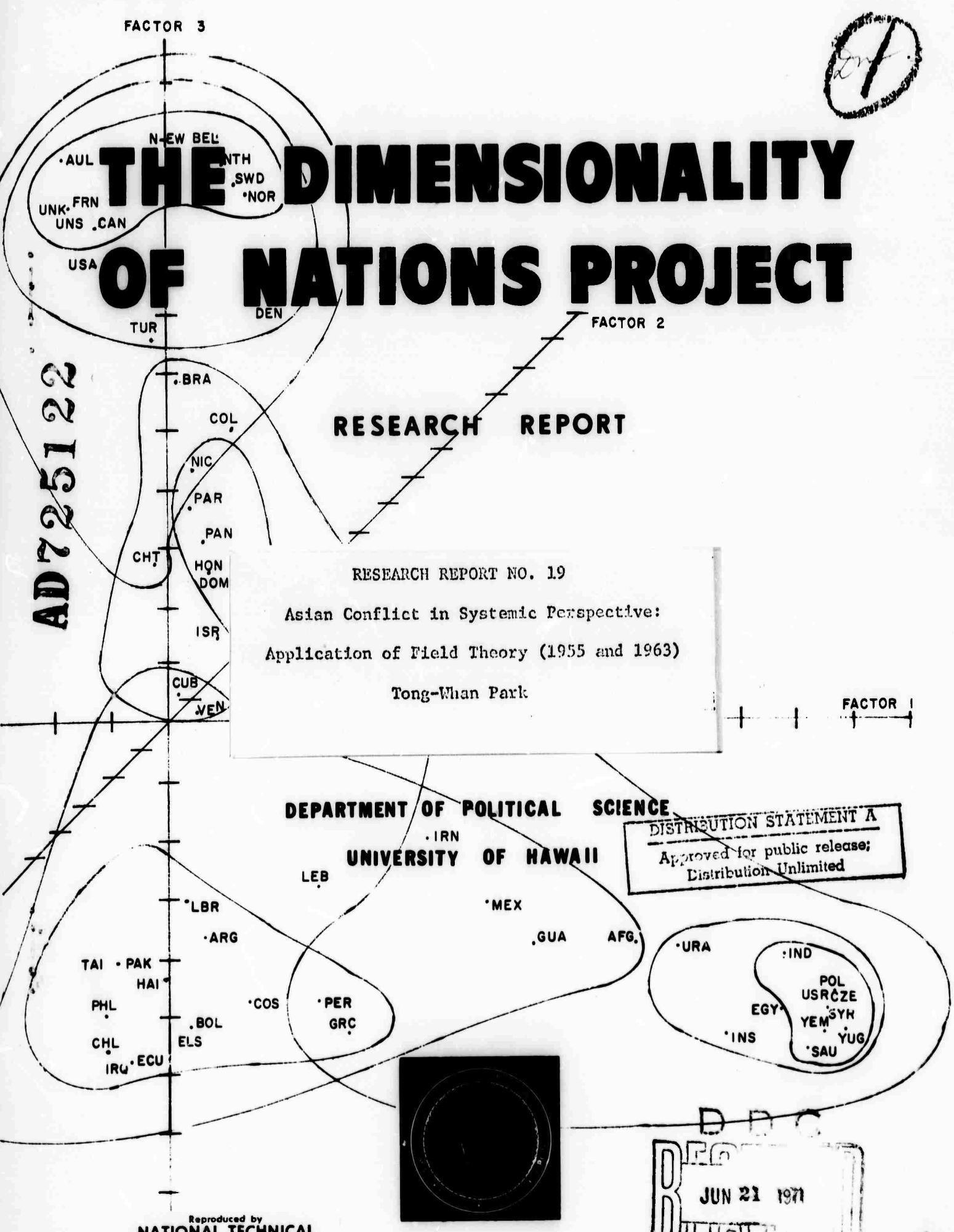

THE DIMENSIONALITY OF NATIONS PROJECT

RESEARCH REPORT

RESEARCH REPORT NO. 19

Asian Conflict in Systemic Perspective:

Application of Field Theory (1955 and 1963)

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Unclassified
Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY (Corporate author)
The Dimensionality of Nations Project
University of Hawaii
2500 Campus Road, Honolulu, Hawaii 96822

2a. REPORT SECURITY CLASSIFICATION
Unclassified

2b. GROUP

3. REPORT TITLE
Asian Conflict in Systemic Perspective: Application of Field Theory (1955 and 1963)

4. DESCRIPTIVE NOTES (Type of report and inclusive dates)
Research Report No. 19

5. AUTHOR(S) (First name, middle initial, last name)
Tong-Whan Park

6. REPORT DATE	7a. TOTAL NO. OF PAGES	7b. NO. OF REFS
November 1968	43	110

8a. CONTRACT OR GRANT NO.	9a. ORIGINATOR'S REPORT NUMBER(S)
N00014-67-A-0387-0003	Research Report No. 19
b. PROJECT NO.	
c.	9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)
d.	

10. DISTRIBUTION STATEMENT
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11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY
2500 Campus Road Honolulu, Hawaii 96822	Advanced Research Projects Agency Washington, D.C.

13. ABSTRACT

The purpose of the proposed research is three-fold: first, to predict conflict and cooperative behavior between any pair of Asian countries (dyad) from knowledge about differences on such attribute dimensions as political, value, economic development, etc. second, to delineate sub-regional groupings of Asian nations with respect to conflict and cooperation; and third, to display the profiles of national attributes for each group.

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Asian conflict						
Field Theory						
Research Design						

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1. INTRODUCTION

Since World War II Asia has been a land of political instability, social friction, and violent conflict. This report describes a line of research that will be undertaken with the conviction that the prerequisite for restoring peace and security in this area is systematic, scientific research. Only when we have reliable knowledge on the causesof conflict and cooperation will we be able to move toward a better Asia.

The purpose of the proposed research is three-fold: first, to predict conflict and cooperative behavior between any pair of Asian countries (dyad) from knowledge about differences on such attribute dimensions as political, value, economic development, etc.; second, to delineate sub-regional groupings of Asian nations with respect to conflict and cooperation; and third, to display the profiles of national attributes for each group.

Data will be collected on measures of conflict and cooperative behavior, as well as national attribute distances involving 342 Asian dyads for 1955 and 1963. Three models with field theoretical implications will be tested employing canonical and regression analysis. Changes from 1955 to 1963 will be measured as residuals from factor comparison analysis and the shifts in the international behavior will be related to changes in the internal characteristic distances between two nations. Sub-regional groupings will be uncovered by applying hierarchical clustering and direct factor analysis techniques to the index of conflict and cooperation. Then the profiles of each group will be presented.

2. STUDIES ON THE INTERNATIONAL RELATIONS OF ASIA

Just as an earthquake in Peru sends tidal waves crashing on the Hawaiian shores and inundates the east coast of Japan, so the political tremors in a corner of Asia can generate formidable impacts all over the world. The growing importance of Asian study evidences the need for the systematic analysis of these political forces. Among numerous aspects

of these forces, two are of main concern in the proposed study: the nature of conflict and cooperation in the Asian behavioral system, and the regional groupings (cooperative) of Asian countries.

2.1. CONFLICT AND COOPERATION IN ASIA

For centuries the study of the international relations of Asia has involved the description of idiosyncratic foreign policies based upon diplomatic history. Studies of this kind have contributed to compiling and updating of historical events, but generalizations from them, if any, are purely intuitive: neither test nor replication is possible. A good example is the work of Gordon (1966). Far beyond the description of foreign policies, Gordon has generalized from empirical materials available to him, personal interviews, and regional histories to some of the major dimensions of dyadic Asian behavior. For example, a major dimension of regional cooperation, he points out, involves communication and collaboration on issues of economic development. As Rummel argues, however, "his generalizations are still intuitive: the weighting of his data is unknown, the intuitive portions of the data cannot be reproduced, and the mode of combining the data to achieve generalizations cannot be established" (1968, p. 40).

It is surprising that there has been no published systematic analysis of the Asia as a whole in terms of conflict and cooperation, even though Asia has been the locale of several violent conflicts since World War II, and is one of the more politically unstable and less known regions of the world.

There exist, however, some systematic studies done on the internal systems of Asian nations and specific issues such as China-Taiwan confrontation, Sino-Indian border conflict, Korean conflict, etc. Berry's (1967) work on the commodity flows and spatial structure of the Indian economy, Lee's (1931) analysis of the periodic recurrences of internecine

wars in China, and MacRae and Smoker's (1967) Vietnam simulation are examples of the former category.

