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The Growth of Government Expenditure: A Review of Quantitative Analysis

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Abstract

This paper reviews the extensive empirical literature on the growth and determinants of government expenditure. Although the coverage does not aim to be exhaustive, the authors provide an overview of the quantitative approaches to analyzing the growth in government expenditure. The main debates in the literature are described, and the authors present a few tests of some theories and describe one or two of their own experiments in others. The paper highlights the data problems and the technical difficulties of hypothesis testing and model estimation in this area, many arising from the nature of the problem studied. It is contended that the quantitative analysis of government expenditure growth has often improved the formulation of hypotheses, but that data and theoretical limitations have meant that the methods employed have not always been justified.

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Summary

This paper reviews the extensive empirical literature on the growth and determinants of government expenditure. The authors identify two major conceptual themes that have been the focus of empirical research on the growth of government expenditure: "Wagner's Law" and the "displacement effect." An overview of the proliferating empirical research based on these speculations reveals that this research has followed two main directions. First, there has been a "vertical" movement manifested in a more rigorous questioning of the data. Second, there has been a "horizontal" movement indicated by a widening of the scope of research.

In the former approach, research has developed from hypothesis formulation to hypothesis testing, and most recently to that of estimation. This latter stage is characterized by an important change of emphasis: instead of asking whether a relationship is verified by the data, the existence of a particular causal relationship is taken to be established and the primary problem is that of assigning values to its parameters. While quantitative research in advanced countries has shown this vertical progression, it has done so on the basis of only a few narrow hypotheses, primarily those emphasizing the strategic importance of per capita income.

In complete contrast, cross-country research, and particularly inter-state studies in the United States, has moved away from this narrow formulation following the discovery of income's relatively meager explanatory power. Indeed, the latter research has given rise to two distinct and important developments: emphasis on noneconomic expenditure determinants and the recognition of the importance of disaggregating public expenditure into more homogeneous categories.

Although many of the problems faced in testing hypotheses about the growth in public expenditures have already been mentioned in the literature, the authors doubt that there has been a full appreciation of the magnitude of the difficulties to be overcome. They argue that these problems stem from three main sources: First, underestimation of the data problems, second, the inability of current theory to provide the basis for identifying relevant relationships, and third, the failure to appreciate this limitation. Coupled with the nature of the problem, this failure has meant that most empirical methods inevitably prove inadequate. As a result, the move to the stage of empirical research characterized by the estimation of a rigorously specified model appears ambitious. Rather, it is contended that in the absence of an adequate theory of the decision process involved in public spending, attempts to specify models borrowed from other areas of economics tend to be oversimplifications and rest on dubious behavioral assumptions. Given the grave conceptual and technical problems faced by any rigorous quantitative formulation in this field, the case is advanced for a return to first principles, to the primary stage of hypothesis formulation, and the search for laws of association.

I. Introduction

Until the early 1960s, public expenditure remained a relatively neglected area in public finance. Since then, however, considerable attention has been focused on various aspects of public expenditure. In particular, empirical studies concerned with the growth and determinants of government expenditure have proliferated. This survey reviews the literature and explores the authors' contention that the quantitative analysis of government expenditure growth has often improved the formulation of hypotheses, but that data and theoretical limitations have meant that the methods employed have not always been justified.

The review of the literature that follows is not exhaustive but is meant to give a flavor of the main debates. It includes a few tests of some theories and one or two experiments in others. After the introduction, Section II reviews two major conceptual themes that have dominated the literature in this field. Section III gives a short overview of empirical approaches to be found in the literature. Two prominent characteristics of this research, the proliferation of studies on the determinants of government expenditure growth and the disaggregation of total government expenditure, are reviewed separately in Sections IV and V. Section VI deals with data problems that have assumed increasing importance in recent research, while Sections VII and VIII review the problems of hypothesis testing and model estimation that have characterized many empirical studies. It is argued in Section IX that many of the latter problems have arisen from the nature of the problem studied. The concluding section offers some comments on the possible directions for future empirical research.

II. A Review of Theoretical Speculations

Many authors have tried to explain the growth of public expenditure over time, by examining either trends in absolute levels of public expenditure or, more frequently, changes in the ratio of public expenditure to a measure of income, usually gross national product (GNP). 1/

While our knowledge of the sources of public expenditure growth still remains conjectural, two central themes have provided guidelines for organizing our thinking about the relative share of the public sector in the economy: Wagner's Law of ever-increasing state expansion and the displacement effect associated with Peacock and Wiseman. Although subject to some ambiguity, the conventional interpretation of Adolph Wagner's thesis implies continuous relative expansion of public

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1/ For a review of the major trends and an international comparison of industrial countries, see Tanzi (1986).

spending as a consequence of the development process. 1/ Wagner suggested that as a society became industrialized the set of social, commercial, and legal relationships within it would become more complex. Government would occupy a more prominent role in setting up and running institutions to try to control this complexity. These regulatory and protective functions of the state would enlarge the size of public budgets. Wagner also believed that many public outputs were income elastic so that during periods of rapid industrialization, and hence rapid income growth, public expenditures would expand. 2/ If public expenditures are income elastic, then the growth in incomes will explain part of the rising trend in public expenditures. Industrialization, urbanization, and demographic changes will result in increased public expenditures as the public sector reacts to these social processes by providing the infrastructure for urbanization and industrialization and by establishing new programs to deal with the social costs of urban life. Wagner's broad approach, therefore, contains many features that could be incorporated into an analysis of public expenditure growth.

On the other hand, the Peacock-Wiseman thesis aimed at an "explanation of the time pattern of expenditure growth rather than upon the absolute magnitude of public expenditures." 3/ Their analysis of U.K. expenditure data found that, what might be called the permanent influences on growth, such as population and employment trends, could not explain the observed time pattern. They then speculated about other relevant influences and, in particular, about the importance of social disturbances. The time pattern Peacock and Wiseman referred to was the set of values taken by the ratio of public expenditure to GNP over time. Their rudimentary theory of the political process was that, in a democracy in which the citizenry had an idea of what constituted a tolerable burden of taxation, governments were, therefore, severely constrained from increasing public expenditures dramatically. During periods of social disturbance, such as war, famine, or some natural disaster, the citizenry's level of tolerance for taxation is reviewed upward and public expenditures expand. The result is that the ratio of public expenditure to GNP will display a sudden jump and the mix of public expenditures will change. After the social disturbance the tolerable rates of taxation do not return to their original levels. The jump in public expenditures was referred to as the displacement effect

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1/ It is generally assumed that Wagner was explaining trends in the ratio of government expenditure to GNP although he never actually makes this explicit. For more detail see Musgrave (1969), p. 73, fn. 1; and Wagner (1890). For subsequent interpretations, see Timm (1961); Schmidt (1966); and Bird (1971).

2/ For critical appraisal of Wagner's Law, see Peacock and Wiseman (1961) and their introduction to the second edition; and Bird (1970), which evaluates some of the subsequent empirical tests of Wagner's Law.

3/ Cf. Peacock and Wiseman (1961), Introduction, p. vii, although the earlier work of Fabricant is more widely recognized as being influential in the United States.

and, using nothing more sophisticated than graphs, Peacock and Wiseman attempted to demonstrate, using U.K. data, that such displacements had occurred at the time of the world wars. This ratchet effect coupled with their inspection effect 1/ provided an explanation of the time pattern of public expenditures that occurred after the social disturbance had subsided.

Both of these works provided the framework for many subsequent empirical studies. Empirical analysis of the Wagner thesis has concentrated on the determinants of the growth of public spending, while quantitative research on the Peacock-Wiseman hypothesis has concerned itself with testing for shifts in public spending caused by social upheavals. While the determinants literature has expanded rapidly, and for the most part has confirmed Wagner's thesis, the empirical treatment of the displacement effect has been, on the whole, less favorable to Peacock and Wiseman and has generated conflicting conclusions. 2/ These conclusions suggest that Peacock and Wiseman have misinterpreted their statistics. For example, Musgrave (1969) argues that after World Wars I and II the U.K. ratio of public expenditure to GNP returned to its prewar long-term trend; that is, there is no long-term effect of social disturbances upon public expenditures.

We do not intend to enter the debate on the existence of displacements in the growth of public expenditures, which has previously been reviewed by one of the authors (Diamond 1977a), who argued that the displacement hypothesis should be interpreted as a theory of the structural break. Viewed in this way, a structural break posits two distinct regimes before and after a social upheaval. Consequently, instead of separate statistical tests for the stability of the constant term and the slopes coefficients of the expenditure function, a total test of structural stability should be applied. Although the results of such tests have been disputed, 3/ it is instructive to note how in the past, theoretical interpretations of the displacement effect have dictated the statistical techniques used to test it. At the same time, statistical testing has helped influence the causal interpretation of any displacements found. 4/ In any case, even if parametric instability

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1/ I.e., that during the social disturbance, groups and individuals in society become aware of the need for expanded public expenditures.

2/ Examination of the displacement effect using the Peacock-Wiseman methodology has been carried out for a number of countries, viz., Andic and Veverka (1964); Blöndal (1969); Donoghue and Tait (1968); Emi (1963); Hook (1962); and Van Waadijk (1964). On the whole, these studies have supported the hypothesis. However, more recent studies using econometric techniques particularly for the United States and the United Kingdom, have questioned the statistical significance of displacements. For the United States see Tussing and Henning (1974). For the United Kingdom, see Gupta (1967); Bonin, Finch, and Waters (1969); and Pryor (1968).

3/ Tussing and Henning (1979).

4/ See Diamond (1977a), p. 396 ff.

could be adequately proved, these displacements still require an explanation in order to improve our understanding of the actual influences on expenditure growth and, in particular, of the apparent instability of those influences.

III. An Overview of Empirical Studies

Quantitative analysis in this field has developed in a not · untypical manner. First, there has been a "vertical" movement manifested in the more rigorous nature of the research question addressed to the data; and second, there has been a "horizontal" movement indicated by a widening of the scope of research. Whereas the work carried out in advanced countries typifies the former development, cross-country and interstate studies in the United States tend to illustrate the latter.

