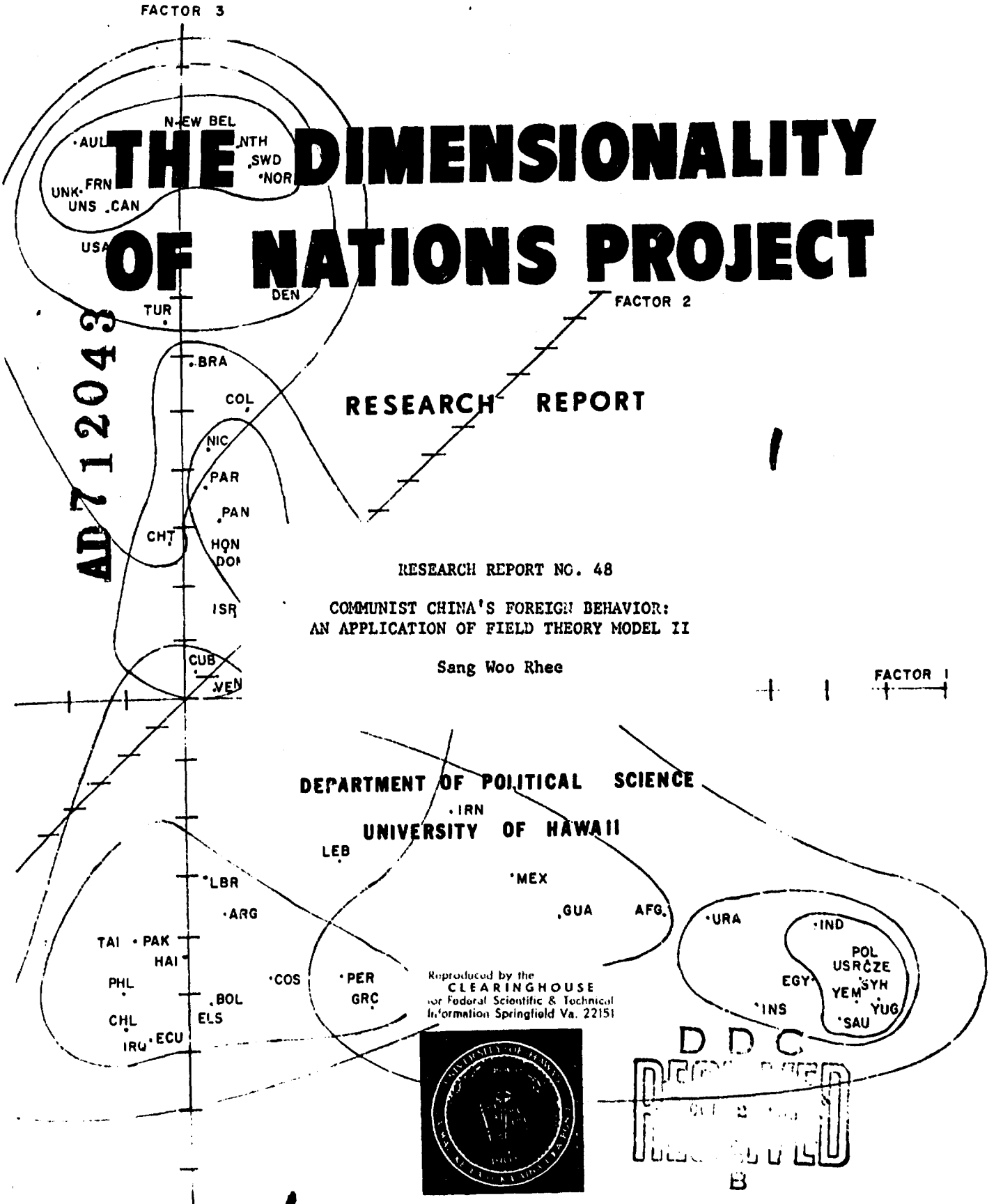

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RESEARCH REPORT

RESEARCH REPORT NO. 48

COMMUNIST CHINA'S FOREIGN BEHAVIOR:
AN APPLICATION OF FIELD THEORY MODEL II

Sang Woo Rhee

DEPARTMENT OF POLITICAL SCIENCE
UNIVERSITY OF HAWAII

B

The Dimensionality of Nations Project
Department of Political Science
University of Hawaii

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Sang Woo Rhee

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13 ABSTRACT

This is a proposal to study Communist China's contemporary foreign behavior patterns. The purpose of the proposed research is to explain Communist China's system of foreign relations by resorting to information about her differences and similarities with each other nation.

The guiding theory of this proposed study is Rummel's field theory, which states "the behavior of one nation toward another is a linear transformation of their differences from each other on their attributes." Applying this theory, a theoretical model of foreign behavior decision-making system is formulated. In this model, the objective attributes distances are related to the final behavior through what shall be called "double subjective modification system"--perceptual framework and behavioral preference systems. First, the decision makers of China perceive the relative distances of China from all other nations on various attributes through their own filtering system or unique perceptual framework. Second, when the Chinese decision makers decide their behavior, the perceived distances are again modified by their idiosyncratic behavioral preference systems, and then they are led to the final decisions. Applying this model, the research will be focused on determining China's idiosyncratic systems of both perceptions of attribute distances and behavioral preferences.

Data will be collected on measures of attribute distances of China from eighty-one other nations and China's behavior *vis-à-vis* all these nations for 1955 and 1963. Then, China's foreign behavior patterns, in terms of perceptual and behavioral preference structures, will be delineated for 1955. The results of the analysis of 1955 will be re-tested on 1963 data to assess the reliability of the delineated patterns.

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The guiding theory of this proposed study is Rummel's field theory, which states "the behavior of one nation toward another is a linear transformation of their differences from each other on their attributes." Applying this theory, a theoretical model of foreign behavior decision-making system is formulated. In this model, the objective attribute distances are related to the final behavior through what shall be called "double subjective modification system"--perceptual framework and behavioral preference systems. First, the decision makers of China perceive the relative distances of China from all other nations on various attributes through their own filtering system or unique perceptual framework. As a consequence, the same distances may be felt differently, by Chinese decision makers, from others. Second, when the Chinese decision makers decide their behavior, the perceived distances are again modified by their idiosyncratic behavioral preference systems, and then they are led to the final decisions. Therefore, in this model, China's foreign behavior patterns will be represented by leadership's unique perceptual framework and behavioral preference structure. Applying this model, the research will be focused on determining China's idiosyncratic systems of both perceptions of attribute distances and behavioral preferences.

Data will be collected on measures of attribute distances of China from eighty-one other nations and China's behavior *vis-à-vis* all these nations for 1955 and 1963. Then, China's foreign behavior patterns, in terms of perceptual and behavioral preference structures, will be delineated for 1955. The results of the analysis of 1955 will be retested on 1963 data to assess the reliability of the delineated patterns.

COMMUNIST CHINA'S FOREIGN BEHAVIOR: AN APPLICATION OF FIELD THEORY MODEL II

1. INTRODUCTION

On April 25, 1970, the Hsin-hua News Agency reported that the People's Republic of China launched her first satellite into orbit on the previous day. The 173 kilogram "Mao's Moon" (so christened by an Italian newspaper) is now broadcasting the Chinese, semi-official, national anthem, "The East is Red," for 40 seconds, every five minutes, as it passes over the 90 capitals of the world.[1] Launching a small satellite is not an impressive event in this, the latter part of the twentieth century. Nevertheless, the satellite's impact on all nations will be great, not only because it implies China's approaching capability to build and use ICBM's[2], the formidable symbol of the super power, but also because it drastically demonstrates China's technical capability which, without doubt, will affect the patterns of her foreign behavior.

Even without nuclear weapons, China, with a well-organized, 800 million population, has already become a formidable power whose behavior has had a strong impact on both her enemies and friends. China is no longer a "sleeping lion" but an "awakening lion." The study of her foreign behavior is now one of the most needed in the field of international relations. In fact, without knowing China's foreign behavior pattern, we can hardly say anything about world politics or world peace.

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[1] The Chosun Ilbo, April 26, 1970, p. 1, and April 28, 1970, p. 3.

[2] The Chinese have already exploded a missile-type H-bomb warhead (the first nuclear explosion on October 16, 1964). China will possess, at the latest, within this year at least some IRBMs with a range of 1,000 miles. See Time, May 11, 1970, pp. 44-7.

The study proposed here will deal with China's contemporary foreign behavior toward all other nations in the world. I shall attempt to answer questions such as: What is the basic pattern of China's conflict behavior? Are there any basic differences in China's behavior toward richer nations and poorer nations? What is the most important factor that affects her cooperative behavior with other nations? Is it her historical relations with other nations or is it the difference in political sytems that account for the cordial attitude of China toward other nations?

For example, with her new assessment of nuclear technology, will China's relations with the Soviet Union be ameliorated or deteriorated? Will the fact that she possesses nuclear weapons affect her policy toward the United States more than her recently retarded economic progress? Or, based on the increasing amount of commercial trade between China and a certain nation, can we predict that the two will cooperate more intensively in a regional, non-governmental organization? These are some of the questions for which I want to find answers. In brief, I wish to find the basic structure of China's unique patterns of foreign behavior so that I can explain and predict such behavior.

Then, what approach can we take to determine the basic structure of China's foreign behavior? Before choosing a tool for this enterprise, let us first have a closer look at the problem itself.

A nation's variation in foreign behavior can be analytically decomposed into two portions: one, universal behavioral patterns common across all nations; two, patterns attributable to that particular nation's idiosyncratic characteristics. And to know the particular patterns of a nation's behavior, we need to know the common universal patterns of nations first, because the uniqueness of a nation's behavior is recognizable only when the

universal behavioral patterns are understood.[3]

Common behavioral patterns have their origins in the fundamental characteristics of a nation. To explain this form of behavior, therefore, we need not pay attention to the nation's unique attributes. This pattern is just a reflection of the laws which govern all nations' behavior. For example, we can easily say that Nepal will not attack China militarily within the next few years. Our knowledge about the weak military capability of Nepal leads us to this judgment. This means that we implicitly apply a basic law that large discrepancies in military capability discourage the weaker nation from initiating military attacks against the stronger. This law is believed to be valid for any pair of nations of the world regardless of the characteristics of the nations involved. If we could have a set of universal laws which govern the basic behavior of nations, then we could explain a great portion of the behavioral variations in nations.

Particular patterns of a nation's behavior can be viewed as deviations from the universal patterns. This means that the universal behavioral pattern is modified by a nation's idiosyncratic decision making system. For example, each nation has her own perceptual framework, and when she makes her foreign policy decisions, this specific framework may put particular emphasis on a certain factor among various components which compose her decision making environment. For instance, we can say that it will be probable that Egypt will cooperate with Syria in a certain common-market-type economic organization, but no one will think of a similar cooperative effort between Israel and Egypt. Why? We know that mutual economic neces-

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[3]See A. Kaplan, 1964, p. 117. He stated, "differences are understood and explained only by reference somewhere to similarities: how we conceive of an individual is the product of generalizations."

sity and geographic proximity as well as historical amity precipitate economic cooperation between nations (let us suppose that it is a universal law). In the case of Israel and Egypt, Israel probably has a unique perceptual framework which puts special emphasis on their religious difference (historical antagonism factor) and, as a consequence, this unique decision making pattern makes her behavior an exception to the universal law of proximity and mutual necessity in her economic cooperative behavior.

Now the task becomes clear. To understand China's foreign behavior patterns, first we need to uncover the basic laws of behavior of all nations that underlie those patterns. Then, with the knowledge of these laws, we can proceed to delineate China's specific patterns of foreign behavior.

How can we uncover the basic laws of the foreign behavior of nations? Social laws are universal generalizations of relationships between two or more phenomena.[4] Therefore, social laws cannot be empirically "discovered," since empirical observation cannot exhaust all possible relationships and a universal generalization, therefore, is impossible. Also, a mere summarization of observational findings does not provide the logical nexus among phenomena.[5] Laws must be "formulated." "Guided by his knowledge of observational data, the scientist has to invent a set of concepts--theoretical con-

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[4]A formal definition of social laws may be given as "statements or equations that will explain or state the form of a relationship between terms in the analytic system." A. Kaplan distinguishes laws from other scientific statements, calling laws "truly universal nomological generalizations, unrestricted as to space and time." (A. Kaplan, 1964, p. 91).

[5]See Hempel, 1952, p. 19. See also Popper, 1968, p. 27. "... it is far from obvious, from a logical point of view, that we are justified in inferring universal statements from singular ones, no matter how numerous; for any conclusions drawn in this way may always turn out to be false: no matter how many instances of white swans we may have observed, this does not justify the conclusion that all swans are white."

structs (which will provide the necessary logical nexus between phenomena)."[6] In this sense, laws are products of the scientist's intuition and, as a result, there are no absolute laws. Laws remain as laws insofar as they serve to explain observable phenomena. Therefore, laws are, inevitably, reflections of the scientist's conception of social reality.

Historically, the reality[7] of international relations has been understood in many different ways. For example, ancient Confucianists in China believed that there exists a perfect universal order (*tien-li*, i.e., Heaven's will), and actual politics (both domestic and international) are the processes of the realization of that order.[8] Later in Western society, Hegel took a similar position about the reality of international relations. He believed that "reason is the substance of the universe ... the design of the world is absolutely rational."[9] Hegel thought change and motion (which are supposed to have a predetermined pattern of themselves) as the only reality and tried to "identify this reality with the historical process of continuous building and becoming."[10]

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[6] *loc. cit.*

[7] For the usage of the term, "reality," see Wright, 1955, p. 11. He states that "I believe it (reality) is commonly used by scientists, to designate existence in time and space apart from any observer, assuming without argument that time and space are characteristics of a world which exists apart from any observer."

[8] See Lee, 1966, pp. 341-60. The Confucianist concept of the world was well illustrated in The Chung-yung, one of the Four Great Books.

[9] Hegel; Philosophy of History, Bohn (ed.), pp. 9-13, quoted in Durant, 1953, p. 224.

[10] Wright, 1955, p. 10.

If we conceive of the world reality as a planned process[11] as the Confucianists and Hegel, we need not pay great attention to the outside environment of a nation in order to explain and predict its foreign behavior. We need to study history (Hegel) or natural laws through introspection (Confucianists) to identify the "inevitable progress" of civilization to explain changes in a nation's foreign behavior as well as other social and political changes.

