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## Government budget processes

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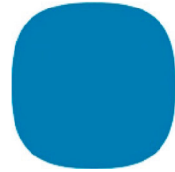
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# Chapter 5

## GOVERNMENT BUDGET PROCESSES

by *Thomas R. Cusack*

### INTRODUCTION

This chapter provides a guide to the GLOBUS budgetary model. The first section begins with some central concerns in the general area of government resource allocation. Then various theoretical approaches to explaining government resource allocation are briefly described by delineating two major dimensions along which these approaches can be placed and thereby providing a context for the approach employed within GLOBUS. Following that is a short discussion of the theoretical bases and guidelines that have shaped the development of the model. The second section deals with the structure and characteristics of the model as now implemented within GLOBUS. An overview of the basic structure of the model along with an outline of the linkages between this and other sectors of GLOBUS is supplied. In addition, a detailed review of the structural elements incorporated within the model and the reasoning that stands behind the specific equational forms are presented. A description of the initial conditions and parameters used to run the model is provided in the third section, and some of the sources and techniques used to specify these values are discussed. The fourth section surveys some results produced by the model when the results of a policy experiment are compared with those of a reference run. The final section contains a brief discussion of planned model extensions and refinements.

## **PROBLEMS RELATED TO THE ALLOCATION OF RESOURCES BY GOVERNMENT**

Central to the concerns of the GLOBUS model are questions dealing with how governments cope with the varied and changing demands that confront them in their political-economic environments. We have attempted to fashion the model in ways which allow us to address such issues and, more importantly, to help further the necessary synthesis of our knowledge and conjecture in clearly interdependent areas of social reality.

Government's role in the allocation of societal resources is of central importance in the affairs of the nation-state. The unique ability of political authorities and their attendants to requisition and employ private means for public purposes is one of the hallmarks of the modern era (Schumpeter 1954; Ardant 1975). The elaboration of ever more sophisticated forms of social and political organization, the evolution of political culture, and the exigencies of governance have along with many other factors been cited as critical to this development (Tarchys 1975).

The centrality of government's role is not likely to diminish in the foreseeable future. Indeed, a great deal of contemporary political discourse in the Western democracies focuses on the difficulty and desirability of reversing the "unnatural" tendency embodied in the seemingly ineluctable expansion of the government sector (see, e.g., Buchanan and Wagner 1977). In other systems the legitimacy or "natural" character of this development is less at issue. Regardless of ideological position on this and related questions, very few debate the importance of government's role. Today, governments control an extensive proportion of their societies' resources - with this share extending to well over half of the national product in some of the more highly developed welfare states. Extracting their income through a variety of means, be they different forms of taxation, return from public entrepreneurial effort, or accumulation of debt, governments allocate funds to an immense variety of activities. These include the maintenance of military establishments, provision of social services in the education and health areas, operation of bureaucracies dedicated to regulating the behavior of individuals and organizations within national boundaries, transfer of funds to households and firms, investment in capital projects, financing of previous debt accumulation, and so on.

The expansion in resource control exercised by government has been accompanied by a broadening of its responsibilities (Rose 1976). These responsibilities are not merely formal. They extend beyond the provision of traditional public services. They have come to reflect the real degree to which a great many individual citizens, the plethora of interest groups endemic to modern society and, indeed, even the participants in government, have come to regard government as the ultimate source of social and economic redress, as the regulator of aggregate economic performance, as well as being the bearer of its traditional responsibilities (Bell 1974).

In an exchange that is difficult to balance and which sometimes becomes precarious, governments, with varying degrees of legitimacy, garner the resources of society and employ these for the public purpose. The greater the scope of extraction, the more apparent is government's role and thus the greater is the likelihood that significant opposition to its purposes and policies – and, indeed, its legitimacy – will heighten (Bell 1974; Rose and Peters 1978). Do the decision strategies employed by governments in the process of allocating resources allow them to cope effectively with the transformations their societies are undergoing? For example, the developed countries have very highly mobilized populations, and, indications are that they will become even more mobilized. This presents a challenge to government as ever more groups and divergent interests become incorporated into the politically relevant strata (Olson 1982). The challenge to government is enhanced through this process because of the increasing likelihood that social, economic, and political conditions become the focus of a wider base of criticism and deeper opposition. The extent to which political authorities, the regime, and the polity itself become targets of both passive and active political opposition is increased (Deutsch 1961; Brunner 1980; Sjoblom 1983). Can resource allocation decisions diffuse such challenges? Or will these decisions only aggravate the problems?

These are important general questions and they encapsulate the set of more specific queries that has guided our work. This set spans a wide area and includes such concerns as the future of the welfare state, the growth of government, and the role of national security in shaping the allocation of public and private resources. As noted above, the growth of government's control of resources has a wide variety of implications and has engendered concern on the part of many (cf. Taylor 1981; Tarschys 1982). One of our interests is the question of whether

governments are likely to increase or decrease this level of control. It follows that given whatever path an individual government follows, certain trade-offs and costs are entailed. Some of these are addressed in the following paragraphs.

In the putative pursuit of national security, many governments have dedicated a large share of their nations' resources to the purpose of maintaining or enlarging their armed forces (SIPRI 1984). What policies or developments within the international and domestic arenas might we expect to alter these patterns? If, for example, international security dilemmas deepen, should we expect a significant transformation of government resource allocation patterns (cf. Alker 1985; Ashley 1980; Bremer and Cusack 1980; Cusack and Ward 1980, 1981; Cusack 1983, 1984b)? A related problem might also be considered. The costs of producing military strength have not stagnated (Skons 1983) and, indeed, according to some (see, e.g., Albrecht 1973), have grown disproportionately and are likely to continue to grow. Is it plausible to expect governments to sustain these costs, and at what price in other sectors (Russett 1970, 1982; Domke, Eichenberg, and Kelleher 1983; Leontief and Duchin 1983; Lindgren 1984)?

In many developed states the inertia of existing welfare programs, demographic shifts, and economic slowdown have combined to place great stress on the ability of governments to sustain their commitments to social equality. Many argue that we are likely to witness even further worsening of this situation (see, e.g., OECD 1981). To what extent might this be the case? Given current tendencies and likely future constraints, how sustainable is the welfare state? What developments might we expect and what would be the political, social, and economic costs of these developments?

The provision of public services, especially in the areas of education and health, has gone far to improve the quality of life. In most developed countries these services are generally widespread. The scope of their provision is generally narrower in the developing lands, but significant progress has been made in many of these countries as recognition of the need to provide for basic human needs through the public sector has grown. Recently, however, with the general slowdown in economic growth, a phenomenon to which the poorer lands are particularly vulnerable, the ability of governments to sustain, let alone expand, these services has decreased (Pluta 1981). Under what conditions might we witness a change in this pattern? If governments are confronting an

era of scarcer resources, what might we expect their coping strategies to be? If these take the form of significant cutbacks in social programs, what are the implications for the quality of life, especially given trends in the demographic area (ILO 1977; World Bank 1984; Deferran 1980)?

Growth, it is often argued, has been the source of general satisfaction with the nature of society and the prevailing political system. Under conditions of growth, governments are afforded opportunities to provide relatively painless solutions to perplexing social problems. Extracting resources and redistributing them at an expanded pace is generally less likely to provoke opposition during periods of sustained growth. Most governments have developed policies and institutions dedicated to promoting economic progress, thus availing themselves of the opportunity to develop and sustain remedial programs that require a large financial base. In an era of heightened economic interdependence and general economic slowdown, government's ability to foster this growth has diminished markedly. Given its extensive responsibilities in other areas (particularly in the areas of social equality and national security), and the need to finance these activities, could government's resource allocation decisions engender a reversal of poor economic performance? What might be the consequences of such efforts—in both the short and the long term (cf. e.g., Curtis and Kitchen 1975)?

The ways in which governments have financed themselves might best be characterized as monuments to both human creativity and perversity. Nonetheless, the instruments governments use to raise revenue entail consequences in a variety of areas (Hanneman 1981). These instruments may sustain or hinder growth and efficiency (see, e.g., Aghevli and Khan 1978; Cameron 1978b; Cebula 1978; Marsden 1983; Silva 1975). They may promote or destroy the potential for social and economic equality (Lipton 1978; Katz, Mahler, and Franz 1983; O'Higgins and Ruggles 1981; Ruggles and O'Higgins 1981). They may, as well, provoke untoward consequences for government itself (Tilly 1975). In what ways are governments likely to finance their activities and what might this entail in the political, social, and economic arenas?

These are some of the central concerns that have helped shape the structure of the government resource allocation model. In the succeeding part of this section, I will examine its theoretical basis, and its position vis-à-vis other approaches to explaining the role of the state in the allocation of societal resources.

## **ORGANIZING DIMENSIONS**

The focus of attention now shifts to the ways in which theorists have attempted to grapple with the problem of explaining government behavior and in particular with the way in which broad budgetary aggregates and specific budgetary items are shaped. The dimensions that are described here could be usefully employed in the study of many other forms of political, social, and economic organization. Two of the most significant dimensions that may be used to characterize the governmental system and theories pertaining to that system include (a) the relative influence of the environment and (b) the prevailing image of decision making used to characterize the workings of the government system.

### **Relative Primacy of the Environment**

Much of macrolevel theorizing and analysis in the social sciences has its roots in nineteenth century thought. Because of the apparent superior relative dynamism of the social and economic spheres, and for deeply rooted reasons of class interest, the role of the state in much of nineteenth century social and economic theory tended to be ignored or dismissed. More a residual nuisance, the state's functions and activities seemed unimportant and of little interest. This intellectual tradition carries on today and imbues many of our theories with a distinct anti-statist hue. It certainly minimizes the autonomy of the state and as a consequence attributes outcomes flowing from the state as merely the derivative product of social and economic forces that overwhelm it. The state is seen as superstructure atop the engine of society. The state system rides on the back of society and one's understanding of what government does needs to be based on an appreciation of the laws of macro-social and -economic dynamics (cf. Tilly 1984; Evans et al. 1985). Little is to be gained from peering inside the "black box" of the state for it has minimal transformation capacity and only slight competence for self-steering and autonomous restructuring. In cybernetic terms (Ashby 1956; Deutsch 1963), this would represent the assumption that the state has no interesting regulative capacity and, at best, merely amplifies the variety of outcomes generated by the socioeconomic system.

This view of the political system and of government is typical of



the sociologically based theory we have come to associate with the structural-functionalist thought of writers such as Easton (1965). While politics is clearly the realm of the "authoritative allocation of values," the independent or even semi-independent production of outcomes by government is minimized. This stands in contrast to an opposing view, the statist approach (cf. Poggi 1978). This approach emphasizes the central importance of the state. Deriving from a long historical tradition that has paralleled the emergence and development of the modern state, it ascribes an autonomous role to government, seeing in it various strengths that help mold and shape the socioeconomic environment as it attempts to ensure survival in a highly competitive world full of similar entities. Indeed, since Machiavelli's time the state has been accorded an independent status of the highest order in this intellectual tradition. In this view, politics and state activity are very deeply rooted in the problem of "us versus them" and resource allocation is tightly intertwined in this conflict.

### **Decision-Making Imagery**

The second organizing dimension relates to the imagery employed to describe the decision-making processes within the governmental system. Practically all explanations attribute some decision-making capacity to the state, although as we have noted above, this may merely be a mirror or repetition of choices in the socioeconomic sphere. The recognition of the importance of decision making in the theoretical apparatus of the various approaches reflects a basic assumption that choice and some measure of free will underlies social behavior; in explaining government resource allocation this is meaningful and obvious.

At the one end of this dimension stand theoretical approaches that represent the state as a unified and unarticulated actor. This can take a number of forms and two fairly common ones portray the state as either an organic whole with a relatively undifferentiated structure or else ascribe almost total control of the state apparatus to a single individual because of the analytical convenience such an assumption provides.

At the opposite end of this dimension one sees the state portrayed as a buzzing welter of disjointed elements and agents. Here the decision-making process contains varying degrees of disorder and minimal conscious collective rationality. Although the image may at times evoke a sense that government is little more than an "organized anarchy," most

approaches that reside toward this end of the scale incorporate structural characteristics which purportedly help impose some order while at the same time allowing for the play of various contending interests.

### **Dimensional Intersection**

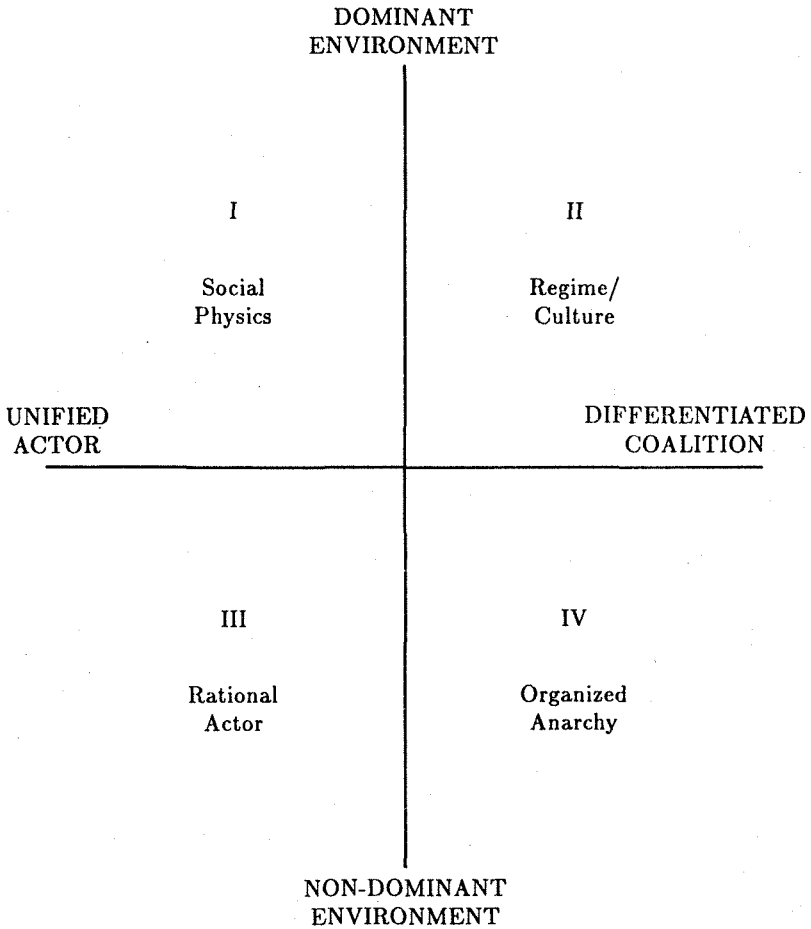
The contention is that these two dimensions provide a sound basis for organizing the vast literature on government resource allocation. Taken in combination, in this instance assuming that they can be portrayed as orthogonal scales, there are in the simplest format four categories within which the different approaches can be placed. A graphic portrayal of this configuration is provided in Fig. 5.1. In the upper left quadrant one sees the intersection of approaches depicting the socio-economic environment as the prime moving force and government to be a unified entity. The upper right quadrant depicts the conjunction of environmental primacy and assumed differentiation within the government sector. The lower left quadrant portrays the situation where government is assumed to be an autonomous and vigorous actor and one which has a tightly integrated, unified decision-making process. In the lower right quadrant, autonomy is again assumed, but in this instance government is itself represented as a grouping or coalition of actors with various degrees of independence.

### **The Field**

#### *I: Dominant Environment/Unified Government*

A very rich tradition characterizes this type of approach. One way of explaining the activities of government stems from the dominant environment/unified government perspective. Indeed, one might suggest that explanations relying on this type of imagery constitute a very significant portion of research and writing dealing with this problem area. Two outstanding characteristics are typical here. First, there is the implicit assumption that the dynamic elements of the social world are to be found outside the analytic and real-world boundaries that define government and the state along with the related assumption that the state itself is a fairly coherent and unified transmission mechanism of the forces of supply and demand at work in the political, social, and economic environments. Second, there is the use of causal imagery that describes the social process as reflecting a kind of ineluctable dynamic that moves society, and thus the state, along some foreordained path(s)

**FIGURE 5.1**  
**ORGANIZING DIMENSIONS**



of "development."

These traits reflect the macrosociological tradition that has its origins in nineteenth century thought that itself grew out of an overriding concern with establishing the "natural laws" that govern social relations and their dynamics. A primary example of this theorizing stems from the work of the German economist, A. Wagner (1890), who posited the existence of a "Law of Increasing State Activity" that derived from changing socioeconomic characteristics of society, themselves the derivative of economic progress and the growth of income that accompanied it. Later this approach spawned an incredible number of empirical studies which suggested that a germ of truth existed within the argument. The approach itself, however, has been subject to serious criticism (e.g., Bird 1971), and has been amended to take into account the critical importance of major systemic upheavals (Peacock and Wiseman 1961), and the significant structural changes that societies undergo with the transition to third-sector, i.e., service-oriented, dominance (Baumol 1967). The roots of the argument remain unaffected. In its simplest imagery, the analytically useful "median voter" derives greater income through economic progress and shifts along the Engel curve toward a desire for greater satisfaction of needs that are more efficiently filled by the servant of the public, the state. There may be hesitancy to continuously allow the expansion of the cost of satisfying these needs (Peacock and Wiseman 1961), but exogenous shocks to the system have the effect of expanding tolerance. The state stands in the service of a large and effectively homogeneous board of directors within society.

### *II: Dominant Environment/Nonunified Government*

In many instances the theories based on the first approach just outlined implicitly assume not only that government itself is unified, but also that the forces within the environment are themselves coherent. Such coherence derives from either some independently settled upon contract that joins together separate interests in a ruling compact or through some simple means of aggregating multitudinous individual preferences which are then squeezed into a coherent policy package. This extragovernmental solution is then foisted upon the state and the outputs of the government system faithfully reproduce that solution. There is an alternative approach which still emphasizes the dominance of the environment, but which imputes a nonunified character to the

governmental system.

This lack of unity or coherence reflects the diversity of environmental forces. Still, the channels through which these pressures drive the governmental system need to be specified. Here, either explicitly or implicitly, analysts use the device of postulating a set of "regimes" that formally or informally control the policy process from without. Thus, within democratic capitalist states, the rise and growth of the welfare state, it is argued, reflects corporatist political forces (cf. Wilensky 1981). Alternatively, political parties, rooted in polities sharply divided on a class basis, enter and withdraw from the policy process and impose sharply different social programs (cf. Castles 1978, 1982). Simultaneously, different elites and other powerful groups within society seize control of the national security policy area and drive it independently of concerns in the social and other areas (Melman 1974; Richardson 1960). Overall, the degree of societal resources channeled through government has been argued to be a function of the scope of national dependence on the international economy and is used by different interests within society to help deal with the continuous adjustment problems endemic to high interdependence (Cameron 1978a).

The most broadly based effort to develop a complete explanation within this approach is to be seen in Wildavsky's recent writing (1985; also, Webber and Wildavsky 1986) on government resource allocation. Here regimes are placed within a "cultural" matrix through which the dynamics of budgeting are described and explained. This argument is based on the assumption that what occurs in government merely reflects the pervading culture of society and that the latter, through the integration of potentially conflicting interests and values, promotes the use of behavioral rules in all aspects of life. Government is one of those aspects and the transformation rules it uses are merely those foisted upon it by a dominating culture.

### *III: Nondominant Environment/Unified Government*

In rejecting the notion of environmental dominance and accepting the notion of the state having an autonomous role within political affairs, analysts often employ an imagery of the state and its behavior suggestive of a degree of coherence and unity that implies that government is for all intents and purposes a unitary actor. This theoretical style is symptomatic of many of the explanatory efforts found in public choice studies. Here the government becomes one of a number of critical ac-

tors within society and its objective is to maximize some utility function which usually includes such valued objectives as survival and income. Confronted by a structured environment, the governmental actor behaves in a "realistic," i.e., rational, way to insure an optimal return with respect to its choices. Now government clearly consists of many people with varying levels of authority and power – not to say differences in values. For many public choice analysts, though clearly not all, such diversity is substantively uninteresting and analytically cumbersome. By making the assumption that the government is incarnate in the form of a single individual, e.g., the highest political leader, or a coherent and integrated coalition, e.g., a political party, the analyst disposes of the interest-aggregation problem, in other words, the specification of the social welfare function, and moves on to the more tractable problem of explaining the budgetary choices of an individual who behaves "as if" he/she were rational.

Some rather interesting theoretical and empirical work has been done within this school of thought. For example, following upon Downs (1957, 1960), the work of Nordhaus (1975), MacRae (1977), Frey (1978a, 1978b), and Tufté (1978), in establishing a theoretical and empirical basis for the "political-business cycle" in Western democratic systems has spawned a tremendous literature (cf. Lybeck 1986). Similar work has gone on as well in trying to account for government resource-allocation patterns by new and entrenched elites within centrally planned systems (Bunce 1980a).

It should be noted that some of those working in the public choice field have come to accept the existence of a degree of pluralism within the governmental system. Thereby, some theorists have been able to point out the importance of the dispersion of power within government and its implications for budgetary behavior (cf. Niskanen 1971; Bendor and Moe 1985; Moe 1985; Frey and Schneider 1979, 1981).

#### *IV: Nondominant Environment/Nonunified Government*

This last approach derives from a basic rejection of many of the assumptions often employed within fields such as public choice. In particular, the notions of rational maximization and the coherence of the policy-making process are dismissed as inadequate. One of the foundations upon which theoretical and empirical work in this area has been built is the behavioral theory of decision making. This theory assumes that neither individuals nor organizations are rational utility-maximizing

creatures. Posited instead is the notion of limited rationality or "satisficing." Specifically with respect to organizations, the theory asserts that the very pluralistic character of any social institution is a key to its behavior and is not an aspect to be either dismissed or assumed away. Organizations, and government is an organization, are coalitions and the structure and weight of the actors in those coalitions, as well as the established procedures (organizational truce), are important in understanding why organizations do what they do.

Following from the work of Simon (1947, 1955, 1956) and Cyert and March (1963), a large number of analysts have attempted to employ this approach in studying government resource-allocation behavior. Early work by Davis, Dempster and Wildavsky (1966a, 1966b) prompted numerous efforts to establish basic rules of budgetary behavior within government. More comprehensive work later attempted to develop full-scale representations of entire budgetary processes (Crecine 1969; Hoole 1976) and to elaborate the menu of strategies employed within budgeting (Wildavsky 1975). Further theoretical and empirical work in this area produced some insightful analysis of the trade-offs and interdependences within the budget and the budgetary process (Fischer and Crecine 1981; Fischer and Kamlet 1984).

### ***THE GLOBUS BUDGETARY PROCESS: THEORETICAL ORIENTATION***

The menu of theories and models from which to choose is clearly rather long. Selection of any one of them cannot be guided by the results of research which has critically tested all of them in a systematic and extensive way. Indeed, as Thompson and Williams (1979) and Downs and Larkey (1979) have demonstrated, some of the most attractive contenders have strong predictive power, ultimately irreconcilable assumptions, and require far more focused comparative examination than they have hitherto received. In the end the choice must be guided by the attractiveness of the models' assumptions. There are clearly those who object to such criteria (Friedman 1954), and yet in the absence of demonstrated superior predictive power and critical testing, no other criteria is available. In this regard, the conceptual basis of the larger model, along with its theoretical and substantive concerns, help to dictate a choice. Given the GLOBUS project's heavy emphasis on the

state and the stresses and strains it confronts, as well as the desire to point out steering strategies, an approach based on the assumption of a dominant environment must be rejected. That leaves two alternatives, both of which assume that the environment is not dominant. Of the two, the plausibility of the assumptions that form the basis of the behavioral theory of decision making seemed far and away greater. As a consequence, in the GLOBUS model an approach from the fourth quadrant was chosen. At the end of this chapter I will return to this issue when I outline plans for further work.

In the tradition chosen, governmental budgeting is represented as a process. The outcomes of this process are not the product of rational calculations on the part of some single individual or unified and tightly coordinated organization with a well-defined set of objectives and an extraordinary capacity to formulate and evaluate the utility of an infinite variety of clearly specified alternative choices. Rather, the process is itself one wherein a variety of actors, with different capabilities and aspirations, joined in a network of institutional roles and responsibilities, behave in a structured but semiautonomous way to resolve the problems and deal with the tasks that confront them. Government budgets reflect this process.

The model outlined below is based on the behavioral theory of decision making (Cyert and March 1963). A critical assumption in such models is the notion that governments are similar to other large and complex organizations. While government appears to perform a bewildering variety of functions, these functions are actually carried out by a large set of different elements or units within government. The behavior of these elements is best described as being more or less a function of a set of generally accepted practices and rules, the rationality of which would not accord with the conventional, i.e., economic, definition of that term (cf. Simon 1955, 1956).

Although it may be a convenient device to portray government in the image of a unified rational actor with a set of clear and distinguishable preferences and an adequate repertoire of instruments needed to achieve its objectives, such an image is a faulty device for explaining or predicting its behavior (cf. Allison 1971; Moe 1979; McKeown 1983). There is probably no aspect of the behavior of government for which the unified rational actor model is more inappropriate than in the case of budgeting. When the question is one of "authoritative allocation of values," there are many visible hands.



Budgeting is problem solving. Constructing a budget is a recurrent problem for governments. Most organizations, when confronted with recurrent problems and the need to contend with changing circumstances, come to formulate and maintain a stable set of programs and decision rules that are employed as adaptive problem-solving mechanisms (cf. Nelson and Winter 1982). In governmental budgeting this is almost universal (Wildavsky 1975). Some of the principal rules and programs used in solving the budget problem include: a cycle or series of activity phases where the elements (or protoelements) of the budget are constructed; disjointed activity on the part of different government units that over the cycle of budget construction leads to adjustments and the finalization of the budget; pursuit of objectives by the different agents which tend to be modified by experience and need not be consistent with each other; and use of relatively simple decision rules to solve what in some abstract analytical form may appear to be intractable problems (cf. Crecine 1969, 1971; Hoole 1976; Wildavsky 1975).

A government budget is the manifestation of both the objectives and power of the different units of the government coalition and the interests they represent. It also involves what is in essence a plan for the activities of government. Constructing a budget, then, requires coordination of an incredible number of tasks. A government budget cannot be produced instantaneously. Rather, the problem of the budget is generally factored into a number of subproblems. These subproblems are then dealt with in seriatim when they are the responsibility of the same element. If, however, they are within the domain of different units, they are treated either simultaneously and later reconciled when necessary or after another unit has solved the subproblem that circumscribes the solution of the unit's own task.

These different subproblems and the processes associated with them represent the peripatetic solution of the governmental system when it deals with the budget problem. In its starkest terms, the ultimate solution represents a combination of conflicting objectives and necessary constraints. On the one hand, each element is seeking objectives which need not accord with and may indeed conflict with those of some other element. On the other hand, these objectives and the claims they represent must be reconciled in some way. The principal means by which these conflicts and constraints are manifested in budgeting usually involves the determination of macrobudgetary objectives by the governmental leadership or authorities, the demands from the differ-

ent bureaucracies for funds to finance their activities at some desired level, and the reconciliation, if necessary, of these potentially inconsistent aspirations (cf. LeLoup 1978; Fischer and Crecine 1981; Fischer and Kamlet 1984).

While behavior is usually purposeful, it need not be synoptically rational (Braybrooke and Lindblom 1963). An organization and the elements within it pursue goals. From the perspective of the behavioral theory of decision making, organizational goals can be seen as a set of "independent aspiration level constraints" that have been imposed on the government by the elements that comprise the government coalition (cf. Simon 1964). This collection of constraints arises because government of a need must factor decision problems into subproblems and assign them to its different elements. In so doing, government can introduce a limited level of rationality since each unit is focusing on a very restricted, hence, usually, tractable set of goals. By promoting such local rationality, through devolution and specialization in objectives and decisions, the incredibly complex set of interdependent tasks and objectives involved in creating a budget becomes more manageable.