The vertical progression in the search for positive laws of government expenditure growth can be structured in the fashion suggested by Haavelmo (1944). The first state is that of hypothesis formulation or the creative stage of constructing tentative models. Here the prime objective is the isolation of systematic relationships between variables as the groundwork for subsequent theoretical explanation based on these empirical regularities, as exemplified by the work of Peacock and Wiseman. The second stage of research is that of hypothesis testing, "the problem of deciding on the basis of data whether to maintain and use a certain theory or to dismiss it in exchange for another" (Haavelmo (1944, p. 12)). It could be argued that, following the pioneering studies, the major part of subsequent research has concentrated on the problem of identifying the most relevant variables that explain the growth in public spending.

Recent studies reveal that quantitative research has attempted to move to the third stage--estimation--which is characterized by a subtle change in emphasis. Instead of asking whether a relationship is verified by the data, the investigator accepts the existence of a particular causal relationship and concentrates on assigning values to its parameters. As a consequence the older one-equation models have been replaced by simultaneous equation models with the adoption of such methods as indirect and two-stage least squares in order to eliminate bias in the estimates (Harowitz (1968); Henderson (1968); Gramlich (1969)). The latter techniques, however, have been most widely used on U.S. data.

While quantitative research in industrial countries has shown this vertical progression, it has only done so on the basis of a few narrow hypotheses, primarily those emphasizing the strategic importance of GNP or per capita income. In complete contrast, cross-country research and, particularly, interstate studies in the United States have moved away from this narrow formulation following the discovery of the relatively meager explanatory power of income. More particularly, the interstate

studies have given rise to two distinct and important developments: the emphasis on noneconomic expenditure determinants, and the recognition of the importance of disaggregating public expenditure magnitudes into more homogeneous categories. 1/ These two developments will now be reviewed.

IV. Determinants of Public Expenditure

A review of the proliferating determinants literature reveals a wide range of explanations for public expenditure growth.

1. Demographic influences

The importance of population size has long been appreciated, many studies having examined public expenditure in per capita terms. Apart from its size, the rapidity of increase, the age structure, 2/ and the geographical concentration 3/ of population have all been mentioned as possible explanations of public sector expansion.

2. Social influences

Taking a demand interpretation of expenditure growth, several writers have emphasized the community's various social needs, such as the rapid expansion of expenditure on education. Some writers explain this by the increasing technological requirements demanded of the labor force (e.g., Pryor (1968, Appendix E7), others by a change in social values and individual preferences (e.g., Musgrave (1969, p. 85 ff), much depending on whether expenditure on education is regarded as consumption or investment.

Another rapidly growing component of public expenditure has been in the areas of health and social services. Again, this development has been interpreted in diverse ways, with some viewing it as a consequence of the change in economic and social organization requiring greater

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1/ Consistent with these changes in the nature and scope of research have gone changes in technique. Recognition of the large number of possible explanatory variables has called forth the use of selection techniques like covariance analysis (Morss, Fredland, and Hymans (1967)), principal components and stepwise regression (Birdsall (1965); Weicher (1970)). The final results are usually presented in the form of a multiple regression equation explaining the growth of some specific category of public expenditure.

2/ For example, Goffman and Mahar (1971) consider the age structure of the population to have been a dominant factor in public expenditure growth in six Caribbean countries during the post-war period.

3/ The consequences of urbanization have been stressed in various studies (Williamson (1961); Deutsch (1961); Thorn (1967); Goffman and Mahar (1971)). However, the consequences of suburbanization have generally been overlooked.

state protection of the individual, 1/ and others as a change in
ideology with a substitution of collective for individual
responsibility. 2/ Parallel to this argument, again stemming from
Wagner's seminal work, several writers have proposed that, as society
develops, the cause and consequence of the division of labor and the
concomitant increase in the complexity of social relationships generate
increasing social friction. Musgrave (1969, p. 79) suggests that, owing
to this increasing interdependency, externalities have increased and
with them the need for greater social control. The requirement of
greater regulation, law, and administration, and the provision and
maintenance of such services would be manifested in increasing
expenditures. 3/ This social unrest argument is in line with the
Peacock-Wiseman displacement hypothesis that major social upheavals,
such as war or rapid inflation, exert an upward pressure on public
spending (Peacock and Wiseman (1961)). Another variant of this argument
underscores the need for government action—such as Keynesian
stabilization measures—to correct malfunctions in the economy.

3. Prosperity and income distribution

The proposition that as incomes increase, people spend
proportionately more on services has resulted in per capita income being
adopted as a favorite explanation of public expenditure growth. The
distribution of income is also likely to exert an influence on
expenditure growth, and would be felt either because it affects total
demand, including the demand for public goods and services, or because
the expansion of public spending has implemented redistribution.

4. Financial constraints

The idea of constraints on the growth in public spending operating
from the supply side has emerged from a number of sources. After
examining developing countries and from the discussion of the limits of
taxation, several writers have stressed the influence of the tax system
on expenditure (Hindrichs (1966); Musgrave (1969); Oshima (1957)). In
particular, the built-in revenue response that is due to the high income

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1/ For example, Williamson (1961) would argue that along with
urbanization has gone the submergence of the informal security of the
village and extended family and the emergence of formal state security.
While Andic and Veverka (1964) see the crucial change in economic
organization as a secular decline in the size of the consumption unit,
so that "as economic growth tends to reduce its size as well as dissolve
many collective organizations interposed between the consumption unit
and the State, this leads to a general demand on the public authorities
to protect the economic status of the individual members of the
community" (op. cit, p. 219).

2/ Cf. Martin and Lewis (1956); Andic and Veverka (1964).

3/ This argument is in line with G.K. Galbraith's emphasis on "market
failure" as necessitating increasing public intervention (Galbraith
(1967, p. 296 ff)).

elasticity of taxation in advanced economies has been pinpointed as favoring expenditure growth. The effects of inflation, coupled with a progressive tax structure (i.e., fiscal drag), have also been considered a cause of public sector expansion.

Of course, the discussion of fiscal ceilings in advanced economies has taken a more sophisticated view in recognizing the set of political constraints that determine the limits imposed on the tax system. In a parallel manner, Peacock and Wiseman introduced the concept of a tolerable level of taxation, which unfortunately is a difficult notion to quantify. A more naive view of this process is the Parkinson thesis that expenditures rise to exhaust the revenue available (Parkinson (1957)), a theme also developed by Please (1967). Morss, Fredland, and Hymans (1967) identified the supply limitation on the expansion of state expenditures in the United States as dependent on the size of the previous year's deficit.

5. Technology

The profound impact that technological change has had on the structure and social organization of the economy implies at least an indirect impact on the growth of public spending. 1/ It has also been suggested that modern technology has increased the efficient scale of production not only in industry but perhaps even for services provided by the public sector. Technology has also affected the composition of production within the economy. As the economy develops, the greater division of labor and regional integration create demands on the service sector to provide this increased interconnectedness.

The productivity-lag hypothesis has been a recurrent theme in the determinants literature as an explanation of the relative growth of public expenditure. 2/ It is argued that the technology of the private sector, particularly the nonservice sector, is more amenable to productivity improvements than are labor-intensive public services. Most of the discussion of this essentially empirical proposition has been undertaken on an a priori basis, owing to the difficulty of devising an output measure for government activities.

1/ It is difficult to decide whether its impact on public spending has occurred directly through, for instance, increasing demand for road construction and complementary services, or more indirectly through the subsequent greater mobility of the population and the exodus from the town to the suburbs, with resulting heavy social capital requirements.

2/ An idea first advanced by Adolph Wagner and supported by later writers (e.g., Baumol (1967); Williamson (1961); Martin and Lewis (1956); Baumol and Oates (1975, Chapter 17)); although Gupta (1967) takes a dissenting view.

6. Political and administrative influences

To date the use of purely political variables to explain public spending has largely been confined to interstate studies in the United States, where they have generated some enthusiasm. 1/ Observers have often considered the prevailing political ideology to be particularly influential in determining the relative expansion of the public sector (Hindrichs (1966); Martin and Lewis (1956); Andic and Veverka (1964); Tanzi (1986)). 2/ Pryor (1968), however, from a comparison of East and West Germany, discounts the importance of this factor.

The effect of changes in political structure on both the growth and time pattern of public expenditure has also been discussed (Dye (1963); Morss, Fredland, and Hymans (1967)). Peacock and Wiseman have emphasized the degree of concentration of spending at the central government level--the concentration process--as a possible determinant of the overall growth of public spending. It could be argued that by transferring expenditure decisions from local to central government, one moves away from the one-to-one relation between benefits received and taxes paid, so that there is a subsequent loss of control, reinforced by the possibilities of interdepartmental logrolling and associated practices at the central government level.

In North America, the administrative process has also been increasingly scrutinized for its influence on the growth of public spending. The idea that civil servants have a stake in the growth of government expansion--that there is a sort of Says Law in operation 3/-- is not new. 4/ Students of the budgetary apparatus have also been convinced of the upward bias it imparts to expenditure decisions (Breton (1974); Wildavsky (1964)). They point out that legislative bodies have to approve the budget in an extremely limited time period and, moreover, the budget is organized on incrementalist lines, hence the argument that the very scale of public spending may have exerted upward pressures on

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1/ For example, Morss, Fredland, and Hymans (1967) conclude, "...our results suggest that more detailed work on political variables will undoubtedly support the conclusion that political factors exert important and predictable pressures on government expenditure behaviour."

2/ These writers resort to the prevailing notion of the role of the state as a causal explanation of public spending. Musgrave (1969, p. 85) is also inclined to stress the "changes in cultural values and philosophy" as an influential conditioning factor.

3/ Or as Bird (1970, p. 45) puts it, "creating a supply of bureaucrats tends to create a demand for services of bureaucrats."