Currently for Morgenthau, reality in international relations is "power politics," which "is governed by objective laws that have their roots in human nature (unchangeable), ... statesmen think and act in terms of interest defined as power."[12]

He assumed that, first, states are entitled to exist, and, second, to preserve their independent identities, states can rely only upon power to avoid conquest by their neighbors. Consequently, the struggle of each to be more powerful than any probable enemy is natural. To Morgenthau, the reality of international relations is a struggle of nations for power, and the mechanics of social equilibrium is the core concept of describing the process of this struggling reality.[13] In this sense, we can say that Morgenthau's belief in power politics is based on his concept of the world as an equilibrium, and to him international relations is a simple mechanical system, changing along with the varying power distribution on each side of the antagonistic groups to maintain the balance of power.[14] To him, therefore, "calculation of the

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[11]Wright classified world views into five kinds; the world as a plan, the world as an equilibrium, the world as an organization, the world as a community, and the world as a field. According to this classification, the above examples of Hegel and the Confucianists belong to 'the world as a plan,' while Morgenthau's (see next paragraph) belongs to 'the world as an equilibrium.' For further discussion, see Wright, *ibid.*, p. 485 and p. 488.

[12]Morgenthau, 1966, pp. 4-5.

[13]See Morgenthau, *ibid.*, pp. 162-163.

[14]*loc. cit.*

aggressive and resisting power of each and the distances and barriers which separated them might sufficiently determine the stability of the system ... and social, moral, and ideological factors might be safely disregarded."[15]

Departing from these simple mechanistic views of reality in international relations, Wright tried to view the world as "a field of conditions, values, ideals, and attitudes, in contiguous flux ... exerting influence upon the actions of individuals, associations, and nations."[16] According to him, the behavior of human beings are conditional to their environmental situations, and discovering the forms of relations between specific patterns of environmental conditions and patterns of the actor's behavior is essential to explain and predict the behavior.

This field concept is the one that is consonant with my concept of a nation as an organic system composed of systematically related roles played by human beings, where its foreign behavior is the reflection of the decisions made by the top decision makers of the nation system. And it is likely that there are laws that specify the forms of relationship between patterns of decisions (therefore, the behavior) and the patterns of environmental conditions including the personal psychology of decision makers, the nation's attributes, and the relative similarities and differences with the other nations.

In this proposed study, Rummel's social field theory Model II[17] will be adopted as a basic tool to explain and predict China's foreign behavior. Rummel's social field theory, based on the field concept of world reality, defines the forms of relationship between the behavior of a nation and her

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[15]Wright, 1935, p. 488.

[16]Wright, *ibid.*, p. 499.

[17]This theory will be discussed in detail in Chapter 3.

environmental conditions in rigorous mathematical functions, stating that, "[a nation's] behavior [toward another nation] is the consequence of the total social situation, and this situation forms a field consisting of social characteristics, or attributes. Behavior is relative ... to the relative similarities and differences of nations on their attributes ... behavior is a linear function of the relative location of the two [interacting nations] in the system of attributes ..."[18] or more simply, "the behavior of one nation toward another is a linear transformation of their differences from each other on their attributes."[19]

As mentioned above, in order to understand China's unique patterns of foreign behavior, we need to know both the universal theory (a set of laws) underlying that behavior and the unique decision making system idiosyncratic to China which modifies the universal laws. Since Rummel's social field theory will tell us the basic relations between China's behavior and her attribute distances, what remains to be done is to define the specific decisional framework which would cause China's behavioral pattern to deviate from the universal pattern of the behavior of nations.

Within the context of Rummel's social field theory, the unique deviation of a nation's behavior from the universal patterns is the result of the actor's particular perceptual and behavioral framework and is left to be defined through empirical testing. In reality, we can see that the same attribute distance is perceived differently by the decision makers of different nations depending upon their unique perceptual framework formulated through their personal experiences, including their belief system, educational background, political value orientation, etc. For example, India may perceive

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[18]Rummel, 1965, p. 183.

[19]Rummel, 1969c, p. 2.

religious distance from other nations to be more significant than other attribute distances, while China pays little attention to religious distances. And even if they perceive attribute distances in the same way, the decision makers of different nations may respond differently depending upon their unique behavioral framework (or decision criteria). China, for instance, will probably adopt economic aid in solving the border disputes with small nations like Burma instead of military maneuvers, if China's leadership has a special preference for non-violent solutions, even though the military solution may be more favorable. In this case, we may consider that China has a unique pattern of behavioral choice and these kinds of patterns constitute a particular behavioral framework of China.

In Rummel's field theory, these perceptual and behavioral frameworks are mathematically represented by the weighting parameters (constants) of the attribute distances and behavior vectors respectively.[20] Methodologically, then, the aim of my intended research is to determine the value of these two parameters of Rummel's model in regard to China by its application to empirically collected data.

In this proposed study, data will be collected on measures of attribute distances and China's various behavior toward all nations for 1955 and 1963. Fifteen variables for attribute distances and thirteen behavioral variables, have been selected, most of them chosen from the variable list used by the Dimensionality of Nations Project. Some variables, however, have been added to cope with China's unique perception and behavior, such as percentage of overseas Chinese in the counterpart nation's population and Chinese attitude toward other nations reflected in the Jen-min Jih-pao. In this study all

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[20] For a detailed discussion, see Chapter 3 of this proposal.

nations are included as objects of China's foreign behavior.

This research prospectus is organized as follows. In Chapter 2, past studies about Communist China's foreign behavior will be examined with special emphasis on theories applied to explain Chinese foreign behavior. In Chapter 3, the model to be applied--Rummel's social field theory Model II--will be presented and discussed in detail. The discussion will focus on clarifying the meaning of the fundamental equation of the theory. Especially, the difference between the multiple regression model and the canonical regression model will be scrutinized. Then, finally, in Chapter 4, the research design will be presented, and variables and data to be used for this study will be discussed.

2. STUDIES ON COMMUNIST CHINA'S FOREIGN BEHAVIOR

In comparison with other areas of international relations, the study of China remains neglected and underdeveloped. Considering her extraordinary size and the importance of her role in the future course of history, we may say that the study of China has been "retarded" in development.[1] A simple check of the articles reported in several leading American professional journals is sufficient to see the symptoms of this retardation.

First, in quantity, the number of articles written about China's foreign behavior was extremely small compared to other fields and regions. For example, in World Politics, a quarterly journal of international relations in general, out of a total of 748 articles printed in the past twenty-one years (from Vol. 1 to Vol. 21), only five articles were related to China's foreign behavior (a total of 28 articles were about China). The American Political Science Review was more extreme. It allocated space for only one article about China's foreign behavior out of 774 articles contained in the last twenty volumes (eight articles were about China in general). The Journal

[1]The expression, "retarded," was used by Howard Boorman. See Boorman, 1960.

of Asian Studies is an area-specific professional journal. Even this Asia-major journal has devoted less than one percent of its space to the study of Chinese foreign behavior.

Secondly, even among the scarce studies of Communist China's foreign behavior, most were purely descriptive works. Of the nine articles about China's foreign behavior reported in the four journals examined (a total of 73 volumes), only two could be regarded as theoretical attempts to explain or predict China's foreign behavior patterns.[2] These facts imply that either there has been relatively few publishable works on China's foreign behavior, or in general, most American political scientists were not interested in the topic.

Chalmers Johnson has well captured the current 'state of the art': "social science analysis has neither staged a 'take-off', nor begun 'the drive to maturity' ... in fact, in my opinion social science has yet to achieve 'the preconditions for take-off' from which it can begin to theorize about China."[3]

The theoretical retardation of China studies can be illustrated in a number of ways. For example, we have studies of Communist China's military policy on the bases of the general Communist foreign policy objectives without any agreement on what the Communist objectives actually are (e.g. Bobrow, 1964). Or without examining the fundamental relationship between the basic ecological situation of a nation and a nation's behavior, some have tried to explain China's foreign behavior based only upon the top decision-makers ideological attributes (Tang Tsou, 1965). As discussed above, a top decision-

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[2]These two are Smoker (1969) and Bobrow (1964). Note that this number refers only to the four journals examined. Recently, many books and articles have been published. For example, in 1967 alone, 17 books and 331 articles were reported in the Bibliography of Asian Studies. This is a worldwide publication list.

[3]Johnson, 1965, p. 256.

maker's political orientation and/or *Weltanschauung* may formulate a unique perceptual or behavioral framework which modifies the basic laws governing the relationship between nations, but it alone cannot be a sufficient explanatory factor of a nation's foreign behavior. In fact, we may say that Mao's revolutionary strategy itself has been formulated as a reflection of his perceived ecological situation of Communist China in past years.

Many reasons for this retardedness have been given. For example, Dorrill gave the following four: 1) lack of available data, 2) inaccessibility to China (both physically and through the communication media), 3) language gap, and 4) socio-politico system different from Western world (Dorrill, 1964). But the basic reason is more likely the lack of appropriate theories. Up until now, there have been very few theoretical models applicable to the study of a nation's external behavior in general.[4]

This lack of theories, however, is not unique to the study of international relations. It is, to some extent, a common problem of the social sciences in general.

One of the functions of theory in the study of international relations, as in any other field in the social sciences, is the organizing function (McClelland, 1966, p. 15, and Deutsch, 1966, p. 8). This means, as McClelland stated, that "theory orients knowledge by furnishing the means to put the pieces together." According to Thompson, "theory gives order and meaning to a mass of phenomena without which it would remain disconnected and unintelligible"

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[4]For taxonomical inventory of the theories in international relations, see Phillips (1969). If we classify the existing theories by the analytical tools employed, we have the following seven kinds of theories (in parentheses, some examples are given): 1) descriptive statistics (Singer and Small, 1966; McClelland, 1967; North, Holsti and Brody, 1967), 2) inferential statistics (Brody, 1963; Haas, 1965; Zinnes, 1967), 3) probability theory (Richardson, 1960a; Horvath, 1963, 1967), 4) calculus (Richardson, 1960b), 5) topology (Lewin, 1951; this is a psychological work, but general enough to be applied in international relations.), 6) linear algebra-graph theory (Harary, 1961; Brams, 1968), 7) linear algebra-factor analysis (Cattell, 1949; Alker, 1964; Rummel, 1965; Gregg and Banks, 1965; Tanter, 1966; Russett, 1967; Denton and Phillips, 1968).

(Thompson, 1955, p. 735). Without theory, therefore, a mere description of a situation is difficult, since we cannot decide which data are most worth getting.

Social reality is too complex to be described in full detail in all its aspects. This means that selection is of the essence. Theory "establishes relative priorities for further inquiries by establishing the criteria of significance" (McClelland, 1966, *loc. cit.*). Theory guides us as to what to look at, and what to describe. Therefore, theory is essential even in the description of a situation or a phenomenon.

For explanation of a certain behavior, theory is even more essential. To explain, in a broad sense, means to "make something intelligible or comprehensible" and "the aim of explanation is the reconciliation with our intellectual desires of the perceptions forced on us by the external world of nature" (A. Kaplan, 1964, p. 330). Then what is the actual process of explanation? Hempel and Oppenheim described it in the following way: "an event is explained by subsuming it under general laws, *i.e.*, by showing that it occurred in accordance with those laws, by virtue of the realization of certain antecedent conditions ... the explanation of a general regularity consists in subsuming it under another, more comprehensive regularity, under a more general law" (Hempel and Oppenheim, 1948, ch. 15). Therefore, explaining a nation's behavior means to discover laws governing recurring regularities in observable behavior. And theory, which includes empirically testable statements of lawlike generalizations,[5] can serve as a guide in seeking the underlying laws of behavior.

For prediction, the function of theory is the same as for explanation, since "the logical structure of a scientific explanation is identical with that of a scientific prediction, the only difference between them being the purely

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[5]Rudner (1966, p. 10): "A theory is a systematically related set of statements, including some lawlike generalizations, that is empirically testable."

pragmatic one of the temporal vantage point of inquirer."[6] In the case of an explanation, we are seeking the conditions and a lawlike statement for the existing event; while in prediction we seek an event on the bases of existing conditions and a known lawlike statement. Since the theoretical structure of an explanation and a prediction are identical, "we have an explanation for an event if, and only if, we could have predicted it."

If we can agree that the final goal of academic enterprise in international relations, as well as in other fields, is to understand and explain (thus predict) empirical phenomena or events occurring within the system concerned (Deutsch, 1960, p. 7), then the first thing to be done is to formulate a theory about the pattern of behavior to be studied. Then we can collect data (where theory provides the selection criteria to sort the data), and with the data, test the validity of the theory. If the theory is inadequate, it must be revised. We should then, as Deutsch stated,"re-examine concepts, methods, and interest and should search for new symbolic models (theories) and/or new strategies in selecting the major targets for the next attack" (Deutsch, 1963, pp. 3-4). Then with revised theory, we should again repeat the above stages.

If we see the process of social science research in this way, what stage has the study of Communist China reached at present? Johnson aptly answered this question, "much of the work already done on Chinese communism has been in the nature of intelligence-collecting rather than social science

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[6] Rudner, *ibid.*, p. 60. He viewed the structure of explanation as the following: "The formal structure of a scientific explanation of some specific event has three parts: first, a statement E describing the specific event to be explained; second, a set of statements C_1 to C_n describing specific relevant circumstances that are antecedent to, or otherwise causally correlated with, the event described by E; third, a set of lawlike statements L_1 to L_u, universal generalizations whose import is roughly, 'Whenever events of the kind described by C1 through C_n take place, then an event of the kind described by E takes place.' "

research. This is neither surprising nor bad in itself, but intelligence compilation is not social science. (The major potential contribution of social science is its capacity to provide for systemic thinking about the nature of Chinese Communist society and politics.)

"Without the systematic application of social science theory to Chinese data, intelligence will provide only the most superficial aids to understanding China ... we must have theory-specific studies of Chinese politics (behavior) in order to use even the data that we now possess and in order to generate newer and better theories" (Johnson, 1965, p. 258).

Let us examine briefly an inventory of the past China studies. In the first section, non-theoretical descriptive studies will be examined and in the latter section, some theory-oriented studies will be discussed.

2.1 Non-theoretical Studies on Communist China's Foreign Behavior

Among the scarce studies which dealt with China's foreign behavior, most were non-theoretical. Furthermore, most books and articles were on China's relations with few particular nations. Levi's "Nepal in World Politics" (1957), Hinton's China's Relations with Burma and Vietnam (1958), Fairbank's The United States and China (1958), Leng's Japan and Communist China (1958), and North's Moscow and Chinese Communists (1953) are some examples.

