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AN ASSESSMENT OF RESEARCH ON ARMS ACCUMULATION ALONG WITH SOME SUGGESTED GUIDELINES

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discussion papers

Introduction

This report outlines the rationale and efforts being undertaken for the part of the DGFK project that deals with arms accumulation. Section 1 deals with some of the issues surrounding the background of this effort. Section 2 provides a preliminary description of some of the theoretical and methodological considerations that will underlie our efforts. Section 3 serves to summarize this part of the report and to provide a precise delineation of steps to be undertaken for the fulfillment of the objectives of this part of the project.

Section 1: Background

The substantive focus for the efforts of this part of the project is primarily on the antecedents of arms accumulation. * With the undertaking of a thorough survey of the extensive social science literature which treats this general problem area, we intend to formalize a set of contending models, test these models against empirical evidence, and develop forecasts of arms accumulation on the basis of these models and in conjunction with the domestic and international conflict research efforts being undertaken in the project.

The General Problem

The effort at arms accumulation continues to absorb more and more resources of both the developed and developing countries. In constant, 1973 prices, total world military spending rose from 154 billion dollars in 1957 to 270 billions in 1976. (SIPRI, 1978, pp. 142-143) This represents

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* Depending on time available, some effort will also be made to account for the political, economic, and social effects of this activity.

a vast wastage of social resources when we realize that the latter figure was equal the combined income of 70 % of the "poorest inhabitants of the Third World" and fourteen times the development aid provided by the industrialized countries for the Third World.

Simultaneous with this vast waste of social resources, the military sector creates two other serious problems in national and international life. First, it fails to perform its basic function, as proclaimed by its advocates, namely the preservation and enhancement of national security. and international peace. No state can arm itself in isolation. Any effort to increase one state's security by armed strength will lead others to follow in pursuit and sometimes overtake the first. At a minimum, the process of armament fails to enhance the security of the state because others will be led to emulate its effort. At its worst, the competitive armaments processs may aggravate existing tensions and lead states into war. This is completely antithetical to any sane and rational notion of security.

Second, the militarization of societies poses severe threats to the internal order of these polities. In developing countries the military can, through the armaments process, become the most powerful element in the polity and thereby destroy any possibility of the democratic development of these states. In more developed societies, increased militarization will distort the further development of these polities as the norms and values of the garrison state become more prevalent. The character of political discourse will be become clouded with the myths and taboos of national security and the extent to which rational political decision-

making on the part of the citizenry and elites of these states takes place is diminished.

Given that military spending has these harmful general effects, the imperative is to find a set of policies that can counteract them. Unless these policies be doomed to failure from the outset,a prerequisite is that they be based on a clear and precise knowledge of the processes associated with arms accumulation. While there is a great deal of research on this question, it would not be overstating the case to say that it is scattered, rarely compelling, frequently inconsistent, and hardly useful to the policy maker.

To date, there has been no systematic effort to provide a thorough review of the causes (and, for that matter, the consequences) of the arms accumulation process. Scattered across both the widely read and the most obscure of scholarly journals, buried in the most unlikely anthologies and conference reports, and hiding in unpublished papers, are scores of research reports on this important question. Only the most diligent and resourceful scholars are aware of their existence. To date, no one has come forth with an effort to evaluate and synthesize the findings of this research. Given that it is addressed to a very important problem, it is imperative that an effort be made to provide such an evaluation and synthesis so that both the scholarly and policy worlds might make use of them.

The scientific research on problems centered on the arms accumulation process varies greatly in its quality. However, it is difficult, if not impossible, to name any one study or series of studies which has provided a thorough and systematic examination of the major models or to cite

one that has any large scope in terms of temporal and spatial setting. The generalizability of any findings to date is just completely undetermined. Anyone at all familiar with the research in this area is certainly aware of the widely divergent theoretical perspectives that are employed. Familiarity will also provide the "knowledge" that by the evaluative standards employed in these reports there is not one of these models that does not do well in "accounting for" the phenomena under question. Little cynicism is required to conclude that more rigorous testing procedures are required to provide a clear understanding of the problem area.