4/ Peacock and Wiseman (1961) coined the term "inspection process" to describe this effect, which also played a prominent part in Parkinson's Law (Parkinson, 1957). Aaron (1966) has advanced the thesis that the size of social insurance schemes in the United States depends on the length of time they have been in operation. More recently, attempts to deal with the optimal size of the public sector have focused on the role of the bureaucracy (Borcherding (1977); Niskanen (1983)).

its growth owing to inadequate control. Such a situation has been exacerbated by the role of special interest groups and rent-seeking behavior (Tanzi (1986); Tollison (1982)). It is difficult, however, to devise empirical indicators for such influences.

V. Disaggregative Approaches to Government Expenditure Growth

Complementing this movement to widen the scope of causal explanations of public expenditure growth has been the tendency to stress the importance of disaggregating total expenditure into more homogeneous categories and explaining the relative expansion of public expenditure in the economy by changes in its composition. For example, Musgrave (1969) rejects the idea that public sector expenditure can be explained by a common set of generalizations. He divides expenditures into public capital formation, public consumption, and transfers. He hypothesizes that early stages of development call for a high ratio of public investment to GNP, particularly in transportation, irrigation, and training. As development continues, these influences wane and public capital formation is needed to complement and protect private investment in such areas as highways, defense, sanitation, and education.

Reflecting this emphasis on the composition of government expenditures, and given data limitations, Musgrave focused on one element of public expenditure—current expenditure—in his empirical tests, based on a 1957/58 data base. Musgrave's contention 1/ that apparent support for the rising-share hypotheses breaks down for low-income and high-income per capita countries taken separately and that the good fit for the whole group "merely reflects a difference in the average levels at the two ends of the scale."

In an unpublished study, one of the authors re-estimated Musgrave's cross-section analysis, using Fund data for 1972/73 for 32 of the original countries. 2/ In addition to concentrating on Musgrave's specification, the model is also applied to total government expenditure (Table 1). In general, the analysis supports Musgrave's contentions. It also suggests that the high t-values registered for the constant term in Musgrave's results indicate a probable misspecification. A dramatic confirmation of this implied result is obtained when we expand the limited sample of countries covered by the Musgrave test to the 92 countries for which we now have data. Test 5 in Table 1 shows that the equivalent test to number 1 (which yielded the good fit of $\bar{R}^2$ = 0.52 for 32 of Musgrave's 35 sample countries) drops sharply to $\bar{R}^2$ = 0.097 when the sample is expanded. What appeared as a good fit for the limited sample is now exposed as an accident. The one favorable

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1/ Musgrave (1969), p. 111.
2/ "Taiwan," Denmark, and Nigeria were omitted. Also, public expenditure was measured as a percentage of gross domestic product (GDP) not GNP. See Tait (1976).

Table 1. Regressions on Central Government Expenditures, 1955-57 and 1972-73 1/

	Number of Countries	Musgrave (1955-57) Coefficients	$\bar{R}^2$	Number of Countries	Check (1972-73) Coefficients	$\bar{R}^2$
1. G/Y	35	$0.120 + 0.000095\ Y_c$	0.57	32	$15.960 + 0.003780\ Y_c$ (7.56)　(5.69)	0.52
2. G/Y < 600	35	$0.097 + 0.000149\ Y_c$	0.27	32	$18.000 + 0.012400\ Y_c$ (6.84)　(1.54)	0.28
3. G/Y > 600	35	$0.272 - 0.000020\ Y_c$	0.05	32	$19.460 + 0.002980\ Y_c$ (5.74)　(3.22)	0.32
4. G/Y	15	$0.187 + 0.000109\ Y_c$	0.33	32	$15.960 + 0.003780\ Y_c$ (7.56)　(5.69)	0.52
5. G/Y				92	$22.340 + 0.002013\ Y_c$ (15.15)　(3.26)	0.10

1/ G represents central government current and capital expenditure except for Musgrave's tests 1, 2, and 3, where only current expenditure is used (see text); Y represents GNP in the Musgrave study and GDP in the 1972-73 check; Y_c is per capita GNP; t-values in brackets.

result Musgrave obtained collapses when a larger sample of more recent data is used and total expenditure, rather than one component of expenditure, is examined. The high t-value for the constant term again implies a fundamental misspecification. Musgrave also found that the relationship became much weaker if the sample countries were divided into high-income and low income groups. Tests 2 and 3 (Table 1) (for per_capita incomes below and above US$600, respectively) obtained an R^2 of only 0.27 and 0.049; the same kind of difference was observed in the 1972/73 tests.

Others have supported Musgrave's view on the importance of compositional changes in public expenditure without emphasizing the causal relation to GNP. Wages and salaries in many countries are an important element in public sector growth. [1] There seems to be a clear bias toward greater-than-expected current expenditure relative to capital expenditure in Africa and in industrial countries; the same regions seem to spend more than expected on subsidies relative to wages. The reverse patterns emerge for Latin America. [2]

When expenditures on public goods are considered, the growth in productivity in this sector is revealed to be typically below that in commodity production.

> "The disparity in sectoral productivity performance is likely to be even further compounded by the absence of market constraints and competition and the influence of bureaucratic pressure groups and highly organized public servants unions which have imposed overmanning or established excessive earnings differentiation." [3]

Demography dominates the increased expenditure on health and education with a widespread increase in average real benefits superimposed. [4] Transfers (unemployment, pensions, income maintenance) are crucially affected by demographics [5] and also by the short political horizons that tempt governments to extend the contractual obligations of the state, knowing the budgetary costs will accrue much later than the government's (indeed, the politicians') lifetime.

Many of the problems that arise from the testing of hypotheses about the growth in public expenditures have already been mentioned in the literature. However, the authors doubt that the magnitude of the difficulties encountered has been fully appreciated. In the following sections, we will argue that these problems have three main sources: (i) data problems have been underestimated; (ii) current theory has been unable to provide the basis for identifying relevant relationships; and (iii) the failure to appreciate this limitation, coupled with the very

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[1] Heller and Tait (1984).
[2] Tait and Heller (1982).
[3] Saunders and Klau (1985), pp. 96-7.
[4] Ibid, pp. 97-101.
[5] Heller, Hemming, and Kohnert (1986).

nature of the problem, has meant that most empirical methods are inevitably inadequate. As a result, attempts to move to the third stage of research, that of estimating a rigorously specified model, appear ambitious. Section VIII will show that in the absence of an adequate theory of the decision process involved in public spending, attempts to specify models borrowed from other areas of economics tend to be oversimplifications and rest on dubious behavioral assumptions. The grave conceptual and technical problems that are involved in any rigorous quantitative formulation in this field advance the case for a return to first principles, to the primary stage of hypothesis formulation and the search for laws of association. The final section thus endorses the view that there is room for exploring the possibility of a ground-clearing operation aimed at uncovering the major patterns of association in the data. A technique is then suggested for this purpose.

VI. Data Problems

Given the ambiguity in Wagner's original formulation of his thesis--in selecting a ratio of public spending to national income-- there has inevitably been some doubt concerning which statistical measure of public spending or national income to employ. 1/ Before the numerator can be chosen, it must be determined what the expenditures should attempt to indicate. Obviously, the appropriate expenditure ratio depends on the purpose for which it is employed. Bird (1970) has suggested the expenditure ratio can be used to indicate the government's relative importance in five main ways: as a consumer, producer, employer, redistributor, and allocator. By outlining the different data requirements for each concept, he highlighted the difficulties of devising operational measures for each of them. One of the authors of the present study has attempted to construct measures for each of these concepts for a sample of 18 developing countries and a sample of 18 industrial countries (Appendix I). First, this attempt demonstrated that, although it is possible to devise many different expenditure ratios, depending on the policy perspective adopted, not all can be quantified unless some dubious assumptions are made. Second, even when quantification is possible, there is likely to be some conflict in the movement of indicators, reflecting important policy trade-offs. Third, expenditure indicators appear particularly sensitive to the data base used, as demonstrated by the large differences that can result when the coverage is changed or data are properly deflated. In recent discussions of Wagner's Law, the latter problem has assumed increasing importance.

Recently, Beck (1979) introduced the possibility that the supporting evidence for Wagner's thesis derived from time-series data was far from conclusive and, indeed, when aggregates were properly deflated, the ratio of government expenditure to GDP in real terms did

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1/ See the discussion, for example, in Michas (1975).

not increase over time but rather declined for a sample of industrial countries. Beck's position was supported by Plutta (1981) and Heller (1981). As a result of these recent studies, the validity of Wagner's thesis has been thrown into even greater doubt and the possibility raised that it is merely a statistical artifact. Given this controversy, the importance of the data base in empirical investigation has assumed major importance. It is therefore useful to examine the data set derived from an international comparison of income and purchasing power parities recently produced by the United Nations, which attempted to correct for some of the more serious problems encountered in international comparisons by relying on purchasing power parities rather than on exchange rates to reduce the data set to an inter-nationally comparable basis. 1/ Moreover, by providing time series data of a length not often available for developing countries these data allowed time series and cross-country comparisons.

The total sample was split into 79 developing countries and 23 industrial countries. Using ordinary least squares, the government's share of real GDP was regressed on per capita real gross domestic income. Cross-section samples of industrial countries revealed no significant relationship between the two variables, while for the sample of developing countries the relationship was generally significant at the 5 percent level, but negative, contradicting the usual interpretation of the Wagner hypothesis that the share of government expenditure in GDP will expand as per capita income rises. This negative relationship persisted when different subperiods were used in the period 1960-80 and when the total sample included a time dummy variable to capture any common trends. In all cases the explanatory power of the regression equation was rather low, with the adjusted $\bar{R}^2$ never greater than 0.12.

To investigate this surprisingly poor relationship between real per capita gross domestic income and the government share in GDP, time series regressions for the period 1960-80 were fitted for each country in the sample. The time series regression analysis fitted the data better, but in many cases the size of the Durbin-Watson statistic revealed the presence of autocorrelation in the residuals, throwing doubt on the significance of this improvement. Countries were grouped into those displaying significant positive relationships (group A) and those displaying significant negative relationships (group B).

