THE DETERMINANTS OF GOVERNMENT EXPENDITURE GROWTH
IN GREECE, 1950-1980

By

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To my parents Eleni and Elias
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The Determinants of Government Expenditure Growth in Greece, 1950-1980

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ABSTRACT

The scope of this study is the examination of various theoretical contributions to the literature of the determinants of government expenditure growth. In the beginning we give a critical overview of different theories, starting with Wagner's Law, then passing onto Peacock and Wiseman's Displacement Effect Hypothesis and then putting bureaucracy, politics and other economic and social factors into perspective. We conclude that the best way of examining the growth of the public sector is by means of interdisciplinary approaches. Then, after giving a synoptic description of the Greek economy, polity and society we proceed into the empirical testing of theoretical propositions, which covers the years 1950-1980. We stress the fact that government expenditures is a non-uniform set interacting with the private sector and we employ empirical causality tests to a large number of variables in an attempt to identify causal relationships rather than assume them ex ante.

Having done this, we proceed into calculating income elasticities for various categories of government expenditures, and we find that, in general, they are unitary except for those which are associated with transfer payments and are higher than unity. Furthermore, we were not able to identify any displacements in the Peacock and Wiseman sense, although we did find out that defence expenditure affects non-defence expenditure negatively. Finally, we constructed a model in order to examine the relative price effect, and the results we obtained were not fully in accordance with Baumol's assertions, any differences, however, being explained by the bureaucratic way of production.
INTRODUCTION

Government growth has been one of the main issues in post-war economic analysis. The study of public expenditure growth had been neglected until the 1950's. Everybody seemed to concentrate on taxation, spending being an issue that nobody cared to discuss at some length. The arrival of the theory of public goods posed questions and gave answers which heralded the arrival of a new dimension in the study of the public sector. Economists started comprehending the importance of public expenditure in the economy and that the issues involved were just as complex as they were important. The study of the public sector can be artificially separated into two broad categories. One dealing with the sources of growth and one dealing with its consequences. We say 'artificially' because these issues are not different. We simply study them separately because of the sheer volume of issues that each of them contains.

The developments in the field of Public Finance meant that a body of economic and political analyses appeared which attempted to identify and explain the process of government expenditure growth by using a variety of theoretical and statistical tools, which has been considerably extended since the seminal works of Fabricant and Peacock and Wiseman in the 1950's. The world recession in the 1970's resulted in making the need to understand government expenditure growth appear more acute than ever, and progressively we moved to a massive accumulation of literature from various disci-
plines on the subject.

The present study deals with the determinants of government expenditure growth as they have been observed in Greece from 1950 to 1980. It includes theoretical and empirical work and deals with a variety of approaches. In Chapter I we give an overview of the literature on the determinants of government expenditure growth. We extend to a variety of approaches to the relevant issues because we realize that such a multifaceted subject involves the examination of inter-disciplinary phenomena. Thus we critically review theories which have their starting points on the demand aspects of expenditure growth, we take into account cost considerations and the bureaucratic way of production, we extend to the effects of exogenous disturbances to the economy, and we deal with political and sociological angles. The end section of Chapter I attempts to put the various approaches in some functional order.

Chapter II deals with some definitional problems which mainly arise when one proceeds to the use of empirical methods and gives a short account of empirical approaches to the various issues. Chapter III presents a description of the Greek State, the economy and polity, so that an inter-disciplinary approach is facilitated and then we provide a report on the chronological evolution of government expenditure growth supported by statistical data. The final chapter (Chapter IV) deals with the testing of the various hypotheses which were discussed earlier. It starts with investigating the causal relationships between various forms of government
expenditure and variables suggested by the theory as their determinants by using an econometric procedure and thus attempting to shed some light on an aspect of empirical work which unfortunately has not been widely dealt with until now. Then we proceed in examining the role of various determinants and we close this chapter by estimating a model based on Baumol's 'relative price effect'. At the end, finally, we provide a summary of our study and some concluding remarks.
CHAPTER I

A Critical Review of the Existing Literature on the Determinants of Government Growth

A) A. Wagner

Adolph Wagner, German economist and 'academic socialist', was a pioneer in the field of government growth. In the late nineteenth century, he presented his ideas and findings in a score of studies, but mainly in his 'Finanzwissenschaft' (1883), and 'Grundlegung der politischen Wissenschafter' (1893), opposing the beliefs which held sway at the time. With the possible exception of the early socialists, who looked upon a collectivization of the economy, it had been widely believed that the scope of government would diminish through time, as mankind matured socially and the economy evolved.

Wagner was the first to recognize an association between the size of the public sector and the development of the economy and pointed towards a secular trend of growth in government expenditures. He

1 The academic socialists were socialists in the sense that they were concerned with the 'social question'.
considered the expansion of the public sector as a natural consequence of economic growth rather than an historical accident. Although he did not present his theory in a formal and complete manner as such, it has lived on in the relevant literature as 'Wagner's Law' or the 'law of ever expanding state activity'. Wagner may not have expected his law to have the validity of a natural law, yet he had the perception that it would generally hold in the long run. To put it in his own words:

"The law (...) is the result of empirical observation in progressive countries, at least in Western European civilization; its explanation, justification and cause is the pressure of social progress and the resulting changes in the relative spheres of private and public economy. Financial stringency may hamper the expansion of state activities, causing their extent to be conditioned by revenue rather than the other way round, as is more usual. But in the long run the desire for development of a progressive people will always overcome these financial difficulties."

(Finanzwissenschaft, from Peacock & Wiseman, 1967, p.17).

From this small abstract we can see that Wagner put forward a causal relationship, where expanding state activities follow as the direct consequence of social progress. Also, he seems to have kept some reservations regarding the universality of the law, alluding to "progressive countries, at least in Western European
civilization", a fact that not many researchers have taken into account. That is Wagner hinted not only at the stage of growth of the country but her sociological elements, as well, which in Western Europe are more or less uniform (or at least not so diversified as when we compare Latin American States to African ones or Western European nations to Asian ones). Finally, Wagner was very explicit about the long term character of his law.

Although Wagner stated that his results were based on observation (involving an assessment of data rather than testing), in the core of his theory we find his views about the role of the State, to which he ascribed 'stabilization' as its main function. Whether he perceived the State as entirely or strongly 'organic' is of minor importance, concerning economic historians, although Afxentiou's (1976, pp. 16-17) suggestions for the latter are not comprehensively supported by his reference to Wagner's assertion about financial stringency and its eventual relaxation. It is of more importance, in this context, to stress the stabilizing role of the State and the benefits from 'bigness' that it can provide, as Wagner saw it. Wagner considered that governments act on three levels:

a) protection of the functions of the markets,
b) participation in material production, and
c) provision of services.

For the first group of activities, he suggested that increased expenditure would result from (i) increased defence expenditure, (ii) increased spending on domestic activities of preventive and repressive
character; this growth of spending occurs as a result of the growing social friction and the centralization of the administration and atomization of society in the process of development and industrialization, which are characterized by growing complexity of the economy, furtherance of the division of labour, increased population density and urbanization, and (iii) increased activities by the state in order to ensure maintenance of and improvement in the quality of the services provided to the growing economy.

About the second group of activities Wagner felt that private capital accumulation might not be adequate for large scale operations, or that public corporations could be more effective by reducing the risk and the effects of business cycles, or that it would be preferable for the state to control large enterprises, which otherwise might encourage instability. Finally, for the third group, the provision of economic and other services, Wagner regarded market failures and improved technology as requiring from the state either more intervention and greater regulatory role with respect to private monopolies, or undertaking operations which are natural monopolies or have intangible social benefits, such as education. Taking into account, also, the fact that in the process of development incomes would increase and the basic needs of the people would be satisfied, thus becoming more concerned about high income-elasticity public goods, Wagner foresaw the increase in public spending as inevitable.

Wagner’s law has been criticized on grounds of the
questionable validity of its underlying philosophical context, of its actual propositions and implications, and on grounds of the results that researchers have obtained in their attempts to interpret and test it empirically. Economists dealing with the law have often mixed these main critical lines in different proportions and despite Bird's (1971) inclination to opt for "the sweeping statement, wrong in many details but pointing to new horizons" rather than "the careful rigorous tidying-up and testing of previously formulated hypotheses" a significant number of empirical studies in the field has been amassed. Nevertheless, theory and empirical work are complements and not substitutes and Bird's inclination is rather wishful thinking.

Examining the philosophical context of the Wagnerian theory, it has been contended that the law suffers mainly because of its teleological character and the adoption of the concept of the 'organic state' (cf. Peacock and Wiseman, op.cit.). As to the first point, Wagner has been accused of regarding the process of the expanding state activity as inevitable, attaching strong deterministic connotations to his assertions, where the 'invisible hand' now acts in the sphere of public economics, continuously boosting expenditures upwards. Bird (op.cit.) contends that the law overlooks individual and organizational choices which could be different, and that it explains the growth of public spending in a functionalistic manner. He concludes by asserting that the theory suffers from generalisations and tautologies and, therefore, empirically it can not be verified or
refuted. Yet, Wagner did put forward a causal relationship, as we saw earlier, and since he believed it would hold, the expectation of increasing state activity is reduced to his optimism that social progress, the first link of the chain, will be increasing. Wagner's theory seems indeed to suffer from generalizations, tautologies and a mechanistic way of looking at things, but it would be difficult to attach determinism to it, simply because such theological characterisms are void of meaning for such theories. Perhaps the "the root of all evil" is, as Herber (1967) pointed out, that Wagner dealt with an interdisciplinary subject without using interdisciplinary techniques.

The concept of the 'organic state', inherent in the law, seems to have been of much concern to some analysts, being the cornerstone in Peacock and Wiseman's critique. This concept of 'anthropomorphism' giving or allowing the State the status of an entity with tastes and preferences of its own has been severely criticized, but some allowance must be made for the time-space nexus of the theory, while Bird, very appropriately, does not deny that the law derives from this principle but he challenges its relevance to the issue of the validity of the law and he quotes Schumpeter: "... it may be an interesting question to ask why a man says what he says; but whatever the answer, it does not tell us anything about whether what he says is true or false". Finally Peacock and Wiseman questioned another of the fundamental rationales of the law, that of the stabilizing role of the State, which Wagner assumed.
Although an important issue of policy, they agree, it is not and there is no reason why it should be the only or most important one.

Looking at the law itself, one of the recognized difficulties is its interpretation. Being methodologically lose and stated in general terms, there has been a controversy about what are the actual causes of government growth that Wagner suggested and what measures of it he implied. This has generated a variety of interpretations and ways of testing the law.

As to the causes of government growth, most of the researchers tend to treat economic development as the one suggested by Wagner, using mainly some form of national income as the prime indicator and adding several others, such as urbanization and population density ratios, or industrialization. Others (like Musgrave, 1969, Andic and Veverka, 1964 et al) have argued that market failure is what Wagner himself actually suggested as the main rationale for his law. The second view seems more compact and perhaps more proper, although it is the first one that has been more widely adopted, since it is, statistically speaking, easier to test and involves less theoretical caveats. Nevertheless, these two interpretations may overlap in broad terms to the degree that market failure is a feature of economic development. Eventually the researchers concluded that there are two major obscure points in the law: first, whether Wagner meant an absolute or relative expansion of the public sector, and second, whether one should compare the absolute size or
the share of public expenditures with the explanatory variables. Most of this controversy, however, has been mainly due to linguistic problems, because only a few passages of Wagner's writings have been available in an English translation (cf. in Musgrave and Peacock, 1967). Thus a point was reached, where Mann (1980) accounted for no less than six different versions of Wagner's law! Musgrave (1969), on the other hand, was writing: "While there is no explicit statement in Wagner that the law of expanding scale relates to the share rather than the absolute level of public expenditures, occasional reference to 'quotas' suggests the former". And indeed, Wagner left no grounds for ambiguity on this issue, as Recktenwald (1976) has shown by quoting Wagner: "... an ever growing and more substantial portion of Kulturvolk's total needs will be satisfied by the state, not by others" (Grudlegung ...), and "in terms of political economy this law implies absolute and even relative expansion" (Staat in nationalökonomischer Hinsicht, in Handworterbuch der Staatwissenschaften, Band VII, Jena 1911, p.734) (emphasis provided). As to the second point Pryor (1967) showed that there is no difference at all between the 'share' and 'absolute' approaches, as long as we deal with per capita sizes 2.

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2 The limitation of dealing with per capita sizes is less serious in the case of aggregate measures of public spending. When public expenditure is disaggregated into functional categories then population should enter as an

(Footnote continued)
In conclusion, we can say that Wagner’s law was indeed pathbreaking. At its time it was an evolutionary theory which brought a revolution to the studying of the public sector. The limitations of his theory are rather obvious; generalizing from and about a set of particular countries, use of rather abstract sizes and limited ability of it being tested are some of these. The main contribution of the law is the concept of association of public spending to income (although Wagner himself preferred to refer to “government activities" and "social progress"). The sort of association is of great importance, as well; yet the law is already a hundred years old, and ‘non-physical’ laws can and do change or loose their meaning, not necessarily replaced by others. To attempt to prove or disprove the law is void of any real significance and has become rather trivial. We have no will to generalize from the results to be obtained in this study; what we will investigate is the association between economic development and public spending, for a certain country and for a specific time period. Whatever the results obtained they will not serve in any case for

\[2\text{(continued)}\]

independent variable, at least for some of them (such as health). Note also that disaggregation is within the spirit of Wagner’s law. Wagner distinguished between protection, general and economic administration and education and welfare expenditures and emphasized the issue of public corporations. Finally Michas (1975) has dealt with the same issue as Pryor.
the adoption or rejection of the law. "Wagner's law" will be used solely as a term in our jargon to describe the afore mentioned association. Finally, the empirical work conducted with regard to the law will be presented separately together with the tests of other hypotheses in the last chapter.

B) Wagner's law revisited: Herber's 'stage hypothesis'

B. Herber (1967) thought that since Wagner's law was directed towards industrializing nations, then the discussion should be restricted within the limits of such countries. Furthermore, he suggested, the income elasticity of public expenditure may change according to the stage of development of a nation's economy. Deriving from the Rostowian socio-economic stages ("traditional society", "preconditions for take-off", take-off into self-sustaining growth", "drive to maturity", and "age of mass consumption"), Herber developed a 'stage hypothesis' for public expenditure growth. He distinguished between three stages: a) the pre-industrial period, b) the period of industrialization, and c) the post-industrial period. Herber then contended that since in a pre-industrial society the demand is directed mainly towards subsistence goods like food, clothing, and housing, which are divisible and traditionally allocated through market type mechanisms by the private sector, then in per capita terms, the real output of the private sector must increase by a larger than propor-
tionate amount than the output of public goods, as income rises (i.e. the income elasticity of public expenditure is lower than one). In the second stage, where the economy enters an industrialization era, the Wagnerian hypothesis comes into effect. Investment in communications, transportation and education takes place and increases in the process of economic growth, and it is provided by the public sector, which in this case is more efficient than the market sector. That is, these social capital items, possessing a high degree of collectiveness, are supplied by the public sector as part of the aggregate demand and public output tends to rise faster than private output as incomes rise (the public expenditure income elasticity is now greater than one). Then the country enters its third phase of development, the post-industrial period. The efficiency advantage of the public sector has been exhausted, and the government has provided all the goods it could by using it (the income elasticity of public expenditure becomes once more lower than one). These three stages are shown diagrammatically in Figure I-1.

To question the validity of Herber's 'stage' theorizing we must look back into Rostow's theory and find its weak point. In a stage theory it is extremely difficult to identify the thresholds between stages. Rostow et al (for a discussion see in Yotopulos and Nugent, 1976) suggested a number of qualifications for each stage which in Rostow's case "does not even provide a satisfactory classificatory scheme", (op. cit.) or in Adelman and Morris' case and their ultra empiricist
Figure I-1.

The three stages of development and the size of the public sector.

\[ \text{Real per cap.} \]
\[ \text{Public Output} \]

\[ G \]

\[ 0 \]

\[ 0 \]

\[ \text{Real per cap. income} \]

I = pre-industrial period
II = industrialization period
III = post industrial period

spirit "they should have been more consistent in recognizing its limitations and in avoiding confusion between hypothesis formulation and testing" (op.cit.). Herber seems to be satisfied with the use of real per capita income as an indicator of the industrialization stage of a country but, of course, this measure is generally admitted to be at least inadequate in its arbitrariness. The weakness of the hypothesis to suggest a clear demarcation rule and indicate possible time-paths renders it non-operational. And what one may come to believe in the end, for that matter, is the inverse of what it had been suggested, i.e. that the size of the relevant elasticity can be used to define an
(abstract) stage of industrialization, which if not totally untrue, involves a tremendous risk. Herber's explanation of the transitional process is indeed very short and mechanistic, and it leaves out many long- and short-run factors which can be of great significance. Actually, he makes the same mistake that he attributes to Wagner (the interdisciplinary techniques needed for interdisciplinary issues, as mentioned earlier).

Herber's Stages are different from and somewhat contradictory to those of Rostow's. Stage I seems to include Rostow's first two pre-take-off stages. Yet, in the pre-take-off period one must be prepared to anticipate substantial government spending (as Rostow suggested) on infrastructure investment, a fact that implies that public capital formation can be relatively of greater importance to pre-industrial countries on the verge of transition (Herber's stage I) than in industrializing ones (stage II). Even then, of course, we must take into account a series of factors in order to decide upon an expected size of the elasticity. Therefore, it likely that the elasticity of public spending may exceed unity sooner than Herber predicts. In the third stage, Herber contended that in the post-industrial period the ratio of public expenditure to income will start falling because of the now 'inferior' public good. Yet one could argue that this might or might not happen, depending on a score of factors which affect the public debt, public services, transfer payments and defence expenditures, which cover the best part of a government's activities and for which
there is no clear-cut reason why they would not be able to rise, even at such a rate as to change greatly the anticipated by Herber elasticity.

Herber's theory, which can lead to very interesting experiments, needs extensive reformulation, so that it becomes more specific from the classificatory point of view, and of greater value with respect to its explanatory understructure. Finally, the hypothesis contains many points of Wagner's analysis (especially stage II), which were discussed in the relevant paragraphs.
In 1953 Peacock & Wiseman (P&W from now on) set out to compile long series of data related to public expenditures in the U.K. The behaviour of these series through time struck them as requiring some explanations, which had not been provided satisfactorily by the then main theoretical efforts in the field of public finance. Their views and suggestions can be found in the now classic "The Growth of Public Expenditure in the U.K." (1967).

The welfare theories, P&W contended, provoke a lot of scepticism as to their value, when real economies are examined. The subsequent expenditure theories they regarded as dubious, criticizing especially their prescriptive nature as highly unrealistic and non-operational with regard to the real-life politics of coercion and consent, as opposed to the implications of the welfare theories concerned solely with the interpretation by the government of the individual choices.

