynamic system as complex as the Middle East. Both arguments are applicable to the comparison of the techniques' descriptions of cooperation and conflict in the NATO-Warsaw Pact context when the weighting schemes' impacts are controlled. The squared correlation coefficients found in cases 2-4 demonstrate that

TABLE 22

INTER-TECHNIQUE CORRELATIONS:
UNWEIGHTED SCORES

	Additive	Vector	r	r^2
Case 1	Cooperation	Cooperation	.63	.40
Case 2	Conflict	Conflict	.92	.85

TABLE 23

INTER-TECHNIQUE CORRELATIONS:
WEIGHTED SCORES

	Additive	Vector	r	r^2
Case 3	Cooperation	Cooperation	.891	.79
Case 4	Conflict	Conflict	.894	.80

each technique description cannot account for a substantial amount (15-21%) of the variance of the other description. This amount of unexplained variance is large enough to demand further investigation, because (as we shall see) the descriptions' divergences are not constant from year to year, but in fact diverge substantially during certain years.

Let us now examine the descriptions of some of these years to further understand the computational characteristics of the two analytic techniques. Figure 13 illustrates a case in which the additive and vector techniques give substantially different descriptions of levels of weighted conflict during certain years while the overall correlative relationship is high. The .61 (1959) to 1.31 (1958) standard deviation differences between the weighted techniques' descriptions of systemic conflict in 1957-1959 certainly illustrate this point.

This same observation can be made with respect to the techniques' descriptions of weighted systemic cooperation: the aggregate inter-technique correlation coefficient is high ($r = .891$, $r^2 = .79$), yet there are substantial divergences during certain years (1956, 1958, 1966, and 1970) as can be seen in Figure 14. When the unweighted cooperation scores (not shown) are considered, we find that the additive and vector techniques diverge substantially in their respective descriptions of 1958, 1966, and 1970. This coincidence of divergences between inter-technique comparisons of unweighted and weighted cooperation is important, because no such correspondence exists in the conflict scores. The latter scores show the techniques' descriptions of unweighted and weighted conflict diverging by more than half a standard deviation four times (1958, 1962, 1969, 1970) and three times (1957,

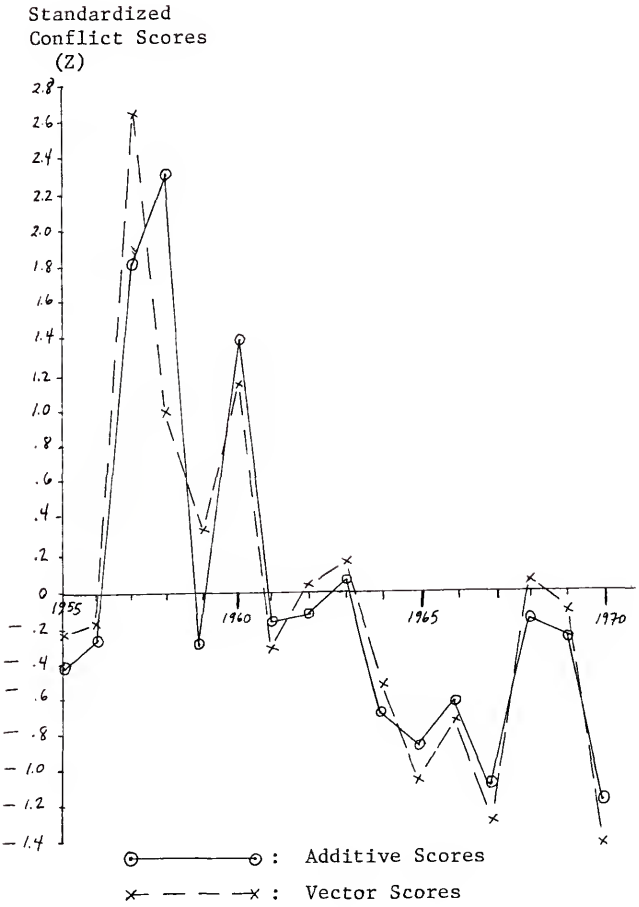


FIGURE 13

WEIGHTED ADDITIVE CONFLICT AND WEIGHTED VECTOR CONFLICT, 1955-1970

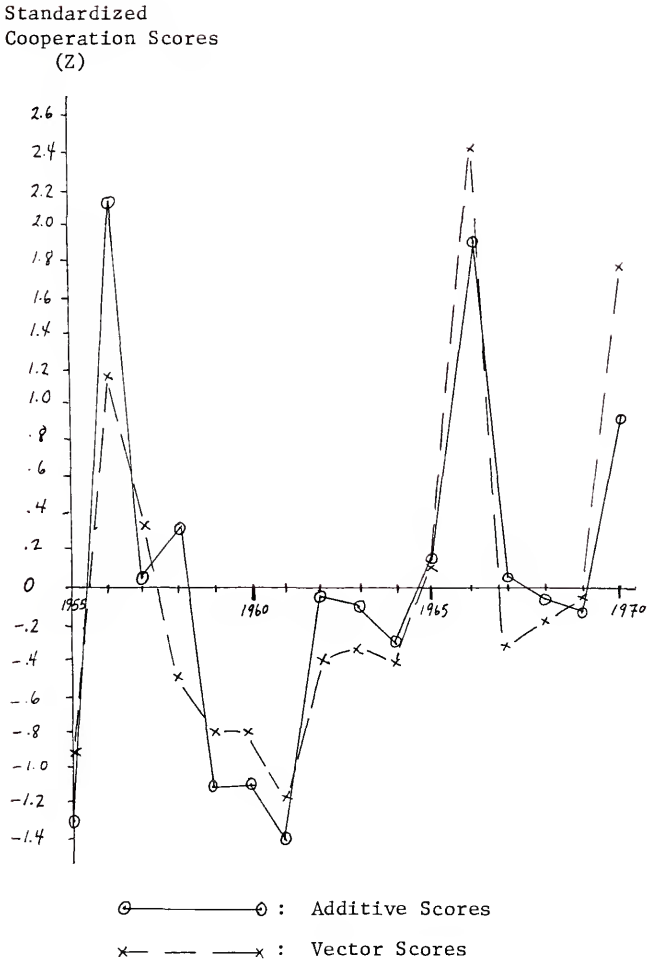


FIGURE 14

WEIGHTED ADDITIVE COOPERATION AND WEIGHTED VECTOR COOPERATION, 1955-1970

1958, 1959); but their only common divergence is found in 1958. This consistency in the cooperation scores regardless of the presence of weighting schemes suggests that something inherent in the computation method of the techniques themselves (rather than the impacts of the weights) is central in explaining the causes of the cooperation score divergences. On the other hand, the dissimilarity between unweighted and weighted inter-technique conflict score divergences suggests that it is the absence or presence of the weighting scheme in interaction with the analytic technique that accounts for these divergences.

In order to understand how the different analytic techniques describe certain years so differently, let us examine two years which exhibit great divergences. As I have noted above, both inter-technique comparisons of systemic cooperation exhibited large divergences in 1958, 1966, and 1970. The years 1966 and 1970 are similar with regard to the distribution of events in that a large number of cooperative events are concentrated among a few dyads [14] in each year. Given the similarity of event distribution in 1966 and 1970, I will only consider 1970 in the examination of technique computational characteristics. Therefore, following a brief recapitulation on calculating additive and vector scores and a hypothetical example, I shall examine the cooperation scores of 1958 and 1970 to illustrate the pre-eminent impact of event distribution on the systemic descriptions of the additive and vector techniques.

In Chapters I and II, I noted that the additive level of conflict was found by summing the frequencies of the number of events in each dyad for each action type. The vector score was found by summing the squares of the frequencies and then finding the sum's square root. Let

me review these operations with a hypothetical example in which we have a system with six dyads (A to F) and two types of events (their degrees of cooperation are not important here). For some year, X, the system is described in Table 24. The additive technique would generate the annual level of conflict as $1+1+1+1+1+1+1+1+1+1+1+1 = 12$ while the vector score would be $\sqrt{1^2+1^2+1^2+1^2+1^2+1^2+1^2+1^2+1^2+1^2+1^2+1^2} = \sqrt{12} = 3.46$. In other words, since the frequency of each cell is low, squaring each cell and then taking the square root will result in a low cooperation score. On the other hand, if all the cells had entries of 0 with the exception of two cells with frequencies of 1 and 11, the vector score would be much higher than the case in which the events are evenly distributed. In this second case, the additive score (11 + 1 = 12) remains the same but the vector score ($\sqrt{11^2 + 1^2} = \sqrt{122} = 11.05$ increases greatly. This demonstrates that unlike the aggregate additive scores which do not reflect different distributions of events, the vector scores vary depending on how evenly distributed the events of the dyads are among the various action categories. Table 25, which shows different distributions of the same number of total events, further illustrates this point.

We see from Table 25 that the vector scores increase to their upper limit (i.e., the most uneven distribution in which all events are in one cell) when it equals the additive score [15].

The years 1958 and 1970 provide excellent examples of different event distributions. As I have noted above, the greatest numbers of cooperative events for any one year of this study (81) occurred in 1958. These 81 events are distributed among 78 of the 84 dyads which comprise the NATO-Warsaw Pact system, In fact, only those dyads with

TABLE 24

HYPOTHETICAL EVENT DISTRIBUTION
IN A SIX DYAD SYSTEM
YEAR X

Dyad	Action Type 1	Action Type 2
A	1	1
B	1	1
C	1	1
D	1	1
E	1	1
F	1	1

TABLE 25

POSSIBLE CONFLICT SCORES AS A FUNCTION OF EVENT DISTRIBUTION

Distribution	Additive Score	Vector Score
1+1+1+1+1+1+1+1+1+1+1+1	12	3.46
2+2+2+2+2+2+[6 (0)]	12	$\sqrt{2^2+2^2+2^2+2^2+2^2+2^2} = \sqrt{24} = 4.90$
3+3+3+3+[8 (0)]	12	$\sqrt{3^2+3^2+3^2+3^2} = \sqrt{36} = 6.0$
4+4+4+[9 (0)]	12	$\sqrt{4^2+4^2+4^2} = \sqrt{48} = 6.93$
6+6+[10 (0)]	12	$\sqrt{6^2+6^2} = \sqrt{72} = 8.49$
9+3+[10 (0)]	12	$\sqrt{9^2+3^2} = \sqrt{90} = 9.49$
10+2+[10 (0)]	12	$\sqrt{10^2+2^2} = \sqrt{104} = 10.20$
12+[11 (0)]	12	$\sqrt{12^2} = 12.00$

Iceland as a member did not generate cooperative events during the year. Seventy-eight of the 81 events all falling into action category 11 (A invites B to a meeting), are equally distributed (one each) among the 78 active dyads. Of the remaining three events, two were generated by the French-Rumanian dyad and one by the British-Polish dyad. Since so many events are distributed among so many cells and the frequencies in each cell are low, the vector score is not high. In fact, while the 1958 additive cooperation score is more than twice as large as any other additive annual score, the vector score is substantially less than the scores of 1966 and 1970. Of course, had the 81 events been concentrated in fewer cells (for instance: 10, 10, 10, 10, 10, 10, 10, 10, 1), the resulting vector score (28.3) would have been substantially closer to the additive score (81) than the vector score (8.9) which described the evenly distributed structure of cooperative events.

Unlike 1958 when events are equally distributed among most of the 84 dyads, 1970 shows many events spread between only two dyads: East Germany-West Germany and West Germany-Poland (see Table 26). The resulting vector score ($\sqrt{2^2+6^2+7^2+1^2+11^2+3^2} = \sqrt{220} = 14.8$) is closer to its limit (i.e., that additive score, 30) than it was in 1958. It is also the highest unweighted vector cooperative score of the 16 year period. We see, then, that the additive and vector techniques select different years as the most cooperative depending on how evenly distributed the events are. Similarly, the techniques' descriptions of conflict also reflect differences in event distribution.

Thus the scores of the vector technique are sensitive to different event distributions while the additive method loses such information.

TABLE 26

1970: DISTRIBUTION OF COOPERATIVE EVENTS

		Action Category			
		9 (Cultural Exchange)	10 (Agree to Attend Meeting)	11 (Invite to Meeting)	Total
		Action Weight			
Dyad (Weight)		1	2	3	
East Germany - West Germany	(28.4)	2	6	7	15
Poland - West Germany	(29.3)	1	11	3	15

This finding demonstrates that vector descriptions provide different descriptions of a variety of behavioral situations than those calculated additively.

Test III: Evaluation of the Techniques' and Weighting Schemes' Sensitivity

In this section, I will examine the techniques' and weighting schemes' descriptions of the patterns of decreasing conflict and increasing cooperation in the NATO-Warsaw Pact system during the 1960's (Flynn, 1976) [16]. The combination of technique and weighting scheme most sensitive to changes in the levels of cooperation or conflict should have the highest standard deviation. In other words, the most cooperative years of the period under investigation should be those described by the largest positive deviations (σ) from the standardized mean.

In an attempt to establish an operational definition of high systemic conflict in Chapter V, I established a criterion of 1.746σ from the mean ($\overline{X} = 0$) of a technique's description of annual levels of systemic conflict. (This definition, using standard deviations, allowed the probabilistic operationalization of high conflict as a level which is relatively infrequent.) It is the relative rarity of a level of conflict (a conflict score 1.746σ from the mean only occurs 5% of the time [17]) that makes that level unusual. Since I have established an independent dimension of conflict, negative Z scores reflect less conflict than average. A cursory perusal of the unweighted Z scores shows that there is general correspondence of the scores' relationships (i.e., positive or negative) and magnitudes. Only in one case (1970)

does the vector score (-2.27) significantly differ from the additive score (-1.38). When the weighted standardized conflict scores are considered, even the 1970 divergence disappears. Since the signs and magnitudes are again similar, I cannot judge one technique to be more sensitive than the other.

In an attempt to discover whether increased levels of NATO-Warsaw Pact cooperation accompanied the relaxation of tensions during the 1960s, I will focus on the standardized cooperation scores. However, since cooperative behavior among adversaries may be rarer than conflict, I will relax the operational criterion (i.e., establish it closer to the mean) for reasons delineated in Chapter IV. Therefore, the measure $+1.0\sigma$ has been selected as the criterion for considering a year to be one of high systemic cooperation. Years characterized by particularly high levels of cooperation should lie beyond this number [18].

If the vector technique is indeed more sensitive to patterns of international behavior than the additive technique, it should be able to demonstrate the relaxation of tensions in the NATO-Warsaw Pact system. We would expect to see 1964-1967 and 1969-1970 identified as years of hightened East-West cooperation given DeGaulle's assertion of French independence from NATO and Willy Brandt's Ostpolitik. The unweighted and weighted additive and vector techniques' descriptions of systemic cooperation are presented in Table 27.

We see that the additive unweighted scores only show 1958 to be a very cooperative year. On the other hand, the vector scores attribute much cooperation to 1966 and 1970. Since I have already discussed the reasons for the techniques' different interpretations of these years in

TABLE 27

STANDARDIZED (Z) NATO-WARSAW PACT COOPERATION SCORES

Unweighted Scores			Weighted Scores	
Additive	Vector	Year	Additive	Vector
- .98	-1.15	1955	-1.27	- .9
- .18	- .37	1956	2.12	1.17
- .5	- .45	1957	.05	.46
3.23	.81	1958	.33	- .49
- .77	- .9	1959	-1.09	- .79
- .77	- .79	1960	-1.07	- .80
- 1.03	-1.26	1961	-1.39	-1.16
.03	- .18	1962	- .03	- .4
- .13	- .18	1963	- .1	- .35
.3	.29	1964	- .31	- .42
- .13	- .13	1965	.14	- .1
.78	1.89	1966	1.88	2.41
- .18	- .31	1967	.03	- .33
- .13	- .03	1968	- .07	- .2
- .07	.5	1969	- .13	- .06
.51	2.36	1970	.92	1.78
4.26	3.62	range	3.51	3.57

an earlier section (see Intra-Technique Correlations), I will not dwell on them again. When weights are applied to the standardized cooperation scores, the cooperative nature of 1958 disappears, both techniques describe 1956 and 1966 as highly cooperative, and only the vector technique describes 1970 as cooperative. Since the additive technique score for 1956 surpasses the vector score and the vector score is greater than the additive score in 1966, it is difficult to describe one technique as the most sensitive.