The countries in groups A and B were then combined into two sepa-rate samples for both industrial and developing countries, and the same regressions were fitted on these cross-section data. The use of these more homogeneous samples of developing countries had the effect of improving the overall fit of the cross-section relationship between real government share and real gross per capita income. The level of

1/ See Kravis (1986); Summers and Heston (1984). One limitation is that the data are based on national accounts concepts and concentrated on government's consumption of resources, excluding transfer payments.

significance of the coefficient was increased, as was the adjusted $\overline{R}^2$. The use of a dummy variable for time did not noticeably improve the results. A more important discovery, however, was that the positive relationships obtained from time series data in group A countries no longer held and the relationship became negative, with the positive influence apparently being captured in the time trend variable, which was also highly significant. For those countries in group B, which displayed a negative time series relationship between the real government share in GDP and real per capita gross domestic income, the cross-country relationship remained negative but only significant at the 10 percent level. It is notable that parallel results were obtained for the industrial countries.

From these results one would be led to conclude that the apparent conflict between time series and cross-section data disappears when allowance is made for common trending, and when variables are consistently deflated to reveal the growth in the ratio of public expenditure relative to income levels in real as opposed to nominal terms. Similarly, these results do not support any difference in the experience of industrial and developing countries, either as distinct groups or individually over time. The conclusion to be derived from these results is one broadly in support of the Beck thesis, namely, that when aggregates are properly deflated, the ratio of government expenditure to GDP in real terms does not increase as proposed by the Wagner thesis but rather declines over time. Indeed, these findings extend Beck's conclusions for industrial countries to developing countries.

VII. Problems of Hypothesis Testing

In complete contrast to the large variety of causal factors encountered in public finance textbooks to explain the growth in public spending, hypothesis testing has tended to be very narrowly focused. This narrowness has undoubtedly resulted from the way the question of public expenditure growth has previously been presented. The emphasis on Wagner's thesis has meant that the statistical association between GNP per capita and the government's expenditure share has been pushed to the forefront. The empirical relationship, once established, is then translated into causal terms: the growth in GNP per capita causes the growth in the share of government spending. Several problems necessarily emerge from any such interpretation. For instance, if GNP per capita, which includes government spending as one of its components, is used as an explanatory variable, the exercise involves regressing a variable on a component of itself--the so-called simultaneity problem. Moreover, the attempt to move in such a manner from statistical connection to describe causation will probably yield incomplete results. The coefficient that measures the responsiveness of public expenditures (or the ratio of public spending to GNP) to income changes may merely reflect all the factors that affect both variables. Unfortunately, ignorance of these factors may result in a spurious

correlation, where association between the two variables may be caused by some unspecified factor. Alternatively, and perhaps more probably, the link between per capita income and the size of public spending may be indirect, being determined by some unspecified mediating factor, say, some attribute of the tax system or the political decisionmaking process. This possibility is increased by the collinearity generally found in economic series and exacerbated by common trending in time series.

A major disadvantage in trying to derive an empirical relationship between some measure of public spending to GNP (G/Y) and per capita income is the obvious limitation of trying to interpret the relationship in causal terms. Apart from the disadvantages of employing per capita income as an indicator of development, to which we will return below, a priori we have two competing theories that could explain their empirical relationship with conflicting presumptions about causation. On one hand, in line with Wagner's approach, government expenditure may be viewed as the behavioral variable, similar to private consumption, and similarly determined by the level of income. An increasing ratio of expenditure to national income would signify an elasticity of demand greater than one.

On the other hand, a Keynesian viewpoint would treat public expenditure as an exogenous policy instrument influencing the level of national income. An increasing expenditure ratio would indicate increased attempts to influence the level of income. Choosing between these two competing causal interpretations is virtually impossible using cross-section data. However, with time series data, Sahri and Singh (1984) have demonstrated on Indian and Canadian data that it is possible to employ various econometric techniques pioneered by Granger (1969) and Sims (1972) to explore the direction and nature of the causal link between government expenditure and national income.

Granger (1969, pp. 428-9) distinguished four different patterns of causality: (a) simple, (b) instantaneous, (c) lagged, and (d) feedback (see Appendix II). In this categorization, the first three patterns refer to a unidirectional causal process, whereby X can be said to cause Y, or the reverse, whereby Y causes X, with differing time lags. The last pattern suggests a bidirectional causal process, whereby X and Y mutually influence each other. Tests for causality in a sample of 18 developing countries using the Granger methodology reveal a variety of individual country experiences. For some no causal relationship was discernable, for others the relationship can be interpreted as a Wagner causal process, and for others the results imply a Keynesian lagged relationship (see Appendix Table III).

Overall, three main conclusions are suggested by these results. [1] First, and perhaps most important, the results imply that different

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[1] A fuller presentation of these results is contained in Appendix II.

causal models may apply to different countries, undermining the universality of Wagner's law. Second, the importance of analyzing the lag structure of Wagner's thesis is underlined. Indeed, in most countries, when allowance is made for common trending and for the influence of other causal variables, the per capita income coefficient becomes significant only after a lag of two years. In the case of some countries (e.g., Nigeria and Uruguay), the sign of the relationship changes from that obtained from the simple unlagged bivariate model. In still other countries the relationship appears negative (e.g., Brazil and Chile), contradicting Wagner's thesis. A third notable feature of these results is that in many cases the fit of the model is rather poor. At the same time, the time variable, which captures the impact of excluded variables, is often highly significant, and the coefficient of the income variable, although statistically significant, is relatively small.

Thus, the empirical testing of the hypothesis that per capita income is of strategic importance in explaining the growth of government expenditure rests on the assumption that all other variables are so unimportant that they can simply be thrown into the error term. This assumption has been denied by cross-section research and is negated by the results reported above. Several cross-country studies have emphasized the impossibility of isolating government expenditure from a country's prevailing political and social environment. Hence, when the ratio of government expenditure to GNP is plotted against per capita income on a scatter diagram, to a large extent countries appear in two separate clusters in the northeast and southwest quadrants, divided for the most part into industrial and developing countries. This result suggests two separate populations, or a difference in kind rather than degree as far as per capita income is concerned.

Gandhi (1971) has demonstrated how conflicting results could arise from cross-section analysis using per capita income as the independent variable when the sample contains both developed and developing countries. 1/ Unfortunately, many of these studies base their inferences on samples of this kind. Earlier analysis by one of the authors of the present study showed that even when a sample of 41 developing countries was examined, and combined into more homogeneous sub-samples, there was little evidence to support Wagner's thesis (Diamond (1977b)). Wagner's thesis appears to be based on a misleading preconception of the similarity of evolution in different countries at different historical periods. The comparison is illegitimate since the initial conditions are not the same for each country.

Other difficulties are encountered in cross-country studies. Owing to data limitations, most of the international studies are undertaken at extremely high levels of aggregation and have not adequately recognized that quantification of changes in heterogeneous aggregates is arbitrary. Studies that have attempted cross-section analysis at a more

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1/ As mentioned in Section V above (Tait (1976)).

disaggregated level have demonstrated that the major part of public expenditure is far from homogeneous, and this has led Pryor to point out that "conclusions that generalize about government expenditure from data on total expenditure would yield very misleading results" (Pryor (1968, p. 344). This finding is confirmed by interstate studies in the United States, and lies behind the move to a disaggregative explanation of expenditure growth (see section above).

Perhaps the most fruitful area in the quantitative analysis of public expenditure growth is found in the studies of the determinants of city, local government, and interstate public expenditures in the United States. Throughout the past decade there has been a trend in these studies to broaden the area of research, discounting purely economic explanatory variables and concentrating more on a wider range of demographic, socioeconomic, and political variables. Unfortunately, there is a special difficulty in using cross-section studies to explain the relative growth in public spending distinct from problems of data comparability, namely, the confusion over change and level.

The confusion arises when moving from statements about differences in levels to statements about changes between levels. The implicit assumption is that the change in the growth of public expenditures, say, when a state's income rises from Y to Y', is exactly equivalent to the difference in public spending between states when one state has the level of income, Y, while another state has a higher level, Y'. The assumption is true, if at all, only for long-run behavior. Certainly, in such a generalization several dynamic aspects are missing in the causal process--the same problem encountered in cross-country research discussed previously (cf. Pryor (1968, Appendix E7)). Moreover, the time series tests of causation described above have stressed the importance of lag structure. The failure to appreciate these limitations restricts the relevance of inferences which can be drawn from these attempts.

The salient features of this determinants literature are: first, many of these studies, both time series and cross-section, appear flawed by deficiencies both in the data base and the statistical method. As a consequence one must doubt not only the degree of statistical association discovered, but also whether they have in fact isolated a true causal nexus. Second, if one accepts the veracity of these statistical results, then one would conclude that the growth in public spending is only partly determined by economic variables. One would also be led to believe that the range of possible determinants of public spending is quite wide, and their importance varies from one government spending unit to another.

Finally, there appears a certain amount of confusion about the aims of such research. One tends to gain the impression that researchers have neither fully grasped the implications of deriving a high degree of statistical association between public expenditure and certain other variables, nor have decided on the rationale underlying this approach.

The goodness of statistical fit criterion may be tenable if the aim is
to set guidelines for normative decisions in, say, cross-section
studies. Only the policy relevance of the chosen variables can be
questioned. Likewise, if the approach has been directed at prediction,
then perhaps the statistical equation is a useful way of summing up the
trend between the time series, although this interpretation is usually
clouded by some unnecessary behavioristic assumptions.

If, however, as is often assumed, the basic preoccupation is to
understand the underlying causes of the growth in public spending, then
one can question the degree of success achieved by such determinants
studies. To develop a positive theory of public spending, one should
aim to infer something about the nature of the fiscal decision process
from the data. However, can we be sure that the variables entering into
these multiple regression equations are strategic for this decision
process? Could we possibly specify a decision model based on such a
wide range of disparate indicators? Unfortunately, despite the
tremendous research effort in the past, we appear no closer to answering
such questions.