Arriving at the macrostatic Keynesian-type models, P&W pointed out that even if we ignore the extreme but rather usual cases of treating government expenditure as an exogenous factor (or even assuming it away) as completely implausible, such models still suffer from a simplistic approach to the question of public spending. Such models include too few variables, they contended, and their static character assumes away any variability in the determinants of government expenditure behaviour.
and character, as well as any variability in the impact of the changing public sector upon the rest of the economy. Moreover, they concluded, the most decisive factor for critique is the fact that the public sector enters simple growth models with the purpose to have values ascribed to the relevant variables, such that make the models' objectives attainable. However, predetermining the actual behaviour of the government sector and its impact according to preconceived ideas about the characteristics that a model should have can only produce unreliability.

Finally, P&W suggested that Wagner's Law was a significant step ahead, but still very inadequate. Their criticisms can be found in the relevant paragraphs about Wagner's Law, but let us mention them again very briefly: (a) the use by Wagner of the organic concept of the State, (b) the obscurity of terms in which the Law has been stated, (c) the omission of the examination of shorter-term changes and the timing of the public sector growth (although it is not very clear what they mean by 'timing'), and (d) the difficulty of actually testing the Law empirically.

P&W stated that their approach is not interested in generalizations (although they did not rule out such a possibility) and that it roughly follows the Wagnerian tradition, in the sense that it deals with real-life phenomena. As they put it, they are "using Wagner's general approach while rejecting the conclusions he reached by it ". Such an approach can take two directions, P&W suggested; one examining the possibility
of permanent influences on public expenditures, where a wide range of variables can be related to the growth of public spending, in various countries and time-periods; the other direction is the examination of the relations which the historical data reveal with respect to social disturbances.

Permanent influences on the growth of government do exist and cannot be ignored, P&W readily admit. But we must reject the case that such influences can formulate a general hypothesis and provide a complete explanation of the trends of public expenditures in different societies through time. It is true, they wrote, that a developing economy acquires more intricate mechanisms through time, new tasks for new government institutions arise, or new technologies are introduced. But there is no constant pattern to allow for the formulation of a general hypothesis. The most obvious permanent influences, they continued, are output, population growth, and changes in the levels of unemployment and prices. Public spending may increase when national income increases (given an emphasis to the provision of public financed services), but such a trend may be counteracted by decreasing transfer payments caused by the increased welfare; even that depends on the views of a given society of who is regarded to be in need and how much help should be given. Demographic changes are also likely to behave in a non-predictable manner; when population rises, output per capita is likely to either remain constant or fall, while total output increases. In this case, the government would face increased demand
for expenditures and simultaneously difficulties to finance them and transfer resources from the private to the public sector. Even when per capita output rises, P&W contended, and it looks relatively secure to predict a growing public sector, the effects of the population changes on expenditures can be distorted by changes in its composition and the increasing urbanization. That is, the population may increase along an irregular time-path, with a changing age-pyramid (especially, the base and the top, which involve most of the transfer payments) and a rising importance of the conurbations with effects on the structure of the state mechanism and the control on expenditures. It can be seen, therefore, that it is to no avail to try to predict either the direction or the scope of the government sector.

Finally, P&W contended, changes in the level of prices and unemployment affect the volume, structure, and growth pattern of public spending, but since they can move in a non-secular manner, it is hard to see how they can affect the relative importance of government expenditure in a constant predictable manner. If to all the above we add the political factor, that is the influence of the dominant (and different) political views and processes peculiar to each geopolitical entity through time, then, P&W conclude, there is no evidence to constitute a constant and predictable pattern of public expenditure growth. It may be so that government expenditures do increase over time, but there is no good reason why their rate of growth should be inevitably faster than (or of fixed proportions to, for that
matter) that of the economy.

The examination of the U.K. statistics led P&W to suggest that the government expenditure in Britain did not grow at a constant rate (both in nominal and real per capita terms), but rather in a stepwise fashion. The pattern of government expenditure growth was not a more or less smooth line, they observed, but rather an alternation of 'peaks' and 'plateaux', the 'peaks' being the transitional points from one 'plateau' to the next, and most importantly coinciding with the two World Wars (Figure I-2).

**Figure I-2.**

A Schematic Representation of the Displacement Effect

The investigation of the role of such major disruptions on the role and growth of the public sector led them to the formulation of the 'Displacement' and 'Inspection' effects hypotheses, which are quoted below:

"(The) displacement effect has two aspects. People will accept, in times of crisis, methods of raising revenue formerly thought intolerable, and the
acceptance of new tax levels remains when the disturbance has disappeared. It is harder to get the saddle on the horse than to keep it there. Expenditures which the government may have thought desirable before the disturbance, but it did not then dare to implement, consequently become possible. At the same time, social upheavals impose new and continuing obligations on governments both as the aftermath of functions assumed in wartime (e.g., payments of war pensions, debt interest, reparation payments) and as the result of changes in social ideas. Wars often force the attention of governments and peoples to problems of which they were formerly less conscious—there is an 'inspection effect', which should not be underestimated."

In the core of P&W's arguments we find the following concepts; since government expenditure depends mainly on tax revenues, and since the decisions about expenditure are made through political processes which do not follow the same patterns as the market choices, then the people's views on public expenditure and the tax burden they should carry can be formed separately. The fact that in the public sector the produce is extremely difficult to be priced, and the costs and benefits involved are incomputable by both the political authorities and the citizens, allows for a discrepancy between what the electorate consider desirable tax and expenditure levels, while the same can be said of the politicians. The introduction of political processes in the formulation of spending decisions was one of the
major contributions of P&W's to the studying of public expenditure growth. Yet, their assumptions were questioned by Bird (1971), among others, who wrote:

"Given the existence of a 'social disturbance' (...) that has acted in some way to raise the tolerable burden of taxation, why should government expenditures rise until the new higher revenue constraint be encountered? Why should ideas about 'desirable public spending' continually outstrip the desire to sustain these expenditures? Even if the burden of taxation that the community is prepared to bear has increased, might it not be favourably disposed toward a government that eases the actual burden by maintaining constant expenditures?"

Then, Bird goes on to point out that P&W did not comprehensively clarify what they meant by "tolerable burden of taxation" and on which basis more burdensome taxation is defined (higher or lower progressivity? or higher average tax rates? or just increased revenues?).

Since P&W put forth their suggestions the discussions about government expenditure growth were revitalized and they attracted both support and criticism for their theses. The discussion that follows is about their views on the permanent influences, on the actual core of the two effects and on the technical side of empirically testing for their hypotheses.

In my opinion, P&W's analysis of the permanent influences on government expenditure is not quite satisfactory. What is P&W's objection to using an
approach based on the permanent influences on government expenditure? Simply that the permanent influences are too changeable and unpredictable to assist in formulating any general hypotheses about the evolution of public expenditures. When they refer to general hypotheses they seem to have in mind a "law" or something similar that will predict in an absolute sense a universal specific path of public expenditure growth. Their own hypotheses, they tell us, do not generalize or, at least, are not intended to. P&W argue that we need no generalizations. Yet, we can argue that generalizations can prove very useful and that we can achieve them at satisfactory degrees by using the permanent influences. This is not, however, likely to happen with the displacement and inspection effects which by nature are caused by events of unpredictable character, strength, and timing. It is true, of course, that there is no sufficient evidence to support the inevitability of an ever growing public sector (either in absolute or relative terms). But when we suggest that a generalization can be inferred, we mean it in a different sense to that of P&W's. When P&W refer to the permanent influences, it is their non-constancy and unpredictability that upsets them. It is the actual final effects that they find of such a diversified nature. But we can make a basic assumption: the same cause has always the same effect; and then we must hurry to add that we recognize that the network of causes which we imply can rarely be identical in all or most cases. It is the interrelationships between causal
factors that produce the uncertainty that P&W point out. These interrelationships are the crucial factors to which P&W themselves refer constantly when they discuss the permanent influences (e.g. links between population and national output). During times of non-global disturbances it is difficult to consistently encounter outliers both in the causes and the effects within the economy. During these "peace-time periods" trends and even transitions between trends tend to be quite smooth.

Are not P&W of the same opinion when they refer to the stability of the people's ideas about the tolerable burden of taxation? Perhaps it is unlikely to have constancy but we can have predictability and from there on we might as well be able to generalize. To practice this we must take into account and work out the interrelationships between the various determinants of public expenditure and introduce conditionality. Therefore, we might be able to say that, e.g. the public sector is always going to grow faster than the rest of the economy given that such and such conditions will hold in the society, economy, and polity. The tools for the empirical work required for such an approach have improved significantly since the 1950's (and we refer to the progress of the econometric theory and the development of powerful computers and software packages), able to make such an approach a definite and useful reality. P&W expose these facts in their analysis only to be unable to grasp their true potential in the end. The level of predictability and generalization we can achieve, will become better the more factors we can
define and take into account. We believe that as far as we can interrelate the various determinants of public expenditure, that is identify and quantify the causal processes in-between them and between them and government expenditure, then the experience of the past can be extremely useful in helping us to predict and formulate general hypotheses under certain conditions, instead of merely describing and ex post explaining specific cases. Surely Wagner’s law would have suffered much less criticism if it were based on a thorough set of assumptions. To conclude, the point we wish to make is that since permanent influences tend to be relatively stable though individually dissimilar in most cases, we can identify general paths of public expenditure growth if we build on a good number of assumptions and conditions, a practice very common in economics.

Another point worth mentioning is the identification of the events, which may lead to displacements. What is a "major disturbance" and how can one recognize it? A World War is easy to deem as a source of disturbance. But what about extensive unemployment, hyperinflation, revaluation of currencies, oil-crises, elections, other political events, scientific and technological breakthroughs, and, in general, events that tend to happen all the time? How can one recognize whether they are sources of disturbances which cause displacements of public spending? By looking at changes of ratios and elasticities ex post? But this is hardly a comprehensive process. How can the effect, in such a case, tell us about the cause, when the cause is not
obvious or defined? A displacement, in such a manner, is possible with us not observing it as such because its origin is not very apparent. Or, the other way around, one may even await a displacement in order to actually define a period as a period of disturbance, and this is sheer inconsequentiality!

These thoughts are not meant as criticisms of P&W's hypotheses but rather to show the obvious: that displacements are likely to happen frequently and that the magnitude of most economic variables evolves along a series of displacements (stepwise) (although not so in the econometric sense most of the times). Therefore we tend to pick out only large, abrupt and readily recognizable changes thus reducing the essence of the displacement effect into a one-every-forty-years phenomenon. The fact is, however, that displacements may happen more frequently, even involving lags, and moreover two or more disturbances may happen under such temporal relationships that the real picture of what disturbance caused what displacement may be absolutely blurry. The above should be borne in mind especially when one adopts interpretations of the P&W hypotheses such as J. Diamond's (1976). Diamond reinterpreted the P&W theory as a theory of structural break the reason being that during an upheaval period all parameters normally assumed to be constant are not, since institutions, tastes and preferences change not only within but outside the public sector as well. Although this suggestion is perfectly legitimate for 'major' disturbances, one still remains with the question what
is the threshold in order to characterize an event as causing a structural break.

Let us now examine the practical side of the two effects. First of all we must ask what are the proper forms of testing for the displacement and inspection effects. P&W themselves, although they discussed empirical tests conducted by Gupta, Andic and Veverka, and others, they never went beyond a simple scrutiny of figures and their plots. Justifiably, from this point of view, Bird questions the validity of P&W's thesis, since, at least visually, the residual line of civilian expenditure, which they presented, shows no apparent shift. In the discussion of the empirical results that we mentioned above, it is evident that P&W conceive the two effects in more than one way. They simultaneously refer to the change in the absolute level of government expenditure, $\Delta G$, in its share in G.N.P., $\Delta(G/Y)/(G/Y)$, and in the ratio of the growth rates of the two sectors, $(\Delta G/G)/(\Delta Y/Y)$. They discuss the growth of G alone and with respect to that of Y, having plotted them both against time; in Wiseman's words (in P&W, 1958), they looked for "the time-pattern of expenditure growth", "how does this compare with the time-pattern of G.N.P. growth" (the latter being the expression of the income elasticity of G), and they also wished "to concentrate on (...) the explanation of how changes in the share (-meaning of G in Y-) occur". Gupta (1967) mentions that he found shifts both in the absolute level and the income elasticity of G for the countries of his sample, such that they indicate the presence of both effects.
But we should be careful of the fact that \( \Delta G/\Delta Y \) need not move to the same direction as \( \Delta(G/Y) \); they can just as well move in opposite directions. It is interesting to remember that for Canada and covering a very similar time-period, Gupta found displacement shifts as expressed by \( \Delta G \) and \( \Delta G/\Delta Y \) while B. Rosenfeld (1973) concluded that no extraordinary shifts were observed, as far as the expression \( \Delta(G/Y) \) is concerned. This may seem strange at first, but let us give a simple example. Let us consider the figures in Tables I-1a and I-1b, where \( G \) and \( Y \) represent the usual variables and \( \eta_{G,Y} \) is the income elasticity of \( G \).

**Table I-1a.**  
En Example of the Displacement Effect  

<table>
<thead>
<tr>
<th>Country A</th>
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<tbody>
<tr>
<td>Period</td>
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</tr>
<tr>
<td>G</td>
</tr>
<tr>
<td>Y</td>
</tr>
<tr>
<td>G/Y</td>
</tr>
<tr>
<td>( \eta_{G,Y} )</td>
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<table>
<thead>
<tr>
<th>Country B</th>
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<tbody>
<tr>
<td>Period</td>
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<tr>
<td>-------</td>
</tr>
<tr>
<td>G</td>
</tr>
<tr>
<td>Y</td>
</tr>
<tr>
<td>G/Y</td>
</tr>
<tr>
<td>( \eta_{G,Y} )</td>
</tr>
</tbody>
</table>

Here we have two distinct cases of two similar
countries A and B, which suffer a major social disturbance. Between the 'peaceful' periods (a) and (b), both countries saw their G and Y increase, G faster than Y, with an elasticity of 1.5, while the share of G in Y rose from 20% to 25%. After the war, which at its end found the public sector occupying 60% of the G.N.P. in both countries, we see that in country A, (G/Y) receded to its pre-war level, while at the same time the elasticity rose from 1.5 to 2.0, while in country B the elasticity remained the same but G/Y fell back only to 40% to rise to 45% in period (d). Therefore, we can see that, although before the disturbance the situation was identical in the two countries, in terms of the levels of G and Y, after the war in country A the elasticity rose, although the share of G in Y remained more or less the same, while in country B the opposite happened; \( \eta_{G,Y} \) remained unchanged while (G/Y) rose significantly.

From this simple example it can be seen that different definitions of the displacement effect may yield different results and therefore one should not always treat the changes in (G/Y) and the elasticity as being the sides of the same coin. In that case, we could ask, which is the valid interpretation of the effects for empirical testing? I am inclined to answer that both of them are. Moreover, I tend to interpret the examination of the (G/Y) ratio as being peculiar to the displacement effect, while that of the income elasticity of public expenditure to the inspection effect. Looking back at our example, the interpretation could be that in country B we had a displacement effect, which was not,
however, followed by an inspection effect, while in A exactly the opposite happened. To ascribe the above empirical 'measures' to the two effects was encouraged by the definitions provided by P&W themselves. They describe the displacement effect in terms of general shifts in the tax-revenue raising capacity of the State in order to finance new demands, while the inspection effect is described in terms of "new and continuing obligations of government both as the aftermath of functions assumed in wartime (...) and as the result of changes in social ideas". I think, therefore, that the new levels of taxation and expenditure in relation to the income can be described by $\Delta(G/Y)$, while the change in social ideas and views can be described by the elasticity. I would also like to add, at this point, that if $G$ is not financed mainly by tax-revenues but, say, debt, then if payments for the debt are distributed in the long-run, we may not be able to observe any displacement effect, while an inspection effect may become probable. Bird criticized P&W, among other things on the grounds that the plots they provided did not support their arguments. This criticism, however, was inadequately supported. The visual impression which one gets from the residual line in question is indeed that no significant shift has taken place. But by measuring the slope of the line as it is or having plotted it against income instead time, one can see clearly that an inspection effect, as described above, was in process, i.e. the slope of $G$ changes, as well as the income elasticity; on the other hand there is no evidence of
any 'permanent' displacement (again in the terms I defined it above). To recapitulate we can say that there are three different aspects of the displacement and inspection effects:

(a) \((\frac{dG}{dt})\), or \(\left(\frac{dG}{G}\right)/\frac{1}{G}\)/dt, which shows the growth of \(G\) in absolute (or percentage terms) and which need not agree with

(b) \((\frac{dG}{dY})\), or \(\left(\frac{dG}{dY}\right)/\frac{1}{G}\), which shows the relative to income growth of public expenditure, and which need not also be in accordance to

(c) \(d(G/Y)\), or \(\left[d(G/Y)\right]/\left(G/Y\right)\), as shown above.

(a) alone is not of much use since growth rates of single variables are not by themselves very informative, when a complex environment, such as the one in our case is under examination. (b) we proposed that it can be used as an expression of the inspection effect, and (c) as an expression of the displacement effect. Finally, the two effects may take place together or independently of each other. At this point we should mention the fact that P&W were critical of various empirical studies because they found them demand-oriented. This contradicted or ignored, they argued, their thesis of 'tolerable' burden, that government expenditures are subject to both demand and supply influences. The fact that they insist on the role of taxation does not make them, however, to suggest an alternative test.
D) The Relative Price Effect

W. J. Baumol (1967), in examining the financial problems of big cities, suggested the formulation of a model, which was to make a great impact on the study of public expenditure growth. Baumol distinguished between two kinds of economic activities: the technologically progressive activities, where output per labour unit rises due to high productivity, and technologically less progressive activities, where productivity in the long-run remains constant on average. The latter kind of activities was ascribed to the services sector and more importantly, in a later version (Baumol and Oates, 1975) it was explicitly recognized that in such an economy the public sector should bear the label of the relatively 'unprogressive' sector.

The reasons for this, according to the writers, are, first, that although the services sector activities are shared between both sectors, any inefficiencies in the private sector will be taken care of by the market mechanisms, and second, that the provision of services is the dominant activity in the public sector, being the subject of all kinds of pressures and failures (failure of political processes, inadequate fiscal systems, corruption etc). The conclusions reached by Baumol and Oates are given below, the corollary being that in the public sector output there is "a tendency toward persistent and cumulative increases over time in its costs relative to those of other outputs".
The model itself has been kept very simple on purpose, and it is assumed that the economy is divided into a sector which provides personal services with constant productivity of labour and output described by

\[ G = a \frac{L_G}{t} \quad (1), \]

and the progressive sector, which exhibits a constant growth rate \( r \) in providing its output, such that

\[ P = b e^{rt} L_p \quad (2), \]

where \( a \) and \( b \) are constants and \( L_G \) and \( L_p \) are the respective quantities of labour employed in the two sectors. \( t \) stands for time and here we should note that all variables are assumed to have a time-subscript which has been omitted here for legibility's sake. Furthermore, it is assumed that the wage rates in the two sectors are equal and they rise in accordance with the productivity of the progressive sector, so that

\[ W = W_0 e^{rt} \quad (3), \]

where \( W_0 \) is a constant.