A longitudinal study of conflict behavior has been carried out on the Taiwan Straits confrontation (McClelland, et al, 1965). The international behavior of China, Taiwan, the U.S., and the U.S.S.R. (1950-64) was examined by a quantitative analysis of 2,600 news items, taken principally from The New York Times and the Times (London). Complementary to this study is Sullivan's (1964) research on U.S.-Chinese relationships, particularly the Quemoy-Matsu crisis. Beside the Taiwan Straits studies, the response patterns of China vis-à-vis the U.S. and the U.S.S.R. have been analyzed. Bobrow (1965) attempted to clarify the nature of processes by which the Peking regime responds to American defense policy choices, and to predict what Chinese behavior would probably follow from different American active and passive defense postures. Employing a stimulus-response model and content analysis, Zaninovich (1964) tried to build an empirical theory of state response between China and Russia.

Time series analyses of the Sino-Indian conflict has been performed with communication data (Smoker, 1964a; 1967; and Greaser, 1966). Serial correlation with time lags revealed some regularities in the patterns of crisis behavior. Border conflict between North and South Korea also drew some scholarly attention. Works of Whiting (1960) and George (1967) are notable, while the efforts made by Snyder and Paige (1958) to apply a decision making model to the Korean case opened a road for future research. Simon's (1969, forthcoming) work on the triangular relationship among Peking, Djakarta, and P.K.I., and Russett's (1967b) analysis of Japanese decision of Pearl Harbor also must be noted.

2.2. ASIA AS A SUBSYSTEM

When we define a system as "a set of objects together with relationships between the objects and between their attributes" (Hall and Fagen, 1956, p. 18), it becomes clear that any given system can be further subdivided into subsystems. Then immediately arises a question of how to delineate the boundaries among subsystems so as to maximize within-system similarity and minimize it between systems: what are the criteria of differentiating one subsystem from the others? Since our main research goal is to unfold conflict-cooperation patterns in Asia, the prerequisite task is finding out what "Asia" is. Is Asia a region embracing a number of nations which constitutes a subsystem?[1] To probe this question, we need some definition of a "region."

Many students of the international relations and comparative politics have tried to establish some criteria for a region, either by empirical findings or by some educated hunch. One popular attempt has been to identify an area isolated from another by natural barriers, while others emphasized the relative homogeneity in physiographic terms: "any portion of the earth's surface whose physical characteristics are similar" (Vance, 1951, p. 123). Further pursuing the latter point, Odum and Moore maintain that a region is a composite of "a relatively large degree of homegeneity measured by a relatively large number of purposes or classifications. This means it must comprehend both natural factors and the social factors" (Odum and Moore, 1938, p. 30). Based upon systems analysis, Brecher set six criteria for a subsystem: the delimitation of scope, existence of at least three actors, recognition by others as constituting a distinctive community, self-identifications, the units of power being relatively inferior to those in Dominant System, and changes in the Dominant System having greater effect on subsystem than the reverse (Brecher, 1963).

From above, it becomes obvious that "regionalism is not one thing, but many things" (Wirth, 1951, p. 392). Depending upon the perspectives of individual researchers, several different definitions and criteria may develop. Dissatisfied with the proliferation of definitions, some students ventured to establish the criteria for a region by empirical findings employing multivariate analysis.

In his original study, Raymond Cattel (1949) factor analyzed 72 widely chosen variables gathered for 69 different countries extracting 12 dimensions of national syntality. He then devised an index of pattern similarity to find the clustering of nations (1950). His findings did not reveal any tight clustering of so called Asian countries. What he called "oriental pattern," for instance, had only three nations in it: India, China, and Tibet. The rest of the Asian countries were spread over several other groupings.

R. J. Rummel (1969a) found 9 groups based upon a similarity measure between nations. He first calculated Euclidian distances between nations in a 14 dimensional space derived from a 236 variable factor analysis on data gathered for 82 nations in 1955. Then he scaled these distances so that they varied from zero to unity: zero standing for complete dissimilarity, unity for perfect similarity. His 9 groups were generated from a direct factor analysis of the similarity matrix. Again, none of his groups could be labelled as Asian.

Recently Phillip Gregg and Arthur Banks (1965) performed a Q-factor analysis of all 68 political variables in the Cross-Polity Survey (Banks and Textor, 1963). They found five groupings which they named as "polyarchic," "centrist," "elitist," "personalist," and "traditional." Even though these groups make some intuitive sense in terms of political similarities, no single factor could represent Asian states: the "centrist" factor, for example, has Afghanistan, Czechoslovakia, and Spain.

Deeply concerned with the failure of several attempts to find regions on one composite criterion, Bruce Russett (1967a) pioneered with a multi-criteria approach. He tried to delineate international regions on five different criteria, to compare their congruence, and to compare shifts over time in regions as defined by the same criterion. Five characteristics upon which he found regions were: (1) social and cultural homogeneity, (2) similar political attitudes or external behaviors as appeared in UN voting, (3) common institutional membership, (4) economic interdependence, and (5) geographical proximity (Russett, 1967a, p. 11). Russett used Q-factor analysis as well as a direct factor analysis technique. After a comprehensive discussion on each of his five criterion, he remarked on Asia:

> "Aside from the boundary problem, there is not even any major Asian cluster that simply can meet the demand of inclusion in the same group over all five criteria. Seven states cluster together on at least four: socio-cultural similarity, trade, international organization membership, and proximity. They differ greatly, however, in their orientations in international politics" (1967a, p. 179).

These seven countries are India, Malaysia, Thailand, Burma, Ceylon, Indonesia, and Pakistan. It is very interesting to note that these states all belong to Brecher's "Southern Asia" (1963) somehow supporting his notion that Southern Asia is the only region that can be considered a subsystem according to his six criteria.

By now we have become almost certain that Asia, as a whole, hardly constitutes a subsystem by any criterion other than the conventional geographic concept. Then a serious problem arises. Is it meaningful to study Asia at all since it is nothing but a cluster of heterogeneity? I would argue "yes" for two reasons. First, the fact that Asia is not a subsystem does not invalidate research on it. In fact, the more complicated Asia is, the more knowledge is needed. Second, knowledge about Asia is best discerned by grouping its members in terms of cooperative behavior. McClelland (1966) argues that now is the time to shift down the level of analysis from Asia as a global system to Asia with subregions in it. In

this regard, I selected 19 Asian countries[2] solely based upon geographic consideration. The nations and their codes to be used in the proposed study are presented in Table 2.1.

Table 2.1

	Nations	Codes
1.	Afghanistan	AFG
2.	Burma	BUR
3.	Cambodia	CAM
4.	Ceylon	CEY
5.	China (mainland)	CHN
6.	Taiwan	CHT
7.	India	IND
8.	Indonesia	INS
9.	Japan	JAP
10.	North Korea	KON
11.	South Korea	KOS
12.	Laos	LAO
13.	Nepal	NEP
14.	Outer Mongolia	OUT
15.	Pakistan	PAK
16.	Philippines	PHL
17.	Thailand	TAI
18.	North Vietnam	VTN
19.	South Vietnam	VTS

3. FIELD THEORY IN THE INTERNATIONAL RELATIONS

The prime objective of the proposed study is to predict conflict and cooperative behavior of Asian dyads from various attribute distances. This is entirely within the framework of field theory which postulates that behavior is the consequence of a field consisting of social characteristics, or attributes at a given point of time. Before locating the field theory in the study of international relations, a brief review of analytic models currently employed in political science is provided.

3.1. ANALYTIC MODELS

A scientific inquiry is a process of incessant interplay between analytic and synthetic systems. An analytic system is a system of undefined symbols, interrelations among symbols, axioms, and theorems, all interwoven

by logical connections. Whether it be verbal or mathematical, an analytic system is content-free, absolutely true, and independent of any empirical interpretations. On the contrary, a synthetic system is a system of perceived empirical phenomena. Whether a researcher starts with explicit theories or some vague ideas, an ideal process of empirical science involves four stages: (1) observation of empirical facts; (2) pinning these facts to some symbols of an analytic system; (3) going through deductions in the system to produce generalizations; and (4) further testing the generalizations with empirical phenomena. What makes an analytic system so important in science is its power of generating true deductions given prior premises.

Accepting the commonplace notion that the study of international relations has been undergoing a scientific revolution, we can divide the analytical systems so far employed in the field into two: logical and mathematical. Logical analysis within the traditional approach have prevailed for a long period in the study of international relations. The works of Liska (1957), Modelski (1962), Kaplan (1964), Burton (1965), and Haas (1964) belong to this group. Most of these can hardly be considered scientific, however, because the validity cannot be established through empirical tests and the reliability of findings, if any, can not be evaluated. Perhaps the only logical theoretical model explicitly organized with rigor and specification is the theory of rank disequilibrium independently developed by Galtung (1964) and Heintz (1968).