Though the main sources adopted for explanation differed among each of the studies (domestic condition, historical relations, China's traditional expansionism, etc.), one common thread appeared throughout: the emphasis was on the unique context within which China and a particular nation ought to behave. These kinds of studies are very helpful for grasping the uniqueness of the relations between that particular pair of nations. But, considering that uniqueness can be meaningfully understood only when the common patterns are recognized, and this recognition is only possible by adopting some theore-

tical model, a mere description of interactions between the two nations (China and the counterpart) does not provide us with a comprehensive picture of the situation.

Even though the numbers are few, there are some fine works of general discussion of Communist China's foreign behavior as a whole. Barnett's Communist China and Asia (1960), Hinton's Communist China in World Politics (1966), Hsieh's Communist China's Strategy in the Nuclear Era (1962), and Levi's Modern China's Foreign Policy (1953) are examples.

One obvious characteristic about the above studies was that they did not formulate or apply any "theory" explicitly and consistently. This lack of theory made the generalizability of their findings significantly limited, and the abundant information they gathered could not contribute directly to succeeding research.

Hinton, for example, clearly stated his antagonism against theory saying that "I proceed on the basis of no general theory or political action; I find most such theories vague and pretentious ... Nor do I employ any unique or complex method based on some such general point of departure. I prefer history ... If there is a master key, it is context and educated intuition." (1966, preface viii, underlining added)

One common characteristic of the explanatory schemata of these non-theoretical, general studies was that common sense and human intuition served as the foundation of understanding. They all described in full detail the contextual situation under which Communist China decides her foreign behavior, by using such historically well known concepts as motivation, national goal, ideology and national power as a working framework. Then implicitly relying on the reader's intuitive logic, they tried to connect the contextual situation and China's decisions. In a rough sense, therefore, they also use a crude form of theory about human behavior (*e.g.*, "under a specific circumstance, all men

are expected to behave in such ways," etc.), while expressedly denying them.

Hinton, for example, denied theories. Nevertheless, his suggested five "roots of Communist China's foreign policy" (the traditional superiority complex, historical anti-Western attitude, backwardness in economic and social development, ideological and political support from the Soviet Union and Maoism ideology[7]), with which he explained China's foreign policy were all based on social scientific theories (*e.g.* psychological attitude theory, economic theory, linkage theory,[8] etc.); though these theories were not explicitly referred to, they were assumed implicitly.

In general, the problems of non-theoretical studies can be summarized into two kinds. First, without theoretical construction, the generalizability of the explanation is reduced. Without a bridge of common theory, we cannot apply the findings generated from one study to another. Furthermore, without theory, we cannot compare the result of one study with those of other similar studies, since we do not have any common frame.

Second, without theory, we cannot "explain" and "predict" behavior scientifically, since the logical structure of explanation presupposes a theory. Besides theory, we have some other explanatory schemes like the metaphor and the analogy. Metaphors, for example, are important aids for explanation, since it may make the reader have the experience of "understanding." But a "metaphorical model cannot be expected to yield logically compelling theorems which are translatable into prediction" (Rapoport, 1958, p. 51).

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[7] Hinton (1966), Part One, section 1, pp. 3-22.

[8] A linkage theory is a theory that postulates the form of relationship between domestic political process of a nation and her outside environmental or political phenomena. Since the time when Rosenau suggested the necessity of developing linkage theories in 1966, there have been several attempts to develop theories within the conceptual framework of the linkage idea, but any rigorous theory has not yet been developed. For the conceptual framework of the linkage theory, see Rosenau, 1969, Chapter 3, and for the examples of theorizing attempts, see Chapters 4-12 of the book.

2.2 Theoretical Studies on Communist China's Foreign Behavior

Recently (since 1960), theoretical studies about China's foreign behavior began to appear either as a part of a global study, or as an independent one. But again most deal with China's behavior toward one or a few particular nations. Zagoria (1962), Greaser (1966), Bobrow (1965), McClelland, *et al.*, (1967), Sullivan (1964), Zaninovich (1964), and Smoker (1969) are some examples.

Although limited in both scope and number of nations involved, their contribution to the knowledge of China's foreign behavior is significant. For example, McClelland's study (McClelland, *et al.*, 1967) was limited geographically (Quemoy and Tachen islands), in time (1950-1964), and in the number of nations involved (Communist China, Nationalist China, U.S.A. and U.S.S.R.). The type of behavior was also restricted to political-military action in regard to limited confrontations. With these restrictions, however, they determined some basic patterns of Communist China's crises and non-crises behavior <u>in general</u> with consistency and repetition of behavioral forms over time (p. 3). Thus, this finding could serve as a model for dealing with China's behavior under similar conditions.

Sullivan's study (Sullivan, 1964) was similar to McClelland's. Starting his research with a general hypothesis that "certain types of societies will tend to routinize their behavior after a crisis and a relationship of stability will be restored," he tried to discover the interaction patterns of China *vis-à-vis* other nations and the changes in these patterns during and after crises periods. Again, with this kind of theoretical approach, Sullivan contributes knowledge which can be applied to other studies.

Zaninovich's study of the Sino-Soviet dispute was to analyze the interaction patterns of the two nations applying the "mediated stimulus-response

model," a kind of behavioral model of the relationship between behavioral stimulus and perceptual response. Again, this research, though it deals with only one dyadic relation, could contribute to knowledge of China's interaction pattern (even to the knowledge of any nation's pattern), because the theory tested was general and applicable to any pair of nations.

Bobrow's studies were especially highly sophisticated and innovative. His basic theoretical stance on a nation's international behavior has been that international behavior is the product of an interaction between action and situation attributes. (This is inferred from his four articles: 1964, 1965, 1967, 1969b). From this basic notion he tried to establish a working model that he would depict China's own behavior system in response to the situation she encounters.

In "Chinese Communist Response to Alternative U.S. Active and Passive Defense Postures" (1965), Bobrow, guided by a further assumption that "the Chinese act on the basis of what they believe to be reality" (p. 2) tried to build a psychological theory applicable to China's responsive pattern to changing American policy toward her. Thus, he contributed significantly to the advancement of analytic studies of Chinese foreign policy, though he dealt with only particular dyad, *i.e.*, China vs. U.S.A.

There have been very few theoretical works which explain the overall pattern of Communist China's foreign behavior. Among China's foreign behavior literature, the single title which fell into this category was Bobrow's "Ecology of International Games: Requirement for a Model of the International System" (1969). What Bobrow attempted was to build a new theoretical model of a nation's overall behavior pattern, and to test the model with China data. After examining all current theoretical approaches, namely, the <u>system</u>, <u>actor</u> and <u>situation</u> approaches, Bobrow argued that we must incorporate the powerful contributions of the three approaches. He further suggested the new models

have to be ones of the interaction of actor games and encountered situations, and finally formulated a theoretical model called "a game ecology-situation module."

With this theory, he experimented with observed data to discover the "ecology of international games in which Communist China is engaged" (p. 14). Methodologically, he factor analyzed China's action data to delineate the "structure of China's action space" and then searched for the extent of association between these activity factors and the universe of political actors. He, however, did not theorize the association. He simply tried to discover empirically regular patterns of association between the actor factors and the types of ecology. In this sense, his study may be regarded as a precursor of theoretical research for China's foreign behavior, but not as a real theoretical study itself.

There were some studies based on some pretheories, however. By the "pre-theory," I mean a "conceptual framework which includes one or more lawlike generalizations, but without any specified relationship among variables." The studies with "pre-theory" are different from non-theoretical studies, since they are guided by an explicitly adopted "theory."[9] However, they differ from the rigorous theoretical studies, since their "theories" lack some essential qualities that a theory requires.[10]

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[9]When I illustrated some non-theoretical studies, I mentioned that we could find some underlying pre-theories. But in their cases, a theory was not explicitly adopted by the authors, nor were the theories applied consistently. In the studies with pre-theories, however, theories were explicitly referred to and consistently.

[10]To be a theory, a conceptual framework should have at least one lawlike generalizable statement constructed in terms of concepts which are measureble, and empirically testable. See Rudner (1966), p. 10, A. Kaplan (1964), pp. 294-8, and McClelland (1966), pp. 6-16.

In this group of studies, I put Halperin and Perkins (1965), Scalapino (1963), and an earlier work of Bobrow (1964). Halperin and Perkins (1965), for example, used a "theory" based on the concepts of "national interest" and "ideology." To infer Chinese national interest and ideology, they manipulated a selected array of variables, "relevant political, ideological, economic, technological, military and cultural factors, as well as predisposing historical and traditional influences,"[11] though the variables were not fully clarified in the main text.

Bobrow's study on China's military foreign behavior (Bobrow, 1964) is another good example. To set forth the "calculus or rationale which Peking employs to select military strategy and tactics," Bobrow employed a well-known traditional conceptual framework composed of such vague concepts as national goal, domestic requirements, etc. Under the assumption that "Peking's leaders adopt what they believe to be the best available military policy to cope with what they perceive to be challenges of foreign opponents, to attain their foreign ambitions, and to satisfy domestic political and economic needs" (notice that this assumption is itself a kind of theory, a mixture of a stimulus-response type interaction theory and a theory based on rationalism), Bobrow tried to analyze four components of China's military calculus: expectations regarding the United States, foreign goals, domestic requirements, and interpretations of previous military experience.

From the brief review above, we may conclude that "social science has yet to achieve the preconditions for take-off from which it can begin to theorize about China."[12] To proceed, therefore, we must have more theory-specific studies of China's foreign behavior. As discussed before, studies

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[11] See Lindbeck's foreword of the book.

[12] See footnote 3 of this chapter.

without theories have only limited utility to describe the present and predict the future nature of Chinese behavior and its determinant. Some "fundamental restructuring and innovation in our tools of concept and method are required to improve our descriptive and predictive capabilities."[13]

Then, practically, what should be done? Bobrow suggested the following:[14] "Wise selection of national trait variables and careful collection of information about China and other nations for those variables (should be carried out) to increase our ability to 1) measure the extent and direction of differences between national traits at different times; 2) establish empirically the extent to which China tends to cluster near to (be similar to) or far from (be different from) other nations; 3) assess the descriptive utility of alternative conceptual typologies and the limits of their applicability; 4) test hypotheses about the statistical co-occurrence of particular traits of nations; 5) determine the nature of the relationship between national traits (input variables to national élite decisions) and national policies (output variables from national élite decisions); and 6) on the basis of analyses of this fifth type select hypotheses about the reasons for policy choices."

With all these suggestions, I can completely agree. What I intend to do in my proposed research is to follow these suggestions exactly; to theorize China's foreign behavior and to select basic indicator variables with which we can explain and predict such behavior. My grand design is to put a stepping stone between the present stage of "preconditions for take-off" and the future "take-off" stage in studies of China's foreign behavior.

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[13] Bobrow (1967), p. 306.

[14] Bobrow, *ibid.*, p. 309.

3. RUMMEL'S SOCIAL FIELD THEORY: MODEL TO BE APPLIED

Philosophically, Rummel's social field theory is based on the concept of the world as a field. Rummel views social reality as "a field consisting of the attributes of social units and their interactions. Attributes are those characteristics by which a social unit can be differentiated from all other social units. The behavior that social units direct toward each other are their interactions." (Rummel, 1968a, p. 26)

Theoretically, Rummel's social field theory is a rigorously structured scientific theory. Based on seven, well formulated axioms, it postulates a law which defines the form of interrelationship between the behavior of a social unit and the relative attribute differences of that social unit from others. The heart of the theory is the basic mathematical equation representing the model of the relations defined by the above law. The analytic system employed in this theory is linear algebra, and many constructs in the theory are expressed in terms of linear algebraic concepts.

In the first section of this chapter (3.1.), I shall discuss the concept of a "field," the core concept of the field theory, reviewing its various applications in order to exemplify the philosophical background of the theory. In section 3.2., the theoretical structure of Rummel's field theory will be elaborated on. Then, in section 3.3. the basic equation of theory will be presented.

3.1 The Concept of A Field

The concept of a field is not new. The notion has existed since the time of Euclid.[1] What is new to us, however, is its application in various fields of modern science.

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[1]For various application of field concept in history, see Wright (1955), pp. 524-8.

3.1.1. The Field Concept in Physics

Even though the notion of a field has been an age-old concept in physics, it was only when Maxwell first introduced it by formulating the law of electromagnetism in the 19th century, that the concept began to play a great role in various theories.[2]

In Newton's mechanics, a system is completely described when the location of the constituent mass points are known as functions of time. But in Maxwell's field theory, "the field variables are defined for all values both of the time coordinate and of the three space coordinates, and are thus functions of four independent variables."[3] More important with Maxwell's field theory, however, is the notion of field strength or intensity. That is, the force acting upon a mass point is determined by the field in the immediate neighborhood of the mass point, and conversely, the presence of the mass point may and usually does modify the field. In other words, a field of force whose "attribute ... at any point is measured by the force which the field exerts upon a unit mass placed at that point,"[4] was conceived. It was the very idea of a relationship between the attribute of the point and the force exerted at the point that was taken by social scientists to explain social phenomena.

In general, a field is defined as "a region of space in which a given effect (as gravity, magnetism ...) exists and has a definite value at each point."[5] Modeled after that, social scientists defined a field as "a complex of coexistent forces (as biological, psychological and social or interpersonal) which serve as causative agents or as a frame of reference in human experience and behavior."[6]

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[2]Bergman (1942), p. 16.

[3]Bergman, *ibid.*, p. 17.

[4]Webster's Third New International Dictionary, 1966. For mathematical definition of "field", see Yilmaz (1965), pp. 62-3.

[5]*Loc. cit.*

[6]*Loc. cit.*

Another influence of physical field theory on the social sciences is the concept of distances. "In Newtonian mechanics, the idea of position or location seems to be fundamental. From it we derive distance or extension as a subsidiary notion. Position is looked upon as a physical fact--as an identifiable point of space--whereas distance is looked upon as an abstraction or a computational result calculated when the positions are known. The view in field theory reverses this. Distance (extension, interval) is now fundamental; the location of an object is a computational result summarizing the physical fact that it is at certain intervals from the other objects in the world .... In brief, space is not a lot of points close together; it is a lot of distances interlocked."[7] This idea is directly reflected in Galtung (1964) and Rummel (1965).