There is another test that might be used to evaluate technique and weight sensitivity. This involves the determining of which set of weighted technique scores exhibits the largest range. This test is based upon a definition of sensitivity which ascribes to the most sensitive technique the ability to discriminate between and "string out" scores which describe different patterns of international behavior.

Examining the ranges of the standardized descriptions of cooperation, we see a substantial difference between the unweighted techniques' descriptions. This substantial difference disappears, however, when the techniques are weighted for the cooperative extent of the dyadic activity and the dyads' weights [19].

With respect to the unweighted scores, the range of the additive scores (4.26) is greater than that generated by the vector technique (3.62). The appearance of the (unweighted) additive technique as a more sensitive indicator of systemic cooperation than the vector technique would tend to contradict my assumption of the latter techniques' superior sensitivity. Nevertheless, the reason for this unanticipated finding is related to the ways that the different techniques describe different distributions of dyadic activity. Since I have already

discussed this topic at length in this chapter's section on inter-technique correlations, suffice it to remind the reader that while additive scores are unaffected by the distribution of international activity, the vector technique attributes the highest scores to uneven distributions of cooperation (and conflict). In 1958, almost all of the 84 dyads were involved in only one event (with a relatively low cooperative weight). On the other hand, a great deal of cooperation occurred between only two dayds (East Germany-West Germany and West Germany-Poland) in 1970. The large differences between the two techniques' standardized cooperation scores in 1958 (3.23 and .81 respectively) and 1970 (.51 and 2.36 respectively) illustrate this point. But when action weights are applied to the cooperative event interactions of these years, the differences in the techniques' descriptions of these years become smaller. This suggests that the particular way the events are weighted also exerts an important influence on the description of the levels of cooperation (and conflict). The importance of the weights is further illustrated by the descriptions of systemic cooperation in 1956 and 1966. In 1956, neither technique reflects the cooperative activity until action weights are applied. In 1966, the year of extensive and intensive cooperation between Bulgaria, Romania, and France, the unweighted additive technique does not reflect the cooperation, whereas the vector technique (unweighted and weighted [20]) does.

In the final analysis, we find that the vector technique is no more capable of identifying years as highly cooperative than the weighted additive approach [21]. While the results of this test in Chapter V allowed us to draw certain positive conclusions regarding the vector

technique's sensitivity, we have discovered in this section that such continued optimism is not warranted.

Test IV: Evaluation of the Cosines of the Angles Between the Systemic Vectors

In Chapter V, I employed the cosine of the angle between vectors describing the Middle East system at different points of time to demonstrate the degree of stability of dyadic relations. Since the cosine of the angle between two vectors is equivalent to the Pearson correlation coefficient (r) between the respective dimensions of each vector, a stable system exists when the squared correlation coefficient was high (i.e., $r \geq .837$ and $r^2 \geq .70$). Such stability did exist in the Middle East from 1953-1957, when Arab-Israeli conflict was pre-eminent and cooperation between Arab nations was serving to mend traditional antagonisms in preparation for the apparently unavoidable war. After the 1956 war, the intra-Arab alliance fell apart amid a variety of mutual recriminations and those leaders' renewed attentions to domestic reconstruction and the re-establishment of their legitimacy. Consequently, Arab-Israeli conflict in the end of the decade and the early 1960s became more irregular. The result, as reflected in the cosine scores, was the decline of any long term systemic stability.

The cosines of the angles between the vectors describing weighted systemic cooperation and conflict for the NATO-Warsaw Pact nations appears in Table 28.

Table 28 does not generally exhibit long term stability. The only modest exceptions of this absence are the moderate levels of conflict (r = .47, .63) from 1955 to 1957 and cooperation (r = .59, .72)

TABLE 28

COEFFICIENTS (COS θ) OF COOPERATION AND CONFLICTUAL ACTIVITY IN THE NATO-WARSAW PACT SYSTEM, 1955-1970

Cooperation			Conflict	
Cos θ = r	r^2	Years	Cos θ = r	r^2
.00	.00	1955-1956	.47	.22
.41	.17	1956-1957	.63	.40
.37	.14	1957-1958	.23	.05
.49	.24	1958-1959	.13	.02
.12	.01	1959-1960	.35	.12
.06	.00	1960-1961	.40	.16
.31	.10	1961-1962	.00	.00
.57	.32	1962-1963	.26	.07
.11	.01	1963-1964	.00	.00
.36	.13	1964-1965	.30	.09
.51	.26	1965-1966	.51	.26
.10	.01	1966-1967	.32	.16
.09	.01	1967-1968	.06	.00
.59	.35	1968-1969	.81	.66
.72	.52	1969-1970	.00	.00

from 1968 to 1970. The low levels of NATO-Warsaw Pact conflictual stability during the Cold War period comes as a slight surprise inasmuch as the term "Cold War" supposedly represents a period of institutionalized patterns of East-West conflict which were carried out to a large extent in the European theatre. Specifically, the issues of German reunification and the status of Berlin consistently appeared as sources of East-West contention during the 1950s and mid-1960s, and one would think that their disposition would be characterized by more stable (conflictual) dyadic relations [22].

A plausible explanation which may account for the absence of higher, prolonged systemic stability during the Cold War is related to the number of dyads actively engaged in event behavior. Independent investigations (Rosenau, 1969; Lewis, 1976) have demonstrated that different descriptions and interpretations of systemic behavior are produced by different distributions of activity among the dyads. In the NATO-Warsaw Pact system, we find that cooperative and conflictual activities are <u>not</u> equally distributed among all 84 dyads. The 25 least active dyads only account for 22 event interactions (all cooperative) in 1958 and no others during the remaining 15 years under investigation. The 15 most active dyads account for a sizable percentage of the total number of events considered in this study (i.e., 65%). Their levels of cooperation and conflict are presented in Table 29.

The remaining 44 dyads' 1955 to 1970 levels of activity range from two to nine. With the exception of the year 1958 during which each dyad generated at least one event, the activity of these remaining dyads is distributed equally among the years [23] and exhibits little

TABLE 29

DISTRIBUTIONS OF COOPERATION AND CONFLICT* AMONG THE 15 MOST ACTIVE NATO-WARSAW PACT DYADS

Dyad	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	Total
East Germany-West Germany	/3	1/2	2/1	1/2	1/		/4	1/	1/	1/2	1/1	2/2	1/	6/6	8/5	15/	41/28
West Germany-Poland			1/	1/			1/	2/	2/1		1/1	/2			6/	15/	29/4
France-Bulgaria		1/		1/					1/	3/	2/	17/					25/0
Bulgaria-Greece	1/			3/1	2/2	/3	/5			7/							13/11
France-Rumania		1/		1/					1/	3/1	3/1	8/1		4/			21/3
United Kingdom-Hungary		1/2	/4	1/1	1/	1/		1/2	1/					2/			8/9
France-Poland		1/		1/					1/		2/2	3/	7/1				12/3
France-East Germany		/1		1/2		/5	/1			/1				/1	/1		1/12
United Kingdom-Rumania			/1	1/2		2/		1/	1/1				1/		3/		9/4
United Kingdom-Czechoslovakia		2/	1/	1/2				1/	/2		2/			2/			9/4
United Kingdom-East Germany				1/3	1/	/5	/1							/1	/1		2/11
United Kingdom-Poland		1/1	2/	2/1				2/			2/		1/				10/2
Poland-Canada	/1			1/		/1		2/	2/			4/					10/2
West Germany-Czechoslovakia			1/	1/				1/	/1		1/1	/2	2/1		1/		7/5
Bulgaria-Italy		1/		1/				1/5	/1	/1							4/6
Cooperation/Conflict	1/4	9/6	7/6	18/14	5/2	3/14	1/11	12/7	12/6	15/4	14/6	34/7	9/2	14/8	18/7	30/0	201/104
Annual Total	5	15	13	32	7	17	12	19	18	19	20	41	11	22	25	30	305

* y/x where y signifies cooperation and x signifies conflict.

stability [24]. The effect of these 44 dyads "blinking" on and off in almost a random pattern serves to lower the annual levels of systemic stability that would have been obtained had these dyads not been included in the analysis. In other words, the levels of stability caused by the continuity of the East German-West German reunification, the Berlin issues, and West Germany's Ostpolitik (beginning in 1968) are lower than those that otherwise might have been obtained if the interactions of the less active dyads were not considered.

In order to further evaluate the methodological utility of the vector approach for describing systemic stability and address the substantive analysis of NATO-Warsaw Pact patterns of cooperation and conflict, I will now examine the subsystem of the 15 most active dyads [25]. The cosines of the angles between the vectors of systemic cooperation and conflict are presented in Table 30. As noted above, the levels of cooperative and conflictual stability are substantially higher due to the exclusion of the less active dyads.

In Table 30, we observe stability coefficients that are generally higher than those encountered in the examination of the 84 dyad system. However, only one brief period of cooperation (1969-1970) and conflict (1968-1969) satisfy the previously defined statistical criterion ($\cos \theta = r \geq .83$; $r^2 \geq .70$) of moderate stability. Nevertheless, the presence of six cooperation and two conflict cosine coefficients in the .50 to .82 range suggests that this NATO-Warsaw Pact subsystem does exhibit moderate stability.

Since the criterion of moderate stability identified above was arbitrarily determined, there is no reason why it must be considered definitive. In fact, there is some statistical evidence [26] to suggest

TABLE 30

SUB-SYSTEMIC STABILITY*

Cooperation			Conflict	
Cos θ (= r)	r^2	Years	Cos θ (= r)	r^2
.00	.00	1955-1956	.60	.36
.55	.30	1956-1957	.75	.56
.53	.28	1957-1958	.36	.13
.67	.45	1958-1959	.19	.04
.17	.03	1959-1960	.39	.15
.00	.00	1960-1961	.49	.24
.47	.22	1961-1962	.00	.00
.70	.49	1962-1963	.33	.11
.22	.05	1963-1964	.00	.00
.45	.20	1964-1965	.44	.19
.64	.41	1965-1966	.68	.46
.15	.03	1966-1967	.39	.15
.18	.03	1967-1968	.00	.00
.64	.41	1968-1969	1.00	1.00
.94	.88	1969-1970	.00	.00

*Figures are rounded to nearest hundredth

that the criterion was established at too high a level. Consequently, if we employ the alternate (albeit less rigorous) technique of visually inspecting the coefficients to identify years that appear correlated with each other punctuated by years that are not, we observe period of moderate cooperative systemic stability in 1956-1959, 1961-1963, 1964-1966, and 1968-1970. Conflictual systemic stability existed in 1955-1957, 1960-1961, 1964-1966, and 1968-1969.

The 1956-1959 period of cooperative stability, the longest stable period observed in the NATO-Warsaw Pact system during 1955-1970, is characterized by the cooperation of East with West Germany, Britain with Czechoslovakia, Hungary, and Poland, and Greece with Bulgaria during 1958-1959. During the 1961-1963 period of stability, stable cooperation is again seen between the two Germanies and Britain and Hungary. However, several new dyads demonstrate stable cooperation: Poland with West Germany and Canada and Britain with Romania.

During the third period of cooperation (1964-1966), while the Germanies continued to display some continued cooperation, France's cooperation with Bulgaria, Romania, and Poland is clearly pre-eminent. This period of French-Eastern bloc cooperation coincides with DeGaulle's decisions to first boycott and then withdraw France's military troops from NATO in an assertion of France's independence from the West [27]. Finally in 1968-1970, we observe the appearance of Willy Brandt's Ostpolitik, which is characterized by the intense amounts of West German cooperation with East Germany and Poland.

Despite the continuing conflict between East and West Germany from 1955-1969, the dyad was also regularly engaged in cooperative interactions. Apart from the German dyad, however, no other consistently

appears to be engaged in cooperative activity in each of the four periods of cooperation. In other words, while individual NATO-Warsaw Pact dyads exhibit substantial levels of cooperative stability during segments of the 16 year period, there is relatively little long term stability in the presence of the dyads that generate the cooperation.

Again referring to Table 30, we see the existence of some conflictual systemic stability in 1955-1957, 1960-1961, 1964-1966, and 1968-1969. Table 31 presents the principal dyads involved in the stable patterns of conflict in each period. With the exception of the last period, the levels of conflictual stability are at best modest. This finding has substantive and methodological interest. Substantively, we find that the institutionalization of East-West conflict does not exist when patterns of conflictual interaction are examined using the vector technique. Hence, the questioning of our intuitive understanding of the Cold War may be in order. Methodologically, the ability of the vector technique to uncover this finding is appealing and of some utility.

As one might expect, the presence of East Germany in conflict with West Germany, Britain, and/or France in each of four time periods underscores the primacy of the Berlin and reunification issues [28]. Secondly, we note that with the exceptions of the East German-French and East German-Britain dyads [29], each of the dyads identified above as being engaged in stable patterns of cooperation. This simultaneous involvement in both cooperative <u>and</u> conflictual interactions demonstrates that these behaviors are positively rather than negatively related. Since an increase in one does <u>not</u> result in a decrease in the other, we find additional support for the contention that the two other types of behavior are <u>not</u> opposite poles of the single dimension.

TABLE 31

PRINCIPAL DYADIC PARTICIPANTS IN THE GENERATION OF SYSTEMIC CONFLICT

Period	Principal Dyadic Participants
1955-1957	East Germany-West Germany; Britain-Hungary
1960-1961	Bulgaria-Greece; East Germany-France; East Germany-Britain
1964-1966	East Germany-West Germany; West Germany-Poland; West Germany-Czechoslovakia
1968-1969	East Germany-West Germany; East Germany-France; East Germany-Britain

A Concluding Note

Unlike the disappointing findings of Chapter V, the findings of this chapter moderately support the hypothesized sensitivity of the weights and the vector technique. The intra-technique correlations demonstrated that the application of dyad and action weights to techniques that describe patterns of systemic behavior results in different descriptions (i.e., the correlations range from .46 to .77). In the analysis of inter-technique correlations (which control for the impacts of the weights), the most similar description (i.e., unweighted additive conflict with unweighted vector conflict, r = .92) still leaves 15% of the variance unexplained. This amount of unexplained variance is too much to simply disregard in the analysis of a complex system. Finally, the vector technique was again shown to be a useful methodology for the examination of systemic stability, since it is sensitive to the internal distributions of actions and dyadic activity.

In a less supportive vein, the test of technique sensitivity (Test III) did not allow me to conclude that the vector technique is more sensitive to the patterns of NATO-Warsaw Pact cooperation than the additive technique. To further examine this findings, I will now compare the descriptions of the two analytic techniques to extra-systemic behavior.

Notes

[1] A chronology of NATO-Warsaw Pact events is found on pages 132-139.

[2] In order for cooperation and conflict to be identified as opposite poles on the same continuum, they should be negatively associated. Consequently, the findings of Kegley (1971:364) which state

that the two types of behavior "tend to co-vary and be consistently associated with one another" support the view of their relationship as independent. Similarly, East and Gregg find that levels of conflict and cooperation positively co-vary with the level of international activity. If these behaviors were unidimensional, when one increased, the other would decrease. Rummel finds no relationship between the magnitude of dyadic conflict and UN voting agreement (1969a:413) nor between transactions and conflict (1968a:211-250). Finally, Russett and Wright independently find that international cooperation actually predisposes nations in the direction of conflict by increasing their interactions and therefore the number of areas of potential disagreement.

[3] Based upon a visual inspection of the event action categories, it is apparent that a division between cooperative and conflictual behavior can be drawn between categories 11 (Nation A invites Nation B to an international meeting) and 12 (Nation A initiates universal military training). Given (a) the original scale is an equal interval scale, (b) the cooperative intensity of each category increases from category 11 through category 7, and (c) the conflictual intensity increases from category 12 through category 30, interval cooperative action weights 1-5 and conflict weights 1 to 16 have been assigned to categories 11 to 7 and 12-26 respectively.