Every element of government, especially when engaged in solving recurrent problems, relies upon standard operating procedures. This tendency arises because any other would doom those involved to become overwhelmed with the complexity of their tasks (Davis, Dempster and Wildavsky 1966; Wildavsky 1975). "Aids to calculation" allow the participants not only to survive the process, but also to achieve results which more often than not are satisfactory. Satisfaction comes not from obtaining some optimal policy state, but rather from producing a short-term reaction in response to short-term feedback (Cyert and March 1963). Since the environment government must deal with generally is complex and uncertain, all the units in government normally come to employ such decision rules when they involve themselves in the budgeting process. In the following section the structure of this model and its relationships with the other elements of GLOBUS are discussed.

## **THEORETICAL STRUCTURE**

The first part of this section describes the structure of the budget as represented within the model as well as other additional outputs that

are generated. Subsequent to that an overview of the budgetary model along with its connections to other models in GLOBUS is presented. The last part of this section sets forth the details of the model structure.

## **THE GOVERNMENT BUDGET**

The main product of the government resource allocation model is the budget of the general government sector. There are, of course, many ways to present a budget and each has a different story to tell about the allocation activities of government. Because of the requirement to maximize the possible linkages between this and other sectors of GLOBUS, and given the need for uniformity and consistency, we have chosen to represent the government sector's budget in terms generally employed in standard national accounting practice.

Table 5.1 provides a description of the GLOBUS governmental budget account. Readers familiar with national accounting practices will recognize most of the contents of this table. Detailed descriptions are available in official (United Nations 1968) and unofficial (e.g., Ruggles and Ruggles 1970) sources. A useful presentation of the standardized government sector accounts for market economies is provided by Wasserman (1976).

There are a number of items in this table that need to be clarified. First, it should be noted that the item labeled indirect taxes (*INDTAX*) is in reality indirect taxes net of subsidies (see Bremer and Cusack 1981). Second, as can be seen shortly, foreign aid outlays (*FAX*) have been incorporated in the current and not in the capital account of the budget and, for convenience sake, are included under government consumption. Third, the capital account has been greatly simplified. The distinctions between receipts and expenditures, as well as domestic and foreign designations are not explicitly incorporated. Capital outlays, net of receipts, is the single item included (*GIX*).

### **Revenue Flows**

In terms of sheer number of linkages, the set of relationships between this model and the domestic economic model is certainly the largest. Thus, on the income side, the rates at which taxes and other earned revenues flow into the government sector must be determined and com-

**TABLE 5.1**  
**MAIN BUDGET CATEGORIES**

Total Government Revenues – GOVREV

Indirect Taxes – INDTAX  
Business Taxes – BUSTAX  
Personal Taxes – PERTAX  
Welfare Contributions – WELCON  
Government Profits – GPROF

minus

Total Government Expenditure – TOTEXP

Government Consumption – GCON  
Welfare Benefits – WELBEN  
Government Investment – GIX  
Debt Management – GDMAN

equals

Government Savings – GSAVE  
[ Surplus (+) or Deficit (-) ]

municated to the domestic economic model. On the expenditure side, the levels of spending on an array of current and capital items need to be produced and directed into the economic system. Given revenue raising rates, flows within the economic sector, and expenditure flows outward, the budget picture can be completed.

On the revenue side there are four tax items: indirect (*INDTAX*), business profits (*BUSTAX*), personal income (*PERTAX*), and welfare contributions (*WELCON*). Each tax is levied against a distinct and specific base at a rate determined within the budgetary model. The application of these rates within the domestic economic model directs revenue flows into the government sector. In the case of indirect taxes, the tax rate (*ITR*) is applied against the base of gross domestic product at factor prices (note that all monetary variables used within the budgetary model are denominated in constant prices). Business profits tax rates (*BTR*) are placed against operating surplus net of dividends and interest (effectively, retained profits and capital depreciation allowances). Taxes on the household sector take two forms: those in the general revenue category, personal income taxes (using rates: *PTR1* and *ptr2*), and what have been labeled welfare contributions (*WELCON*; rate: *WCR*), which represent required payments for social insurance and associated schemes. Within the model, personal income is the base against which both these tax rates are applied.

There are two other revenue items within the budget. The first, labeled government profits (*GPROF*), represent the net entrepreneurial earnings of the public sector transferred to the government budget. In terms of the income splitting mechanisms within the domestic economic model, this is the ultimate residual item. No control of this item is directly represented within the budgetary model. The last item which represents a potential revenue source for the government sector is the deficit (*-GSAVE*) it can carry. *GSAVE* is discussed further below.

### Expenditure Flows

On the expenditure side, four major categories of spending are represented. These include, government consumption (*GOVCON*), transfers by government to the household sector through social welfare programs (*WELBEN*), investment outlays (*GIX*) through the general budget, and debt management payments (*GDMAN*).

Government consumption (see Table 5.2) includes two major items,

defense(*DEX*) and civilian (*CIVEXP*) spending. The first category, defense, includes a variety of subitems. The major split here is between spending for conventional military items (*DEXCON*) and that for strategic nuclear purposes (*DEXSTR*). Conventional defense spending is further subdivided between outlays earmarked for capital items (*DEXK*), such as ships, aircraft, etc., and those going toward the payment for labor (*DEXL*). These represent different sorts of demands on the economy and are treated accordingly within the domestic economic model. Spending on nuclear capabilities is assumed to occur within only a very small subset of the GLOBUS nations (viz., the United States, the Soviet Union, the People's Republic of China, the United Kingdom, and France). Spending in this category is also assumed to be exclusively in the capital area.

The second major component of government consumption (*GOVCON*), civilian expenditures (*CIVEXP*), has four major items. These include education(*EDX*), health (*HEX*), administration (*ADX*), and foreign aid (*FAX*). Education expenditures represent total current education outlays by government. In order to allow for the depiction of various social processes, this item is further subdivided into two elements: expenditures for the operation of combined primary and secondary education (*EDXPS*) and outlays used to finance publicly supported advanced, or tertiary, education (*EDXT*). Health expenditures (*HEX*) represent the public health outlays by government. These include direct purchases of goods and services and exclude health-related transfers to the household sector. These latter are included under the social welfare spending title. Administrative outlay (*ADX*) is a residual item, i.e., government consumption net of defense, education, health, and foreign aid. It includes payments for a diverse set of programs and activities (public order, revenue collection, economic services, etc.). Foreign aid (*FAX*) represents spending by the government sector for purposes of advancing economic development on the part of other countries. It should be noted that while included as an expenditure item for donor nations, which are assumed to be only the seven developed market economies, viz., the United States, Canada, the United Kingdom, France, the Federal Republic of Germany, Italy, and Japan, aid for recipient states, amongst the GLOBUS states these being Mexico, Venezuela, Brazil, Argentina, Nigeria, Iran, Turkey, Egypt, Saudi Arabia, India, Pakistan, and Indonesia, represents a revenue source (*FORAID*).

The second major spending category found at the bottom of Ta-

**TABLE 5.2**  
**COMPONENTS OF GOVERNMENT CONSUMPTION**  
**AND SOCIAL WELFARE TRANSFERS**

GOVERNMENT CONSUMPTION	
Defense DEX	Conventional - DEXCON Labor - DEXL Capital - DEXK Strategic - DEXSTR
Civilian CIVEXP	Education - EDX Primary & Secondary - EDXPS Tertiary - EDXT Health - HEX Administration - ADX Foreign Aid - FAX

SOCIAL WELFARE TRANSFERS	
Welfare Benefits WELBEN	Pensions per Client - WBPC Unemployment Compensation per Client - WBUC Other Outlays per Client - WBOC

ble 5.2 deals with transfers to the household sector under social welfare programs (*WELBEN*). This includes a variety of expenditure programs with the characteristics of: (a) being direct income transfers to individuals in the household sector and (b) generally being based on one form or another of an insurance-funding scheme. The latter characteristic, however, is not universal across all programs included within this category (see, e.g., U.S. Department of Health, Education and Welfare 1977; International Labor Organization 1981). Within the modeled budget, three subcategories are represented. These include pension programs, unemployment compensation programs (where such exist), and a third or residual item incorporating such programs as family allowances, etc. On a per client basis, financial outlays for these programs are referred to, respectively, as *WBPC*, *WBUC*, and *WBOC*.

Returning to Table 5.1, the third major category, government capital formation (*GIX*) represents the net expenditures made by government for the purchase of nonmilitary capital items. In the developed market systems this is mainly restricted to infrastructure development and capital items required for the performance of governmental activities. Amongst developing countries, a fair portion of this item actually represents investment for production purposes within the economy. In centrally planned economies this is one of the major sources of economic investment.

Government debt management payments (*GDMAN*), corresponding to net property income payable, represent the payments made by government to finance the outstanding debt that it has managed to accrue. With accumulated surpluses, this would take on negative values - indicating earnings from surpluses accumulated by the government sector.

### Balancing Elements

The item, *GSAVE*, when negative, indicates that the government, through choice and perhaps necessity, is operating with insufficient earned revenues and is drawing these out of the economy through borrowing. The item can as well be positive, indicating that the government sector is actually lending money to other sectors of the economy - and thus also either reducing an accumulated debt or adding to an accumulated surplus. The determination of net borrowing on the part of government results from targeted decisions by government and the



realization of this target based on the budgetary plan adopted and economic conditions prevailing at the time of the budget's implementation. Finally, government debt (*GDEBT*) represents the accumulated debt (or surplus of assets) that previous budgetary imbalances have produced.

### **Other Output Elements**

Aside from financial elements, expressed solely through the budget, the government resource allocation model also provides information of two other forms. In the defense area, a variety of measures are generated for use in other models. These include indicators of conventional and strategic nuclear military capabilities, and assessments of threat and potential military assistance along both these dimensions. In the area of education, production functions in combination with demographic information generate educational performance measures, expressed as enrollment ratios at the primary/secondary and tertiary levels.

## **STRUCTURAL OVERVIEW**

The model represents the development of a government budget. It portrays the decision making involved in setting expenditure levels and altering the rates of revenue raising. Budgeting is depicted as a set of interrelated activities wherein forces at different levels of government seek to satisfy their interests. As structured in the model, this activity is represented in part by a process where the political leadership and those responsible for the financial activities of the government develop and attempt to impose their preference with respect to the overall sum of budgetary outlays. Standing in opposition to this preference as well as in competition with each other are the different sectors of government responsible for its major functions and programs. These competitors attempt to advance their interests and perform their responsibilities in part by acquiring the budgetary resources they calculate as necessary (cf. Fischer and Kamlet 1984; Van Winden and Van Praag 1981; Niskanen 1979; Breton 1974; Caiden and Wildavsky 1978; Wildavsky 1964, 1975; Kiefer 1981; Kamlet and Winder 1978; Auten et al. 1984; Cusack 1982). On the revenue side, decisions are modelled as a combination of intention and drift (cf. Larkey et al. 1981; Alt 1983; MacMahon

1973). Their basis is seen as following from the leadership's (and other financial authorities') desire for maintaining the fiscal solvency of the government and the leadership's stabilization policy concerns.

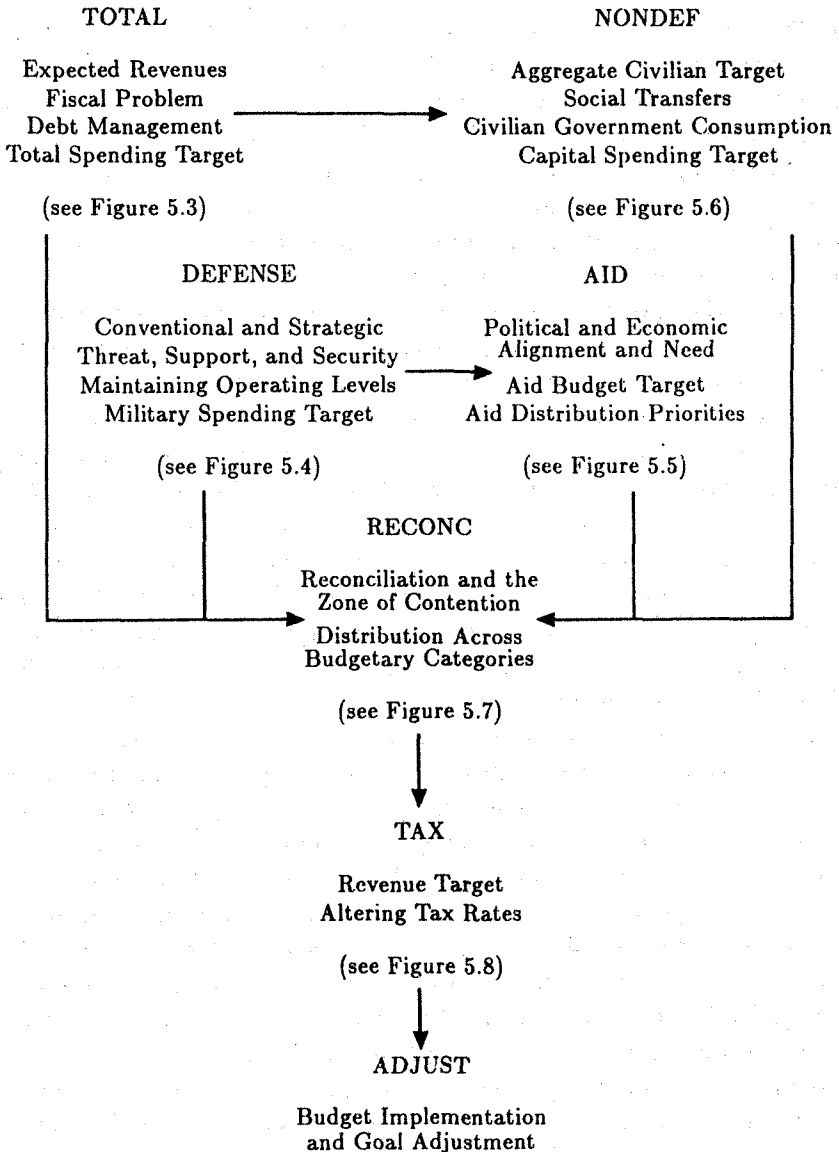
In the succeeding parts of this subsection an effort will be made to provide the reader with a clear sense of the model's structure. Since it is rather large and somewhat complicated it may be the case that no one way of describing it will make it transparent. In light of this, two complementary perspectives are provided with the hope that in combination they will prove helpful to the reader in gaining a complete overview of the model. This overview should facilitate the transition to the discussion of structural details that follows in the next section.

### **Budgetary Procedures**

The formal representation of the budgetary decision-making procedures is incorporated within six analytically decomposable phases. A seventh phase deals with the implementation of decisions and the adjustment of goals. This division is intended to capture some of the very distinctive features of the budgetary process. The division has as well been heavily influenced by the desire to structure the model in such a way as to enhance our ability to provide an empirical basis for important decision-making parameters.

The six phases along with the goal adjustment and implementation activities within the model are portrayed in Fig. 5.2. Each phase or block of activities represents a relatively integrated set of activities that may or may not be dependent upon other activity within the budgetary process. There is, however, a distinct ordering which allows activities to take place in a consistent manner and one which bears general similarity to actual governmental budgetary processes. In reality, the first four blocks of activity (TOTAL, DEFENSE, AID, NONDEF) precede the crucial fifth locus of activity represented within RECONC. The latter precedes the sixth and final behavioral set of processes, TAX. Interdependence within the first set of four occurs in two instances. The first is a limited set of linkages between TOTAL, wherein economic forecasts as well as the fiscal authorities' target budgetary total are developed, and NONDEF. In NONDEF economic forecasts that have been developed within TOTAL are used in two parallel sets of processes dealing with (a) the development of aggregate targets for civilian outlays as well as government investment, and (b) the development of specific program

**FIGURE 5.2  
AN OVERVIEW OF MAJOR PROCESSES  
WITHIN THE BUDGETARY MODEL**



spending targets by the different bureaucratic-functional elements involved with civilian consumption and welfare transfers. The second linkage is that between military based security assessments being made within DEFENSE and the efforts to develop a foreign aid allocation within AID. The national security apparatus operates independently in processing and formulating budgetary targets for the defense sector in DEFENSE, but the information it produces with respect to threat identification is employed in the civilian sector when aid allocation decisions are formulated within AID. The fifth phase, RECONC, is the arena wherein the independently developed and potentially inconsistent set of spending targets are reconciled and the various components of the major budgetary aggregates are finalized for the budget in the coming year. This reconciliation and finalization produces information which along with other independently developed information and aspirations is used in the sixth and final behavioral process phase, represented in TAX. Herein, total and specific revenue targets are set for the *Next + 1* budget and coming tax rates are adjusted accordingly.

This block structure reflects two important features of the model. First, the division into blocks is based on substantive and temporal grounds. From a substantive perspective, while the results of any one block may influence elements in another, the sequence in which the results are produced reflect the sequence generally followed in budget construction. The elements and decisions in later blocks often follow from decisions made earlier and frequently are constrained by those decisions. In effect, the structure of the model replicates the "funnel" of decision making in budgeting.

Second, time is important. Not only is the mimicking of time in terms of sequential processing vital, but so too is the identity of the time period for decision implementation. During any period a budget is being implemented. Simultaneously a new budget is being constructed and there is a difference between the two major sets of decisions – those relating to expenditures and those dealing with taxation – in terms of the period during which they will be implemented. On the expenditure side, represented in the blocks preceding and including the reconciliation phase incorporated within RECONC, decisions are made at each time step for the next budgetary period, with constraints provided by revenue decisions in the previous budget playing an important role. On the revenue side, decisions are made for two budgetary periods ahead, dependent in part on previous spending and taxing decisions. The stag-

gering of decision and implementation is based on two considerations. First, revenue decisions in the form of tax rate changes are notoriously slower in the time it takes to implement them. Second, the theoretical position we have adopted places emphasis on the expectation that governmental actors hold with respect to revenue government will receive during the period for which expenditures are planned. These former are greatly constrained by the relative rigidity of the revenue instruments authorities have at their disposal.

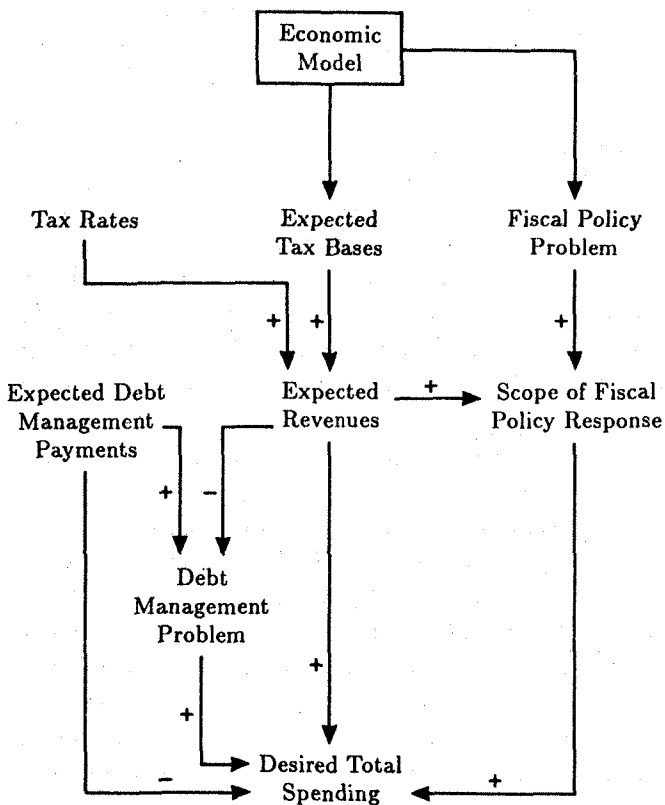
### **Focused Portrayal**

Such a depiction of the set of concentrated activities in the interdependent budgetary process provides one with a very broad image of the model's structure. If, however, one wishes to understand in more detail how the model works it is necessary to narrow the focus and restrict the range of vision. Here I will examine each of the major blocks discussed above and attempt to show by means of diagrams the primary forces at work in each.

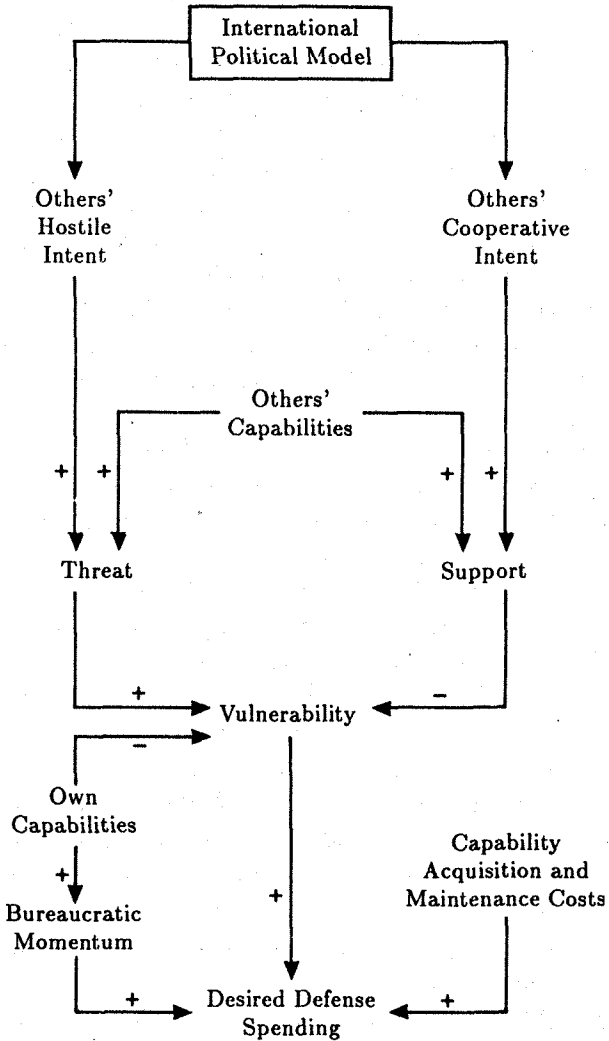
The first major set of processes deals with the development of the authorities's desired level of total spending (see Fig. 5.3). Desired total spending is represented as being a function of expected revenues and a stabilization policy response, as well as considerations with respect to debt management payments and problems associated with the financial burden entailed by the latter. It should be noted that the stabilization policy response formulation hinges upon the type of political-economic system being represented with unemployment motivating response in Western developed economies and foreign sector balances stimulating action within centrally planned and developing economies.

The defense and civilian bureaucracies are represented as independently formulating desired levels of spending for their areas. In the defense sector (see Fig. 5.4), two major programs are represented: the first deals with conventional military capabilities and the second with strategic nuclear systems. In each of these programs, perceived security requirements and pressures for maintaining or expanding previous levels of operation generate desires which are aggregated to produce a total for the desired level of defense spending. In each of these areas, security requirements come to be defined on the basis of expected levels of threat, one's own capabilities, expected levels of assistance, a goal with respect to security, and direct cost calculations - in effect a monetary value

**FIGURE 5.3**  
**FISCAL AUTHORITIES' TOTAL**  
**SPENDING TARGET**



**FIGURE 5.4**  
**MILITARY SPENDING TARGET**



is produced which represents the cost of dealing with vulnerability in the national security area. Direct cost calculations (along with depreciation considerations) enter into the determination of spending level aspirations with respect to maintaining or incrementally increasing previous levels of operation – bureaucratic pressure. The desired level of spending in this sector then has to be reconciled with the competing aspirations from the “top” and from competitors at the “bottom.”

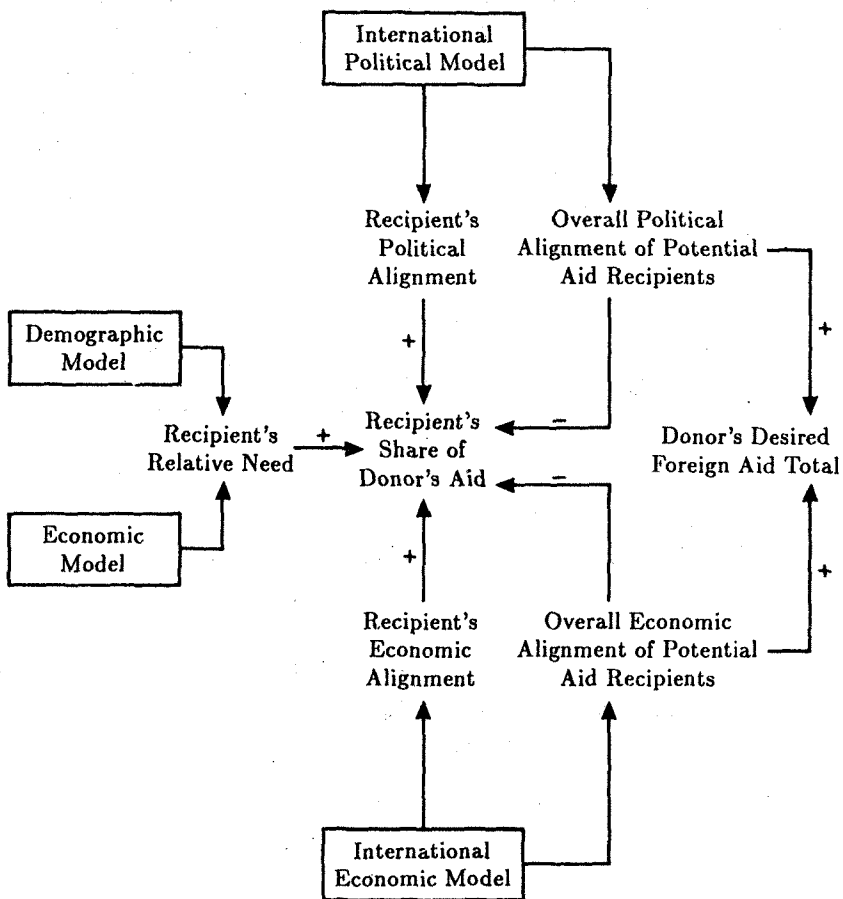
Two processes are represented within the foreign aid area. One deals with the generation of a spending target in terms of an overall foreign aid budget. The other process focuses on the problem of distributing the total aid budget within a pool of potential aid recipients. An overview of both is provided in Fig. 5.5. In both processes the alignment of potential aid recipients plays a central role in formulating aid decisions. Additionally, in the distribution of the aid budget amongst recipients, their relative economic need plays a role. It should be noted that the target for the overall aid budget does not influence the finalization of major aggregates but, instead, influences the allocation of civilian noncapital spending in the final part of the reconciliation process.

It should be noted that the civilian sector includes a large number of programs. Two main streams are represented – the first on the exhaustive side and the second on the capital side. With respect to the first, two parallel sets of processes are represented. The first is a representation of the development of a desired spending level at an aggregate level for all of the programs within the area (see Fig. 5.6). Demographic and economic conditions along with pressure to maintain or expand previous levels of performance in the whole sector generate a desired level of spending. Concurrent with this, but at a very disaggregated level, individual program requests are formulated, based on cost, clientele, and performance considerations, for later use in the reconciliation phase. On the capital side, growth considerations and a factor representing the tendency for government to assume responsibility for capital formation enter into the determination of a desired spending level. The desired aggregate spending levels are principal elements in the reconciliation and finalization of the expenditure side of the budget.