Therefore, we can see that the model is based on the following assumptions:

a) the economy is divided into two sectors as described above,

b) there is only one input (labour) and all outlays other than labour costs have been ignored,

c) both sectors exhibit constant returns to scale, and
d) the wage rates in the two sectors converge, at least in the long-run.

The model then provides the following propositions:

1. The unit cost of output in the non-progressive...
sector will rise without limit and remain constant in the progressive sector.

Proof: If \( C_g \) and \( C_p \) are the costs in the non-progressive and progressive sectors, respectively, then

\[
\frac{W L_G}{L_G} = \frac{W_0 e^{rt} L_G}{a L_G} = \frac{W_0 e^{rt}}{a}
\]

or

\[
C_g = \frac{(W_0 / a)e^{rt}}{a}
\]

Also the relative costs will behave similarly and irrespectively of wage increases as shown by (3), since

\[
\frac{C_g}{C_p} = \frac{(b/a)e^{rt}}{a}
\]

(2) The outputs of the non-progressive sector for which demands are not highly price inelastic and income elastic will tend to decline.

Proof: If prices are proportionate to costs, then

\[
P_g G/P_p P = \frac{C_g G}{C_p P}
\]

\[
= \frac{W L_G}{W L_P} = \frac{L_G}{L_P} = A \text{ (constant)}
\]

and

\[
G/P = a L_G / b e^{rt} L_P = a A / b e^{rt}
\]

where \( G/P \) \( t \rightarrow \infty \rightarrow 0 \).

(3) The non-progressive sector will tend to absorb more resources relative to the progressive sector, until
ultimately they are all transferred to the former, if the ratio of the outputs of the two sectors is held constant.

Proof: If \( G/P = K \), then

\[
\frac{aL_g}{b e^{rt} L_p} = K
\]

or

\[
\frac{L_g}{L_p} = (b/a) K e^{rt}
\]

(9)

(4) If productivity in one sector remains constant, then the economy will asymptotically achieve zero growth rate in per capita terms. That is, when productivity gains are unbalanced between the two sectors, an attempt to achieve balanced growth will result in a declining growth rate relative to the growth rate of the labour force (or a declining growth rate of per capita output).

Proof: Let us assume the expression

\[
I = m_g G + m_p P = m_g aL_g + m_p b e^{rt} L_p
\]

(10)

where \( I \) is an index of output of the economy, and \( m_g \) and \( m_p \) are the constant weights for the respective outputs of the two sectors. From (9) we have

\[
L_p = \frac{(a/bK) e^{-rt} L_g}{L_g} \quad (9a)
\]

or

\[
L_p = V e^{-rt} L_g \quad (11)
\]

where

\[
V = \frac{a}{bK} \quad (11a)
\]
Substituting (11) into (10) yields

\[ I = ( m_s a + m_p b V ) L_g = \]

\[ = R L_g \quad (12), \]

where

\[ R = am_g + bpm_p V \quad (12a). \]

From (11) we also have that

\[ L_g + L_p = (1 + V e^{-r t}) L_g \quad (13), \]

and assuming that total labour force \((L_g + L_p)\) is proportionate to population, we can substitute (12) and (13) into (10) in order to obtain an index of per capita output. Thus

\[
\frac{I}{L_g + L_p} = \frac{RL_g}{(1 + V e^{-r t}) L_g} = \frac{R}{1 + V e^{-r t}} \quad (14)
\]

where \([I/(L_g + L_p)]\) rises at a declining rate as time \(t\) increases and for a very large \(t\) it asymptotically reaches \(R\).

This being the basic model that Baumol used, we shall now deal with some questions it gave rise to. The sources of the productivity discrepancies between the two sectors, according to the reasoning of the above model, are the inherent labour-intensity in the unprogressive (read public) sector, and the adoption of
new technologies. The issue of whether the public sector is more or less labour intensive than the private sector has been resolved by Baumol and Oates apparently by intuition or by the use of very specific examples, which fail to respond to the aggregation of the model.

Peacock (1979, Ch.3) questioned the labour intensity of the public sector by bringing as an example the health service, while Orzechowski (1974) produced data which also questioned the assumption of labour intensity in the public sector. Later we shall produce evidence that in Greece, as well, public sector labour intensity is not the case. The logical conclusion then is that if the public sector is not labour intensive relative to the private sector and productivity differentials persist, we must consider two other major factors. First, technological differentials, whereas capital in the two sectors is used differently. In the private sector there may be higher levels of investment in process and product technological innovation than in the public sector, where, as Peacock (op. cit.) pointed out, there may exist significant barriers to the introduction of new technologies with less pressure to remove the old ones. The second factor is the institutional differences between the two sectors. In the public sector we have an extensive bureaucratic mechanism. Its analysis follows later in this chapter, but suffice to mention that bureaucrats are likely to maximize objectives other than those considered within the private sector, a fact that may have a significant impact on productivity rates and the cost function.
Actually, the cost function may change depending on the viewpoint of the interested party and also contain items other than wage costs, or output costs in general. This is not to say that the cost and productivity relationships as described by the model are too simple. We think that the reduction in the model is worth the convenience of studying it in simple terms and that it hardly affects the analysis. The point is simply that bureaucratic mechanisms (and their connection to the rate of technological growth) may well be a source of productivity differentials, where arguably the model still stands valid but for different underlying reasons.

Another point raised with respect to the model was that the input-output ratio used to measure productivity is not always applicable to the service sector (Bell, 1968), where according to the author it would be by far more correct to measure productivity as changes in a ratio consisting of labour input and consumption utility, because of the special relationship between production and consumption in the service sector. In most cases, of course, it is impossible to do this, but nevertheless, Bell concludes, one should be very careful in comparing the relative growth of goods-producing industries and the service sector.

Lynch and Redman (1968) made the point that Baumol overlooked the fact that it is not the size of the price elasticity alone that dictates which goods of the public sector will eventually disappear, but the net effect produced by the difference between the real income elasticity and the price elasticity. However, we think
unlikely, especially since an upward trend in \((G/P)\) has been observed as economies develop.

Also, he concluded, the fact that \(\left(\frac{C_G}{C_p}\right) = A(P/G)\) combined with (18) yields

\[
\frac{C_G}{C_p} = \frac{b}{a} e^{rt}
\]

(19)

for a perfect wage diffusion, shows that if relative unit costs do not follow the pattern described by (19), then the Baumol result is not tenable.

In conclusion, Baumol's model provided us with a new insight into the analysis of public expenditure growth. In the form presented here it certainly suffers from certain deficiencies such as absence of quality considerations and lack of treating bureaucratic characteristics, among others, and it may be too oversimplifying to be used for empirical purposes. But it certainly contributes to our understanding of the public sector by its demonstration of how relative prices, costs, inputs, and outputs can evolve through time.
Bureaucracy in the public sector is a multi-faceted issue, its wide range of topics supported by voluminous literature. In this section I will restrict myself as much as possible to examining those issues only which bear direct relevance to public expenditure growth, although a following brief discussion on definitional mainly aspects will serve as an introduction to the subject.

Each author chooses to emphasize different characteristics of bureaucracy and the table below, taken from Hall (1961) gives a cross-section of the views of leading theoreticians in the field.

Table I-2.

<table>
<thead>
<tr>
<th>Characteristics of bureaucracy as listed by major authors</th>
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<tbody>
<tr>
<td>Dimensions of bureaucracy</td>
</tr>
<tr>
<td>Hierarchy of authority</td>
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<tr>
<td>Division of labour</td>
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<tr>
<td>Technically competent participants</td>
</tr>
<tr>
<td>Procedural devices for work situations</td>
</tr>
<tr>
<td>Rules governing behaviour of members</td>
</tr>
<tr>
<td>Limited authority of office</td>
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<tr>
<td>Differential rewards by office</td>
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<tr>
<td>Impersonality of personal contact</td>
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<tr>
<td>Administration separate from ownership</td>
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<tr>
<td>Emphasis on written communication</td>
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<tr>
<td>National discipline</td>
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<tr>
<td>Weber</td>
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The definitions shown above illustrate a substantial
agreement between writers and share a common characteristic; they all follow the structural approach to bureaucracy. We shall discuss bureaucracy from the economist's perspective, which is based on an approach structural in essence. This means that bureaucracy will be defined within a framework where structural organizational characteristics will comprise our very basic set of assumptions.

The structural approach is the one commonly followed by economists, even in models which are described as 'behavioural', some of which are considered below. This is in contrast to two other major approaches, namely the behavioural approach and the Blau approach.

The behavioural approach, as the name suggests, defines bureaucracy in terms of behavioural patterns, i.e. what makes an organization bureaucratic are conducts such as 'discretion', 'consistency', 'red-tape', 'thirst for power', 'buck-passing' etc, to name but a few. Such behavioural patterns, however, are too diversified in time and space in order to provide any consistent basis for analysis. On the other hand, Blau's approach lets both structural and behavioural characteristics vary and be recognizable only ex post, since, according to it, one must examine first whether the organization in question achieves its purpose(s), in order to be called bureaucratic (Blau, 1956). As it will become apparent later on, such an approach operates at a level of analysis different to the one intended here.

The structural approach does not de-emphasize the
behavioural patterns of an organization. It rather facilitates the identification and classification of such patterns and this makes it flexible and operational on the one hand, but coherent enough, on the other, to serve as a basis of analysis. The definition of bureaucracy which we shall be using here is a very general one and consists of the following features:

   a) Hierarchy of authority. This refers to a graded system of supervision. Thus, the structural continuity is preserved but cohesion and inter/intra-unit relations of the subsystems are allowed for.

   b) Division of labour. This does not necessarily lead to strict specialization and competence. This principle rather shows the subsystematized structure of bureaucracy, bringing into focus the role of the bureaux.

   c) Administration separate from ownership. It may seem as a pleonasm in the case of public administration. However, I think that it must become explicitly clear that the bureaucrat in no case is the discrete owner of any means of production (other than own labour) within the public sector from which he may have a profit accruing to him personally. Extending this and following Niskanen (1971) we can assume that the financing of the bureaux comes, at least partly, in the form of a periodic appropriation or grant.

   The above are three minimal structural presuppositions for a public bureaucratic organization to which other structural and/or behavioural characteristics can be added according to the author's views.
1) The Niskanen Model

Niskanen's model of bureaucracy focuses on the efficiency of resource allocation and compares the bureaucratic organization to other forms of market organizations. Following the early works of Downs (1967), Tullock (1965), and Williamson (1964), Niskanen assumes that the bureaucrat seeks to maximize personal utility, which is a function of arguments such as salary, reputation, power, perquisites of the office, patronage and ease of managing and bringing changes to the office. All of these are finally reduced to one variable: the size of the bureau's budget. All the arguments above are deemed to be related positively to the budget except for the last two, which are related negatively to the size of the bureau and hence to the size of the budget.

The bureaucrat therefore will seek to maximize the size of the budget of the bureau. Pursuing this aim the bureaucrat is subject to a number of constraints. Being financed exclusively (or almost exclusively) by the central political authorities, a bilateral monopoly situation emerges. The bureau is the sole supplier of 'output' to be 'bought' by its superior political authority which is a monopsonist. In this relationship of bilateral monopoly the bureaucrats have a vital advantage, which unavoidably affects the relative power and bargaining position of the two parts. The bureaux not only do they supply output on an exclusive basis, but they supply information to the political decision
makers and this position makes the bureaucrat likely to have a much better concept and understanding of both the cost and demand functions which, however, they do not necessarily convey to their sponsoring agency. The latter is subsequently pushed into a position where its informational disadvantage will merely permit actions of rather limited and abstract scope, such as the monitoring of fulfillment of minimal expectations, or whether the output is 'enough' or 'good enough' with respect to the politicians' own utility function. The bureaucrats enjoy monopolistic and discretionary power and on these grounds Niskanen introduced the model described below which investigates the issues set out in the beginning of this section. The model, assuming competitive input markets, stands as follows:

\[ B = aQ - bQ^2, \quad 0 < Q < \frac{a}{2b} \quad (1) \]
\[ V = a - 2bQ, \quad 0 < Q < \frac{a}{2b} \quad (2) \]
\[ TC = cQ + dQ^2, \quad 0 < Q \quad (3) \]
\[ MC = c + 2dQ, \quad 0 < Q \quad (4) \]
\[ B > TC \quad (5) \]

(1) is the budget-output function, where \( B \) is the maximum size of budget that the sponsor is willing to grant for an expected level of output \( Q \). To produce this level of output a minimum total payment to factors equal to \( TC \) is necessary. This relationship is described by (3), the cost-output function. (2) is the first derivative of (1), i.e. \( V = dB/dQ \), and is described as the marginal valuation function. \( V \) stands for the
maximum price per unit of output that the sponsor is willing to pay, and since there is no explicit price at which the bureaux sell output, this function has a theoretical rather than operational relevance and corresponds to the standard concept of the demand function. Finally, (5) represents the constraint that the budget must be at least as high as the total minimum costs.

From (1) we can find the value of Q at which B is maximum by setting

\[
dB/dQ = V = 0 ,
\]
or

\[
a - 2bQ = 0 ,
\]

which yields

\[
Q = a/2b \quad (6).
\]

(6) is the upper bound for the value of Q, while to find the lower bound we must set

\[
B = TC ,
\]
or

\[
aQ - bQ^2 = cQ + dQ^2 ,
\]

which is equivalent to

\[
(a - bQ)Q = (c + d)Q
\]
or

\[
a - c = (b + d)Q ,
\]

which finally yields

\[
Q = \frac{a-c}{b+d} \quad (7).
\]

Thus the equilibrium level exists where
and the relationship $a = \frac{2bc}{b-d}$ (8) is the threshold through which we move from the budget-constrained domain to the demand-constrained domain. This becomes clearer in the diagram which follows in Figure I-3.

**Figure I-3**
A Diagrammatic Representation of Niskanen’s Economic Model of Bureaucracy

In Figure I-3, $V_1$ represents the demand that a bureau faces for its output, which is produced under the cost conditions described by $MC$, the marginal cost function. The bureau will produce $Q = \frac{(a_1-c)}{b+d}$,
where B=TC, i.e. the areas below the demand and marginal cost curves are equal, or \((a_{1}ce)=(re)\). At this level of production no ‘fat’ in the budget is obvious. The bureau cannot maximize its budget by moving from 1 to \(k\), where \(Q=(a_{1}/2b)\), because at \(k\) TC>B since \((keg)>(a_{1}ce)\). Also at 1 the bureau produces exactly twice as much as a competitive firm would \((0l=2x0n)\). A competitive firm would reach equilibrium where \(V_{1}=MC\), or \(a-2bQ=c+2dQ\), which yields \(Q=(a_{1}-c)/(2(b+d))\), and therefore there is allocative inefficiency by the bureau, indicated by the distance nl.

Now if demand expanded from \(V_{1}\) to \(V_{2}\) the new equilibrium quantity for the bureau would be at \(j\) where \(Q=(a_{2}/2b)\). The bureau maximizes its budget (area \(0a_{2}j\)), which now contains ‘fat’, since as it can be seen \((ca_{2}i)-(hij) > 0\).

Therefore, Niskanen suggested, at low demand conditions the bureau will produce within the budget-constrained domain and at high demand conditions it will produce within the demand-constrained domain. However, Niskanen does not clearly define the two domains. When do we have high or low demand conditions? \((8)\) by itself is not very descriptive. To redefine the bounds of the two domains we employed line \(M\), which is simply the locus of all mid-points on the demand curves parallel to \(V_{1}\). \(M\) is a theoretical device only and it resembles an income-expansion line and is described by \(M=2bQ\).  

\[\text{Footnote continued}\]
We can now say that the bureau operates in the budget-constrain domain, when MC lies above M and in the demand-constrain domain, when MC lies below M, the threshold being point \( m_0 \), where \( a = \frac{2bc}{b-d} \), as Niskanen put it. Alternatively, we can say that low demand conditions are implicitly defined by Niskanen as the demand equilibrium levels where price (meaning \( V \)) elasticity is greater than unity, and high demand conditions where we have a price elasticity which is less than unity, the threshold (i.e. where \( Q \) for \( B_{\text{max}} \) and for \( B=\text{TC} \) coincide) being the equilibria points which possess unitary elasticity. Since \( M = 2bQ \), we can define this threshold as the point where \( M = MC \), or \( 2bQ = c + 2dQ \), which yields \( Q = c/(b-d) \) (which corresponds to point \( m_0 \)), and which also corresponds to a level of production by the bureau of \( Q = c/(b-d) \), which is exactly the same to what one would find should he substitute (8) either in (6) or in (7), except that we now know that it also

\[ V_1 = a_1 - 2bQ \]
\[ V_2 = a_2 - 2bQ \]

then the co-ordinates for the points on the axes are:

for \( V_1 : \{(a_1, 0), (0, a_1/2b)\} \), and

for \( V_2 : \{(a_2, 0), (0, a_2/2b)\} \).

Then the co-ordinates for the mid-points are:

for \( m_1 : \{(a_1/2, a_1/4b)\} \), and

for \( m_2 : \{(a_2/2, a_2/4b)\} \).

The slope of line M is then given by

\[
\frac{(a_2/2) - (a_1/2)}{(a_2/4b) - (a_1/4b)} = \frac{4b(a_2-a_1)}{2(a_2-a_1)} = 2b
\]
corresponds to the point of intersection of $V$ and $MC$ which has unitary elasticity. The obvious conclusion to this is that, according to the Niskanen model, if the bureau produces facing inelastic demand, then the budget it receives is bound to include 'fat'. However, this link between demand ($V$) and supply ($MC$) provided by the relevant elasticity is not explored by Niskanen, his model gives the impression of a deterministic process, since he did not investigate the mechanism of transition from one domain to the next.

The picture that one gets from Niskanen's model is that the bureaucrats provide any level of output they wish, provided that their budget covers, at least, the costs. This comes as a result of the much superior bargaining position of the bureau relative to the position of the sponsoring agency, which in turn is a situation emerging from the informational advantage enjoyed by the bureaucrats. However, this factor is more likely to determine the limits of output and price (and therefore the budget) rather than their final values, which will be the outcome from the bargaining process between the two parties. At this point, Niskanen tends to play down the power of the decision making rights of the political agency and its monopsonistic power to fix the size of the budget. The importance of the balance of power is further accentuated by the demand side politics, where politicians in order to get reelected will try to satisfy the electorate's wishes for more optimal allocation and therefore reduce the monopolistic power of the bureaucrats. Finally, the basic behavioural
assumption of the model that bureaucrats are budget maximizers can be questioned. This is so because of the nature and variability of the bureaucrat’s utility function. Earlier, when the bureaucrat’s utility function was described, we mentioned that not all of the variables are positive monotonic functions of the budget, and therefore to opt for Niskanen’s model of oversupply would be the same as to prejudge the trade-offs among the arguments in the bureaucrat’s utility function, which can plausibly vary from bureau to bureau, country to country and time period to time period. Some of the alleged deficiencies of Niskanen’s model are also discussed below within an alternative bureaucratic model developed by Migue and Belanger (1974).