[4] $t = 8.1$; $n = 16$

[5] At this point, the reader may wonder why the jointly weighted scores are being analyzed rather than the dyad-only weighted scores, especially in light of their high correlations and the previous discussion about the negligible impacts of action weights on the descriptions of systemic activity. I have chosen to focus on the jointly weighted scores, because in spite of their high correlations to unweighted additive and vector scores in the Middle East analysis ($r = .995$ in each case), their application to the dyad weighted vector scores allowed me to identify 1955 as a year of high conflict. This important impact of action weights may suggest that action weights do in fact exercise important influences on descriptions of systemic behavior when used in conjunction with dyad weights. Furthermore, we should not assume that the Rosenau and Ramsey (1975) deprecation of action-weights' impacts is directly transferable to vector generated descriptions of behavior since their findings are based on behavioral descriptions calculated by the additive technique.

[6] The criterion of "noteworthiness" is necessarily arbitrary, determined principally by (a) which events were included in the annual editions of Keesing's Contemporary Archives and (b) the author's desire for parsimony.

[7] The military expenditure levels of England and France in 1956 (at $US 1970 prices) were $6235 million and $5108 million respectively. Excluding the expenditure of the U.S. and the U.S.S.R., these nations accounted for more than 48% of the total NATO-Warsaw Pact military expenditure in 1956 (SIPRI, 1973b:396-9). See Appendix B for a complete listing of NATO-Warsaw Pact military expenditures.

[8] Italy's 1956 military expenditures (at $US 1970 prices) was $1467 million. This figure accounts for 6% of the total military budget ($23450 million) of the NATO-Warsaw Pact nations excluding the U.S. and the U.S.S.R. (SIPRI, 1973b:396-9).

[9] Action categories 1-6 are not utilized by the 84 dyads under observation during the years 1955-70.

[10] The division of dyad weights into the categories shown is arbitrary.

[11] The average number of annual conflict events is 9.

[12] "Nation A calls military staff conference on short notice."

[13] "Nation A stops Nation B's ships at sea."

[14] In 1966, 35 cooperative events were generated by six dyads. However, two of these dyads (France/Bulgaria and France/Rumania) were responsible for 17 and eight of these events respectively. The distribution of cooperative events in 1966 appears below.

	Action Category				
	8 (Extend Military Aid	9 (Conclude Treaty)	10 (Agree to Attend Meeting)	11 (Invite to Meeting)	
	Action Weight				
Dyad	4	3	2	1	Total
France Bulgaria		10	3	4	17
France Poland		2		1	3
France Rumania		4	3	1	8
West Germany East Germany	1		1		2
Turkey Bulgaria		1			1
Canada Poland			3	1	4
Total	1	17	10	7	35

In 1970, all 30 of the NATO-Warsaw Pact system's cooperation were generated by the West German / East German and West German/Polish dyads in the following distribution.

	Action Category			
	9 (Conclude Treaty	10 (Agree to Attend Meeting)	11 (Invite to Meeting)	
	Action Weight			
Dyad	3	2	1	Total
West Germany East Germany	2	6	7	15
West Germany Poland	1	11	3	15
Total	3	17	10	30

[15] One might expect then that in years such as 1970, when the vector technique more closely approaches its additive limit, we would not encounter large divergences between the descriptive scores of the different techniques. However, the translation of raw scores into Z scores (which allows us to compare the scores in terms of standard units) means that the Z scores represent additive or vector scores with respect to other like scores. Since we have already noted how the vector technique calculates large scores when many events fall into a simple or few cells, we can understand how the resulting vector score is further away from the vector scores' mean than the additive score of such a year. In other words, the Z scores represent the amount of cooperation (or conflict) of a year relative to all other years, and it is the relative scores which we are comparing.

[16] With the exception of the unweighted additive scores, the average cooperation scores of the three other combinations of weights and techniques for the 1960-1970 period are higher than the average scores for 1955-1959. However, this implied increased cooperation definition of *détente* is superficial. In Chapter VII, I present an interaction definition of *détente* which looks at the (ratio of the) annual levels of conflict divided by the annual levels of cooperation. Evidence is presented to substantiate the existence of *détente*.

[17] This assumes a relatively normal distribution of events.

[18] Since 67% of the events lie between $\pm 1\sigma$ from the mean ($\bar{X} = 0$), one half of the remaining 33% (i.e., 16.5%) of the events should lie beyond the $+1\sigma$ criterion.

[19] The correlation (r) between the unweighted scores of the additive and vector techniques is .457 ($r^2 = .21$). The weighted techniques' correlation coefficient is .891 ($r^2 = .79$).

[20] The reflection of the high level of cooperation in 1966 by the unweighted vector technique suggests that the technique may have some descriptive accuracy apart from the impact of the weights.

[21] The only difference between the two techniques is found in 1970, and one case is not sufficient basis to draw generalizations.

[22] The WG-EG dyad accounts for 14.7% (i.e., 69) of all 470 events utilized in this study.

[23] The average ($\overline{X}$) number of events per year of the 44 dyads of intermediate activity is 10.3 with a standard deviation (σ) of 1.61.

[24] During no one year period does the cosine of the angle between the vector of the 44 dyads' levels of cooperation or conflict surpass .36.

[25] The selection of 15, rather than some other number of dyads as the focus of this analysis is arbitrary. These 15 dyads account for 305 of the total 470 events analyzed in this dissertation (i.e., 65%).

[26] To calculate a probablistically determined criterion, one must employ a t-test (given the sample size, n = 16) described below.

$$t = \frac{\sqrt{r^2(n-2)}}{1-r^2}$$

r^2 is the squared correlation coefficient (which is equivalent to cosine θ^2) and n is the number of cases being considered. The n-2 in the formula above represents the degrees of freedom, "the number of quantities that are unknown minus the number of independent equations linking these unknowns" (Blalock, 1971:203).

Since I have already established the significance level of p = .05 as the level at which the significance of the cosines will be evaluated, we find (Garson, 1976:359) that the minimum t score that must be generated by the cosine is 1.771 (df = n-2 = 13). Having obtained the criterion t score, we can generate the following mathematical calculations to determine the minimum level that cosine θ must satisfy:

$$1.771 = \frac{\sqrt{r^2(n-2)}}{1-r^2}$$

$$(1.771)^2 = \frac{r^2(13)}{1-r^2}$$

$$3.14-3.14\ r^2 = r^2(13)$$

$$.194 = r^2$$

$$r = .44$$

Since I have already noted that cosine Θ equals the correlation coefficient, r, we could observe that the minimum level of statistical significance demands cosines greater than or equal to .44.

However, the cosine of .44 should be treated as a suggestive rather than conclusive guideline for the criterion of stability. The reason for this caution lies in the fact that the level of statistical significance is largely a function of sample size. Therefore, in order to accept the probabilistic criterion of .44 above, we would also have to accept a criterion of .18 for the population of 84 dyads and this coefficient intuitively seems too low.

[27] Several explanations that possibly account for France's increased independence from U.S. policy objectives are (1) DeGaulle sought to re-establish France's former glory and continental importance by serving as a non-partisan bridge between East and West; (2) with the Soviet Union's achievement of rough parity with the United States, DeGaulle doubted the credibility of America's defensive commitment to Europe; and (3) DeGaulle's affection for the U.S. had been strained by a number of affronts by President Roosevelt during World War II as well as post-war disputes.

[28] During the 1955-1957 period, the major sources of NATO-Warsaw Pact conflict were (1) West-Germany's admission into NATO and the Pact's subsequent creation and (2) tolls and travel restrictions that were inposed by East Germany on access to West Berlin. During 1961, the major crisis of course was the construction of the Berlin Wall and during the final two periods (1964-1966 and 1968-1969), travel restrictions provided the main source of conflict.

[29] During the 1955-1970 period, the interactions between East Germany and West Germany's western guarantors (i.e., England and France) were essentially conflictual. The aggregate levels of East Germany/United Kingdom and East Germany/France cooperation/conflict are 2/11 and 1/12 respectively.

CHAPTER VII

PREDICTIONS OF THE ADDITIVE AND VECTOR ANALYTIC APPROACHES TO EXTRA-SYSTEMIC BEHAVIOR

In the preceding two chapters, I have evaluated the various weighting schemes and the two analytic techniques with respect to their abilities to provide different information concerning systems of conflict, accurate descriptions of shifts in internal distributions of power as well as in aggregate levels of systemic changes, and finally sensitivity to years of high levels of systemic conflict and cooperation. I will now consider the final area of analysis: the predictions of combinations of weights and techniques to certain types of extra-systemic behavior. The predictive capability of the techniques and weights is important, because it helps to establish their utility as analytical tools which help us describe phenomena under investigation.

Predictions to Events Lying Outside the Middle East System of Conflict

Given this importance of prediction, let us now turn our attention to the relative abilities of the unweighted and weighted additive and vector analytic approaches to predict the occurrence of Middle East extra-systemic behavior. In Chapter IV, I defined violent conflict as existing outside the system of conflict [1] and noted that it was classified by Blechman in Action Category 22 [2] . Its occurrence will be predicted by observing how highly it correlates with

the occurrence of non-violent systemic conflict. This strategy is based upon the assumption that the amount of non-violent conflict increases before and during periods of violent conflict. Therefore, non-violent and violent behavior should be highly correlated [3].

Tables 32 and 33 demonstrate that, on the average, the vector technique (r^2 ave. = .795) does not offer better predictions to extra-systemic violent conflict than the additive technique (r^2 ave. = .76). Comparing the two predictions across correlative cases (i.e., case 1 additive v. case 1 vector), we note that the vector technique's predictive capability is not significantly higher in any case. This similarity of their predictions is expected, however, given the high intra- and inter-technique correlations discussed in Chapter V.

Before moving on to the evaluation of predictive capabilities of the weights and techniques with respect to the NATO-Warsaw Pact system of conflict, several words of caution are appropriate regarding the relatively high correlations found in the Tables 32 and 33. A correlation coefficient is an aggregate measure in that it summarizes a mass of data. Such a measure may be misleading if it obscures the fact that the data coordinates are not uniformly distributed around the line of best fit. In other words, a high correlation coefficient does not preclude the possible existence of a heteroschedastic (i.e., non-uniform) [4] distribution. One must look at the data to see if the high correlation is caused by a tight, uniform clustering of points about the entire line or whether a tight cluster of points at one part of the line compensates for a looser clustering somewhere else.

Figures 15 and 16 [5] both demonstrate that this latter distribution describes the predictions of each technique to extra-systemic

TABLE 32

ADDITIVE PREDICTIONS TO MIDDLE EAST EXTRA-SYSTEMIC (i.e., VIOLENT) BEHAVIOR

	X	Y	r	r^2
Case 1	Unwtd. non-violent	Unwtd. violent	.85	.73
Case 2	Non-violent conflict wtd. only for dyads	Violent behavior wtd. only for dyads	.90	.81
Case 3	Non-violent conflict wtd. only for action	Violent behavior wtd. only for action	.83	.69
Case 4	Non-violent conflict wtd. for dyads and action	Violent behavior wtd. for dyads and action	.90	.81

TABLE 33

VECTOR ANALYTIC PREDICTIONS TO MIDDLE EAST EXTRA-SYSTEMIC (i.e., VIOLENT) BEHAVIOR

	X	Y	r	r^2
Case 1	Unwtd. non-violent	Violent-unwtd.	.87	.76
Case 2	Non-violent-dyad	Violent-dyads only	.91	.83
Case 3	Non-violent-action	Violent-action only	.87	.76
Case 4	Non-violent-dyad and action	Violent-dyads and action	.91	.83

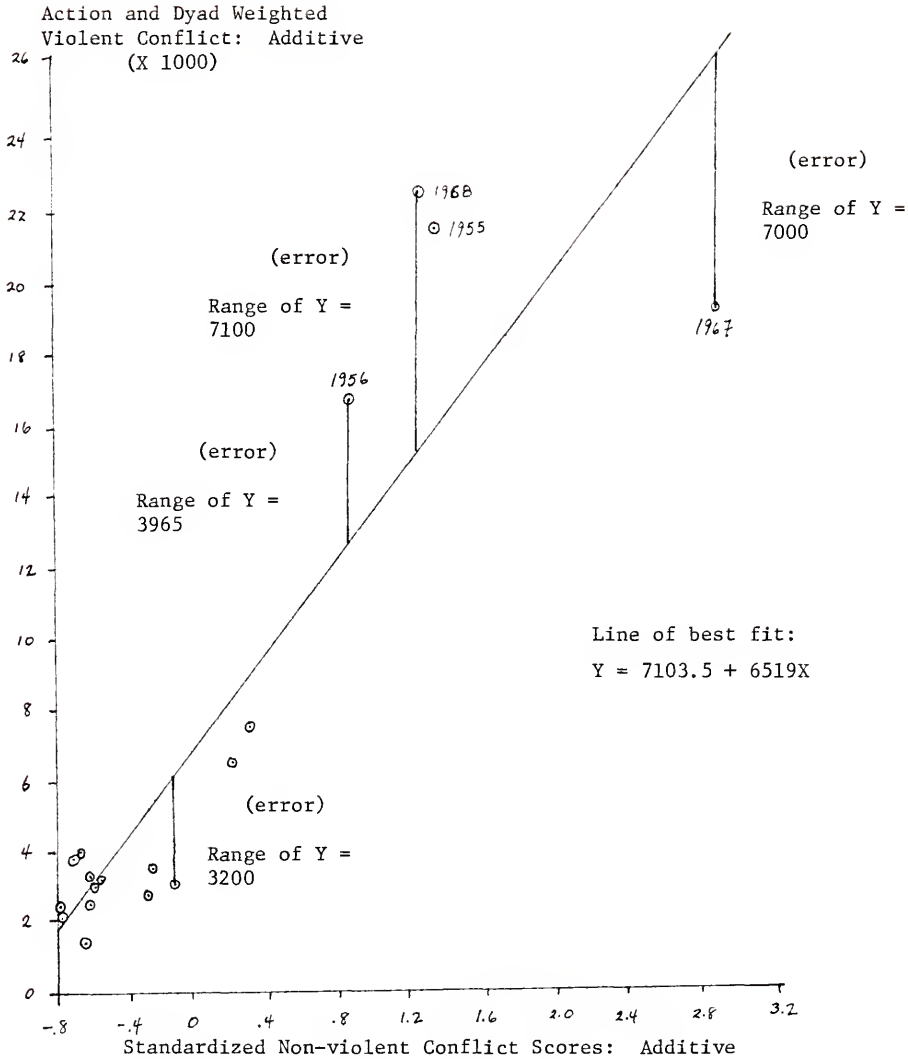


FIGURE 15

WEIGHTED ADDITIVE PREDICTIONS TO EXTRA-SYSTEMIC (VIOLENT) BEHAVIOR

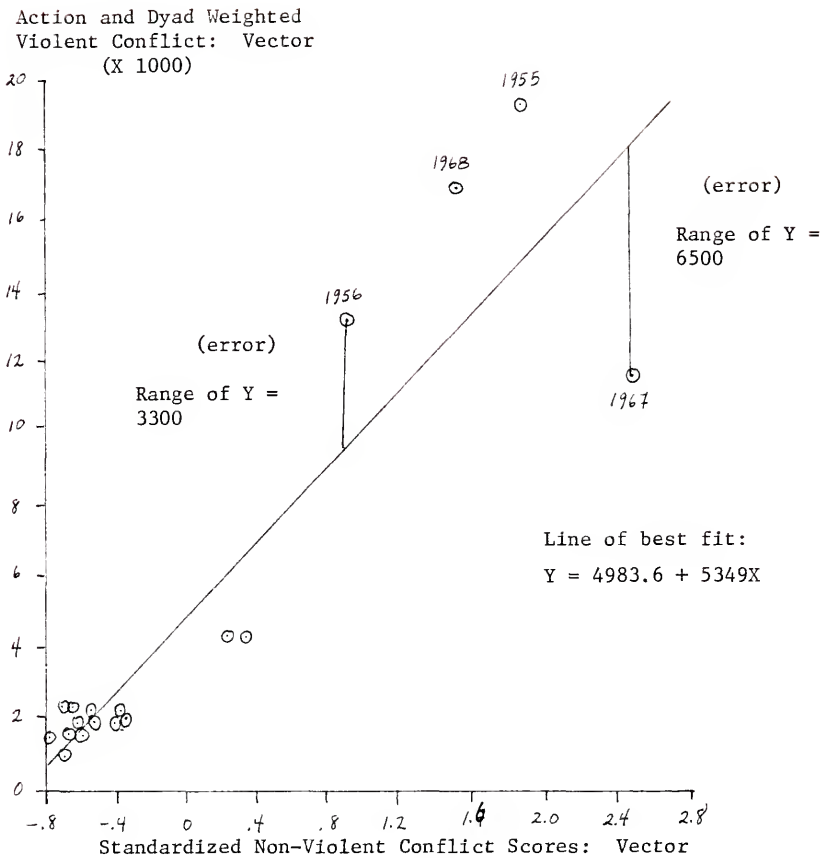


FIGURE 16

WEIGHTED VECTOR PREDICTIONS TO EXTRA-SYSTEMIC (VIOLENT) BEHAVIOR

behavior. The high predictive correlations are inflated by the tight clusters of coordinates at the low non-violent conflict end of each abscissa. No such tight cluster appears at the high conflict end of the X-axis. The presence of heteroschedasticity means that predictions of high conflict based upon a line of best fit cannot be made with the same degree of confidence as predictions at the low end of the non-violent conflict continuum. Since the Middle East system exhibits only four years of high conflict, no definitive conclusions may be reached regarding the techniques' predictions to extra-systemic high conflict behavior. Therefore, let us now examine the predictions of European cooperation to observe whether the vector scores produce different predictions than their additive counterparts.