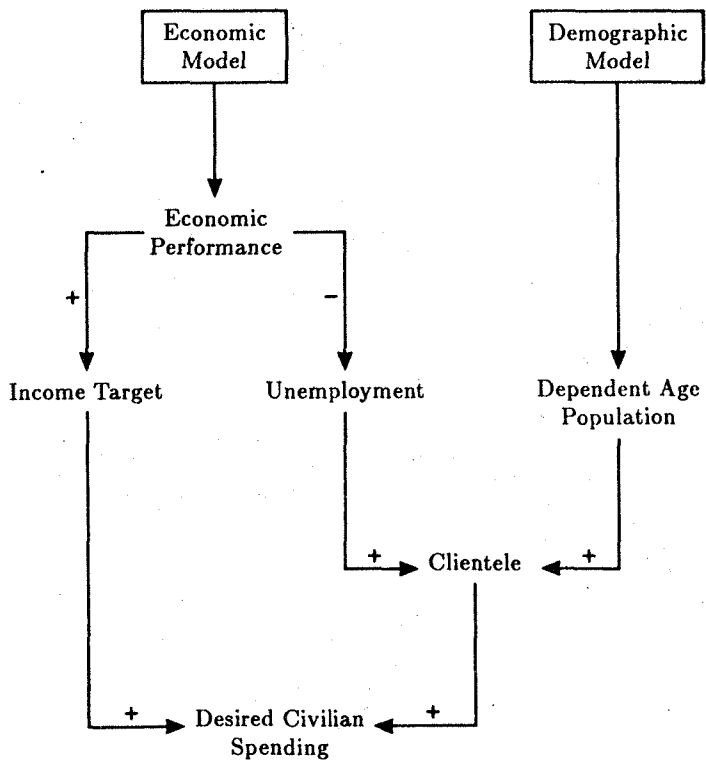
Now, in light of this desired total and the aspiration levels generated in the defense and civilian sector, the degree of budgetary slack is determined (see Fig. 5.7). This corresponds to the extent to which the combined aspirations from the “bottom” differ from that of the “top.” In the absence of any difference, desired spending levels are trans-



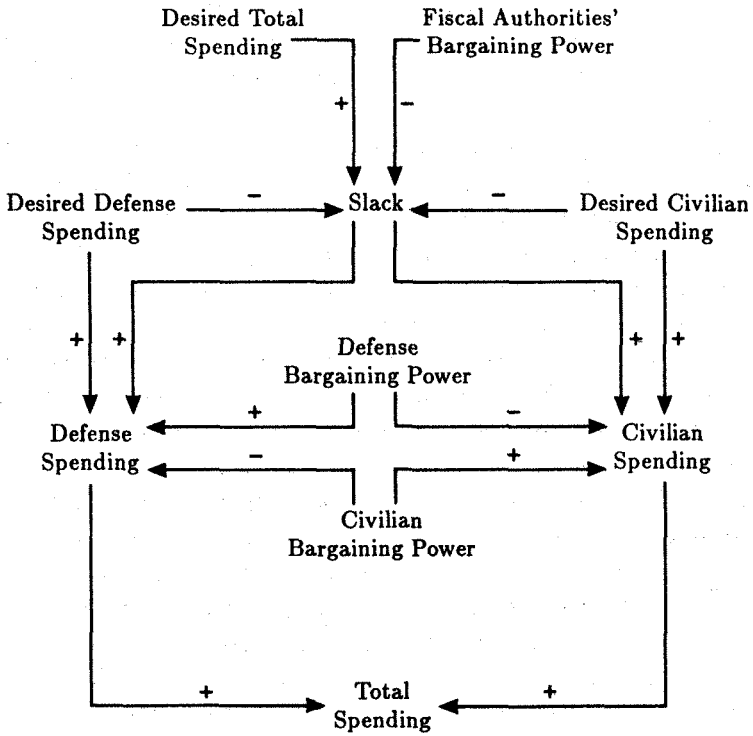
**FIGURE 5.5  
AID TARGET AND DISTRIBUTION  
PRIORITIES**



**FIGURE 5.6**  
**CIVILIAN SPENDING TARGET**



**FIGURE 5.7**  
**RECONCILIATION PHASE**



formed into final budgetary figures. Differences between the "top" and "bottom" need to be reconciled and the outcome of this reconciliation process hinges on the character and scope of the differences and the relative bargaining weights of the actors. The extent to which such reconciliation is required directly corresponds to the degree to which the authorities at the "top" have independently provided sufficient scope for the aspirations from the defense and the civilian sectors and, as well, the magnitude of the latter's independently generated target spending figure.

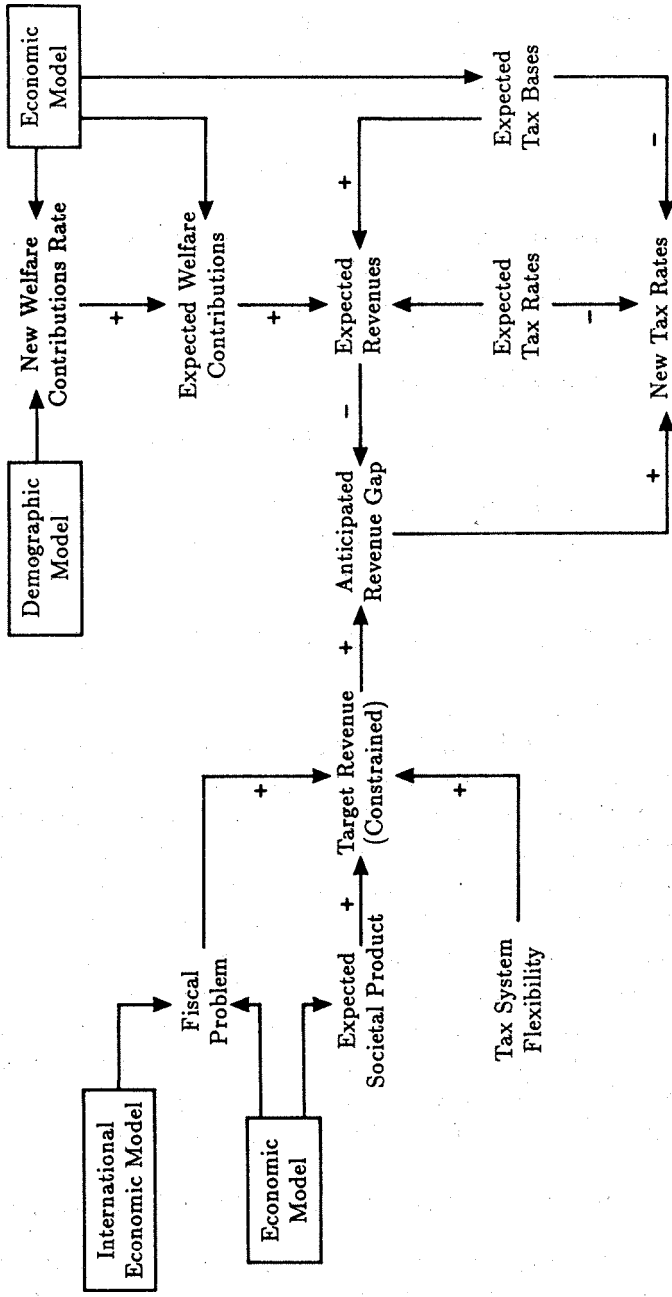
Without portraying the process graphically, it should be noted that after the finalization of major expenditure levels for the planning period, specific programs are then allocated funds. In the defense sector, distribution occurs principally between conventional and (where appropriate) strategic components. Further distribution then occurs on the conventional side with the appropriated funds being divided between capital (demand is transferred to the arms sector of the domestic economic model) and labor (demand on the service sector). The latter division derives directly from the desired capital to labor ratio and the expected existing capital stock in the planning period.

In the civilian sector allocations are made from the planned total for nondefense amongst the various programs and subprograms. These allocations hinge upon existing program expenditures, requested program expenditures, and the aggregate of existing, requested, and finalized expenditures. Within the simulation model a dampening factor can be invoked to minimize excessive shifts in relative program size.

Resource extraction decisions by government are effectively concentrated in the alteration of taxation rates (see Fig. 5.8). These are represented as following from governmental authorities' basic tendency to expand previous levels of extraction in light of overall performance within the economy, concern for restricting the expansion of the size of the debt relative to the capacity of the economy, and, in the case of the centrally planned economies, untoward developments within the external sector. The target revenue figure that results from these considerations is compared against revenues that could be anticipated given the expected tax rates and bases in the forecast period and any gap evokes modification of the expected rates.

Finally, there is a set of procedures, incorporated within the block labeled ADJUST, that represents the implementation of budgetary decisions and also incorporates the modification of aspiration levels

**FIGURE 5.8**  
**REVENUE DECISIONS**



throughout the budgetary sector. Budgetary decisions relate mainly to two categories, expenditure levels and tax rates. In both instances, an existing level is modified in light of the outcome of the budgetary decision-making process in the present period:

$$\text{Level}' = \text{Outcome} - \text{Level} \quad (5.1)$$

In terms of aspiration levels, two major factors are at work. The first is the prevailing aspiration level and the second is the present level of performance with respect to that goal. The general form used is:

$$\text{Aspiration}' = \left( (\text{adjust}_1 * \text{Aspiration}) + (\text{adjust}_2 * \text{Performance}) \right) - \text{Aspiration} \quad (5.2)$$

This completes the overview of the structure of the model. Discussion now turns to a more detailed description of the model.

## ***DETAILED REVIEW OF THE STRUCTURE***

The model incorporates the processes whereby competing aspiration levels for spending throughout the government are generated and reconciled so as to produce allocations for the next annual budgetary period. Four major streams of parallel activity are represented; these include the specification of the fiscal authorities' desired level of total spending, the defense sector's generation of a preferred level of military outlays, the production of a desired level of civilian spending (consumption and transfers), and the determination of the capital sector's requirements for funding. Following the production of these independently generated targets, a reconciliation process is invoked and the broad outlines, in terms of the major spending aggregates, are finalized. Ultimately, the process shifts to the development of succeeding budget revenue requirements and implements alterations in taxation rates.

### **Formulating the Authorities' Total Spending Target**

The total spending target held by the political and fiscal authorities is represented as deriving from a set of related calculations on their part. In particular, they are concerned with the character of economic condi-

tions (stabilization policy) during the period within which the budget is to be implemented, what those conditions imply given previously settled upon taxation rates, and the problem of managing the level of debt that the government has accrued in years previous.

### *Forecasting Economic Conditions and Expected Revenues*

Relying upon a forecast of domestic product based upon recent economic performance, the fiscal authorities use information on the way in which that product will be divided into various income streams and estimate the expected revenues that would accrue to the government sector given the tax rates that are to be applied during the forecast period. The product of these calculations, *EGVREV*, represents the total expected earned revenues for the government sector. As the following equations make clear, this includes in addition to forecasts on the part of the government with respect to the size of the individual tax bases along with previously set tax rates, expectations regarding government profits and, where appropriate, anticipated foreign aid receipts.

$$\begin{aligned} EGVREV_n = EITAX_n + EPTAX_n + EWCON_n & \quad (5.3) \\ & + EBTAX_n + EGPROF_n + EFAREV_n \end{aligned}$$

where

$$EGDP_n = \frac{GDPN_n}{PINDX_n} * (1 + GDPRIg_n)$$

$$EITAX_n = ITRN_n * EGDP_n$$

$$EKDEP_n = kdarat_n * (EGDP_n - EITAX_n)$$

$$EPINC_n = pishar_n * (EGDP_n - EKDEP_n - EITAX_n)$$

$$EPTAX_n = PTR1N_n * EPINC_n^{ptr2_n}$$

$$EWCON_n = WCRN_n * EPINC_n$$

$$\begin{aligned} EBPROF_n = bpshar_n * (EGDP_n - EKDEP_n \\ - EITAX_n - EPINC_n) \end{aligned}$$

$$EBTAX_n = BTRN_n * (EBPROF_n - EKDEP_n)$$

$$\begin{aligned}
 EGPROF_n &= EGDP_n - EITAX_n - EKDEP_n \\
 &\quad - EPINC_n - EBPROF_n \\
 EFAREV_n &= FORAID_n \\
 &\quad \text{(aid recipients only, otherwise, 0.0)}
 \end{aligned}$$

In sum, there are four tax sources and expectations regarding each of these, viz., expected indirect taxes (*EITAX*), expected personal income taxes (*EPTAX*), expected social welfare contributions (*EWCON*), and expected business profits taxes (*EBTAX*), are developed by using the soon to be implemented tax rates and the expected tax bases. Expected government profits (*EGPROF*) and, where appropriate, expected foreign aid receipts (*EFAREV*) combine with these expected tax revenues to produce a central figure in the budgetary decision process, the total expected revenues (*EGVREV*).

#### *Fiscal Policy Response*

An important aspect of government's role in resource allocation relates to the use of the budget to counter imbalances within the economic sphere. Explicitly incorporated within the model are activist fiscal policy considerations whereby governments act in a more or less limited role attempting to stimulate or slow down demand within the economy. Within developed market systems the economic indicator that authorities are modeled as monitoring and responding to is the unemployment rate. Underemployment is represented as indicating the need to move away from a balanced budget. The inclusion of this mechanism within the model for this set of conditions is in keeping with the extensive theoretical and empirical support for the notion that a fiscal stabilization response, keyed to unemployment, whether as an "automatic" or "semiautomatic" response is endemic to advanced industrialized pluralistic systems (see, e.g., Cowart 1976; Frey and Schneider 1981; Mosley 1976; Cusack 1985; Rice 1983).

Within any economic system there are a variety of markets and governments monitor and seek to manipulate their workings to varying degrees. This manipulation depends critically upon their stage of development and the prevailing ideology (Lindblom 1977). Clearly, since the time of Keynes, the major focus of governmental fiscal stabilization policy in industrialized pluralistic systems has been on the relatively



well-developed labor market and the problems endemic to it as well as signaled by tendencies therein. Within developing lands and in centrally planned systems, the use of budgetary instruments for dealing with such problems is much less common (see, e.g., Goode 1984; Premchard 1983). For a variety of reasons, for example, desire for autarky, weakness in the international economic system, etc., the principal stabilization concern that manifests itself in budgetary politics resides in the strength or weakness of the nation's foreign sector. In light of this, fiscal authorities are represented as keying on trade balances in adjusting their maximum aspiration for total spending around their basic propensity to maintain a balanced budget. This adjustment factor is called *FPROB* and is the prevailing unemployment rate for the West group and the ratio of the settlements balance to the earnings from exports for all other groups.

#### *Debt Management Payments*

Debt management payments play a significant role in the fiscal authorities' determination of a desired ceiling level for total spending. These are forecasted to be equal to present debt management payments (a function of the interest rate, *INTR*, and the stock of government debt, *GDEBT*) plus the requirements developing in the present budget (i.e., the interest rate times the budgetary deficit, *-GSAVE*).

$$GDMAN_n = INTR_n * GDEBT_n \quad (5.4)$$

$$EGDMAN_n = GDMAN_n + (INTR_n * -GSAVE_n) \quad (5.5)$$

Under all but extraordinary circumstances the authorities are portrayed as treating the payments required to service accumulated debt as not subject to direct manipulation and effectively acting to crowd out other forms of spending. Thus, when generating their desired spending ceiling, it is assumed that they are treating the revenues that are required to finance the debt as already allocated and not available for other purposes. Included within the model, however, is a mechanism which allows this assumption to be overridden should the relative magnitude of the burden of maintaining the debt begin to overwhelm the government sector. Dependent upon a parameter setting, this mechanism (with its effects manifested in *DEFAULT*) is triggered when expected debt management payments (*EGDMAN*) require a significant amount

of expected revenues to be employed solely for this purpose.

$$\begin{aligned}
 &\text{if } EGDMAN_n > (dpaymx_n * EGVREV_n) && (5.6) \\
 &\text{then } DEFALT_n = EGDMAN_n - dpaymx_n * EGVREV_n \\
 &\text{else } DEFALT_n = 0.0
 \end{aligned}$$

### Total Spending Target

The processes of forecasting economic conditions and developing an appropriate stabilization response, assessing the level of revenues that will be brought in through various revenue collection instruments, and the calculations associated with the debt management problem, allow the authorities to define their aspiration level for total spending. The target, *DTOTEX*, is expressed as follows:

$$\begin{aligned}
 DTOTEX_n = & \left( dtp1_n * (EGVREV_n - EGDMAN_n \right. && (5.7) \\
 & \left. + DEFALT_n) \right) + \left( dtp2_n * FPROB_n \right. \\
 & * (EGVREV_n - EGDMAN_n + DEFALT_n) \left. \right) \\
 & + totadj_n
 \end{aligned}$$

where for the West  $FPROB_n = UNEMPR_n$

$$\text{and for others } FPROB_n = \frac{SETBAL_n}{EXPRTN_n}$$

In brief, the aspiration for total spending is conceptualized as the maximum the authorities are willing to implement given their base propensity for balancing the budget and the scope of their desire to counter cyclical imbalances in some part of the economy – taking into account the need to manage the debt of the government sector and, in extraordinary circumstances, an acceptance of the need to temporarily disavow or repudiate responsibility for debt. Included as well within the equation is an adjustment term, *totadj*, which is initialized in the first iteration of the model in such a way as to take into account the discrepancy that may exist between observed tendencies in total spending and the initial result deriving from the model's calculations.

The authorities' aspiration for total public spending reflect a number of behavioral characteristics. The first assumption relates to the notion that spending authorities adopt a general stance which is characteristically more or less restrictive in terms of balancing outlays with earned revenues. Somewhat analogous to the "permanent income" spending rule (cf. Alt and Chrystal 1983), this rule is in the tradition of much of the contemporary political economy literature that ascribes a significant role to revenue considerations in the determination of major budgetary aggregates (see, e.g., Crecine 1971; Frey and Schneider 1981; Cusack 1980, 1985a, 1986; Fischer and Kamlet 1984). The overall level of restrictiveness is effectively incorporated within the parameter *dtp1*, with values greater or less than one in direct proportion to the extent that the authorities seek to maintain a balanced budget when they engage in bargaining during the reconciliation of the competing aspirations within the system. In addition, expected normal debt management considerations (represented in *EGDMAN*), are effectively treated as "coming off the top" - i.e., fiscal authorities will take these outlays into account and see the budgetary constraint they are developing as assuring the payment required to finance the debt. The occurrence of an extraordinary debt management problem, manifested in *DEFAULT* (explained above), will, however, motivate authorities to relax their normal degree of restrictiveness. Finally, demand stabilization policy, reflected in the parameter *dtp2*, intrudes upon the decision on the spending target and takes into account the degree to which stabilization is required and the fully defined resource base the authorities foresee as available.

## Formulating the Military Spending Target

### *Conventional and Strategic Nuclear Capabilities*

The defense sector is modeled as generating an aspiration level for a minimal amount of defense spending in the budget under construction. For most countries represented within the model, this spending will be directed toward the purchase of labor and capital inputs in the conventional military area. For five of the countries, viz., the United States, the Soviet Union, China, France, and the United Kingdom, a parallel process is incorporated whereby a budget figure is also proposed for purchases within the strategic nuclear area. These two are then aggregated for the total defense request. Since the equations used in both the conventional and strategic area are analogous to one another,

I will present only one set, that for the conventional, and note, where appropriate, the corresponding elements on the strategic side.

In both areas, two sets of considerations, reflecting internal and external problems (cf. Russett 1983), help to organize the defense sector's formulation of its minimal aspiration with respect to its budget. In terms of internal considerations, parochial interest in at least maintaining if not expanding the level of operations within the defense sector is paramount. This general rule of behavior is reflective of widely supported notions with respect to the behavior of organizations in general (see, e.g., Allison 1971; Davis, Dempster, and Wildavsky 1966a; Crecine 1969), and defense bureaucracies in particular (see, e.g., Kanter 1974; Rattinger 1975). External considerations also come into play. Here the environmental concern is with "security" considerations and it reflects organizational response to functional responsibility. This behavioral rule accords, again, with widely supported notions, which may be viewed as complementary and not contradictory to the "autarkist" arming propensity, regarding the response of governments to "threats" to their national security (see, e.g., Richardson 1960; Ashley 1980; Allan 1983; Armington 1983; Lambelet 1971, 1973; Lambelet, Luterbacher, and Allan 1979). In sum, defense sector authorities are represented as formulating their sector's minimal aspiration for budgetary allocations in response to rules that allow them to maintain or advance their parochial interests and also allow them to respond to environmentally generated problems that impinge upon their area of functional responsibility.

#### *Assessing Threat, Support, and the Security Situation*

Taking external security considerations first, the model represents the national security sector as searching the international environment with the objective of defining the threat and support it may expect from other states. Two critical elements in the determination of each of these conditions are the intentions of other states and their capabilities. The latter is determined first for each state and then a further search is conducted which generates information on the way in which each actor in the international environment orients itself toward all other states in terms of hostile as well as cooperative intentions. These different intentions combined with capabilities are assumed to represent, respectively, the threat and the support that national security agents perceive within the international environment.

Hostile intent ( $INTNTI$ ) on the part of any actor is assumed to be a weighted value of the hostile actions directed by that actor toward a target:

$$INTNTI_{a,t} = HSENT_{a,t} * \frac{HSENT_{a,t}}{HSENT_{a,t} + CSENT_{a,t}} \quad (5.8)$$

Cooperative intent ( $ANTNTI$ ) takes on an analogous form:

$$ANTNTI_{a,t} = CSENT_{a,t} * \frac{CSENT_{a,t}}{HSENT_{a,t} + CSENT_{a,t}} \quad (5.9)$$

The threat that is perceived as being directed at the state is assumed to be a multiplicative function of the relative hostile intention of each state in its environment and the respective capability ( $POW$ , on the conventional side) of that state, summed across all of the actors in the perceiving state's environment:

$$THREAT_t = \sum^A \left( \frac{INTNTI_{a,t}}{\sum^T INTNTI_{a,t}} * POW_a \right) \quad (5.10)$$

The formula indicates that any state engaging in hostile behavior poses a threat in proportion to the relative hostile intent it manifests times the capabilities it has available to it. An analogous formulation is used to assess support ( $AMAID$ ) from the international environment:

$$AMAID_t = \sum^A \left( \frac{ANTNTI_{a,t}}{\sum^T ANTNTI_{a,t}} * POW_a \right) \quad (5.11)$$

Both the threat and support measures are meant to facilitate the representation of security calculations by the states included within the model. While clearly not perfect indicators, they do provide us with a solution to the perplexing problem of realistically treating the security problem in a multistate system (see, e.g., Singer 1958; Deutsch and Singer 1964; Bueno de Mesquita 1975; Rapkin, Thompson, and Christopherson 1979; Ashley 1980). An extensive discussion of both variables, their measurement and significance is provided in earlier papers (see Cusack 1981, 1985b). On the strategic side, the hostile and cooperative

intent measures are based on the actions within the smaller subsystem of states possessing strategic nuclear weapons. These intent measures are then used in combination with the measure of strategic capability (*STRAT*) to produce threat (*STHRET*) and support (*SMAID*) in the strategic sphere.

Both the threat and support measures that act directly on the calculation of the security position of the state are not those immediately calculated, but rather indices representing stock-like measures of expectations. Thus, at any time, the prevailing threat (*ETHR* for the conventional; *ESTHR* for the strategic) and support (*AAMAD* for the conventional; *SAMAD* for the strategic) situation acts to alter expectations that in the near future are used to assess the state's security position.

Included as well within the representation of the security dynamics influencing defense allocations is a goal for security that changes in light of performance (cf. Cyert and March 1963; Bremer 1977). This aspiration level is used to evaluate the security position of the state. The latter reflects a favorable or unfavorable balance between, on the one side, expected threat, and, on the other, the state's own capabilities in combination with the support it has come to expect from the international environment (*CONRA* on the conventional side; *STRRA* on the strategic). A discrepancy between desired and actual position generates a corresponding request for a modification in the present level of capabilities (cf. Bennett and Alker 1977).

### *Maintaining Operational Levels*

On the internal side, the principal dynamic behind the determination of the defense sector's minimum aspiration level for spending is the tendency of the defense bureaucracy to safeguard or expand its organizational scope, thus ensuring the parochial interests of its members. This tendency to preserve or expand operating levels and thus provide for intraorganizational security requires that the defense sector develop an estimate of the budgetary cost of maintaining or enhancing previous bureaucratic momentum. On both the conventional and nuclear strategic sides, this means that they need to take into account a minimum operating level coefficient, the existing stock of organizational capabilities (defined in capital and labor terms on the conventional side, and only in capital terms on the strategic side), the rate at which these capabilities depreciate, and the unit cost of replacement.

Within the model this process is captured by the defense sector fixing some level of capabilities that it wishes to have as a minimum during the succeeding budgetary period, estimating the level it would have given a fixed depreciation rate, estimating the unit cost that it will confront (this unit cost is known to move not only in line with general prices within the economy but to be subject to its own autonomous inflation), and calculating the budgetary requirements that follow from these considerations.

On the conventional side (an analogous process takes place on the strategic nuclear side), the unit cost of capabilities expected to be confronted, as well as the level of capabilities that will be available after depreciation (note that the capability index is meant to represent a composite of both labor and capital items with the former assumed to "depreciate" completely, i.e., the cost of all labor must be paid for completely within any budgetary period, while only a portion of capital is assumed to depreciate during any one period) need to be computed:

$$EUCD_n = UCD_n * (1 + ucdp1_n) \quad (5.12)$$

*EUCD* represents the expected cost of a conventional capability unit (corresponding variable on the strategic side is *EUCDS*), *UCD* is the prevailing unit cost (*UCDS* for strategic capabilities), and *ucdp1* is the autonomous rate of inflation in the conventional capability area (the analogue in the strategic area is *ucdp2*).

$$EPOW_n = ddr_n * POW_n \quad (5.13)$$

In the conventional area *POW* and *EPOW* represent, respectively, the present and expected stock of conventional capabilities, while *ddr* stands for the rate of survival in existing capabilities. The corresponding variables on the strategic side include *STRAT* and *ESTRAT* for present and expected strategic capabilities and *ddrs* for the rate of survival.

### *Military Spending Target*

With the capability requirements generated by both the security and organizational related processes, and with information on the amount of capabilities available after depreciation and the unit cost of replacement, the defense sector is capable of generating its minimum aspiration

level for defense spending in the coming budget. On the conventional side, the desired minimum is equal to:

$$TCDEXD_n = \left( dxcp1_n * EUCD_n * (POW_n - EPOW_n) \right) \quad (5.14) \\ + \left( dxcp2_n * EUCD_n * \left( ETHR_n - (CONRA_n \right. \right. \\ \left. \left. * (POW_n + AAMAD_n) \right) \right) \right) + dxcadj_n$$

Note that  $dxcp1$  is a parameter representing the minimum desired level of organizational scope, or in this instance, capabilities, based on bureaucratic considerations which are embodied in the difference between present and expected capabilities weighted by the cost of replacement. The corresponding parameter on the strategic side is  $dxsp1$ . The "increment" to conventional capabilities based on national security considerations is controlled by the parameter  $dxcp2$ . The term  $CONRA$  represents a goal level with respect to national security and acts to discount or enhance the subjective weight attributed to one's own capabilities and the support one expects from the international environment in countering threats from that same environment. The analogous goal on the strategic side is  $STRRA$ . Included as well within the equation is an adjustment term,  $dxcadj$ , which is initialized in the first iteration of the model in such a way as to take into account the discrepancy that may exist between observed tendencies in conventional military spending and the initial result deriving from the model's calculations. A similar adjustment term,  $dxsadj$  is present in the equation determining the target for strategic expenditures.

As I have noted in passing, an analogous formulation is used to represent the determination of desired minimum level of spending for strategic nuclear capabilities for those countries possessing such. One slight difference does exist. This is in the case of the three non-"superpower" states, the United Kingdom, France, and the People's Republic of China. Here the effects of security calculations have an impact only when an adverse position exists. When the consequences of security calculations would lead to reductions in outlays in this area, the input from the security area is set to zero and only the outcome of the bureaucratic momentum calculations plays an active role in shaping the desired spending target. The consequence of this determination,  $TSDEXD$ , is then employed to determine the overall level of military



spending deemed as a minimal aspiration on the part of the defense sector:

$$DESDEX_n = TCDEXD_n + TSDEXD_n \quad (5.15)$$

This minimum aspiration later enters the overall budgetary reconciliation and finalization process and, in conjunction with its component minima, is used in the allocation of funds across the two defense areas.