The third idea similar to physical field theory is the coordinate system in social field theory. As we have seen above, field in physics is defined by a time-space four dimensional coordinate system. Wright's field theory started with the introduction of the coordinate systems. (See 3.1.3.)

3.1.2. Lewin's Field Theory

The most comprehensive among earlier attempts to utilize the concept of field in social science studies was Lewin's (1964).[8] To cope with a multitude of factors influencing an event, he used the "construct," field. He conceived of all behavior as "a change of some state of a field in a given unit of time (dx/dt)." In treating individual psychology, the field is the "life space" which consists of the person and the psychological environment as it exists for him.[9] In dealing with group psychology or sociology, a similar formulation

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[7] Eddington (1957), pp. 9-10.

[8] Since this is a collection of ten different works by Lewin, the exact year cannot be given here. 1964 is the year of publication of the book which includes papers published between 1940 and 1947.

[9] Lewin (1964), p. xi.

was proposed. Lewin viewed that the social happening occurs in, and is the result of, "a totality of coexisting social entities, such as groups, subgroups, members, barriers, channels of communication, etc."[10] He also viewed that the relative position of the entities (within the field) represents the structure of the group and its ecological setting and that this relative position expresses also the basic possibilities of locomotion within the field."[11]

To summarize, his "construct" of behavior is viewed as the function of life space: B = f(P,E) = f(LSp), and explaining behavior (B) then is identical with 1) finding a scientific representation of the life space (LSp) and 2) determining the function (f) which links behavior to the life space.[12] But Lewin did not formulate the function. He only suggested the broad relationship between a unit's behavior and its setting, but neither mathematized the structure of his "theory," nor his deduction. Therefore, his construct remained short of the theory we discussed in Chapter 1.[13]

3.1.3. Wright's Field Concept

Wright (1955) defined a field as "a system defined by time and space or by analytical coordinates, and by the properties, relations, and movements of the entities within it."[14] He believed that every situation can be conceived as a field by postulating suitable coordinates. Then he argued that a "description of the field provides a basis for explaining the past and in a measure predicting the future of the entities (within the field)."[15] On the basis of these postulates, he presented a verbally structured field theory applied to international relations.

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[10] *Ibid.*, p. 200.

[11] Lewin (1964), *loc. cit.*

[12] *Ibid.*, p. 240. B = behavior, P = person, E = environment, LSp = life space and f = "function of".

[13] For theoretical comment on his theory, see Rummel (1968a), p. 23, note 10.

[14] Wright (1955), p. 324.

[15] *Loc. cit.*

Wright suggested two different types of fields, geographic and analytic. The former "locates the people and groups of the world and their characteristics, motivations, actions, institutions, and conditions in actual time and space."[16] And the latter implies that "each international organization, national government, association, individual, or other 'system of action,' or decision-maker may be located in a multidimensional field which is defined by coordinates, each of which measures a political, economic, psychological, sociological, ethical, or other continuum influencing choices, decisions, and actions important for international relations."[17]

Then observing movements of the entities across time within the field, and analyzing relative distances among entities, he tried to link behavior to its setting defined by the given situational dimensions.

Compared to Lewin's field theory, Wright's has some advantages; since its coordinate system and vector notions give it potential for developing equations relating behavior to structural dimensions. But Wright himself did not formulate any generalizable lawlike statement concerning the relationships, nor did he provide any tool to define interrelations among the dimensions of the field. In brief, his ideas were not integrated into a rigorous theory.

3.1.4. Rummel's Field Concept

Ten years after Wright's verbal formulation of the concept of a "field," Rummel systematized a "social field theory" using a linear algebraic model. (Rummel, 1965)

The basic philosophy of Rummel's social field theory, as I have quoted elsewhere, is that "behavior is the consequence of the total social situation, and this situation forms a field consisting of social characteristics, or attributes, which stand in definite relation to each other." (Rummel, 1968a; see also page 8 of this paper).

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[16] Wright (1955), p. 540.

[17] *Ibid.*, p. 543.

One notable departure of Rummel's concept from Wright's and others' is the structure of the field. Wright, for example, considered the Cartesian coordinates system for the structure of the fields he conceived. Since Cartesian space has orthogonally-fixed coordinates, and Wright assigned each of the attribute dimensions to each of these coordinate axes, we cannot express the relationship among the attribute dimensions in this space. But, Rummel's field is a vector space where the attribute distances and nation's behavior are represented by vectors which can denote both the magnitude (in terms of length of the vector), and interrelationships among various attribute dimensions and behavior (in terms of the angles between vectors).

Rummel "analytically divides social reality into two vector spaces. One space is that of attributes of social units, and the other is that of behavior between social units. Within attribute space, each social unit is located as a vector in terms of its attributes. Within the behavior space, every pair of social units, called a dyad, is located as a vector in accordance with the interaction of the two members." (Rummel, 1968a, p. 24)

A basic characteristic of Rummel's concept which sets it apart from Wright's is the notion of distances. Wright also considered various attribute distances (geographical, psychological, technical) as acting as a force influencing international relations (Wright, 1955, p. 297). In his field structure, however, the individual nation's attribute vector (the location of a nation in the field and the magnitude of the variance of the attribute variable) are regarded as fundamental and the distances (differences) are looked upon as a subsidiary notion or as a computational result calculated from known positions of the nations.[18]

But in Rummel's field, the distance is regarded as fundamental. A justification for preference of distance to magnitude was given by Rummel, drawing on an analogy with small group behavior: "The typical behavior of an individual in a social group is highly related to his personality characteristics. Place an individual in different groups and his behavior will shift as a function of his personality differences with members of the group. That is, relative <u>distances</u> on personality dimensions between individuals influence behavior more than the actual characteristics themselves. Likewise, for nations it is social, economic, political, and geographic distances that influence international behavior. Differences in technological levels, values, power, and perception of the international order relate to the 'moves' that nations direct toward each other." (Rummel, 1968c, p. 214) In this sense, Rummel's field concept is more similar to the original concept of a field in physics rather than to other field concepts.

As we have seen, the basic philosophy of Rummel's field theory overlaps partly with Lewin's and Wright's. Indeed, there is little new about Rummel's

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[18]For example, he considered, "the relations of friendliness or hostility of two systems of action can be indicated by the direction of <u>their</u> <u>vectors</u> toward or away from one another in the value field." (Wright, 1955, p. 545). He did not directly utilize the <u>distance</u> vector as a force in determining relations.

social field theory in its components. What is new is that "it integrates an orientation toward social reality and research with mathematics and some social propositions in a different way. The theory represents a reorientation toward social action, a different point of view." (Rummel, 1968a, p. 24) Being well integrated into a rigorous scientific theory, once the truth of the lawlike statement of the theory is validated by empirical testing, then the whole theory will serve as a useful general explanatory model about social behavior applicable to international relations, *i.e.*, as "a framework within which deduction about social action and international relations may be made." (Rummel, *loc. cit.*) This is the merit of Rummel's social field theory.

3.2 The Structure of Rummel's Social Field Theory: Seven Axioms

Rummel's social field theory (hereafter, it will be referred to simply as field theory) is based on several assumptions.[19] Field theory assumes 1) that a nation's attributes and behavior coexist in a field and that the whole field is relevant to understanding the specific behavior; that the past is presumed to operate through behavior and attributes currently coexisting in the field, and 3) that absolute magnitudes of behavior and attributes are considered irrelevant to behavior; what is relevant is the relative behavior between nations and their attributes relative to each other (Rummel, 1969c).

These assumptions of field theory are mathematically structured in the following way.

1) The international field of attributes and behavior is divided into two infinite vector spaces, one of behavior and the other of attributes.

2) In attribute space, nations are projected as vectors according to

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[19]The field theory is a general theory applicable to all kinds of social units. If we define social reality as international relations and social units as nations, then it serves as an international relations theory, and "we can represent international relations within the analytic structure of field theory and then describe the linkage between a nation and its attributes by the theory." (Rummel, 1969b, p. 10)

their standardized attributes scores, and in behavior space, nations are coupled into nation dyads by the behavior of one nation to another, and all possible dyads are projected into this space as vectors.

3) The linkage between the two spaces is postulated as a linear dependence of a dyad's position in behavior space on the distance vectors between the nations in attribute space. These distance vectors are then conceived of as social forces affecting international behavior.

Formally, field theory consists of seven axioms, describing social reality and functionally relating the behavior of social units to their attributes. The seven axioms are:[20]

Axiom 1. International relations is a field consisting of all the attributes and their complex interrelationships.

Axiom 2. The international field can be analytically divided into attribute, A, and behavioral, B, spaces into which attributes and interactions are projected, respectively, as vectors.

Axiom 3. The attribute and behavioral spaces are generated by a finite set of linearly independent dimensions.

Axiom 4. Nations are located as vectors in attribute space and coupled into dyads in behavior space.

Axiom 5. The distance vectors in A space that connect nations are social forces determining the location of dyads in B space.

Axiom 6. The direction and velocity of movement over time of a dyad in B space is along the resolution vector of the forces, d.

Axiom 7. B space is a subspace of A space.

Axiom 1 is a definitional statement. It says that the field consists of all the attributes and interactions of nations and their complex interrelationships. Here the attributes are not properties of the nations, but the quantities

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[20]The mathematical structure of the seven axioms of field theory is given in Rummel, 1965, Appendix I.

that define relative positions of the elements in the field *vis-à-vis* other nations. Any descriptive concept which can differentiate the position of a nation within the field from other nations can be an attribute variable. These may be such distinctions as size, shape, income, education, race, values or geographic locations. (Rummel, 1968a, p. 16) Therefore, they may be infinite in number.

Interactions of nations are defined as behavior acts; any action of one nation toward a specific other nation. This action then couples the two nations together. Two nations so coupled by the actions of one are called a dyad and the action involved is dyadic behavior.

Attributes and behavior are all in one space and they are all interrelated in a complex way. An attribute is not only related to other attributes but also to behavior. The focus of field theory is to find specifically the relations between attributes and behavior among other relations. Axiom 2 is postulated to separate all these complex interrelations into these two groups. The separation is purely for the purpose of the theory. The second part of the axiom is designed to connect the reality of international relations with an analytic system, linear algebra. No longer simply a tool for analysis, linear algebra is an intrinsic part of the theory itself, and any deduction possible within it is allowable in this theory.

As stated above, the spaces defined by Axioms 1 and 2 could be infinite in their dimensions. To make the space finite, so that we can handle it, we need Axiom 3 which implies that if a behavior is dependent on any set of attributes, then it will be dependent on a basis (which is finite) of A space.

Axiom 4 defines the constructs of A and B spaces. By Axiom 2, the field is separated into two analytic spaces, in which attributes and interactions are represented as vectors. By the fourth axiom, we represent nations and nation dyads as vectors. Since the same nations are plotted in the two spaces (in A space, as a separate entity; in B space, as dyads), this provides us with an

important bridge to connect the two spaces.

Axiom 5 is the core of field theory. It relates attribute space to behavior space. The axiom is not an analytic, nor a definitional statement, but an empirical one which is empirically disconfirmable. This axiom makes the whole theory a testable one.

The relationship between A and B spaces defined by Axiom 5 is static. To give a dynamic interpretation to this, we need Axiom 6 which stipulates, 1) that the position of any dyad in B space shifts according to the changes in the forces of A space (this implies that the origin in B space is the stable equilibrium of all the social forces), 2) that the changes occur along the resolution vector of the forces, d. This axiom is also non-analytic, whose truth should be verified by an empirical test. This proposed study, however, will deal only with the static relations postulated in Axiom 5.

Finally, Axiom 7, tells us that B space is completely contained in A space and a basis of B space is a linear combination of a basis of A. This axiom is not based on philosophical grounds but on a technical necessity. It provides a favorable condition under which we can connect the two spaces mathematically (see next section). On the other hand, it may reduce the generalizability of the whole theory. If we can innovate the necessary mathematical manipulations this axiom can be deleted.

3.3 The Model of Field Theory

A theory is one of many possible interpretations of a calculus.[21] In field theory, the calculus is the analytic system composed of the seven axioms described above. When we interpret one or more lawlike statements of the analytic system, within the context of the system, such that the interpreted

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[21] "A model for a theory consists of an alternative interpretation of the same calculus of which the theory itself is an interpretation." (Rudner, 1966, p. 24)

relation can be tested empirically, we have a theory. By employing a different semantic rule, we can interpret the same calculus in different ways, and thus establish another theory. So far as we do not violate any part of the contents of the axioms, all interpretations are isomorphic to each other. Therefore, even though they are different models, they are still the same theory.

The lawlike statement which is empirically disconfirmable, in field theory, is the fifth axiom: the distance vectors in attribute space that connect nations are social forces determining the location of dyads in behavior space. Depending upon how we operationalize the attribute distances and how we relate these distance vectors to the location of dyads in behavior space, we have different models of field theory.

3.3.1. The Basic Equation

The fundamental linkage between behavior and attributes proposed by Rummel, is

$$w_{i\to j,k} = \sum_{\ell=1}^{p} \alpha_\ell d_{i\to j,\ell} \qquad (1)$$

where $w_{i\to j,k}$ is the k-th dimension of B space and i→j is a particular dyad, nation i as the actor and nation j as the object. The term $d_{i\to j,\ell}$ is one of the elements of the distance vector between nations i and j on the ℓ-th dimension in A space and α_ℓ is a weighting scalar parameter on that dimension.

1) The term $d_{i\to j,\ell}$ is one of the elements of the distance vector from nation i to j on the ℓ-th attribute dimension. If we define nation i's value on the ℓ-th coordinate as $a_{i,\ell}$ and nation j's value as $a_{j,\ell}$, then,

$$d_{i\to j,\ell} = a_{j,\ell} - a_{i,\ell} \qquad (2)$$

For example, China's GNP in 1962 was 42 billion U.S. dollars, while Japan's

was 77 billion.[22] In this case, the distance from China to Japan on the GNP dimension is calculated as

$$d_{\text{China}\rightarrow\text{Japan, GNP}} = 77 - 42 = 35 \text{ (billion dollars)}^{23}$$

In a similar fashion, we can calculate the distance from China to Japan on other attribute dimensions; population distance = -484 million, steel production distance = 17 million tons,[24] and so on. Field theory axiomizes that each of these distances are the components of the force vector that makes a nation behave in a certain way.