Predictions to Behavior Lying Outside the NATO-Warsaw Pact System of Conflict

I argued in Chapter IV that the patterns of conflict between the members of NATO and the Warsaw Pact could reasonably be expected to covary positively with the levels of conflict between the respective bloc's military, economic and ideological leaders: the U.S. and the U.S.S.R. Therefore, the effects of the thaw in the Cold War between the United States and the Soviet Union which began in the early 1960s (Whitson, 1976:4) and gradually evolved into the present *détente* should covary positively with the changes in the levels of European conflict. In the last chapter, however, empirical evidence suggested that conflictual and cooperative events should not be treated as lying on the same dimension and that one loses information from such a unidimensional perspective. Consequently, the unidimensional perspective will not be employed in this section.

The definition of détente as ". . . a lower level of international tensions [emphasis added], even an attempt to codify the terms of competition; it means not only continued rivalry but also superpower cooperation [emphasis added] in the field of arms control, as well as other political, economic, technique, and scientific areas" (Spanier, 1975; 104), suggests that any discussion of the subject must take both types of behavior into account. Therefore, let us examine the magnitudes and dispositions of Soviet-American and NATO-Warsaw Pact event interactions independently to determine whether this relationship can be identified between cooperative and conflictual behavior during the period of East-West détente.

The unweighted and weighted levels of NATO-Warsaw Pact and Soviet-American cooperation and conflict [6] appear in Tables 34 and 35.

The attempts to predict the presence and extent of NATO-Warsaw Pact détente using the levels of Soviet-American cooperation did not meet with much success (see Table 36). Consequently, we are forced to ask whether an independent analysis of cooperative activity can allow one to identify the existence of détente.

Furthermore, the squared correlation coefficients are too low to allow one to meaningfully discuss which combination of analytic technique and weights yields the superior description of systemic activity. Of substantive interest, however, is the inverse relationship between superpower and inter-alliance cooperation. Although the correlations are low, the negative association suggests that alliance leaders may exercise less control over allies during periods of inter-bloc cooperation when the perception of threat is not prominent (Schandler,

TABLE 34

NATO-WARSAW PACT LEVELS OF CONFLICT, COOPERATION

Year	Additive No. Wts.	Additive Wts.	Vector No Wts.	Vector Wts.
1955	5,2	739,139	2.2,1.4	476,130
1956	9,17	931,2423	3.0,4.4	396,690
1957	7,11	3144,1027	3.0,4.1	1653,491
1958	27,81	3675,1218	6.0,8.9	981,491
1959	5,6	910,260	2.6,2.4	704,159
1960	15,6	2712,276	4.6,2.8	1040,156
1961	11,1	1041,62	3.9,1.0	446,62
1962	7,21	1098,975	3.6,5.1	582,261
1963	9,18	1296,930	3.3,5.1	642,273
1964	7,26	507,788	3.0,6.9	360,256
1965	6,18	309,1088	2.8,5.3	143,339
1966	7,35	578,2261	3.0,13	286,994
1967	3,17	77,1014	1.7,4.6	480,297
1968	19,18	1064,947	5.6,5.7	599,314
1969	7,19	985,911	3.6,7.7	539,349
1970	0,30	0,1618	0,14.8	0,830

TABLE 35

SOVIET-AMERICAN: CONFLICT, COOPERATION

Year	Additive No Wts.	Additive Wts.	Vector No Wts.	Vector Wts.
1955	14,18	73,40	7.07,11.04	35.87,28.6
1956	19,6	88,11	11.96,4.24	57.71,6.4
1957	13,2	55,5	6.08,1.4	26.70,3.61
1958	32,10	161,19	19.08,6.48	95.95,13.15
1959	20,20	114,47	10.0,11.92	54.46,31.7
1960	31,1	172,2	14.93,1	77.28,3
1961	20,12	94,23	10.00,7.87	46.37,15.52
1962	17,11	75,14	7.55,9.11	31.67,9.7
1963	12,9	67,25	6.63,5.74	36.21,17.12
1964	7,12	42,35	3.31,9.17	21.21,27.44
1965	4,0	16,0	2.83,0	11.66,0
1966	4,6	9,18	3.16,6	6.17,18
1967	3,3	15,3	1.73,3	9.64,3
1968	5,6	24,13	2.65,3.16	16.91,6.71
1969	3,6	13,15	1.73,3.16	8.77,8.31
1970	3,5	19,11	1.73,3	13.96,7.28

TABLE 36

CORRELATIONS BETWEEN SOVIET-AMERICAN AND NATO-WARSAW PACT COOPERATION, 1955-1970 [7]

	r	r^2
Unweighted additive cooperation scores	-.08	.01
Weighted additive cooperation scores	-.38	.14
Unweighted vector cooperation scores	-.32	.10
Weighted vector cooperation scores	-.23	.05

1976:62; Hopmann, 1967-231) [8] than they do during periods of high conflict.

The other aspect of the proposed definition of détente suggests that the levels of superpower and alliance bloc conflict should be highly correlated. The information in Table 37 moderately confirms this expected relationship as well as giving additional evidence that the additive technique yields higher predictions of systemic activity than the vector technique regardless of the absence or presence of dyad and action weights.

An Interaction Approach to the Definition of 'Detente'

Spanier's definition of détente as ". . . a lower level of international tensions . . . but also superpower cooperation" suggests that cooperation and conflict might be examined together to accurately describe this superpower relationship. In the previous tables, these types of behavior were analyzed and employed separately to assess whether superpower détente "trickled down" to the respective alliances. But the results of this avenue of research were mixed. Nevertheless, it is possible to approach the analysis of cooperation and conflict from another perspective that avoids the unidimensional criticism. This interaction perspective posits that while systemic behavior can and should be disaggregated into its cooperative and conflictual components, these components still affect each other and should be considered together. Inasmuch as conflict between some nations can generate cooperation (i.e., fence-mending) and cooperation can increase both the points of interaction and the potential for disagreements, there is a certain face validity to the interaction perspective.

TABLE 37

CORRELATIONS BETWEEN SOVIET-AMERICAN AND NATO-WARSAW PACT CONFLICT, 1955-1970

	r	r^2
Unweighted additive conflict scores	.60	.36
Weighted additive conflict scores	.69	.48
Unweighted vector conflict scores	.54	.29
Weighted vector conflict scores	.50	.25

One measure that incorporates both levels of behavior is the annual amount of systemic conflict divided by the annual amount of systemic cooperation [9]. Using this measure, we find that a high level of cooperation relative to the level of conflict and a low level of conflict relative to the level of cooperation produces a ratio which approaches zero. A ratio of one indicates equal amounts of conflict and cooperation. Furthermore, a consistent (i.e., stable) relationship over time between the numerators and denominators will generate the same quotient regardless of the specific magnitudes of conflict and cooperation. For instance, if we consider a hypothetical system with levels of conflict and cooperation of (40,5), (64,8) and (80,10) at three successive points in time, we note that the quotient "8" is consistently obtained. Therefore, the interpretations of the zero point, the quotient of one, and the consistent quotients allow one to compare various system states. And these advantages definitely constitute a major strength of this measure.

The interactive détente quotients for the United States-Soviet Union dyad and the NATO-Warsaw Pact system are presented in Table 38.

An examination of the figures in Table 38 indicates that the quotients displayed for 1955-1962 [10] are generally higher than those occurring from 1963-1970 regardless of the technique or weighting scheme employed. Large quotients indicate low levels of cooperation relative to the amounts of conflict. The average Cold War (1955-1962) and Thaw/Détente (1963-1970) quotients for the Soviet-American dyad and the NATO-Warsaw Pact system, broken down by analytic technique and weighting scheme, are presented in Table 39. In all but one case, the latter period's average quotients are smaller, suggesting that the amount of

TABLE 38

LEVELS OF DÉTENTE DETERMINED BY CONFLICT ÷ COOPERATION

	United State-Soviet Union				NATO-Warsaw Pact			
	Additive		Vector		Additive		Vector	
Year	No Weights	Weights	No Weights	Weights	No Weights	Weights	No Weights	Weights
1955	.78	1.83	.64	1.26	2.50	5.32	1.57	3.66
1956	3.17	8.00	2.82	9.02	.53	.38	.68	.72
1957	6.5	11.00	4.34	7.42	.64	3.06	.73	3.37
1958	3.2	8.47	2.97	7.30	.33	3.02	.67	4.16
1959	1.00	2.43	.84	1.72	.83	3.50	1.08	4.43
1960	31.00	86.00	14.93	38.65	2.5	9.83	1.64	6.67
1961	1.67	4.09	1.27	2.99	11.00	16.79	3.9	7.19
1962	1.09	5.36	.83	3.26	.33	1.13	.71	2.23
1963	1.33	2.68	1.16	2.12	.50	1.39	.65	2.35
1964	.58	1.20	.39	.77	.27	.64	.43	1.41
1965	*	*	*	*	.33	.28	.53	.42
1966	.67	.50	.53	.37	.20	.26	.23	.29
1967	1.00	5.00	.58	3.21	.18	.08	.37	.16
1968	.83	1.84	.84	2.52	1.06	1.12	.98	1.91
1969	.50	.87	.55	1.06	.37	1.08	.47	1.54
1970	.60	1.73	.58	1.92	0.	0.	0.	0.

*Denominator (cooperation) = 0. The answer is ∞ (infinity).

TABLE 39

SOVIET-AMERICAN AND NATO-WARSAW PACT AVERAGE COLD WAR, THAW/DÉTENTE PERIODIC DESCRIPTIONS

	United States-Soviet Union				NATO-Warsaw Pact			
	Additive		Vector		Additive		Vector	
Time Period	No Weights	Weighted	No Weights	Weighted	No Weights	Weighted	No Weights	Weighted
1955-1962 (Cold War)	6.05	1.59	3.58	8.95	2.33	5.38	1.37	4.05
1963-1970 (Thaw/Détente)	.79	1.98	.65	1.71	.36	.61	.46	1.01

cooperation relative to the amount of conflict increased. Such a pattern satisfies the defined condition of détente.

Having empirically verified the emergence of East-West détente after 1962, I will now examine the predictions of NATO-Warsaw Pact détente based upon the levels of Soviet American détente. These predictions appear in Table 40.

These predictions allow me to cautiously support two of the hypotheses advanced in the earlier chapters. In the first place, notice that the weighted predictions are higher than the unweighted regardless of the analytic technique employed. These higher predictions further support my earlier contention that one gains valuable information about the patterns of interactions by considering the involved nations' relative impacts and the nature of the interactions.

Second, as hypothesized, the prediction of the weighted vector technique is the highest. However, this correlation coefficient of .5 is moderate at best. Furthermore, it is not so much greater than the weighted additive coefficients ($r = .4$) that we can conclusively argue the former's unmistakable superiority.

In conclusion, then, it is the presence of action weights rather than the technique employed that exerts the greatest impact upon the predictions. Substantively, the explanation of only 25% of NATO-Warsaw Pact variance by the Soviet-American levels of détente suggests that the superpowers' allies engage in relations that are to some extent independent of the bloc leaders' interactions (Flynn, 1976) [11].

TABLE 40

PREDICTIONS OF NATO-WARSAW PACT DÉTENTE
(DÉTENTE SCORES = CONFLICT ÷ COOPERATION)

Variable X (Soviet-American)		Variable Y (NATO-Warsaw)		r	r^2
Unwtd.	Add.	Unwtd.	Add.	.10	.01
Wtd.	Add.	Wtd.	Add.	.40	.16
Unwtd.	Vector	Unwtd.	Vector	.20	.04
Wtd.	Vector	Wtd.	Vector	.50	.25

A Final Note

I hypothesized in Chapter IV that the vector technique ought to produce more accurate (i.e., more highly correlated) predictions of extra-systemic behavior than additive descriptions of systemic conflict owing to the former's greater sensitivity. But the results of this chapter have failed to conclusively bear this out. In the Middle East, the vector and additive approaches predict extra systemic behavior with the same accuracy. In Europe although the presence of East-West *détente* can be empirically demonstrated, the vector technique's predictions are only slightly higher than those of the additive technique. In addition, the weighted predictions are higher than the unweighted predictions regardless of the technique employed. However, the absence of this finding in the analysis of Middle East predictions serves to temper any assertion of weighting scheme utility.

This chapter concludes the three chapters of tests comparing different weighting schemes and different analytic approaches. The results are mixed. Therefore, let me now turn to review the overall merits and problems associated with the vector technique and the weighting schemes. I shall also discuss the impact that such a methodology may contribute to the analysis of international behavior.

Notes

[1] See note [1], Chapter VIII.

[2] Violent Middle East Conflict
(Action Category #22)

Year	Additive				Vector			
	No Wts.	Dyad Wts.	Action Wts.	Dyad & Action Wts.	No Wts.	Dyad Wts.	Action Wts.	Dyad & Action Wts.
1951	62	210	806	2724	43.2	144	562	1874
1952	32	104	416	1356	24	73	311	945
1953	98	231	1274	3004	84	181	1090	2358
1954	191	497	2483	6459	137	330	1784	4292
1955	287	1649	3731	21431	208	1490	2702	19369
1956	364	1208	4732	26741	234	1001	3043	13004
1957	182	582	2366	7560	110	337	1434	4385
1958	96	239	1248	3111	56	135	725	1753
1959	72	216	936	2811	42	154	561	2003
1960	65	232	845	3021	39	143	506	1859
1961	49	181	637	2361	29	110	382	1434
1962	66	158	853	2068	49	116	634	1512
1963	50	188	650	2444	29	109	372	1423
1964	82	293	1066	3804	51	173	663	2246
1965	84	294	1092	3822	52	1974	675	2261
1966	75	265	975	3453	49	165	640	2148
1967	267	1473	3471	19145	148	897	1928	11667
1968	409	1725	5317	22418	335	1307	4354	16994

[3] See note [1], Chapter VIII. The fact that Middle East cooperation and conflict covary in the same direction suggest that they are not on the same dimension. For cooperation and conflict to be considered as opposite ends of the same dimension, they should be negatively correlated.

[4] For an excellent discussion of heteroschedasticity, see Garson (1976:205).

[5] These graphs are representative of the relationships observed with the unweighted and singly weighted additive and vector descriptions.