### **Formulating Foreign Aid Distribution Priorities**

#### *Assessing International Alignment and Need*

As mentioned in the discussion regarding Fig. 5.5 earlier, two processes are included within the foreign aid area. The first produces a spending target for the aid budget and the second deals with the allocation of the aid budget to a number of potential recipients. In both processes the interests of the donor play a central role in decision making. This is in keeping with the utilitarian notions that many argue to be the driving elements in foreign aid policy (cf. Frey 1984; Flemming 1985). The donor's interests are assumed to be reflected in the way in which potential recipients align themselves, both politically and economically, within the international system. On the political side, the degree of alignment is seen in "zero-sum" terms. Focus is on the cooperative behavior emitted by potential recipients. The more a potential recipient cooperates with the donor relative to the degree of cooperation it displays toward the donor's principal opponent within the international system (information generated within the defense/national security sectors), the more disposed the donor is to provide aid flows toward the recipient. On the economic side, trade dependence, reflected by the importance of the potential recipients to the donor, generates a disposition to provide more aid. In addition, "need" of particular donors, defined in income terms, is represented as playing a role in the disposition to allocate more or less aid to any particular recipient.

With respect to political alignment, the decision-making process requires information on the identity of the nation's principal international opponent. This information is provided by the defense/national security sector. Based on the threat assessment calculations, the state within the international system that presents the largest threat is designated as the principal opponent. In the off-chance that two or more

states are seen as most threatening, the selection criteria is shifted to an evaluation of the degree of hostile intent manifested by these equally threatening states. The state with the maximum hostile intent is then designated as the principal opponent.

Political alignment is then assessed by comparing the relative levels of cooperation that a potential recipient displays toward the donor and the donor's principal opponent:

$$CSCO_{rn,dn} = \frac{CSENT_{rn,dn}}{CSENT_{rn,x_{dn}}} \quad (5.16)$$

where  $rn$  is the potential recipient,  $dn$  is the donor,  $x_{dn}$  is the principal opponent of  $dn$ ,  $CSENT$  is the level of cooperation, and  $CSCO$  represents the alignment of an individual potential recipient.

The degree of alignment of all potential recipients ( $CSCOT$ ) is also assessed for use in the determination of the total aid budget. This is represented as simply the sum of the individual political alignment scores:

$$CSCOT_{dn} = \sum^{RN} CSCO_{rn} \quad (5.17)$$

A parallel assessment is made in the economic area. Here the concern is with the importance of individual potential recipients and the entirety of the recipients in terms of economic ties with the donor. The ties are defined in terms of the trade flows between the donor and the potential recipients. The relative economic alignment of any recipient is represented as its share of the total trade ( $PTRADE$ ) between the donor and the pool of potential recipients:

$$AATRAD_{dn} = \frac{BIMPS_{rn,dn} + BIMPS_{dn,rn}}{PTRADE_{dn}} \quad (5.18)$$

Finally, need is defined for use in helping to determine the share of the donor's total aid that will be allocated to each recipient. A potential recipient's need is assessed in relative terms. This is done by first calculating the average GNP per capita in the pool of potential recipients,  $APYP$  (in a common currency unit), and then specifying need as equal to the ratio of the average pool per capita income to the

per capita income of the potential recipient:

$$AIDNED_{rn} = \frac{APYP}{YP_{rn}} \quad (5.19)$$

$$\text{where } YP_{rn} = \frac{(GNP_{rn}/PINDX_{rn}) * DOLRX_{rn}}{TOPOP_{rn}}$$

where *AIDNED* represents the relative need of a potential recipient, *GNP* its gross national product in local currency, *PINDX*, the recipient's price deflator, *DOLRX*, the value of its currency in US dollars at prevailing exchange rates, and *TOPOP*, the recipient's total population.

#### *Distribution Priorities*

Two sets of decisions are made with the information generated as described above. The bureaucracy responsible for foreign aid first formulates a proposal for a total aid budget. This target or proposal will be used in the later reconciliation phase. The target budget reflects the degree to which the entirety of the potential aid recipient pool has shifted to or away from a base period alignment in terms of its political and economic orientation. This is captured in the following equation:

$$\begin{aligned} FAXD_n &= FAXT0_n * faxp2_n & (5.20) \\ &* (CSCOT_n/TSCOT_n)^{faxp3_n} \\ &* (PTRADE_n/PTRADT_n)^{faxp4_n} \end{aligned}$$

where *FAXD* is the target total foreign aid budget, *FAXT0* is the foreign aid budget in the initial year of the simulation, i.e., 1970, *CSCOT*, as defined above, is the assessment of the degree to which the total aid recipient pool is politically aligned with the donor at the time of the budget proposal formulation, *TSCOT* is its alignment in the base or initial year, *PTRADE*, as above, represents the trade dependence between the donor and the entirety of the aid recipient pool in the present year, and *PTRADT* is the trade dependence in the base year. The parameters, *faxp2*, *faxp3*, and *faxp4*, represent, respectively, a scaling constant, the elasticity for changes in political alignment, and the elasticity for changes in trade dependence. The general profile of the behavior across the donors is to reward increasing alignment and pun-

ish declines therein by targeting higher total aid budgets when political and economic ties are strengthened and lowering the targeted budget when ties deteriorate.

The second decision process focuses on the allocation of the foreign aid budget across the pool of potential aid recipients. A preliminary allocation is made by taking into account the relative need of each potential recipient, as well as the respective degrees of political and economic alignment. The following equation is used for this calculation:

$$\begin{aligned}
 AIDSHR_{dn, rn} = & fadcon_{dn, rn} * AIDNED_{dn, rn}^{fasp2n} & (5.21) \\
 & * AATRAD_{dn, rn}^{fasp3n} \\
 & * CSCO_{dn, rn}^{fasp4n}
 \end{aligned}$$

where *AIDSHR* represents the share of the donor's aid budget to be allocated to recipient *rn*, and *AIDNED*, *AATRAD*, and *CSCO*, are, respectively, the relative economic need of *rn*, and the trade and political alignment of *rn* toward the donor *dn*. The parameters, *fadcon*, *fasp2*, *fasp3*, and *fasp4*, represent a constant, and the elasticities for need, economic and political alignment. As with the total budget, closer alignment generally elicits an increasing share of aid. In addition, need tends to attract a greater share of the donor's aid. This initial calculation is modified to take into account other aid commitments on the part of the donor – commitments to other nations and to multinational aid organizations. The sum of the shares (*ASSUM*) determined by the initial calculation is used in conjunction with an assumed constant disposition to provide to these "rest of world" recipients, thus, the sum of the shares allocated to the GLOBUS recipients (*fags*, for each donor *dn*) is held constant. The *AIDSHR* values are readjusted to take this into account:

$$AIDSHR_{dn, rn} = \frac{AIDSHR_{dn, rn}}{ASSUM_{dn}} * fags_{dn} \quad (5.22)$$

The aid share allocated to the 26th entity in GLOBUS, the "rest of world," is thus equal to  $1 - fags$  for each donor, *dn*.

## Formulating Civilian Spending Targets

As noted previously, there are two major civilian expenditure categories for which aggregate minimum spending targets are generated. On the one side is that for civilian outlays, while on the other is capital outlays. The succeeding pages focus on the first category which includes elements of direct consumption by government as well as transfers from the government sector. Capital outlays are then dealt with.

### *Aggregate Civilian Spending Target*

In the model two parallel processes are represented in the development of spending targets for the civilian category. One represents the development of a minimal aspiration spending target for all exhaustive civilian items. The second represents the development of spending targets for particular programs and subprograms. The outcome of the first process is transferred to the overall budget reconciliation and finalization process while those that emanate from the second are used solely for the purpose of allocating the finalized civilian expenditure total amongst component programs and subprograms.

Spending by government for nonmilitary goods and services and in support of income transfers has come to be one of the principal items in modern budgets. In the main, the growth in this category of spending is held by many to depend upon incremental but persistent pressures from bureaucracies administering such programs, demographic developments in the form of a waxing clientele, and improvements in general economic well-being (see, e.g., Kelly 1977; OECD 1976a, 1976b, 1977; Wilensky 1975; Uusitalo 1984; Pryor 1968; Frantianni and Spinelli 1982; Bird 1970).

In generating a minimum spending target (*DNDCX*) in this area, four elements are considered. The first is the expected size of the demographic grouping that act as principal clients (*EXDPOP*) for this area of government activity. For all countries included within the model the retirement age population (+65) and the younger cohorts (age 0 to 24) are treated as clients. In the case of the developed market systems, the unemployed labor force is also included. The second element is a goal target with respect to service level. Service level (*SERLV*) is defined as the ratio of related program spending per member of clientele group in comparison with gross domestic product per capita. The service level goal (*SERLG*) adapts in light of performance in this area. The

third element, representing the state of economic well-being within society, gross domestic product per capita, acts in combination with these other variables. Finally, a parameter value,  $cxcpl_1$ , represents this sector's minimum desire for matching its goal performance level in light of changing economic and demographic conditions.

$$DNDCX_n = cxcpl_1 * SERLG_n * \frac{EGDP_n}{ETPOP_n} * EXDPOP_n + ndxadj_n \quad (5.23)$$

Included as well within Eq. 5.23 is an adjustment term,  $ndxadj$ , which is initialized in the first iteration of the model in such a way as to take into account the discrepancy that may exist between observed tendencies in civilian consumption and transfer spending and the initial result deriving from the model's calculations.

### *Social Transfer Spending Targets*

Parallel to the development of this minimum aggregate spending level aspiration, the major programs and subprograms in this area are represented as formulating spending level targets. These targets are used in the allocation of the finalized civilian spending total. Five major spending programs are included. This set contains social welfare transfer programs, education, public health, foreign aid, and administration.

There are three social welfare transfer categories: pensions, unemployment compensation, and other welfare spending. In each category a similar set of considerations are invoked in generating a spending target. These include demographic or clientele loads, considerations with respect to the generosity of the program, and the financial position of the entire social transfer scheme. In the pension area, expected retirement age population is the demographic target group. Expected unemployed, of course, serve as the focus of the compensation program. Total population serves as the reference demographic group for the third category, which includes such things as family allowances, public health insurance, etc.

Expected disposable personal income per capita ( $EDINC$ ) weighted by a matching goal ( $WGTP$ ,  $WGTU$ , and  $WGTO$ ), which adapts with experience, sets the basic generosity level of each program. Pressure which allows that to expand or contract emanates from considerations

with respect to a comparison between a target for the degree to which social welfare programs should be self-financing (*WFG*) and the actual present level of self-financing. Each of the three spending targets are generated on the basis of a similar formulation:

$$PENDING_n = wbp1_n * (WGTP_n * EDINC_n * (RAPOP_n + RAPOP'_n))^{wbp2_n} * WFG_n^{wbp3_n} \quad (5.24)$$

$$UNCOMD_n = wbp4_n * (WGTU_n * EDINC_n * EUNL_n)^{wbp5_n} * WFG_n^{wbp6_n} \quad (5.25)$$

$$OWBD_n = wbp7_n * (WGTO_n * EDINC_n * ETPOP_n)^{wbp8_n} * WFG_n^{wbp9_n} \quad (5.26)$$

where  $WFG_n = \frac{WELCON_n / WELBEN_n}{WFTAR_n}$

and  $WBD_n = PENDING_n + UNCOMD_n + OWBD_n$

### *Civilian Government Consumption Spending Targets*

In the area of education the model includes representations of two programs. One deals with education at the primary and secondary levels, while the other focuses on advanced education – for the most part, university level. As with the other programmatic spending elements in the model, a variety of factors shape and influence the allocation of resources to this area. In terms of the specification of target spending levels for both programs, the principal factors at work include demographic, economic, program performance, and bureaucratic forces.

In both educational programs the cost of educating a student plays a significant role. Cost in both sectors is determined by economic conditions and the prevailing scope of services. As detailed below, these costs rise as a consequence of increasing general economic well-being and

the expansion of coverage across relevant demographic cohorts (OECD 1966b). The former effect generally follows from improvements in the quality of educational service that accompanies development (Simon and Pilarski 1979), while the latter reflects the marginally increasing expense of providing universal service in this area (MacMahon 1970). At the primary and secondary levels, then, the expected cost per student (*ECOSTE*) increases as overall income increases and as the scope of enrollments expands. These effects are captured by comparing anticipated income per capita (*EGDP/ETPOP*) against the level that prevailed in the initial period (*YCIN*) and taking the ratio of the present enrollment ratio (*ERED*) to the enrollment ratio in the initial period (*TERT*). In combination with the associated elasticities (*cedp2* and *csp2*), these factors are then multiplied by the initial cost per student at this level of education (*CEDP1*) and a constant (*csp1*). An analogous formulation is used at the tertiary level in calculating the expected cost (*ECOSTT*).

$$ECOSTE_n = csp1_n * cedp1_n \quad (5.27)$$

$$* \left( \frac{EGDP_n/ETPOP_n}{YCIN_n} \right)^{cedp2_n} * \left( \frac{ERED_n}{TERT_n} \right)^{csp2_n}$$

$$ECOSTT_n = uepar1_n * ctp1_n \quad (5.28)$$

$$* \left( \frac{EGDP_n/ETPOP_n}{YCIN_n} \right)^{ctp2_n} * \left( \frac{ERT_n}{TERT_n} \right)^{uepar2_n}$$

These costs combine with an aspiration level for enrollment scope based upon previous experience (*EENP1* and *EENP2*), expected demographic burdens (*ESAP* and *ESAPT*), and parameters reflecting the educational bureaucracies' base tendency to alter the standard of performance (*edp1*, *edp2*) to produce spending targets. Thus, the primary and secondary education spending target (*PEDXD*) as well as that for the tertiary level (*TEDXD*), which together combine to produce the overall education spending target (*EDXD*), are:

$$PEDXD_n = edp1_n * EENP1_n * ESAP_n * ECOSTE_n \quad (5.29)$$



$$TEDXD_n = edp2_n * EENP2_n * ESAPT_n * ECOSTT_n \quad (5.30)$$

where  $EDXD_n = PEDXD_n + TEDXD_n$

The public health expenditure target is shaped by a similar constellation of forces. Demographic burdens, an income effect, and bureaucratic momentum combine to produce a spending target (cf. Maxwell 1981). Expected total population ( $ETPOP$ ) is treated as the clientele. Changes in societal wealth are assumed to prompt expansion of the level of services. A per capita service target ( $HEXPT$ ), based upon adaptation to previous service levels, and a basic propensity to seek improvement in performance levels ( $hexp1$ ) serve to complete the definition of the public health spending target.

$$HEXD_n = hexp1_n * HEXPT_n * ETPOP_n \quad (5.31)$$

$$* \left( \frac{EGDP_n / ETPOP_n}{YCIN_n} \right)^{hexp2_n}$$

Administrative expenditures, a residual item in the accounts of non-defense government consumption, is the last category for which a spending target is generated within this part of the model. It is assumed that this element represents the costs of operating various regulative programs and supporting the infrastructure required to sustain other governmental programs. The spending target, then, is represented as moving in conjunction with other major program aspirations. Within the model, the relevant comparison is made with the combined target for other exhaustive civilian outlays ( $ADBSD$ ). The target figure is a weighted value of these combined targets:

$$ADX D_n = adxp1_n * ADBSD_n \quad (5.32)$$

where  $ADBSD_n = WBD_n + EDXD_n + HEXD_n + FAXD_n$

Finally, the individual program targets in both the transfer and

civilian consumption areas are aggregated in *DNDEXP* for use in the final allocation of expenditures within the resolution phase (RECONC) of the budgetary process.

$$DNDEXP_n = WBD_n + EDEX_n + HEXD_n + ADXD_n + FAXD_n \quad (5.33)$$

#### *Capital Spending Target*

The target for capital spending is represented as deriving mainly from a basic propensity on the part of government to allocate a certain share of societal income toward increasing or maintaining productive capital stock. The capital target is portrayed as subject to this sector's own minimal aspiration for maintaining previous levels of resources and a tendency to respond to an unfavorable discrepancy between desired and actual economic performance. The formulation of the latter is incorporated in the following:

$$GRPROB_n = \max(0, MAVRY_n - GDPRIg_n) \quad (5.34)$$

where *MAVRY* is an adaptive target for the rate of growth in gross domestic product and *GDPRIg* is the actual growth rate. The stimulus, *GRPROB* is added to bureaucratic minimum aspiration parameter (*dgip1*) and employed in the calculation of the minimum spending target for capital:

$$DGINV_n = \left( (dgip1_n + GRPROB_n) * \frac{GIXIN_n}{GDPIN_n} * EGDP_n \right) + gixadj_n \quad (5.35)$$

where *GIXIN* and *GDPIN* are the initial values of government investment and gross domestic product. Also included within the equation is an adjustment term, *gixadj*, which is initialized in the first iteration of the model in such a way as to take into account the discrepancy that may exist between observed tendencies in capital spending and the initial result deriving from the model's calculations.

## Reconciling Competing Aspirations and Finalizing the Expenditure Side of the Budget

### *Reconciliation and the Zone of Contention*

To this point, four independent processes have worked to generate aspiration levels for major spending aggregates. From the top, the political leadership has formulated a maximum target with respect to total spending (net of required debt management payments). Three major bureaucracies have simultaneously formulated minimum spending targets for their specific areas, viz. defense, civilian, and capital. All of these processes represent the first of two major steps in the finalization of the broad aggregates of the expenditure side of the forthcoming budget.

The second major step is the reconciliation of any conflict that is inherent in these independently generated aspirations. In the resolution stage, the general outcome of the budgetary process with respect to any component reflects not only the autonomously generated aspiration for that component, but also mirrors the aspirations held by other sectors, the constraints placed on total spending, and the budgetary bargaining power of the major actors involved (cf. Fischer and Crecine 1981; Fischer and Kamlet 1984; Cusack 1985a, 1986).

The reconciliation and finalization equations take the following form:

$$\begin{aligned}TOTEX_n = & DESDEX_n + DNDCX_n + DGINV_n \quad (5.36) \\ & + (top1_n * (DTOTEX_n - DESDEX_n \\ & - DNDCX_n - DGINV_n))\end{aligned}$$

$$\begin{aligned}DEX_n = & DESDEX_n \quad (5.37) \\ & + (top2_n * (DTOTEX_n - DESDEX_n \\ & - DNDCX_n - DGINV_n))\end{aligned}$$

$$\begin{aligned}
 NDEXN_n &= DNDCX_n & (5.38) \\
 &+ (top3_n * (DTOTEX_n - DESDEX_n \\
 &- DNDCX_n - DGINV_n))
 \end{aligned}$$

$$\begin{aligned}
 GIXN_n &= DGINV_n & (5.39) \\
 &+ (top4_n * (DTOTEX_n - DESDEX_n \\
 &- DNDCX_n - DGINV_n))
 \end{aligned}$$

With the identity that must hold, i.e.,

$$TOTEXN_n = DEXN_n + NDEXN_n + GIXN_n \quad (5.40)$$

one of these equations is, of course, superfluous. Together, however, they help one comprehend the process by which the reconciliation is achieved.

The terms, *top2*, *top3*, and *top4*, are parameters that represent the bargaining strength or power of each of the spending bureaucracies. It should be noted that certain restrictions hold with respect to these parameters. First, the sum of the three must be within the range of zero to one, inclusive. Second, each of the parameters must be greater than or equal to zero. Third, the sum of the three must be equal to *top1*. Thus, the value of  $1 - top1$  can, in turn, be viewed as the bargaining power of fiscal authorities.

The implications of the reconciliation system of equations and the restrictions on the parameters of the system provide for some interesting insights into the allocational process. For example, in the case of one of the three individual spending items, a value of zero attributed to its associated parameter would imply that the sector would receive the minimum level to which it aspires. There are two possible regimes which are associated with instances where the parameter is greater than zero. In the instance where slack is present, i.e.,

$$DTOTEX_n > (DESDEX_n + DNDCX_n + DGINV_n) \quad (5.41)$$

then the "zone of contention," represented by

$$top1_n * (DTOTEX_n - DESDEX_n - DNDCX_n - DGINV_n) \quad (5.42)$$

would be available to be added to its minimum spending target in direct proportion to the value of its associated bargaining power parameter value. On the other hand, under the regime where the minimum aspiration levels are higher than the fiscal authorities desired maximum, i.e.,

$$DESTOT_n < (DESDEX_n + DNDCX_n + DGINV_n) \quad (5.43)$$

the sector's "fair share" cut from its minimum would be equal to its bargaining power coefficient times the amount represented by the value included within the "zone of contention."

For monitoring purposes a variable is defined to represent the relative presence or absence of slack:

$$SLACK1_n = top1_n * \left( 1 - \frac{DESDEX_n + DNDCX_n + DGINV_n}{DTOTEX_n} \right) \quad (5.44)$$

Since it is assumed that the model will be used for experimental purposes, an auxiliary process is appended to the reconciliation sector which allows the user to minimize the untoward effects of exaggerated parameter settings or alternative structures. This routine can be invoked by giving a nonzero value to a parameter, *mxcpar*.

$$MAXCUT_n = \min \left( mxcpar_n, \frac{TOTEX_n}{TOTEX_n - GDMAN_n} \right) \quad (5.45)$$

Effectively, when *mxcpar* is greater than the ratio of the newly budgeted total expenditures to the present level of total spending (where both totals are net of debt management payments), a major budgetary crisis is being confronted and the auxiliary process overrides the reconciliation outcomes supplied in Eqs. 5.36-5.39. *MAXCUT* is a proportional adjustment term which is then applied to each of the three major budget aggregates, defense, civilian, and capital, in a way such as to produce new, but tentative allocations:

$$DEXN_n = \max(MAXCUT_n * DEX_n, DEXN_n) \quad (5.46)$$

$$NDCHEK_n = WELBEN_n + EDX_n + HEX_n + ADX_n + FAX_n \quad (5.47)$$

$$NDEXN_n = \max(MAXCUT_n * NDCHEK_n, NDEXN_n) \quad (5.48)$$

$$GIXN_n = \max(MAXCUT_n * GIX_n, GIXN_n) \quad (5.49)$$

To arrive at the final allocations, the gap (*RECONC*) between the sum (*BBASE*) of these tentative allocations and the previously generated total (*TOTEXN*) needs to be computed:

$$BBASE_n = DEXN_n + NDEXN_n + GIXN_n \quad (5.50)$$

$$RECONC_n = TOTEXN_n - BBASE_n \quad (5.51)$$

The gap is then used to readjust the tentative allocations to produce final values:

$$DEXN_n = DEXN_n + \left( \frac{DEXN_n}{BBASE_n} * RECONC_n \right) \quad (5.52)$$

$$NDEXN_n = NDEXN_n + \left( \frac{DEXN_n}{BBASE_n} * RECONC_n \right) \quad (5.53)$$

$$GIXN_n = GIXN_n + \left( \frac{GIXN_n}{BBASE_n} * RECONC_n \right) \quad (5.54)$$

The logic of this set of mechanisms works to dampen excessive shifts

in allocation patterns. As an auxiliary to all of the previously defined budgetary mechanisms, it can be easily justified in terms of arguments based on the behavioral theory of organizations which impute to firms, governments, etc., an inherent conservatism vis-à-vis environmental stimulants and extreme slowness in major readjustments of internal organization (cf. Cyert and March 1963; Nelson and Winter 1982).

One other set of mechanisms is executed during the initial time step of a model run. These override the reconciliation phase by placing the major aggregates along observed historical trajectories relative to gross domestic product and calculating the differences between the products of the initial operation of the model and these trajectories. The differences are themselves then continuously used to adjust the target spending mechanisms for the major aggregates. This adjustment process is needed for two reasons. First, the difficulties of deriving precise parametric values for the major equations suggested the need for additional information to be incorporated within the model. Second, the possibility of altering initial conditions throughout any part of the larger model could unwittingly lead to major imbalances which could work untoward effects upon the results generated by the model. By incorporating these adjustment mechanisms the effects of both these conditions can be minimized. Executed only during the initial iteration of the model, the elements of this set of adjustment mechanisms take a similar form. In the case of total expenditure, the outcome of the reconciliation phase is compared with that which holds given an exogenously supplied income elasticity ( $tadje$ ) and the real growth rate in income supplied by the domestic economic model. The difference between the two is used as a parameter in the formulation of the desired total equation in later time steps and the calculated total is substituted for that which was generated in the reconciliation equation above.

$$TOTEXA_n = \left( 1 + (GDPRIG_n * tadje_n) \right) * (TOTEX_n - GDMAN_n) \quad (5.55)$$

$$totadj_n = TOTEXA_n - TOTEXN_n \quad (5.56)$$

$$TOTEXN_n = TOTEXA_n \quad (5.57)$$

The same form of adjustment and substitution takes place in the defense area where both spending for conventional and strategic sectors are required.

$$DEXA_n = \left(1 + (GDPRIg_n * dadj_e_n)\right) * DEX_n \quad (5.58)$$

$$dxcadj_n = (DEXA_n - DEXN_n) * \left(1 - \frac{DEXSTR_n}{DEX_n}\right) \quad (5.59)$$

$$dxsadj_n = (DEXA_n - DEXN_n) * \frac{DEXSTR_n}{DEX_n} \quad (5.60)$$

$$DEXN_n = DEXA_n \quad (5.61)$$

The aggregate of civilian consumption and transfers is similarly dealt with.

$$NDXA_n = \left(1 + (GDPRIg_n * cadj_e_n)\right) * NDEX_n \quad (5.62)$$

$$ndxadj_n = NDXA_n - NDEXN_n \quad (5.63)$$

$$NDEXN_n = NDXA_n \quad (5.64)$$

And, finally, the government investment area undergoes the same adjustments.

$$GIXA_n = \left(1 + (GDPRIg_n * iadj_e_n)\right) * GIX_n \quad (5.65)$$

$$gixadj_n = GIXA_n - GIXN_n \quad (5.66)$$



$$GIXN_n = GIXA_n \quad (5.67)$$

The adjustment parameters, *totadj*, *dxcadj*, *dxsadj*, *ndxadj*, and *gixadj*, are incorporated within all later calculations of the relevant target spending figures.

This completes the discussion of the elements and processes contained within the first part of the reconciliation phase. Now that the major spending aggregates have been determined for the coming budget, their allocation amongst the specific programs within the defense and civilian sectors must take place. Discussion now turns to these processes.

#### *Distributing Across Budgetary Programs*

In this phase the model decomposes the finalized defense spending figure for the upcoming budget and allocates it across a number of expenditure categories. For most countries the only decision here is the split between purchases of capital and payment for labor. For the five countries treated as having strategic nuclear forces a prior allocation choice has to be made between spending for the acquisition of strategic capabilities and spending for conventional forces. This strategic/conventional split is based on relative performance in the two sectors. Relative performance is assessed by taking into account the ratio goals in the two areas (*RLSEC*) in comparison with the initial ratio goal (*rlseci*). *RLSEC* is defined as:

$$RLSEC_n = \frac{CONRA_n}{CONRA_n + STRRA_n} \quad (5.68)$$

The conventional share of the new military budget (*CONSHN*) is adjusted by comparing present versus initial performance and taking into account the revealed preference for conventional outlays in the initial period (*conshi*). Additionally, it is bracketed by two extreme values which prevent either of the two sectors, conventional or strategic, from receiving zero allocations:

$$CONSHN_n = \max \left( .01, \min \left( \frac{RLSEC_n}{rlseci_n} * conshi_n, .99 \right) \right) \quad (5.69)$$

Spending, then, for the conventional area is equal to the new alloca-

tion share times the defense total that emerged from the reconciliation phase:

$$DXCONN_n = DEXN_n * CONSHN_n \quad (5.70)$$

and the strategic budget is the remainder:

$$DEXSTRN_n = DEXN_n - DXCONN_n \quad (5.71)$$

Allocations in the conventional area follow from an assessment of the capabilities that can be purchased with the new conventional budget and the level of extant capabilities that will continue to exist:

$$TPOW_n = \frac{DXCONN_n}{EUCD_n} + (ddr_n * POW_n) \quad (5.72)$$

The division of the conventional budget depends upon the desired capital/labor ratio ( $dklr$ ). In order to specify the labor and capital spending categories, the amount of labor required is first specified:

$$NLAB_n = \left( \frac{1}{dklr_n^{powels_n}} \right) * TPOW_n \quad (5.73)$$

The labor budget is then set equal to:

$$DEXLN_n = \frac{NLAB_n * EUCD_n * dklr_n * powels_n}{2} \quad (5.74)$$

The capital budget is the residual of the conventional category of spending:

$$DEXKN_n = DXCONN_n - DEXLN_n \quad (5.75)$$

In an earlier phase two parallel processes were invoked in the area of civilian spending. One generated a target spending figure ( $DNDCX$ ) for the entire area while the second developed spending targets ( $WBD$ ,  $EDXD$ ,  $HEXD$ ,  $ADXD$ , and  $FAXD$ ) for the various major categories and subcategories of spending in this area. With the finalization of

the total spending figure (*NDEXN*) for this budgetary area that was developed in the major spending aggregates reconciliation phase, the civilian program allocation process undertakes to determine program spending levels.