VIII. Problems of Model Specification

We now turn to a review of the studies that have attempted
(although sometimes only implicitly) to specify models of the fiscal
decisionmaking process underlying the growth in public spending. Two
main conceptual orientations are discernible which, for convenience, may
be labelled as individualistic and collectivist. The individualistic
approach is based on an analogy with the market mechanism. Perhaps it
is not surprising that economists start with the assumption that, since
only individuals have preferences, then budgetary decisions made
collectively can only be explained as the efforts of individuals to
maximize personal satisfaction. From this premise there has developed a
demand interpretation of the growth of public spending. Thus, not only
has the statistical relationship between government expenditure and
income been interpreted causally, but there has also been a tendency to
see this relationship as equivalent to a statement about the derived
demand for public services that justifies the estimation of an
elasticity coefficient. There are two problems with this approach--the
serious technical difficulties it entails and the dubious behavioral
implications of the market analogue.

The technical problems of a one-equation approach have not always
been appreciated. Since per capita income is likely to affect the
supply of tax revenue, a variable that affects both the supply and
demand for public services, is being included, giving rise to the charge
that what is being estimated is a mongrel equation--the classic under-
identification problem. Goffman (1968) has pointed out that, owing to
another form of misspecification, many of these elasticity studies have

the dice loaded in their favor. This arises from the common practice of avoiding simultaneity by using a simple ratio G/Y, instead of the more accurate income elasticity concept (dG/G)/(dY/Y).

Another source of doubt arises from the simple technical problem that most regression models have been specified to provide constant elasticity estimates. Although Gupta (1967) tried to get around this restriction by using a polynomial double logarithmic function, his attempt has met with equally valid criticism (Bird (1971)). Moreover, it is particularly noticeable that the time dimension "viewed as a statistical demand function" has largely been ignored in most studies. As Fisher (1961, p. 21) has pointed out, "it seems doubtful to speak of an estimated demand reaction with some specification of the time period in which the reaction is supposed to take place." As a result, the question of whether or not a short-run or a long-run elasticity is the relevant parameter to be estimated has been avoided. By ignoring lags, investigators have derived the former although their prime interest typically seems to be centered on the latter, secular relationship. Furthermore, if a long-run relationship is being investigated, we must be prepared for shifts in the function over time.

The attempt to explain the growth in public spending with a model derived from the private sector also encounters some fundamental conceptual problems. Even if the demand interpretation could be accepted, the typical statistical model relies on some dubious behavioral assumptions. Usually the dependent variable has been total government spending, both current and capital, which makes the elasticity coefficient harder to justify theoretically. Even if total current expenditure is concentrated on, there is still an aggregation problem. As Andic and Veverka (1964) have argued, some public services may be expected to show relatively high income elasticities (e.g., education), while others may behave as inferior goods (e.g., public transport). However, disaggregating and attempting to explain the growth in components of expenditure leads to the question of the legitimacy of isolating individual components that are clearly interrelated as well as related to their growth in aggregate.

The whole approach seems to be based on the assumption that the politicians who make expenditure decisions have no objectives other than those that reflect individual preferences. Thus, no account is taken of the political process and the institutions that are supposed to translate individual preferences so perfectly into collective action. For this reason alone, the market analogy appears somewhat naive. For instance, a simple demand interpretation ignores the possibility that a systematic tendency for public spending to grow faster than income could

stem from supply rather than demand factors. 1/ The fact remains that budgetary decisions are made on a political, and not an economic, basis. It should always be remembered that the central problem in this area arises because transactions normally take place under compulsion, where goods are not easily priced and benefits are difficult to assign individually. All of this seems to preclude the use of the market analysis.

At the other extreme, from the individualistic market analogue, a collectivist solution has been proposed for modeling the budgetary decision process. The approach has much in common with that originally adopted by Adolph Wagner, who based his analysis of the growth in public spending on a view of government conceived as a unitary being with a will of its own (cf. Peacock and Wiseman (1961, p. 16)). A variant of this approach has been adopted in econometric studies in the United States to explain the growth in state and local expenditures (Harowitz (1968); Henderson (1968); Gramlich (1969)).

All three studies posit a government welfare function involving the consumption of public and private goods, whose maximization is subject to a set of constraints. The different studies make different assumptions about the form of this utility function, although typical assumptions are that the marginal utility declines with increasing public spending and the marginal disutility of taxes increases as the tax burden increases. Thus a quadratic function may be assumed:

$$U = a_1 E + \frac{a_2 E^2}{2} + a_3(Y - T) + \frac{a_4}{2}(Y - T)^2 - a_5 B - \frac{a_6 B^2}{2}$$

where Y = income; E = government spending; T = taxes; and B = borrowing. Analogous to consumer theory, the community as a whole is assumed to face a budget constraint so that expenditures cannot exceed total borrowing and taxes: $E \leq T + B$. The community, through its elected representatives, is then assumed to select levels for private and public spending that maximize the community's welfare within the above budget constraint. Thus a Lagrangian function can be formed, and the partial derivatives set to zero. Solving for the Lagrangian multiplier and by substitution, the system can be transformed into two structural equations for determining expenditure and taxes, written in stochastic form for estimation.

In a similar approach, Heller (1975) specifies the preference function of the policymaker in developing countries as follows:

1/ Indeed, as noted previously, two aspects of supply continually appear in the literature as explanations of the growth in public expenditures, namely, "productivity lag" in the public sector (Martin and Lewis (1956); Baumol (1967); Levitt (1984)), and the importance of the elasticity of the tax system (Williamson (1961); Hindrichs (1966)).

$$U = F[I_g, (Y-T), G_c, G_s, B; A_1, A_2] \qquad \underline{1}/$$

where I_g is government investment; (Y-T) disposable income in the private sector; G_c civil consumption by government; G_s socio-economic consumption by government; B the flow of domestic borrowing; A_1 foreign grants to public sector; and A_2 foreign loans to the public sector. The functional form of the equation ensures diminishing marginal utility for each variable as it rises beyond a target variable. Utility is then maximized subject to some constraint conditions (in this case, primarily aid). The conclusions of this analysis are that the signs and magnitudes of the utility expressions look sensible and confirm "that public decisionmakers clearly differentiate in their preferences between types of expenditure and their mode of financing." $\underline{1}/$ The Please effect is confirmed in that an increase in the tax burden is unlikely to be fully used for investment--it is far more likely to be allocated to G_s and G_c. Aid causes a strong shift from public consumption to investment. A recent study by Mosley, Hudson, and Horrell (1987) has also employed the Heller approach and extended his model to examine the differential effectiveness of aid across countries.

Such a model of public expenditure determination raises the important question of whether the government can be viewed as any other large economic organization that is seeking to achieve certain goals, but is limited in its range of action by external constraints. The authors of the present study are doubtful whether the collective decisionmaking process can be viewed as a reflexive response with given objectives and constraints. It could be argued that politicians attempt to alter preferences and remove constraints. In any case, as Morss (1969) points out, a more complex formulation would be required for the central government, simply to reflect its many objectives and the innumerable constraints encountered. Regularities will not emerge from the correlation of public expenditures with objective characteristics of countries if expenditures are intended to achieve quite different objectives including the prospects of re-election and of prolonging a government's life. Furthermore, these noneconomic policies cannot be assumed to be constant through time and certainly not between countries.

Of course, Lindblom (1961) and others would question the basic presumption of maximizing behavior in public decisionmaking, arguing that the objective function is defined by a set of decisions ex post and has no operational meaning to decisionmakers ex ante. Moreover, objections can be raised about the preference function assumed. Ignoring the difficulties of any particular specification and the time dimension of this function, the adoption of a social welfare function sidesteps the important issue of whose preferences are to be included in that function. Theoretically Arrow (1963) has shown that there is no consistent mechanism for aggregating individual preferences to provide

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$\underline{1}/$ See Heller (1975), p. 430.
$\underline{1}/$ Heller (1975), p. 441.

the basis for collective choice, so there is little chance of devising rules to solve the problem. Indeed in their original study Peacock and Wiseman (1961, p. 12 ff) drew attention to the imperfections in the political mechanism by which the public sector perceives the preference patterns of its citizens. By downgrading the importance of individual preferences, this approach implicitly adopts a supply-oriented view of expenditure determination. Of course, in Wagner's hands this interpretation had distinctly authoritarian overtones.

Recently, Tussing and Henning (1974) have used a similar orientation by viewing the fiscal decision process as conforming to a partial adjustment model. If the issue of the derivation of a preference function is sidestepped, the desired level of public spending, C^*, is assumed to exist as some simple function of income, Y:

$$C_t^* = a + b\, Y_t + u$$

The government is then viewed as partially adjusting actual spending to the desired level in a manner described by the adjustment function:

$$G_t - G_{t-1} = k\ (G_t^* - G_{t-1})$$

where k denotes the speed of adjustment. Unfortunately, this study suffers from several estimation problems. At the same time, the behavioral implications of their model are as dubious as those of the social welfare function approach described previously. It cannot be doubted that Tussing and Henning's view of fiscal decisionmaking is rather facile. For example, it is highly unlikely that desired spending depends only on the level of income. Moreover, Tussing and Henning cannot escape the fact that they must somehow provide a behavioral theory to explain the specification of a geometric lag in adjustment and the rationale for their assumption that the government is unable to completely adjust actual spending to desired spending. 1/

IX. Broader Methodological Problems

So far we have argued that the major difficulties encountered in the quantitative analysis of public expenditure growth have stemmed from data and theoretical limitations. Yet these difficulties have been exacerbated by the nature of the problem itself. It has been little realized that the task of deriving a positive theory of public expenditure involves the evaluation of a much broader issue: the role of the state in the development of the economy. In any attempt to present and account for such a significant change in the organization of society as reflected in the public accounts, the researcher is inevitably faced with a multitude of variables and a large variety of possible interrelationships. The multidimensional character of

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1/ For a more detailed critique of this and related approaches see Wiseman and Diamond (1975).

development, it could be argued, suggests that only a large number of variables could adequately explain public expenditure growth. As a result, the choice of relevant variables is not easy and, as pointed out above, current theories about the fiscal decisionmaking process do not give much guidance to empirical research. When this aspect of the problem is viewed, serious doubts emerge about the operational possibility of using formal econometric methods to solve this problem; these methods will now be considered in greater detail.