[6] In the second table, the weighted scores only are based on action weights and not action and dyad weights as are the NATO-Warsaw Pact scores. The reason for this is that the dyad weights for each dyad in the latter case are relative to all the other weights in the system. Since the United States-Soviet Union dyad is a single data point defined as lying outside the system, the computation of such a dyad weight would be meaningless.

[7] Categories 1-11 of the Hopmann and Hughes data set. Conflict is defined as categories 12-26.

[8] This generalization concerning the lack of alliance cohesiveness during periods of inter-adversary cooperation raises an interesting question. If members of opposing alliance systems exhibit behavior relatively independent of the policies of their respective bloc leaders during periods of reduced conflict, how then is it possible for NATO-Warsaw Pact détente (already defined as a partial increase of cooperative behavior) be predicted by increases of the levels of Soviet-American cooperation?

One answer to this question may be that the disaggregation of conflict and cooperation and their consideration as independent entities is unrealistic. Thus the cost of this approach is misleading analysis. If this is the case, a strong argument might be made for treating them together. However, their treatment on one dimension has already been illustrated as problematic. In the final pages of the chapter, I suggest the employment of an interaction measure which is derived from the independent levels of cooperation and conflict yet constitutes a summary evaluation.

A more cynical answer to the question raised above would suggest that détente is nothing more than a state of mind based upon perceptions of actions rather than the actions themselves. If so, then the quantified operationalization of détente may indeed demonstrate little association with empirical reality!

Of course, the empirical question of whether the relation exists between the interaction measure of Soviet-American détente and NATO-Warsaw Pact behavior is explored later in this chapter.

[9] I considered another measure of détente which uses cooperation and conflict scores, but then rejected it. This measure subtracted the annual level of systemic cooperation from the annual level of systemic conflict, thus making its descriptions of systemic behavior difficult to interpret. For instance, consider a hypothetical system with conflict and cooperation scores of (18,1) and (35,19) at successive points in time. Each system state would be described by "17" but the changes in behavioral levels are not at all consistent. While the level of conflict doubled from t_1 to t_2, the cooperation level

increased 19 times! One might be hard pressed to describe the dispositions of these two system states as similar despite the consistent remainder. On the other hand, as has been noted in Chapter VII, consistent quotients can only be obtained when the relationship between cooperation and conflict also remain consistent.

[10] The selection of 1955-1962 and 1963-1970 as periods of Cold War and Thaw/Détente respectively is based on the interpretation of the Cuban missile crisis (October, 1962) as the watershed event in Soviet-American relations (Spanier, 1975: Kahan, 1977).

[11] It has been suggested that alliance cohesion is greatest during periods when the perception of threat is greatest. If this is the case, we would expect to find the 1955-1970 correlations of NATO-Warsaw Pact behavior with Soviet-American behavior weaker than those generated only during the Cold War (1955-1962). The data, however, do not support this. Cold War correlations range between -.02 and .38 and correlations for the 1963-1970 period range between -.17 and .56, thus indicating that the greatest amount of European independence of superpower behavior occurred during the former period. Even during the détente, Soviet-American levels of détente are unable to account for no more than 31% of the NATO-Warsaw Pact variance. Thus in general, it can be noted that the two systems behave rather independently of each other.

CHAPTER VIII

SUMMARY OF THE FINDINGS AND DISCUSSIONS OF THE CAVEATS

In the preceeding chapters, I have performed a variety of tests in an attempt to demonstrate the superior descriptive and predictive accuracy of weighting cooperation and conflict scores calculated by vector algebra instead of the additive method. The results were mixed. Some tests, especially those in Chapters V and VII, generally failed to substantiate the hypothesis. On the other hand, several encouraging findings were presented in Chapter VI. On the whole, these findings do vindicate the enthusiasm for the application of weights and the use of vector algebra to describe systemic behavior. But these mixed results point to the need for additional research about the units of measurement, the weights, and the techniques themselves.

Summary of the Findings

The intra-technique correlations, performed between the unweighted and weighted scores within each analytic technique, indicate the extent to which descriptions of systemic behavior weighted for the different dyadic impacts and intensities of actions depart from unweighted descriptions. They also demonstrate whether the additive or vector approach is most affected (i.e., exhibits the lowest intra-technique correlations) by the introduction of such weights.

In the intitial chapters of this dissertation, I argued that the applications of dyad and action weights to the analysis of events data should provide us with different perspectives of systemic behavior. Chapter V contained limited statistical substantiation of the weights' utilities. However, a strong case for the weights was made in conjunction with a recounting of the history of events in the Middle East. In Chapter VI, the lower intra-technique correlations for both analytic techniques demonstrated the different descriptions of systemic behavior produced when weights are applied to the analysis.

Also in Chapter V, there were exceptionally high positive correlations between the unweighted and action weighted additive ($r = .995$) and vector ($r = .995$) descriptions of Middle East conflict. This finding implied that action weights make insignificant contributions to unweighted descriptions of systemic behavior as suggested by Rosenau and Ramsey [1]. But notwithstanding this limited statistical impact of action weights, the limited contributions of action weights when coupled with the dyad weights may still produce more sensitive descriptions of systemic behavior (i.e., Test III).

With regard to the impacts of the weighting schemes on the different analytic techniques themselves, the intra-technique correlations between the additive and vector conflict scores for the Middle East and the conflict and cooperation scores for the NATO-Warsaw Pact systems are so similar that one cannot conclude that the weights affect one technique more than the other.

Thus, these findings suggest both positive and negative interpretations of the weights' utilities and more conclusive evaluations of said utilities will require more research.

With the moderate exception of the unweighted inter-technique correlation of cooperation descriptions in Chapter VI, the inter-technique correlations in Chapters V and VI (in which the impacts of the weighting schemes are controlled) show that both analytic techniques produce generally similar descriptions of systemic behavior. The exceptionally high correlations from Chapter V (range of r: .969-.981) seemed to indicate at first that the additional computational rigors involved in generating vector scores are not worth the effort. However, I demonstrated that the distributions of descriptions of systemic conflict around the line of best fit are heteroschedastic.

Therefore, these extremely high inter-technique correlations are largely a function of the tight clustering of both techniques' conflict scores during periods of low conflict. During the periods of high conflict, it appears that different techniques yield different systemic descriptions. However, the existence of high conflict in only one of the data sets (i.e., the Middle East) does not conclusively prove that the techniques' descriptions of high conflict will consistently differ to an appreciable degree.

The inter-technqiue correlations from Chapter VI merit additional attention. It is hardly surprising that two techniques applied to the same data set generate similar descriptions. Yet, unweighted cooperative analysis (r^2 = .40) aside, the substantial amounts of unexplained variance (r^2 = .15 to .21) suggest that the additive and vector techniques do in fact provide different perspectives of systemic behavior. The repeated occurrence of dissimilar descriptions in the two data sets offers some substantiation of the differences between the techniques and justifies the call for additional research concerning their utility in describing the real world.

The final case of support for the vector technique derives from the analyses of the cosines of systemic direction. The vector technique proved to be a useful and sensitive means of detecting the presence of and measuring the extent of intra-systemic stability in the Middle East and NATO-Warsaw Pact systems. Such utility was observed even when the aggregate levels of systemic conflict remained unchanged over time, thereby demonstrating that the vector technique is sensitive to the distributions of dyadic and event activity.

The ability of the jointly weighted vector technique to demonstrate the presence of high systemic conflict in the Middle East and the increase of NATO-Warsaw Pact cooperation given the probabilistically determined ($\overline{X} + 1.746\sigma$ and $\overline{X} + 1\sigma$ respectively) criteria is not completely supported by the findings. While relatively clear vector sensitivity to arbitrarily defined and probabilistically determined criteria is demonstrated in Chapter V, the similarity of vector and additive standardized scores in the next chapter is disappointing. The split support of the findings again emphasizes the need for additional research and the inability to state any generalizations at this time.

This summary of the weights' and techniques' comparisons ends on a disappointing note inasmuch as the vector technique failed to generate predictions of extra-systemic behavior that were substantially different from those of the additive technique.

It is difficult to conclude arguing that sometimes the vector technique is superior to the additive technique, yet sometimes it is not. This dissatisfaction is especially acute when, as I have often suggested in previous discussions, a portion of the analytic discontinuities may be due as much to idiosyncracies of the data sets as to

differences between the techniques themselves. Thus with these problems in mind, I shall conclude with a discussion of several caveats pertaining to the data and the analytic techniques.

The Data

In this dissertation, I have explored two empirical questions: (1) whether the vector analytic method of describing patterns of international cooperation and conflict offers different descriptions of international behavior than the additive method, and (2) whether the applications of dyadic and action weights produce different descriptions of systemic behavior with respect to those of the unweighted (i.e., weighting the impact of every dyad and event equally) analysis.

The utilization of events data to evaluate these questions implicitly assumes that they are in fact valid and accurate indicators of the non-routine dimension of international behavior. While many students of international politics have persuasively argued the merits of events data (Kegley, 1972; Azar, McClelland, Brody, 1972; Burgess and, Lawton, 1972) and employed these data creatively (McClelland and Hoggard, 1969; Wilkenfeld, 1972; Rosenau and Ramsey, 1975), many valid criticisms of the data still exist and must be discussed inasmuch as their validity tempers the substantive and methodological findings herein.

The events data bases analyzed in Chapter V (Blechman, 1971) and VI (Hopmann and Hughes, 1974) and the ways they are analyzed are open to several criticisms based on the unit and the level of analysis and certain inaccuracies of events data themselves. Each of these criticisms will be treated in turn.

The Unit of Analysis

The coding criteria limited the collection of data to international behavior that is explicitly expressed between governments (i.e., their official representatives) of nation-states. The requirement that an event must have both an initiator and a target nation excludes all forms of behavior that are not explicitly aimed at other nations. For instance, a unilateral Israeli announcement that it was increasing the size of its military by 50% would not be reported as an event because no specific target is specified. Nevertheless, such an act would certainly be interpreted by the region's Arab nations as conflictual (and probably generated conflictual Arab responses with Israel as the target) given the volatile context of Arab-Israeli relations.

Second, interactions between government officials engaged in covert activity or non-government officials (such as executives of multinational corporations) and foreign leaders are excluded from the data set, although they may indeed exercise a great impact upon the levels of international cooperation and conflict. A recent example of such international impact occurred in 1976 with the Lockheed and ITT disclosures. Although information about covert activity would be missing in any other data sources as well, the problem remains that the assessment of analytic techniques and insights is hindered by incomplete information which makes the explanation of behavioral variance speculative.

Third, Blechman excludes international accusations regarding the mistreatment of minorities, because since they occur so frequently, they lose their uniqueness and become routine transactions. Similarly, the

perpetuation of conflict which results in its institutionalization causes confusion about the boundary between non-routine events and routine transactions. For instance, the increasing frequency of co-operative activity between two adversaries may become so routine as to lose its newsworthiness. Such a development might exercise a crucial impact upon the way data is collected during a period of détente. In either event, the routinization of international behavior may bias the data collection by excluding important types of behavior. And the results of such exclusions might in turn be biased analysis.

Finally, Schroeder (1977) has argued that a decision not to pursue some action can have as monumental an effect upon the disposition of systemic behavior as the active pursuit of some objective. Since a non-action is not considered an event, this important aspect is not included in the data, thereby complicating the interpretation of systemic activity.

The Level of Analysis

I have chosen to aggregate this analysis on an annual level for the sake of parsimony and the stated focus of this dissertation. The monthly analysis of the Middle East (1951-1968) and the NATO-Warsaw Pact nations (1955-1970) would have generated 216 and 192 data points respectively. The distribution of relatively few (i.e., 2681 and 470) events among so many time periods would have resulted in many periods with no/little activity. This would have complicated the analysis and thwarted the attempts at longitudinal analysis. Even if there were enough data points to avoid this problem, the presentation of so many data points might have submerged the general trends of systemic behavior

under a myriad of monthly crests and troughs. Although several techniques, such as the calculation of moving averages and fitted curves, could have smoothed out these undulations, such activity and orientation is beyond the explicit focus (i.e., long term analysis of aggregate systemic behavior) of this dissertation.

My decision to define the number of dimensions of a system as being a function of the number of dyads produced by including all the nations in the region has an idiosyncratic effect that merits special attention. The orientation which examines all of the dyads is based on the theoretical foundation which seeks generalities by observing the regularities displayed by large numbers of actors (i.e., all of the system's components). However, Charles Kegley (1975) and others (Lewis, 1976) have found that the disposition of systemic behavior is quite different when inactive dyads are excluded from the analysis. Regarding the Middle East analysis, all of the 15 dyads were active [2] and the small number of dimensions (15) was easily manageable. Hence, all 15 dyads were considered. In the NATO-Warsaw Pact analysis, however, a consideration of the large number of dyads characterized by little activity or null behavior coupled with the difficulty of working with so many (84) dimensions suggested that such a use of a subsystem of the most active dyads would be more advisable. In choosing how to define "most active" dyads, one can consider as the criteria of selection either 1) a certain percentage of dyads which generate a given cumulative percentage of activity, or 2) a minimum level of activity for each dyad. Whether the application of such data reduction criteria would have significantly affected systemic descriptions in the Middle East is an empirical question. However, given the different perspectives

(especially regarding systemic stability) obtained by such a modification in Chapter VI (where criterion #1 was employed), it is quite possible that an alternate description of Middle East behavior might have been produced [3].

The Accuracy of Events Data

The remaining caveats concern the validity of the concept of an event and the accuracy of the data themselves. In the first place, events data are abstracted fron newspapers as I have discussed earlier. The Middle East data set was abstracted from the New York Times Index by Blechman and the European data set was generated by Hopmann and Hughes from the index of Keesing's Contemporary Archives. Events data are based upon the assumption that all attempts by foreign policy makers and international leaders to influence other national actors are in the public domain as reported in the newspapers. Such an assumption is clearly inconsistent with the nature of diplomacy (Von Clausewitz, 1968). Furthermore, many other shortcomings of events data have been discussed in numerous articles: (1) censorship (Rummel in Singer, 1968:71; McClelland, 1968a; Jensen, 1972) often effectively prevents many international events from being reported; (2) countries of little international importance are not covered by international publications (Rummel, 1968a:71) such as the Times and Keesing's as extensively as are more powerful nations (Doran, et al., 1973); (3) international publications print sensational and violent events more regularly than they report cooperative events (Azar, 1970; Rummel in Singer, 1968:71), and their focus on these events at the expense of the inclusion of contextual information may often result in coding errors (Doran et al., 1973); and

(4) whether an event finds its way into a newspaper depends not only on its own newsworthiness but also on how many other newsworthy events have occurred, how newsworthy they are with respect to the event at hand, and how much space is left in the newspaper after more newsworthy events and advertising are included [4].

Since both of the events data sets utilized in this study were abstracted from a single information source (Azar, 1970), this may also introduce distortions into the substantive findings (Hermann, 1970; Sigler, 1972). For instance, the events covered in the New York Times do not overlap very highly with those reported in other important newspapers such as France's Le Monde (Jensen, 1972:9). Moreover, the coverage between sources does not have the same distribution across event action categories (Doran, et al., 1973:180-189), and often sources diverge on the number of events they report (Doran, et al., 1973:180-189).

Nevertheless, there are several factors which make the sources of data employed herein valuable. Above, I have noted that single global sources generally report news biased in favor of violence as well as over-reporting news from areas considered trouble spots and of direct concern to the U.S. This is especially true of the New York Times (Doran, et al., 1973). Therefore, the use of the Times as the source of data for an analysis of the Middle East (which certainly is a violent area of immense interest to the U.S.) may not introduce as much distortion into the analysis as one might expect given the previous criticisms of single source data.

The use of Keesing's also particularly suits the purposes of this analysis. Published in England, this data set gathers its information

from a variety of sources in Eastern and Western Europe as well as the United States. The use of a well-established European source to extract information about European international events seems intuitively appropriate. Also, given the fact that Keesing's is derived from multiple sources, it may overcome some of the problems of single source data sets.