2) Next, the term α_ℓ is the weighting parameter of each attribute dimension. Each attribute distance may have a different impact on the decision-makers of different nations. For example, the Chinese may be very concerned about their economic distance from other nations, while regarding the religious distances (differences) as trivial. Each α_ℓ is the specific scalar weight for each of the different attribute distances.

3) The symbol Σ denotes that we need to sum all attribute distances (differently weighted) in order to calculate the resultant force which is exerted on the nation to determine her behavior.

4) Finally, the term $w_{i\rightarrow j,k}$ represents one of the elements of the vector of nation i's behavior to j on the k-th behavioral dimension in B space. In field theory, as we discussed above, the unit of nation behavior is defined as a dyad, a pair of nations, one of which directs her behavior toward another (with our notation i→j, the nation i is the actor, and j is the receiver). For example, the fact that China gave 50 million dollars of economic aid to North Korea (1955)

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[22] Eckstein, 1966, p. 249, Table 7-1.

[23] In field theory, all data are assumed to be in standard score units. Therefore, d actually measures differences in standard scores. The "raw differences" are given here purposedly to clarify the concept of distance. In actual research, both $a_{i,\ell}$ and $a_{j,\ell}$ will be standardized first, and then d will be calculated.

[24] Both figures are from the UN Statistical Yearbook, 1965.

is expressed as

$$W_{\text{China}\rightarrow\text{N.Korea, economic aid}} = 50 \text{ million dollars}$$

Equation (1) given above is in scalar form. That means, we take one general element from the left side and one from the right side, and express the relationship between them, or in other words, the equation denotes only one dyadic relationship. If we express equation (1) in matrix (vector) form, *i.e.* for all m dyads, it becomes

$$W^k_{mx1} = D_{mxp}\, P_{px1} \tag{3}$$

where W^k_{mx1} is the k-th dimensional behavior vector of B space which is composed of the same behavior of all m dyads; D_{mxp} is the matrix of the distance vectors, each column of which represents an attribute distance vector for m dyads; and P_{px1} is a set of p weighting parameters each of which correspond to an attribute vector.

The expanded form of this matrix equation is,

$$\underset{W^k_{mx1}}{\begin{bmatrix} w_{i\rightarrow1,k} \\ w_{i\rightarrow2,k} \\ \vdots \\ w_{i\rightarrow j,k} \\ \vdots \\ w_{i\rightarrow m,k} \end{bmatrix}} = \underset{D_{mxp}}{\begin{bmatrix} d_{i\rightarrow1,1} & \cdots & d_{i\rightarrow1,\ell} & \cdots & d_{i\rightarrow1,p} \\ d_{i\rightarrow2,1} & \cdots & \cdot & & \cdot \\ \vdots & & \vdots & & \vdots \\ d_{i\rightarrow j,1} & \cdots & d_{i\rightarrow j,\ell} & \cdots & \cdot \\ \vdots & & \vdots & & \vdots \\ d_{i\rightarrow m,1} & \cdots & d_{i\rightarrow m,\ell} & \cdots & d_{i\rightarrow m,p} \end{bmatrix}} \underset{P_{px1}}{\begin{bmatrix} \alpha_1 \\ \alpha_2 \\ \vdots \\ \alpha_\ell \\ \vdots \\ \alpha_p \end{bmatrix}} = \tag{4}$$

$$\alpha_1 \begin{bmatrix} d_{i\to 1,1} \\ d_{i\to 2,1} \\ \vdots \\ d_{i\to j,1} \\ \vdots \\ d_{i\to m,1} \end{bmatrix}_{D^1} + \cdots \alpha_\ell \begin{bmatrix} d_{i\to 1,\ell} \\ d_{i\to 2,\ell} \\ \vdots \\ d_{i\to j,\ell} \\ \vdots \\ d_{i\to m,\ell} \end{bmatrix}_{D^\ell} + \cdots + \alpha_p \begin{bmatrix} d_{i\to 1,p} \\ d_{i\to 2,p} \\ \vdots \\ d_{i\to j,p} \\ \vdots \\ d_{i\to m,p} \end{bmatrix}_{D^p}$$

where D^ℓ is the ℓ-th column vector of D. If we define D^W as the weighted resolution vector of D^ℓ vectors where each D^ℓ vector is weighted by corresponding α_ℓ weights, then,

$$W^k = D^W = \sum_{\ell=1}^{p} \alpha_\ell D^\ell \tag{5}$$

Geometrically, the basic equation of the field theory can be illustrated as in Figure (1). Here, the location of China's position is taken as the origin of the coordinates. (In general, any point in the attribute space may be chosen as origin. The relative distances among all nation points are not affected by choice of origin.) There are q dimensional vectors in W and each of them are related to D^W in the form of equation (5). If we express all the equations as a single equation, we would have

$$W_{m\times q} = D_{m\times p} P_{p\times q} \tag{6}$$

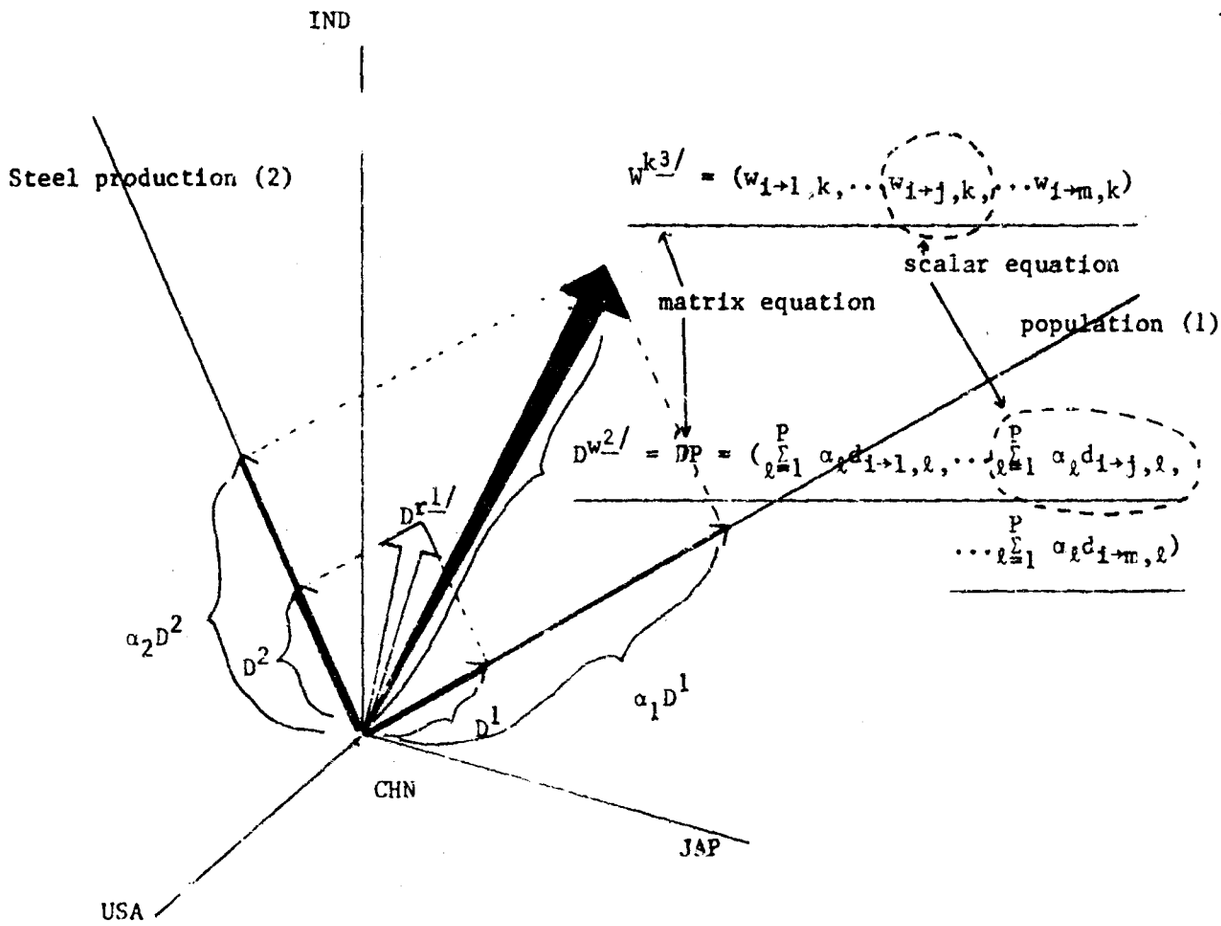
where $W^k_{m\times 1}$ is one of the column vector (k-th vector) of $W_{m\times q}$.

3.3.2. Field Theory Model I and Model II

There are two different models developed by Rummel according to the different interpretations for the weighting parameters. In Model I, the parameters are universal, *i.e.*, the same across all the actors. This implies that the unique experiences and capacities of each nation and the structures

FIGURE 1

Geometric Expression of the Basic Equation
of Field Theory



1/ D^r = resolution vector of D^ℓ

2/ D^W = resolution vector of weighted D^ℓ $(\alpha_\ell D^\ell)$.

$$D^W = DP = \alpha_1 D^1 + \alpha_2 D^2 + \ldots + \alpha_\ell D^\ell + \ldots + \alpha_p D^p$$

Therefore, the first term of D^W is $\alpha_1 d_{i\to 1,1} + \alpha_2 d_{i\to 1,2} \ldots + \alpha_\ell d_{i\to 1,\ell} + \ldots + \alpha_p d_{i\to 1,p} = \sum_{\ell=1}^{P} \alpha_\ell d_{i\to 1,\ell}$ and the j-th term is $\sum_{\ell=1}^{P} \alpha_\ell d_{i\to j,\ell}$

3/ W^k = k-th vector of W. The j-th element of W^k is $w_{i\to j,k}$.

within them are irrelevant to her behavior. In other words, a nation's responses to the various kinds of distances are the same as all other nations. Furthermore, it implies that the behavior of nation i to j is the exact opposite of the behavior of nation j to i. This obviously contradicts common sense.[25]

In Model II, the parameters are unique to each actor nation. This model allows the impact of each of the attribute distances on behavior to differ according to each nation. This is the point where each nation's intelligence can be geared in. Thus, for example, although China's attribute distances from other nations are the same as India's, the impact of these distances on her foreign policy will differ from India's, due to her unique perceptual framework. For this reason, Model II is preferable to Model I. In Model II, the equation that links behavior and attribute difference is,

$$w_{i\to j,k} = \sum_{\ell=1}^{p} \alpha_{i\ell}\, d_{i\to j,\ell} \qquad (7)$$

Here, $\alpha_{i\ell}$ has replaced α_{ℓ} in the equation of Model I, equation (2).

In matrix form, the equation is

$$W^{k}_{mx1} = D_{mxp}\, P^{i}_{px1} \qquad (8)$$

and for all q behavioral vectors together,

$$W_{mxq} = D_{mxp}\, P^{i}_{pxq} \qquad (9)$$

where P^{i}_{px1} and P^{i}_{pxq} are unique weighting parameters which represent each nation's idiosyncratic decision making system. For convenience the superscript i will be dropped, since this study will deal with only one actor,

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[25] "Recall that a distance vector for nations i and j is a difference. Thus, when we reverse i and j we only reverse the sign on the distance vector. Then, the behavior of i to j will only differ from j to i in the sign, and not the absolute value." (Rummel, 1969b, p. 18)

China, P_{pxq} can denote P^{China}_{pxq} without any confusion. Hereafter, when I refer to field theory, it will be Model II, if not specified otherwise.

3.3.3. Multiple Regression Model and Canonical Regression Model

Now let us turn our attention to the behavior vector in B space which is supposed to be related to the resolution vector of the individually weighted attribute distance vectors of A space (D^W).

Axiom 5 states that "the distance vectors in A space that connect nations are social forces determining the location of dyads in B space." Mathematically this axiom tells us only that distance vectors in A space are functionally related to the behavioral vectors in B space, but does not specify how these two kinds of vectors (or the two spaces) are related. How this is done, therefore, depends upon our intuitive interpretation of the nexus under the guidance of the overall philosophy of field theory. Among many possible interpretations, I will discuss two; Rummel's original formulation and an alternative.

Rummel's original formulation was given above in equations (7) and (8). This relates the resolution vector of attribute distances (D^W) to the k-th dimensional vector of B space (W^k). In this formulation, the same matrix D^W weighted with different sets of weighting parameters, P^1, P^2, ... P^k, ... P^q is linked to each of behavioral vectors in B space, respectively, namely, W^1, W^2, ... W^k, ... W^q. The model, however, has nothing to do with the interrelationship among the behavioral vectors. The equation (9), $W_{mxq} = D_{mxp} P_{pxq}$, is therefore, a mere aggregation of q separate vector equations.

Theoretically, this formulation would tell us that a particular behavior (*e.g.* negative communication) is explained by a certain subset of attribute distances (*e.g.* GNP, political distances, etc.), while another behavior (*e.g.* economic aid) is mainly explained by another set of distances (*e.g.* number of communist party membership, steel production, etc.) without specifying the interrelations between these individual behaviors (*e.g.* negative communica-

tion and economic aid).[26]

In this model, the weighting parameters P may be understood as the actor's unique "decision-framework" which represents the combination of both the perceptual framework and the system of behavioral choice, since this is the only set of parameters by which the actor's idiosyncracy may be expressed.[27]

Geometrically, the relations between each of W^k and D^V may be illustrated as in Figure 2.

When we apply this model to an empirical study, we need to evaluate the P matrix of equation (5). Since this model requires an analysis of the relations among a single criterion measure (k-th behavioral vector) and two or more predictor measures (p attribute distance vectors), we can evaluate the values of P employing the least-squares estimation technique, a standard solution of a multiple regression model which assures us of finding the best unbiased estimation of W^k.[28] Hereafter, I will call this formulation the Multiple Regression Model of Field Theory (MRM).

Technically, however, this model (MRM) creates a problem. In this study, I am seeking: first, to determine a set of attribute indicators that best account for China's foreign behavior, and second, to "assess the empirical fit of B space to A space."[29] The first goal can be achieved with the MRM, since the estimate of W by P which is evaluated through the least-squares technique is the best unbiased estimate of W.[30]

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[26] If we use the orthogonal basic dimensions rather than raw behavioral vectors, this orthogonality gives meaningful interrelationship among these separate equations, *i.e.*, they are mutually independent. In this case, notice that the relationships are specified by the intrinsic characteristics of the basis, but not by the model.