The rectificationof the three problems just described would bring us a long way in providing useful information to both the scholarly and policy communities. We intend to accomplish this task, but we intend to go even further. Thus, after a thorough and exhaustive examination of the contending models, we propose to develop a computer simulation of the processes at work and employ that simulation for the purposes of contingent forecasting with the intention of focusing on policy instrument variables.

In sum, the proposed research will:

1. focus on causes of arms accumulation;
2. provide an exhaustive and thorough survey of extent research in this area;
3. formalize the major theories and models in this area;
4. subject these formalizations to a thorough and exhaustive empirical test across a broad temporal and spatial domain;

5. utilize the knowledge gained from the proceeding efforts to construct a well-calibrated simulation of the relevant processes along with the associated processes of domestic and international conflict and explore the implications of reasonable policy alternatives in this area.

Section 2: Theoretical and Methodological Considerations

There are a variety of operational formulations possible to represent the notion of arms accumulation. One general and dominant mode is the focus on available weaponry. Examples of such are the factor analytic representations of hardware available, as developed in the Mihalka (1975) and Snyder (1976) studies, simple counts of major strategic item, e.g., battleships (Lambelet, 1975), long-range bombers and missiles (McGuire, 1978, Organski et al., 1978).

Another general and dominant mode of operationalization is in the representation of the resources employed for arms accumulation purposes. Here a variety of measures of military spending and personnel have been used. Levels of military spending (e.g.,Lambelet, 1972; Choucri and North,1975), rates of change in that spending (e.g., North and Choucri, 1969), military spending as a share of societal product (e.g., Olson and Zeckhouser, 1966), military spending as a share of government resources (Cusack, 1978) have been used to represent the financial and economic aspects of the resource allocation notion of arms accumulation. Total military personnel (e.g., Chadwick, 1970) and total military personnel over total population (e.g., Terrell, 1971) have been employed to represent the demographic aspects.

Both of the general modes of representation are fraught with problems of measurement and meaning (Huiskan, 1973). (There is insufficient space to go into these problems here; we should indicate that a report will be forthcoming on this question.) We have chosen to employ the second general mode for two reasons.

First, there is the problem of data availability. The effort and time needed to gather complete information on weapon systems available to all countries during the post-World War II period (the prospective validation base) is incalculably large. Problems of access to, and accuracy of, information would vitiate any such effort. With respect to data on military spending and personnel, as well as the associated measures of societal and governmental economic resources and societal demographic resources, no such problem exists. Such data have been collected by a number of research teams. When available in machine readable form these have already been introduced to our data archives. When not in such form, they are being coded and punched for accession. True, as alluded above, there are some measurement and interpretation problems connected with these data. Nevertheless, they represent the state of the art and until such time as the proposed UN accounting scheme can be implemented and retrospective accounting takes place (see UN report 1977, Becker, 1977), the data we will employ is most likely the best available.

The second factor which leads us to employ the economic and demographic mode of representation for the arms accumulation notion is the theoretical perspective shared within the research team. That is to say, we view the problem of

resource allocation as far more critical than characteristics of weapons technology to the other aspects of the project, viz., domestic and international conflict and the political, economic, and social determinants of the three "dependent variables".

The project is viewed as an integrated whole. Any effort to isolate one aspect of it, in this instance, arms accumulation represented in the weapons system mode, from the other two would weaken the efforts being undertaken in those two areas and quite likely diminish the capacity of the team to develop the interdependencies that exist across the processes underlying arms accumulation, domestic conflict, and international conflict.

The form of our operationalization of the arms accumulation variable, then, will be in the resource mode. Traditionally, as noted above, there are 5 basic ways of representing this mode. These are listed below (Table 1) along with the information relevant to the data sources we will employ. It should be noted, of course, that each of these can be represented in a dynamic fashion, e.g., first differences, rates of change. It should also be noted that some effort will be made to develop a composite index of the economic and demographic dimensions.