2) The Migue - Belanger Model

Migue and Belanger (M-B) contended that although Niskanen’s model (among other models of authors they do not mention) is based on the wide discretionary power of the bureaucrat, in the end very narrow margins of discretion are allowed for. M-B suggested a model, where discretionary power is represented by discretionary profit. The bureaucrat is then described not as an output maximizer but a profit maximizer, who is constrained by a utility function, which involves expenses for the production of output and ‘other’ expenses as substitutes. The reasoning behind the latter is that the bureaucrat will choose to divide profit between expenses for output and other expenses. The bureaucrat’s budget is then given by the maximum
discretionary profit; that is profit is given by

$$\Pi = B - TC ,$$

or

$$\Pi = (a-c)Q - (b+d)Q^2 \quad (9) ,$$

which is maximized at $$\frac{d\Pi}{dQ} = 0$$, or

$$Q = \frac{(a-c)}{2(b+d)} \quad (10) ,$$

which is in fact the equilibrium quantity for the perfectly competitive firm. On the other hand, the minimum profit that the bureaucrat can enjoy is nought, and from setting $$\Pi = 0$$ and dismissing the corner solution (of $$Q=0$$), (9) will yield

$$Q = \frac{(a-c)}{(b+d)} \quad (11) .$$

Therefore we can construct a profit function as seen in Figure I-4, where (OSV) is the budget curve for the bureau, and of which only the part (SV) is relevant since in (OS) we have positive slope and both output and profits are rising. Also (OSV) is always concave to the origin, since $$\frac{d^2 \Pi}{dQ^2} = -2(b+d) < 0$$, for $$b,d > 0$$.

The equilibrium condition is then that the bureaucrat will produce at the point where the slope of the budget-profit curve is equal to the marginal rate of substitution between output and 'other' desirable expenses. Such is point T in Figure x, where the bureau will produce a quantity not very much different from the
socially optimal one. M-B conclude that oversupply is not generally the problem with bureaucrats. The real problem is oversized budgets and the violation of the least-cost condition from the consumer's perspective.

To recapitulate, the main points of the M-B model are the following:

a) the bureaucrat receives a budget which consists of expenses for output and other expenses,

b) the bureaucrat will demonstrate preference for a certain combination of these expenses,

c) the bureaucrat's effective budget function is given by the falling part of the profit function,

d) the level of production is shown by the point where the bureaucrat's profit function has a slope equal to the marginal rate of substitution between the two kinds of expenses, and

e) the eventual outcome is a budget which includes 'fat' at a level of production which is generally much nearer to the social optimum than Niskanen predicted.
M-B's original article was followed up by a discussion between the authors and Niskanen, where Niskanen pointed out, among other things, that in the M-B model the bureaucrat exhibits a direct preference for output, although there is no evidence to explain why should a bureaucrat be interested in output as such. However it should have been made clear by now that M-B refer only to expenses for output, which is something quite different. Niskanen's subsequent argument that the M-B model implies that there might be bureaucratic resistance against larger budgets and levels of output is dismissed by M-B as "specious", since "it was shown in our paper that an increase in the demand for a bureau's services raises the bureaucrat's discretionary resources and thus his real income". But more importantly, M-B argue that it is budget maximization that could go against the bureaucrat's self-interests, since beyond the level of output where MC=V "the amount of rent that can be appropriated by bureaucrats is a negative function of output and hence of the budget".

Also Niskanen remarked that in the M-B model bureaucrats are mainly production inefficient and therefore easily detectable by cost analysts, while in his model they are allocative inefficient and not so easily detectable. However, as M-B replied, this only means that supply conditions are not the only determinant of the equilibrium and demand-side constraints can reduce the bureaucrat's margin of discretion, which in turn means a shift of the bureaucrat's trade-off line downwards. Such a reduction in the bureau-
crat's discretionary power also depends on the extent of inefficiency that the cost-analysts are able to detect and the costs incurred by the sponsoring agency with respect to the benefits from employing stricter control devices (Breton and Wintrobe, 1975 and 1982).

3) The Incrementalist Model

The incremental model of budgetary process was developed based on the major assumption that decision makers are individuals restricted by bounded rationality. The general view of incrementalism is that current budgetary process is a function of past budgetary processes. According to the incrementalists, decision makers frequently find themselves in situations where they must handle very complex phenomena with too much or too little data, often imprecise and ambiguous, in their disposal. Therefore, it is very likely that the time it would take for the information to be processed properly and completely is very long, maybe to the point that a new situation will have replaced the old one. The complexity of the situation combined with the limited capacity of individuals to deal with them finally lead the decision makers to bound their rationality, simplify and use non-complex rules and aids to calculation.

Therefore, budgets are prepared not from scratch (as in zero-base budgeting) but on the basis of

2 A good exposition of the incrementalist thesis can be found in, among others, Wildavsky (1975), and Davis, Dempster and Wildavsky (1966, 1974). A review on incrementalism is comprehensively given in Jackson (1982).
decisions taken in the past. Hence, every year there is a review of marginal changes in the budget, instead of a review in the base. The budgetary process is then a sequence of exchanges between the bureaux and the legislature. Each bureau submits its request for a certain level of budget; the central political authority and the various subcommittees receive the request and examine it as thoroughly as their information and time permits. Earlier budgetary decisions are taken for granted and only requests for new expenditures are decided upon. Faced with complexity and uncertainty, both parties concerned (the sponsor and the receiver) will try to satisfice rather than maximize by taking decisions on a small range of alternatives by means of simple rules. Such rules have been described by Davis, Dempster and Wildavsky (op. cit.) and are distinguished between those used by the bureaux and those used by the sponsors.

For the bureaux we have:

$$B_t^* = \beta_0 B_{t-1} + v_t$$  \hspace{1cm} (1),

where

$B_t^*$ is the budget requested by the bureau for the current period and $B_{t-1}$ is the actual budget received in the previous period. (1) shows that the bureau's request for a certain year is a fixed percentage $\beta_0$ of the previous year's appropriation plus (or minus) a random increment $v_t$ due to current circumstances (where $v_t$ is
normally distributed with zero mean and unknown finite variance).

On the other hand the bureau's request might take into account the difference between its request and granted appropriation of the previous year, thus smoothing out its stream of appropriations. In this case we have:

\[ B_t^* = \beta_1 B_{t-1} + \beta_2 (B_{t-1} - B_{t-1}) + v_t \]  \hspace{1cm} (2),

where the bureau submits a 'padded' estimate to make up for the loss in expected funds.

Finally, we have:

\[ B_t^* = \beta_3 B_{t-1} + v_t \]  \hspace{1cm} (3),

where the bureau's request is a straightforward function of its request of the previous year. This strategy may appeal to the bureau especially when it is convinced of the value of its spending programmes while the sponsor, on the other hand, tends to grant budgets much the same to the ones requested.

The three rules given above, although they are not the only possible ones, are thought to be quite representative of a bureau's behaviour within the incrementalist model.

In similar fashion we have rules for the sponsoring agency:

\[ B_t = \gamma_0 B_t + u_t \]  \hspace{1cm} (4),
where the budget granted $B_t$ by the political authorities is a fixed proportion $\gamma_0$ of the bureau's request for the same year plus a random increment or decrement $\mu_t$. On the other hand, the sponsor might observe that the bureau's request sometimes represents an extension of programmes above or below the desired level, or might suspect the bureau of 'padding' its requests. In such a case the sponsoring agency may award a budget which is not a fixed proportion of the request, such as

$$B_t = \gamma_t B_t + \epsilon_t$$  \hspace{1cm} (5),

where $\gamma_t$ stands for the mean of the usual percentages and $\epsilon_t$ is the random disturbance which represents budget deviations from the relatively fixed percentage.

If the sponsoring agency desires to normalize the situation then we have:

$$B_t = \gamma_1 B_t + \gamma_2 \epsilon_{t-1} + \mu_t$$  \hspace{1cm} (6),

where the appropriation for the bureau is a fixed mean percentage of its request for that year plus a stochastic disturbance representing a deviation from the usual relationship between bureau and sponsor in the previous year (i.e. the current budget is normalized by $\gamma_2 \epsilon_{t-1}$) plus a random variable $\mu_t$.

Finally, if we assume that the sponsoring agency knows the decision rule of the bureau and takes into
account its behaviour, then we have:

\[ B_t = \gamma_3 B_t + \gamma_4 \lambda_t + u_t \]  \hspace{1cm} (7),

where \( \lambda_t \) is a dummy variable, which in year \( t \) represents

\[ v_t \]  \hspace{1cm} if (1) holds,

\[ \beta_2 (B_{t-1} - B_{t-1}) + v_t \]  \hspace{1cm} if (2) holds,

\[ v_t \]  \hspace{1cm} if (3) holds.

Therefore, (7) indicates that the budget given to a bureau in a certain year is a fixed mean percentage of the bureau's request for the same year, plus a fixed mean percentage of the part of the bureau's request which was not part of its appropriation or request of the previous year, plus a random variable representing the part of appropriation attributable to special circumstances.

If we were to combine (1) and (4) we would obtain the simplest of behavioural rules in the incrementalist sense, i.e. by substituting (1) into (4) we would have:

\[ B_t = \gamma_0 B_{t-1} + \gamma_0 v_t + u_t \]  \hspace{1cm} (8a),

or

\[ B_t = \alpha B_{t-1} + \mu_t \]  \hspace{1cm} (8b),

where \( \alpha = \beta_0 \gamma_0 \) and \( \mu_t = \gamma_0 v_t + u_t \). (8b) shows that this year's appropriation is simply a function of last year's appropriation.
The incrementalists have been subject to criticism on a number of issues which could be categorized in four groups:

a) The importance of exogenous issues

An obvious limitation of the incremental linear equations shown above is that they fail to take into account important objective factors affecting expenditures (inflation, unemployment etc.). Davis, Dempster and Wildavsky (1974) extended their model by including exogenous variables. Then a reduced form of equations was used for statistical estimation, but their macro-model lacked the micro-foundations to provide an account if why the variables which appear in the equations are relevant. Despite the inclusion of exogenous factors, there are no specific demand and supply functions for outputs to relate these factors to expenditures.

b) Political and organizational forces.

The incrementalist model has also been criticized for being partial in the sense that it does not place equal interest on the dynamics of political bargaining by which priorities are set and activities that become continuing government policies are determined.

"It is this variation in the competitive success of alternative programmes, rather than the cognitive process of decision makers, which is central to the politics of public administration. It is this aspect of government that the 'problem solving' perspective is inherently unable to explain." (Natchez and Bupp, 1973, p.955).

The level of aggregation in incrementalist studies
is such that changes in the composition of the budget, i.e. changes in the activities of the bureaux, are not captured. Also, the concentration on expenditures rather than outputs suggests that the analysis remains wanting from that aspect as well. Finally, the incrementalist model fails to take into account the continuous competition of public policies for scarce resources. The point is that bureaux adapt to political pressures and compete for funds and therefore there is no simple or automatic behaviour, such as the incrementalists suggest, to describe the budgetary process adequately.

c) Lack of theoretical basis.

As was pointed out earlier, the incrementalist model, even when other exogenous variables are used, does not provide a theoretical account of why the variables used are relevant. In general, wide critique was developed against the lack of theoretical foundation to the model:

"There is no convincing narrative contained in the literature (...) that can explain either why incrementalism occurs at all or why some other systems are less incremental than others."

(Greenwood, Hinings and Ranson, 1977, p.26)

Regretably the inductive rather than deductive approach of incrementalism to the budgetary process does not involve the level of analysis and understanding of the economic models within the equilibrium paradigm. No matter how well an incrementalist model may predict, its explanatory value with regard to the understanding of interrelationships involving politics, public administr-
ation and economics is non-existent (Jackson, 1982). The use of rules of thumb has been examined within the similar framework of private organizations. Papandreou (1955, p.935) pointed out that

"...the advocates of the non-rational approach must be in a position (...) to predict which rule of thumb will be employed in what firms and at what time and place. The attempt to do so, I am convinced, will make it necessary for them to fall back upon a rational-action model".

The rational basis of rules of thumb was also pointed out by Williamson (1966). Williamson determined the value of a parameter such as $\alpha$ in (8b) in terms of demand and politics -unlike the incrementalists-, whereas the higher the income elasticity and the lower the price elasticity of demand, the higher will be the value of the mark-up for the respective programmer. As Jackson (1982, p.162) pointed out:

"there is nothing incompatible between an economic explanation in terms of demand factors and a political explanation in terms of the way in which preferences and the intensity of preferences are articulated through the system".

d) Non-incremental decisions.

Etzioni (1967) argued that there are fundamental, non-incrementalistic decisions, which are much more significant than the incrementalist ones, despite the fact that the former may be taken less often or may be 'prepared' by the latter in order that the final change is less abrupt. Thus, incrementalism might be disfun-
ctional because it deals with the short-run decision making. Etzioni remarked that

"while an accumulation of small steps could lead to a significant change, there is nothing in that approach to guide the accumulation; the steps may be circular—leading back to where they started—leading in many directions at once but leading nowhere" (p.387)

The analysis of the three models above (Niskanen’s, M&B’s and the incrementalist model) is by no means fully comprehensive or even demonstrative of the enormous volume of studies on bureaucracy. The present exposition allowed a brief glimpse of a certain aspect of bureaucracy, namely its connection with government expenditure growth. We hope that it has by now become apparent that, at least theoretically, bureaucracy does have an impact on government expenditure growth, be it for its incrementalistic rigidity, its allocative inefficiency or its X-inefficiency. It seems also clear that both theoretically and empirically, it is more appropriate to examine bureaucracy in combination with other demand and supply factors, and this is the line we shall try to follow in the next chapters. Also later on some more theoretical arguments about bureaucracy will be picked up according to our empirical findings.
F) The Politico-economic Models

While traditional Keynesian macroeconomics ignore the role of the government as a supplier of goods and concentrate on the instrumental character of expenditures with respect to stabilization policy, the politico-economic models introduce an endogenous government behaviour.

These models are built around assumptions about the utility functions, time perspectives and information processes of voters and government, including characteristics of the economic and political sectors. The general idea behind the politico-economic models is the existence of an interactive relationship between the voters' perception of the government's performance (and consequently the chances of the latter to get re-elected) and the government's application of its programmes. Broadly speaking a government has two behavioural aspects: first, the ideological aspect, which is related to the socio-political views of the government and the actions it would like to take according to them; second, the vote-maximizing aspect, which is related to the effects that the government's actual policies have on its effort to maximize votes and secure re-election. In other words, a politico-economic model shows that voters evaluate the performance of government by substantially taking into account the economic conditions, which in turn the government tries to manipulate in order to stay
in power and implement its policies according to its ideology. This inter-relationship was illustrated by Frey (1978) by means of the diagram given below in Figure I-5.

**Figure I-5**
The relationship between the economy and the polity.

All the interacting parties in the politico-economic models are assumed to act rationally and we could in general describe their behaviour as follows:

A) Voters

Voters are assumed to be rational in the sense that if they are dissatisfied with the government they will support an opposition party. Their support (or lack of it) to the government can then be measured with a popularity index (from regularly collected polls and elections). Kramer (1971) also remarked that due to public goods effects, the voters are likely to bound their rationality and become satisficers. As to the arguments that are included in the voters' utility function, these can differ strongly both theoretically
and empirically. There are authors who even deny the political effects of any macroeconomic variables (e.g. Stigler, 1971). And there are authors who choose from a wide range of variables such as disposable income, unemployment, inflation, transfer payments (either in terms of absolute sizes or differences), in order to explain the way by which economic conditions exert significant effects on political events. The issue becomes more complicated by introducing the time dimension, vis a vis the speed of discount by the electorate of past government performance.

B) Government

Government on the whole is assumed to behave with rationality or bounded rationality, depending on the model, competing with other parties on the vote-market, seeking to maximize a vote-related variable, such as votes, plurality or vote-share, either in absolute or probability terms. Usually there is a utility function to be maximized which contains ideological goals, subject to political (re-election) constraints (general economic status, deficits etc). The time horizon of the government has been modelled so that it can consist of one (up to the next election) or more periods.

C) Characteristics of the Political sector

These characteristics vary considerably among authors. There are models that take into account the competition between independent parties or the forming coalitions (e.g. Breton, 1974), while at the extremes the Marxist approaches assume away any competition between parties, on the one hand, or even, on the other,
it has been assumed that the parties form a coalition against the electorate (Witman, 1973). Also, in describing the political sector, one has to cope with problems such as differentials between percentage of votes and the actual percentage of seats in parliament, or if elections are held at irregular intervals, the identification problem of whether the economic conditions led to elections or the economy was steered in view of the elections.

D) Characteristics of the Economic sector

Most models are partial in the sense that they focus their attention on issues such as the Phillips curve, although full macroeconomic treatment has been used in a limited number of studies.

Again Frey (1978) provides us with an interesting table which demonstrates the different assumptions with respect to the policy and evaluation functions used in six representative politico-economic models. In Table I-5a Frey has grouped the six models according to their assumptions with respect to the voters' utility function and the government's objective function, while in Table I-5b he has arranged the models so that the different assumptions about the government's prospective and voters' retrospective time-horizon emerge. Complete with other assumptions about the degree of information and the structure of the economy, these models have been the 'mainstream' of the politico-economic models and a brief description of them is given below.

At first we have the Nordhaus, MacRae and Lindbeck
Table I-3a
Assumptions about the voters' and government's utility functions

<table>
<thead>
<tr>
<th>Government's objectives</th>
<th>Vote maximization</th>
<th>Utility maximization</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Growth</td>
<td>Fair (1975)</td>
</tr>
<tr>
<td>Arguments in the voters' utility function</td>
<td>Inflation</td>
<td>Nordhaus (1975)</td>
</tr>
<tr>
<td></td>
<td>Inflation &amp; Unemployment</td>
<td>MacRae (1977)</td>
</tr>
<tr>
<td></td>
<td>Growth, Inflation &amp; Unemployment</td>
<td>Frey &amp; Lau (1968)</td>
</tr>
</tbody>
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Table I-3b
Assumptions about the voters' and government's time perspective

<table>
<thead>
<tr>
<th>Government's time horizon</th>
<th>Next election</th>
<th>Infinite</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voters' rate of discount of the past</td>
<td>Complete (approx. year)</td>
<td>Lindbeck</td>
</tr>
<tr>
<td>(within an election period)</td>
<td>Current election</td>
<td>Fair</td>
</tr>
<tr>
<td></td>
<td>Positive, finite</td>
<td>Nordhaus</td>
</tr>
<tr>
<td></td>
<td>No discounting</td>
<td>MacRae</td>
</tr>
</tbody>
</table>

models, which deal with vote-maximization in an inflation-unemployment trade-off regime. The government maximizes its vote, knowing the voters' preferences over the course of many electoral regimes and the democratic system approaches a steady state equilibrium on the long-run Phillips curve. The democratic equilibrium, according to Nordhaus is non-optimal if society does not discount the future completely, because there is higher
inflation and lower unemployment than the social welfare function dictates. However, a purely myopic policy is not a general characteristic of democracies (Frey and Ramser, 1976). The democratic outcome is not necessarily non-optimal if a different assumption is made about the government's utility function, e.g. that the government maximizes the length of time which it can expect to remain uninterruptedly in power.