Here the major spending categories are first determined. The principle employed in this allocation process is a modified form of Machiavellianism. A program's desired spending target share, equal to the ratio of its spending target to the sum of the spending targets across the area, plays an important role in the determination of its new budget. Two other elements modify the impact of aggressive budgeting here. The first is the share allocated in the present budget to the particular category and the second is a parameter, *dampner*, ranging between zero and one, that, dependent upon its setting, constrains the extent to which a discrepancy between the desired share and the existing share is covered within the new budget. The process takes the following form. An initial calculation of the final figure is made based on the present share, the ratio of the program target to the sum of the program targets, the allocated total figure, and the dampening factor. The initial allocation is finalized by assuring that the sum of the initial allocations do not exceed the total for the area.

$$InitAlloc_{n,b} = \left( \frac{TargetShare_{n,b}}{ProgShare_{n,b}} \right)^{dampner_n} * ProgShare_{n,b} * NDEXN_n \quad (5.76)$$

$$FinalAlloc_{n,b} = \frac{InitAlloc_{n,b}}{\sum^B InitAlloc_{n,b}} * NDEXN_n \quad (5.77)$$

Here *TargetShare* is equal to the program's target figure divided by *DNDEXP*, the sum of the program spending targets (*WBD*, *EDXD*, *ADXD*, *HEXD*, plus *FAXD*). *ProgShare* is the program's present share of spending in this area, *NDEXN* is the total for the area generated in the reconciliation phase, and *dampner* is the adjustment term.

The welfare transfers budget (*WBA*) is a notional figure which is used to determine the spending figure per client under the new budget.

The per client pension, unemployment compensation, and other welfare program spending levels ( $WBPCN$ ,  $WBUCN$ , and  $WBOCN$ , respectively) are set as follows (with the actual outlays ultimately determined by the client load during the implementation of the budget):

$$WBPCN_n = \frac{(PEND_n/WBD_n) * WBA_n}{RAPOP_n + RAPOP'_n} \quad (5.78)$$

$$WBUCN_n = \frac{(UNCOMD_n/WBD_n) * WBA_n}{EUNL_n} \quad (5.79)$$

$$WBOCN_n = \frac{(OWBD_n/WBD_n) * WBA_n}{ETPOP_n} \quad (5.80)$$

Finally, the total education budget is allocated across the two programs, primary/secondary and higher:

$$PSSHR_n = \frac{EDXPS_n}{EDX_n} \quad (5.81)$$

$$PSSHRN_n = \frac{PEDXD_n}{EDXD_n} \quad (5.82)$$

$$EDXPSN_n = \left( \frac{PSSHRN_n}{PSSHR_n} \right)^{damper_n} * PSSHR_n * EDXA_n \quad (5.83)$$

$$EDXTN_n = EDXA_n - EDXPSN_n \quad (5.84)$$

This completes the reconciliation and finalization phase for the expenditure side of the newly formed budget. At this juncture the model

begins the process of formulating revenue decisions.

## Taxation Decisions

### *Revenue Target*

This phase deals with taxation decisions. As noted previously, during any iteration the spending decisions generated within the processes described above are directed toward actions to be taken in the next budgetary period. Significant constraints are placed on the expenditure development process within the model since tax rates are already fixed for that time. Decisions regarding tax rates are represented as being targeted for implementation with an even longer lag, i.e., two budgetary periods ahead. This asymmetry between the timing of expenditure and taxation decisions is meant to reflect the relatively slower and more difficult process of adjusting the rate of extraction of resources from society.

In summary form, the process represented is one where fiscal authorities develop a target total revenue level, evaluate whether that target is within a "reasonable range," modify it if not so as to bring it into that range, then assess what revenues are likely to be collected given existing tax rates, and, finally, alter those rates if there is a shortfall or surplus under those prevailing rates. Generally, the initial target revenue figure is derived from an expected level of societal income, an associated propensity to "consume" or "extract" on the part of government, and the flexibility of the tax system, i.e., how readily government is able to adjust to its target. In addition, in the developed market systems, debt considerations are represented as playing a role: with government attempting to decrease future debt burdens by adjusting its extractive effort upwards. Centrally planned systems are represented as using extractive devices to help cope with foreign trade imbalances.

The general form of the target revenue equation is as follows:

$$\ln TR_t - \ln TR_{t-1} = a(\ln \widehat{TR}_t - \ln TR_{t-1}) \quad (5.85)$$

where  $TR$  stands for the target,  $\widehat{TR}$  represents the desired level given variables shaping the decision-makers' preferences, and  $a$  embodies the adjustment speed with which the system can move toward these preferences, in other words, the flexibility of the extractive apparatus.  $\widehat{TR}$ , representing decision-makers' preferences for the extraction level, is var-

iously composed, depending upon the system under consideration, but takes the general form:

$$\widehat{TR}_t = A * Y_t^{b_1} * D_t^{b_2} * T_t^{b_3} \quad (5.86)$$

where  $A$  represents a constant,  $b_1$  through  $b_3$  are parameters,  $Y$  represents societal income, or GDP,  $D$  represents the debt burden, i.e., government debt as a proportion of GDP, and  $T$  stands for the trade balance, i.e., the ratio of imports to exports.

Within the model, the general form for the determination of the initial revenue target takes the following form:

$$\begin{aligned} \ln TARREV_n = \ln EGVREV_n + & \left( e\text{gpar}3_n \right. & (5.87) \\ & * \left( \ln(e\text{gpar}1_n * E2GDP_n^{e\text{gpar}2_n} \right. \\ & * AGDEBT_n^{e\text{gpar}4_n} * EXTBAL_n^{e\text{gpar}5_n}) \\ & \left. \left. - \ln EGVREV_n \right) \right) \end{aligned}$$

$$\text{where } EXTBAL = \frac{IMPRTN_n}{EXPRTN_n + FORAID_n} * PINDX_n$$

where  $TARREV$  is equal to the initial target revenue for two budgetary periods ahead,  $EGVREV$  is the expected revenues in the next budgetary period,  $E2GDP$  is the expected level of GDP two periods ahead,  $AGDEBT$  is a non-negative ratio of government debt to GDP, and  $(IMPORT/EXPORT)$  represents the trade balance.

The permissible range of extraction by government is assumed to be time dependent. The maximum and minimum shares of GDP are defined as follows:

$$GRRMAX_n = GRRINT_n * \exp(\text{rgpmax}_n * t) \quad (5.88)$$

$$GRRMIN_n = GRRINT_n * \exp(\text{rgpmin}_n * t) \quad (5.89)$$

where  $GRRINT$  represents the initialized revenue to GDP ratio,  $t$  stands for number of periods since the start of the simulation, and

*rgpmax* and *rgpmin* are parameters defining the change in the allowable ceiling and floor for revenue extraction. The target share is defined as:

$$DGRRAT_n = \frac{TARREV_n}{E2GDP_n} \quad (5.90)$$

The finalized target revenue share is determined in the following way:

$$PGRRAT_n = \max(GRRMIN_n, \min(DGRRAT_n, GRRMAX_n)) \quad (5.91)$$

with the level of target revenues defined as:

$$TARREV_n = PGRRAT_n * E2GDP_n \quad (5.92)$$

#### *Adjusting Specific Tax Rates*

At this point a forecast of expected revenues is developed based on the tax rates that will prevail during the forthcoming budgetary period and the expected tax revenue bases. Expected general revenues are first calculated. To do this, four general revenue flows are forecasted. These include the expected indirect taxes (*E2ITAX*), the personal taxes (*E2PTAX*), business taxes (*E2BTAX*), and government profits (*E2GPRO*):

$$E2ITAX_n = E2GDP_n * ITR_n \quad (5.93)$$

$$E2KDP_n = kdarat_n * (E2GDP_n - E2ITAX_n) \quad (5.94)$$

$$E2PINC_n = pishar_n * (E2GDP_n - E2ITAX_n - E2KDEP_n) \quad (5.95)$$

$$E2PTAX_n = PTR1_n * E2PINC_n^{ptr2_n} \quad (5.96)$$

$$E2BPRO_n = bpshar_n * (E2GDP_n - E2ITAX_n - E2KDEP_n - E2PINC_n) \quad (5.97)$$

$$E2BTAX_n = BTRN_n * (E2BPRO_n + EKDEP_n) \quad (5.98)$$

$$E2GPRO_n = E2GDP_n - E2ITAX_n - E2KDEP_n - E2PINC_n - E2BPRO_n \quad (5.99)$$

The rate of contributions to social welfare programs is altered independently of direct general revenue considerations and is then used to help define expected total revenues. The principal force at work here is the desire to minimize the difference between a desired and actual level of self-financing, or independence from general revenues:

$$WCR2_n = WCRN_n * \left( \frac{WFTAR_n}{EWCON_n/WBA_n} \right)^{wcrpar_n} \quad (5.100)$$

The expected level of revenues from welfare contributions is thus defined:

$$E2WCON_n = WCR2_n * E2PINC_n \quad (5.101)$$

Where appropriate, an expected level of foreign aid receipts also comes into consideration. The expected level of revenues is then:

$$E2TREV_n = E2ITAX_n + E2PTAX_n + E2BTAX_n + E2GPRO_n + E2WCON_n + EFAREV_n \quad (5.102)$$



A discrepancy (*SHORT*) between the target revenue level and the level of expected revenues is defined as:

$$SHORT_n = TARREV_n - E2TREV_n \quad (5.103)$$

A nonzero value for *SHORT* invokes rate changes in the general revenue area. The extent to which any rate is altered depends upon the size of the discrepancy manifested in *SHORT*, the size of the expected base, the tax rate that will prevail in the next budgetary period, and, finally, the authorities' dependence upon the particular tax instrument. The process of adjusting the three general revenue tax rates proceeds recursively with the indirect tax rate first altered and the factor income consequences computed:

$$ITR2_n = ITRN_n + itrpar_n * \frac{SHORT_n}{E2GDPF_n} \quad (5.104)$$

$$E2ITAX_n = ITR2_n * E2GDPF_n \quad (5.105)$$

$$E2KDEP_n = kdarat_n * (E2GDP_n - E2ITAX_n) \quad (5.106)$$

$$E2PINC_n = pishar_n * (E2GDP_n - E2KEP_n - E2ITAX_n) \quad (5.107)$$

The new average personal tax rate can then be computed in light of the anticipated gap, the factor income consequences in terms of household income, anticipated rates, and the reliance on personal taxes as a revenue source:

$$PTEFR2_n = \frac{PTR1N_n * E2PINC_n^{ptr2_n}}{E2PINC_n} + \left( ptrpar_n * \frac{SHORT_n}{E2PINC_n} \right) \quad (5.108)$$

$$PTR12_n = \frac{PTEFR2_n * E2PINC_n}{E2PINC_n^{ptr2_n}} \quad (5.109)$$

Finally, the business tax rate can be adjusted:

$$E2BPRO_n = bpshar_n * (E2GDP_n - E2KDP_n - E2ITAX_n - E2PINC_n) \quad (5.110)$$

$$BTR2_n = BTRN_n + \left( btrpar_n * \frac{SHORT_n}{E2BPRO_n + E2KDEP_n} \right) \quad (5.111)$$

This completes the description of the processes representing the development of the budget within the government resource allocation model. These represent the last major substantive elements of the model, and so attention now turns to the specification of the initial values and parameters.

## PARAMETERS AND INITIAL VALUES

This section provides information on the initial values and parameters used within the budgetary model. In the first part of the section the main sources employed in initializing the model and in developing parameters for it are briefly described. After that, the values of the state and a number of the defined variables associated with government income and debt, along with parameters used to regulate behavior with respect to revenue decisions, are discussed. The last part presents the variables characterizing the expenditure side of the budget (and related items) along with the parameters used to regulate outlay decisions.

### SOURCES

A fairly extensive set of sources were used to initialize the model and to develop many of the model's parameters. In the main, *OECD National Accounts Statistics* annuals, *OECD Revenue Statistics of Member Countries* annuals, the *OECD annual Development Reports* and *Geo-*

*graphical Distribution of Foreign Aid*, and the United Nations *Yearbooks of National Accounts and Statistical Yearbooks*, served as the principal sources for the industrialized democracies. With respect to the centrally planned economies, a wide variety of specialized monographs and statistical reports were used to supplement data provided in official national publications, United Nations *Yearbooks of National Account Statistics* and *Statistical Yearbooks*, periodically issued reports by the Joint Economic Committee of the U.S. Congress, the *Occasional Papers* of L.W. International Financial Research, Inc., and World Bank reports. The UN yearbooks, the IMF *Government Finance Statistics* annuals, and the various *World Bank Tables* were used to supplement official national publications, specialized monographs and statistical reports in the construction of budgetary aggregate values for the developing countries. Other primary sources generally used across regions included the *Statistical Yearbooks* of UNESCO, the SIPRI *Yearbooks on World Armament and Disarmament*, the IISS *Military Balance*, the ILO's periodically issued *The Costs of Social Security* and *The Costs of Social Security: Basic Tables*, and tapes supplied by the UN Office for Development Research and Policy Analysis, the Correlates of War Project, and the World Bank.

Data based on the original accounting framework for GLOBUS (see Bremer and Cusack 1981) are stored within the GLOBUS Sir Data Base System. More extensive holdings used to supplement these series are stored within a Budgetary Data Base System (see Cusack, Flemming, and Zimmer 1985).

## **REVENUES AND DEBT**

The government sector's revenues are defined as flowing from four tax sources (indirect taxes, business taxes, welfare contributions, and personal taxes) and also include two nontax sources, government profits and, where relevant, foreign aid receipts. Table 5A.1 provides an overview of the initial total government revenue situation for each of the GLOBUS countries. Presented there are the initial values of the sum of government revenues in local currency (*GOVREV*) and the more useful indicator, from a comparative perspective, the initial share of gross domestic product represented in government revenues (*GRGDP*).

Indirect taxes are composed of mainly value-added, sales, and excise

taxes. Included as well are a variety of minor nondirect tax components, while subtracted from the total are subsidies to nongovernmental sectors. In order to insure that aggregates within the domestic economic sector are properly specified, the values for indirect taxes are actually initialized within the domestic economic sector, which precedes in sequence the initialization of the budgetary model. Indirect taxes (*INDTAX*) are set equal to the initialized indirect tax rate (*ITR*) times the initialized base:

$$INDTAX_n = ITR_n * \frac{gdpin_n}{1 + ITR_n} \quad (5.112)$$

In the simulation run tax decisions are made during any iteration for two budgetary periods forward. This requires that values for indirect tax rates for the initialization period +1 (*ITRN*) also be initialized. The initialized variables relating to indirect tax levels and rates are reported in Table 5A.2.

Business taxes are levied against the profits of the corporate sector. The initial year's business taxes (*BUSTAX*) are initialized and the business tax rate (*BTR*) computed in light of factor income aggregates initialized within the economic sector:

$$CDEPAL_n = kdarat_n * (gdpin_n - INDTAX_n) \quad (5.113)$$

$$PERINC_n = pishar_n * (gdpin_n - CDEPAL_n - INDTAX_n) \quad (5.114)$$

$$BPRO_n = bpshar_n * (gdpin_n - INDTAX_n - CDEPAL_n) \quad (5.115)$$

$$BTR_n = \frac{BUSTAX_n}{CDEPAL_n + BPRO_n} \quad (5.116)$$

From national accounts and budgetary information the observed business tax rate for the succeeding period (*BTAXRN*) is used in combination with the observed business tax rate for the initial year

(*BTAXR*) to initialize the next period's business tax rate (*BTRN*):

$$BTRN_n = \frac{BTAXRN_n}{BTAXR_n} * BTR_n \quad (5.117)$$

The initialized level of business tax receipts as well as the computed values for the initial and second period business tax rates are reported in Table 5A.3.

Welfare contributions (*WELCON*) are government income directly used to finance social welfare programs. The base for this tax is represented as the gross, pretransfer income of the household sector (*PERINC*). Both the initial period's welfare contributions rate (*WCR*) and the succeeding period's rate are calculated on the basis of the initialized value of receipts and the base:

$$WCR_n = \frac{WELCON_n}{PERINC_n} \quad (5.118)$$

$$WCRN_n = \frac{WCONRN_n}{WCONR_n} * WCR_n \quad (5.119)$$

where *WCONR* and *WCONRN* represent the rates observed for the initial and succeeding years. The initial level of welfare contributions receipts and the computed tax rates are presented in Table 5A.4.

Personal taxes (*PERTAX*) are general fund government revenues that also derive from the gross, pretransfer income of the household sector (*PERINC*). For any period two values are needed to compute the effective personal tax rate; these include a measure of the elasticity of the personal tax system (*ptr2*), a constant for each nation's tax system, and a base rate that is variable (*PTR1*). Estimates of *ptr2* are based on analysis of the behavior of national personal tax developments during recent times (see Bremer and Cusack 1981). The first year's value of *PERTAX* and the parameter *ptr2* are initialized and the base rate is computed:

$$PTR1_n = PERTAX_n * PERINC_n^{-ptr2_n} \quad (5.120)$$

The base rate for the succeeding period is computed by taking

the ratio of observed rates for the initial ( $PTAXR1$ ) and succeeding ( $PTXR1N$ ) years and multiplying that by the computed initial base rate:

$$PTR1N_n = \frac{PTXR1N_n}{PTAXR1_n} * PTR1_n \quad (5.121)$$

The initial level of personal tax receipts and the two computed base rates as well as the initialized elasticity of the system are presented in Table 5A.5.

Government profits ( $GPROF$ ) are effectively treated as a residual item in the division of factor income within the economy. They are initialized by taking into account the settings of various economic and budgetary variables and are set equal to:

$$GPROF_n = gdpin_n - INDTAX_n - CDEPAL_n - PERINC_n - BPROF_n \quad (5.122)$$

The remaining income stream of the government sector, foreign aid receipts ( $FORAID$ ), is restricted to only a subset of the GLOBUS countries and is set equal to the initialized value of foreign aid total flowing from other GLOBUS countries (in US dollars) divided by the nation's exchange rate:

$$FORAID_n = \frac{NETAID_n}{DOLRX_n} \quad (5.123)$$

Because of the call-sequence within GLOBUS,  $NETAID$  must be initialized within the trade sector of the model. Its computation is based upon initialized values of total aid provided by donors and the allocation policies of the donors ( $AIDSHR$ ). The  $NETAID$  received by any state is set equal to:

$$NETAID_{rn} = \sum^{DN} \left( AIDSHR_{dn, rn} * \frac{FAX_{dn}}{DOLRX_{dn}} \right) \quad (5.124)$$

The values of government profits and foreign aid receipts are reported in Table 5A.6.

Government revenue-raising actions are guided by decisions regard-

ing total revenues, expectations regarding receipts from sources not directly controllable within the budgetary sphere, i.e., government profits and foreign aid receipts, and the relative reliance upon individual tax instruments. In the present version of the model, the latter are treated as constants and are set equal to observed tendencies in the initial period. The parameters regulate reliance upon general revenue-raising taxes and do not directly control decisions regarding the welfare contributions' tax rate. The values for the relative reliance upon personal taxes (*ptrpar*), indirect taxes (*itrpar*), and business taxes (*btrpar*) are presented in Table 5A.7.

Decisions regarding the welfare contributions' tax rate reflect concerns for maintaining some degree of balance between revenues tied to the program and the level of expenditures summed across the components of the program. Two factors are initialized which act to control the welfare contributions' rate. These are a target for the ratio of contributions to total outlays within this program (*WFTAR*) and a parameter (*wcrpar*) which indicates the sensitivity of authorities to an imbalance between the target, which itself varies with performance, and the actual balance between program revenues and spending. *WFTAR* is generally initialized at the actual value in 1970; *wcrpar* is set equal to 0.5 for all countries – a value with the range which some exploratory statistical analysis of historical data have suggested as reasonable. The values for *WFTAR* are provided in Table 5A.7.

In the revenue extraction area the principal element regulating dynamics is the target revenue decision (see Eq. 5.87). A transformation of the basic equation for the determination of target revenues takes the following form and was used for country level analysis (the time series generally extended from the early 1950s to the late 1970s) to generate preliminary estimates of the parameters:

$$\ln TARREV = a + b_1 \ln E2GDP + b_2 \ln AGDEBT + b_3 \ln EGVREV + b_4 \ln \frac{IMPORT}{EXPORT} + u \quad (5.125)$$

where

$$egpar3_n = 1 - b_3$$

$$egpar2_n = \frac{b_1}{egpar3_n}$$

$$egpar4_n = \frac{b_2}{egpar3_n}$$

$$egpar5_n = \frac{b_4}{egpar3_n}$$

The national level analyses generally provided reasonable estimates of the parameters but dissatisfaction with the quality of the data that were available led to the use of a pooling strategy whereby parameter settings for any member of a class of countries were made equal to the average of the values estimated. India and Mexico, it should be noted, are given an equation specification similar to the developed market systems. Analysis of data on these countries suggested that this was more appropriate. The values of the *egpar* parameters are detailed in Table 5A.8.

Two additional parameters, *rgpmin* and *rgpmax*, need to be specified for revenue decisions. These two parameters, in combination with the initial share of gross domestic product represented by total government revenues (*GRRINT*), define through time the limits of the range of possible target revenues. They represent per annum growth rates for the minimum and maximum target revenues. For all countries, they are set to zero and 0.015, respectively. The former value allows for significant expansion in the overall share of societal resources controlled by government, while the latter effectively prevents decreases in that share. The use of both values was suggested by the need to prevent extraordinary results arising from extreme interventions that might occur during experimental analysis with the model.

Finally, variables associated with government debt are initialized. These include debt itself, debt as a percent of GDP, and the debt target. The debt target is set to zero. The debt figures as absolute values and in relation to GDP are presented in Table 5A.9.

## **EXPENDITURES AND RELATED ITEMS**

### **Major Aggregates**

Total government expenditures (*TOTEX*) are defined as the sum of four major categories of government outlay. This set of categories includes government consumption (*GOVCON*), welfare benefits



(*WELBEN*), government investment (*GIX*), and debt management payments (*GDMAN*). The initial conditions for both the total and the major aggregates, as well as the total represented as a share of gross domestic product (*GXGDP*) are presented in Table 5A.10.

Government consumption includes a variety of spending programs. On the civilian side, education (*EDX*), health (*HEX*), administration (*ADX*), and foreign aid (*FAX*) are represented. Military expenditures (*DEX*) round out this figure. It should be noted that this definition treats administration as a residual figure and that were foreign aid, as arguably it could be, treated as a nonconsumption item, its initial value would be higher in those states represented as having foreign aid programs. Tables 5A.11 and 5A.12, respectively, provide the breakdowns of the consumption part of the budget in terms of local currency and as shares of GDP.

## Education

The education sector is treated as having two major programs. The first deals with primary and secondary education while the second deals with higher education. A variety of variables and parameters need to be specified in this area. First, education expenditures are divided into two outlay streams that correspond to the two levels within the education sector. Primary and secondary education expenditures (*EDXPS*) are set equal to its initial share of the total:

$$EDXPS_n = \text{expsi}_n * EDEXP_n \quad (5.126)$$

and higher education receives the residual:

$$EDXT_n = \text{exti}_n * EDEXP_n \quad (5.127)$$

The cost per student in each program (*cedp1* for primary and secondary; *ctp1* for higher) is calculated by taking into account the number of individuals within the appropriate age category (*SAPOP* and *AGE20S*, respectively), the enrollment ratio of the age category (*ERED* and *ERT*), and the level of spending in the program:

$$\text{cedp1}_n = \frac{EDXPS_n}{ERED_n * SAPOP_n} \quad (5.128)$$

$$ctp1_n = \frac{EDXT_n}{ERT_n * AGE20S_n} \quad (5.129)$$

In computing the cost of educating a student in either program (*COSTED* or *COSTT*), two factors are taken into consideration. The first is the level of performance relative to the initial period, defined in terms of the enrollment ratio, and the second is the level of economic development relative to the initial level. This requires setting base values (*tered* and *tert*) for the two educational levels. These are set equal to the initial enrollment ratios. Target enrollment levels, which adapt to previous target values and performance, are set equal to the initial values as well (i.e.,  $EENP1 = ERED$ ;  $EENP2 = ERT$ ). The base value for level of development is set equal to gross domestic product per capita (*ycin*). The initialized values for the shares of education expenditures going to the programs, the cost per student in each program, and the enrollment ratios are provided in Table 5A.13.

A number of other parameters are used within the education sector. Six are employed within the equations that determine the cost of educating students in the two different sectors. Both the constants in the primary/secondary sector (*csp1*) and in the higher education sector (*uepar1*) equations as well as the elasticities on the effects of economic development (*cedp2* and *ctp2*, respectively) are set to one. The elasticities on the effects of the relative increase in the delivery of educational services are set to 0.1. These values reflect the results of some exploratory statistical analysis and can be improved upon.

In both of the desired expenditure equations for the education sector a parameter is used to reflect bureaucratic efforts at enhancing the scope of control for resources available. Both of these (*edp1* for primary and secondary and *edp2* for higher) are set to 1.105. Finally, two other parameters control the setting of target levels of performance – in this instance enrollment ratio levels. Again, these parameters are used in many places within the model and are use in this instance to control the effects of present target levels and present performance levels on the change in the target level. These parameters, *adj1* and *adj2*, take on the values of 0.8 and 0.2, respectively, for all nations. The first represents the contribution of the target level and the second the contribution of the present level of performance to the change in the target level.

## Health, Administration, and Foreign Aid

In the health area four parameters are employed. The first is the initial value of health expenditures divided by total population (*hexpt*). The second is the initial level of development as represented by the level of GDP per capita (*ycin*). The third (*hexp2*) represents the effect of changes in the relative level of development on the desired level of health spending and is set at 0.2 for all countries. The final parameter is *hexp1*, a multiplier for the desired health expenditure equation which is set at one for all countries. Both *hexp1* and *hexp2* are derived from some preliminary statistical analysis based on cross-sectional data and better estimates could be made if an improved data base in this area were available.

In the administration area one parameter is used. This is a multiplier (*adxp1*) in the desired administrative expenditure equation which is based upon the relative position of this sector vis-à-vis other civilian, noncapital elements. It is set equal to the initial position of administration relative to those items:

$$adxp1_n = \frac{ADX_n}{EDX_n + HEX_n + FAX_n + WELBEN_n} \quad (5.130)$$

Due to serious obstacles in creating comparable data series for foreign aid expenditures by the centrally planned systems, aid donation has been restricted to the industrialized democracies. The initial allocation patterns of these states vis-à-vis potential aid recipients within the GLOBUS system are presented in Table 5A.14. The parameters controlling aid distribution policy for the aid donors, *fasp2*, the impact of need, *fasp3*, the impact of trade alignment, and *fasp4*, the effect of political alignment, are presented in Table 5A.15. These values are drawn from a GLOBUS project study on aid policies of the Western nations (see Flemming 1985). Since the GLOBUS donors extend aid to recipients outside the GLOBUS system, a constant (*fags*) based on the 1970 share of a donor's aid remaining within the GLOBUS system is used in the aid allocation process. The values for this parameter are also presented in Table 5A.15.

Changes in the desired level of total aid budgets depend upon the shifts in the position of the potential aid recipient pool in terms of political and trade alignment. Such shifts are assessed by comparing present

values for both variables against the initial values. The initial values for the potential aid recipient pool's political alignment (*TSCOT*) and economic orientation (*PTRADT*) are equivalent to those described in the previous section. The parameters used in the equation *farp2* (constant), *farp3* (elasticity on political alignment), and *farp4* (elasticity on trade orientation) are based on some preliminary statistical analyses and the stylized values of 1.015, 0.5, and 0.5 are used.