Table 1

Variable	Source
Military Expenditure (MLX)	Two basic sets of data on this variable are now being introduced to our archive. These are the SIPRI and COW series. The former is available in native currency current price form as well as constant price US dollars. The latter is available in current price native currency as well as current price US dollars.
Military Expenditure as a Share of Societal Product (MLX/SP)	Data set on this variable available from SIPRI. Data now being introduced to our computerized archive. Presently considering possibility of introducing societal product (GNP, NMP) series from UN and other sources.
Military Expenditures as a Share of Governmental Resources (MLX/GR)	Data on total government expenditures and revenues presently available on machine for a limited period of time. Present plans call for expansion of series available.
Military Personnel (MP)	Complete data set from COW project already in our archive.
Military Personnel as a Share of Total Population (MP/TP)	Complete data set from COW project already in our archive.

Note that our plans, as presently formulated, are to carry out our statistical analyses on all countries in the international system (see Singer and Small, 1972) for the period 1950-1977). Note also that all the series enumerated above are annual time series for individual nations and that most of these series are complete for the entire period (or as long as the country was in the system during the period).

As indicated earlier, there is a vast buzzing welter of contending approaches to the explanation of arms accumulation. Presently our plans are to develop an extensive research report which will summarize and evaluate this intellectual tradition by way of synthesis and delineation as well as logical and empirical evaluation. Preliminary estimates set the number of reasonably distinctive approaches at about twenty.

Most of these approaches, however, suffer from a number of problems. In some instances the logical precision of the arguments would appear to be lacking. In some cases, one would find it difficult or, given the state of the art, impossible, to operationalize many of the key concepts contained in the arguments. In still others, while neither of the above criticisms would hold, no effort has been undertaken to provide an empirical assessment of the model.

Given these problems, the number of possible explanatory models deemed worthy of consideration at this point is much reduced. It should be noted here that a failure to include any particular approach in our present candidate list does not necessarily indicate that such an approach falls into one or more of the categories detailed above. Of necessity, we must limit the number of alternative models. Limited time and resources dictate such an overall decision. Judgement, born out of extensive experience in the area, finalizes our list by excluding those approaches which we feel have not shown much utility for the kind of effort we are undertaking. It should be pointed out that this list is not the final one and that changes, i.e., additions and/or deletions, will likely take place over the next few months.

There are six candidate approaches which will take up our attention for the next few months. It should be indicated here that each of these approaches has had at least two alternative operational formulations and that our presentation of them here represents a distillation of what appears t be the principal elements of the approach and may not capture all of the minor variations and emendations on the basic theme. By way of classification, it is useful to divide these six approaches into two groups, those which impute the principal driving forces to be external to the state, and those which impute priority to internal forces.

We should note, at this point, that our expectation is that no one of these approaches will be capable of providing a complete explanation of the arms accumulation process. It seems likely that at some point in the future we shall need to combine parts of two or more models in order to provide a "complete" explanation. It may also be reasonable to expect that more than one model will prove sufficiently attractive to be retained and employed in our forecasting effort.

Model I: External Security and the Power Politics Approach

The first approach to be considered may be found in the traditional theory of the "balance of power". Arguing that states which have (1) mutual salience, as well as (2) roughly comparable basic capabilities, will tend to pursue security through the accumulation of arms, this approach has pervaded much of the classical writings in the discipline as well as a large fraction of recent systematic and quantitative research. In the latter, one can point to both very simple and quite complex formulations.