Furthermore, certain problems accompany the use of multiple sources of information which should mitigate some criticism of this study's use of single source generated data. Researchers relying on several sources may be confused when they get contradictory data or when different papers interject their own national biases into the reporting of an event (Azar, 1970). In any case, regardless of a study's reliance upon single or multi-source data bases, certain errors are likely to be introduced into the analysis. Therefore, the researcher is obligated to evaluate which type of data furthers the investigation before he or she selects it and then mention the possible caveats that attend the data.

The last point I would like to discuss here is the discrete nature of events data. Jenkins and Chittick argue that the assumption of discreteness results in a failure

> . . . to place discrete acts . . . in the context of the total amount and distribution of behavior that one state sends to another . . . and . . . fail [s] necessarily to tap the basic orientations underlying the sending of any particular act. (1975:82)

The authors go on to argue that foreign policy is a process and that the discrete orientation, while able to offer valuable insights, nonetheless, distorts the description of international behavior when studied without reference to continuous variables. As a result, models of

prediction using events data are unable to accurately predict extra-systemic behavior (86-89). This argument criticizes a central assumption of events data: that the boundary between non-routine events and routine transactions is meaningful, easily identified, and can be used to further understand foreign policy behavior. Hence we return to the question of where to separate routine from non-routine events and whether the exclusion of routine acts from the analysis does indeed distort the findings as they relate to conflict and cooperation.

The variety of these problems with events data may sufficiently acquaint the reader with one of many reasons for evaluating the results of a project such as this with caution. Misleading, incomplete, and insensitive data may make it difficult to evaluate the relative merits and demerits of the analytic techniques and weighting schemes. Thus, even though it has been presented here as a superior method of analysis, the vector method may quite possibly not appear so, because it is more sensitive than the data it uses.

Nevertheless, the several positive findings of the vector approach certainly merit continued examination of its validity and reliability. But any final evaluation of the method's characteristics will depend to a large extent upon the refinement of events data, a task which should serve as yet another incentive to continue research on this source of international data.

The Techniques

The inter-technique correlation analysis in Chapter VI detailed how the techniques produced divergent descriptions of the same year based on different distributions of international activity. I showed

that the vector technique was more sensitive to different distributions of cooperation and conflict than the additive technique. Particularly, the vector technique could distinguish between equal aggregate amounts of activity generated either by a few actors producing many events or by many actors producing a few events. Rather than dwell any more on these orientations, though, I would like to conclude my analysis with some thoughts about a major assumption and characteristic of the vector analytic technique.

When the number of dimensions is discussed in vector algebra, each dimension is assumed to be independent of all the others. Consequently, throughout this study, the formula for calculating vector magnitudes took for granted that the numerous dimensions of the Middle East and NATO-Warsaw Pact (84) systems are independent of each other. This in turn requires the assumption that each dyad's pattern of behavior remains independent of all the others' and that within the overall distribution of events for each dyad, the action categories are also independent. Theoretically, these assumptions are valid. Ideally, every sovereign nation derives its foreign policy independently; and inasmuch as a nation is responsible for its own well-being and can simultaneously pursue cooperative and conflictual relations with another nation, any single action category is independent of all others.

But while this assumption simplifies the complex web of international politics and permits the manipulation of large data sets by elegant methodologies, the fact remains that the dimensions of international systems of conflict simply are not independent. Patterns of influence based on alliance commitments (Singer and Small, 1969:526-7), geographical proximity (Brams, 1966:889); Cobb and Elder, 1970:134),

trade (Smoker, 1965:167), and a variety of other reasons, determine relationships between individual dyads and between groups of dyads. Furthermore, the immediate history of a particular nation with another nation or group of nations similarly structures the relationship between them. W. Phillips (1973) and others (McClelland and Hoggard, 1969:712) have argued that nations with violent histories predictably tend to experience more violence than nations with histories of cooperation. The relations among these latter nations also tends to be cooperative. In addition, according to Dina Zinnes (1968), mutually reinforcing leaders' perceptions of each other are associated with reciprocal (i.e., interdependent) foreign policy.

Such inconsistency between the assumptions of this paper and the untenable nature of international politics is a common characteristic of social science research. In fact, the independence assumption is made all the time by practitioners of casual modeling, path analysis, regression analysis and (orthognal) factor analysis. But if one accepts the tenet that everything is related to everything else and that consequently every phenomenon has an infinite number of variables (many of which cannot be quantified), then one can never understand or explain anything. In fact we understand our environment by arbitrarily drawing boundaries on phenomena and making generalizations based on such assumptions as independence, ceteria paribus, and causation. In other words, our imposition of order on a stubbornly complex environment allows us to achieve parsimonious explanations. Furthermore, a researcher can always modify the independence assertion after having carried out the initial analysis and expanded broad generalizations.

These generalizations can later be refined to account for linkages between systemic variables and parameters.

Fortunately, we need not throw up our calculators in despair at the interdependent environment which forces us to use grossly unrealistic models. A cosine adjustment can be made of the vector computation to take into account the amount of interdependence [5]. In a system which exhibits low levels of interdependence between its n dimensions, the cosine adjustment is small. Conversely, in highly interdependent systems the adjustment is large. Since the adjustment increases the magnitude of a vector score in such a situation, the additive score (which assumes perfect scalability and independence) is the maximum limit of a vector score. But once this admission is made, it in no way destroys the importance and necessity of approaching the analysis of international conflict from the vector orientation. The additive approach offers no theory or method to make adjustments as discussed above. Not only does vector algebra offer a methodology for employing this refining adjustment, but the study of stress provides an interesting physical hueristic model.

A Final Comment

In Chapter I, I questioned the additive technique's assumptions of perfect scalability and unidirectionality. Why should 2 + 3 always equal 5 rather than some number less than 5 given certain likely conditions? That units of conflict (or cooperation) could be added in a straight line implied that the angle of divergence of these events was zero. Thus, I criticized the assumption of uniform complete interdependence of foreign policy events as unrealistic. To correct this

mistake, I may have erred in employing a formula for vector magnitudes that makes the equally simplistic assumption of perfect foreign policy event independence.

In any event, the question of which analytic technique gives the more accurate and sensitive description of international behavior is difficult to decide in light of certain findings discussed above. Furthermore, the data's omissions, biases, and inaccuracies may obscure actual differences between the techniques. Therefore, at this time, one might be well-advised to employ the less time consuming and less complicated additive technique for systemic analysis, enumerative histories, etc. This selection may also be useful in systems characterized by highly interdependent foreign policies since the vector descriptions will more closely approximate the additive scores.

Nevertheless, I do not wish to simply abandon the vector technique out of hand, because it has shown itself to be a valuable means of evaluating the stability of intra-systemic relations and the magnitude of systemic interactions when activity is concentrated among a few actors. Furthermore, the possible utilization of the cosine adjustment to more accurately describe systemic activity (once the problematic chore of determining the angle of interdependence is resolved) remains as an attractive methodology pending the further refinement of events data.

Finally, the vector approach when applied to the study of international behavior would integrate its methodology with those of engineering and physics which study the effects of force and stress on structures. The hueristic contributions of these approaches might indeed offer different perspectives about the effects of conflict on international

stability and the strengths of alliances, to mention only a few possible areas of investigation. Moreover, these endeavors would satisfy Butterfield's prescription (1959:1), noted in the Introduction that we put "on a different kind of thinking cap" when tackling the increasing complexity of our modern world.

Notes

[1] Additional support for the Rosenau-Ramsey thesis is supplied in the following table on the Middle East which demonstrates that cooperation and conflict exhibit "across the board" increases and decreases simultaneously during annual time periods (Kegley, 1971, 364). This is illustrated below where Middle East cooperation (Categories 1-10) is generally as highly correlated with violent conflict (Category 22) as it is with non-violent conflict (Categories 11-21). One explanation for this relationship is that prior to periods of war and during periods of serious conflict, nations seek to protect themselves by forming alliances. But after the threat of serious conflict passes and the members' individual interests reassert themselves, they subordinate the sacrifices demanded by the alliance. That is, the level of conflict decreases with the level of cooperation.

Technique/Weight	Variable X*	Variable Y†	Correlation Coefficient (r)
Additive/Unweighted	Cooperation	Violent Conflict	.78
Additive/Unweighted	Conflict	Violent Conflict	.76
Additive/Dyad Weights	Cooperation	Violent Conflict	.87
Additive/Dyad Weights	Conflict	Violent Conflict	.89
Additive/Action Weights	Cooperation	Violent Conflict	.76
Additive/Action Weights	Conflict	Violent Conflict	.82
Additive/Dyad & Action Weights	Cooperation	Violent Conflict	.87
Additive/Dyad & Action Weights	Conflict	Violent Conflict	.89
Vector/Dyad & Action Weights	Cooperation	Violent Conflict	.65
Vector/Dyad & Action Weights	Conflict	Violent Conflict	.71

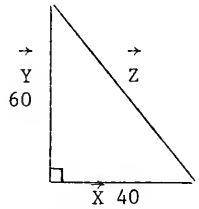
* Cooperation = categories #1-10; Conflict = categories #11-21.
† Violent Conflict = category #22.

[2] During each year in the Middle East analysis, at least eight of the 15 dyads generated at least one event. The total 18 year proportion of events was .12 for the most inactive (Jordan-Iraq) dyad.

[3] It is also possible that the application of the second data reduction criterion might have altered the findings of Chapter IV.

[4] These criticisms of events data were made by Professor Keith Legg (Department of Political Science, University of Florida) in a personal conversation with the author.

[5] In order to understand this adjustment, let us first review a two dimensional problem in finding a vector's magnitude, remembering that the same procedure; and arguments extend to n dimensions.



In simple figure above, $\vec{X}$ and $\vec{Y}$ represent orthoginal (i.e., independent) vectors and their resultant vector $\vec{Z}$, is calculated by applying the following formula:

$$Z = \sqrt{X^2 + Y^2}$$

$$= \sqrt{40^2 + 60^2}$$

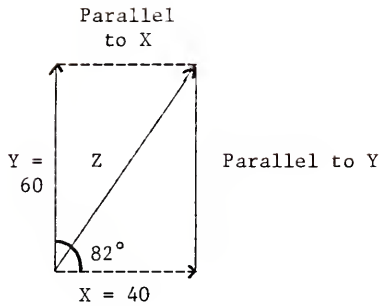
$$= \sqrt{5200}$$

$$= 72.11$$

In the case of dependence between the vectors, a cosine adjustment may be made employing the parallelogram principal (Beer and Johnson, 1962, 20-25). This adjustment appears in the following formula:

$$Z = \sqrt{X^2 + Y^2 + 2XY\ (\cos\ \theta)}$$

To illustrate this adjustment, let us assume that our two vectors, X and Y still equal 40 and 60 respectively. Further suppose that these vectors are almost independent (i.e., the angle between then, ϕ is 82° instead of 90°). Their representation would be as follows and the solution is carried out below.



$$Z = \sqrt{40^2 + 60^2 + 2(40)(60)(\cos 82°)}$$

$$= \sqrt{1600 + 3600 + 4800(.13917)}$$

$$= \sqrt{5200 + 668.016}$$

$$= 76.6$$

If in two additional cases, case a and case b, the length of the vectors remained 40 and 60 but the relationship between them because more dependent (i.e., the angles between them are 20 and 1 respectively), the calculations of the resultant vectors' magnitudes would show increases whose limit would be the sum of the 2 original vectors! These calculations are demonstrated as follows:

$$Z = \sqrt{40^2 + 60^2 + 2(40)(60)(.99969)}$$

$$= 98.54$$

$$Z_b = \sqrt{40^2 + 60^2 + 2(40)(60)(.99984)}$$

$$= 99.9962$$

The progression of case a and case b towards 100 (i.e., 60 + 40) shows us that additivity is the limiting case of total dependence.

This may present us with another possible explanation as to why the vector analytic approach was unable to produce better predictions of extra-systemic conflict. For example, the Middle East and the NATO-WARSAW PACT systems of conflict were intra-dependent to such a great extent that the independence assumption inherent in the vector approach resulted in error. In these instances, adjustments were necessary and perhaps their applications would have generated superior vector analytic predictions to extra-systemic behavior. This speculation, however, is an empirical question which indeed deserves additional attention. This speculation, of course, raises a multitude of questions: for instance, would this same mechanism work well in a cooperative/highly dependent system? How does one determine the size of the angle between the vectors in order to make the accurate adjustment? An answer in the affirmative would give researchers of international behavior a powerful predictive tool coupled with a sensitive descriptive indicator of the changing distributions and levels of international conflict.

APPENDIX A

MIDDLE EAST MILITARY EXPENDITURES, 1951-1968
SIPRI (1973:238-239)

	1951	1952	1953	1954	1955	1956	1957	1958	1959
Egypt	102.5	109.8	125.9	165.7	249.8	288.4	257.9	236.0	232.7
Iraq	27.9	39.5	58.6	65.9	66.3	93.3	102.3	110.0	128.2
Israel	69.2	43.9	35.0	31.7	34.0	68.3	96.5	108.2	122.7
Jordan	35.6	37.3	39.8	40.5	41.1	49.0	50.1	58.5	72.9
Lebanon	7.4	7.3	9.4	10.1	12.2	16.5	15.9	17.7	16.2
Syria	21.3	20.0	27.3	25.8	28.1	48.4	40.1	71.9	70.7

	1960	1961	1962	1963	1964	1965	1966	1967	1968
Egypt	256.6	297.3	336.7	367.7	461.3	499.9	515.1	634.5	805.2
Iraq	147.5	153.4	164.0	190.7	225.0	271.0	278.0	287.5	332.0
Israel	144.1	144.1	162.3	201.5	250.9	287.3	306.2	407.2	551.7
Jordan	68.3	66.6	71.3	72.0	70.9	71.2	84.9	114.8	137.4
Lebanon	17.4	20.6	29.1	24.5	26.7	30.7	37.9	41.0	43.7
Syria	70.7	72.2	79.5	83.0	91.3	100.0	81.8	90.6	142.9

APPENDIX B

NATO-WARSAW PACT MILITARY EXPENDITURES,† 1955-1970*
(IN $ US MILLIONS AT 1970 PRICES)

	NATO													
Year	Iceland**	France	Greece	West Germany	Italy	Luxembourg	Netherlands	Norway	Portugal	Turkey	United Kingdom	Belgium	Canada	Denmark
1955	0	3930	169	2891	1426	17	802	237	132	246	6389	507	2582	246
1956	0	5108	219	2705	1467	11	866	230	133	232	6235	491	2651	237
1957	0	5312	193	3365	1518	12	809	245	137	227	5896	512	2490	249
1958	0	4905	191	2255	1559	11	712	227	139	235	5779	506	2299	229
1959	0	5004	198	4041	1607	11	634	241	156	271	5719	511	2147	236
1960	0	5158	210	4371	1678	7	720	230	263	287	5895	518	2140	264
1961	0	5316	203	4636	1732	8	839	250	261	312	5877	525	2204	268
1962	0	5513	206	5861	1903	9	894	276	296	326	5989	558	2294	328
1963	0	5418	211	6572	2121	9	905	288	290	327	6057	612	2132	332
1964	0	5568	220	6313	2172	11	984	292	316	354	6271	651	2249	342
1965	0	5658	238	6218	2251	11	959	338	316	376	6256	635	1981	360
1966	0	5821	258	6101	2436	11	935	336	333	365	6194	646	2033	356
1967	0	6133	332	6358	2378	9	1037	346	409	368	6394	678	2185	358
1968	0	6127	388	5637	2423	8	1023	383	430	389	6250	709	2057	381
1969	0	6045	439	6136	2378	8	1070	387	399	388	5864	709	1944	375
1970	0	6014	474	6188	2506	8	1103	389	430	416	5850	755	2040	368

† Excluding US, USSR, and Albania. The latter withdrew from the Pact in in 1968.

* Source, Stockholm International Peace Research Institute Yearbook, 1973, p. 236-7.

** Iceland does not maintain an army or navy (SIPRI Yearbook, 1975, p. 1021). It is protected by the US by treaty agreement.