The model, according to Nordhaus, may also be used to study the political business cycle, i.e. the short-run behaviour within an election period. The typical cycle resulting is a deflationary policy undertaken immediately after the election by increasing unemployment, the latter being continuously reduced subsequently at the expense of rising inflation, finally reaching the purely myopic point when it is election time again. To have such a cycle, it does not matter whether the voters are concerned with the current election period only (Nordhaus) or whether there is no discounting over the election period (MacRae). The generation of the political cycle by the government fitting the electoral cycle is an optimal outcome in both cases. Similar results are also obtained if instead of absolute levels one uses changes (Lindbeck).

Fair used a complete macroeconomic model for the U.S.A. making the following assumptions: the American government has a time-horizon extending up to the next election and the available instruments it has are purchases of goods in real terms and government securities in current terms; using these instruments the
government will try to maximize its vote by inducing, during the election year, the maximum growth rate to real per capita G.N.P., which is the only economic variable that the myopic voters take into account. Fair found that the political cycle should bring about a growth rate of approximately 20%, which is unbelievably high. The differential between the actual and the would-be growth rates was attributed by Fair to factors like restrictions on the Government by the Congress and the Federal Reserve, and non-vote maximizing criteria used by the government, especially when the latter thinks that voters judge its performance by additional or other criteria than G.N.P. growth. Finally, Frey (1978) pointed out that, even leaving aside the question of what economic variables influence the electorate's choice, and the ad hoc explanations which Fair provided, the model suffers from lack of an explicit description of the interdependence between decision makers.

The third set of models moves within a complete macroeconomic context, assuming that government is a utility maximizer, in the sense that it pursues ideological accomplishment goals concerning the desirable state of the economy. When voters evaluate the government's performance with geometrically declining weights towards the past, then the optimal policy for the government is to create a political business cycle by pursuing an ideological policy at the beginning of the election period and then progressively adjust its policies so that re-election is ensured (Frey and Lau, 1968). This process takes place under informative,
legal, bureaucratic and economic constraints. The government follows a satisficing policy which depends on the differential between current level of popularity and level of popularity necessary to get re-elected. The higher the government's popularity deficit is and the nearer election time is, the stronger the government's efforts will be to increase its popularity with the voters. If its popularity is high enough to secure election, then the government pursues ideological policies, which with respect to the budget they will aim, according to Frey, at a reduction in expenditures for a right-wing party and a respective rise for a left-wing party.

In conclusion the model is specified in terms of the two functions depicted in Figure I-5, where the evaluation function measures the popularity of the government, popularity being a positive function of income and a negative function of unemployment and inflation, all in terms of growth rates, as well as a function of other political and non-economic factors. On the other hand the policy function describes the use of economic policy instruments (especially public expenditures) according to the government's current popularity 'surplus' or 'deficit' and its ideological position, under bureaucratic and other constraints.

The shortcomings of models such as the above lie with simplification and omission of important aspects, as Frey (op. cit.) readily admits although he does elaborate. One weak point is the unclear specification of right and left wing parties and the roles they have
been ascribed. There is no reason why the ideology of a party should be clear cut, or to put it differently, the government may not reveal (or it may conceal) its ideological preferences either because it is politically convenient or because it simply does not itself have a clear picture of them.

This, of course, applies to all parties, especially when they are involved in coalitions, which is the case that Frey et al completely ignore (trade-offs in coalition governments). Also, unfortunately for these models, no political sector usually offers to the analyst the luxury of a black-white antithesis. Even in essentially bipartite systems it may be a vain effort to discover who is 'right' and who is 'left', let alone in multipartite systems. And Frey et al give no good reason as to why, given the constraints, left wing parties are bigger spenders than right wing parties, especially at the margin.

The picture becomes more complicated if we start asking questions such as, whether a centre-left party is inclined to spend more or less compared to a centre-right or 'pure' left party. The thought of capturing the government's ideological motivation is valid and useful but the assumptions and methods used in the model are not very helpful. Finally, to make it worse we must say that there is the case of variability in the ideology of the ruling party, name it evolution of political thought or sheer political inconsistency or opportunism (which itself can be the underlying real ideology!). Even if we assume that clear-cut ideological distinction between
parties is possible, the full effect of it is not described by this set of politico-economic models, since ideology affects only the instruments of policy, which restrictively are defined as 'expenditures'.

Targets and constraints such as unemployment, inflation, balance of payments not only should appear in the models explicitly, but they should be ascribed different (variable if possible) weights (as e.g. Nordhaus does), and their possible trade-offs should be taken into account (Alt, 1978, Pissarides, 1972). Moreover, targets and constraints should be viewed not as independent but as interdependent variables. Taxation or a certain group of expenditures, for instance, may act as instruments on the one hand and as constraints on the use of other instruments, on the other (Chrystal & Alt, 1979).

The models we have just described, rather in brief, comprise the core or at least the most well known efforts of the politico-economic modelling, which consists of a vast literature of numerous approaches to the issue of endogenizing government behaviour into the economy. Despite their deficiencies, one feels that the politico-economic approach and especially the political business cycle assumption may be a step in the right direction. In the next chapter we shall return to these models to examine in a little more detail their mathematical structure and their results.

1 In such an extreme (?) case the re-election effort pushes aside the ideology effect and the outcome is the non-appearance of an electoral cycle, at least in the sense that Frey et al describe it.
Other relevant hypotheses

1) The "ratchet" effect

Bird (1970,1971) attempted to give an alternative explanation to the shifts reported by P&W by stressing the demand side of public expenditure. He borrowed the term 'ratchet effect' from Duesenberry and the consumption function literature and tried to describe the shift in (G/Y) in its terms. Bird employed the following diagram to expose his model:

Bird suggests that the (G/Y) ratio may move along line (OB), which effectively is an illustration of Wagner's Law. In Figure I-6a, a move from R to S depicts the upward shift of (G/Y) caused by the increased tax burden (indicated by the move from TT to T'T') due to the crisis. Bird goes on to argue that "since in the long run revenues must equal expenditures, it is really
this shift (TT to T'T′) which permits the move along (OB) from R to S. Figure I-6b describes the 'ratchet' hypothesis: (OB) is the same as in Figure I-6a, that is the longrun government expenditure function, and (GG) and (G′G′) are the short run functions and express the different speeds of response by G and Y to a disturbance. If Y falls, then G falls as well, but less faster; if on the other hand Y rises, then G rises, slower at first and faster later, than Y. This happens because of the delay of adjustment of the spending patterns. This difference in the speed of adjustment, Bird concludes, leads us to expect that $\eta_{G,Y}$ will vary considerably depending on how long ago the crisis took place, although he admits that, at least statistically, it is probably impossible to distinguish between the effect generated by movement along (OB) and the influence of revenue elasticity and budgetary process. In other words, Bird argues that the share of the public sector expenditures in national income is inflexible downwards, thus making it easier for it to rise in times of growth than fall in times of crisis and recession. As Diamond (1977) pointed out, the ratchet effect describes a cyclical movement of the (G/Y) ratio around a long-run trend. What is somewhat contradictory, is that, on one hand, Bird stresses the demand side of public spending, while on the other, he implicitly recognizes the importance of the supply side. Actually, his thesis is included in the chapter of his book which examines the supply of public services. Also, while he finds P&W's empirical support to their ideas negligible himself
fails to do exactly this for his own suggestion. Diamond performed a test for the 'ratchet effect' for the U.K., which he found nonexistent.

2) The historical cycle approach

R. W. Crowley (1971) brought into the attention of those studying the growth of government expenditure the observations of the French historian H. Pirenne. Pirenne argued that a dichotomy exists between states of laissez-faire and public control from back as the 11th century. He contended that the 11th, 12th, 15th, 16th and 19th century are characterized by laissez-faire economies while the 13th, 14th, 17th, 18th and 20th centuries by economies of very active governments. On these premises, Crowley suggests that this cyclical movement should be taken seriously into account when hypotheses about the increasing role of governments in the economy are examined. Furthermore, he tries to bridge Pirenne's categorization with the P&W hypotheses and quotes G. Stigler's (1961) comment:

"The dominant era of the free market place was in the Nineteenth Century. I believe (...) that the absence of major wars in this century the only peaceful century in history was related to this reign of liberty." (p.98).

Crowley then proceeds to point out that:

"Since tax revenues for most of recorded history
have been based on per capita levies essentially unrelated to production, there could be no automatic growth in revenue without changes in tax rates. If inflation is generally coincident with or follows war activities, the real values of tax revenues based on per capita levies must decrease. Thus government expenditures (constrained by revenues) will decrease relative to private production until war activities again permit tax rates to increase.

In an analogous manner he links war and productivity by suggesting that if wars are intended to increase the productivity of the private sector (since wars are means for the necessary peace and security for the development of private business) then "a decrease in war activity will signal a period when the relative price of privately produced goods is low. " Crowley recognized that such an approach has quite a few deficiencies. One such limitation is that the relative scope of government activities depends on, among other things, whether the private and public sectors are characterized by complementarity or their activities are substitutes. Also, he admits that the criteria for distinguishing periods are not explicit while the breakdown itself is very elementary (by centuries). I would like to add that such a categorization may be useful to a historian like Pirenne but it is hard to think of its use to an economist. Crowley simply remarked that the public sector instead of continuously growing through the centuries in fact presented a cyclical movement where governments shrink during periods of laisser-
faire. Yet, this remark is essentially descriptive because it is the range of activities of the public sector which will characterize an era as one of laissez-faire or of public control and not the other way round. Crowley conducts a very interesting experiment where he tries to prove that there is a relationship between wars and the alternating economic regimes as expressed by the different time periods. The results he gets from the relevant regressions do not at all justify his final comments. He concludes that "the evidence we have examined suggests that the relative share of government has alternately increased and decreased". Yet, his estimations do not at all involve government expenditures and national output (and how could they for a timespan of almost 10 centuries?). Only war and time are present with the former having a hypothetical relationship with government expenditure in the P&W spirit. Even the cycles he observes do not exactly fall in place as predicted, a fact that Prof. Crowley readily admits. His concluding remark that researchers should recognize the possibility of turning points, valid as it is, is not definitely supported by the presented evidence.

3) C. Clark's "ceiling" hypothesis

In the mid-1940's C. Clark suggested that there must surely be some limit to the share of the G.N.P.
that the government sector can take up and he rather arbitrarily placed it around 25% (C. Clark, 1945). Beyond such a limit, he argued, the whole economic system is liable to collapse. Inflationary pressures come into effect when the tax burden exceeds a certain percentage to the national income, which an analysis of data for various countries and various time periods led him to believe that it must lie approximately between 23-27%. This limit is explained, according to C. Clark, by the political argument of "transfer of allegiance" by interest groups. According to it, there are groups in society that favour a stable or declining price level and groups that favour rising prices (creditors vs. debtors, for instance). Such groups are at equilibrium when the price level is stable or moves gradually. The "transfer of allegiance" by politicians and other influential groups occurs from the deflationary to the inflationary side when excessive taxation is imposed which can be relieved in real terms by a general rise in prices. Since then his suggestions were confronted with a lot of scepticism, a good deal of criticism and perhaps a little of irony. ("Colin's Clark 25% is in my view just another statistic. (...) Colin Clark is known (...) for the ability he has to produce percentages of this kind that excite other people and stimulate discussion. I don't think it is too improper to say that I myself regard his contribution in these contexts as very important, but that is rather of the same value as is the existence of fleas to the human race. Fleas make you keep yourself clean" (J. Wiseman in "L' importance
et structure des dépenses et recettes publiques", 1960, p.326). It is a fact, of course, that the 25% limit has been exceeded by far long ago in a great number of countries and the mere production of such a percentage is rather unfortunate. However, I think that there is more in C. Clark's reasoning. R. Bird (1970) who appears to be more sympathetic to Clark's views draws our attention to the fact that if taxes take up as much as 50% or 75% or 90% then the structure of the economy will have changed and therefore there may indeed exist a threshold, an appealing idea which has not been shown enough care. Therefore two questions seem to be central to the theme: a) can such a threshold exist? and if the answer is yes, then b) how can we locate it and measure it? Let us assume that the two sizes under examination are G and Y, as defined before. Now, it is very likely that G and Y are connected through a feedback relationship, where either of them is a function of the other. If a feedback loop is the actual causal pattern between two variables, then this loop may have a positive or negative return effect\(^1\) and the values of the structural coefficients determine the form of feedback. If the return effect of the coefficients is positive then, we say that an amplifying feedback loop is in effect. If the loop is an amplifier, then it will take the initial change and build up to a larger final change. The variables will reach a higher level as every loop is completed. Moreover, if the return effect is greater

\(^1\) As return effect we mean the product of the coefficients by which each variable affects the other.
than or equal to 1 the loop is an unstable one (stable otherwise). An unstable amplifying loop produces ever increasing increments, while a stable amplifying loop produces continually decreasing growth (Figure I-7).

**Figure I-7**
*Example of a stable amplifying loop*

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Similarly, if the return effect is negative then we have a control structure, whereas if it is less than or equal to 1 the loop again is unstable. Let us assume that the relationship between government expenditure and income is one of amplifying feedback. If the loop is stable then the size of the increments will become very small in the very (?) long-run. Subsequently, the G/Y ratio will remain constant at a point which we could deem as Clark's "ceiling". On the other hand, if the loop is unstable it is going to be an explosively exponential one. Sooner or later the system will reach its limits of capacity, it will become insensitive to
input signals and is likely to collapse. This means that as the system becomes unstable through time new factors will appear, the old factors may disappear or take new values and even the mathematical relationships between the variables may change, for example from linear to nonlinear. Then the "ceiling" might be considered as the G/Y ratio at which finally the system collapsed. This unstable loop theory seems that it also fits the displacement effect, since it involves a "catastrophy". The above arguments are, of course, purely theoretical and made in a macroeconomic sense rather different from that of Colin Clark's but they show that there is some sense in talking about "limits of taxation", although it is not apparent how such limits can be pinpointed in practical terms either in times of stability or in times of disturbances. One complicating factor is that in reality a system for the determination of public expenditure can not and should not be defined in terms of income alone. Many other factors, either exogenous or endogenous to the system are equally important. Therefore such a system may have multiple loops which must all be defined in terms of their (in)stability potential since some loops can be individually unstable but counteracting each other the system thus reaching an equilibrium point or the system may be unstable although the loops involved are all stable. The sheer complexity of the system not only makes the estimation of any limits of the G/Y ratio wishful thinking but also poses many questions as to the operationality of any theoretical arguments, like the ones presented above as
to where such a limit might lie.

Pelchman and Mayer (1952) categorically rejected any simple rules of thumb and questioned both the data interpretation by Clark and the theoretical foundations of his assertions. Finally, it should be mentioned that recently a revived interest in the subject appeared mainly from the politico-economic modelling perspective. (see Frey, 1985 and K. Schmidt, 1985).

4) The Marxist View

Close to the Wagnerian assertions we find the Marxist analysis, which, although from a different perspective, reaches similar conclusions. A first view on the growth of the State is found in F. Engels’ historical analysis:

(The State) 'is a product of society at a certain level of development; it is the admission that this society has become entangled in an insoluble contradiction with itself, that it has split into irreconcilable antagonisms which it is powerless to dispel. But in order that these antagonisms, these classes with conflicting economic interests might not consume themselves and society in fruitless struggle, it became necessary to have a power, seemingly standing above society, that would alleviate the conflict and keep within the bounds of “order”; and this power, arisen out of society but placing itself above it, and alienating itself more and more from it, is the state.'
One of the most valid Marxist analyses for the state is J. O'Connor's (1973). The author, working along the traditional Marxist lines, pointed out that the state serves two contradictory purposes, vis a vis accumulation and legitimization. O'Connor saw the growth of the public sector through a fiscal crisis because of the structural gap between state expenditures and revenues. He divided the economy in three sectors: (i) the competitive/petite bourgeoisie sector, whose main features are low capital intensity, low profitability, easy entry, slow productivity growth, low wages, poor working conditions, and low degree of unionization.

(ii) the monopoly sector characterized by high capital intensity, barriers to entry, high profitability, high productivity growth, high wages and high degree of unionization.

(iii) the state sector, which produces by use of its own or contracted private capital, and is characterized by slow productivity growth, wages linked to those in the monopoly sector, high unionization, protection from competition, goals other than profit when it assumes production by itself, high capital intensity and profitability when it assumes production in combination with the monopoly sector. Also O'Connor classified state expenditure by the following scheme:

(i) Social capital. It is required for assisting and promoting capital accumulation in the other sectors of the economy and it consists of investment and consumption.
(ii) Social expenses. They are required to maintain social order and fulfill the legitimization function of the state and they consist of military and welfare expenditure. In the process of development, the monopoly sector being the moving force of the capitalist economy, grows and becomes increasingly complex, requiring higher ratios of social investment (especially on infrastructure works) and more human capital of higher quality (better education, training etc), while demand for social capital consumption increases as well, the reason being that services such as health, recreation, housing and social insurance are guarantees for higher productivity of the labour force. Investment and consumption of social capital serve the accumulative role of the state and grow in the process of industrialization. On the other hand, the state must foster social harmony promoting the legitimization of its activities. From this aspect, the welfare state will protect the capitalist accumulation by preventing social unrest, especially of the surplus labour, by increased welfare expenditures. Accepting that the capitalist mode of production uses an increasing capital to labour ratio in order to achieve the required productivity gains, then overproduction results in a) surplus capital for which boosts in demand are necessary in order to absorb it, and b) surplus labour, which must not be restless and troublesome. To increase the domestic demand and the control on the population increased expenditures on welfare must be provided. The result is to boost demand and dampen the effects of group poverty and
unionization. The fiscal crisis then comes as a product of the increasing lagging of state revenues behind the inevitable expenditure growth, whose financing relies heavily not on the monopoly capital which has the political power but mainly on the relatively highly payed employees in the monopoly sector. The fiscal crisis is compounded when the working classes see through the complexities and concealments of the taxation system and resist to it by using their industrial strength. As we can see from the above brief description of the Marxist approach, the starting point of the Wagnerian and Marxist analysis are quite different but much of the essence and conclusions are the same, since in O’Connor’s analysis we encounter elements such as social friction, protection of the markets, an implicit high income elasticity, and in general the process of development of the (capitalist) economy with a simultaneous (faster) growth of public sector expenditures. While many of O’Connor’s answers may be disputed or rejected on the grounds of limited scope of analysis and unsystematic and fragmented evidence, the value of his book lies with the questions it poses, and it must be said that these questions have not been fully explored by the supporters of the socialdemocratic Keynesian state (Heald, 1983). Very useful interpretations of government expenditure growth from the Marxist perspective have been also suggested by, among others, Deaton (1973), Foley (1978) and Gough (1975).
5) Openness Of The Economy

The international trade situation of the country also has been offered as an explanatory factor of the growth of government expenditure. Hinrichs (1965) suggested that for a less developed country, openness of the economy is the key determinant of government revenue share, the importance of per capita income rising as the country is being developed. The main reason for this connection is that in less developed countries tax revenues are based on the foreign trade sector. These countries, facing a limited capacity of raising tax revenues inside the country because of low income, depend mainly on import duties, taxes on exports, taxes on exporting companies and so on. Also a spillover effect appears with respect to the ability of collecting taxes from elsewhere in the economy. The greater the size of the foreign trade sector is, then the more likely it is that the degree of the monetization of the economy is higher and that, in such probably dual economies, more income is generated within the 'islands of development' (exporting companies, administrators, etc) and more income tax revenues are collected. The openness of the economy can be defined either as the percentage of the sum of exports plus imports to G.N.P. or, alternatively, as the ratio of imports alone to G.N.P. since imports tend to be more stable for short time periods and more accurately measured. To put it in other words (eg. see Lindbeck, 1976 and Dahl and Tufte, 1973) openness is an indication that a country is trade dependent and therefore this definition applies to
advanced capitalist countries, especially the smaller ones. Cameron (1978) offers a review on authors, where the main issue is how the openness of the economy can destabilize the economy of the country in various ways (inflation, unemployment, balance of payments deficits, levels of domestic production). Subsequently the government assumes its stabilizationary role and the state intervenes by increasing the scope of its activities, vis a vis subsidies, unemployment compensations, and provision of capital funds to reduce the vulnerability of the private sector. Thus, one would expect from any country whose economy is relatively open to the rest of the world to expand their public expenditures.