The most general formulation of this argument is as follows. States basically seek to achieve some desired ratio of their own military forces to the military forces that <u>might</u> be arrayed against them. A discrepancy between the state's desired ratio and actual positions will lead it to increase its arms accumulation when the discrepancy is adverse and diminish its arms levels when the actual position surpasses the desired one, other things being equal. In addition, there are two other factors which lead a state to alter its level of arms accumulation. These factors are the cost of the arming effort and the degree of actualized threat, i.e., the conflict behavior directed toward it. One representation of this formulation is seen below:

$$MLX_{A_T} = a_1 + a_2 \, (MLX_A - DESMLX_A)_{T-1} + a_3 \, RES_{A_T} + a_4 \, CONFTOA_T$$

where: MLX = Military spending of country A at T

$(MLX_A - DESMLX_A)_{T-1}$ = Difference between military position of A and its desired position at T-1

$RES_{A,T}$ = The resources available to A at T

$CONFTOA_T$ = The conflict directed toward A at T

and $a_2 < 0$

$a_3 > 0$ when RES represents some absolute level of resources (and)

$a_3 < 0$ when RES represents the share of resources devoted to MLX

$a_4 > 0$

A great deal of success has been reported with the use of this type of model in accounting for arms accumulation in the East-West conflict arena (see Zinnes and Gillespie,1973; Strauss, 1971,1978; Gregory, 1974; Hollist, 1976; Taagepara et al., 1975; Luterbacher and Lambelet, 1978, Shisko, 1977, etc.), in the Middle East conflict arena (Milstein, 1972; Lambelet 1972;Gillespie et al., 1978;CACI, 1975), the 19th and early 20th century major power conflict arena (Wallace,1976; Wallace and Wilson,1977;Milstein and Mitchell,1969;Richardson,1960; Taagepera, et al. 1975), the Persian Gulf conflict arena (Abolathi, 1978) and the India-Pakistan feud (Chatterji, 1969). There are, however, discordant notes to this lengthy tune. For example, while the overall fit of the model has been quite good in these instances, many times the estimated parameters have been opposite those predicted by the formulation. Frequently, one finds the same country's behavior for the same period manifesting completely different behavioral parameters across different studies. In addition, many methodological and interpretive criticisms can be laid against these studies and improved analytical technique has sometimes shown the model wanting in explanatory power (see Ostrom, 1977; Cusack, 1978). Nonetheless, it is clear that this formulation represents the dominant paradigm in the arms accumulation literature and any research effort in this area much entertain it as a major contending model - provided, of course, that more adequate operationalizations and analytic techniques go along with the effort.

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Modell II: International Status Approach

Though certainly not as widely used an approach, this one represents a continuing tradition in the international politics-arms accumulation literature. In essence, it argues that arms accumulation arises out of a desire to achieve international status. Position in the international pecking order has long been viewed as a driving force in the behavior of nations (see, e.g., Schwarzenberger, 1967; Morgenthau, 1960). Such a motive presumably propels states along a variety of behavioral demensions (e.g., imperial expansion, non-coercive economic activity, diplomatic involvements, etc.). Much of the quantitative work in this approach to international relations has focused on this factor as an underlying cause of international conflict (see, e.g., Midlarsky, 1969; Wallace, 1973; Ray, 1974; Gochman, 1975). There has, however, recently been an effort to utilize this paradigm in a systematic way to account for arms accumulation. Thus, Wallace (1972b) determined that "status inconsistency" (see Galtung, 1963) is an important factor in systemic level arms accumulation. Kohler's work (1975, 1977) reputedly demonstrates the efficacy of this general approach at the national level as does Weede's (1977) paper.