	WARSAW PACT						
Year	Bulgaria	Czechoslovakia	East Germany	Hungary	Poland	Rumania	Total
1955	130	1000	300	100	792	400	22296
1956	130	1071	350	100	754	400	23450
1957	133	1094	400	110	634	405	23741
1958	149	1047	487	130	704	381	21945
1959	141	1035	620	144	898	365	23979
1960	154	1035	750	175	936	380	25121
1961	187	1018	750	205	1068	395	26054
1962	222	1118	815	288	1156	414	28466
1963	233	1282	815	349	1300	435	29688
1964	224	1329	815	346	1376	436	30439
1965	199	1282	826	284	1482	481	30151
1966	207	1212	974	292	1583	509	30602
1967	228	1282	1062	313	1658	530	32058
1968	228	1459	1171	371	1828	550	31412
1969	261	1529	1873	458	2073	679	33025
1970	279	1741	1990	513	2224	748	34036

APPENDIX C

DISTRIBUTION OF MIDDLE EAST EVENTS, BROKEN DOWN BY YEAR AND ACTION CATEGORY

	Action Category																						
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	Annual Total
1951	3	7	5		3	7	1	16		1	7	28	21	4	11	1	2	3	3		5	62	190
1952	1	4	4	3		1		6	1	5	4	28	4	4	2		1		2		2	32	104
1953	2	13	4		1	8	2	10	1	8	7	62	27	11	8	6	8	5			8	98	289
1954	4	8	2		2	13	1	6	1	4	7	118	25	18	9	4	3	6	11		11	191	444
1955	8	7	20	2	10	6		30		10	6	89	9	14	6	10	4	6	7		8	287	539
1956	15	7	18	1	21	14	4	29	10	14	9	103	18	18	20	9	4	22	2		4	364	709
1957	8	1	2	5	3	11	2	5	2	3	4	75	19	7	11	8	5	9	2			182	370
1958	2					10		4		1		41	8	5	1	2	1	6	3		5	96	185
1959			6	4		4	1	4		2	2	29	5	3	5		2	1			6	72	146
1960		2	2	1	2	3		2		1	3	31	6	5	1	2	2	5	3		3	65	136
1961	2		2						1			8	1	2			1	2	1		4	49	73
1962			2		2			2	1			16	19			1	2				1	66	112
1963		1	1		1	2		6		2	1	21	16	1	1	4		3			2	50	112
1964	1		14			1		4				14	7	3		1	2	2			2	82	133
1965		2	2	1	2				2	1	1	11	18	3		4		2			1	84	134
1966	3		5	4	5	9	1	3	1	3	3	45	8	12	1	9	6	5	2			75	200
1967	2	2	26	7	8	16	7	30	7	18	18	17	21	19	15	15	16	15	5		3	267	689
1968			14	3	5	7		5	6	9	13	131	15	8	11	13	1	3	3		2	409	658
Category Total	51	54	129	31	65	112	19	162	33	82	85	1022	247	137	102	89	60	90	44	0	67	2531	5221
%*	.02	.02	.05	.01	.02	.04	.01	.06	.01	.03	.03	.38	.09	.05	.04	.03	.02	.03	.02		.02	X	

*These figures are percentages of the total number of events (2681) of categories 1-21, the non-violent conflict. The percentages are rounded and do not add to 1.00

APPENDIX D

DISTRIBUTION OF NATO-WARSAW PACT EVENTS, BROKEN DOWN BY YEAR AND ACTION CATEGORY

Year	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	Coop./ Conf.	Total	%
1955			1	1		2	1		1										1			2/5	7	1.5
1956	10	1	2	3	1	5	3					1										17/9	26	5.7
1957			7	4				2			1			3							1	11/7	18	3.8
1958			2	1	78	1	1	6		1		18										81/27	108	23.0
1959			2	2	2			1	2	1	1											6/5	11	2.3
1960			5	1		1	4	2		4	4											6/15	21	4.5
1961				1			1	2		3	1		1	3								1/11	12	2.5
1962			2	19						3		1				1					2	21/7	28	6.0
1963		2	13	3			1	1		4				3								18/9	27	5.7
1964			15	7	4	3		1		1	2											26/7	33	7.0
1965			7	4	7	3	3															18/6	24	5.1
1966		1	17	10	7	3		2	2													35/7	42	8.9
1967		1	8	3	5	3																17/3	20	4.3
1968			6	7	5		16				3											18/19	37	7.9
1969			2	9	8	1				5		1										19/7	26	5.7
1970			3	17	10																	30/0	30	6.4
Total (470)	10	5	92	92	127	22	30	17	5	22	12	21	1	9	0	1	0	0	1	0	3	326/144	470	100.
%	2.1	1.	19.6	19.6	27	4.7	6.3	3.6	1	4.7	4.7	4.5	.2	1.9	0	.2	0	0	.2	0	.6	100	-	-

APPENDIX E

BLECHMAN W.E.I.S. ACTION CATEGORIES
(Blechman, 1972:5)

Code Number	Label	Sample types of actions included
01	Yield	Surrender, yield position, retreat, evacuate
02	Comment	Explain policy, comment on situation
03	Consult	Meet with, receive visit, visit, go to
04	Approve	Praise, hail, applaud, endorse other's position
05	Promise	Promise support, assure, reassure
06	Grant	Grant privilege, apologize, suspend negative sanction
07	Reward	Extend aid or assistance
08	Agree	Make substantive agreement, agree to future action
09	Request	Ask for information or assistance, call for, request action, appeal to, plead
10	Propose	Offer proposal, urge course of action
11	Reject	Refuse, oppose, turn down proposal, reject protest
12	Accuse	Charge, criticize, blame, denounce
13	Protest	Make complaint or protest

Code Number	Label	Sample types of actions included
14	Deny	Deny an accusation or attributed role
15	Demand	Insist, issue order or command
16	Warn	Give warning
17	Threaten	Threaten with or without specific sanction, issue ultimatum
18	Demonstrate	Walk out of, mobilize, maneuver
19	Reduce relations	Cancel or postpone planned event, halt negotiations, break diplomatic relations
20	Expel	Order personnel or organization out of country
21	Seize	Detain or arrest person, seize position
22	Force	Any event involving violence

BIBLIOGRAPHY

Alexandroff, A., R. Rosecrance, and A. Stein (1977) "History, quantitative analysis, and the balance of power." J. of Conflict Resolution 21, 1:35-57.

Alker, H. (1968) "The long road to theory: Problems of statistical non-additivity," pp. 137-169 in M. Kaplan (ed.), New Approaches to International Politics. New York: St. Martin's Press.

Ashby, R. (1960) Design for a Brain: The Origin of Adaptive Behavior. New York: John Wiley.

Axelrod, R. (1970) Conflict of Interest. Chicago: Markham.

Azar, E. (1970) "Analysis of international events." Peace Research Reviews 4, 1:1-113.

---, R.A. Brody, and C.A. McClelland (1972) International Events Interaction Analysis: Some Research Considerations. Beverly Hills and London: Sage Publications.

Bachrach, P. and M.S. Baratz (1963) "Decisions and non-decisions: An analytic framework." American Political Science Review 57: 632-642.

Bales, R. (1950) Interaction Process Analysis: A Method for the Study of Small Groups. Reading: Addison-Wesley.

Beer, F.A. (1973) How Much War in History: Definitions, Estimates, Extrapolations and Trends. Beverly Hills and London: Sage Publications.

Beer, F.P. and E.R. Johnson (1962) Mechanics for Engineers: Statics. New York: McGraw-Hill.

Bentley, A. (1954) Inquiry into Inquiries: Essays in Social Theory. S. Rutner (ed.) Boston: Beacon Press.

Berkley, G.E. (1978) The Craft of Public Administration. Boston: Allyn and Bacon.

Bernard, J. (1975) "The sociological study of conflict." pp. 33-117 in International Studies Association The Nature of Conflict. Paris.

Blalock, H. [ed.] (1971) Causal Models in the Social Sciences. Chicago: Aldine.

Blau, P. (1964) Exchange and Power in Social Life. New York: John Wiley.

Blechman, B.M. (1971) Arab-Israeli Event/Interactions. Ann Arbor: Inter-University Consortium for Political Research.

Boulding, K. (1965) The economics of human conflict," pp. 211-248 in E. McNeil (ed.) The Nature of Human Conflict. Englewood Cliffs: Prentice Hall.

--- (1962) Conflict and Defense: A General Theory. New York: Harper.

Bouthoul, G. (1972) "Les baromètres polémoligiques." Etudes Polémoligiques 4, 2:30-54.

Brams, S. (1969) "The structure of influence relations in the international system," pp. 583-599 in J. Rosenau (ed.) International Politics and Foreign Policy. New York: Free Press.

--- (1966) "Transaction flows in the international system." American Political Science Review 4:880-898.

Brecher, M. (1969) "The subordinate state system of southern Asia," pp. 153-167 in J. Rosenau (ed.) International Politics and Foreign Policy. New York: Free Press.

Britannica Book of the Year (1956-1971) "Chronology of major international events." London and Chicago: University of Chicago Press.

Burgess, P.M. and R.W. Lawton (1972) Indicators of International Behavior: An Assessment of Events Data Research. Beverly Hills and London: Sage Publications.

Burrowes, R. and D. Muzzio (1972) "The middle east: An enumerative history." J. of Conflict Resolution 16, 2:211-226.

--- and D. Muzzio (1970) "The road to war: An enumerative history of the external politics of Israel, Jordan, Saudi Arabia, Syria, and the U.A.R., 1965-1967." Presented at the American Political Science Association Annual Meeting (September) Los Angeles.

--- and B. Spector (1970) "Conflict and cooperation within and among nations: Enumerative profiles of Syria, Jordan, and the United Arab Republic, January 1965 to May 1969." Presented at the International Studies Association Annual Meeting (April) Pittsburgh.

Butterfield, H. (1959) The Origins of Modern Science. New York: Macmillan.

Casanova, P. (1966) "Internal and external policies of developing countries," pp. 131-149 in R. Farrell (ed.) Approaches to Comparative and Foreign Politics. Evanston: Northwestern University Press.

Cattell, R. (1952) Factor Analysis. New York: Harper.

Choucri, N. and R.D. North (1975) Nations in Conflict: National Growth and International Violence. San Francisco: W.H. Freeman.

--- (1972) "The search of peace systems: Skandinavia and the Netherlands, 1870-1970," pp 376-421 in B. Russett (ed.) Peace, War, and Numbers. Beverly Hills and London: Sage Publications.

--- (1969) "The determinants of international violence." Peace Research Society Papers 12:33-63.

Cobb, R. and C. Elder (1970) International Community: A Regional and Global Study. New York: Holt, Rinehart, and Winston.

Cohen, B. (1973) The Question of Imperialism: The Political Economy of Dominance and Dependence. New York: Basic Books.

Converse, E. (1968) "The war of all against all: A review of 'The Journal of Conflict Resolution,' 1957-1968." J. of Conflict Resolution 12, 4:471-532.

Copson, R.W. (1973) "Foreign policy conflict among African states, 1964-1969," pp. 189-218 in P.J. McGowan (ed.) Sage International Yearbook of Foreign Policy Studies. Beverly Hills and London: Sage Publications.

Coser, L. (1956) The Functions of Social Conflict. New York: Free Press.

Costner, H. and R. Leik (1964) "Deductions from 'axiomatic theory'," American Sociological Reviews 29:819-835.

Dedring, J. (1976) Recent Advances in Peace and Conflict Research: A Critical Survey. Beverly Hills and London: Sage Publications.

Deutsch, J. (1974) Politics and Government. Boston: Houghton Mifflin.

--- (1966) Nationalism and Social Communication. Cambridge: MIT Press.

--- and J.D. Singer (1969) "Multipolar power systems and international stability," pp. 315-324 in J. Rosenau (ed.) International Politics and Foreign Policy. New York: Free Press.

Dodd, S. (1947) Dimensions of Society. New York: Macmillan.

Doran, D.F., R.E. Pendley, and G. Autunes (1972) "A Test of Cross-National Event Reliability." Rice University, January. (mimeo)

--- (1973) "A test of cross-national event reliability: Global vs. regional data sources." International Studies Quarterly 17, 2:175-203.

East M. (1972) "Status discrepancy and violence in the international system: An empirical analysis," pp. 295-316 in J. Rosenau, V. Davis, and M. East (eds.) The Analysis of International Politics. New York: Free Press.

--- and P. Gregg (1967) "Factors influencing cooperation and conflict in the international system." International Studies Quarterly 11:244-269.

Easton, D. (1965) A Systems Analysis of Political Life. New York: John Wiley.

Farrell, R.B. [ed.] (1966a) Approaches to Comparative and International Politics. Evanston: Northwestern University Press.

--- (1966b) "Foreign policies in open and closed political systems," pp. 167-208 in R. Farrell (ed.) Approaches to Comparative and International Politics. Evanston: Northwestern University Press.

Fitzsimmons, B. (1969) "The Role of Violence in International Conflicts." World Event/Interaction Survey Support Study I, University of Southern California, March. (mimeo)

---, G. Hoggard, C. McClelland, W. Martin, and R. Young (1969) "World Event-Interaction Survey Handbook and Codebook." World Event/Interaction Survey, Technical Report I, University of Southern California, January. (mimeo)

Flynn G. (1976) "The content of European _détente_." Orbis 20, 2: 401-416.

Galtung, J. (1969) "Violence, Peace and Peace Research." J. of Peace Research 3:167-191.

--- (1966) "East-West interaction patterns." J. of Peace Research 3:146-176.

Gamson, W.A. and A. Modigliani (1971) Untangling the Cold War. Boston: Little, Brown.

Garson, D.G. (1976) Handbook of Political Science Methods. Boston: Holbrook.

George A. (1960) "Predictions of Political Action." Public Opinion Quarterly 20:534-545.

---, D. Hall, and W. Simons (1971) The Limits of Coercive Diplomacy: Laos-Cuba-Viet Nam. Boston: Little, Brown.

Goldman, J. (1973) "East-west tension in Europe, 1946-1970: A conceptual analysis and a quantitative description." World Politics 26, 1:106-125.

Guetzkow, H. (1968) "Some correspondence between simulations and realities' in international relations," pp. 271-320 in M. Kaplan (ed.) New Approaches to International Relations. New York: St. Martin's Press.

Haas, E. and A. Whiting (1956) Dynamics of International Relations. New York: McGraw-Hill.

Haas, M. (1970) "International subsystems: Stability and bipolarity." American Political Science Review 64, 1:98-123.

Heintz, P. (1976) "On the change of parameters of the international system: An analytic review of some recent literature." J. of Conflict Resolution 20, 1:173-184.

Hermann, C.F. (1970) "What is a foreign policy event?" Presented at the Michigan State University International Events Data Conference (April) E. Lansing.

Hoggard, G. (1969) "The WEIS Data Collection: A Status Report." World Event/Interaction Survey Technical Report 4, University of Southern California, February. (mimeo)

Holsti, O.R., P.T. Hopmann, and J.D. Sullivan (1973) Unity and Disintegration in International Alliances: Comparative Studies. New York: John Wiley.

Homans, G. (1950) The Human Group. New York: Harcourt and World.

Hopmann, P.T. (1972) "Internal and external influences on bargaining in arms control negotiations: The partial test ban," pp. 213-238 in B.M. Russett (ed.) Peace, War, and Numbers. Beverly Hills and London: Sage Publications.

--- (1967) "International conflict and cohesion in the community system." International Studies Quarterly 11:212-236.

---, and B.B. Hughes (1974) Dyadic and Multilateral Events. Ann Arbor: Inter-University Consortium for Political Research.

Jenkins, J.B. and W.O. Chittick (1975) "Reconceptualizing foreign policy behavior: The problem of discrete events in a continuous world," pp. 79-92 in R. Merritt (ed.) Foreign Policy Analysis. Lexington: Lexington Books.

Jensen, L. (1972) "Predicting international events." Peace Research Reviews 4, 6:1-65.