## Defense

The military sector has a number of major budgetary components. In most cases the budget is divided between two items: payments for labor and payments for capital. For a small subset of the states, the United States, the Soviet Union, the People's Republic of China, France, and the United Kingdom, a further budgetary allotment is directed toward the acquisition and maintenance of strategic nuclear capabilities. Table 5A.16 presents the initial distribution of military spending across these categories for the GLOBUS countries.

Expenditure for labor (*DEXL*) is derived from the following formula:

$$DEXL_n = \left( \frac{1}{dklr_n^{powels_n}} \right) * POW_n * UCD_n \quad (5.131)$$

$$* \left( \frac{dklr_n}{2} \right) * powels_n$$

In this equation *dklr* stands for the desired capital to labor ratio in the conventional sector, *powels* is the elasticity of substitution between capital and labor, *POW* is the composite conventional capability index, and *UCD* is the unit cost of conventional capability. The national figures for the desired capital to labor ratio (*dklr*) are based on the observed mix of labor and capital inputs to the production of conventional capability during the half-decade ending in the initialization year. For all countries the elasticity of substitution between capital and labor is simply set to 0.5. *POW*, the conventional capability index, is a composite measure based on capital and labor inputs where:

$$POW_n = Kap_n^{powels_n} * Lab_n^{1-powels_n} \quad (5.132)$$

*Kap* and *Lab* represent standardized composite indices of major conventional military equipment (land, sea, and air) and military personnel. Annual observations for these indices were constructed for the 50 Extended GLOBUS countries for the period from 1950 through 1980. The method of computation and some of the results from the index construction effort have been reported in earlier papers (Cusack 1981, 1985b). The *UCD* measure, the unit cost of conventional capability, is initialized at the value equal to the cost of replacing one unit given the level of conventional spending in the initial year and the level of capabilities needed to replace the given normal depreciation:

$$UCD_n = \frac{conshi_n * DEX_n}{(1 - ddr_n) * POW_n} \quad (5.133)$$

Here *conshi* represents the share of defense spending allocated to conventional forces and *ddr* is the survival rate of conventional capabilities. The parameter *ddr* generally takes on a value of either 0.4 or 0.45 depending on the degree to which the national military system has traditionally favored labor over capital inputs.

Conventional outlay for capital items (*DEXK*) is simply the residual of the nonstrategic military budget, i.e.,

$$DEXK_n = (conshi_n * DEX_n) - DEXL_n \quad (5.134)$$

Another parameter required in specifying the basis for the internal workings of the conventional military sector is the autonomous rate of inflation therein, *ucdp1*. Time-series analyses for the 50 Extended GLOBUS countries for the three decades ending in 1980 were undertaken using the following formulation:

$$POW_{n,t} = d_1 * DEX_{nt} * \exp(d_2 * t) + d_3 POW_{n,t-1} \quad (5.135)$$

The parameters in this equation can be interpreted in the following way:  $d_1$  is the inverse of the unit cost of conventional capabilities in the base year (1970);  $d_2$  is the negative value of the autonomous inflation rate in the conventional capability area; and  $d_3$  is the survival rate coefficient for existing capabilities. These analyses allowed us to identify the national autonomous inflation terms in the conventional military sector. Again, estimates for classes of countries were pooled

and average values are used. The initialized values for the capability index (*POW*), the unit cost (*UCD*), the survival rate (*ddr*), and the autonomous rate of inflation (*ucdp1*) in the conventional area are presented in Table 5A.17.

Expenditures on the strategic nuclear side are initialized as a residual where:

$$DEXSTR_n = (1 - conshi_n) * DEX_n \quad (5.136)$$

Information on this budget item as well as on unit costs, survival rates, and autonomous inflation is quite scarce. In the main, I have relied upon the information that could be acquired from public sources and, as well, have attempted some estimation work in arriving at the figures employed here. Nonetheless, this is an area clouded by great secrecy and replete with glaring holes and inconsistencies. The values at present employed in initializing the model with respect to strategic nuclear capabilities (*STRAT*), their unit costs (*UCDS*), survival rates (*ddrs*), and autonomous inflation rates (*ucdp2*) are presented in Table 5A.18. It should be noted that the strategic capability index employed is the Total Equivalent Megatonnage (*TEMT*) available to the strategic nuclear forces. This is one of a number of "static indicators" of the strategic balance (see Richelson 1982). It is equal to the sum of the Equivalent Megatonnage of a nation's strategic nuclear arsenal, or:

$$TEMT = \sum^W Y_w^{2/3} \quad (5.137)$$

It should be noted that  $Y_w$  is the yield in megatons of the  $w$ th nuclear warhead carried on strategic platforms.

A number of significant variables in the military area that need to be initialized are computed on the basis of information available from other initializations within the budget model and the foreign policy model. These deal with assessments of international threat and support in the conventional and strategic areas. In both areas, threat and support are assessed in terms of intentions and capabilities. Readers are referred to Eqs. 5.8 to 5.11 for the exact specifications. It should be noted that the measures of expected threat (*ETHR* for conventional; *ESTHR* for strategic) and expected support (*AAMAD* for conventional; *SAMAD* for strategic) are set equal to the initial prevailing threat and security

measures. The two security goals, *CONRA* and *STRRA* (conventional and strategic, respectively), are set equal to the relevant threat index divided by the sum of the state's own capabilities and the expected level of support, i.e.,

$$CONRA_n = \frac{ETHR_n}{POW_n + AAMAD_n} \quad (5.138)$$

$$STRRA_n = \frac{ESTHR_n}{STRAT_n + SAMAD_n} \quad (5.139)$$

The parameter, *rlseci*, which is instrumental in shifting allocations between the two military sectors, is set equal to the initial ratio of the conventional goal relative to the sum of the goals in both the conventional and strategic sectors. The initialized values of *CONRA*, *STRRA*, and *rlseci* are presented in Table 5A.19.

### Welfare Transfers

Three specific programs make up the entire package of social welfare transfers. These include spending on pensions, unemployment compensation, and other transfers to the household sector. The spending levels for each are initialized in light of the shares of the total allocated. *penshr* and *unshar*, the proportions of welfare benefits (*WELBEN*) allocated to pensions and unemployment compensation, respectively, are initialized (see Table 5A.20) and, *othshr*, the residual program share, is set equal to:

$$othshr_n = 1 - penshr_n - unshar_n. \quad (5.140)$$

For each program an outlay per client value is calculated and the associated replacement rate (relative to per capita disposable income) is developed. The outlay figures per client are set equal to:

$$WBPC_n = \frac{penshr_n * WELBEN_n}{RAPOP_n} \quad (5.141)$$

$$WBUC_n = \frac{unshar_n * WELBEN_n}{UNEMPL_n} \quad (5.142)$$

$$WBOC_n = \frac{othshr_n * WELBEN_n}{TOPOP_n} \quad (5.143)$$

Here *WBPC*, *WBUC*, and *WBOC* are, respectively, the per client outlays for pensions, unemployment compensation, and other social transfers. *RAPOP*, the retirement age population, is the target population for pensions. *UNEMPL*, the unemployed labor force, is the target population for unemployment compensation outlays. *TOPOP*, total population, is the target population for the residual of the social transfers program. The target replacement rates (*WGTP* for pensions, *WGTU* for unemployment compensation, and *WGTO* for the residual) are set equal to the per client spending figures relative to disposable income per capita, i.e.,

$$WGTP_n = \frac{WBPC_n}{DIPINC_n} \quad (5.144)$$

$$WGTU_n = \frac{WBUC_n}{DIPINC_n} \quad (5.145)$$

$$WGTO_n = \frac{WBOC_n}{DIPINC_n} \quad (5.146)$$

$$\text{where } DIPINC_n = \frac{DISINC_n}{TOPOP_n}$$

In each of the equations specifying the target spending figures for the three programs there are three parameters, a scaling factor, the elasticity with respect to meeting target replacement levels given the expected clientele size, and the elasticity with respect to the effects of overall program self-financing. It was possible to perform only limited empirical analysis in the effort to provide values for these parameters.



This analysis suggested that a value of unity for the constants ( $wbp1$ ,  $wbp4$ , and  $wbp7$ ) and the elasticities with respect to target replacement levels ( $wbp2$ ,  $wbp5$ , and  $wbp8$ ) and that a value of 0.5 for the program self-financing elasticities ( $wbp3$ ,  $wbp6$ , and  $wbp9$ ) were compatible with observed regularities.

### Main Aggregate: Target Spending Levels and Bargaining Weights

A central part of the government resource allocation model is the system of equations that defines various principal spending aspiration levels and allows the bargaining power of the major actors to help finalize the overall dimensions of the expenditure side of the budget. In previous reports (Cusack 1985a, 1986b), the logic of this formulation, i.e., the Competing Aspiration Levels Model (CALM), drawn from the work of Fischer and Kamlet (1984), was discussed and extensive comparative empirical analyses for a large number of governments were reported upon.

The estimation results serve as the basis for the specification of related parameter values within. Using the notation of a previous report (Cusack 1985a), the CALM equation system takes the following form.

Set 1:

$$T_t = (DMIN_t + CMIN_t + KMIN_t) + a_1(TMAX_t - DMIN_t - CMIN_t - KMIN_t) + u_{1,t} \quad (5.147)$$

$$D_t = DMIN_t + a_2(TMAX_t - DMIN_t - CMIN_t - KMIN_t) + u_{2,t} \quad (5.148)$$

$$C_t = CMIN_t + a_3(TMAX_t - DMIN_t - CMIN_t - KMIN_t) + u_{3,t} \quad (5.149)$$

$$K_t = KMIN_t + a_4(TMAX_t - DMIN_t - CMIN_t - KMIN_t) + u_{4,t} \quad (5.150)$$

$$- CMIN_t - KMIN_t) + u_{4,t}$$

$$T_t = D_t + C_t + K_t \quad (5.151)$$

On the left-hand side of the equations,  $T$  stands for total government spending (less debt management payments),  $D$  for defense spending,  $C$  for civilian spending (including purchases of goods and services and transfers), and  $K$  for capital expenditures. On the right-hand side,  $TMAX$  represents the fiscal authorities' aspiration level for maximum total spending,  $DMIN$  is the defense sector's aspiration level for minimum defense spending,  $CMIN$  is the aspiration level for minimum civilian spending, and  $KMIN$  is the aspiration level for minimum capital spending. Note that  $a_i$  represents the bargaining power of the  $i$ th actor.

The aspiration level equations used in the present model take the following form:

Set 2:

$$TMAX_t = f_1 ER_t + f_2 STAB_t + u_{5,t} \quad (5.152)$$

$$DMIN_t = f_3 DMOM_t + f_4 SEC_t + u_{6,t} \quad (5.153)$$

$$CMIN_t = f_5 CMOM_t + u_{7,t} \quad (5.154)$$

$$KMIN_t = f_6 KMOM_t + u_{8,t} \quad (5.155)$$

Here  $ER$  represents expected revenues (less debt management payments),  $STAB$  stands for the unemployment rate times  $ER$  in the case of countries in the *West* and the value of one minus the trade balance times  $ER$  for all others,  $DMOM$  is the depreciation in military capability units (conventional only) times the unit cost of capabilities.  $SEC$

is the monetarized value of capability acquisition required to close the gap between expected threat and the sum of own capabilities and expected support. *CMOM* is the product of three factors (these being the previous performance level in the civilian area, expected clientele size, and an income target), and *KMOM* is the previous share of societal income allocated to government investment times the expected level of societal income.

In order to estimate the model, it is necessary to substitute the aspiration level equations (set 2) into the reconciliation system (set 1):

$$\begin{aligned}
 T_t = & a_1 f_1 ER_t + a_1 f_2 STAB_t & (5.156) \\
 & + f_3(1 - a_1)DMOM_t \\
 & + f_4(1 - a_1)SEC_t + f_5(1 - a_1)CMOM_t \\
 & + f_6(1 - a_1)KMOM_t + e_{1,t}
 \end{aligned}$$

$$\begin{aligned}
 D_t = & f_3(1 - a_2)DMOM_t + f_4(1 - a_2)SEC_t - a_2 f_1 ER_t & (5.157) \\
 & + a_2 f_2 STAB_t - a_2 f_5 CMOM_t - a_2 f_6 KMOM_t + e_{2,t}
 \end{aligned}$$

$$\begin{aligned}
 C_t = & f_5(1 - a_3)CMOM_t + a_3 f_1 ER_t + a_3 f_2 STAB_t & (5.158) \\
 & - a_3 f_3 DMOM_t - a_3 f_4 SEC_t \\
 & - a_3 f_6 KMOM_t + e_{3,t}
 \end{aligned}$$

$$\begin{aligned}
 K_t = & f_6(1 - a_4)KMOM_t + a_4 f_1 ER_t - a_4 f_2 STAB_t & (5.159) \\
 & - a_4 f_3 DMOM_t - a_4 f_4 SEC_t - a_4 f_5 CMOM_t + e_{4,t}
 \end{aligned}$$

$$T_t = D_t + C_t + K_t \quad (5.160)$$

The correspondence between the parameter names used within the

simulation model and the symbols in the estimation equations is as follows:

Aspiration Parameters		Bargaining Parameters	
<i>Simulation</i>	<i>Estimation</i>	<i>Simulation</i>	<i>Estimation</i>
<i>dtp1</i>	$f_1$	<i>top1</i>	$a_1$
<i>dtp2</i>	$f_2$	<i>top2</i>	$a_2$
<i>dxcp1</i>	$f_3$	<i>top3</i>	$a_3$
<i>dxcp2</i>	$f_4$	<i>top4</i>	$a_4$
<i>cxcp1</i>	$f_5$		
<i>dgip1</i>	$f_6$		

Both qualitative and quantitative data limitations dictated the following strategy. Analysis of the model was undertaken for any of the 50 GLOBUS and Extended GLOBUS nations for which sufficient data of moderately decent quality were available. The simultaneous equation system model was estimated, using a FIML technique, for 12 developed market systems, 12 developing countries, and 3 centrally planned systems. In the main the results were generally very good. In specifying parameters in the simulation model we originally chose to abstract from these results values that reflect the average tendency in each of the three classes of states. This strategy was later modified in three ways. First, the bargaining weight parameters of the three spending areas, defense, civilian, and investment, were recomputed for each nation by taking into account each component's initial share of total spending and multiplying that share by the group value for *top1*. Second, since the security response parameter was on average somewhat lower than expected, it was increased slightly in all three groups and, indeed, was given the same value across the groups, i.e., 0.2. Third, within the simulation model adjustment constants were added to each of the aspiration level equations. The constants are based on estimated elasticities between expenditure aggregates and gross domestic product. Where possible, nation-specific elasticities are employed. The values for the parameters in the aspiration level equations based on the FIML estimates are provided in Table 5A.21, except *dxcp2* and *dgip1* which are 0.2 and one, respectively, for each nation. It should be noted that the parameters for the strategic military sector are set equivalent to those in the conventional area. Table 5A.22 contains the expenditure elasticities with respect to income used to generate the adjustment coefficients. The

values of the bargaining weights are presented in Table 5A.23.

This completes the description of the initial conditions and parameters employed within the budgetary model. In the next section an examination of the model's behavior is provided.

## ILLUSTRATIVE RESULTS

In this section the results of a preliminary exercise with the model are reported. Results from the earlier studies (Cusack 1984, 1985b; Cusack and Eberwein 1985; Cusack and Hughes 1986) focused mainly on aspects of international security and, in the last study mentioned, combined this with a concern for the implications of alternative taxation policies. The study reported here deals primarily with the economic consequences of alternative fiscal policy stances within the developed market systems.

It should be noted that the overall GLOBUS model as well as the budgetary model have undergone many significant changes since a preliminary version was first available in early 1984. As a consequence, results produced by the model have changed – sometimes in very important ways. It is hoped that the structural changes introduced have improved the quality of the model.

The last point deserves emphasis. The model is not intended to serve as an instrument for prognostication. The principal objective in building the model was to help foster a synthesis of knowledge about large-scale structures and processes in interdependent areas. Our belief is that the lack of cumulateness in the social sciences derives in part from the relative absence of such syntheses. What the builders of the model have learned in the process of its construction and what can be learned from using, and, more importantly, revising and extending the model is not of any direct value to those who shape public policy. The real immediate value is to those who believe that a basis for progress in understanding the social world may come through an intensive effort at linking together existing islands of knowledge in a systematic, comprehensive, and reproducible manner.

In turn, one of the objects of the study described here is to provide information about the structure and behavior of the model. By discovering the varying degrees of sensitivity that characterize the dif-

ferent elements of the model, and by locating critical points where the model's behavior seems at variance with theoretical expectations and empirical observation, the analyst is engaged in a necessary part of the interactive sequence of model building that includes conceptualization, formulation, testing, reconceptualization, and refinement. And ultimately the effort at testing provides the information required to know when to stop (Richardson and Pugh 1981).

## ***THE EFFECTS OF FISCAL RESTRAINT***

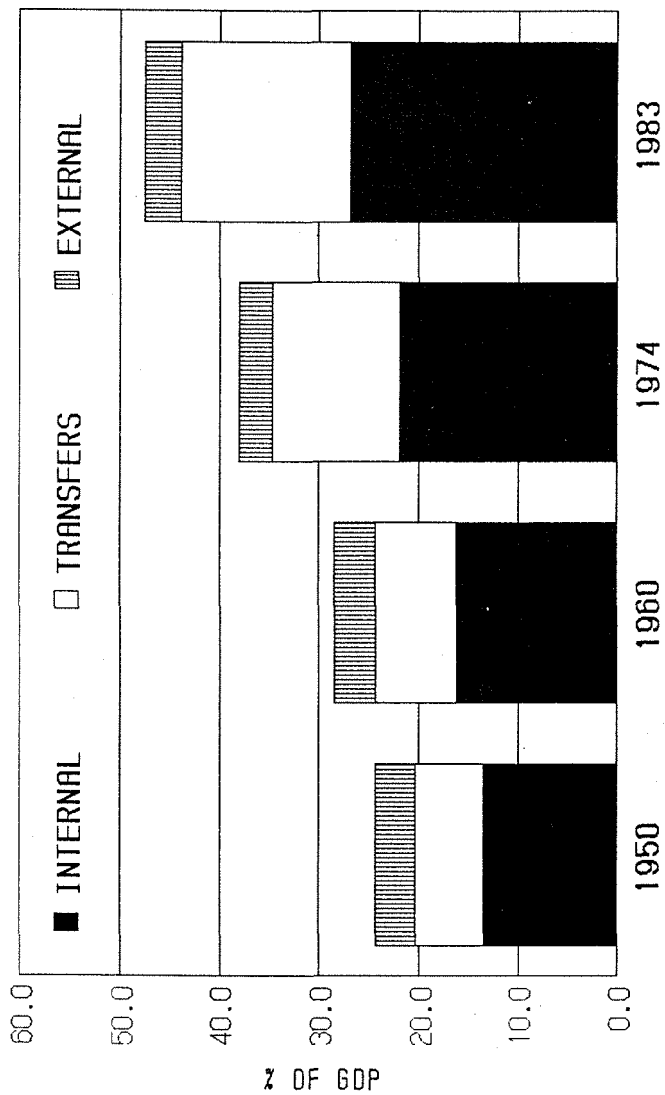
The growth of government in the West has been a hallmark of the post-World War II era. As Fig. 5.9 demonstrates, this has been a period of tremendous expansion in the average government's control of resources.<sup>1</sup> In 1950 the average size of the public sector stood at slightly less than one-quarter of Gross Domestic Product. Increasing slightly during the 1950s, it surged to a level of nearly one-half of GDP by 1983. In the main, this growth has been concentrated on the domestic side of the budget. Indeed, spending for external functions, defense and foreign transfers, has tended to stagnate. On the internal side, combined spending for civilian consumption and investment has about doubled in terms of their share of the Gross Domestic Product between 1950 and 1983. During the same period the share of product represented in transfers, mainly to households in the form of income supplements, has increased nearly two and a half fold.

Controversy regarding the implications of the growth of the public sector is widespread and is particularly focused on its economic consequences. On the one side there are those who argue that the expansion of government has profoundly disturbing consequences for economic performance. Through their own inefficient operations, through the excessive regulations that they impose on the economic system, and through fiscal and monetary policy that distorts economic incentives

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<sup>1</sup> The sources for the data used here include Nutter (1978) and the 1985 version of the OECD National Accounts tape. Countries included: the United States, Canada, the United Kingdom, the Netherlands, Belgium, France, Switzerland, the Federal Republic of Germany, Austria, Italy, Sweden, Norway, Denmark, Finland, Japan, and Australia. "Internal" includes civilian government consumption and investment. "Transfers" includes government transfers to households. "External" includes defense spending and foreign transfers (in the main, foreign aid).

**FIGURE 5.9**  
**GENERAL GOVERNMENT SPENDING IN ADVANCED**  
**INDUSTRIAL DEMOCRACIES 1950-1983**



and leads to lower productivity, governments, and particularly growing governments, are seen as a detrimental influence. Political profit is viewed as the rewards that politicians short-sightedly pursue and in so doing over the long term manage to expand their control over society's resources. The effect is to inject a malaise into the economic system which detracts from the potential for growth and welfare (see, e.g., Wagner 1977).

On the other hand, there are those who see this growth of government as reflecting a needed expansion of public control in inherently unstable economic systems (see, e.g., O'Connor 1973). Governments in market systems must intervene to help assure the latter's smooth functioning and to obtain socially optimal performance. Without this expanded control, such systems would stagnate. That stagnation would produce untoward political consequences.

Controversy and disagreement on this question is not confined to the levels of political debate and theoretical conjecture. The results of an extensive amount of systematic empirical work have not provided a conclusive answer. On the one side, for example, a number of studies have demonstrated that the size and growth of the public sector have had harmful effects on economic performance. Smith (1975), in a cross-sectional study of the OECD countries, found that public consumption growth cuts into capital formation and as a consequence each percentage increase in such outlays reduces GDP growth by two-tenths of one percent. In two separate studies, Landau (1983, 1985) arrived at similar conclusions. In his first analysis focusing exclusively on government consumption and dealing with an extensive set of nations in a cross-sectional design, he concluded that there is a negative relationship between public sector size and the rate of growth in GDP. In the later study focusing on 16 OECD states he concluded that growth in total government sector size slows down economic performance. He noted that this depressing effect is moderated to the extent that transfers are favored over other forms of outlays.

Arriving at the same general conclusion regarding the effect of the size and growth of the total public sector in 19 OECD states during the period from 1960 through 1980, Marlow (1986) found that the growth of social expenditures did not have this meliorative quality and that they were as depressing in their effects as other forms of spending. And in an earlier study by Barro (1981) dealing only with the United States, evidence of positive output effects from government spending could be



found only when the latter were essentially "transitory" in quality (e.g., wartime spending). There was no evidence that permanent upward shifts in government spending had the potential for altering the level of total output.

Equally compelling is the significant amount of evidence that attests to the economically beneficial consequences of government growth. For example, Curtis and Kitchen (1975), in a study combining a focus on Canada along with an eight-nation comparative analysis, concluded that budgetary expansion has been stimulative in its long-term effects though short-term stabilization consequences have been somewhat mixed.

Looking at the revenue side, Rubinson's cross-sectional study (1977) dealing with both developed and poorer lands concludes that government size has a beneficial effect on economic performance. The study by Katz et al. (1983) of the effects of tax systems in OECD countries concluded that no discernible deleterious consequences for economic growth could be associated with the size of government revenue extractions. The conclusions of both of these studies run counter to the findings of Marsden (1983). His cross-sectional study of ten developing and ten developed countries found that the relative size of the public sector as measured in terms of tax revenue extraction depressed "critical growth determinants" (i.e., investment, labor supply and productivity, and exports) and was negatively correlated with GDP growth.

Two later studies of the impact of government spending on economic growth are generally supportive of the conjecture that public sector expansion is beneficial. Friedlander and Sanders (1985) argue that government budgets in modern industrial societies incorporate two forms of "welfare state," one that supports households and individuals and a second that sustains the business sector. Additionally, spending for so-called consumption purposes, be it education or defense, helps round out the expenditure side of the budget. Their analysis suggests that differentiating amongst the many components of public sector resource allocation activities provides a clearer picture of the consequences of government growth for overall economic performance. Their results point to a positive relationship between government spending directed toward households and successful economic performance – and just the opposite in the case of public sector transfers to the business sector. Ram's extensive study (1986) combined cross-sectional and national level time-series analyses for 115 market economies during the period

1960-1980 . Using cross-nationally comparable series based on purchasing power parity indices, he found overwhelming evidence in support of the proposition that growth in public consumption has beneficial effects for overall economic performance.

In sum, there are alternative views on the effects of government growth for economic performance particularly as this is reflected in the rate of growth. The political and theoretical debate has been addressed by conventional econometric methods and the arguments of both sides have found both support and contradiction. In what follows this question will be addressed by manipulating certain parametric values within the budgetary model. By so doing no definitive resolution of the debate is expected. However, given the laboratory-like quality of the model, some insight may be gained into this and associated questions.

### Experimental Design

The design of the experiment is relatively straightforward. The results of the model using the parametric values described in the last section are employed to generate a base or "reference run." Certain parameters that determine the dynamics of public spending decisions are then altered during the execution of the experimental run in such a way as to produce the effect of slowing down, if not reversing, the trajectory of government spending. In order to keep the analysis and discussion manageable, the experimental manipulation of parameters is restricted to one set of countries, the *West*. Within GLOBUS these include the United States, Canada, the United Kingdom, France, the Federal Republic of Germany, Italy, and Japan.

In operational terms two sets of parameters need to be altered. These include in the first set the parametric values defining the fiscal authorities' maximum aspiration level for total spending. The second set includes the bargaining weights of the budgetary actors. In terms of the fiscal authorities' aspiration level parameters, the weight ( $dt p1$ ) given to the degree to which they attempt to match spending to the level of expected revenues is drawn down to a balanced budget figure (in the instance of all countries involved, this means a reduction from 1.10 to 1.00), and the sensitivity of these authorities to unemployment concerns ( $dt p2$ ) is halved. The combination of these two changes should bring the authorities' total spending target closer into line with a balanced budget than would occur within the reference run. Simultaneously, the

bargaining weight of the fiscal authorities (*top1*) is doubled by halving the bargaining strength of each of the three major spending sectors, defense (*top2*), civilian (*top3*), and investment (*top4*). The effect of this is to reduce the zone of contention within which the spending agencies could extract resources greater than those that reflect their minimum aspiration levels. In combination, both these sets of changes should significantly alter the trajectory of the public sector in terms of the size to which it could grow during the model's run. The implementation of changes in both sets of parameters occurs immediately after 1986 and these changes are retained through the remaining 24 years of the run.<sup>2</sup> To contrast the outcomes of this "fiscal restraint run" with that of the reference run, the analysis will proceed by examining certain critical variables and the differences that obtain in the period after the scenario is implemented.