[27] This distinguishes this model from the canonical model where perceptual and behavioral frameworks are separated and represented by different parameters. See pp. 8-9 and the next part of this chapter.

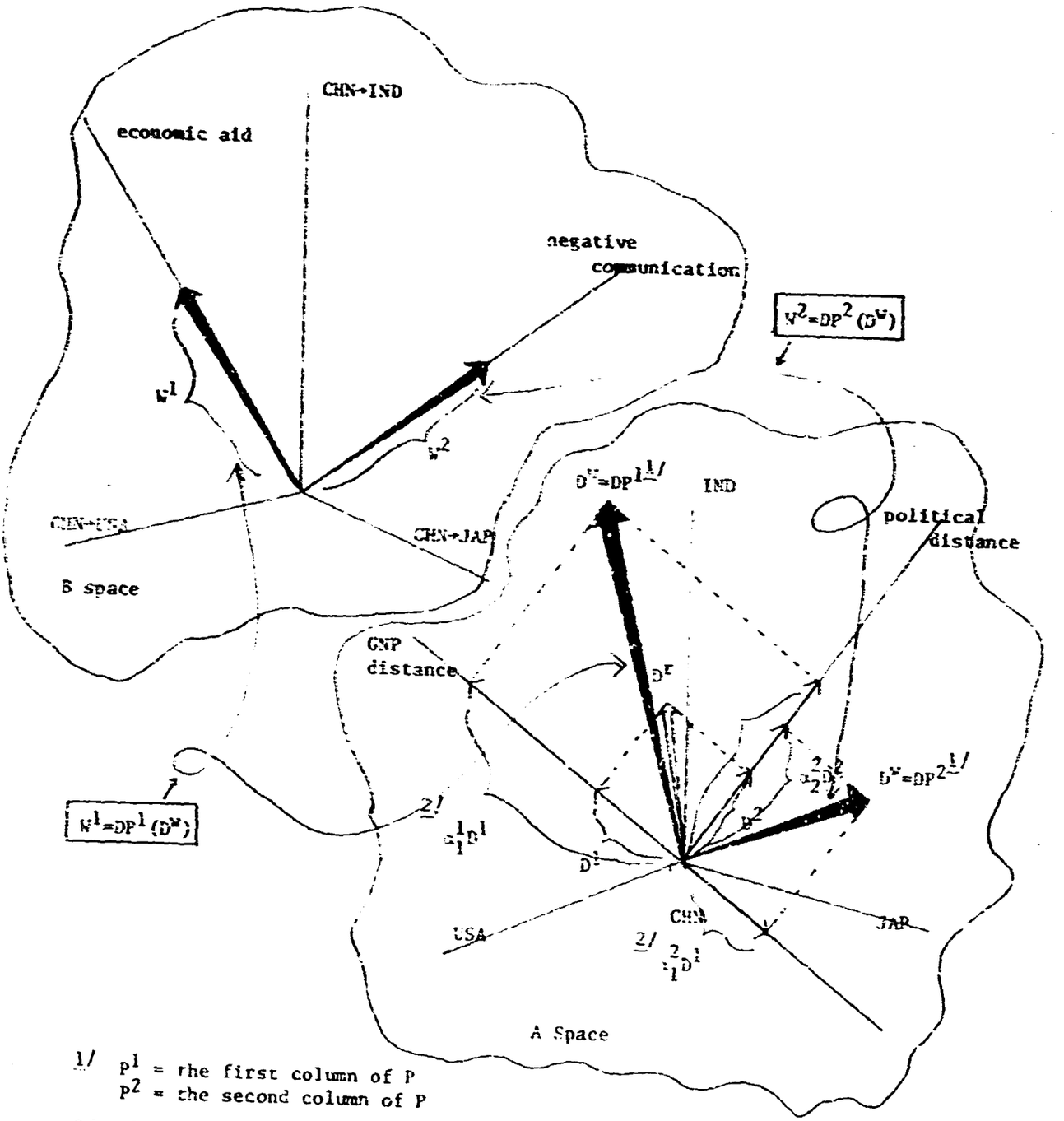
[28] For the conditions and mathematical derivations for the solution of the multiple regression model, see Johnston, 1963, pp. 108-115, and Cooly and Lohnes, 1962, pp. 31-35.

[29] These two goals are the same as Rummel's. See Rummel, 1969b, p. 22.

[30] If the n dyads are a random sample from a multinormal universe. Rummel, *loc. cit.*

FIGURE 2

Geometric Illustration of MRM
(Multiple Regression Model) of Field Theory



1/ p^1 = the first column of P
p^2 = the second column of P

2/ a_1^1 = the first element of the first column of P
a_2^2 = the first element of the second column of P

In assessing the maximum fit between A and B spaces, however, there is a problem with the MRM. To judge the fit between the two spaces, we measure the proportion of variance in B space accounted for by A space. If q variables of W are mutually orthogonal, then the 'trace correlation squared' ($\bar{r}^2$), which is the mean variance of q behavioral variables in W accounted for by corresponding q estimate of the variables ($\hat{W}^k$), can measure the fit, since $\bar{r}^2$ has the largest value in orthogonal W when W^k is estimated through the least squares method.[31] The equation for $\bar{r}^2$ is

$$\bar{r}^2 = \frac{1}{q} \sum_{k=1}^{q} \left(\frac{1}{n} W^{k\prime} \hat{W}^k\right)^2 \tag{10}$$

or in general

$$\bar{r}^2 = \frac{1}{qn^2} \mathrm{tr}\left[(W'\hat{W})'W'\hat{W}\right] \tag{11}$$

where "tr" is the sign for summation of the diagonal elements of the matrix.

The problem is that empirically we cannot expect that the variables of W are orthogonal, and, therefore, the mean correlation squared of all multiple regression correlations between W^k and D^W may not be the largest possible trace correlation squared between A and B space.

If we are interested in assessing the maximum fit between two spaces and not in reproducing the best estimated value of individual behavior variables, then we can start the analysis with any of the orthogonal basis of W instead of the raw variables. For example, if we factor analyze the W space with the varimax rotation criterion, we can find a basis of W, whose dimensions are mutually orthogonal and whose trace correlation with D^W is the maximum when we regress each of the behavioral basic dimensions onto D^W individually. But in this case, there is another problem.

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[31] Rummel, 1969b, p. 22.

The basis is not unique. Theoretically, there may be an infinite number of bases of W, all of which have the same maximum trace correlations with D^W, because we can rotate any basis of W by any linear transformation without altering its inner structure (inter-dimensional relationship). For different bases, however, the distribution and magnitude of correlations between each component behavior vector and D^W will vary from one basis to another. Therefore, we need one more restriction on the model which will determine the basis that would find the W^k which is best accounted for by the distances.

To solve this problem, I shall make a simple modification of the interpretation of Axiom 5 in Rummel's original model. Instead of relating the W^k vector of B space to D^W of A space, I shall relate W^W, the weighted resolution vector of q dimensions of W, to D^W. The scalar equation of the new model, then, is

$$\sum_{k=1}^{q} \beta_{ik} w_{i+j,k} = \sum_{\ell=1}^{p} \alpha_{i\ell} d_{i+j,\ell} \qquad (12)$$

where β_{ik} is the weighting parameter of the k-th behavioral dimension of W. In matrix form, the equation is

$$W_{nxq} Q_{qxl} = D_{nxp} P_{pxl} \qquad (13)$$

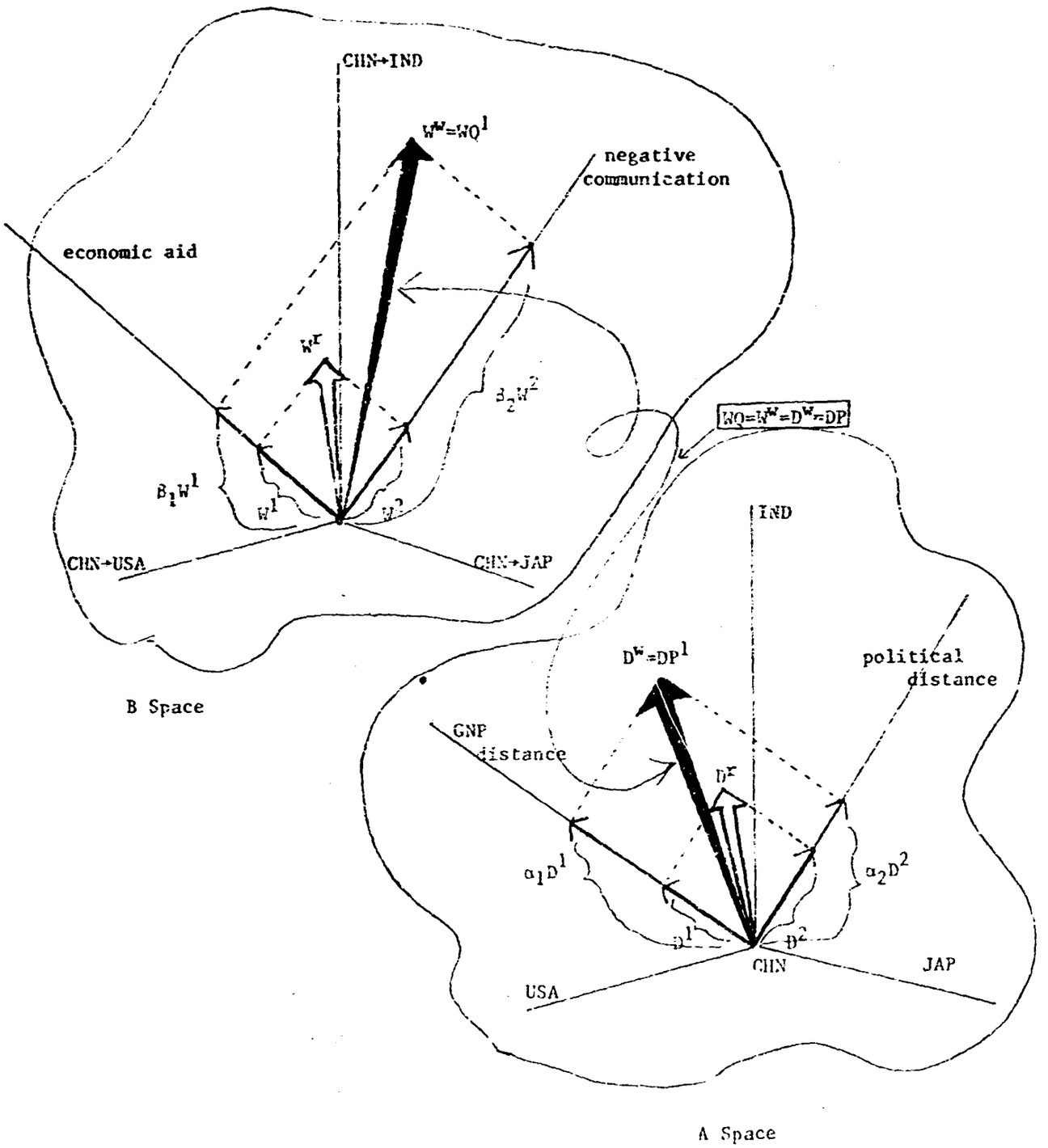
where Q_{qxl} is the matrix of β parameters for all q dimensions.

Technically, what I have done is to form a composite variate (V) out of p distance dimensions of D, weighting each p dimension by P, and another composite variate (Y) out of q dimensions of W, weighted by Q, and, then, relate these two composite variates. Geometrically, the relationship between the two variates is illustrated in Figure 3.

Theoretically, with this model, the parameters of P are the actor's unique perceptual framework of attribute distances, which is formulated by her

FIGURE 3

Geometric Illustration of CRM
(Canonical Regression Model) of Field Theory



historical background, value system, cultural heritage, etc., and the parameters of Q the unique behavioral framework or system of behavioral choice which gives different emphasis on each behavior when given forces are applied.

To apply this model to China's behavior, we must evaluate both P and Q empirically, or solve Q and P of the following equation

$$WQ = DP + U \tag{14}$$

or

$$Y = V + U \tag{15}$$

where W and D are known, and U is the random error uncorrelated with any of the variables in D.

A solution is possible if we put the following restrictions on the equation[32]

$$\begin{aligned} &Y'_h V_g = \text{maximum correlation when } h = g \\ &Y'_h V_g = 0, \text{ when } h \neq g \\ &Y'_h Y_h = V'_h V_h = 1 \end{aligned} \tag{16}$$

The equation (14) with restrictions (16) is the canonical regression model[33] and we can solve for the best fitting Y and V from W and D employing canonical analysis. Then "V(=DP) will give the parameters of P best in the sense of minimizing U, and Y(=WQ) will give the behavior dimensions of Q having the best correlations with attribute differences D."[34]

The canonical analysis gives us q different canonical equations,[35] each

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[32] See Rummel, 1969b, p. 24.

[33] For the model of canonical regression and its mathematical derivations, see Hotelling, 1935, Hooper, 1959, Cooley and Lohnes, 1962, Anderson, 1958, and Glahn, 1969.

[34] Rummel, *op. cit.*, p. 24.

[35] The number of pairs of canonical variates which come out from (cont.)

of which maximizes the correlation between the paired canonical variates (Y_h and V_g) under the restriction that each pair of canonical variates is orthogonal to all other pairs. In other words, the first canonical equation gives the highest possible correlation between the first composite score (variate) of distances (V_1) and the first composite variate of behavior (Y_1). The second equation gives the next composite variate of distances (V_2) and behavior (Y_2) which maximizes the correlations of the remainder of the total variances (the unexplained portion of the variances which is independent of those explained by the first canonical equations) after the first equation had explained as much as possible, and so on for the third to qth equations.

Then how can we fit this model to our reality? I will interpret the model in the following: The whole decision space of the decision makers, which includes both the inputs (targets of perception; here these are attribute distances between the decision maker's nation and other nations) and outputs (decision result; behavior), may be decomposed into many subspaces or substructures of decision process. For example, for military aid to other nations Chinese decision makers would consider mainly economic distances and political systems rather than literacy rates, language difference, and catholic population. In determining behavior concerning student exchange, however, language difference , and technical distances may emerge as major considerations. Here we may say that the first pattern of relations is a political subset of the behavior structure while the latter constitutes a cultural subset.