One can schematically describe the methodology of econometrics as follows. First, strategic variables are selected and related by systems of independent or autonomous relationships. This formal system of variables and relations is termed a structure and, in its general form, may be written:

$$Y_n = f_n(X_1, X_2, \ldots, X_j; a_1, a_2, \ldots, a_k; u_1, u_2, \ldots, u_i)$$

where n variables, Y, are dependent on n functions, f, describing n independent equations of the model. The model thus has j exogenous variables, X; k constants, a; and i random variables, u. To estimate such a system of equations the researcher must assume first, that there is a certain invariance in the relationship between endogenous and exogenous variables; and second, that there is constancy in the parameters. The aim is to explain observed facts by postulating plausible human behavior under given institutional and technological conditions, the so-called conditioning factors.

Four aspects of a formal approach to analyzing the problem of the growth of public spending can then be scrutinized: first, the process of selecting variables and relationships for study; second, the constancy of the structure assumed; third, the neutrality of the structure; and last, the implications of the invariance of relationships derived. Each aspect poses problems in this area of research.

In any attempt to derive and measure empirical relationships the approach to the data is necessarily selective: to emphasize some relationships, to relegate others as being random, and to discard still others as being irrelevant. Although it is not surprising that investigators have appealed to economic theory to make sense of the facts, it should be pointed out that this interpretation is only valid for narrow-gauged problems whose causal relationships are fairly well understood. As previously noted, recent empirical research confirms the danger of regarding any single type of causal factor, whether economic or noneconomic, as decisive in explaining a complex historical process like the growing importance of the public sector and its changing role in the economy. The inevitability of having to include a wide range of causal influences means that technical problems, such as multi-collinearity and spurious correlation, are greatly increased.

Thus the procedure for testing particular hypotheses or estimating the relative importance of variables becomes extremely difficult. Moreover, dealing with so large and important a sector implies that the feedbacks will be considerable and cannot be neglected. As a result, one suspects that any attempt to construct a rigorous model to test and/or measure the parameters of the set of interrelationships is doomed to be under-identified and incomplete. However, even if all important factors could be identified and their relationship to public spending specified, there are further limitations on the construction of an adequate econometric model.

For the econometrician the conditioning factors (the legal, political, and social institutions of a society and the preference and behavioral characteristics of its individuals) need not be known as long as they are given and constant. He then examines, in this idealized abstract system, how small changes in some dependent variable, such as the growth in public spending, can be explained by small changes in independent variables, such as per capita income. If the conditioning factors change, completely different effects result. In terms of the econometric model, its structure would be said to have altered. Insofar as development can be characterized as a transformation of an economy from a simple level of social organization to a more complex one, then this process is difficult to picture in terms of fixed parameters and fixed structural equations.

On the contrary, the process of a social evolution necessitates structural change, for it is through the reform of existing institutions, including those in the public sector, that the parameters describing the structure of the economy can be changed (cf. Hagen (1968)). For this reason the assumption of a given and invariant set of initial conditions is difficult to accept since it is this very impermanence that characterizes the development process of which the growth in government activity must be seen as an integral part (Peacock (1978)). Undoubtedly the shorter the time period, the less severe the problem, but it could be argued that given the present size of the public sector, a growth rate of a few percentage points in a relatively short period would still represent a substantial reorganization in an economy.

Added to our doubts about the adequacy of econometric models for analyzing the development process, special difficulties also arise because of the nature of the public sector in this process. These stem from the econometrician's claim of neutrality for this structure, or in Kuenne's (1963) words, "structure is applied to the outcome determining but not the outcome determined conditions." Thus frcm the viewpoint of deriving an empirical law of public expenditure growth, we must add the assumption that a change in public spending will leave such conditions unchanged. Only in this way is it legitimate to concentrate purely on the adjustment process. If this assumption is felt to be unjustified, then the system must be closed by making endogenous those variables previously deemed exogenous.

However, it could be argued that government activity, of which
public expenditure is a manifestation, is directed toward just such a
structural change. One can view government as an institution whose
function is the maintenance and change of other institutions, that is,
at least partly directed to bringing about change in the conditioning
factors. The above difficulties arise from the economist's usual
approach to problems. The neoclassical view of economics can be
characterized as "the study of the adaptation of scarce means to a
multitude of conflicting ends." Neither the ends nor the resources used
as means are to be explained by the economist--the whole emphasis is on
the intermediary process of adjustment. But in the long run it could be
argued that one of the ways of adapting limited resources to the
multitude of ends is through institutional change. Normally, however,
these means of adaptation are excluded from the problems of economics by
such well-used ceteris paribus assumptions as "given social
institutions," "given constant technology," and "in the short-run." The
legitimacy of these assumptions for the problem under review may be
questioned.

On the contrary, the central problem in deriving a positive theory
of public spending lies in analyzing the functioning of a social
institution--the fiscal decisionmaking process. In order to accomplish
this, it appears we should commence with the broadest view of this
process, namely, that individual preferences have largely governed the
formation of the social system and its institutions, and the democratic
system roughly translates the prevalent ideology into administrative and
legal machinery. In this way government activity and associated public
expenditures represent a collective attempt to influence the state of
society, and hence give credence to the Gladstonian notion that
"expenditure depends on policy." It is difficult to reconcile this
viewpoint with the empirical view, found in most "determinants" studies,
that sees public spending merely as a reflexive response to
environmental factors. Rather, the environmental factors are likely to
play a less direct role by structuring human preferences and social
needs that, when translated through a political decisionmaking process,
result in a certain level and pattern of public spending. The prime aim
then should be to review the environmental factors likely to condition
individual preferences as well as the characteristics of the fiscal
decisionmaking process, and to try to discover empirical regularities
between them and the resulting expenditure decisions.

X.   Considerations for Future Research

It should be evident that the authors doubt the value of recent
quantitative analysis of the growth of public expenditure, because
researchers are over-ambitious and assume a higher level of
understanding than they actually have. There is a strong case for
moving away from specific hypothesis testing and the estimation of
unrealistic models, toward new ways of formulating more suitable
hypotheses. This would involve explicit recognition that economists are

still at the preliminary stage of hypothesis formulation. Peacock and Wiseman (1979) also appear skeptical of much of recent quantitative analysis, though they do not favor retreating to their original historico-descriptive methods. They argue for a primarily inductive analysis to describe empirical regularities in interrelationships over time, and suggest that quantitative research should order, simplify, and systematize our thinking about the determinants of public spending.

The problem is to disentangle the complex interrelationships that describe the development of any economy, of which the growth in government activity is just one aspect. To structure the many possible determinants, Peacock and Wiseman suggest using factor analysis, a generic term for that branch of multivariate analysis that deals with the internal structure of the correlation-covariation matrices. Essentially it describes a procedure for exposing the basic underlying structure behind the covariation of a set of variables.

The first stage is to select relevant variables from a survey of the expansive literature on the determinants of public spending, with the presumption that interdependence is the norm (hence the problem of multi-collinearity). The second stage involves using an orthogonal factor analysis to disentangle the complex of interrelationships. The factors derived describe the predominant independent regularities in the data. 1/ By mapping the empirical domain in this manner it may be possible to reduce the variance of n variables to m factors, where m < n. The final stage of the analysis would explore the potential of this empirical typology for theory building, using the factors as new variables.

As yet, however, experiments using this empirical approach do not seem to have allowed generalizations about the underlying influences that structure decisions on public spending, or to have pinpointed relevant areas for future research. We have experimented with this approach on cross-country and time-series data but have discovered that, though "groups" of factors were generated that could be discussed in a perfectly plausible way, the information was not especially compelling or original. We suspect that the choice of variables to be included and different techniques of factor analysis generate different groups that could be equally plausible, and the explanatory content of any special group is very limited. As Peacock and Wiseman (1979) admit, "factor analysis is ultimately only a taxonomic device," and its use indicates an acknowledgement that we are only at the "black box" stage of research into public expenditure growth. By taking measures of the outputs from the box (i.e., public expenditures) under different inputs (environmental factors), investigators attempt to empirically describe the observable functioning of the black box. It is a sad commentary on progress in this field that almost a century after Wagner's initial

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1/ This assumption may be relaxed by using different techniques to reduce the dimensions of the data into factors that are correlated (termed oblique rotation).

speculations, and after almost three decades of extensive empirical research, we are only at the stage of guessing at the mechanisms that affect the transformation inside the box.

The Expenditure Ratio as a Fiscal Indicator

1.   The choice of expenditure ratio

The choice of a ratio of public spending to national income has raised doubt about which statistical measure of public spending or national income to employ. Before the numerator can be chosen, it must be determined what the expenditures should measure, which in turn will depend on the purpose for which the numerator is to be employed. Bird (1970) has suggested the expenditure ratio can be used to indicate the government's relative importance in five main ways: as consumer, producer, employer, redistributor, and allocator.

a.   The government as consumer or absorber of resources

For this concept an indicator should be devised to measure the proportion of the community's final output that is absorbed by government. This treatment is closest to the treatment in the national accounts, where all government exhaustive expenditure (i.e., excluding transfers such as subsidies or interest payments) is considered a final product like consumer expenditure, or

$$G1 = F_g + 0_g$$

where F_g = final goods purchased from the private sector
(whether for current use or capital expenditure),

0_g = value of final goods produced by government,

i.e., $0_g = WL_g + rK_g$

where WL_g = government wage bill,
rK_g = return on government capital.