During the past decade constant effort has been made to replace verbal ideas by rigorous theories using numerical analytical systems. This trend toward quantification can be divided into two categories. The descriptive and inferential statistics form one branch, while model building based upon mathematics establishes another genre. This classification does not rule out the possibility that the model builders use statistical tools. In fact, almost all model builders resort to statistics for empirical tests.

The most typical use of descriptive statistics has been the single index approach. North, Holsti, Brody (1967), Singer, Small (1967), Tanter (1967), McClelland (1967), and numerous other scholars have attempted to represent a concept by a single variable and describe its distribution or its change over time. As far as inferential statistics are concerned, there are too many works to be cited here. Any work which tried to infer to some population using classical significance test falls into this category.

Among the various mathematical models applied, those which have had considerable impact and acknowledgement in the study of international relations are (1) classical calculus models, (2) probability models, and (3) linear algebraic models.

The claculus models have been employed by Richardson (1960a), Smoker (1965), McGuire (1965), etc. Based upon the notion of traditional Cartesian space, rate of change was the main focus of the bivariate relationships.

Probability models have not been frequently used in international relations. Horvath (1963; 1967), Weiss (1963; 1966), and Richardson (1960b) are a few who studied probability distribution of violent conflicts. Though seldom applied to international relations per se, Riker's coalition model (1962) has a great potentiality for application in the field.

Among many possible uses of linear algebraic models[3], the most widely employed is the factor analytic model. Considering the variables as vectors in a multidimensional space, this approach attempts to delineate the inter-relationship between these vectors and to find a linearly independent set of vectors (basis) upon which all the vectors in the space are dependent. The works of Rummel (1963), Alker (1964), Russett (1967a), Tanter (1966), Cattell (1949), and Gregg and Banks (1965) belong to this class.

One of the recent developments in linear algebraic models is field theory, which relates vectors in a nation behavior space to distances between nations in an attribute space. Now lets turn to the discussion

of its assumptions and deductions.

3.2. FIELD THEORY

Thirteen years ago Quincy Wright (1955) introduced the field concept as an organizing scheme in the study of international relations. Wright's formulation was largely based on the works of Kurt Lewin (1951), Talcott Parsons (1951), and L. L. Thurstone (1935). He viewed international relations as a composite of geographic and analytic fields, and further specified that the relations between social units in the field are determined and predicted by the internal characteristics of these units or entities.

Ten years after Wright's verbal formulation of the concept, Rummel systematized "a social field theory" using a linear algebraic model (1965a; 1965b). Rummel's field theory assumes that the social reality consists of two vector spaces. One space is that of attributes of social units, and the other is that of the behavior between social units. In both spaces the variables are represented as vectors. Within the attribute space, each social unit is located as a vector in terms of the characteristics describing it. Within the behavior space, every pair of social units, called dyad, is located as a vector in accordance with the interaction between two members.

The essence of the theory is that the nature of the distances between two social units on their attributes are forces determining their behavior towards each other. What makes this theory operational is the concept of dimensions. A dimension is a vector in a basis; a basis is a set of linearly independent vectors generating the space of all vectors. The theoretical manipulation of a possibly infinite number of attributes and interactions can be performed by defining a smaller set of basis vectors.

Leaving the detailed discussion on concepts and mathematization of the theory to Rummel's article (1965a), six theoretical propositions of the field theory are given here.

1. Social reality is a field consisting of all the attributes and interactions of social units and their complex relationships.

2. The social field can be divided analytically into attributes, A, and behavior, B, spaces into which attributes and interactions are projected, respectively, as vectors with length and direction.

3. The A and B spaces are spanned by dimensions which generate the spaces and which are finite and empirically determinant.

4. Social units are located as vectors in attribute space and coupled into dyads in behavior space.

5. The distance vectors, $\vec{d}$, in A space that connect social units are social forces determining the location, $\vec{w}$, of dyads in B space, according to the linear function $\vec{w}=\Sigma a_m \vec{d}_m$.

6. The direction and velocity of movement over time of a dyad in a behavior space is along the resolution vector of the forces, $\vec{d}_m$ (Rummel, 1965a, p. 185)[4].

4. MODELS TO BE TESTED

The proposed study is based on the field theory axiom that behavior is a resultant of attribute distances. This postulation does not preclude non-distance attributes as predictors of behavior, however. Moreover, distances may be operationalized as symmetric or asymmetric. Symmetry or asymmetry will have special meaning in the present context different from ordinary usage in mathematics: symmetry means that $d_{A\to B} = d_{B\to A}$; asymmetry indicates that $d_{A\to B} = -d_{B\to A}$.

First, concepts other than distances are included as predictors of behavior between two nations. From geo-politics two concepts are introduced: the <u>propensity</u> of two nations to interact, and their <u>capability</u> of spanning the geographical distance between them. According to Boulding, "the strength of a nation diminishes with increasing distance from home base" (1962, p. 272). Furthermore, Wright suggested that "national boundaries produce two classes of obstacles toward a shrinking world: those operating within each of the states and those operating among states" (1955, p. 541). This implies that the geographical distance that two nations have to traverse for interaction can be divided into two elements: internal

and external. Internal distance is the geographic distance within a nation, while external distance is the territorial distance between two nations.

Second, not all attribute distances will be considered as symmetric. Since the behavior of U.S. toward North Korea cannot be assumed equal to that of North Korea directed toward U.S., some distances in the attribute space have to remain asymmetric. Pertinent to this conception is Galtung's (1964) notion of top-dog and under-dog phenomena prevalent in international relations. In the proposed research, power distance and economic distance will be treated asymmetrically.

To demonstrate the difference between symmetric and asymmetric distances vis-à-vis their relations to behavior, a matrix of two hypothetical variables is given in Table 4.1 and illustrated in Figure 4.1.

Table 4.1

Symmetric and Asymmetric Distances:

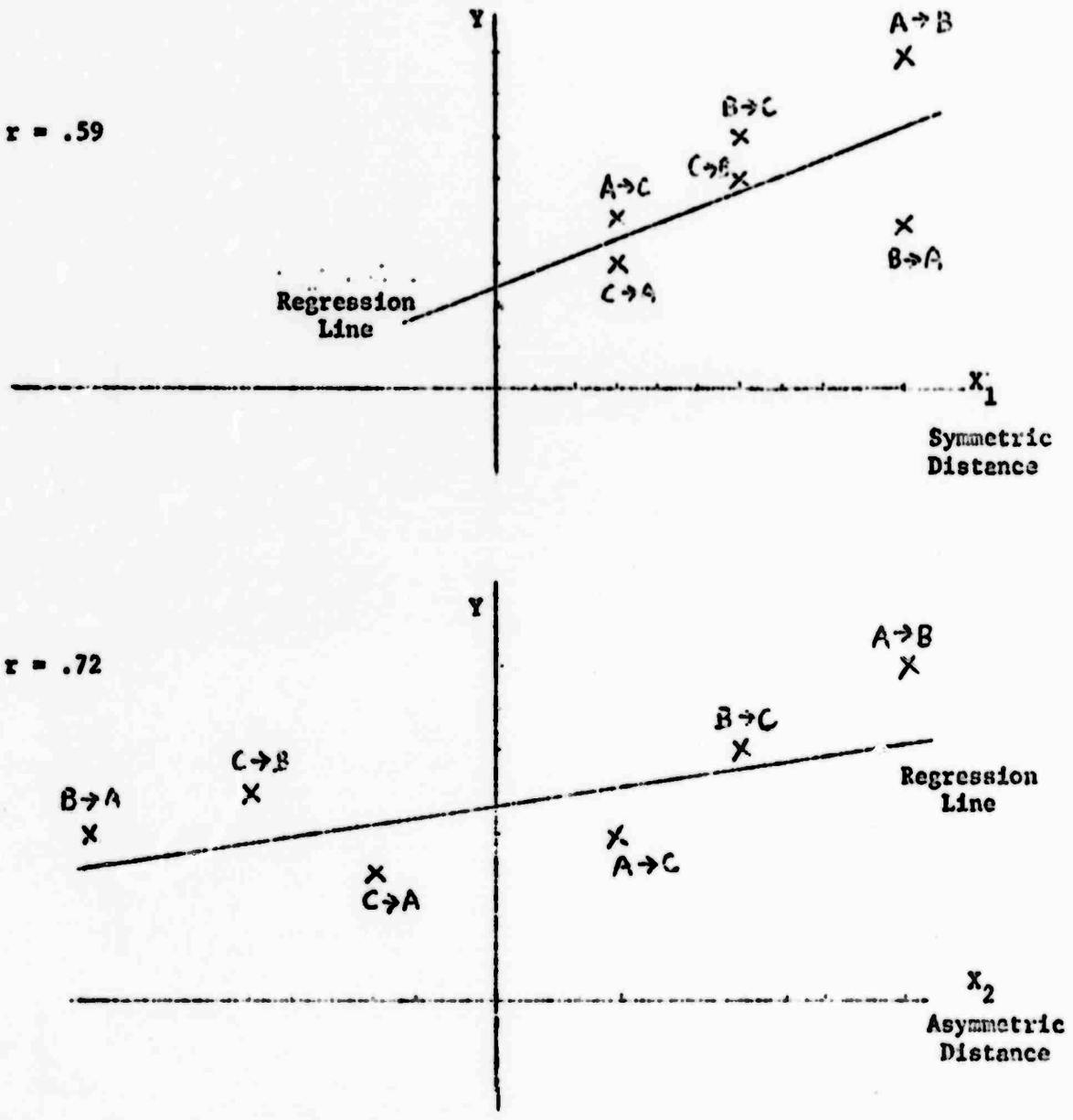
Matrix of Two Hypothetical Variables

Dyads	Attribute Distance (X)		Behavior (Y)
	Symmetric (X_1)	Asymmetric (X_2)	
A → B	10	10	8
B → A	10	-10	4
B → C	6	6	6
C → B	6	- 6	5
A → C	3	3	4
C → A	3	- 3	3

Figure 4.1

Symmetric and Asymmetric Distances:

Plot of Two Hypothetical Variables



As can be seen from the graph, two regression lines -- one based upon asymmetric distance and the other symmetric distance -- are not the same.

Before presenting the models to be tested, I will give the notations for the variables (Table 4.2) whose operational definitions are elaborated in Section 5.

Table 4.2

Notations

CF : Conflict behavior

CP : Cooperative behavior

P_A : Power capability of nation A

P_B : Power capability of nation B

t : Time since last change of systemic relationship

Di_A: Geographic distance within nation A

Di_B: Geographic distance within nation B

De : Territorial distance between nations A and B

E : Economic development distance

Po : Political distance

Rc : Racial dissimilarity

L : Language dissimilarity

Rl : Religious dissimilarity

4.1. INTERACTION MODEL

Behavior between two nations appears to be some mixture of conflict and cooperation. Therefore, studying conflict or cooperation separately doesn't seem to be intuitively pleasing. In overall relationships between two nations, dichotomous cases of pure conflict, with no cooperative aspects, are rare, indeed.

Let us assume that conflict and cooperation occupy the major portion of dyadic interactions. Then, based upon classical geo-politics, we can establish a model of interactions.

$$(CF + CP)_{A \to B} = \alpha i + \beta_{i1}\, t\frac{P_A + P_B}{(Di_A + Di_B + De)} + \beta_{i2}\, t\frac{P_A}{P_A + P_B} \quad \ldots (1)$$

The lower case i subscripting the parameters α and β means that they are for the interaction model.

This equation postulates that the total amount of conflict and cooperative action taken by nation A toward B is a function of $t\frac{P_A + P_B}{(Di_A + Di_B + D_e)}$ and $t\frac{P_A}{P_A + P_B} \cdot \frac{P_A + P_B}{(Di_A + Di_B + D_e)}$ is a measure of potentiality that two nations interact. The greater the numerator (joint power of A and B), the more ability each nation has to contact the other. The denominator $(Di_A + Di_B + D_e)$ is the sum of internal distances and external distance that two nations have to span for interaction. Again, the importance of internal distance must be emphasized: even though nation A may be contiguous with B, interaction is impossible unless A can control its own territory.

$\frac{P_A}{P_A + P_B}$ is the power of nation A relative to joint power. If P_A is greater than P_B, then the amount of action to be taken by A toward B is assumed to be greater than B towards A. This is concomitant with the notion that the behavior between two nations is, in general, asymmetric.[5]

How is time, t, related to this model? Time is brought in as a probability measure of the likelihood of a trigger event occurring. This concept of time was originally developed by Rummel to test his foreign conflict models.[6] He argued that a conflict situation is a necessary condition for conflict behavior but not sufficient. What this means is that not all conflict situations lead to some kind of overt conflict behavior.

Only in those conflict situations involving power parity and experiencing some trigger event will conflict behavior be generated.

To operationalize this trigger function, Rummel analogized from the law of gases, $P = \frac{T}{V}$, where P denotes pressure, T temperature, and V volume. Imagine a sealed flask with hydrogen in it. When this flask is placed on an alcohol lamp with constant temperature, the hydrogen molecules will increase their random movement and their random hitting against the side of container. As time goes on, the temperature within the container will go up and this movement of molecules will become more and more active. After reaching the point of maximum containability, the flask will burst. Even though the molecular movement is random, the pressure in the container can be represented as some function of time and temperature. From this phenomenon of gas, the analogy is drawn for the role of time in conflict. Given constant distances on attributes (i.e., temperature of the lamp) and the random movement of infinitely many possible triggers (i.e., hydrogen molecules), the likelihood of occurrence of a trigger event (i.e., pressure generated by molecules hitting on the container) may be measured as a function of time. Once distances on attribute dimensions are given, a trigger event is more likely to occur, the more time that has elapsed. Rummel, therefore, measured the time since the last change of systemic relationship between two nations. The role of time in his model was multiplicative to the conflict situation.

In this study, however, the time since the last change of systemic relationship will be treated as a probability measure of the likelihood of a trigger occurring for both conflict and cooperation. Depending upon the initial configuration of distances, time can be hypothesized to work toward either conflict or cooperation. If the last change of systemic relationship (say, a peace treaty) had narrowed the major distances between two nations, then time can be considered a measure of likelihood of some cooperative event

occurring. The relationship among the probability of a trigger for some international event, time, and attribute distances is illustrated in Figure 4.2.1 and Figure 4.2.2. Figure 4.2.1 represents a probability surface, while Figure 4.2.2 shows a vertical slice of that surface. In other words, Figure 4.2.2 represents the relationship between the probability of a trigger and distance when a particular value is selected for time. As can be seen from this figure, a hypothetical probability curve would take a shape of a parabola: the shaded area on the left of some mid-point stands for the likelihood of cooperation, whereas the shaded area on the right-hand side represents the likelihood of conflict.

It is also worth noting that there is, in effect, no way of knowing whether time is functioning toward conflict or cooperation as far as the overall relationships between two nation are concerned. Since most interactions are a mixture of conflict and cooperation, all we can say is that time is working for the occurrence of some international event.

4.2. CONFLICT MODEL I

In his current development of the field theory of foreign conflict behavior Rummel established three stages; namely, latent conflict, conflict situation, and overt conflict behavior.[7]

Latent conflict is a function of value distances, political distance, rank distance between two nations. "The existence of mutually incompatible or contradictory goals or values" (Rummel, 1965b) is hypothesized to measure the potentiality of conflict behavior. To measure value distances, racial, language, and religious dissimilarities between two nations are used. As far as rank disequillibrium is concerned, Rummel states:

> "Following Galtung (1964), with some revisions, it will be hypothesized that the difference in social rank between nations creates a strain, a disharmony, between them. Nations which have attained a high rank position on one or more of these attributes wish to maintain their position against those who have not. Moreover, there is a rank disequilibrium encouraging tension between those nations