In a dynamic mode, and cast at the national level of analysis, this model can be formulated as follows:

$$
\begin{aligned}
MLX_A = a_1 &+ a_2\ (RANK_A - DESRANK_A)_{T-1} \\
&+ a_3\ (MLX_{NHC} - MLX_A)_{T-1} \\
&+ a_4\ (RESGRO_A - DESRESGRO_A)_{T-1} \\
&+ a_5\ RES_{A_T}
\end{aligned}
$$

where:

$RANK_A$ = Rank of state A in terms of relative military capabilities in most salient international setting

$DESRANK_A$ = Desired military capability ranking: based on relative political, economic and social capabilities of A

MLX_A = Military spending of country A

MLX_{NNC} = Military spending of country A's nearest, and superior competitor

$RESGRO_A$ = Growth of country A's resources

$DESRESGRO_A$ = Country A's desired growth in resources

RES_A = Country A's resources

and

$a_2 < 0$

$a_3 > 0$

$a_4 > 0$

$a_5 > 0$

It should be noted that this approach has never been formulated and tested in a dynamic mode. Our formulation above will likely be modified especially to the extent that some of the postulated effects should be non-linear and perhaps the entire set of effects multiplicative instead of additive.

Model III: Collective Security Approach

The collective security approach to military spending has its theoretical base in the formulations associated with the theory of public goods (see, e.g., Samuelson, 1954a, and b; Olson, 1968). Arguing that deterrence, the assumed product of defense expenditures in a collective security setting, constitutes a public good, i.e., non-exclusive and indivisible, this theory's basic proposition is that there exists a fundamental tendency for the smaller parties in the collective to "exploit" the larger parties (Olson and Zeckhauser, 1966). In addition, the larger the group involved, the greater the shortfall in the provision of an "optimal amount" of the collective good (Olson, 1968). Although clearly not part of any formalization, it is also reasonable to expect, in light of other theories of small group behavior (see, e.g., Coser, 1958), and also in light of quantitative research in other areas of international alliance behavior (Holsti, et al., 1973), that conflict behavior directed toward the group will increase the membership's internally cooperative actions -- an instance being an increase in defense effort to strengthen the collective's deterrence potential.

A fair deal of empirical evidence has been garnered in support of the first of the postulated relationships cited above. The research of Olson and Zeckhauser (1966), von Ypersele (1968), Pryor (1968), and Russett (1970) has demonstrated the utility of this proposition in accounting for the relative defense efforts of NATO members. Pryor's (1968) as well as Starr's (1974) research has shown it useful in explaining variations in the defense efforts of the Warsaw Treaty Organization membership. However, no studies known to this author

have been undertaken to demonstrate the potency of this explanation in venues outside the East-West conflict arena. In addition, the latter two postulated effects have not apparently been the object of any systematic empirical scrutiny.

One interpretation of this argument can be shown in the following equation:

$$MLX_A = a_1 + a_2\ THCOLL_T + a_3\ (RES_A/RES_C)_T + a_4\ SIZE_{C,T}$$

where:

$THCOLL_T$ = Security threats to members of collective at T

$RES_{A,T}$ = Resources of A at T

$RES_{C,T}$ = Resources of all members of collective at T

$SIZE_{C,T}$ = The number of members of the collective at T

and:

$a_2 > 0$

$a_3 > 0$

$a_4 < 0$

It should be noted that the quantitative studies employing this approach have almost invariably employed MLX/RES as the dependent variable. This is perfectly reasonable but it seems equally as reasonable to employ an absolute measure as shown in the equation above. Substitution of relative terms would necessitate little or no need to modify the terms on the right hand side of the equation.

Model IV: Internal Instability and Repression Approach

A fourth approach argues that the driving force in defense spending is the consideration of domestic political factors. The focus is on the internal security of the regime and the class or classes whose interests the regime represents. Political instability (i.e., conflict behavior directed toward the regime and elite) and societal inequalities (a manifestation of the exploitation by the elite of other classes) fundamentally determine the absolute and relative level of military resource allocation (see, e.g., Terrell, 1971; and Passos, 1968). Others consider this an important causal nexus, but really only one of many (Bremer, 1976). Others agree with this conception in the sense that they see it as the immediate cause, but contend that it is, in most instances, reflective of the exploitive activities of the dominant capitalist powers in the international system (see Albrecht, et al., 1974; Kaldor, 1977).