It should be noted that this indicator does not differentiate between recurrent and capital exhaustive expenditures, a distinction based on the durability of the goods purchased. Further, in reality a good deal of government output is intermediate rather than final and, as in the national income accounts, is usually assumed away, as is the return on government capital. As a result,

$$G1^* = F_g + WL_g.$$

b.   The government as producer

To quantify this concept, an indicator of the final value of output that may be attributed to government must be devised. However, since goods disposed of through nonmarket processes will not be priced, the value added to the economy by government cannot be readily determined. This problem is compounded by the government's producing intermediate inputs to private sector production processes. As a compromise we may define,

$G2* = V_g$, value added by government,

$\quad = WL_g + rK_g$.

If we assume, as with Gl, that intermediate services provided by government and the return on government capital can be ignored, then

$G2 = WL_g$.

c.   The government as purchaser of factor services

For this indicator, the proportion of the community's total real resources employed by government needs to be measured. One such measure is the proportion of factor incomes originating in the government sector, i.e.,

$G3 = WL_g + rK_g$.

If the return on government capital is assumed away, it can be seen that $G3 = G2$.

d.   The government as redistributor

In this concept the prime concern is to develop an indicator of the proportion of private income attributable to government transfers, including personal transfers, transfers to enterprises (subsidies) that are not shifted forward in the form of lower consumer prices, and tax expenditures that are similarly not shifted, 1/ i.e.,

$G4 = T_b + T_e + T_p + I$

where T_b = unshifted transfers to business,

$\quad T_e$ = unshifted tax expenditures,

$\quad T_p$ = transfers to persons,

$\quad I$ = interest on public debt.

If one is prepared to assume that the portion of subsidies not shifted forward is negligible and accept the highly dubious assumption, as in the national accounts, that tax expenditures are zero, then one can derive a measurable indicator,

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1/   Insofar as they are shifted forward and lower the denominator, this formulation will result in an overestimation of the government as a redistributor. Moreover, since the national income accounts data exclude tax expenditures from gross national expenditures, including them in the numerator would bias the indicator of the government's redistributive role upward.

$$G^*_4 = T_p + I.$$

e.   The government as reallocator of resources

This concept is a rather broad one, and appears statistically intractable. 1/ To what extent are resources in the private sector employed in ways different from those in a hypothetical market economy untouched by government expenditure and revenues?

As for the denominator of the G/Y ratio, several options are available. For example, is it better to concentrate on GDP, and exclude factor incomes from abroad (e.g., GNP)? Should the chosen national income aggregate be measured at market prices or factor cost? For some developing countries because of the importance of foreign ownership of factors of production, and in some sectors the employment of non-nationals, it has been suggested that perhaps income to nationals is the more relevant aggregate. However, since governments have the power to tax non-national incomes originating within its frontiers, and given the openness of many developing countries, it has been the convention to concentrate on GDP rather than on GNP. In valuing GDP it has been considered more consistent to measure income at market prices rather than at factor cost, since government purchases are made at market prices. The subtraction of indirect taxes (minus subsidies) from GNP would, in any case, involve some doubtful assumptions as to the shiftability of these taxes. Also, since available government expenditure data typically are measured gross of depreciation of capital stock, it would seem consistent to choose a measure of national product that is also gross of capital depreciation.

2.   Empirical comparisons of expenditure ratios

This section will explore some of the problems of constructing expenditure ratios for a sample of developing and industrial countries. It is difficult to identify a homogeneous set of developing countries, much depending on the criterion chosen for grouping countries. From the policy viewpoint, one obvious group is the 15 countries identified in US Treasury Secretary James Baker's speech at the October 1985 World Bank/IMF Annual Meetings. Appendix Table I shows various expenditure ratios that can be constructed within the data constraints, namely G1, G2, and G4 as defined in the previous section. To give some impression of movements in these ratios a comparison is made, where possible, over discrete periods of time in the 1970s.

As an indicator of the government's relative size as consumer, three different sets of data have been used to calculate G1, G1*, and G1** in Appendix Tables I and II. The first (G1) uses Government

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1/ As a compromise, Bird (1970) has proposed a revenue-based indicator, namely the proportion of private income taken in taxes (op. cit., pp. 206-7.

Appendix Table I. Advanced Countries: Summary Expenditure Ratios

	Years		G1 1/		G1* 2/		G1** 3/		G2 4/		G4 5/	
	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
United States	1973	1980	8	7	19	18	16	14	8	7	11	15
Canada	1974	1980	6	5	19	20	13	11	5	5	14	17
Australia	1970	1980	6	5	12	16	10	12	...	...	11	17
Japan	1970	1980	3	4	7	10	7	7	...	...	7	13
Austria	1973	1980	10	11	15	18	14	14	8	10	19	26
Belgium	1970	1980	12	14	14	18	10	11	9	11	23	35
Denmark	1973	1980	10	9	20	27	17	20	9	9	20	28
Finland	1973	1980	8	6	14	18	12	14	6	6	14	19
France	1973	1980	10	10	13	15	12	11	9	10	21	29
Germany	1973	1980	10	11	16	20	13	11	9	10	15	18
Ireland	1973	1980	9	11	15	20	15	17	7	9	23	34
Italy	1973	1980	9	9	14	16	12	12	8	8	21	35
Netherlands	1973	1980	8	10	16	18	11	11	7	8	32	41
Norway	1973	1980	10	8	17	19	14	15	8	7	25	29
Spain	1970	1980	11	14	9	12	8	9	8	12	7	13
Sweden	1973	1980	9	8	21	29	15	17	7	7	18	31
Switzerland	1973	1980	5	6	11	13	8	9	4	6	9	13
United Kingdom	1970	1980	13	13	18	21	21	23	11	13	18	25

1/ Based on GFS fiscal data and National Accounts Statistics (United Nations, 1986).

2/ Based on National Accounts Statistics (United Nations, 1986).

3/ Based on constant price data provided in Summers and Heston (1984).

4/ G2 equals wage bill (including employer contributions to social security, if applicable), divided by GDP at current prices.

5/ Current transfers (including subsidies), plus interest on the public debt, divided by GDP at current prices.

Appendix Table II.   Baker Countries: Summary Expenditure Ratios

	Years		G1 1/		G1* 2/		G1** 3/		G2 4/		G4 5/	
	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
Argentina	1974	1980	8	8	14	13	12	12	...	...	10	10
Bolivia	1973	1980	7	10	11	15	17	18	5	7	1	3
Brazil	1973	1980	6	4	11	9	14	14	3	2	10	13
Chile	1973	1980	22	14	13	12	15	12	9	9	12	14
Colombia	1979	1980	7	8	9	10	10	9	3	3	6	6
Côte d'Ivoire	1973	1980	...	20	17	18	26	26	...	8	...	7
Ecuador	...	1980	...	6	...	15	19	20	...	4	...	6
Mexico	1973	1980	7	10	9	11	9	12	4	4	4	6
Morocco	1973	1980	12	27	12	20	15	30	9	12	4	8
Nigeria	1973	1978	8	12	9	14	10	18	3	2	2	2
Peru	1975	1980	6	6	13	13	17	19	5	4	4	7
Philippines	1974	1980	6	9	9	8	19	17	3	3	2	2
Uruguay	1973	1980	11	12	14	12	20	22	7	7	11	10
Venezuela	1973	1980	14	13	13	14	12	17	9	9	4	6
Yugoslavia 6/	1977	1980	10	7	...	...	...	...	...	...	...	...

1/   Based on GFS fiscal data and National Accounts Statistics (United Nations, 1986).
2/   Based on National Accounts Statistics (United Nations, 1986).
3/   Based on constant price data provided in Summers and Heston (1984).
4/   G2 equals wage bill (including employer contributions to social security, if applicable), divided by GDP at current prices.
5/   Current transfers (including subsidies), plus interest on the public debt, divided by GDP at current prices.
6/   Based on net material balances.

Finance Statistics (GFS) fiscal data that concentrate on consolidated
central government, and the second (G1*) uses UN national accounts data,
with both aggregates measured at current market prices. Unfortunately,
while GFS data concentrate on central government, national accounts data
take a broader view and attempt to cover general government, defined to
include local and state governments. 1/ In countries with federal
systems and/or more devolved fiscal systems this could create wide
disparities between measures of central government resource use and that
for the government sector as a whole. In the majority of countries
where time series data are available, the ratio tended to increase in
the 1970s in 8 out of the 15 Baker countries. When one concentrates on
national accounts data alone, seven countries show increasing ratios
and, for some countries (e.g., Peru, Philippines, Uruguay, Venezuela)
the movement in the ratios is reversed from that obtained when GFS data
are used.

     In part, this results from different statistical treatment of the
main aggregates in the two data sources (e.g., inclusion of depreciation
allowances in national accounts data, adjustment of GDP to a fiscal year
basis), and in part from differences in coverage. While differences in
coverage explain why the ratio based on national accounts data is
typically much higher than that based on the GFS data, deviations in the
trends found in the two series are more difficult to explain. These
interpretative problems are further increased when data are suitably
deflated and corrected for changes in international terms of trade. 2/
This is done in the indicator G1** of Appendix Table I using the data
constructed by Summers and Heston (1984). Some countries (e.g.,
Argentina and Brazil) consistently display a falling expenditure ratio
when measured in current prices but show no change when data are
compared in real terms. Other countries (e.g., Colombia and the
Philippines), which show ratios rising in current prices, show a decline
in real terms. This very preliminary view of the data suggests that
expenditure ratios should be interpreted cautiously, and that the data
base most relevant for policy purposes should be defined carefully.