Figure 4.2.1

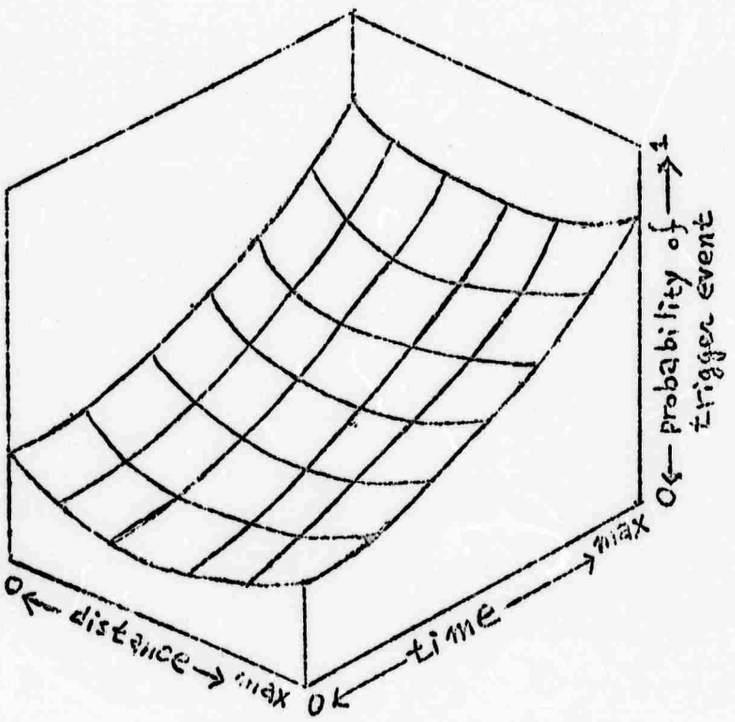
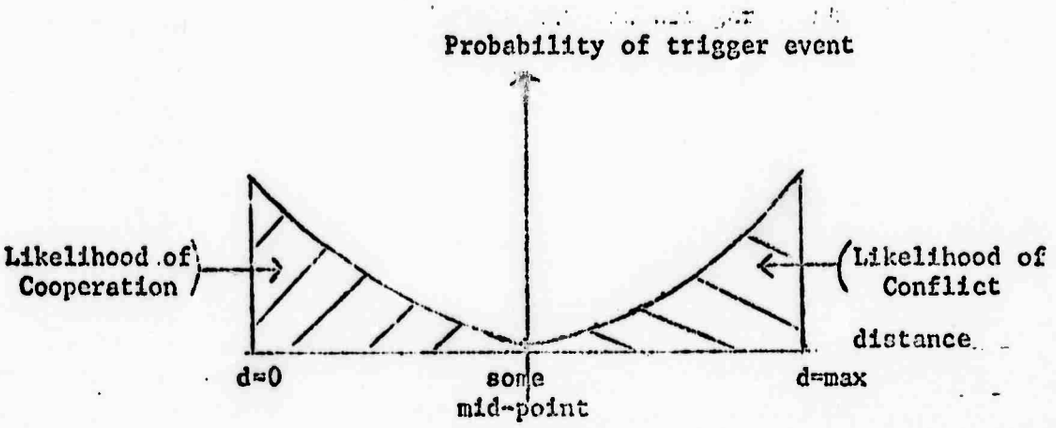


Figure 4.2.2



differentially high on the three attributes (economic development, power, and prestige). For the U.S., for example, to be high on economic development, power, and prestige while the U.S.S.R. is high only on power orients these two nations differentially towards the international order permitting and sanctioning this allocation of rank positions" (1965b, p. 134).

Thus the model of latent conflict is formulated as:

$$C_L = \alpha_L + \beta_{LV}V + \beta_{LPo}Po + \beta_{LR}R$$

where C_L = latent conflict
V = value distances
Po = political distance
R = rank distance.

Conflict situations are a function of latent conflict plus the possibility of interaction between two nations. If two nations are not powerful enough to span geographic distance between them, there will be no contact. Chile and North Korea give a good example of little interaction due to geographic barriers, while the United States and North Korea have shown considerable interaction thanks to the capability of the United States to overcome the geographic distance. Thus conflict situation is hypothesized as:

$$C_S = \alpha_S + \beta_{SC_L}C_L + \beta_{SG}G$$

where C_S = conflict situation
$G = d_G - \beta_{GD}D + \beta_{GDP}D(P_A+P_B)^{\theta}$

Finally, conflict behavior is seen as a function of the interaction between the conflict situation and time, plus power parity. Power parity measures the deterrence relationship between two nations. If nation A is considerably more powerful than B, B is unlikely to initiate a conflict with A because of the deterrence capability of A. A is also unlikely to resort to conflict with B, knowing that A's demand may be achieved by means other than violence. There is a zone of near equality of power for two nations, however, in which conflict potential may become actual. This might occur when either nation calculates its power as being sufficient to overcome that of the other. Conflict behavior, C_B, is hypothesized as,

$$C_B = \alpha_B + \beta_{BC_s} C_s + \beta_{Bt} C_\varepsilon - \beta_B \left[(P_A - P_B)^2\right]^{\frac{1}{2}}$$

This is the equation that has been tested by Rummel for the global system. Dealing with selected and random samples of dyads, he found that about twenty per cent of variation in the conflict behavior could be accounted for by this model.

In the proposed research, however, the primary goal is predicting the differential between conflict and cooperative behavior (CF- CP). In order to uncover the effect of attribute distances on hostile behavior between two nations, it seems appropriate to control for the element of cooperative acts linking the two types of behavior. This notion is based upon the previous assumption that most interactions are a mixture of both conflict and cooperation. Selecting (CF - CP) as a dependent variable requires a departure from Rummel's three stage development. Two catalytic elements which theoretically convert latent conflict and a conflict situation into conflict behavior are the propensity of two nations to interact and time as a probability measure of a trigger event occurring. Both elements are dropped since they are assumed to function similarly in both conflict and cooperation. Thus it is hypothesized that (CF - CP) between two nations is a function of distance on value, political, and rank dimensions, plus power parity. This formulation, therefore, is different from Rummel's conflict behavior model as the geographic distance, joint power, and time are not included.

The Conflict Model I to be tested is:

$$(CF - CP)_{A \to B} = \alpha_{fp} + \underbrace{\beta_{fp1} R_c + \beta_{fp2} L}_{\text{Value}} + \underbrace{\beta_{fp3} R_l + \beta_{fp4} P_o}_{\text{Political}} + \underbrace{\beta_{fp5} E}_{\text{Rank}} + \underbrace{\beta_{fp6} (P_A - P_B)}_{\text{Parity}} + \underbrace{\beta_{fp7} \left[(P_A - P_B)^2\right]^{\frac{1}{2}}}_{\text{Parity}} \quad \text{-----(2)}$$

For notations see Table 4.3. The lower case letters fp indicate that the parameters are for Conflict Model I.

4.3. CONFLICT MODEL II

Adding equation (1) and (2) and dividing by two generates a model of "gross" conflict, where the dependent variable is CF only:

$$\left[(CF + CP)_{A\to B} + (CF - CP)_{A\to B}\right]/2 = CF_{A\to B}$$

$$CF_{A\to B} = \alpha_f + \beta_{f1}\left(\frac{P_A+P_B}{(D_{1A}+D_{1B}+D_e)}\right) + \beta_{f2}\left(\frac{P_A}{P_A+P_B}\right) + \beta_{f3}R_c + \beta_{f4}I_c$$

$$+ \beta_{f5}R_l + \beta_{f6}P_o + \beta_{f7}E + \beta_{f8}(P_A-P_B) + \beta_{f9}\left[(P_A-P_B)^2\right]^{1/2} \quad \text{---- (3)}$$

The lower case letter f means that the parameters are for Conflict Model II.

4.4. CONFLICT-COOPERATION INDEX

Since one of the research goals is to delineate the clustering of Asian countries in terms of cooperation, an index of conflict and cooperation (CC) has been devised as following:

$$CC = \frac{(\dot{CP}_{A\to B} + \ddot{CP}_{B\to A}) - (CF_{A\to B} + CF_{B\to A})}{2}$$

This index is designed to measure "net" cooperative behavior between two nations after excluding the conflict. Since behavior from A to B is not necessarily the same as that directed from B toward A, the averages of CP and CF are taken to generate symmetric relationship. Theoretically, this averaging process can be justified on the ground that I am interested in uncovering the clustering of nations rather than that of dyads. For this purpose, the locations of nations in the behavior space must be specified in relation to all others. This can be done by averaging. No attempt is made to rescale this index, because my operationalization requires standard scores which provide relative positions for dyads.

This index will be employed to find clustering with two methods. A direct factor analysis of CC, for example, will give bipolar factors of conflict and cooperation, while a hierarchical clustering analysis will produce a tree diagram.