The linkage between instability and military resource allocation is fairly straight forward: actualized threats to the regime lead to behavior which will strengthen the regime against those threats. For the second factor, societal inequalities, the linkage is less direct. Here it is assumed that an unjust distribution of societal resources is clearly to the advantage of the regime and that while such inequality may not have led to actual anti-regime activities, it has the potential to do so. Distinctly illegitimate, the most likely course of behavior to protect the status quo is one which forsakes all pretence of legitimacy -- i.e., the expansion and development of repressive forces through the vehicle of the military budget.

A formalization of this approach can be seen below:

$$MLX_{A,T} = a_1 + a_2\ POLIN_{A,T} + a_3\ SOCINQ_{A,T}$$

where: $MLX_{A,T}$ = Military expenditure of A at T

$POLIN_{A,T}$ = Level of political instability of A at T

$SOCINQ_{A,T}$ = Level of social inequality of A at T

and $a_2, a_3 > 0$

No cross-temporal analysis of this approach is known to the author. Limited cross-sectional studies have been performed by Terrell (1971) and Passos (1968) in this area, and cross-sectional analysis of somewhat similar ideas has also been reported by Chadwick. The results of these studies have been generally supportive of the approach.

Model V: Fiscal Growth and Budgetary Politics Approach

This represents the combination of two approaches. Yet their combination is justifiable in light of recent work in the area (see Crecine, 1974; Cusack, 1978). The first has taken a more general tack arguing that all government expenditures tend to grow at a faster pace than total societal resources. This notion emanates from the the work of Wagner (1883). A vast literature has sprung up around this question and while it is not possible to go into much detail here, it should be noted that the proposition is subject to a fair deal of interpretive criticism while at the same time receiving apparent empirical support (see Bird, 1972). An effort at focusing exclusively on military spending, as opposed to total government spending, has demonstrated that defense expenditures seem to be the most income elastic of all government expenditures for at least developing countries, and have a degree of elasticity that would be predicted by the Wagner proposition (Enweze, 1973).

The second line of research and theorizing here, budgetary politics, can be said to be one of the principal approaches in the arms accumulation literature. Drawing on the now classic piece by Davis, Dempster and Wildavsky (1966), many scholars have applied the "incrementalist" notion, and varients thereof, to the analysis of military spending. (For an exhaustive accounting of the approach, its subleties and implications, see Allison, 1971 1974 and Allison and Morrison, 1975.) Rattinger's work (1975, 1976) has shown the utility of this approach in the analysis of arms accumulation in the East-West and Middle East conflict arenas. Organski, et al. (1978) have successfully applied this approach

to strategic arms accumulation on the part of the Soviet Union and the United States during the post-World War II era. This line of research, however, has also been subject to criticism. in terms of substantive interpretation and the analytical techniques used to validate its predictive claims (see Ostrom, 1977; and Nincic and Cusack, 1979).

Efforts to integrate these two approaches in a way that minimizes the problems inherent in both traditions have proved useful in accounting for US military spending in the post-World War II era (Crecine, 1974) and the arms accumulation efforts of the European major powers during the 19th and early 20th centuries (Cusack, 1978).

One relatively simple formulation of the notions contained in this approach would argue that military spending covaries directly with the amount of societal resources available to the government, inversely with the relative share of governmental resources allocated recently to the military (representing the competitive and balancing aspects involved in budgetary politics) and inversely with the recent deficits incurred in government fiscal activity (signifying the importance of the balanced budget criteria almost universally applied by governments).

Thus,

$$
\begin{aligned}
MLX_{A,T} = a_1 &+ a_2\ RES_{A,T} \\
&+ a_3\ (MLX/GREX)_{A,T-1} \\
&+ a_4\ (GEX/GREV)_{A,T-1}
\end{aligned}
$$

where: $MLX_{A,T}$ = Military spending of A at T

$RES_{A,T}$ = Societal resources of A at T

$(MLX/GREX)_{A,T-1}$ = Military spending share of total government budget of A at T-1

$(GEX/GREV)_{A,T-1}$ = Relative fiscal deficit or surplus of A at T-1

and $a_2 > 0$

$a_3, a_4 < 0$

Other formulations of this approach are, of course, possible.