Each substructure of the behavior pattern is represented by each of the

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[35] (continued)
canonical analysis is q or p, whichever is the smaller. Axiom 7 tells us that $q \leq p$.

canonical equations of the model. In this sense, equation (13) is one of the subsets of the whole model which contains q number of subsets.

I will call this new model the Canonical Regression Model (CRM) of field theory.[36]

As discussed above, the MRM has one decision framework and the CRM has two--perceptual framework and behavioral system--and this means that the decision framework in the MRM is decomposed into two separate systems in the CRM.

The CRM, however, has one theoretical disadvantage compared to the MRM. In evaluating Q and P, the solution under the standard restrictions of the canonical analysis maximizes only the correlation between the composite canonical variates of both W and D; each individual behavior variable is identifiable only as it contributes to the particular variate. Also, the solution does not assure us of finding the maximum correlation between individual behavior and distances. Therefore, the CRM is not an adequate model to be applied if we are interested in reproducing the raw values of each of the behavioral variables which has the maximum multiple correlations, with the set of distances.

Since with this study, I wish both to find China's unique system of perception of attribute distances and preference of behavior, and to predict the actual value of behavioral variables, I will use both models. To delineate China's unique foreign policy structure (behavior pattern), the CRM is better

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[36] Technically speaking, the MRM is a special case of the CRM where all β coefficients except for one, the k-th parameter β_k are zeros. In other words, if we give another restriction, $\beta_k = 0$ if $k \neq$ number of the equation, and $\beta_k = 1$ if k = number of the equation, then equation (12) will degenerate into $W_{i\to j,k} = \sum_{\ell=1}^{p} \alpha_\ell d_{i\to j,\ell}$, which is the multiple regression model. This is only true when W and D are orthogonal matrices. If we use factor scores (obtained from the orthogonal varimax rotation) instead of raw data, W and D are orthogonal.

than the MRM, while to calculate the best estimated real value of a specific behavior in the future, the MRM is better. A detailed strategy for the utilization of both models will be discussed in the next chapter.

4. RESEARCH DESIGN

4.1 Research Strategy

The goals of this study, as discussed in the introduction, are first, to uncover China's unique behavioral patterns by applying Rummel's field theory, and second, utilizing the knowledge of these patterns to assess our capability to predict the values of the behavioral variables in the future. What follows is the strategy for achieving these basic goals.

4.1.1. Delineation of China's Behavioral Structure

The CRM of field theory will be applied to delineate the structure of China's unique pattern of behavior. The parameters of the CRM will be evaluated with data for 1955, and then with 1963 data, the stability of the estimated parameters will be checked.

1) The bases of A and B Spaces.

To meet the third condition of the CRM (equation 16), we need to first find the orthogonal bases of A and B space. Both A and B space data (see section, 4.3.4.) will be factor analyzed employing the principle component technique,[38] and rotated with the varimax criterion.[39] The resultant orthogonal factors of the data matrices are the bases of the two spaces.[40] The basis

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[38]For definition and solution of the principle component analysis technique, see Rummel, 1970, pp. 338-345 (14.3.4.).

[39]See Rummel, *ibid.*, pp. 391-393.

[40]A basis is a set of vectors which span the space. Therefore, any linear transformation of a basis is also a basis of the space, since it also spans the space. The dimensionality of a basis is unique, but the basis itself is not unique. For further detailed discussion, See Rummel, *ibid.*, pp. 66-71.

of B space thus delineated will be W and that of A, D in the CRM (equation 14).

2) Canonical Analysis.

Taking W to be dependent and D to be independent, canonical regression analysis will be performed. This analysis will give us two kinds of matrices. The first matrix is the regression coefficients, the α's and β's of the CRM. These are the weighting parameters of each of the dimensional vectors which maximizes the canonical correlation between each pair of canonical variates (Y_1 and V_1, Y_2 and V_2, ... and so on).[41] With these regression coefficients, we can formulate q number of relational equations

$$\beta_1 W^1 + {}_2W^2 + \ldots + \beta_k W^k + \ldots + \beta_q W^q = \alpha_1 D^1 + \alpha_2 D^2 + \ldots + \alpha_\ell D^\ell + \alpha_p D^p \quad e \quad (7)$$

where e is random error. Each of these equations would represent each subset of China's behavior pattern discussed in Chapter 3. Let us call this the canonical regression coefficient matrix (C_r).

Another matrix we can obtain from canonical analysis is a canonical loading matrix. The matrix contains correlations between the canonical variates and the original behavioral variables.[42] Therefore, each of the elements of this matrix, when squared, will give the proportion of variance in Y_h and V_g accounted for by the corresponding dimensions. Utilizing this knowledge of the contribution of individual dimensional variables in constituting canonical variates, we can see the pattern structure of China's behavior; which distances are related to which behavior. If we define the loadings of W^k in Y_h as b_{kh},

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[41] There will be q sets of canonical variates, where q is the dimensionality of W.

[42] On the left hand side the correlations are between $W^k{}_h$ and Y_h, and on the right hand side, between $D^\ell{}_g$ and V_g, where $W^k{}_h$ is the value of W^k in h-th canonical equation, $D^\ell{}_g$, the value of D^ℓ in g-th canonical equation.

and the loadings of D^{ℓ} in V_g as $a_{\ell g}$, then we can construct the following (structure equations).

$$b_{1h}W^1 + b_{2h}W^2 + \ldots + b_{kh}W^k + \ldots + b_{qh}W^q$$

$$\rightarrow a_{1g}D^1 + a_{2g}D^2 + \ldots + a_{\ell g}D^{\ell} + \ldots a_{pg}D^p \qquad (18)$$

where g = h, and the arrow means "relatedness" between the two combinations. Each of these equations will tell us which attribute distances are important in explaining a specific combination of behaviors. Let us call this the canonical structure matrix (C_s). Both equations, (17) and (18), will serve to uncover the patterns of China's foreign behavior.

3) Test of the Degree of Fit.

The following three statistics will be utilized to measure the degree of fit between the model and data.

trace correlation squared ($\bar{r}^2$): The formula for calculating the trace correlation squared was given as equations (10) and (11). The $\bar{r}^2$ will give the proportion of overall variances in W accounted for by the model ($\hat{W} = DP$). To see the overall fit between A and B spaces, therefore, this statistic is an adequate measurement.

standard error of residuals: The canonical variate is a hypothetical composite variable of all dimensional vectors of distances and behavior, which are patterned by unique weighting parameters. By subtracting distance scores from behavior scores, we can ascertain the degree of similarity between the two patterns. The standard error of residuals--the remnant variance of behavior scores after subtraction of the distance scores--will serve as a bench mark for the degree of similarity between distance and behavior patterns.

communality estimate (H-SQ): In equation (18), if we square each of the loadings and sum them together for each side ($\sum_{k=1}^{q} b^2_k$ and $\sum_{\ell=1}^{p} a^2_{\ell}$), we will have

another statistic called communality estimates.[43] This statistic will tell us the proportion of the variance in each variable contained in the pattern represented by the equation (17). If the H-SQ of distance in one pattern is low, that means little relation between the component variables and the pattern. If very high, it indicates that most of the variables are identified with the model. This statistic will, therefore, tell us the inner structures of A and B space patterns.

4) Test of Stability of the Patterns.

If China's behavioral patterns change from time to time, they cannot be used to predict China's future behavior. At least for a certain time period, let us say ten or twenty years, the patterns must remain sufficiently unchanged if they are to be utilized for prediction. The stability[44] of patterns, therefore, should be tested across time. In this proposed study, the stability, expressed in terms of P and Q coefficients of CRM, will be tested against the 1963 data.

First, with D and W of 1963, I will complete the analyses described above for 1955. Second, I will repeat the same analyses with the P and Q parameters calculated from 1955 analyses, and compare the results of both analyses in terms of the trace correlation squared, and the standard error of residuals. This comparison will tell us the degree of stability of the patterns.

The comparison, however, requires the same structure for the spaces (both D and W) across the two time points, *i.e.*, D in 1955 and D in 1963 must have the same factors as does W. If the factors are not identical at the two

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[43]The communality estimates (H-SQ) of behavioral vectors will always be 1.00, since B space is smaller than A in dimensionality. Therefore, only the H-SQ of distances is meaningful for interpretation. See Phillips and Hall, 1968, p. 12.

[44]The term "stability" is used as a synonym of reliability, accuracy, and predictability. For definition of the term, see Kerlinger, 1964, pp. 429-32.

time points, we can no longer compare them. Only when I can assume the two spaces have similar factors, I will try the comparison.

4.1.2. Prediction of Future Behavior

One of the goals of this study is to formulate equations to predict the future behavior of China. This time, the problem is to estimate the values of specific variables as accurately as possible. To achieve this goal, I will apply the MRM as a basic tool.[45]

1) The Prediction Equation

The prediction equation for each behavior variable can be derived directly from the model (MRM), the equation (9),

$$W_{mxq} = D_{mxp}P_{pxq} + U_{mxq} \tag{9}$$

where W_{mxq} is the factor scores of the standardized behavior variables Z^B_{mxv} (q, number of basic factors in W; v, number of variables).

If we define F^B_{vxq} as the factor loading matrix of W space, then

$$Z^B_{mxv} = W_{mxq}F^{B'}_{qxv} \tag{19}$$

Replace W in (19) with above model (9).

$$\begin{aligned} Z^B &= (DP + U)F^{B'} \\ &= DPF^{B'} + UF^{B'} \end{aligned} \tag{20}$$

Therefore, we can get the estimated value of Z^B ($\hat{Z}^B$) from equation (20)

$$\hat{Z}^B = DPF^{B'} \tag{21}$$

And since

$$Z^A = DF^{A'}$$

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[45]The reason for preference of MRM to CRM was given in 3.3.3. of this paper.

$$Z^A F^A = DF^{A'} F^A$$

$$Z^A F^A (F^{A'} F^A)^{-} = D \qquad (22)$$

where Z^A is standardized data of distances (A), and F^A is the factor loading matrix of D space, equation (21) can be expressed as

$$\hat{Z}^B = Z^A F^A (F^{A'} F^A)^{-1} P F^{B'} \qquad (23)$$

This equation will be the prediction equation for each behavior variable from known set of distances.

2) Test of the Fit of the Model

The standard error of the discrepancies between observed value (Z^B) and the estimated value ($\hat{Z}^B$) will be used to measure the degree of fit between the model and the data.

3) Test of Stability of the Model Across Time

First, the P of equation (9) will be calculated using the 1955 D and W matrices. Then with this P (P-1955) and Z^A-1963, the Z^B of 1963 will be predicted. This estimated value of Z^B-1963 will be expressed as $\hat{Z}^B$-1963*. Second, the value of Z^B-1963 will also be estimated directly from Z^A-1963 with P-1963. This will be expressed as $\hat{Z}^B$-1963. Then Both $\hat{Z}^B$-1963* and $\hat{Z}^B$-1963 will be checked against Z^B-1963. Comparing the standard error of residuals of the first estimation ($\hat{Z}^B$-1963* minus Z^B-1963) with that of the second ($\hat{Z}^B$-1963 minus Z^B-1963), we can tell the degree of stability of the model.

4.1.3. Causality Test

The models of field theory presuppose contemporaneity of the distances and the behavior, *i.e.*, the attribute distances at time t_1 is believed to be related to the behavior at time t_1.[46] But in this study, I am assuming that a nation has her unique perceptual and behavioral framework and that the decision maker acts <u>after</u> he perceives the distances. If so, then there

[46]For example, see Rummel, 1969c, p. 1.

must be a time lag between the perception of distances and of behavioral choices, and the distances of t_1 should be related to the behavior of $t_1 + \Delta t$.

This "guess," will be tested as follows: First, W-1963 will be estimated from D-1963 (see 4.1.1. (4)) and from D-1955. Then, the two results will be compared. If the results of the second analysis are better we can say that there exists a time lag between perception of distances and behavior. Though it is a crude method[47], it will give some suggestions for future study.

4.2 Variables and Data Generation

4.2.1. The Population

In 1955, there were ninety-nine independent nations in the international system, and in 1963, there were one hundred and thirty-nine.[48] For the study planned, all smaller nations (population less than 500,000) and those which did not exist as independent nations at either time points (1955 and 1963)[49] have been deleted, leaving eighty-two nations for which data will be collected. These nations are listed in Table 1.

4.2.2. The Variables

The data stored in the Dimensionality of Nations (DON) Project Data Bank will be primarily utilized. Variables in the Dimensionality of Nations

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[47] We do not know the size of Δt, the actual time lag. This should be discovered empirically. For example, the same analyses with different Δt (Δt = 1 year, 2 years, ... 10 years) will delineate the Δt that gives the best fit between D and W. In this study, I will test the model with 1963 and 1955 data, *i.e.* Δt will be eight years, since these data will be collected only for these two time points. But later, I will retest the model with various Δt's (my rough guess is that the Δt is around 1 year).

[48] See Information Please Almanac: 1965, pp. 615-6.

[49] For the comprehensive list of national political units, see Russett-Singer-Small, 1969. Five hundred thousand population criterion for deleting smaller nations is arbitrary. For further discussion, see the comments of both Michael Haas and George Modelski, *et al.*, on Russett-Singer-Small list, in the American Political Science Review, vol. 62, No. 3, pp. 952-5.

Table 1.