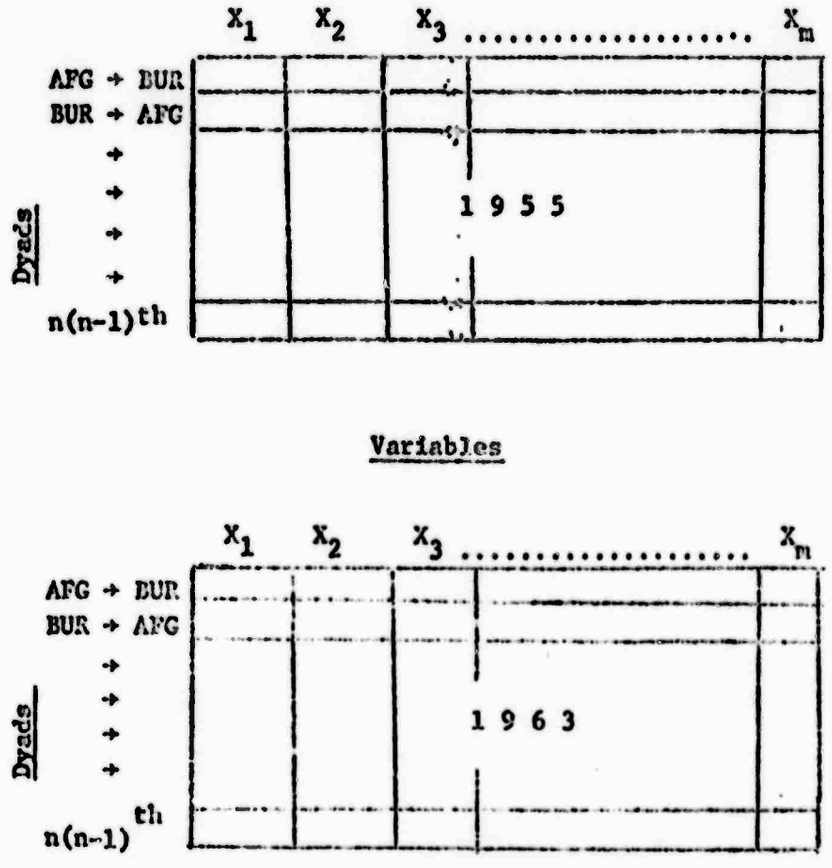
5. DATA AND OPERATIONALIZATION

5.1. THE POPULATION

The unit of analysis is a directional dyad A→B, where the arrow means I am measuring the behavior of nation A to B. Each variable will be measured for both A→B and B→A. Nineteen nations included in this study thus generate n(n-1) directional dyads totaling 342. Data will be collected for these 342 dyads for 1955 and 1963, mostly from the data bank of the Dimensionality of Nations (DON) Project. The data matrices will look like the ones given in Figure 5.1.

Figure 5.1

Data Matrices



5.2. OPERATIONAL DEFINITIONS

Operationalization of any concept involves a certain degree of arbitrariness. The proposed study is not devoid of this bias. The most important criterion considered in selecting operational measures is the degree of relevance to theory building.

5.2.1. Independent Variables

Power capability of nation A will be measured by energy production multiplied by the population of nation A. Specifically, the measure will be in metric tons of coal multiplied by the population and scaled by 10^{-12}. $Log_{10}(x+1)$ tranformation will be carried out before calculating distances. I am dealing with the population, and therefore, there is no need to attain normal distributions for statistical inference, but since other studies have transformed this variable a similar transformation will facilitate comparison of results.

Economic development distance will be measured by the difference in the energy consumption per capita with a $\log_{10}(x+1)$ transformation.

Time since last change of systemic relationship between two nations will be measured as the number of years since (a) last world war, (b) last political system change such as social revolution or coup, or (c) last dyadic war (large scale involving strategic maneuver), whichever comes last.

Geographic distance within nation A will be measured as the square root of the area of nation A. Data will be transformed to match the unit of measurement with the territorial distance between nation A and B.

Territorial distance between nations A and B will be measured as the shortest distance between borders of A and B on a 16 inch (diameter) globe (unit = centimeter).

Racial, language, and religious similarities between two nations are measured as the inner product of two vectors. One vector refers to nation A; the other to nation B. The components of the vectors stand for square roots

of the proportion of the population of ancestry (or religion or language when these variables are of concern) X_1, ancestry X_2, etc. When the inner product is taken, the result will be weighted by the proportion of A and B that refer to the same ancestors. Thus a dot product of 1.00 means that A and B have exactly same ancestry; a dot product of 0.00 means they are completely different.

Since proportions sum to one, each component -- proportion -- of the vectors are assumed to measure the squared values of the vectors. This assumption allows the vectors to be considered as unit length. The inner product is then of the square roots of the components and measure the cosine between the vectors in this space. Therefore, the similarity (or the inner product of the vectors) for nation A and B on ancestry proportions X_1, X_2..., and Y_1, Y_2, ... is:

$$\sqrt{X_1Y_1} + \sqrt{X_2Y_2} + \ldots = \text{similarity.}$$

After the inner product is calculated, an ordinal rating is made as following:

Rating	0	1	2	3	4	5	6
Inner Product	0-.049	.05-.199	.20-.399	.40-.599	.60-.799	.80-.945	.95-1.00

In the proposed study, this scale of rating will be reversed by multiplying minus one to measure dissimilarities rather than similarities.

Political distance will be measured as an Euclidian distance[9] on Western Democracy, Communism, and Monarchical dimensions generated from a factor analysis of ten political variables (Rummel, 1965b) from Banks and Textor (1963).

5.2.2. Dependent Variables

Essentially three sets of dependent variables are of concern: conflict behavior, cooperative behavior, and the differential between the two.

Conflict Behavior. Data on the foreign conflict behavior between nations occurring in 1955 and 1963 and reported in daily issues of The New York Times have already been collected, using a foreign conflict code sheet (Rummel, 1966). Each hostile act was recorded as to actor, object, date, type of action involved, and descriptive information of the act. Data were collected according to six categories of foreign conflict behavior: warning and defensive acts, violent acts, negative behavior acts, negative communications, unofficial violence, and nonviolent demonstrations. These primary categories are further divided into approximately one hundred subcategories.

2,139 acts of foreign conflict involving 340 dyads over 16 variables (those acts that occurred with sufficient frequency for analysis) were recorded for 1955. The year 1963 saw almost 3,000 conflict acts involving 275 dyads and 24 variables. To each data matrix (1955 and 1963) was added a "peace dyad" having all zero entries. Then each matrix was factor analyzed to a principal component solution with varimax rotation to generate five dimensions for each year (Rummel, 1967; Hall and Rummel, 1968).

The five dimensions for 1955 are:

1. military violence
2. negative communications
3. negative sanctions
4. diplomatic conflict
5. antiforeign demonstration.

The 1963 factors are labeled as:

1. negative communications
2. unofficial violence
3. violence intensity
4. warning and defensive acts
5. negative sanctions.

Factor scores of 342 Asian dyads on these dimensions will be the measures of conflict behavior. Those dyads with no conflict will be given the scores of the peace dyad.

Cooperative Behavior. The DON data bank has recordings of numerous dyadic cooperative acts such as trade, legations, treaties, international organizations, etc. From these we can compute factor scores in the same manner as we did on conflict behavior. Most unfortunately, however, not all of this information is systematically organized and it would involve an enormous amount of time and effort to organize this data. Consequently, it is reasonable to put off this task for the future. For the purpose of the proposed study, a tentative solution will be made by selecting a number of representative variables for the cooperation space. Six possible candidates are:

1. Treaties
2. Exports
3. Exports/Gross National Products
4. Nongovernmental Organizations (NGO)
5. Relative NGO's: the number of NGO's of which nation A and B are comembers divided by the total number of NGO's of which A is a member.
6. Diplomatic Representation (Embassy and Legation)

These are the variables which were highly loaded on six dimensions out of twelve factors generated from a series of factor analyses of 1955 dyadic data on the global system.[10] Because most of these variables have high loadings on more than one dimension, a measure of cooperative behavior can be derived by two steps: (1) getting weighted average of standardized variables highly loaded on each factor where the weights will be squared factor loadings, and then (2) summing these weighted averages across six factors.

Differential between Conflict and Cooperation. Ideally, scores on a number of principal components in the conflict and cooperation space will be calculated separately. Summation of these standard scores in the cooperation space would then be subtracted from the summed score in the conflict space for each dyad to generate the net conflict behavior measure. In matrix notations, this can be shown as:

$$CF - CP = (Z_{f1} + Z_{f2} +...+ Z_{fq}) - (Z_{p1} + Z_{p2} +...+ Z_{pq})$$

where Z_f and Z_p represent the standardized scores in the conflict and cooperation spaces, and q stands for the number of dimensions extracted.

Accordingly, the total interaction (CF + CP) would be measured as the addition of two elements on the righthand side of the above equation.

In the proposed study, however, the lack of time and resources does not enable me to compute this comprehensive index. Tentatively, $(Z_{p1} + Z_{p2} +...+ Z_{pq})$ will be replaced by the ad hoc measure of cooperative behavior derived from summation of weighted averages over several factors.

6. RESEARCH DESIGN

Verification (or falsification) of theory must be based upon appropriate tests. In order to carry out empirical tests of the models, various multivariate techniques will be employed. A flowchart of the analysis design is presented in Figure 6.1 specifying steps with numbers in circles. Description of methods will be made following the steps that I expect to take in the research.