6) Fiscal Illusion

According to authors like Downs (1960), Wilensky (1975), and Buchanan and Wagner (1977), the levels of government revenues are affected by the methods they are raised. This is so because of the nonvisibility of costs and benefits of the public goods. Given the non divisibility of public goods and therefore their suboptimal provision, the government must conceal the seemingly high costs. Hence a fiscal (or tax) illusion is created to the taxpayer where the person incurs payments which are actually higher than he or she thinks. This concealment is carried out through the revenue raising mechanism. According to Buchanan and Wagner (1977) "complex and indirect payment structures create a fiscal illusion that will systematically produce higher levels of public outlay than those that would be observed under simple
payments structures" (p.129). The major form of fiscal illusion comes in the form of indirect taxes on goods and services as well as in the form of direct tax payments which are made before individuals receive income, e.g. social security contributions by the employers. Therefore, one would expect economies with higher ratios of direct to indirect tax revenues to have larger public sectors those with lower ratios (other things, of course, being equal).

7) The Median Voter and Interest Groups

The median voter political models of government were first developed by Downs (1957) and Black (1958). These models assume that the voters decide directly, say upon the size of the budget, and each voter votes for the best alternative, as it seems proper to him or her. The final outcome is the one voted by the median voter and is considered to be 'optimal', in the sense that this is what the population as a whole desires. The conditions for a median voter equilibrium are very restrictive and can be described as follows (see Larkey, Stolp and Winer,):

a) Each voter has a single point of maximum utility on the issue, the utility decreasing or remaining constant as one moves away from this point, i.e. all voters have single peaked preferences.

b) The decision made on a particular issue is independent of decisions made on other issues.
c) The alternatives to choose from are assumed to arise in a paired fashion. The voter makes up his or her mind through a sequence of decisions concerning two alternatives. The proposing of alternatives is assumed to be free of any costs.

d) Voters do not vote strategically. They do not engage gaming practices but vote in a straightforward manner for the alternative they think best.

e) The final decision is reached by majority rule. Bergstrom (1973) shows that the median voter's point will be suboptimal unless the average and marginal rates of substitution are equal. This might occur when the preferences of all voters are symmetrically distributed around the median, i.e. the mean and the median coincide. Bergstrom put it as follows:

"If demand for public goods is elastic then it follows that where everyone in the community pays the same tax rate and shares the same amount of public good the wealthier one is the higher will be one's marginal rate of substitution between public and private goods. Since in most communities wealth is not symmetrically distributed it seems unlikely that the marginal rate of substitution will be symmetrically distributed" (p.291).

Meltzer and Richard (1978), furthermore, suggested that it is the divergence between distribution of wealth and distribution of voters that causes the growth of the government sector. The expansion of the voting franchise has seen the decline of the median voter's income. Hence, the median voter favours higher levels of public
expenditure, since in that way wealth is redistributed in his favour. Accordingly, the more tax revenues the government raises, the more wealth it takes from the relatively rich, motivation to earn more decreases and the median income comes closer to the mean, thus favouring smaller government. In a different model Denzau, MacKay and Weaver (1979) show that if a reversion level exists, that is a status quo level of expenditure which is the default level in general if the new proposal fails, then if this level is lower than the level preferred by the median voter, the actual level to be decided will be higher than that that the median voter has suggested, the difference roughly being equal or proportionate to the difference between the reversion level and the level favoured by the median voter. The median voter models, in general, show that the public expenditure levels can be much higher than the majority wishes, and even in the case that median level of expenditure is adopted it may not be Pareto optimal. However, these models have the disadvantage that they depart very much from reality, both because of their restrictive assumptions and because of the limited information they use about the rest of the actors in the process of determining the level of public expenditure.

On the other hand several authors turned their interest to the behaviour of pressure groups and their effect on government decision making. The interest group model assumes a number of groups of people with special interests, such as unions, environmentalists, industrialists, bureaucrats etc, which lobby the government
competing for scarce resources. Olson (1965) pointed out that this theory is related to the 'free rider' problem (since we are dealing with groups pursuing a goal that will benefit all its members regardless of the effort they personally made) and also that smaller groups are more likely to go unopposed to their requests for expenditures, thus the government financing more programmes than actually desired. Salisbury (1978) also argued that the interest groups are more likely to have a larger impact on ongoing programmes rather than on creating new ones. Finally Aranson and Ordeshook (1977) showed that under a certain set of assumptions, the government will be providing private goods under the pressure of the interest groups even when costs exceed benefits.
H) The Reviewers

Nowadays, many empirical studies, theoretical works and books on Public Finance contain in some form or other an overview, usually critical, of theories and hypotheses about public sector growth. This is a necessity which was generated by the intense interest in this field during the past three decades and the subsequent plethora of views on the subject, as, we hope, it has become apparent to reader by now.

In our opinion four works stand out as the most important reviews, at least as far as the number of different views found in them is concerned. These reviewers, at random order, are the following:

a) Larkey, Stolp and Winer (L-S-W) (1983), who offer a comprehensive discussion on the subject, including approaches across the spectrum and a review of the reviewers,

b) Cameron (1978), who completes a rather synoptic discussion with a categorization of theories,

c) Bird (1970), who offers a wide variety of determinants of government expenditure, groups them and conducts an extremely thorough and useful discussion in reviewing them, and

d) Tarschys (1975), who concentrates on the potential determinants and classifies them into nine modes of explanation.

These works are of great significance and
assistance, since they offer a relatively condensed and comprehensive picture of the issue and 'tidy up' in a good and accessible order all the important, yet dispersed information. L-S-W are the least interested of the four in a classifying scheme as such, in the sense that their purpose is to use it as an aid in discussing the relevant theories. The same can be said about Bird, while the two remaining studies are more of a classificatory character.

L-S-W's classification consists of four groups of approaches; first, what they call 'empirical generalizations', the main contributors being, of course Wagner and Peacock and Wiseman; second, formal models of political and economic institutions, including the various voter/politicians/bureaucrats/interest groups behavioural models; third, organizational process models; fourth, other theoretical contributions, including among others the relative price effect, the Marxist views and the Keynesian economic policies impact.

D. Cameron elaborates on five types of explanation of government expenditure growth, namely the economic, the fiscal, the political, the institutional and the international explanations. The economic explanation refers to the relationship between economic growth and the expansion of state activities and includes all the relevant, mostly Wagnerian, literature. The fiscal explanation refers to the fiscal illusion effect, as described in the relevant section. The political explanation includes the theory of the political business
cycle, the effects of ideology and democratic competition, and the incremental budgetary process. The institutional explanation consists of the issues of bureaucracy and fiscal centralization, and finally the international explanation refers to the relationship between government expenditure growth and the openness of the economy. A drawback in Cameron's study is that he does not refer at all to the possible interdependence between the various determinants. Bird, on the other hand, while he gives a classificatory scheme of the same sort, draws our attention to the interrelationships between the different determinants, while Tarschys introduces a two-dimensional scheme in order to accommodate such links.

Bird distinguished between the following five groups of factors potentially affecting government expenditure:

i) "Environmental" factors
   1) Geography (including climate and location)
   2) History
   3) Constitutional framework (including legal institutions)

ii) "Technological" factors
   4) Population growth and age structure
   5) Population density and distribution (especially urbanization)
   6) Production and consumption technology

iii) Economic factors
   7) Growth of national income
   8) Distribution of income (including regional distribution)
   9) Level and rate of growth of per capita income
   10) Rate of price change
   11) Productivity changes

iv) Political factors
   12) Ideology
   13) Character of political institutions
   14) Tax tolerance
15) Occurrence of crises
16) Attitudes to centralization

v) Administrative factors
17) Nature of budgetary process
18) Nature of bureaucracy
19) Habit

As we can see Bird's grouping is quite exhaustive and expressed in rather general terms, and at any rate more general than that of Cameron's, focusing on the determinants instead their theoretical sources.

Tarschys' work, it can be said, is more detailed and successful in schematically giving the different sides and various determinants of government expenditure growth. Tarschys distinguished between three sides of the public sector, with three levels of explanation for each one. The three sides of the public sector are:

a) The demand side or 'consumer's perspective'

b) The supply side, or 'producer's perspective', i.e. politicians and bureaucrats, and

c) The financial perspective, which is the set of institutionalized processes (or the medium) through which consumers of collective goods can strike an equilibrium at a super-individual level.

This how Tarscys reasoned this classification, ending with a crucial remark:

"Whereas transactions in the private market are a function of two variables, i.e. demand and supply, transactions in the collective market are a function of three variables, i.e. demand, supply and finance. (...) A given volume of government activity presupposes a certain quantum of each variable. An increase of the public sector would then require an increase in both
supply (production), demand (consumption), and finance. (...) A new undertaking would be detectable as growth along three different dimensions. The crucial question is then what causal relationship exists between the three sides.” (1975, p.16).

This interrelationship is illustrated by means of an equilateral triangle, as shown in Figure I-8, where expansion of public expenditure can be seen as an expansion of the three sides of the triangle, although the causal relationship is not known a priori.

**Figure I-8**

The three sides of the public sector

Production (Supply)          Consumption (Demand)

Finance

The levels which Tarschys distinguished between were:

a) The socio-economic level, referring to changes in the economy, technology, society and demographic structure,

b) The ideological-cognitive level focuses on changes in knowledge, beliefs, tastes and preferences among influential groups or individuals, and

c) The political-institutional level, which includes all the processes through which factors of the
two other levels are translated and exert influence on the actual decision making and the formulation of public policy.

Then Tarschys goes on to identify twenty five major determinants of government expenditure growth at the intersection points of the three levels and three perspectives described above. A summarized description of these determinants follows below after a schematic demonstration of them is given in Table I-4

Table I-4

<table>
<thead>
<tr>
<th>The Determinants Of Public Expenditure Growth In Nine Modes Of Explanation</th>
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<td>The Consumer's perspective</td>
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<tr>
<td>Socioeconomic Level</td>
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<td>3) Technological Change</td>
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<td>16) Fiscal Decision Making</td>
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<td>17) Revenue Sharing</td>
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<td>18) Pressure along Electorall/Parliamentary Channels</td>
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<td>19) Rising Costs in Public Production</td>
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<td>21) Demands for Equality</td>
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<td>22) Organizational Expansion</td>
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<td>23) Pressure along Administrative Channels</td>
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<td>24) Pressure along Electorall/Parliamentary Channels</td>
</tr>
<tr>
<td>25) Insensitivity to Change</td>
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</table>

1) Geographical mobility. It refers to urbanization and the costs involved because of expenditures on various forms of infrastructure to accommodate for the enlarged city-population and also because of the increasing costs of public services to the shrinking rural population. This determinant can also take into account transnational migration.
2) Demographic change. It captures changes in the population age-pyramid and their effects on government expenditure.

3) Technological change. New techniques of production potentially affect enterprises, labour and consumers, who create higher levels of demand for public services and give rise to government intervention.

4) Market extension. It has to do with the openness of the economy, as described in previous section, as well as the increasing division of labour, which may require more production of collective goods and safety measures and regulations to protect the uninterrupted supply of goods necessary to the households.

5) Changes in the labour force. One main aspect of this variable is the increasing share of women in the labour force. Thus, services which used to be provided by households are now taken care of by communal or regional non-private institutions.

6) Income-elastic demands. As the standard of living rises, new consumer demands, especially for 'superior' goods, are generated, while on the other hand there is an expansion of the consumer groups.

7) Demonstration effect. The growing ease of access to information creates awareness of levels of public output and its distribution among the consumers, with respect to both regional and international differentials.

8) Proportional representation. It refers to the potential influence of minority groups, as described earlier.
9) Corporativism. It refers to the potential influence of organized interest groups, as described earlier.

10) Consensus politics. It refers to the consensus among the political actors against possible post-decision criticism, and its possible relevance to the expansion of the public sector.

11) Decision practices. It refers to the automatic and self-generating growth of expenditures, in the sense that decisions can create long-standing commitments.

12) Increase in economic exchange. It refers to the transfer of activities from the household to the market and public sector, in the process of industrialization. This transition from an 'invisible' to a 'visible' sector of the economy allows the government to extract more taxes and thus finance an expansion of its services.

13) Income-elastic attitudes to taxation. Tax payers present less resistance to more taxes the higher their income is.

14) The Legitimacy and Efficiency of the government. Tax payers will also be less resistant to a government which is democratic and representative of the people, enjoys high prestige and has a good efficiency record.

15) Doctrines of government. It refers to the role of ideology as a determinant of government expenditure growth, as described in earlier section.

16) Fiscal decision-making. The higher the number of the institutional bodies which decide on and collect taxes and the higher the degree of independence between
them, then it seems likely that the less synchronized the tax system and the higher the tax revenues will be, than the case would be if fiscal policies were made and carried out by a single body. On the other hand, the fiscal system itself may favour a tax revenue increase, if e.g. we have a highly progressive system and high inflation.

17) Revenue sharing. The overall volume of government activities may also rise if there are different decision centres for expenditure on the one hand and fiscal policies on the other.

18) Idle manpower. Unemployment causes transfer payments to rise and creates pressure on the government to generate more jobs in the economy and/or employ more people itself.

19) Rising costs in public production. (see section D).

20) Professional Norms. New doctrines and skills disseminated through the educational system may make the younger generation of public producers more enterprising and expensive than the old one.

21) Demands for equality. A demonstration effect within the public sector, where civil servants demand equal treatment, leading to an upward standardization of wages and benefits and thus shifting the wage bill upwards.

22) Organizational expansion. "Parkinson's Law" or how the bureaucracies seek for expansion.

23) Pressure along administrative channels. It refers to the information monopoly of bureaucracy.
24) Pressure along electoral-parliamentary channels. It refers to alliances of the civil servants with the consumers and their impact on the political and budgetary processes.

25) Insensitivity to change. It refers to the case when decisions are taken on an incrementalistic basis and policies seldom change and this only after a great amount of new experience/information has been gathered.
I) Some general remarks

From the studies described in the earlier sections, what has become clear is that the occurrence of public expenditure is a multidimensional and liquid event, its determinants and how they are manifested potentially changing in time and space. The literature we examined is impressively diversified and ranges from "empirically stark, highly abstract formal models though heavily empirical, largely atheoretical treatments to the ideologically assertive, logically loose verbal models of ideologues".(L-S-W, 1983, p.159).

If we attempted a comparative assessment of the various theoretical work, we would admit that works like Wagner's, P&W's or even Baumol's lack that theoretical or even empirical lustre that will take them to a place higher than the one they now, as they stand, command in the literature. However, we could not say that they necessarily lack intuition or that they do not have any credible and convincing explanatory power. On the contrary, these theories have become so popular exactly because of the, obvious now, importance of the factors they point out, in a rather clear cut manner, despite any sort of inadequacies they may possess.

On the other hand, the more recent theories dealing with the budgetary process and the interaction between citizens, bureaucrats and politicians tend to be more sophisticated and elaborate than their predecessors but admittedly even they fail to achieve a successfully spherical picture of the processes determining the
growth of public spending.

If we adopt Tarschys' scheme of a three-dimensional public sector, namely demand, supply and finance, we finally understand that eventually 'everything matters'. This one can see from the plethora and variety of determinants, which Tarschys and the other authors offer, their lists, however, not exhausting the issue. For example, there is nowhere an explicit reference to the role of the public debt, although it was one of the first explanations ever offered, or the role of tax evasion as a constraint to revenue and subsequently expenditure growth.

What we mean to say is that there is an enormous number of variables, which are all candidates to be incorporated in a general, so to speak, theory of public expenditure growth. But one wonders if such a thing as a general theory is attainable. We do not think so, the reason being the highly diverse nature of the issue. Some general rules and hypotheses applying to wide sets of cases can of course be developed. That is what Wagner set up to do in the first place. But now we know how difficult this is to be done. Variables cannot and should not be used indiscriminately if there is not some sort of theoretical ground and, moreover, if the causal patterns between them are not exactly identified, because this could generate wrong empirical observations and theoretical explanations.

The demand factors seem to be the first choice for one who wants to examine public sector growth. Population growth, need for protection, education and health
are quite obvious factors. The issue becomes more complicated if we add supply factors which not only are less readily indentifiable but usually more difficult to quantify. Add the financial side and then try to sort out not the individual only but combined effect of them on public spending and one has a perfect mess of a situation which requires excellent theoretical thinking and too careful empirical handling. Not every single approach we examined seems to offer an adequate solution to our problem, although all of them are more than plausible partial ones. Urbanization, industrialization, market failures, exogenous catastrophic events, relative costs and prices, fiscal constraints, bureaucratic production, political power etc are all useful determinants which have to be combined somehow. If one, on the other hand, wants to try partial approaches, this should not mean that ‘everything else’ should not lie somewhere in the researcher’s background of reasoning; that is a partial approach, such as the ones examined earlier, should not suppress the existence of certain determinants but rather bring into focus the one(s) in use.

We think that the theoretical problem facing the student of government expenditure growth is a very serious one and if a solution exists this should be sought after in combination with the equally important empirical problems in mind. The empirical experience and identification of problems with respect to government expenditure growth is, therefore, the theme of our next chapter.
Passing from theoretical analysis to actually conducting empirical work has always been a ground for arguments among researchers with respect to the assumptions and methodology used. The literature on the determinants of public sector growth has been no exception and we could classify the issues involved into two broad categories: a) definition and measurement of the sizes involved, vis a vis what should one treat as public sector in each particular case and how to quantify it, and b) empirical (statistical and econometric) methods used for analyzing data and testing hypotheses. Therefore, this chapter is going to deal with general issues of identifying and measuring the public sector first, and then give an account of the contributions of the empirical work carried out until recently.