### Public Sector Size

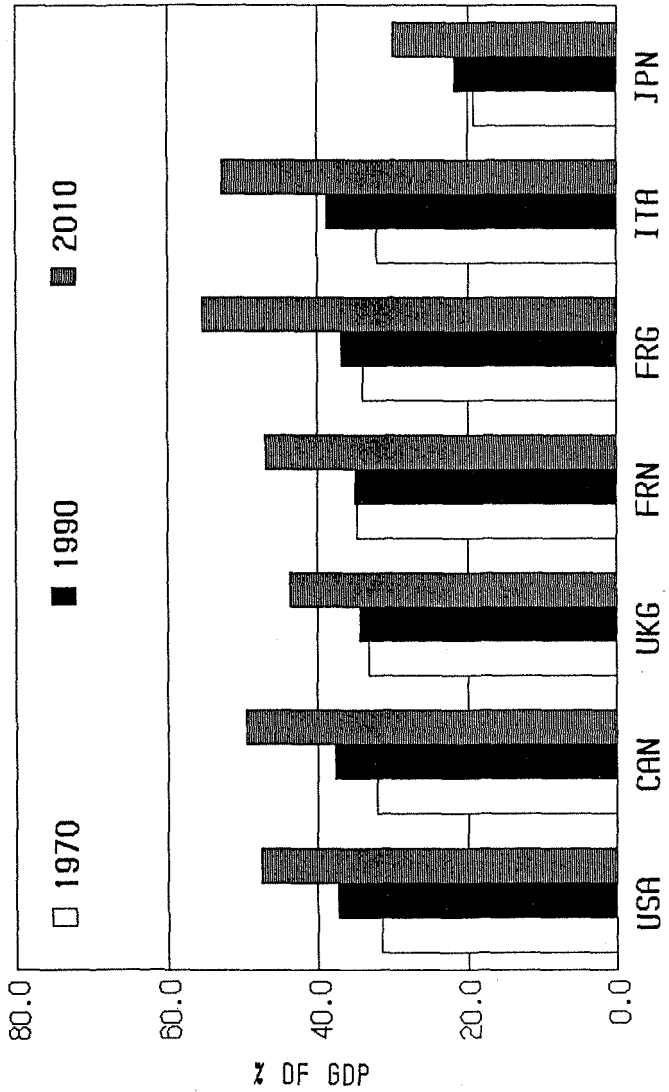
Under the reference run, the size of the public sector expands at varying paces across the seven nations (see Fig. 5.10).<sup>3</sup> This general tendency is in line with the postwar experience. There are, however, four cases where the time paths seem problematic. The first case, Japan, appears implausible in the sense that, even though it remains the traditional laggard in this sphere, we know that far greater growth has occurred there than is reproduced within the model. Our assessment of the problem that lies behind this is similar to our conclusions regarding the three other problem countries, the United Kingdom, France, and the Federal Republic of Germany. In these three instances rather slow growth is evident in the first half of the reference run. This pace is quickened significantly in the last half. Across both sets of countries there is evidence of very slow growth in government revenues as well as rather minimal problems with respect to underemployment. The first problem emanates from the revenue-raising functions within the budgetary model and calls for a refinement in their specification and improved parameter estimates. The latter are symptomatic of the lack

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<sup>2</sup> These runs were carried out on a Tandon AT microcomputer using a time step of 1.0.

<sup>3</sup> The size of the public sector is measured by total government spending as a percentage share of gross domestic product (*GXGDP*).

**FIGURE 5.10**  
**SIZE OF THE PUBLIC SECTOR**  
**REFERENCE RUN**



of exogenous shocks to the economic system that are part of the history of the period being simulated. They may also reflect an overly symmetric wage-employment response within the domestic economic model. Overall, though, the general trajectory evident in the public sector for all seven countries is in keeping with present tendencies and seems a plausible basis against which to compare the effects of altering that path.

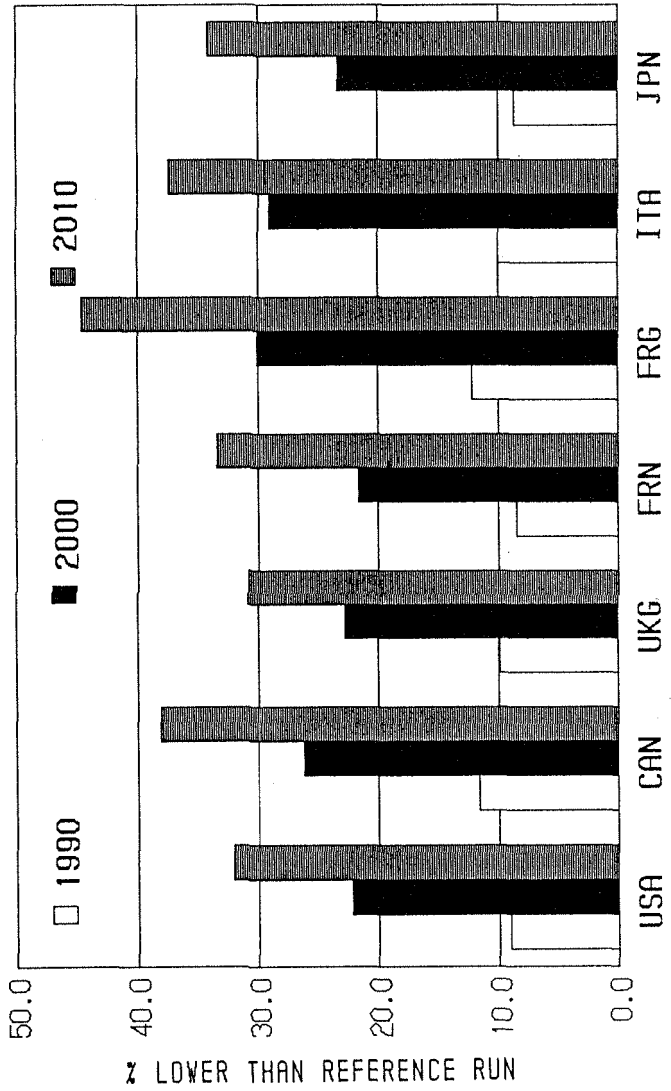
Figure 5.11 displays the first-order effects of the introduction of fiscal restraint into the budgetary systems of these seven countries. Imposing a tighter fiscal policy has the effect of significantly altering the time paths of total public spending in the seven states. The effect by the end of the experimental or fiscal restraint run is to produce a public sector size at least 30% lower than that generated within the reference run. In the case of the Federal Republic of Germany the reduction is even greater, approximately 45%. Once the intervention occurs the seven countries generally begin cutting back slightly in total outlays though in some instances modest increases are apparent after a decade or so. The average effect is to return the overall size of the public sector, in relative terms, to a level approximately equal to the value prevailing during the initial year, i.e., 1970. In sum, the fiscal restraint introduced does not set in motion an overwhelming rollback in the size of government, but it does prevent the major expansion apparent in the reference run.

## Economic Performance

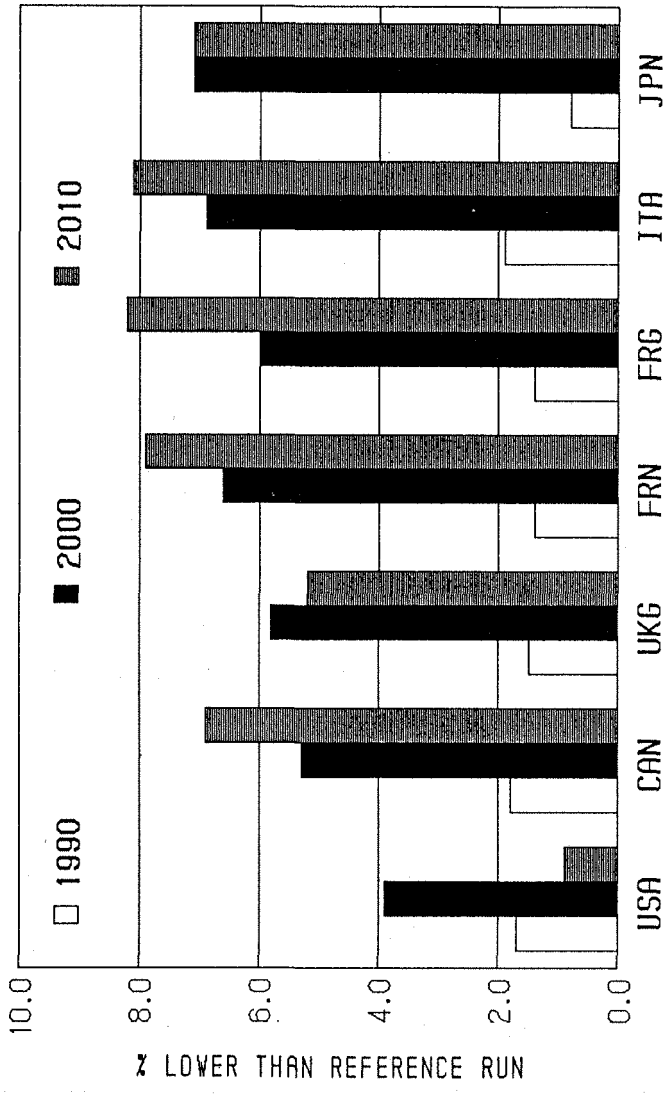
What impact did this fiscal restraint have on economic performance? Figure 5.12 provides one perspective on this question. This figure displays the percent reductions in Gross Domestic Product per capita observed relative to the reference run. By the last year, the average reduction is slightly more than 6% – a significant decline. There is at least one exception here – the case of the United States where a recovery in the last decade produces by the last year a GDP per capita only slightly less than 1% lower than that generated within the reference run.

Of course, given the GDP identity, which includes government consumption, the observed reductions may reflect to a significant extent simply the imposed restraint on increased government spending. Another way to assess the economic impact then would be to exclude

**FIGURE 5.11**  
**REDUCTION IN PUBLIC SECTOR SIZE**  
**DUE TO FISCAL RESTRAINT**



**FIGURE 5.12**  
**REDUCTION IN GDP PER CAPITA**  
**DUE TO FISCAL RESTRAINT**



government consumption from the aggregate measure. This is done in Fig. 5.13 where the percent changes in GDP (less government consumption) per capita are displayed for the seven countries. From this perspective, the impact of fiscal restraint relative to the unrestrained reference run is far more diverse in its pattern. In four instances, the United States, Canada, the United Kingdom, and the Federal Republic of Germany, significant increases in the more refined measure of product per capita are registered by the end of the period. A modest decline and then a somewhat larger increase after the imposition of restraint is registered in Italy. In the French case there is barely a perceptible difference by the end of the run. And in the case of Japan, a somewhat lower level of nongovernmental product per capita is observable.

From a welfare perspective the results of the experiment suggest that a not insignificant loss to society would result by introducing fiscal restraint into the budgetary system of these countries. However the private sector implications are less clear. At the aggregate level some of the economies would experience appreciable upward shifts in private sector output while others would be affected only marginally. These results suggest that a closer examination of some of the economic consequences generated by the experiment is in order.

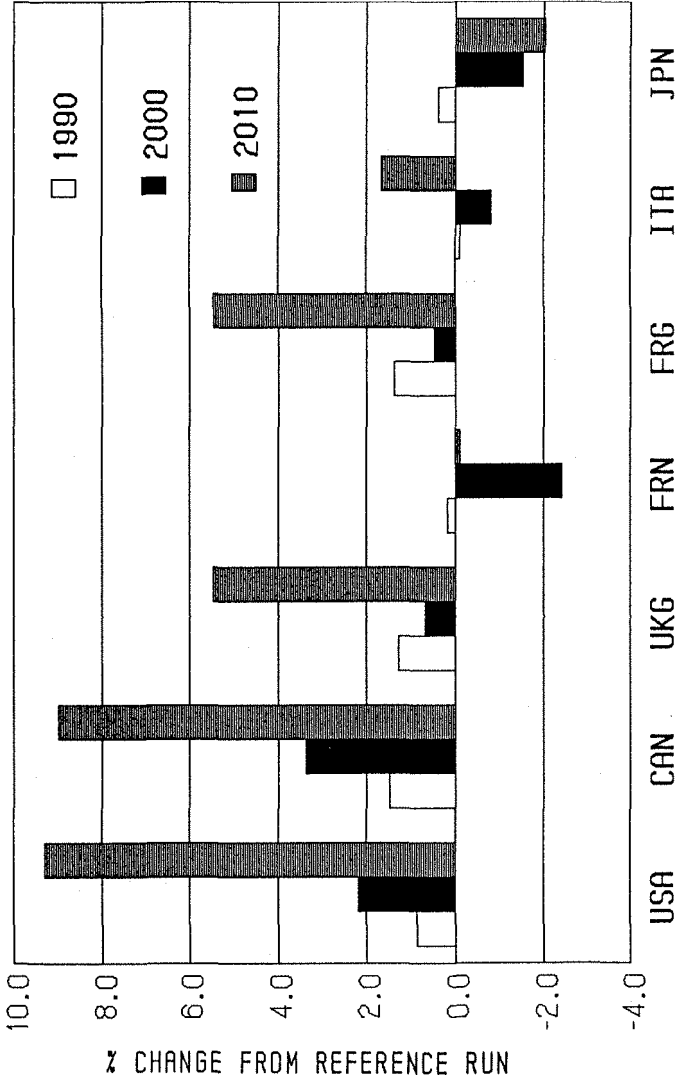
## **Inflation**

Among other consequences that have been suggested as following from the expansion of the public sector and the way part of this expansion has often been funded, i.e., deficit financing, is inflation. Whether this occurs through long-term outward shifts of the so-called Phillips curve by the continuous introduction of politically inspired business cycles, or through increased demand in the financial markets accompanied by accommodating monetary policy, the growing governmental sector is often seen as one of the root causes of heightened inflation.

Darat (1985), for example, has shown that governmental deficits in the United States have had an inflationary effect. Cameron (1978b), in an extensive comparative study focused on the questions of whether political authorities employ fiscal instruments in ways that accord with the political (electoral) business cycle argument and whether the instruments that moved in conjunction with the electoral cycle were responsible for inflationary tendencies in modern economies, arrived at a somewhat similar conclusion. His findings were mixed in that there



**FIGURE 5.13**  
**CHANGE IN PRIVATE GDP PER CAPITA**  
**DUE TO FISCAL RESTRAINT**



was strong evidence that one or another fiscal instrument seemed to have been employed for the political-electoral benefits that would accrue from their use but that there was no clear pattern linking the particular instrument selected and inflationary tendencies. On the other hand, his findings did suggest that overall fiscal policy carried with it an independent effect on inflation that often was very considerable.

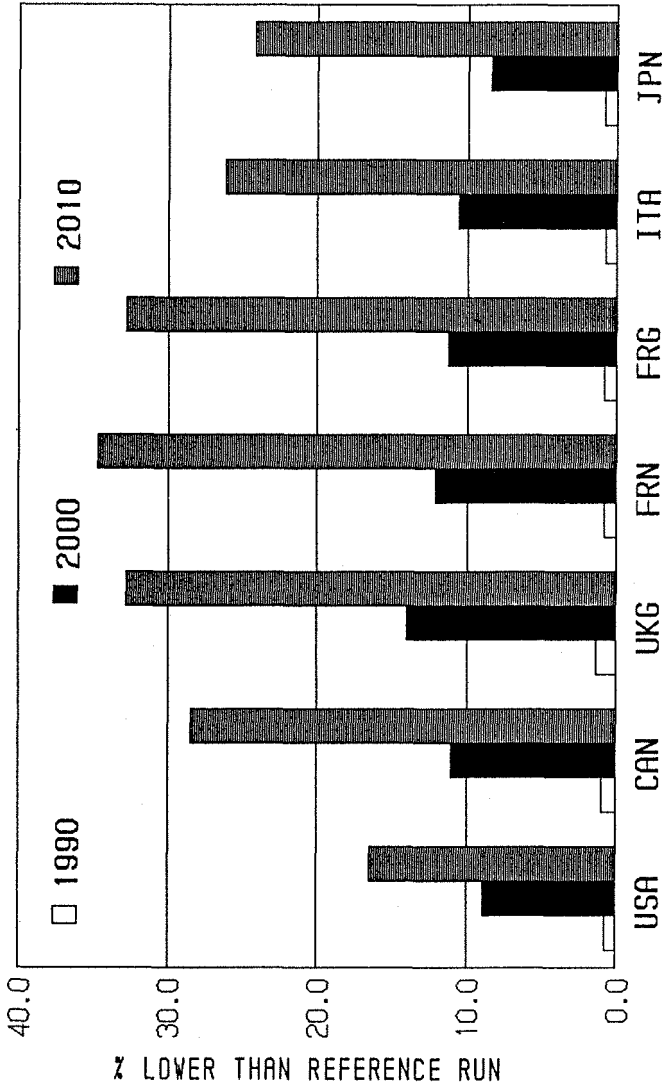
On the other hand, a number of analysts have not been able to discover evidence of an inflationary impact deriving from fiscal policy. For example, Niskanen (1978) examined the American experience during the period 1948–1976 to test the widely shared belief that federal deficits have inflationary consequences. The findings suggested that no apparent significant effect from deficits on inflation could be seen operating either through the rate of money growth or independently of it. Sharp and Flenniken (1978) also found no clear and significant relationship between deficits and inflation in the U.S. during the postwar period. In a comparative study of the postwar experience of 17 industrialized countries, Guess and Koford (1984) were also unable to detect any causal relationship whereby deficits led either to inflation or reduced economic growth. Indeed, in at least one country, the United States, they concluded that the relationship would appear to work in the opposite direction. Finally, Smith (1975) found that over the long term inflation was unrelated to the scope of public current expenditures.

Within the reference run a fair amount of debt accumulation through deficit financing is recorded for most of the countries under study. Under the conditions of fiscal restraint imposed in the experimental run, a significant reversal in this propensity takes place. Generally the public sectors are able to operate with balanced budgets or surpluses. The effects on price levels seem to be appreciable. In Fig. 5.14 the percent reductions in price levels at various intervals after the introduction of restraint are displayed for the seven countries. While in no case is there evidence of deflation, the rate of inflation is sharply lowered. Indeed, by the end point of the run, the level of the GDP deflator is 28% lower on average.

## Income

Under the fiscal restraint scenario, then, there appears to be a loss in socially directed resources but no consistent pattern of reduction in aggregate welfare within the private sector. On top of this though

**FIGURE 5.14**  
**REDUCTION IN GENERAL PRICE LEVEL**  
**DUE TO FISCAL RESTRAINT**



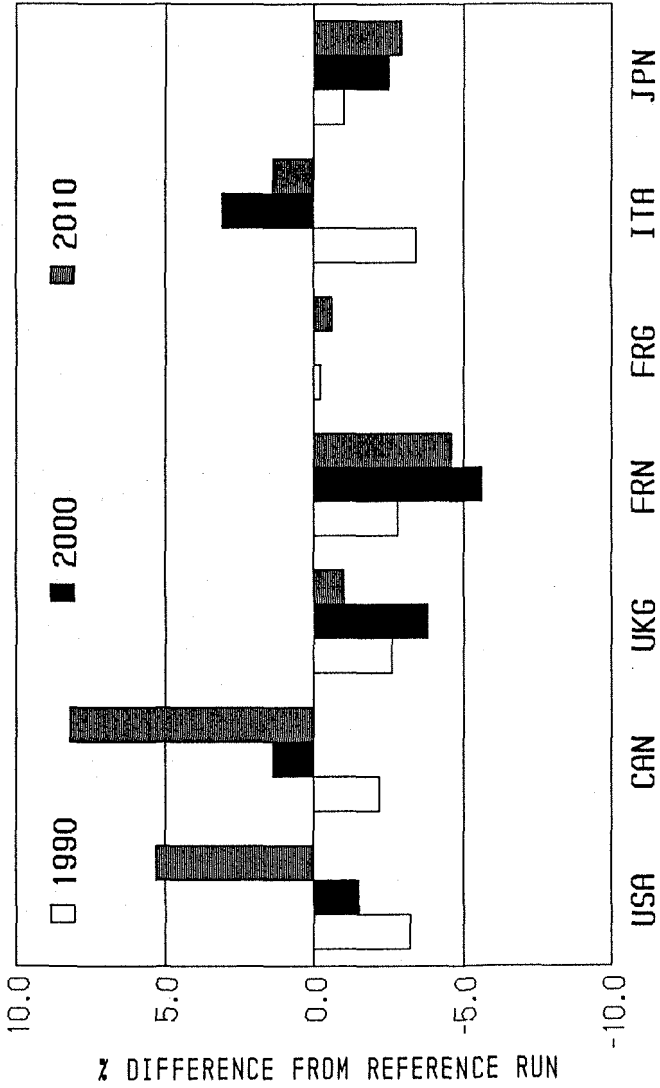
there is a beneficial effect of reduced inflation. How does the household sector fare then under these conditions? At the aggregate level there is no consistent pattern of loss and gain when viewed in the broadest sense, i.e., in terms of average disposable income. As demonstrated in Fig. 5.15, only two countries register significant gains in this area; these are the United States and Canada. On the other hand, the long-term effect for four other countries is minimal and only in the case of France is there an appreciable and consistent loss.

From a more focused perspective, however, there are widespread significant effects on how different elements of the private sector are affected. In general, the impact seems to be one of redistribution away from both private and social wage earners.

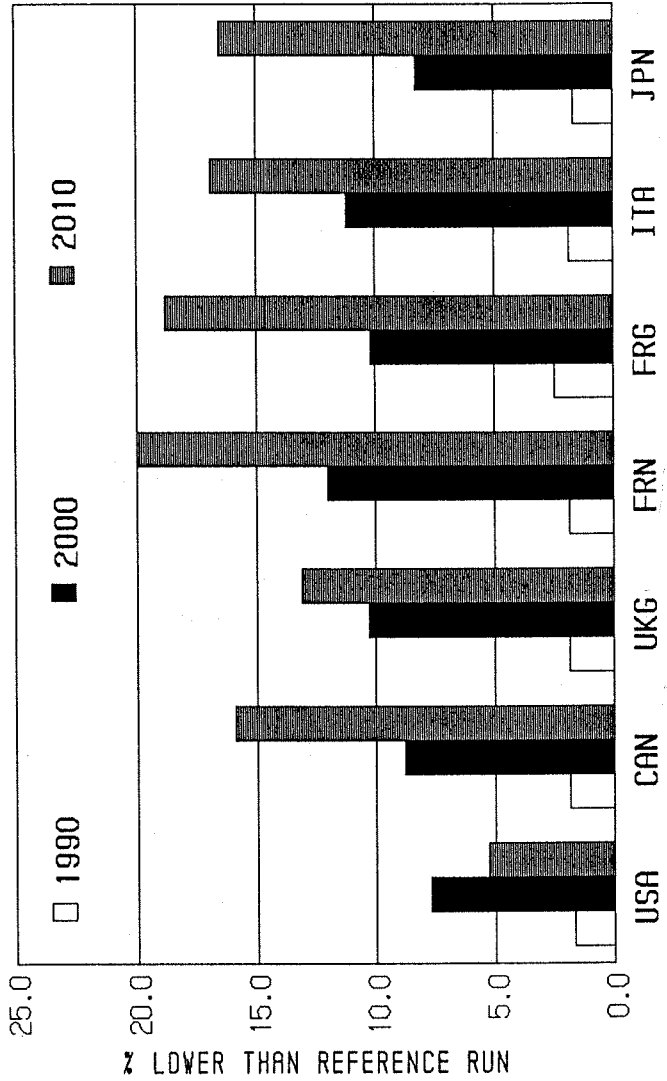
As Devine (1983) has pointed out, government spending has had a prolabor effect. An increasing level of government spending tends to stimulate demand for labor and drive down the ratio of profits to wages. This effect seems to come through forcefully when the fiscal restraint scenario is introduced. In Fig. 5.16 the reductions in real wages in the manufacturing sector across the seven countries are displayed. By the end of the run, real wages in manufacturing average a level 15% lower than those that obtained in the reference run. Although there are differences across the six sectors represented within the domestic economic model, these are relatively small and the overall impact is definitely unfavorable to labor.

And, of course, it might be expected that the imposition of fiscally restrictive budgetary policies would also work its effect on the ability of governments to operate income transfer programs to target populations within the private sector. As many analysts have demonstrated (see, e.g., Danziger et al. 1981; Dennis 1983; Hibbs 1986; Saunders 1984; Smeeding et al. 1985; Stack 1978), this is a very significant, if not the most significant, item within the "fisc" in terms of reducing income inequalities. The primary element within this set of programs, both in terms of its size as well as its redistributive impact has been public pension systems (cf. Uusitalo 1985). The imposition of the fiscal restraint scenario seems to have a profound impact on this major redistributive program (see Fig. 5.17). The average reduction in the pension replacement rate (defined as pensions per client relative to GDP per capita) is over 35%. In four of the seven cases these replacement rates fall below those prevailing in the initial year, 1970.

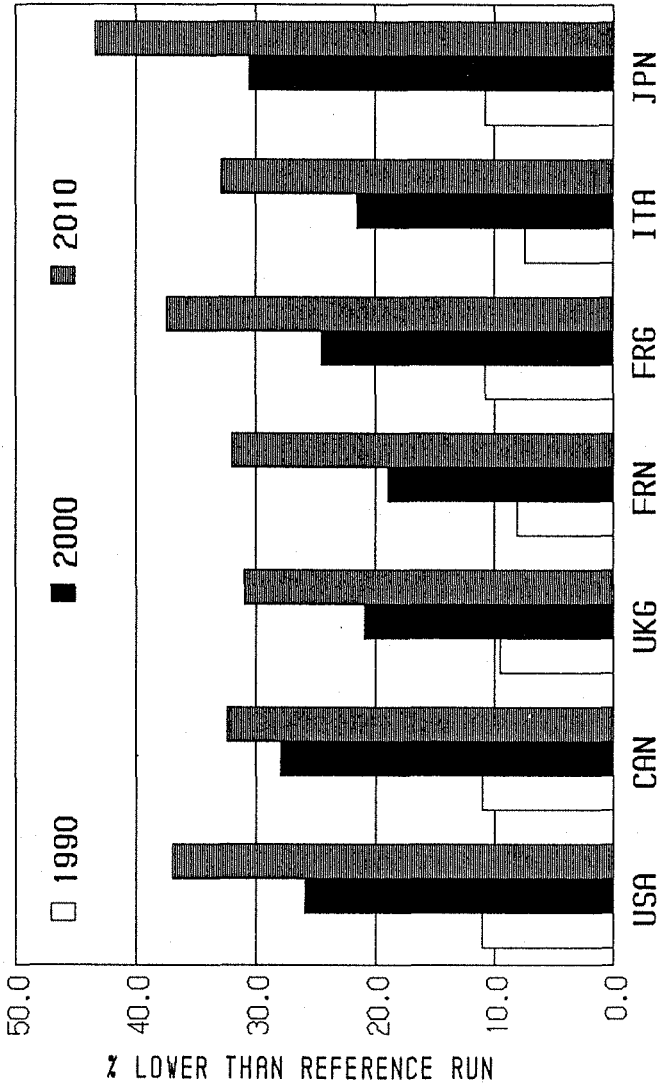
**FIGURE 5.15**  
**CHANGE IN REAL DISPOSABLE INCOME**  
**DUE TO FISCAL RESTRAINT**



**FIGURE 5.16**  
**REDUCTION IN REAL WAGES IN MN**  
**DUE TO FISCAL RESTRAINT**



**FIGURE 5.17**  
**REDUCTION IN PENSION REPLACEMENT**  
**RATE DUE TO FISCAL RESTRAINT**



## **CONCLUSION**

In substantive terms the results of the scenario create a plausible picture. Taken in combination these reductions in private and social wages, joined with the lack of apparently harmful effects to the aggregate flow of disposable income into the household sector, suggest a significant redistributive effect. In conjunction with lower public service output, the economic consequences of the conservative fiscal strategy would appear to be highly favorable to those well-off within society. This gain on the part of the more affluent would come as a consequence of losses to those less well-off and would not produce any consistently appreciable higher level of overall societal welfare.

## **FUTURE DEVELOPMENTS**

There are four major areas where further development efforts in the budgetary sector of the GLOBUS model could prove particularly beneficial. The first relates to the large menu of alternative theoretical structures that could be used to represent the budgetary process. The second deals with the potential for "unpacking" the public sector, i.e., representation of geopolitically distinct elements of government and the relationships that define their place within the allocation process. The third concerns the further elaboration and enrichment of the revenue decision process representation. The fourth area for further development relates to an improved data base and empirical estimation of critical parameters within the model.

As discussed in the first section of this chapter, many different approaches have been used to account for the dynamics of government resource allocation. The model employed here was selected because it appeared to be one of the most attractive and it fit comfortably within the conceptual orientation of the overall project. Nonetheless, there are clearly other interesting models that could be used within this area. Given the objectives of the overall project, i.e., the exploration of alternative long-term problems confronting the state, the possibility of employing distinctly different theoretical representations of how states engage in the process of resource allocation would seem a very fruitful kind of undertaking. The core question, of course, would be whether



these alternative representations entail different consequences. Does, for example, a model drawn from the political business cycle school suggest different long-term developments and problems than those implied by a model drawn from the variety of arguments suggesting that environmental factors are the dominant determinants of government resource allocation outcomes?