Data Collection (Step 1)

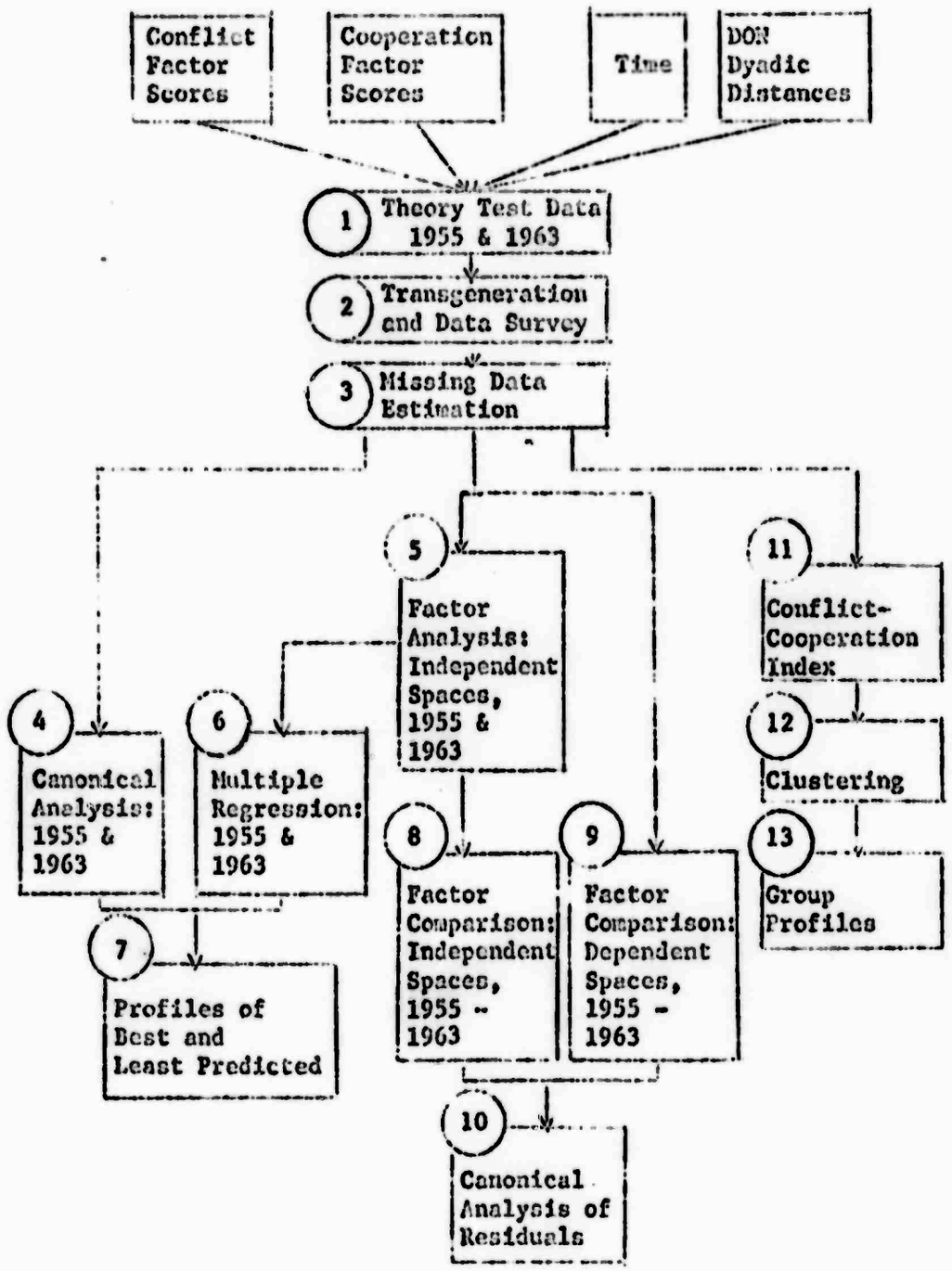
Data on conflict, cooperation, time since last change of systemic relations, and several dyadic distances on DON dimensions will be collected and punched for 342 Asian dyads. There will be two sets of data: one for 1955 and the other for 1965.

Transgeneration and Data Survey (Step 2)

After the data on the initial variables are prepared, transgeneration will be performed to produce such complex variables as the propensity to interact modified by capability and geographic distance. As I will be dealing with more than twenty variables, a final check on the data must be done through the data survey program which lists all the essential

Figure 6.1

Analysis Design Flowchart



univariate statistics including extreme outliers.

Missing Data Estimation (Step 3)

As in most studies with aggregate data, missing data will be a problem. Among these problems are: (1) a nongramian correlation matrix resulting in negative eigenvalues and (2) the inability to calculate factor scores for the cases with missing entries. Many attempts (e.g., deletion, mean insertion, or rating) have been made to tackle the missing data problem, none of which give satisfactory results. The best way to cope with this missing data problem, is a systemic estimation using multiple regression developed by Wall and Rummel (1968). In this method, the available data on each variable is regressed on the available data on the other variables to determine regression estimates for the missing data. A number of regression equations equal to the number of variables with missing data are thus computed to determine regression estimates for all missing data. The equations may be recomputed, including the missing data estimates this time, to generate a new set of estimates. These recomputations may be carried through several cycles until the estimates converge to stable values for the missing data. This regression estimation appears to be a reliable approach as long as the variables in the data matrix are highly correlated. In case, however, the correlations between all the variables are not high, we can partition the matrix into subsets of highly correlated variables. No new information is added by this method. But it enables us to utilize the existing information fully. Missing cells in our data matrices will be filled with estimates generated from this solution.

Canonical Analysis: 1955 and 1963 (Step 4)

My models will be tested using canonical regression and correlation for 1955 and 1963. When we have more than one dependent variable, canonical analysis gives us the linear combinations of independent and

dependent variables that maximize the correlation between two sets of variables. There can be as many canonical relationships as the smaller rank of the two sets. The first canonical equation accounts for the maximum variation in the dependent set; whereas the second relationship accounts for the maximum variation independent of the first, and so forth. In other words, the second depicts the relationship in the residual space after excluding the first (Cooley and Lohnes, 1962). Let us denote independent variables as X's and dependent as Y's. Then assuming that the rank of the dependent space is smaller than that of the independent space, we can write simultaneous equations such as:

$$a_{11}y_1 + a_{12}y_2 + \ldots + a_{1p}y_p = b_{11}x_1 + b_{12}x_2 + \ldots + b_{1q}x_q + e_1$$

$$a_{21}y_1 + a_{22}y_2 + \ldots + a_{2p}y_p = b_{21}x_1 + b_{22}x_2 + \ldots + b_{2q}x_q + e_2$$

$$\ldots \qquad\qquad \ldots$$

$$\ldots \qquad\qquad \ldots$$

$$a_{p1}y_1 + a_{p2}y_2 + \ldots + a_{pp}y_p = b_{p1}x_1 + b_{p2x2} + \ldots + b_{pq}x_q + e_p$$

where e's stand for the residuals.

What canonical analysis does is to find a's and b's (regression weights) such that linear combinations of X's and Y's have maximum correlation within each equation, while each equation is independent of others.

Computationally, this analysis partitions the correlation matrix into four submatrices,

$$\left(\begin{array}{c|c} R_{11} & R_{12} \\ \hline R_{21} & R_{22} \end{array}\right)$$

where R_{11} is the submatrix of correlations among independent variables, R_{22} among dependent variables, R_{12} correlations between independent and

dependent variables, and R_{21} the transpose of R_{12}. Then employing a characteristic equation the canonical correlation coefficient and the regression weights are calculated as following:

$$(R_{22}^{-1} R_{21} R_{11}^{-1} R_{12} - \lambda_i I) b_i = 0$$

$$a_i = (R_{11}^{-1} R_{12} b_i) / \sqrt{\lambda_i}$$

where a and b are canonical regression weights and λ is the squared canonical correlation measuring the percentage of variation accounted for by the i^{th} relationship.

Factor Analysis of Independent Spaces: 1955 and 1963 (Step 5)

The matrices of independent variables will be factor analyzed for 1955 and 1963 separately. The principal component method with orthoginal (varimax) rotation will be used, since I am interested in both the common and specific variation of variables (Harman, 1967). Cattel's Scree test (1966) will be employed to determine the number of factors to be extracted.

The purpose of the factor analysis will be to delineate more than a parsimonious solution. First, replacement of specific predictor variables in Step 6 (multiple regression) by the standardized factor scores facilitates the interpretation of regression analysis. Particularly, the contribution of each predictor to the variance accountability becomes self-explanatory, because no consideration on the partial correlation is necessary. Second, this principal axis solution is a preparatory step leading toward Steps 8 and 10.

Multiple Regression: 1955 and 1963 (Step 6)

Each dependent variable of the Conflict Model II will be regressed on the principal components generated at Step 5. This analysis is complementary to the canonical analysis (Step 4). The focus will be upon how well a particular type of conflict behavior can be predicted by the model.