A) General issues of definition and measurement

The public sector consists of a multidimensional set of concepts and activities with varying scope in time and space. Therefore, one must first ask the question 'what is public sector?' and put the issue
in such a perspective which is compatible to the purposes of the specific study, using measures which will reflect as precisely as possible the dimensions which are intended to be analyzed. However,

"...to date much of the analysis of the growth of government has been like the search of the proverbial drunkard, who looked for a lost house-key under the lamppost, because the light was better there. We have been looking for governmental growth in forms for which data are more readily available, in quantifiable form, ubiquitous units, and preferably in interval form." (Peters and Heisler, 1983).

This aphorism, true in essense, is nothing else but an admission of the complexity of the issue and the weakness of the analyst to capture all of its dimensions. The public sector carries out a multitude of activities within the polity, society and economy. The government is the legislator, regulating the relationships between the units of the society, it is the collective organization that will implement the laws, it governs the defence mechanism of the country, it is the major single allocator of resources, it effectively concentrates and executes all the stabilization policies for the economy, it is the provider of public goods, and is the main redistributor of income and wealth. Not all of these activities involve, at least in a direct way, some monetary or physical sizes to make them readily identifiable and quantifiable. Taking into account that these activities are stimuli or responses to activities generated within the country (any sector) or abroad
merely adds to one's problems. The point is that if one uses non-quantifiable sizes, one is going to have non-quantifiable results and hence follow abstract policies, which are not always desirable by the policy-makers. Therefore, the need emerges if not to depart from reality, at least to simplify or generalize to such a degree that hard evidence can be generated and concrete policies can be formulated. Thus, the whole issue is reduced to a problem of precision, a problem of balance between the costs of departing from reality and the benefits of having some tangible concept of it.

To return to the issues specific to the expansion of the public sector, its measurement and its sources, there are numerous suggestions as to what one should regard as the public sector. Deutch (1983) gives two general indicators; one he calls public sector, is a subset of GNP and involves anything and everything within the GNP not on the market; the second he calls the government sector, which is a subset of the public sector devoted to administrative, political and military purposes. Deutch considers different quantifiable aspects of the public sector, such as the central government revenue and expenditure, the general government (i.e. central government and local authorities of all levels) revenue and expenditure, the general government budget with the addition of public institutions, or the latter plus nationalized industries or even private firms to which the public sector is a monopsonist. These broad categories are generally accepted as representative of the public sector's
activities and are usually broken down further into categories such as defence, education, health, administration etc. The form of expenditures one will use largely depends, therefore, on the point of view from which government is seen.

The most serious problem facing the researcher is probably the actual evaluation of government activities. Government output is very difficult, if not impossible for the most part, to be expressed in monetary terms, since it is not sold on the market. Without explicit prices, and with little consideration about quality and productivity changes, eventually the value of government's inputs is taken as representative of the value of the government's output, thus the roles of the government as producer and consumer can mistakingly become practical synonyms. Bird (1970) gives several examples on the subject, whereas one measure of public spending, e.g. exhaustive expenditure may provide us information about the government as a consumer but it is misleading about its role as a producer.

So far we have dealt with the size of the public sector in absolute terms, which is void of any meaning until we compare it with some other aggregate size in the economy. The usual practice has been to compare public expenditure of some form with some national income aggregate. However, there is a number of alternative national income measures, such as GDP at factor cost or market prices, GNP at factor cost, or net national product at factor cost. Use of different measures of the national income will invariably lead to
small or large variations in the relative size of the public sector. Brown and Jackson (1980) argue that a 'gross' measure of income may be superior to a 'net' one, on the basis that errors in the measurement of capital consumption are likely to be lower in the estimation of gross product, thus the variation in the ratio of public expenditure to national income being less sensitive to the actual variation in time and space of the method used for calculating capital consumption.

The same authors also demonstrate the difference resulting from the use of factor cost and market prices by means of the following example. Let two countries, called A and B, have identical GDPs, equal to 200 units. Each country devotes 100 units to public expenditure, but the financing takes place through a different in each country tax-mix. Then the following situation arises:

If country A finances 10 units of public expenditure, G, through direct taxation and 90 through indirect taxation, while subsidies stand at 20 units, then

\[
\text{GDP (market prices)} = \text{GDP (factor cost)} + \text{ind. tax - subsidies} = 200 + 90 - 20 = 270
\]

and \[ \frac{G}{GDP} \text{ (factor cost)} = 50 \% \]

\[ \frac{G}{GDP} \text{ (market prices)} = 37 \% . \]

If country B, on the other hand, finances 90 units of its public expenditure by direct taxation, 10 by
indirect taxation and subsidies come up to 30 units, then

\[
\text{GDP (market prices)} = 200 + 10 - 30 = 180
\]
and
\[
\text{G/GDP (factor cost)} = 50 \%
\]
\[
\text{G/GDP (market prices)} = 56 \%
\]

From the above example it becomes clear that the use of GDP in market prices can be unreliable, since it also reflects variations in the structure of tax revenues. On the other hand, however, the use of GDP at factor cost may also lead to bias because it involves the strong assumption of complete forward shifting of indirect taxes and subsidies, which may not hold in practice. A final point should be made, to which we shall return later, about another possible bias resulting from the fact that the denominator in the public expenditure over income ratio includes the nominator.

Another very important issue concerning the measurement of government expenditure has been that of deflation. Morris Beck (1979a, 1979b, 1981, 1982, 1985) had been the most ardent supporter of separate deflation of public spending and national income. Not only that but also separate deflation of the various categories of public spending, especially of those which involve the direct use of resources and those which do not. In such a way one can adjust for relative price effects and have a better idea of the real relative size of the public sector. Separate deflation is now widely accepted as
common practice so as the impact of inflation and the diversified nature of the different kinds of public spending can be taken into account. What remains a problem, to a higher degree for cross-sectional studies rather than time-series ones, is the mathematical construction and consistency of such deflators.

B) The income elasticity of Public Expenditure

The income elasticity of public expenditure, a very useful tool in policy making, has received, probably, most of the attention of the researchers in the literature, and is, to a great extent, associated with testing Wagner's Law. Since econometric theory tells us that \( \frac{\partial \ln G}{\partial \ln Y} \) is the expression for the income elasticity of public expenditure, then it seems only natural to run a regression, such as \( \ln G = a + b \ln Y \), in order to derive \( b \), which is the relevant elasticity. Such a procedure, however, has to face insuperable, in many cases, theoretical and statistical obstacles. The main points of difficulty lie in the choice of the relevant variables for public expenditure and income (especially for those who deal with the validity of Wagner's Law), and the choice of the method for statistical estimation.

Different authors have proposed different tests, and Mann (1980) gave no less than six different basic versions of expressions extracting an income elasticity; these were the following:

\[
\ln G = a_0 + a_1 \ln GNP \quad (1) - P&W (1967)
\]
InG = b_0 + b_1 In(GNP/N) \hspace{1em} (2) - Goffman (1968)

InGC = c_0 + c_1 InGDP \hspace{1em} (3) - Pryor (1968)

ln(G/N) = d_0 + d_1 ln(GNP/N) \hspace{1em} (4) - Gupta (1967)

ln(G/GNP) = e_0 + e_1 ln(GNP/N) \hspace{1em} (5) - Musgrave (1969)

ln(G/GNP) = f_0 + f_1 ln(GNP) \hspace{1em} (6) - Mann's P&W 'modified' version.

(G is government expenditure, N is population).

The above are basic versions, as we mentioned earlier, and have been used for more extended models, e.g. with the inclusion of social, demographic, or price variables. Of the above six expressions, one should note that, according to Pryor (1968), (4) and (5) are monotonically related, the association being precisely $e_1 = d_1 - 1$. Also, it can be shown that (1) and (6) are as well associated through $f_1 = a_1 - 1$. Each of the above versions have been proposed as the real expression of Wagner's Law, and although, as we stressed in Chapter I, accepting or refuting the Law leaves us rather indifferent, the size of the elasticity is of great importance, and therefore it is worth demonstrating some further elaborations by major authors, towards deriving an elasticity as unbiased as possible.

Gandhi (1971) set two conditions, which he expected to be satisfied for the Law (as expressed by (1)) to hold.

1) $\eta_{G,Y} > 1$,
2) $\eta_{G,N} > 1$,

$\eta_{Y,N} > 1$, and

$\eta_{G,N} > \eta_{G,Y}$.

According to the above conditions, not only must we
have an income elasticity of public expenditure greater than unity, but both per capita G and per capita Y must rise, the former faster than the latter, which, also, brings into mind Bird's ratchet effect.

C) Testing for the Displacement and Inspection Effects

Gupta (1967) examined the P&W thesis, on the basis of a time-series analysis, by testing whether significant shifts had occurred in the absolute level and the income elasticity of public expenditure in the aftermath of a crisis. He considered a function of the form:

\[ \ln G = a + \ln Y \]

for each sub-period (before and after the disturbance), where, G is per capita total non-war related government expenditure, and Y is per capita GNP, both in constant prices.

For a measure of the shift in G with relation to Y, he calculated the level of G at the period immediately after the shift, with reference to the regression equation for the period prior to the upheaval. This he subtracted from the level of G calculated with reference to the regression for the period after the crisis. For the shift in the income elasticities, he performed the same test with respect to the slopes. More analytically, for the shift in the level of G he tested the significance of

\[ |t| = \frac{\text{Shift}}{S} \]

with \((N_1 - 2)\) degrees of freedom, where,

\[ S = \frac{\sum (y_i^1 - \bar{y}_i^1)^2}{N_1 - 2} \left[ 1 + \frac{1}{N_1} + \frac{(X_{N+1} - \bar{x}_i)^2}{\sum (x_i - \bar{x}_i)^2} \right] . \]
For the shift in slope, he tested the significance of

\[ |t| = \frac{b_1 - b_2}{\frac{1}{\Sigma(x_i - \bar{x}_i)^2} + \frac{1}{\Sigma(x_k - \bar{x}_k)^2}} \cdot \frac{N_1 + N_2 - 4}{\Sigma(y_i - y_i^1)^2 + \Sigma(y_k - y_k^1)^2} \]

In the above expressions, the symbols used have the following significance:

- \( N_1, N_2 \) = number of observations in the pre- and after crisis sub-samples, respectively.
- \( y_i, x_i \) = observed values of G and Y before the disturbance.
- \( x_{i+1} \) = observed value of Y immediately after the disturbance.
- \( \bar{x}_i = \Sigma x_i / N_i \)
- \( y_k, x_k \) = observed values of G and Y after the disturbance.
- \( y_i^1 \) = value of G from the regression before the disturbance.
- \( y_i^k \) = calculated value of G after the disturbance.
- \( \bar{x}^k = \Sigma x^k / N_2 \)
- \( b_1, b_2 \) = income elasticities of G.

By applying the above test, Gupta confirmed shifts in the level of public expenditure, associated with crises, for the U.K., U.S.A., Canada, but not Sweden, and shifts in the elasticities for all of them. Nagarajan (1983) pointed out that this test is essentially a less formal test for structural change at a single point of time, based on a testing forecasts technique, while, he remarked, Sweden did experience a
significant shift in the absolute level of $G$, which, however, was missed out by Gupta due to a miscalculation.

Pryor (1968) adopted a dummy variable technique, by using the following equations:

1. $\ln G = a_0 + a_1 T + a_2 A + a_3 B$ (1)
2. $\ln G = a_0 + a_1 T + a_2 A + a_3 B + a_4 \ln Y$ (2)
3. $\ln C = a_0 + a_1 T + a_2 A + a_3 B$ (3)
4. $\ln C = a_0 + a_1 T + a_2 A + a_3 B + a_4 \ln Y$ (4),

where $T = \text{time}$

$G = \text{total per capita public expenditure}$

$C = G - \text{war-related expenditure}$

$A = \text{dummy variable for WW-I}$

$B = \text{dummy variable for WW-II}$

$Y = \text{per capita national income}$.

Using data for the U.K., Pryor's results from (2) and (4) produced significant coefficients, while (1) and (3) produced conflicting results; (1) yielded significant coefficients, while (3) did not, and this lead Pryor to conclude, rather hastily, as Diamond (1976) remarked, that the displacement effect should be solely attributed to war-related expenses.

Bonin et al (1969) used a dummy variable technique, as well, in order to capture shifts both in the intercept and the slope. Moreover, they contended that, in order to be able to account for the "replacement" effect, government expenditure should be taken net of spending for replacement of non-military public goods sacrificed during war-time. Replacement expenses, they argued, cause shifts in public spending, which persist
after a war, because of the need to catch up with the backlog of foregone peacetime spending. The equations Bonin et al used were of the type

\[ G^*_t = a + bD + (c+dD)Y, \]
\[ G^R = a + bD + (c+dD)Y, \]

where \( G^*_t \) and \( G^R \) stand for total per capita public expenditure net of debt and war-related spending, including and excluding replacement expenses, respectively, \( Y \) for per capita private national income, while \( D \) is the relevant dummy variable. The results from these regressions were contradictory, especially with regard to Gupta's results, and this caused Bonin et al to speculate on the possibility of trade-offs between slope and intercept shifts.

Finally, Diamond (1976), who restated the P&W thesis as a theory of structural breaks, used a Chow test, in order to discover possible structural changes between the periods before and after the two World Wars, as well before and after the Great Depression. Although the Great Depression seemed to have no significant impact, when war-related expenses were excluded, Diamond reported a possible structural break caused by WW-II, whose importance, however, seemed also to diminish when defence and war-related expenses were excluded. More importantly, perhaps, Diamond also reported significant changes in the composition of public expenditure, as P&W had predicted.

In the case of Greece, such tests, desirable as they may be, present all sorts of difficulties. The most serious problem is that there is lack of data, or to be
more precise, the data before and after WW-II are incompatible. As will be shown in the next chapter, data for both national income and government expenditure exist for only after 1911. Even so, the national income figures between 1911 and 1939 are unofficial estimates, since there are no official statistics for that period, while the government expenditure figures are unavailable in constant prices (using a separate deflator from national income) and are not always clear what they include and what they do not. Also, it should be noted that Greece was at war from 1913 to 1922, experienced a dictatorship from 1936 to 1941, multiple occupation from 1941 to 1944, and a civil war thereafter until 1949. Therefore, it is not possible to formally test for a displacement effect either by using the structural break approach (since between 1941 and 1944 there are no data, while the Greek state as such did not exist — i.e. there is a great discontinuity), or by using dummy variable techniques (because of the unreliability and discontinuity of the data). However, we shall attempt to identify possible displacements for periods for which we are relatively in an advantageous position with respect to the available data, by using the Bonin et al dummy variable technique, since the length of our data does not permit the structural break approach. As will be seen later on, a possible displacement that may have happened was after 1974, when the Turkish invasion of Cyprus took place, but it must be noted that the same year is connected to changes in the internal affairs of the state; that same year the regime changed from
dictatorship to democracy, while the effects of the first oil crisis were still very much felt strongly in the economy.

D) The Politico-Economic Models

Similar restrictions hold for the empirical testing of politico-economic models. If, for example, we take the model suggested by Frey and Schneider (1979), we can notice the following. The flow diagram (Figure I-5) describing the model suggests that voters in the lower loop express their evaluation of the government policies through the popularity function, while the government and bureaucracy jointly determine the use of instruments that will affect the economy. Therefore, the model utilizes three equations which are the following:

\[
\text{INSTR}_{t+1} = a_0 + a_1 \text{INSTR}_t + a_2 \text{TAX}_t + a_3 (1-Q)(\text{POP}_t - \text{POP}_0)^2 + a_4 (1-Q)T + \text{ID}
\]

\[
\text{ID} = [b_R + b_L + (1-R)(1-L)]Q(\text{POP}_t - \text{POP}_0)^2
\]

\[
\text{POP}_t = c_0 + c_1 \text{UR} + c_2 \text{IR} + c_3 \text{Y}_t + c_R \cdot R + c_C \cdot C + c_L \cdot L
\]

INSTR is a government instrument such as consumption or transfers, TAX is tax revenues, POP is current popularity level of the government, POP0 is the popularity level required for re-election, Q takes the value 0 when the government faces a popularity deficit, and 1 otherwise, ID records the ideological bias of the party in power, where R=1 indicates a period when a 'right-wing' government is in power, L=1 when a 'left-wing' government is in power and C=1 when the government is formed by coalition. Finally, UR, IR, and
\( y_d \) are the unemployment and inflation rates and the growth rate of disposable income.

The 'political', so to speak, variables in the system present great problems when empirical estimation comes in. The popularity level of the government is usually measured by regular polls, which, in the case of Greece are simply non-existent. Also, the convenient distinction between right, left and coalition governments collapses in the case of Greece because of the seven year dictatorship, and the caretaker governments that preceded it. Finally, the model implies some regular electoral life. Even if we exclude the years of the dictatorship (for example by the use of a dummy variable), we are faced with a particularly irregular electoral time-pattern, as shown in the next chapter. On top of that, to assert that the elections were caused by some changes in the economic conditions, is also untrue since the major reasons for frequent elections were mainly political, and this can not be expressed in a model such as the one above.

E) Some General Remarks

Until now we have established the theoretical significance of determinants of government expenditure; we have also described some problems associated with the measurement of the public sector and the methods of investigating its growth. The range of determinants we have covered so far is considerable. What remains to see is whether they have affected the growth of government
expenditure in Greece and in what way. Not all of the approaches discussed in Chapter I will be possible to investigate empirically, at least in an exhaustive fashion. It is not that we consider some variables more important than others. The point is that some variables are more dominant than others, or more direct, or easier to quantify, or that data exist for some variables and for some they do not. Even if some variable is not treated as such in an explicit way during our empirical tests, this does not mean that this specific variable has not been considered, or even that it does not lie somewhere in the background of our analysis in some non-quantitative form.

In the empirical work to be presented in the last chapter we have searched for a consistency in our analysis. What is of crucial importance is that our empirical estimations must be trustworthy, otherwise no theoretical conclusions will be sound. Therefore, the quality of the empirical work is of paramount importance and for that reason not even the 'simplest' of cases, for example the extraction of an income elasticity, is taken for granted, as will become apparent later on.

Before we pass on to the econometric part of the thesis, we deal with the description of the public sector in Greece in Chapter III, where we put into perspective the sizes we are going to be dealing with, by giving a short exposition of their historical trends in absolute and relative terms and exactly defining them in the spirit of the preceding analysis.
A. The Greek Economy and Polity before 1950

In this chapter, we shall provide a description of the Greek public sector, placed within the context of the economy and polity. Although the 1950-1980 period is the one where our interest is focused, we think that a short reference to the earlier Greek state will contribute to our understanding of the post-WWII years.