Due to an early project decision the possibility of representing different levels of government, e.g., central and local, was rejected. It was felt that this would add too much complexity. The representation of the entire public sector as a coherent whole consequently became part of the model design. In most federal systems, of which there are a fair number included within the GLOBUS 25, the government resource allocation process is far more disjointed and involves dynamics other than those presently represented within the model. Representation of at least two elements of government, the central and noncentral, as well as important relationships that obtain between the two, would improve the quality of the model. It would allow, for example, the possibility of addressing a variety of questions relating to the effectiveness of fiscal policy in decentralized systems. Of course, the addition of more complexity could pose significant problems and ought to be dealt with by reducing some of the complexity that already exists. Again, early project decisions imposed the requirement of producing a significant number of budgetary categories, such as in the social spending area. It was felt that these would be required in order to deal with such central issues as the fulfillment of basic needs within the developing countries. However, no corresponding structures were developed within other parts of the GLOBUS model to handle these concerns and so an obvious strategy would be to move to a higher level of aggregation in terms of the expenditure side of the budget and thereby remove a fair number of variables and equations for which there exist no correspondents within other sectors of GLOBUS.

The structural elements used to represent revenue raising decisions within the model are fairly simplistic and with some effort could be improved. In part this simplicity is reflective of the relative lack of attention given to the taxation process within the theoretical and empirical literature. Given the centrality of the revenue process, and the implications of making one assumption or another regarding the degree to which revenues or expenditures lead one another (cf. von Furstenberg et al. 1985), an effort to enrich this area ought to be undertaken.

Recent work in the political economy tradition (e.g., Karran 1985) is suggestive of the kind of structures that might be incorporated.

Some experienced modellers suggest that too much attention is paid to the development of data bases and the empirical estimation of model parameters in efforts at constructing large-scale models (Meadows and Robinson 1985). The GLOBUS project has given over a great deal of time and effort to such matters and certainly the frustrations involved in these activities prompt one to take a sympathetic view of such a charge. On the other hand, these efforts have a number of beneficial aspects; they quickly alert one to the relatively impoverished situation that exists regarding most variables of interest, they point out, through the process of hypothesis testing, the inadequacy of many seemingly attractive specifications, and they give one some confidence in the formulations finally settled on. Within the budgetary area, an inordinate amount of time and energy was spent dealing with both measurement and estimation problems. There is still dissatisfaction with what was available and with the estimation results that were produced. At the time of this writing one more effort at data set construction and model estimation (the fifth during the term of the project) is underway.

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**TABLE 5A.1**  
**GOVERNMENT REVENUES**

Nation	GOVREV	GRGDP	Nation	GOVREV	GRGDP
USA	275282.	27.79	USR	159978.	40.81
CAN	26123.	30.34	NIG	742.	12.74
MEX	46946.	11.15	SAF	2918.	22.99
VEN	20643.	39.37	IRN	276189.	30.48
BRA	66623.	31.54	TUR	31060.	21.18
ARG	18104.	19.14	EGY	725.	23.22
UKG	17855.	34.41	SAU	6689.	28.47
FRN	279979.	35.34	CHN	67027.	34.55
FRG	235365.	34.39	JPN	15055100.	20.14
GDR	60858.	44.12	IND	68753.	16.35
POL	366409.	42.32	PAK	8555.	16.58
CZE	182789.	48.01	INS	516465.	15.01
ITA	17345200.	29.56			

**TABLE 5A.2**  
**INDIRECT TAXES AND RATES**

Nation	INDTAX	ITR	ITRN
USA	89163.	.090	.102
CAN	11299.	.131	.149
MEX	20800.	.049	.054
VEN	1902.	.036	.037
BRA	30755.	.145	.162
ARG	5203.	.055	.055
UKG	7266.	.141	.152
FRN	103659.	.130	.149
FRG	77540.	.113	.129
GDR	9699.	.070	.072
POL	225723.	.260	.203
CZE	46080.	.121	.135
ITA	6092000.	.104	.111
USR	51095.	.130	.160
NIG	415.	.072	.080
SAF	885.	.069	.078
IRN	57400.	.063	.069
TUR	14372.	.098	.149
EGY	445.	.140	.157
SAU	350.	.015	.013
CHN	26710.	.138	.161
JPN	4397000.	.059	.063
IND	35270.	.084	.101
PAK	4785.	.094	.099
INS	188000.	.056	.066

**TABLE 5A.3**  
**BUSINESS TAXES AND RATES**

Nation	BUSTAX	BTR	BTRN
USA	34477.	.2254	.2149
CAN	3339.	.203	.1948
MEX	7894.	.229	.229
VEN	4600.	.4351	.434
BRA	0.	.0	.0
ARG	825.	.0857	.0997
UKG	1712.	.2497	.1833
FRN	18613.	.1491	.1396
FRG	12400.	.097	.126
GDR	6800.	.3505	.3505
POL	10600.	.1437	.0471
CZE	0.	.0	.0
ITA	798000.	.1286	.132
USR	0.	.0	.0
NIG	143.	.5032	.61
SAF	748.	.3138	.2775
IRN	15300.	.1166	.1166
TUR	1143.	.1007	.0797
EGY	120.	.409	.489
SAU	3913.	.3078	.3078
CHN	0.	.0	.0
JPN	3077000.	.1933	.1718
IND	6780.	.3195	.2812
PAK	930.	.268	.268
INS	8900.	.403	.403

**TABLE 5A.4**  
**WELFARE CONTRIBUTIONS AND RATES**

Nation	WELCON	WCR	WCRN
USA	58712.	.0775	.0804
CAN	2470.	.0423	.0407
MEX	10208.	.046	.046
VEN	845.	.0303	.019
BRA	11877.	.088	.088
ARG	4888.	.0653	.0635
UKG	3132.	.0826	.0804
FRN	116560.	.2081	.2089
FRG	80150.	.1699	.1595
GDR	8800.	.1131	.1237
POL	54610.	.1086	.111
CZE	2150.	.0115	.0176
ITA	7871000.	.1697	.1757
USR	9400.	.0427	.0439
NIG	9.	.0017	.0017
SAF	36.	.004	.0045
IRN	5700.	.0106	.0106
TUR	5418.	.0447	.0501
EGY	56.	.02	.02
SAU	0.	.0	.0
CHN	0.	.0	.0
JPN	3169000.	.0637	.0663
IND	0.	.0	.0
PAK	3.	.001	.001
INS	0.	.0	.0

**TABLE 5A.5**  
**PERSONAL TAXES AND RATES**

Nation	PERTAX	PTR1	PTR1N	ptr2
USA	102774.	.0322	.0296	1.106
CAN	8970.	.0034	.0034	1.347
MEX	7584.	.019	.019	1.0
VEN	721.	.023	.023	1.0
BRA	0.	.0	.0	1.0
ARG	1307.	.007	.007	1.0
UKG	6271.	.0589	.0575	1.098
FRN	37525.	.0072	.0065	1.169
FRG	60440.	.0037	.0035	1.271
GDR	4100.	.0527	.0532	1.0
POL	16300.	.0326	.0317	1.0
CZE	25400.	.137	.136	1.0
ITA	2646000.	.0025	.0025	1.178
USR	13370.	.0607	.0625	1.0
NIG	9.	.002	.002	1.0
SAF	565.	.0021	.0021	1.379
IRN	3800.	.0063	.0063	1.0
TUR	8350.	.0005	.0005	1.413
EGY	29.	.01	.01	1.0
SAU	98.	.0121	.0121	1.0
CHN	0.	.0	.0	1.0
JPN	2939000.	.0049	.0054	1.14
IND	4130.	.013	.013	1.0
PAK	544.	.013	.013	1.0
INS	32700.	.013	.013	1.0



**TABLE 5A.6**  
**OTHER GOVERNMENT REVENUES**

Nation	GPROF	FORAID	Nation	GPROF	FORAID
USA	-8170.	0.	USR	86501.	0.
CAN	351.	0.	NIG	93.	74.
MEX	-129.	650.	SAF	691.	0.
VEN	12550.	33.	IRN	190875.	3212.
BRA	23370.	869.	TUR	100.	1853.
ARG	5796.	106.	EGY	57.	22.
UKG	-295.	0.	SAU	2321.	7.
FRN	6664.	0.	CHN	40317.	0.
FRG	7010.	0.	JPN	1506190.	0.
GDR	31558.	0.	IND	16273.	6376.
POL	64697.	0.	PAK	357.	1949.
CZE	109557.	0.	INS	132506.	154488.
ITA	64952.	0.			

**TABLE 5A.7**  
**REVENUE INSTRUMENT RELIANCE RATES**  
**AND WELFARE PROGRAM FINANCING TARGET**

Nation	ptrpar	itrpar	btrpar	WFTAR
USA	.454	.394	.152	.756
CAN	.38	.479	.141	.354
MEX	.208	.569	.223	1.018
VEN	.1	.263	.637	1.354
BRA	.0	1	.0	1.207
ARG	.179	.709	.112	.918
UKG	.411	.477	.112	.658
FRN	.235	.649	.116	.868
FRG	.402	.516	.083	.940
GDR	.199	.471	.33	.690
POL	.065	.893	.042	1.014
CZE	.355	.645	.0	.076
ITA	.276	.639	.084	.879
USR	.207	.793	.0	.412
NIG	.015	.732	.253	2.033
SAF	.257	.403	.34	.123
IRN	.05	.75	.2	.606
TUR	.35	.602	.048	2.216
EGY	.049	.749	.203	1.437
SAU	.022	.08	.898	.0
CHN	.0	.1	.0	.0
JPN	.296	.422	.282	.910
IND	.089	.764	.147	.0
PAK	.089	.764	.147	.106
INS	.106	.607	.287	.0

**TABLE 5A.8**  
**TARGET REVENUE PARAMETERS**

Nation	egpar1	egpar2	egpar3	egpar4	egpar5
USA	.003	1.353	.530	.294	.0
CAN	.008	1.353	.530	.294	.0
MEX	.006	1.242	.438	.970	.0
VEN	.028	1.242	.438	.0	.0
BRA	.019	1.242	.438	.0	.0
ARG	.012	1.242	.438	.0	.0
UKG	.007	1.353	.530	.294	.0
FRN	.006	1.353	.530	.294	.0
FRG	.006	1.353	.530	.294	.0
GDR	1.304	.911	.485	.0	.604
POL	1.122	.911	.485	.0	.604
CZE	1.662	.911	.485	.0	.604
ITA	.002	1.353	.530	.294	.0
USR	1.585	.911	.485	.0	.604
NIG	.021	1.242	.438	.0	.0
SAF	.025	1.242	.438	.0	.0
IRN	.012	1.242	.438	.0	.0
TUR	.020	1.242	.438	.0	.0
EGY	.039	1.242	.438	.0	.0
SAU	.028	1.242	.438	.0	.0
CHN	.363	1.0	1.0	.0	.0
JPN	.000	1.353	.530	.294	.0
IND	.022	1.242	.438	.970	.0
PAK	.014	1.242	.438	.0	.0
INS	.005	1.242	.438	.0	.0

**TABLE 5A.9**  
**GOVERNMENT DEBT**

Nation	GDEBT	GDGDP	Nation	GDEBT	GDGDP
USA	487268.	49.19	USR	0.	0.
CAN	37592.	43.66	NIG	1806.	31.03
MEX	430900.	102.33	SAF	5128.	40.40
VEN	5492.	10.48	IRN	0.	0.
BRA	279500.	132.32	TUR	57772.	39.39
ARG	12883.	13.62	EGY	2144.	68.63
UKG	54350.	104.75	SAU	0.	0.
FRN	98816.	12.47	CHN	0.	0.
FRG	83209.	12.16	JPN	30345000.	40.60
GDR	0.	0.	IND	162758.	38.70
POL	0.	0.	PAK	1588.	3.08
CZE	0.	0.	INS	998000.	29.01
ITA	9269800.	15.80			

**TABLE 5A.10**  
**TOTAL GOVERNMENT EXPENDITURE**  
**AND ITS MAIN COMPONENTS**

Nation	GXGDP	TOTEX	GOVCON	WELBEN	GIX	GDMAN
USA	31.47	311756.	190764.	77631.	29084.	14287.
CAN	32.13	27665.	16937.	6985.	3157.	588.
MEX	16.99	71559.	32575.	10029.	15339.	13618.
VEN	39.07	20483.	6902.	624.	12752.	205.
BRA	28.55	60298.	21176.	9840.	20450.	8848.
ARG	23.81	22523.	9055.	5322.	7940.	335.
UKG	33.23	17241.	9174.	4762.	2435.	899.
FRN	34.80	275679.	110498.	134259.	30102.	822.
FRG	34.01	232802.	110295.	85230.	30679.	6600.
GDR	43.56	60086.	23495.	12750.	23841.	0.
POL	42.05	364075.	161920.	50910.	151245.	0.
CZE	47.29	180049.	109620.	28230.	42199.	0.
ITA	32.16	18869600.	7424710.	8951000.	1989631.	505000.
USR	39.81	156069.	83070.	22806.	50194.	0.
NIG	13.41	781.	578.	4.	139.	60.
SAF	26.55	3370.	1564.	293.	1336.	177.
IRN	27.97	253404.	141600.	9400.	102404.	0.
TUR	17.62	25844.	18719.	2445.	3825.	860.
EGY	41.00	1281.	792.	39.	357.	87.
SAU	23.06	5417.	3798.	24.	1595.	0.
CHN	33.56	65106.	32570.	2000.	30536.	0.
JPN	19.32	14440800.	5624800.	3483000.	4850473.	458000.
IND	14.31	60165.	38010.	5780.	14227.	2160.
PAK	16.29	8405.	5270.	283.	2784.	68.
INS	9.88	339834.	293000.	0.	32463.	14400.

**TABLE 5A.11**  
**GOVERNMENT CONSUMPTION**  
**EXPENDITURE COMPONENTS**

Nation	EDX	HEX	FAX	ADX	DEX
USA	42800.	9300.	3050.	57760.	77854.
CAN	5994.	4107.	350.	4425.	2061.
MEX	10779.	1619.	0.	17427.	2750.
VEN	1951.	1350.	0.	2710.	891.
BRA	5687.	619.	0.	10944.	3926.
ARG	1796.	135.	0.	5324.	1800.
UKG	1872.	1860.	201.	2797.	2444.
FRN	38387.	18273.	5360.	15806.	32672.
FRG	24846.	10208.	2185.	50483.	22573.
GDR	5812.	5877.	0.	3912.	7894.
POL	37200.	33200.	0.	52850.	38670.
CZE	12400.	12280.	0.	67340.	17600.
ITA	2228000.	455000.	91706.	3088000.	1562000.
USR	19834.	9300.	0.	7700.	46236.
NIG	84.	36.	0.	159.	299.
SAF	141.	56.	0.	1110.	257.
IRN	23000.	8000.	0.	56600.	54000.
TUR	3914.	1053.	0.	7515.	6237.
EGY	13.	4.	0.	295.	480.
SAU	606.	166.	0.	1371.	1655.
CHN	2756.	1047.	0.	13567.	15200.
JPN	2885646.	255000.	163804.	1750354.	570000.
IND	3349.	1660.	0.	21254.	11747.
PAK	457.	390.	0.	1448.	2975.
INS	92439.	45000.	0.	53361.	102200.

**TABLE 5A.12**  
**GOVERNMENT CONSUMPTION COMPONENTS**  
**AS A PERCENTAGE SHARE OF GDP**

Nation	GEDGDP	GHXGDP	GFAGDP	GAXGDP	GDXGDP
USA	4.321	.939	.308	5.831	7.860
CAN	6.962	4.770	.407	5.140	2.394
MEX	2.560	.385	.0	4.138	.653
VEN	3.721	2.575	.0	5.169	1.700
BRA	2.692	.293	.0	5.181	1.859
ARG	1.898	.143	.0	5.627	1.903
UKG	3.608	3.585	.387	5.391	4.710
FRN	4.845	2.306	.677	1.995	4.124
FRG	3.630	1.491	.319	7.376	3.298
GDR	4.214	4.261	.0	2.836	5.723
POL	4.300	3.835	.0	6.104	4.466
CZE	3.257	3.226	.0	17.688	4.623
ITA	3.797	.775	.156	5.263	2.662
USR	5.059	2.372	.0	1.964	11.794
NIG	1.443	.618	.0	2.732	5.137
SAF	1.111	.441	.0	8.744	2.025
IRN	2.538	.883	.0	6.246	5.959
TUR	2.669	.718	.0	5.124	4.252
EGY	.416	.128	.0	9.445	15.369
SAU	2.579	.707	.0	5.836	7.045
CHN	1.420	.540	.0	6.993	7.834
JPN	3.861	.341	.219	2.342	.763
IND	.796	.395	.0	5.054	2.793
PAK	.886	.756	.0	2.807	5.767
INS	2.687	1.308	.0	1.551	2.970

**TABLE 5A.13**  
**EDUCATIONAL PROGRAM VARIABLES**

Nation	expsi	exti	COSTED	COSTT	ERED	ERT
USA	.705	.295	564.	1484.	1.06	.4943
CAN	.703	.297	753.	2765.	.99	.3459
MEX	.882	.118	796.	5182.	.69	.0578
VEN	.579	.421	402.	8913.	.75	.099
BRA	.238	.762	75.	9764.	.58	.0526
ARG	.743	.257	316.	1685.	.74	.1382
UKG	.735	.265	136.	832.	.93	.14
FRN	.809	.191	3210.	11052.	.92	.1609
FRG	.799	.201	1880.	9663.	.93	.1377
GDR	.746	.254	1362.	4837.	.93	.3288
POL	.703	.297	3949.	28153.	.83	.1384
CZE	.781	.219	4323.	20674.	.78	.1044
ITA	.886	.114	238576.	358840.	.79	.1717
USR	.854	.146	300.	644.	.94	.2495
NIG	.762	.238	17.	1339.	.21	.0031
SAF	.75	.25	23.	421.	.67	.045
IRN	.85	.15	3779.	45500.	.54	.0309
TUR	.514	.486	269.	11063.	.68	.0609
EGY	.796	.204	2.	12.	.52	.0792
SAU	.598	.402	881.	39231.	.23	.0126
CHN	.816	.184	9.	395.	.99	.02
JPN	.859	.141	125513.	223279.	.95	.1702
IND	.851	.149	34.	168.	.5	.0639
PAK	.782	.218	59.	806.	.28	.025
INS	.777	.223	4607.	81960.	.43	.027



**TABLE 5A.14**  
**DESTINATION OF FOREIGN AID IN 1970**  
**(Million US Dollars)**

Recipient	Donor Nation						
	USA	CAN	UKG	FRN	FRG	ITA	JPN
MEX	4.	.0	.2	9.4	3.1	7.8	.2
VEN	2.	.0	.1	.0	1.6	.1	.0
BRA	125.	.7	.5	.3	28.6	.1	.5
ARG	5.	.4	.2	.0	14.9	.1	.0
NIG	37.	.6	27.2	.0	17.	.1	4.7
IRN	10.	.0	1.5	10.1	6.	.2	12.
TUR	99.	3.3	12.4	3.2	36.4	5.8	.2
EGY	0.	.0	.8	9.1	10.4	31.5	.1
SAU	0.	.0	.0	.0	.1	.0	.0
IND	424.	105.8	107.5	15.2	83.8	5.5	59.4
PAK	211.	44.9	25.5	2.8	45.5	.0	49.8
INS	195.	3.1	6.4	14.8	24.6	18.7	128.8
ROW	1942.	182.1	298.7	903.4	327.	186.5	202.3

**TABLE 5A.15**  
**AID DISTRIBUTION POLICY PARAMETERS**

Nation	fasp2	fasp3	fasp4	fags
USA	.374	.34	.091	.364
CAN	.209	.176	.06	.474
UKG	.185	.202	.199	.379
FRN	.141	.415	.168	.070
FRG	.255	.264	-.066	.454
ITA	.141	.415	.168	.475
JPN	.27	.265	.094	.558

**TABLE 5A.16**  
**DISTRIBUTION OF MILITARY SPENDING**

Nation	DEXL	DEXK	dklr	DEXSTR
USA	36575.	29367.	1.489	11912.
CAN	965.	1096.	1.061	--
MEX	654.	2096.	.326	--
VEN	506.	386.	1.558	--
BRA	1520.	2406.	.863	--
ARG	863.	937.	1.325	--
UKG	945.	1425.	.916	73.
FRN	13611.	18735.	.857	327.
FRG	9314.	13259.	.824	--
GDR	3954.	3941.	1.214	--
POL	19183.	19487.	1.191	--
CZE	9425.	8175.	1.388	--
ITA	561753.	1000250.	.626	--
USR	20805.	18357.	1.366	7074.
NIG	24.	275.	.037	--
SAF	144.	113.	1.522	--
IRN	17937.	36063.	.534	--
TUR	2013.	4224.	.6	--
EGY	180.	300.	.684	--
SAU	633.	1022.	.709	--
CHN	3956.	11092.	.398	152.
JPN	334619.	235381.	1.668	--
IND	2520.	9227.	.265	--
PAK	735.	2240.	.352	--
INS	12342.	89858.	.084	--

**TABLE 5A.17**  
**CONVENTIONAL MILITARY CAPABILITIES**

Nation	POW	UCD	ddr	ucdp1
USA	489.38	245.	.45	.033
CAN	12.24	306.	.45	.033
MEX	5.05	908.	.4	.051
VEN	4.63	350.	.45	.051
BRA	22.89	286.	.4	.051
ARG	20.6	146.	.4	.051
UKG	47.52	83.	.4	.033
FRN	59.64	986.	.45	.033
FRG	59.28	692.	.45	.033
GDR	16.99	845.	.45	.04
POL	35.54	1978.	.45	.04
CZE	27.59	1160.	.45	.04
ITA	41.6	68269.	.45	.033
USR	487.99	146.	.45	.04
NIG	4.39	114.	.4	.051
SAF	7.25	65.	.45	.051
IRN	15.19	6464.	.45	.051
TUR	47.09	221.	.4	.051
EGY	29.86	29.	.45	.051
SAU	3.43	877.	.45	.051
CHN	223.29	112.	.4	.04
JPN	40.86	25364.	.45	.033
IND	59.69	328.	.4	.051
PAK	23.19	214.	.4	.051
INS	13.47	12645.	.4	.051

**TABLE 5A.18**  
**STRATEGIC MILITARY CAPABILITIES**

Nation	STRAT	UCDS	ddrs	ucdp2
USA	4763.	25.	.9	.015
UKG	107.	7.	.9	.015
FRN	5.	653.	.9	.015
USR	4310.	16.	.9	.015
CHN	18.	84.	.9	.015

**TABLE 5A.19**  
**SECURITY RATIO GOALS**

Nation	CONRA	STRRA	rlsecl
USA	.724	.355	.671
CAN	.337	--	--
MEX	.123	--	--
VEN	.149	--	--
BRA	.072	--	--
ARG	.239	--	--
UKG	.408	.032	.928
FRN	.331	.175	.654
FRG	.451	--	--
GDR	.660	--	--
POL	.181	--	--
CZE	.349	--	--
ITA	.081	--	--
USR	.582	.472	.552
NIG	.495	--	--
SAF	2.982	--	--
IRN	.067	--	--
TUR	.083	--	--
EGY	.354	--	--
SAU	.343	--	--
CHN	1.642	5.209	.240
JPN	.213	--	--
IND	.304	--	--
PAK	.122	--	--
INS	.355	--	--

**TABLE 5A.20**  
**SHARES OF WELFARE BENEFITS**  
**ALLOCATED TO PENSIONS**  
**AND UNEMPLOYMENT COMPENSATION**

Nation	penshr	unshar	Nation	penshr	unshar
USA	.759	.072	USR	.726	.0
CAN	.331	.086	NIG	.0	.0
MEX	.282	.0	SAF	.0	.0
VEN	.053	.0	IRN	.268	.0
BRA	.436	.0	TUR	.443	.0
ARG	.315	.0	EGY	.812	.007
UKG	.67	.058	SAU	.0	.0
FRN	.36	.011	CHN	.0	.0
FRG	.632	.033	JPN	.161	.089
GDR	.61	.0	IND	.76	.0
POL	.694	.0	PAK	.0	.0
CZE	.608	.0	INS	.0	.0
ITA	.553	.017			

**TABLE 5A.21**  
**EXPENDITURE ASPIRATION LEVELS PARAMETERS**

Nation	dtp1	dtp2	dxcpl	cxcpl
USA	1.106	.754	.767	1.03
CAN	1.106	.754	.767	1.03
MEX	1.3	.04	.783	1.0
VEN	1.167	.04	.783	1.0
BRA	1.167	.04	.783	1.0
ARG	1.167	.04	.783	1.0
UKG	1.106	.754	.767	1.03
FRN	1.106	.754	.767	1.03
FRG	1.106	.754	.767	1.03
GDR	1.0	.2	.766	1.0
POL	1.0	.2	.766	1.0
CZE	1.0	.2	.766	1.0
ITA	1.106	.754	.767	1.03
USR	1.0	.2	.766	1.0
NIG	1.167	.04	.783	1.0
SAF	1.167	.04	.783	1.0
IRN	1.167	.04	.783	1.0
TUR	1.167	.04	.783	1.0
EGY	1.3	.04	.783	1.0
SAU	1.0	.04	.783	1.0
CHN	1.0	.2	.766	1.0
JPN	1.106	.754	.767	1.03
IND	1.167	.04	.783	1.0
PAK	1.167	.04	.783	1.0
INS	1.167	.04	.783	1.0

**TABLE 5A.22**  
**EXPENDITURE LEVELS ADJUSTMENT**  
**ELASTICITIES**

Nation	tadje	dadje	cadje	iadje
USA	1.107	.793	1.291	.661
CAN	1.157	.679	1.257	.809
MEX	1.547	.62	1.768	1.613
VEN	1.653	.926	1.791	1.373
BRA	.476	.294	1.184	.015
ARG	1.547	.62	1.768	1.613
UKG	1.139	.935	1.241	.627
FRN	1.148	.84	1.24	.994
FRG	1.204	.834	1.286	.947
GDR	1.0	1.04	.96	1.0
POL	1.0	1.04	.96	1.0
CZE	1.0	1.04	.96	1.0
ITA	1.155	.935	1.198	1.064
USR	1.0	1.04	.96	1.0
NIG	1.653	.926	1.791	1.373
SAF	1.547	.62	1.768	1.613
IRN	1.653	.926	1.791	1.373
TUR	1.547	.62	1.768	1.613
EGY	1.547	.62	1.768	1.613
SAU	1.653	.926	1.791	1.373
CHN	1.0	1.04	.96	1.0
JPN	1.204	.956	1.249	1.134
IND	1.547	.62	1.768	1.613
PAK	1.547	.62	1.768	1.613
INS	1.653	.926	1.791	1.373

**TABLE 5A.23**  
**BUDGETING BARGAINING WEIGHTS**

Nation	top1	top2	top3	top4
USA	.518	.104	.401	.013
CAN	.518	.07	.431	.017
MEX	.648	.033	.512	.103
VEN	.648	.037	.304	.306
BRA	.648	.062	.42	.166
ARG	.648	.064	.439	.145
UKG	.518	.133	.364	.021
FRN	.518	.105	.397	.016
FRG	.518	.091	.407	.02
GDR	1.000	.603	.08	.317
POL	1.000	.547	.093	.36
CZE	1.000	.602	.156	.242
ITA	.518	.093	.332	.092
USR	1.000	.813	.039	.148
NIG	.648	.282	.291	.075
SAF	.648	.066	.405	.177
IRN	.648	.161	.314	.174
TUR	.648	.177	.415	.056
EGY	.648	.309	.221	.118
SAU	.648	.218	.31	.12
CHN	1.000	.722	.035	.243
JPN	.518	.046	.408	.064
IND	.648	.151	.403	.094
PAK	.648	.278	.236	.134
INS	.648	.202	.41	.036



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