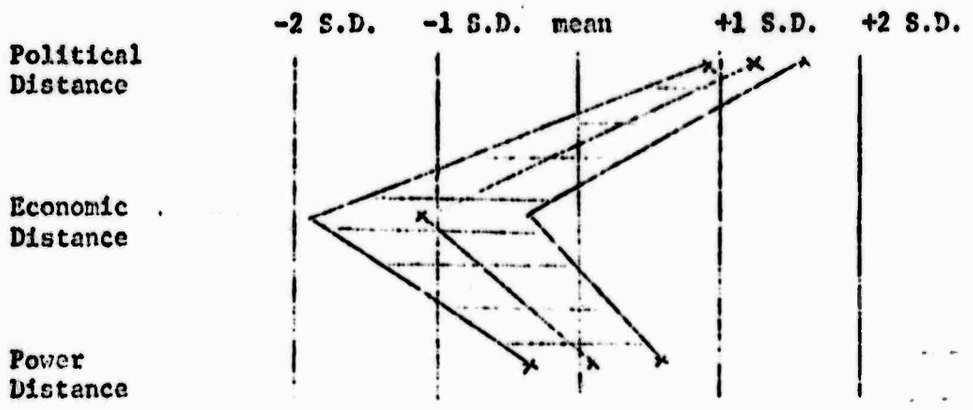
Profiles of Best and Least Predicted (Step 7)

Canonical analysis (Step 4) and multiple regression (Step 6) produce residuals with some substantive importance. Residuals from each equation (canonical or regression) will be categorized as "least predicted" if they are greater than |2.00| standard error of estimate and as "best predicted" if smaller than |0.06| standard error. For these least and best predicted groups, their profile on the independent and/or dependent variables will be studied.

The profile program developed by Hall (1968) first standardizes the variable over all cases, and then it computes mean and one standard deviation interval for each group. This program enables us to pinpoint the characteristics of the group and to search for some systematic bias existing in that particular group. Suppose we have a least predicted group of four dyads -- N. Korea→S. Korea, S. Korea→N. Korea, China→India, and India→China -- with regard to a certain type of behavior. The profile of this group on the political distance, the economic distance, and the power distance might look like the one given in Figure 6.2.

Figure 6.2

A Hypothetical Profile



This hypothetical profile indicates that the group is very high on the political distance, low on the economic distance, and about average of the total population in terms of the power distance.

Factor Comparison (Steps 8 and 9)

To measure changes in the independent and the dependent spaces from 1955 to 1963, transformation analysis[11] (Ahmavaara, 1954) will be employed. Transformation analysis applies the basic form of regression analysis and, in matrix terms, is,

$$\text{Lambda} = (F_1'F_1)^{-1}F_1'F_2$$

where Lambda is a matrix of transformation (regression coefficients) of F_1 matrix of factors to matrix F_2. F_1 is the factor matrix for 1955 and F_2 is the one for 1963. F_1 and F_2 need not be the matrices of factors. When we choose factor matrices, however, then the original variables factored must be equivalent. For the conflict subspace, only sixteen variables are found to be common for 1955 and 1963 (Hall and Rummel, 1968).

Taking the 1955 matrix as independent and the 1963 matrix as dependent, Lambda will be calculated. The Lambda matrix will then be used to get a least squares estimate, $\hat{F}_2$, for 1963,

$$\hat{F}_2 = F_1 \text{ Lambda}.$$

Step 8 will compute $\hat{F}_2$ and the residuals $F_2 - \hat{F}_2$ for the independent space, while Step 9 will calculate the same for the dependent space.

Canonical Analysis of Residuals (Step 10)

The residuals from the transformation analysis represent the deviational change from 1955 to 1963. By looking at the relationship between these two sets of residuals, we can study how the changes in the dependent space are related to those in the independent space. Canonical analysis will be used for this purpose.

Clustering and Group Profiles (Steps 11, 12, and 13)

The conflict-cooperation index can be seen as a measure of closeness or similarity between two nations. This index serves the purpose to group Asian countries in terms of their distances on the conflict and cooperation. We first establish a symmetric matrix of order 19x19 (the number of nations in this study) with the conflict-cooperation index. Then two grouping methods will be employed: the hierarchical clustering scheme with connectedness method (Johnson, 1967), and direct factor analysis of similarities (Rummel, 1969b, Chapter 22). The former gives a neat dendrogram (tree diagram) but with some difficulties (Phillips, 1968, forthcoming), while the factor groups seem most reasonable and straightforward. The groups generated from two methods will be compared, and then profiles of each group on attributes (predictors) will be discussed.

FOOTNOTES

1. It is worth noting that Michael Brecher conceives a region as purely geographic. He contends that a subsystem is a political as well as a geographic concept and, therefore, the region is a necessary but not a sufficient condition for a subsystem (1963, p. 220). In the present study, however, a region and a subsystem are considered as interchangeable terms.

2. Malaysia is excluded because she was not an independent state in 1955. The Federation of Malaya agreement was signed on August 5, 1957 and on August 31 she became independent.

3. Some examples of the application of graph theory are Brams (1968) and Harary (1961).

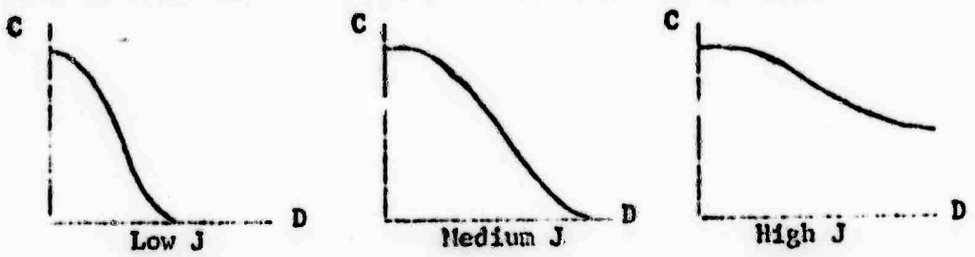
4. Rummel originally postulated seven theoretical propositions, but later dropped the seventh one due to theoretical inconsistency.

5. This term is brought in after an extensive discussion with Richard Chadwick.

6. For models of the conflict behavior, conflict situation, and latent conflict developed by Rummel, see <u>infra</u> 4.2.

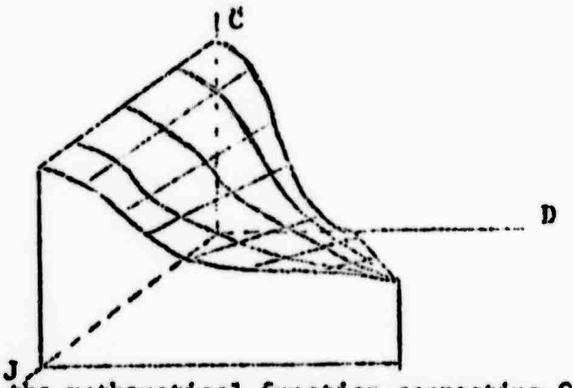
7. This line of research is being undertaken by the Dimensionality of Nations Project (University of Hawaii). Some preliminary analyses revealed quite promising results.

8. The propensity of two nations to interact and, therefore, to get involved in conflict situation is shown as a function of geographic distance and joint power. To reach the specific formulation of $C = \alpha_C - \beta_{GD} D + \beta_{GDP} D(P_A + P_B)$, Rummel hypothesized several relationships among the propensity for conflict (C), geographic distance (D), and joint power (J). Three figures, given below, present the hypothesized relationships between C and D for low level of J, medium J, and high J.



For low J, the curve shows a markedly decreasing slope, and moderate decline for medium J. For high J, however, the curve has a slow slope and does not meet D axis. This means that when two nations are high on J, D has virtually no effect on C. In all three diagrams the curves start from some point on C axis implying that geographical contiguity is associated with high propensity for conflict.

When these graphs are joined together in a three dimensional space, the propensity for conflict is seen to form a warped surface (shaded area in the diagram given below).



Then what is the mathematical function connecting C, D, and J holding other things constant? Based upon the logic that the slope of C with regard to D changes as a function of J, the function is found as following:

$$C = f(J, D)$$
$$= \alpha + D(\gamma J - \beta) \quad \text{where} \quad (\gamma J - \beta) \text{ is the slope}$$
$$= \alpha + \gamma DJ - \beta D$$

9. The Euclidian distance is calculated as follows:

$$d = \sqrt{\sum_{j=1}^{p} (S_{Aj} - S_{Bj})^2}$$

where

S_{Aj} = nation A's factor score on a factor (j)

S_{Bj} = nation B's factor score on a factor (j)

p = number of dimensions involved in calculating distance

10. See DON 1955 Data Dyadic Summary Chart, #3, 1966.

11. This technique is also discussed in Rummel (1969b), Chapter 20.

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