List of Nations (N= 82)

I.D.	Name of Nation	Code	I.D.	Name of Nation	code
1.	Afghanistan	AFG	41.	Israel	ISR
2.	Albania	ALB	42.	Italy	ITA
3.	Argentina	ARG	43.	Japan	JAP
4.	Australia	AUL	44.	Jordan	JOR
5.	Austria	AUS	45.	Korea(DPRK)	KON
6.	Belgium	BEL	46.	Korea(ROK)	KOS
7.	Bolivia	BOL	47.	Laos	LAO
8.	Brazil	BRA	48.	Lebanon	LEB
9.	Bulgaria	BUL	49.	Liberia	LBR
10.	Burma	BUR	50.	Libya	LBY
11.	Cambodia	CAM	51.	Mexico	MEX
12.	Canada	CAN	52.	Nepal	NEP
13.	Ceylon	CEY	53.	Netherlands	NTH
14.	Chile	CHL	54.	New Zealand	NEW
15.	China (PRC)	CHN	55.	Nicaragua	NIC
16.	China(ROC)	CHI	56.	Norway	NOR
17.	Colombia	COL	57.	Outer Mongolia	OUT
18.	Costa Rica	COS	58.	Pakistan	PAK
19.	Cuba	CUB	59.	Panama	PAN
20.	Czechoslovakia	CZE	60.	Paraguay	PAR
21.	Denmark	DEN	61.	Peru	PER
22.	Dominican Republic	DOM	62.	Philipoines	PHI
23.	Ecuador	ECU	63.	Poland	POL
24.	Egypt(UAR)	EGP	64.	Portugal	POR
25.	El Salvador	ELS	65.	Rumania	RUM
26.	Ethiopia	ETH	66.	Saudi Arabia	SAU
27.	Finland	FIN	67.	Spain	SPN
28.	France	FRN	68.	Sweden	SWD
29.	Germany(DDR)	GME	69.	Switzerland	SWZ
30.	Germany(FRG)	GMW	70.	Syria	SYR
31.	Greece	GRC	71.	Thailand	TAI
32.	Guatemala	GUA	72.	Turkey	TUR
33.	Haiti	HAI	73.	Union of South Africa	UNS
34.	Honduras	HON	74.	USSR	USR
35.	Hungary	HUN	75.	United Kingdom	UNK
36.	India	IND	76.	USA	USA
37.	Indonesia	INS	77.	Urguay	URA
38.	Iran	IRN	78.	Venezuela	VEN
39.	Iraq	IRQ	79.	Vietnam(north)	VTN
40.	Ireland	IRE	80.	Vietnam(south)	VTS
			81.	Yemen	YEM
			82.	Yugoslavia	YUG

Project studies (See Rummel, 1964, 1966, 1966b, and 1969a) were adopted as the basic list of variables. Then variables in other similar studies (Russett, 1967; Berry, 1960; and Catell and Gorsuch, 1965) were cross-checked against the DON variables. Since the DON studies were global and not particularly aimed at China study, several supplementary variables were added in consideration of the uniqueness of China's ecology (see Bobrow, 1969b).

1) Attribute Variables

First, I chose seven variables which loaded highest on each of seven basic dimensions delineated in Rummel's work (Rummel, 1969a).[50] They are:

variables	dimensions
energy consumption/pop	economic development
population	size = power
bloc membership	politics
killed in foreign violence	foreign conflict
killed in domestic violence	domestic conflict
Roman catholics/population	catholic culture
population/area	density

Since the seven dimensions delineated by Rummel fit quite well with similar studies,[51] it seems safe to use these variables to represent the overall scope of the general attribute space. But because Rummel's politics dimension had a relatively low correlation with Russett's (-.54), I selected a variable to cover this gap

communist party membership/population.

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[50]The reason for selection of the variables which have highest loadings on the basic dimensions is that I want to cover the broadest possible variations in China's attributes with the smallest number of variables. Taking the highest loaded variables from each of the independent basic vectors virtually guarantees that the chosen seven variables would cover most of the variability in A space which was originally contained in nearly one hundred different variables.

[51]For example, intraclass correlations with Russett (1967) was .93, and with Berry (1960) .96. Technique for comparison employed was Ahmavaara's transformation analysis. See Rummel, 1969a, p. 134, and Ahmavaara's and Markkanen, 1958, pp. 80-3.

Then, from a broad scanning of traditional studies about China's behavior[52] and from my own research experience,[53] I included the following seven variables.

Chinese population/population in object nations
geographical distance from China
defense expenditure
number of combat airplanes
amount of U.S. aid
amount of U.S.S.R. aid
attitude toward China issue in U.N.

The list of variables finally selected are shown in table 2.

2) Behavioral Variables

As a basis for selection of the behavioral variables, I again examined ten variables which loaded highest on each of the ten basic dimensions delineated by Rummel (Rummel, 1969a).[54] They are

variables	dimensions
tourist A→B	salience
emigrants A→B/A's population	emigration and communication
weighted UN voting distance	UN voting
student A→B/A's students to all	foreign student
export A→B/A's GNP	export
IGO A→B/A's IGO membership	international organization
military violence factor score A→B	official conflict behavior
embassy or legation A→B/A's total	diplomatic representation
UN voting distance on self determination pattern A→B	self determination voting
anti-foreign behavior factor score A→B	anti-foreign behavior

Unlike the A space variables, this time I changed a number of entries. Although good for global studies, some are not adequate to measure Communist

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[52] I was influenced especially by Hinton, 1966.

[53] For example, The Ch'ing Tributary System and The Foreign Policy of The People's Republic of China: A Quantitative Study, University of Hawaii, 1969, unpublished paper.

[54] The ten dimensions are a result of a composite of four accumulated studies done by Rummel. See Rummel, 1969 a, pp. 140-1.

Table 2.

Attribute variables *

var. #	code	variable name	operational definition*
1	POPUL	population	actual number
2	DNSIT	density	population/area in km^2
3	ENERG	energy consumption/pop	energy consumption will be measured in metric tons of coal equivalent
4	CATHO	Roman catholics/pop	in percent
5	CHINP	Chinese/population	in percent. Chinese are defined as those who retain Chinese names.
6	BLOCM	bloc membership	rating: 0=Communist bloc, 1=neutral bloc, 2=western bloc. Communist and western bloc membership is determined by military treaties or alliances with USSR or USA.
7	COMPA	Communist party membership/pop	in percent.
8.	FKILL	killed in foreign violence	The total number of deaths resulting directly from any violent interchange between countries
9	DKILL	killed in domestic violence	any death resulting directly from violence of an intergroup nature
10	DEFEX	defense expenditure	in US $. includes total current and capital outlays
11	PLANE	number of combat airplanes	in actual number
12	USAID	aid from U.S.A.	in US $.
13	URAID	aid from U.S.S.R.	in US $.
14	DISTG	geographical distance	distance between capitals plus distance between nearest borders. measured in Cm on 16 inch globe.
15	UNATT	attitude on China representation issue in nearest UN gen. assembly	rating: 0=against, 1=abstention 2=absent, 3= favorable

*For detailed definitions, see Rummel, 1964.

China's behavior. For example, there had been almost no tourists and emigrants from and to China during the period selected for this study. I deleted tourist, emigrant and student variables for this reason. I also eliminated all variables relating to U.N. votings, since China has not been a U.N. member nation.

Similar variables were inserted for three of the original variables. That is, I dropped denominators from the three variables--embassy, export and IGO. Since I will be dealing with only one actor, division by the total figures is meaningless.

Then I added the following eight variables: import/GNP of nation; official comment, negative communication, positive communication, economic aid, treaties, official visits and conferences. Selected variables with operational definitions are given in table 3.

4.2.3. Missing Data Estimation

In general, there are four approaches to solving the problem of missing data in cross-national data: 1) the order of the data matrix can be reduced until only the complete data remains, 2) missing data may be treated as blanks in the analysis, 3) some of the missing data may be estimated judgementally, or 4) all the data may be estimated by ratings, mean values, measurement scale reduction, factor analysis, or regression analysis. (See Wall and Rummel, 1969, p. 1).

In this study, method (4) will be applied. I will estimate the missing data using the MISDAT program developed by Wall and Rummel.[55] With this method, the available data on each variable will be regressed on the available data on the other variables to determine regression estimates for the missing data. Then, with estimated data included, the computation will be repeated again and again until the estimates converge to stable values for the missing data. This

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[55]See Wall and Rummel, 1969, pp. 1-2, This is a kind of regression estimate method.

Table 3.

Behavioral Variables

var. #	Code	Variable Name	Operational definition
1	EXPOR	export from China to B / B's GNP	in US $.
2	IMPOR	import by China from B / B's GNP	in US $.
3	EMBLG	embassy of legation	rating: 0= no exchange, 1=one side (either Chinese embassy or legation in object nation, or emabassy or legation of the nation in Peking), 2=both side
4	IGOMB	International Gov'tal Organizations of which China and object nation are members	number of co-participated IGO
5	TREAT	treaties signed	number of treaties co-signed
6	ECAID	economic aid	in US $.
7	MVIOL	military violence	factor scores on military violence dimension
8	COMMT	official comment	frequency of editorials that contains comment on object nation in Jen-min jih-pao, during the year.
9	NEGCM	negative communication	frequency of articles in Jen-min jih-pao during the year that denounce, accuse or threat the object nation.
10	POSCM	positive communication	frequency of articles in Jen-min jih-pao during the Year that praise or support cause of object nations
11	VISIT	official visit	in frequency.
12	CONFE	coparticipation in conference	number of conference
13	ANTIB	unofficial anti-foreign behavior	factor scores on anti-foreign behavior dimension

process will be applied to all variables with missing data.

4.2.4. Data Preparation

To apply field theory to this study, we need to prepare the data in the forms of dyadic behavior and attribute distances. And, for the CRM, the orthogonal bases of the spaces should be delineated.

1) Raw Data Matrices

After all the data are collected and the missing ones are estimated, the data will be transformed into the desired forms. Since the behavior data are already in the desired form (dyadic behavior form), we need to transform only the attribute data into "distances." In this study, I interpret "distance" as simple "differences."[56] Therefore, on each variable, if China's score is

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[56]There have been several different interpretations of field theory concerning the "kind" of distances to be employed. For example, some have used Euclidean distances, where distance between nation i to j on ℓ attribute is calculated as

$$d_{i \to j,\ \ell} = \pm \sqrt{(b_\ell - a_\ell)^2}$$

where $d_{i \to j, \ell}$ is the distance on ℓ variable, a_ℓ and b_ℓ are scores of i and j on variable ℓ. Note that here we lost the "direction" of difference, since there are two square roots for one value (+ and -) and we do not know which to take. If there are more than two variables (*e.g.* ℓ, k) then the distance between i and j will be

$$d_{i \to j} = \pm \sqrt{(b_\ell - a_\ell)^2 + (b_k - a_k)^2 \ldots}$$

but in the original model of field theory, Rummel specified how to aggregate individual distances into one, stating that the aggregation should produce "the resolution" vector. Therefore, we cannot calculate the distances in this way.

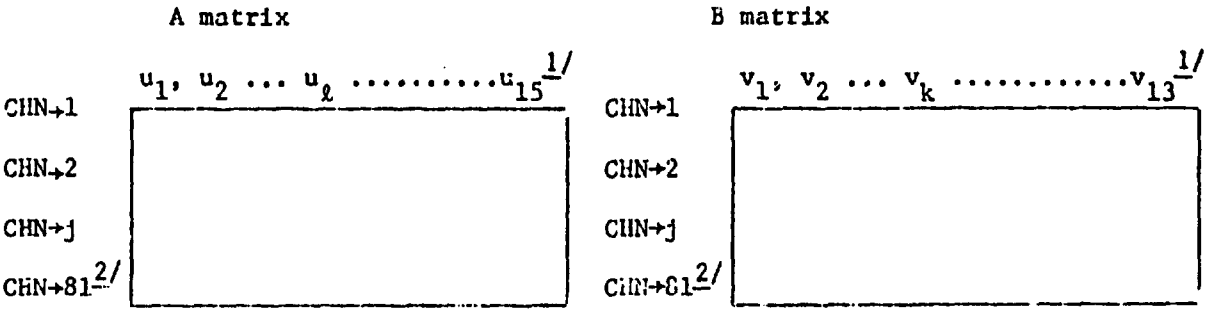
Gleditsch (1969, pp. 12-3) once discussed four "permissable" interpretations of the distances. The four are 1) signed differences on attribute dimensions, 2) squared differences on attribute dimensions, 3) sums on attribute dimensions, and 4) squared sums on attribute dimensions. Among these, however, No. 3 and No. 4 are obviously not "distances" and should be excluded. The "squared differences" (No. 2) is also not desirable for the following two reasons: First, "squared distances" do not fit the original meaning of "distance," since it cannot discriminate the position of i from the position of j in the field. The "distance" is a quantity that defines the position of point i relative to other points in the field. It is the relative position which is defined by both direction and magnitude, not only the magnitude of the distances, that works as force. Second, there is no reason for substituting "squared differences" for "signed differences." The original argument for this substitution

(continued)

subtracted from the score of object nation j, we shall have the attribute distance. In vector algebraic terms, this means that the whole space is moved to a new coordinate system, the origin of which is identical to the location of China's position. The data matrices in their final form, then, will look like the following (Figure 4).

FIGURE 4

The Form of Raw Data Matrices



note: 1/ u_ℓ is ℓ-th attribute variable, and v_k is k-th behavioral variable.

2/ The number of cases in these matrices is 81 each. The total number of nations in this study is 82. But since China's behavior toward herself and China's attribute distances from herself (all zero) are meaningless, the rows for China are removed from both matrices.

2) The Bases of Attribute and Behavior Spaces

For the application of the CRM, we need to find an orthogonal basis of each of the two spaces. As I suggested earlier (3.3.3.) I will factor analyze both spaces using the principle component technique with varimax rotation.

correlation matrix: First A matrix (since all processes of factor analysis for B is exactly the same as for A, I will discuss only A) will be standardized (Z^A). Then the correlation matrix will be

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(continued)[56]
was basically grounded on the fact that with signed differences the behavior i→j should be the exact reverse of j→i which is unrealistic in the empirical world. But if we take Model II rather than Model I, this argument becomes pointless, since different weighting parameters for each nation actor will "adjust" this absurdity. As a conclusion, there is no alternative interpreation of the distances "permissible" within the context of field theory. I will retain the original interpretation.

$$R^A = \frac{1}{n} Z^{A'} Z^A \tag{20}$$

where n is number of cases (=81).

factoring: This R^A matrix will be factor analyzed, and we can get the factor loading matrix (F^A) and the factor score matrix (D) from the following equations.

$$F^A = E\lambda^{\frac{1}{2}} \tag{21}$$

where F^A is the factor loading matrix of A, E is a matrix of the eigenvectors of the space and λ is a diagonal matrix of corresponding eigenvalues, and

$$D = Z^A F^A (F^{A'} F^A)^{-1} \tag{22}$$

where D is the factor score matrix and Z^A is the standardized matrix of A.[57] The basis D defines "a minimum orthogonal coordinate system for A space,"[58] and will serve as the B in our models.[59]

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[57] For derivations, see Rummel, 1969b, pp. 13-4. See also Rummel, 1970, p. 436.

[58] Rummel, 1969b, p. 14.

[59] The factor score matrix such derived from B will be W.

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