Model VI: Political Economy Approach - Economics as a Demand Factor

In all the other approaches resources have entered the formulations as supply factors. This approach turns the question of resources on its head. Here the need to exhaust "surplus capital", or to maintain a relatively "balanced economy", for political and/or social reasons is seen as the driving force in arms accumulation. Spending for arms is used to prop up the economy or to exhaust resources which might be usefully employed, in order to preserve class and political distions and interests. The principal statements of this theoretical approach is to be found in Kalecki (1943) and Baron and Sweezy (1966). Arguments of a similar vein have been put forth in works by Kidron (1970), Cypher (1974), Melman (1974). Limited cross-sectional studies have not provided much support for aspects of this approach (see e.g. Smith, 1977; and Syzmanski, 1973). However, work by Nincic and Cusack (1979) have shown a variant of this approach quite compelling in terms of explaining the arms accumulation behavior of the United States during the 1948-1976 period. In terms of overall government spending, Ames (1977) has demonstrated the utility of another variant in the Latin American context for roughly the same period.

One general formulation of this approach can be seen below:

$$MLX_{A,T} = a_1 + a_2\ (RES - DESRES)_{A_3T-1}$$

$$+ a_3\ RECPOL\Delta_{A,T}$$

$$+ a_4\ (GEX/RES)_{A,T}$$

where: $MLX_{A,T}$ = Military spending of A at T

$(RES-DESRES)_{A,T-1}$ = Performance of economy of A at T-1

$RECPOL\Delta_{A,T}$ = Time since recent "political regime" change in A at T

$(GEX/RES)_{A,T}$ = Government spending relative to societal resources for A at T

and either:

$a_2, a_3 > 0$

or: $a_2, a_3 < 0$

and: $a_4 > 0$

Note that the parameters a_2 and a_3 could take on different predicted values, depending on the theoretical justification provided (in the case of a_2) or the kind of phenomena being described (in the case of a_3). Where military spending is seen as a "safety valve" used to absorb "surplus capital", a_2 should be positive. Where military spending is seen as a means to prop up an economy through the creation of "effective demand", a_2 should be negative. When recent political change has been "regular and/or legitimate", a_3 should be positive. When that change was "irregular and/or illegitimate", it should be negative. Actually, depending on the coding scheme used for RECPOLΔ, and the type of effect, i.e., linear or non-linear, the value of a_3 will vary. The effect we are describing is best captured by the following statement. "Regular and legitimate political changes " induce a downswing in military spending. This movement reverses itself the further away the system is from the last change and the closer it is to

the next. In the instance of "irregular and illegitimate" change the movement is upward but reverses itself the further away the system is from the last change.

Note on Independent Variables

To reiterate, the formulations presented above are only preliminary. Further conceptual work on each is required and it is likely that in the near future a fair amount of modification will be required for each. Given this situation, it is quite unnecessary that we go into the problems of the measurement of the independent variables. Suffice it to say that the question of data availability should not prove too great a problem for any of the terms contained on the right hand side of the equations.

Section 3: Summary

The purpose of the overall project is the development of a set of one or more models that can be employed in forecasting levels of arms accumulation, domestic conflict and international conflict. This paper has reviewed some of the preliminary steps that have been taken to deal with forecasting efforts in the arms accumulation sector. Thus, the focus, in terms of operationalized indicators for the dependent variable, has been specified and justified. In addition, six alternative models have been set forth as candidates for assessment as to their empirical validity. An interactive process of theorizing, measuring and testing is projected for the immediate future. That set of models which is found to have the best postdictive power will be employed for purposes of forecasting singly and in conjunction with the models developed to forecast domestic and international conflict.

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