     Similar caution is suggested when comparing different concepts of
relative government size in the economy. It is evident from Appendix
Table I that there are often conflicting movements in the ratios between
various measures of G1, indicating the government's relative size as a

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     1/ It should be noted that for some countries the GFS Yearbook
contains comparable general government data. However, for the majority
of these countries, GFS data are not available or are not available for
a sufficiently long period to allow meaningful comparisons.
     2/ Summers and Heston (1984) report data in which quantities in each
year are made comparable across countries through the use of a common
set of world average prices. To allow for changes in the terms of
trade, constant 1975 international prices are used for domestic
absorption, but current international prices are used for the net
foreign balance.

consumer in the economy, compared to that of G2*, which may be used as
an indicator of the government's relative importance as producer and
employer. Further, both G1* and G2 may be in conflict with G4, which
may be used as an indicator of the size of the government's
redistributive function. For example, some countries show G1* rising as
G2 is falling, indicating a relative expansion in those expenditures
other than wages, (e.g., Colombia, Nigeria, Peru, and Uruguay) and vice
versa (e.g., Venezuela).

     In contrast, with few exceptions G1* and G4 move together,
indicating that the relative increase in government's consumption of
resources has complemented, rather than competed with, its
redistributive role. It is also notable that, in some countries, the
relative size of government as measured by this redistribution indicator
is greater than the extent of its role as a consumer (e.g., Argentina
and Brazil), while for most countries the reverse holds true. This
result may be explained by the relative importance of interest payments
in total government expenditure in these countries.

     For comparative purposes, Appendix Table II shows equivalent ratios
constructed for a sample of 18 industrial countries. It is evident
that, when GFS data are used to measure G1, countries are split into ,
roughly equal groups, with eight countries showing declining trends in
central government resource use over the period examined and ten
countries displaying increasing trends. While for most countries,
employing national accounts data to measure G1 results in similar
trends, for six countries the trend is reversed from that obtained when
GFS data are used (Australia, Denmark, Finland, Italy, Norway, and
Sweden). Given the relative importance of expenditure by lower levels
of government in these countries, this result may be due to the
difference of coverage by the two indicators. When constant price data,
adjusted for international prices, are used to measure this ratio, the
picture is somewhat different, with ten countries showing increasing
ratios over the period examined, four countries declining ratios, and
four countries no change. Indeed in only five countries (Belgium,
Spain, Sweden, the United States, and the United Kingdom) do all three
measures of G1 move in the same direction over the same time period.

     When the G2 ratio, measuring the government's role as an employer,
is examined, it can be seen that for most countries the movement in this
indicator follows that of the G1 ratio when the latter is based on GFS
data. The exceptions are Finland, Italy, and Sweden. However, for the
G4 ratio, which indicates the extent of the government's redistributive
role, increased in all advanced countries and in most cases was
significantly higher than the G1 ratio. The level of the G4 ratio was
noticeably higher in the industrial countries than in the developing
countries, indicating the government's important and increasing
redistributive role in the former. This phenomenon is explained by the
relative importance of transfers, rather than interest payments, in
total government expenditures, as was the case in some developing
countries.

The above discussion has attempted to show that the use of aggregate expenditure ratios as indicators of change in government intervention is fraught with many conceptual and measurement difficulties. First, it has been shown that, depending on the policy perspective adopted, it is possible to devise different expenditure ratios, although not all are amenable to quantification without some dubious assumptions. Second, even when quantification is possible, there is likely to be some conflict in the movement of indicators reflecting important policy trade-offs. Third, expenditure indicators appear particularly sensitive to the data base used, as witnessed by the large differences that can result when the coverage is changed or the data are properly deflated.

Testing Causality Between the Expenditure Ratio and National Income

Granger (1969, pp. 428-9) distinguished four different patterns of causality: (a) simple, (b) instantaneous, (c) lagged, and (d) feedback. In this categorization, the first three patterns refer to a unidirectional causal process, whereby X can be said to cause Y (X→Y) or vice versa. In the simple causal process (a), the immediate past causes the present. An instantaneous causal process (b), can be of two types: (i) weak, when the present and the past cause the present; and (ii) strong, when only the present causes the present. In a lagged causal process (c), the distant past causes the present. The last pattern (d) suggests a bidirectional causal process, whereby X and Y mutually influence each other (X↔Y).

As a basis for the empirical testing for causal process, Granger suggested the following general causal model:

$$Y_t = b_o + a_o X_t + \sum_{j=1}^{m} a_j X_{t-j} + \sum_{i=1}^{n} b_i Y_{t-1} + U_t$$

$$\text{and } X_t = c_o + d_o Y_t + \sum_{i=1}^{n} c_i X_{t-i} + \sum_{j=1}^{m} d_j Y_{t-j} + V_t$$

where U_t and V_t are uncorrelated random series such that

$$Eu_t u_{t'} = Ev_t v_{t'} = 0 \text{ for all } t \text{ and } t' \ (t \neq t').$$

In empirical testing for a causal process, these equations are estimated by ordinary least squares and the null hypothesis that $a_j = d_j = 0$ for all j ($j = 0, 1, \ldots, m$), tested against the alternative hypothesis that $a_j \neq 0$ and $d_j \neq 0$ for at least some j. The acceptance of the null hypothesis implies no causal relationship between X and Y, while accepting $a_j = 0$ implies X does not cause Y and accepting $d_j = 0$ implies that Y does not cause X. Such tests enable us to identify patterns of causality in the following way:

Case A X causes Y	Test
1. Simple causation	$a_o = d_j = 0$ but $a_k \neq 0$
2. Instantaneous (i)	$d_j = 0$ but $a_o \neq 0$, $a_k \neq 0$
(ii)	$d_j = a_j = 0$, but $a_o \neq 0$
3. Lag	$a_o = d_j = a_s = 0$ but $a_{s+1} \neq 0$

Case B Y causes X	Test
1. Simple causation	$d_o = a_j = 0$ but $d_k \neq 0$
2. Instantaneous (i)	$a_j = 0$ but $d_o \neq 0$, $d_k \neq 0$
(ii)	$a_j = d_j = 0$, but $d_o \neq 0$
3. Lag	$d_o = a_j = d_s = 0$ but $d_{s+1} \neq 0$

Case C   Bidirectional causality (feedback)

1. Simple causation $a_o = 0$ but $a_k \neq 0$
2. Instantaneous (i) $a_o \neq 0$ but $a_k \neq 0$
   (ii) $a_j = 0$, but $a_o \neq 0$
3. Lag $a_o = a_s = 0$ but $a_{s+1} \neq 0$

Case D   Bidirectional causality (feedback)

1. Simple causation $d_o = 0$ but $d_k \neq 0$
2. Instantaneous (i) $d_o \neq 0$ but $d_k \neq 0$
   (ii) $d_j = 0$, but $d_o \neq 0$
3. Lag $d_o = d_s = 0$ but $d_{s+1} \neq 0$

with $j = 1$, ----s, s+1, ----m
and $k = 1$, ----m_1, with $m_1 < m$.

Tests for causality were carried out using the subset of the Baker initiative countries for which data were available from the Summers and Heston study for a 30-year period, 1950-80. 1/ Using time series, the real share of government consumption in GDP is related to per capita GDP, both estimated at constant internationally adjusted prices. The significance of each of the cases outlined above was tested by using a F-test. However, since the F-statistic is generally quite sensitive to the presence of autocorrelation among the residuals, it is important to test for $\rho = 0$. This was carried out by regressing $\hat{U}_t$ on $\hat{U}_{t-1}$, Y_{t-1} and the set of explanatory variables in the original model and testing for the significance of the coefficent of $\hat{U}_{t-1}$. 2/ As suggested by Sims (1972), evidence of autocorrelation in the residuals was dealt with by pre-filtering the time series using his suggested filter of $(1 - 0.75 L)^2$ where $LX_t = X_{t-1}$. 3/

Appendix Table III attempts to summarize the empirical findings. It can be seen that once a time trend is introduced to capture the impact of common trending and other causal influences, for some countries (Colombia and Mexico) no relationship is discernible between the expenditure ratio and per capita income. For one country, Ecuador, the rejection of the hypothesis that $d_o = d_1 = a_o = 0$ suggests in the Granger terminology that the expenditure ratio and per capita income exhibit instantaneous bidirectional (feedback) causality. For three countries (Brazil, Morocco, and the Philippines) the rejection of the hypothesis that $d_j = 0$ and the acceptance of $a_o = a_j = 0$ imply a

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1/ See Appendix I for further discussion. Owing to data limitations, Côte d'Ivoire and Yugoslavia are excluded from the sample.

2/ These test for first order autocorrelation and do not preclude the existence of higher degrees of autocorrelation.

3/ Based on a study (Box and Jenkins (1970)) that presented evidence that "this filter approximately flattens the spectral density of most economic time series" (op. cit., p. 53).

Appendix Table III. Summary of Empirical Tests on Causality

Case A	Per capita income causes expenditure ratio	Country
1.	Simple causation	
2.	Instantaneous (i)	Chile
	(ii)	
3.	Lag	Argentina, Bolivia Nigeria, Peru, Uruguay, Venezuela
Case B	Expenditure ratio causes per capita income	Country
1.	Simple causation	
2.	Instantaneous (i)	
	(ii)	
3.	Lag	Brazil, Morocco, Philippines
Case C	Bidirectional causality (feedback)	Country
1.	Simple causation	
2.	Instantaneous (i)	
	(ii)	Ecuador
3.	Lag	
Case D	No relationship	Country
		Colombia, Mexico

Keynesian lagged relationship between the relative size of the
government and per capita income (that is, causality is of the type
$Y \to X$). However, for the majority of the sample countries we would accept
the hypothesis that $a_j \neq 0$, implying that causation runs from income to
expenditure ratio (that is $X \to Y$). Only in Chile is the relationship
unlagged. In all other cases the hypothesis $a_0 = d_j = a_s = 0$ but
$a_{s+1} \neq 0$ appears to hold, implying a lagged causal pattern. It should
also be noted that the sign of the income coefficient differs between
countries: for Argentina, Bolivia, Peru, and Venezuela, the
relationship is positive, whereas for Brazil, Chile, Nigeria, and
Uruguay, the relationship is negative. The latter countries would thus
negate the Wagnerian thesis.

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