Johnson, L.G. (1976) Conflicting Concepts of Peace in Contemporary Peace Studies. Beverly Hills and London: Sage Publications.

Jones, S. and J.D. Singer (1972) Beyond Conjecture in International Politics. Itasca: Peacock.

Kahan, J.H. (1977) Security in the Nuclear Age. Washington, D.C.: The Brookings Institution.

Kaplan, A. (1964) The Conduct of Inquiry. San Francisco: Chandler.

Kaplan, M. (1968) "International systems." International Encyclopedia of the Social Sciences 15:479-486.

--- (1968b) New Approaches to International Politics. New York: St. Martin's Press.

--- (1957) System and Process in International Politics. New York: John Wiley.

Katzer, J.H., K.H. Cook, and W.W. Crouch (1978) Evaluating Information: A Guide for Users of Social Science Research. Reading: Addison-Wesley.

Kean, J.G. and P.J. McGowan (1973) "National attributes and foreign policy participation: A path analysis," pp. 219-252 in P.J. McGowan (ed.) Sage International Yearbook of Foreign Policy Studies 1. Beverly Hills and London: Sage Publications.

Kegley, C.W. (1975) "The generation and use of events data," pp. 129-161 in C.W. Kegley et al. (eds.) International Events and the Comparative Analysis of Foreign Policy, International Relations Series 4. Columbia: University of South Carolina Press.

--- (1973) A General Empirical Typology of Foreign Policy Behavior. Beverly Hills and London: Sage Professional Paper in International Studies.

--- (1972) "Applying events data to the measurement of systemic transformation: Problems and perspectives." Presented at the International Studies Association South Meeting of the Southern Political Science Association (November) Atlanta.

--- (1971) Toward the Construction of an Empirically Grounded Typology of Foreign Policy Output Behavior. Syracuse: Syracuse University Press.

---, S.A. Salmore, and D. Rosen (1974) "Convergences in the measurement of interstate behavior," pp. 309-339 in P.J. McGowan (ed.) Sage International Yearbook of Foreign Policy Studies 2. Beverly Hills and London: Sage Publications.

--- (1973) "Convergences in the measurement of interstate behavior." Presented at American Political Science Association Annual Meeting (September) New Orleans.

Keim, W. (1971) "Nations and conflict individuality." J. of Peace Research 8:287-292.

Lasswell, H. (1942) "The politically significant content of the press." Journalism Quarterly, 19:12-23.

Leik, R. and W. Gove (1959) "The conception and measurement of assymmetric monotonic relationships in sociology." American Sociological Review 74:696-709.

Lewis, J. (1976) "Retest for a Pre-Theoretical Extension." University of Florida, June. (mimeo)

Mack R. and R. Snyder (1975) "The analysis of social conflict - toward an overview and synthesis." J. of Conflict Resolution 1, 2:212-248.

McClelland, C. (1970) "Two Conceptual Issues in the Quantitative Analysis of International Event Data." University of Southern California, March. (mimeo)

--- (1969) "World Event/Interaction Survey Handbook and Codebook." World Event/International Survey Technical Report I. University of Southern California, January. (mimeo)

---(1968a) "Access to Berlin: The quantity and variety of events, 1948-1963," pp. 159-186 in J.D. Singer (ed.) Quantitative International Politics: Insights and Evidence. New York: Free Press.

--- (1968b) "International Interaction Analysis: Basic Research and Some Practical Applications." World Event/Interaction Survey Technical Report 2. University of Southern California, November. (mimeo)

--- (1965) "Systems theory and human conflict," pp. 250-271 in E. McNeil (ed.) The Nature of Human Conflict. Englewood Cliffs: Prentice Hall.

---, and G. Hoggard (1969) "Conflict patterns in the interactions among nations," pp. 711-724 in J. Rosenau (ed.) International Politics and Foreign Policy. New York: Free Press.

McGowan, P.J. (1974) "Problems in the construction of positive foreign policy theory." pp. 25-43 in J. Rosenau (ed.) Comparing Foreign Policy: Theories, Findings, and Methods. Beverly Hills and London: Sage Publications.

--- (1970) "Garbage? No. Events? Yes. A Method for Evaluating Coder Performance in the Abstraction and Description of Political Events Data." Syracuse University. (mimeo)

--- and M. O'Leary (1971) Comparative Foreign Policy Analysis Materials. Chicago: Markham.

--- and M.B. Shapiro (1973) The Comparative Study of Foreign Policy: A Survey of Scientific Findings. Beverly Hills and London: Sage Publications.

McNeil, E. [ed.] (1965) The Nature of Human Conflict. Englewood Cliffs: Prentice Hall.

Mead, G.H. (1938) The Philosophy of the Act. Chicago: University of Chicago Press.

Merritt R. [ed.] (1975) Foreign Policy Analysis. Lexington: Lexington Books.

Modelski, G. (1974) World Power Concentrations: Typology, Data, Explanatory Framework. Morristown: General Learning Press.

Moses, L.E., R.A. Brody, O.R. Holsti, J.B. Kadane, and J.S. Milstein (1967) "Scaling data on inter-nation action." Science 156: 1054-1059.

Newcombe, A. (1970) "Toward the development of an inter-nation tensionmeter." Peace Research Society Papers 13:11-27.

--- and H. Newcombe (1972) "Approaches to peace research." Peace Research Reviews 4, 4:1-23.

Nogee, J. (1973) "Polarity: An ambiguous concept." Presented at the American Political Science Association Annual Convention (September) New Orleans.

Odell, J.S. (1975) "The hostility of United States external behavior: An exploration," pp. 107-134 in P.J. McGowan (ed.) Sage International Yearbook of Foreign Policy Studies 3. Beverly Hills and London: Sage Publications.

Organski, A. (1968) World Politics. New York: Alfred A. Knopf.

Park, P. (1969) Sociology, Tomorrow: An Evaluation of Sociological Theories in Terms of Science. New York: Pegasus.

Parsons, T. (1968) "Social systems." International Encyclopedia of the Social Sciences 15:458-473.

--- (1951) The Social System. Glencor: Free Press,

--- and E.A. Shils [eds.] (1962) Toward a General Theory of Action. New York: Harper.

Peterson, S. (1975) "Research on research: Event data studies, 1961-1972," pp. 263-305 in P.J. McGowan (ed.) Sage International Yearbook of Foreign Policy Studies 3. Beverly Hills and London: Sage Publications.

Phillips, W. (1973) "The conflict environment of nations: A study of conflict inputs to nations in 1963," pp. 124-147 in J. Wilkenfeld (ed.) Conflict Behavior and Linkage Politics. New York: David McKay.

Pickus, R. and R. Woito (1970) To End War. New York: Harper and Row.

Rapoport, A. (1968a) "General systems theory." International Encyclopedia of the Social Sciences 15:452-458.

--- (1968b) "Editor's introduction" and "Concluding remarks," pp. 11-82; 411-414 in A. Rapoport (ed.) Clausewitz on War. Baltimore: Penguin.

--- (1957) "Lewis Richardson's mathematical theories of war." J. of Conflict Resolution 2, 2:249-299.

Rescher, N. (1967) The Logic of Decision and Action. Pittsburgh: University of Pittsburgh Press.

Richardson, L. (1960) Arms and Insecurity. Pittsburgh: Boxwood Press.

Riker, W. (1957) "Events and situations." J. of Philosophy 54, 1:57-70.

Rosecrance, R. (1969) "Bipolarity, multipolarity, and the future," pp. 325-336 in J. Rosenau (ed.) International Politics and Foreign Policy. New York: Free Press.

--- (1963) Action and Reaction in World Politics: International Systems in Perspective. Boston: Little, Brown.

Rosenau, J.N. [ed.] (1969) International Politics and Foreign Policy. New York: Free Press.

--- [ed.] (1967) Domestic Sources of Foreign Policy. New York: Free Press.

--- (1966) "Pre-theories and theories of foreign policy," in R.B. Farrell (ed.) Approaches to Comparative and International Politics. Evanston, Ill.: Northwestern University Press.

--- [ed.] (1961) International Politics and Foreign Policy. New York: Free Press.

--- and D.G. Hoggard (1971) "Foreign policy behavior in dyadic relationships: Testing a pre-theoretical extension." Presented at the International Studies Association Annual Meeting (March) Puerto Rico.

--- and G. Hoggard (1974) "Foreign policy behavior in dyadic relationships," pp. 117-149 in J. Rosenau (ed.) Comparing Foreign Policy: Theories, Findings and Methods. Beverly Hills and London: Sage Publications.

--- and G.H. Ramsey (1975) "External and internal typologies of foreign policy behavior: Testing the stability of an intriguing set of findings," pp. 235-262 in P.J. McGowan (ed.) Sage International Yearbook of Foreign Policy Studies 3. Beverly Hills and London: Sage Publications.

Rosenberg, M. (1967) "Attitude change and foreign policy in the cold war era," pp. 111-160 in J. Rosenau (ed.) The Domestic Sources of Foreign Policy. New York: Free Press.

Rummel, R.J. (1973) "Dimensions of conflict behavior within and between nations," pp. 59-106 in J. Wilkenfeld (ed.) Conflict Behavior and Linkage Politics. New York: David McKay.

--- (1972) "United States foreign relations: Conflict, cooperation, and attribute distances," pp. 71-133 in B.M. Russett (ed.) Peace, War, and Numbers. Beverly Hills and London: Sage Publications.

--- (1970) "U.S. Foreign Relations: Conflict, Cooperation and Attribute Distances." DON Project Research Report 41, University of Hawaii, July. (mimeo)

--- (1969a) "Some dimensions in the foreign behavior of nations," pp. 413-469 in J. Rosenau (ed.) International Politics and Foreign Policy. New York: Free Press.

--- (1969b) "Dimensions of foreign and domestic conflict behavior: A review of empirical findings," pp. 43-75 in D.G. Pruitt and R.C. Snyder (eds.) Theory and Research on the Causes of War. Englewood Cliffs, N.J.: Prentice Hall.

--- (1968a) "Attribute and Behavioral Spaces of Nations: Variables and Samples for 1950." DON Project Research Report 13, University of Hawaii, August.

--- (1968b) "The relationship between national attributes and foreign conflict behavior." pp. 211-250 in J.D. Singer (ed.) Quantitative International Politics: Insights and Evidence. New York: Macmillan.

--- (1963) "Dimensions of conflict behavior within and between nations." General Systems Yearbook 8:1-50.

Russett, B. (1973) "Proportionality in war." Worldview, March: 42-44.

--- [ed.] (1972) Peace, War, and Numbers. Beverly Hills and London: Sage Publications.

--- (1967) International Regions and the International System. Chicago: Rand McNally.

--- (1966) "Discovering voting groups in the United Nations." American Political Science Review 60, 2:327-339.

Sawyer, J. (1967) "Dimensions of nations: Size, wealth, and politics." American Journal of Sociology 73, 3:145-172.

--- and H. Guetzkow (1965) "Bargaining and negotiations in international relations," pp. 466-520 in H. Kelman (ed.) International Behavior: A Social-Psychological Analysis. New York: Holt, Rinehart, and Winston.

Schandler, H. (1976) "Europe: The problem of concensus," pp. 57-75 in W.W. Whitson (ed.) Foreign Policy and U.S. National Security: Major Post-Election Issues. New York: Praeger.

Schnetz, A (1951) "Choosing among projects of action." Philosophical and Phenomenological Research 12:161-184.

Schroeder, P. (1977) "Quantitative studies in the balance of power: An historian's reaction." J. of Conflict Resolution 21, 1: 3-22.

Shapiro, H. and M. O'Leary (1974) "Events Data: Possibilities and Problems." Syracuse University, March. (mimeo)

Sigler, J. (1972) Reliability Problems in the Measurement of International Events in the Elite Press. Beverly Hills and London: Sage Publications.

Simmel, G. (1955) Conflict: The Web of Group Affiliations. Translated by R. Bendix. Glencoe: Free Press.

Simon, H. (1957) Models of Man. New York: John Wiley.

Singer, J.D. [ed.] (1968) Quantitative International Politics: Insights and Evidence. New York: Free Press.

--- and M. Small (1969) "National alliance commitments and war involvement, 1815-1945," pp. 513-542 in J. Rosenau (ed.) International Politics and Foreign Policy. New York: Free Press.

Small, A. (1905) General Sociology: An Exposition of the Main Developments in Sociological Theory from Spencer to Ratzenhofer. Chicago: University of Chicago Press.

Smoker, P. (1965) "Trade, defense, and the Richardson theory of arms races: A seven-nation study." J. of Peace Research 2:161-176.

Spanier, J. (1975) American Foreign Policy Since World War II. New York: Praeger.

--- (1975) Games Nations Play. New York: Praeger.

Spiegel, S. (1972) Dominance and Diversity. Boston: Little, Brown.

Stein, A. (1976) "Conflict and cohesion: A review of the literature." J. of Conflict Resolution 20, 1:143-165.

Stockholm International Peace Research Institute (1973a) "Alternate estimates of Warsaw pact military expenditures, 1961-1971," pp. 214-227 in SIPRI Yearbook. Stockholm: SIPRI.

--- (1973b) "World military expenditures." pp. 376-440 in SIPRI Yearbook. Stockholm: SIPRI.

Sumner, W. (1911) War and Other Essays. New Haven: Yale University Press.

Thurston, L. (1935) The Vector of Mind. Chicago: University of Chicago Press.

Touval, S. (1966) "Africa's frontiers: Reaction to colonial legacy." International Affairs (London) 42:641-654.

Vincent, J. (1968) "National attributes as predictors of delegate attitudes at the United Nations." American Political Science Review 62, 3:916-931.

Von Clausewitz, C. (1968) Clausewitz on War. A. Rapoport (ed.) Baltimore: Penguin.

Waltz, K. (1969) "International structure, national force, and the balance of world power," pp. 304-314 in J. Rosenau (ed.) International Politics and Foreign Policy. New York: Free Press.

Warshay, L. (1975) The Current State of Sociological Theory: A Critical Interpretation. New York: David McKay.

Whitson, W.W. (1976) Foreign Policy and U.S. National Security. New York: Praeger.

Wilkenfeld, J. [ed.] (1973a) Conflict Behavior and Linkage Politics. New York: David McKay.

--- (1973b) "Domestic and foreign conflict," pp. 107-123 in J. Wilkenfeld (ed.) Conflict Behavior and Linkage Politics. New York: David McKay.

--- (1972) "An evaluation of conflict interaction in the Middle East." Presented at the International Studies Association Annual Meeting (March) Dallas.

--- (1969) "Some further findings regarding the domestic and foreign conflict behavior of nations." J. of Peace Research 6, 2:147-156.

--- (1968) "Domestic and foreign conflict behavior of nations." J. of Peace Research 5, 1:56-69.

Wilson, T. (1971) "Critique of ordinal variables," pp. 615-547 in H. Blalock [ed.] (1971) Causal Models in the Social Sciences, Chicago, Aldine.

Wittkopf, E.R. (1974) "The Concentration and Concordance of Foreign Aide Allocations: A Transaction-Flow Analysis," pp. 301-339 in K.R. Cox et al. (eds.) Approaches to Power and Conflict. Beverly Hills and London: Sage Publications.

--- and R. Bradley (1974) "A Partial Comparison of Events, Transactions, and Roll Call for a Developed-Developing International System." University of Florida, March. (mimeo)

Wright, Q. (1964) A Study of War. L. Wright (ed.) Chicago: University of Chicago Press.

Young, O. (1969) "Political discontinuities in the international system." pp. 336-345 in J. Rosenau (ed.) International Politics and Foreign Policy. New York: Free Press.

Zinnes, D.A. (1968) "The expression and perception of hostility in prewar crises: 1914," pp. 85-122 in J.D. Singer (ed.) Quantitative International Politics. New York: Free Press.

--- (1966) "A Comparison of hostile behavior of decision makers in simulate and historical data." World Politics 18, 2:457-502.

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I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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This dissertation was submitted to the Graduate Faculty of the Department of Political Science in the College of Arts and Sciences and to the Graduate Council, and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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