Greece was established as a sovereign and independent state in 1832, after 400 years of Ottoman rule. It extended to one third of its present territory, and had a population of less than a million. The economy was based on agriculture, and the country was largely dependent on imports. The resources of the country were extremely weak in every respect, and the manpower was dispersed and mostly illiterate.

Internally the country was tormented by considerable political instability, and the 1832-1939 period was marked by a series of revolutions, coups d'etat, dictatorships, constitutional changes, and rapid successions of governments. On the foreign front, Greece had embarked on an almost constant war effort, lasting well over a century, in order to regain its territories. The culmination was the 1912-1923 period, during which, Greece participated in the Balkan Wars, the First World War, and realized a military campaign in Asia Minor. In the end, Greece had more then tripled its 1832 original
III-2
territory, but at a tremendous cost. The constant war
effort had hardly contributed to mending the country's
structural weaknesses of the economy.

In 1923 Greece emerged as a defeated victor, with a
colossal war expenditure, valued at forty five billion
real drachmas, as compared to that year's national
income of 38 billion; or, as Prof. Sbarounis (I.I.F.B.,
1960) put it, the Treasury had a war expenditure of 3.2
billion U.S.$ of 1956, against which it received
reparations of only 100 million. Until then the country
had already been under the pressure of an excessive
external debt; for example, in 1878, 40% of the budget
had been directed to debt servicing, the rest going
mostly to war-related activities, leaving no resources
for the development of the country, while in 1893 Greece
had effectively declared bankruptcy.

Taking a look at the public finance of those times
reveals that, for example, in 1920, 51.67% of the state
revenues was loans; direct and indirect tax revenues
contributed 7.6% and 13.4%, respectively, to the overall
account. In 1930, loans comprised 44.4% of the revenues,
and direct and indirect taxation 8.96% and 22.2%
respectively. From the expenditure side, 1920 was a year
of war and 59% of the budget was going to war-related
ministries, and only 15.5% was allocated to the Ministry
of Finance; on the other hand, in 1930, a 'peaceful'
year, the situation was reversed, and 67% of the budget
was taken up by the Ministry of Finance, and only 11% by
the war-related ministries.

Between 1890 and 1924, a sixth (!) of the
III-3

population (mainly rural) had emigrated abroad (mainly to the U.S.A.). In the following years, on the other hand, and as a result of the defeat in Asia Minor, Greece received one and a half million refugees, accounting for one quarter of its population (!). The refugees gathered around the urban centres of Athens, Piraeus, and Salonica, and the need for public works, and some sort of intervention in the economy became more pressing than ever. The limited scope of such activities taken up by the government was once again financed from abroad through loans and aid.

In 1929, Greece felt very heavily the consequences of the Crash, and even in the relatively peaceful early 1930's, Greece still relied heavily on loans from abroad for the development of its infrastructure. World War II found Greece under a dictatorial regime, and a debt equal to 80% of her income.

Throughout all these years, the Greek public sector was of considerable size, as can be seen from Table III-1. This is attributed, of course, to the country's constant involvement in wars, and the permanent territorial threat under which the country was. Although the statistics of the time are very vague, and at any rate not comparable to modern data, we gather that the pre-WW-II public sector in Greece was characterized by extensive centralization (the finances of local authorities comprising less than 1% of the budget), small levels of civilian spending, an inefficient tax-system based on indirect taxation (since real incomes were so low, eventually indirect tax revenues
came to amount to six times as much as those from direct
taxes), and a growing regulatory role in the economy.

### Table III-1

<table>
<thead>
<tr>
<th>Year</th>
<th>(1) G/Y</th>
<th>(2) Y per cap.</th>
<th>(3) Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1911</td>
<td>19.42</td>
<td>7515</td>
<td>2701 1</td>
</tr>
<tr>
<td>1912</td>
<td>19.85</td>
<td>8380</td>
<td>2719</td>
</tr>
<tr>
<td>1913</td>
<td>22.52</td>
<td>5245</td>
<td>4820 2</td>
</tr>
<tr>
<td>1914</td>
<td>38.33</td>
<td>5717</td>
<td>4818</td>
</tr>
<tr>
<td>1915</td>
<td>24.16</td>
<td>6028</td>
<td>4817</td>
</tr>
<tr>
<td>1916</td>
<td>10.30</td>
<td>6570</td>
<td>4816</td>
</tr>
<tr>
<td>1917</td>
<td>9.14</td>
<td>5907</td>
<td>4815</td>
</tr>
<tr>
<td>1918</td>
<td>30.69</td>
<td>5723</td>
<td>4815</td>
</tr>
<tr>
<td>1919</td>
<td>26.79</td>
<td>7088</td>
<td>4815</td>
</tr>
<tr>
<td>1920</td>
<td>28.04</td>
<td>6738</td>
<td>5531 3</td>
</tr>
<tr>
<td>1921</td>
<td>39.08</td>
<td>6356</td>
<td>5604</td>
</tr>
<tr>
<td>1922</td>
<td>27.06</td>
<td>8459</td>
<td>5913 4</td>
</tr>
<tr>
<td>1923</td>
<td>23.44</td>
<td>6309</td>
<td>6077</td>
</tr>
<tr>
<td>1924</td>
<td>23.32</td>
<td>6755</td>
<td>5923</td>
</tr>
<tr>
<td>1925</td>
<td>25.60</td>
<td>6718</td>
<td>5992</td>
</tr>
<tr>
<td>1926</td>
<td>27.52</td>
<td>6807</td>
<td>6091</td>
</tr>
<tr>
<td>1927</td>
<td>21.56</td>
<td>6937</td>
<td>6168</td>
</tr>
<tr>
<td>1928</td>
<td>24.41</td>
<td>7051</td>
<td>6253</td>
</tr>
<tr>
<td>1929</td>
<td>50.61</td>
<td>6328</td>
<td>6315</td>
</tr>
<tr>
<td>1930</td>
<td>32.21</td>
<td>6907</td>
<td>6367</td>
</tr>
<tr>
<td>1931</td>
<td>34.30</td>
<td>6925</td>
<td>6463</td>
</tr>
<tr>
<td>1932</td>
<td>24.54</td>
<td>7290</td>
<td>6544</td>
</tr>
<tr>
<td>1933</td>
<td>18.09</td>
<td>7539</td>
<td>6624</td>
</tr>
<tr>
<td>1934</td>
<td>18.58</td>
<td>7829</td>
<td>6727</td>
</tr>
<tr>
<td>1935</td>
<td>20.50</td>
<td>8127</td>
<td>6837</td>
</tr>
<tr>
<td>1936</td>
<td>23.95</td>
<td>8175</td>
<td>6936</td>
</tr>
<tr>
<td>1937</td>
<td>23.27</td>
<td>8391</td>
<td>7029</td>
</tr>
<tr>
<td>1938</td>
<td>20.38</td>
<td>8753</td>
<td>7122</td>
</tr>
<tr>
<td>1939</td>
<td>21.80</td>
<td>8993</td>
<td>7222</td>
</tr>
</tbody>
</table>

(1) : State expenditure as a percentage of National Income, both in current prices.
(2) : Per capita National Income, expressed in constant drachmas of 1938.
(3) : Population (in thousands).

1 area of 63,211 km².
2 area of 121,794 km².
3 area of 150,833 km².
4 area of 130,199 km².

In 1940, Greece entered the War on the side of the Allies, and from 1941 to 1944 the country was under
triple military occupation (German, Italian, and Bulgarian). This period of occupation saw the complete collapse of the Greek economy. The occupying forces sucked the resources of the country by sending all gold reserves abroad, by forcing the exportation of goods to the countries of the Axis and its satellites, and by consuming most of the production of the country. The few scarce resources were pumped out of the Greek economy by means of issuing banknotes, which led to hyper-inflation and the complete paralysis of the fiscal and monetary life of the country. Within the four years of occupation, the price level rose 15-fold. The public sector shrank, and real revenues and expenditure were reduced by 97% and 75%, respectively, between 1938 and 1944, as it can be seen in Table III-2.

### Table III-2

<table>
<thead>
<tr>
<th>Billion drachmas</th>
<th>Billion drachmas of 1938</th>
</tr>
</thead>
<tbody>
<tr>
<td>1938</td>
<td>1941</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>1. Revenue</td>
<td>14.7</td>
</tr>
<tr>
<td>2. Expenditure</td>
<td>15.3</td>
</tr>
<tr>
<td>a) Budget</td>
<td>20.1</td>
</tr>
<tr>
<td>b) Occupation Forces</td>
<td>38.0</td>
</tr>
<tr>
<td>c) Legal Entities</td>
<td>9.9</td>
</tr>
<tr>
<td>3. Deficit</td>
<td>0.6</td>
</tr>
<tr>
<td>4. Revenue to exp. ratio</td>
<td>96%</td>
</tr>
</tbody>
</table>

After the liberation, per capita national income, in constant prices of 1938, was 4,459 drachmas, i.e 50% lower than the 1939 level, as seen in Table III-1. Also, the 1945-6 National Accounts were showing revenues of 187 bn. and expenditure of 314 bn., which yielded a deficit of 127 bn., which was covered by issuing new money, and thus resulting to new inflationary pressure on the economy. In 1946, ordinary revenues, in real terms, had decreased to 30% of their pre-war level, and represented less than 70% of the total revenues of the State. At the same time, the Civil War had already broken out, and was to last until 1949. This meant that reconstruction of the country had to be largely postponed because of the social conditions, as well as the financial constraints to the government. Most of the civil war expenses realized by the government were covered by British, at first, and then American aid, but the war presented the need for increased social expenditure, thus distracting the few scarce resources from reconstruction. In 1948 and 1949 defence expenditure was accounting for 48% and 49% of total current government expenditure, a trend that was to continue well into the 1950's, despite the end of the Civil War. Thus, it is seen that the reorganization of the National Army and of the various defence structures was receiving high, if not the highest, priority. Our main analysis starts in 1950; the new decade found Greece politically extremely unstable (15 changes in administration) between 1944 and 1950), with large public sector deficits, which were financed largely (up to 98%) by American aid, with
persisting high rates of inflation, almost non-existent infrastructure, low levels of productivity, and in general an economy, which urgently needed drastic measures in order to recover.


On the basis of the afore mentioned facts, it can be said that 1950 is the year, when Greece managed to achieve some minimal conditions for the beginning of an effort aiming at social and economic development. Since then Greece achieved some remarkable, at least at first sight, rates of growth, and the development of the economy is reflected in the movement of basic National Accounts sizes. Thus, as can be derived from Table III-3 (below), real per capita income rose at average annual rates of 4.7% between 1950 and 1954, 4.3% between 1955 and 1959, 6.5% between 1960 and 1964, 5.6% between 1965 and 1969, 3.8% between 1970 and 1974, and 2.7% between 1975 and 1980. Despite the high growth rates, the country lagged considerably behind other European countries, and it must be said that, in terms of current per capita GDP, Greece presented a poor less than 50% relationship to the average income of the countries that became known as the EEC of Nine. Yet it must be recognized that Greece, within thirty years managed to increase almost 5-fold the real per capita income. This, of course, could be observed in the behaviour of the population, who, for example, in 1975, were spending 25% of their total food expenditure on meat products, as
compared to 9.5% in 1950.

TABLE III-3

Some Indicators for the Greek Economy, 1950-1980

<table>
<thead>
<tr>
<th>Year</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>10532</td>
<td>11.74</td>
<td>-14.39</td>
<td>2.28</td>
<td>7.69</td>
</tr>
<tr>
<td>1951</td>
<td>11358</td>
<td>11.58</td>
<td>-17.50</td>
<td>5.28</td>
<td>12.94</td>
</tr>
<tr>
<td>1952</td>
<td>127718</td>
<td>12.58</td>
<td>-4.75</td>
<td>3.39</td>
<td>9.20</td>
</tr>
<tr>
<td>1953</td>
<td>129128</td>
<td>12.82</td>
<td>3.90</td>
<td>3.47</td>
<td>15.92</td>
</tr>
<tr>
<td>1954</td>
<td>14991</td>
<td>13.05</td>
<td>-4.97</td>
<td>3.52</td>
<td>3.68</td>
</tr>
<tr>
<td>1955</td>
<td>15894</td>
<td>13.14</td>
<td>-4.93</td>
<td>3.98</td>
<td>2.30</td>
</tr>
<tr>
<td>1956</td>
<td>16406</td>
<td>13.74</td>
<td>-6.21</td>
<td>3.75</td>
<td>1.43</td>
</tr>
<tr>
<td>1957</td>
<td>16837</td>
<td>13.39</td>
<td>-4.59</td>
<td>8.07</td>
<td>2.41</td>
</tr>
<tr>
<td>1958</td>
<td>17467</td>
<td>14.26</td>
<td>-5.61</td>
<td>9.06</td>
<td>1.57</td>
</tr>
<tr>
<td>1959</td>
<td>19267</td>
<td>13.83</td>
<td>-5.00</td>
<td>9.57</td>
<td>1.93</td>
</tr>
<tr>
<td>1960</td>
<td>19492</td>
<td>14.48</td>
<td>-5.00</td>
<td>10.22</td>
<td>-0.38</td>
</tr>
<tr>
<td>1961</td>
<td>21408</td>
<td>14.24</td>
<td>-5.73</td>
<td>12.27</td>
<td>2.86</td>
</tr>
<tr>
<td>1962</td>
<td>23131</td>
<td>14.92</td>
<td>-7.56</td>
<td>13.28</td>
<td>0.93</td>
</tr>
<tr>
<td>1963</td>
<td>25136</td>
<td>15.05</td>
<td>-9.12</td>
<td>13.87</td>
<td>3.12</td>
</tr>
<tr>
<td>1964</td>
<td>26474</td>
<td>15.57</td>
<td>-5.44</td>
<td>15.73</td>
<td>4.98</td>
</tr>
<tr>
<td>1965</td>
<td>27625</td>
<td>16.17</td>
<td>-5.28</td>
<td>17.56</td>
<td>1.69</td>
</tr>
<tr>
<td>1966</td>
<td>29428</td>
<td>17.08</td>
<td>-6.50</td>
<td>18.94</td>
<td>0.33</td>
</tr>
<tr>
<td>1967</td>
<td>32164</td>
<td>17.90</td>
<td>-6.95</td>
<td>20.89</td>
<td>2.49</td>
</tr>
<tr>
<td>1968</td>
<td>34621</td>
<td>19.10</td>
<td>-6.41</td>
<td>20.95</td>
<td>2.92</td>
</tr>
<tr>
<td>1969</td>
<td>37110</td>
<td>19.60</td>
<td>-5.60</td>
<td>21.35</td>
<td>2.99</td>
</tr>
<tr>
<td>1970</td>
<td>40151</td>
<td>19.37</td>
<td>-5.64</td>
<td>22.58</td>
<td>4.28</td>
</tr>
<tr>
<td>1971</td>
<td>42996</td>
<td>21.02</td>
<td>-8.07</td>
<td>18.96</td>
<td>15.54</td>
</tr>
<tr>
<td>1972</td>
<td>41210</td>
<td>20.81</td>
<td>-6.69</td>
<td>19.64</td>
<td>26.90</td>
</tr>
<tr>
<td>1973</td>
<td>43110</td>
<td>20.88</td>
<td>-7.45</td>
<td>21.81</td>
<td>13.00</td>
</tr>
<tr>
<td>1974</td>
<td>45324</td>
<td>21.65</td>
<td>-5.72</td>
<td>21.49</td>
<td>14.16</td>
</tr>
<tr>
<td>1975</td>
<td>46319</td>
<td>21.33</td>
<td>-5.84</td>
<td>21.71</td>
<td>11.63</td>
</tr>
<tr>
<td>1976</td>
<td>48640</td>
<td>21.36</td>
<td>-5.03</td>
<td>28.60</td>
<td>12.50</td>
</tr>
<tr>
<td>1977</td>
<td>49860</td>
<td>21.75</td>
<td>-5.59</td>
<td>26.80</td>
<td>19.14</td>
</tr>
</tbody>
</table>

(1) : Per capita GNP - constant drachmas of 1970
(2) : Percentage of secondary production to GDP - constant prices (1970)
(3) : Balance of goods, services and incomes with the rest of the world, as a percentage of GNP.
(4) : Public debt as a percentage of GNP.
(5) : Rate of inflation (based on the Consumer’s Price Index).

Source: National Accounts of Greece - Various issues.

During the same period, a serious structural change took place: Greece, a country predominantly agricult-
ural, experienced a shift in the production structure. Secondary production, as can be seen in Table III-3, almost doubled its share in GDP; agriculture, which had an average growth rate of around 4%, saw its share declining from 30% to 13%, while the service sector occupied a more or less stable share of slightly more than 50%.

In agriculture, the increase in real income was mainly due to the quantitative and qualitative changes of the inputs, and the extensive irrigation programmes. Between 1960 and 1975, we had an increase in the expenditure on fertilizers of over 300%, an increase in the expenditure on pesticides of more than 200%, a more than 9-fold increase in consumption of electricity, and a more than four-fold increase in the use of tractors, while the irrigated land area was increased by 70% between 1950 and 1963, and 50% between 1964 and 1980.\(^\text{1}\)

As we mentioned earlier, the secondary sector of production in Greece was developed considerably during the thirty years, which followed the end of the Civil War. Although its share of GDP is roughly half of that found in the industrialized countries, a remarkable increase of activities in mining, manufacturing, construction, and electricity and water supply works, was observed. The mining sector developed at an average rate of almost 10% annually; manufacturing at around 7.5%; construction at 5.5%; electricity production at

\(^\text{1}\) All data are taken from various issues of the National Accounts.
around 12%. Especially, employment in manufacturing increased by approximately 50%, while productivity rose by 200%, but it must be noted that, still, over 90% of establishments employ ten persons or less. This shows the small scale of the Greek industry, which has serious consequences in terms of productivity gains, since, for Greece it has been found that small establishments can be as much as 30% less productive than the larger ones. However, at this point, it is encouraging to bring to attention that the internal structure of the manufacturing sector has changed in favour of the heavy industry. This can be seen in Table III-4, below, where, between 1950 and 1975, the share of food etc., textiles, clothing and footwear, was reduced by around 30%, while the heavy industry increased its share by more than 70%.

During the first half of the 1950's the price level showed signs of improvement, although inflation remained at relatively high levels. In 1955 inflation fell below 6%, and stayed there for almost a decade, the price level showing an absolute fall in 1962 (see Table III-3), for the first time since 1939. The two oil crises, however, combined with internal problems gave rise to high rates of inflation for once more. Also, just after the end of the period under examination, stagnation started creeping in, and until the mid-1980's, it can not be said that Greece has shown serious signs of recovery.

The Greek economy has traditionally been very much dependent, in terms of international trade. This, it can be said, is a result of a variety of factors, such as
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Table III-4

Average annual growth rates (%) and structure of the gross income from manufacturing, in terms of constant prices of 1970

<table>
<thead>
<tr>
<th>Branch</th>
<th>Growth rate</th>
<th>Share %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Food, drink &amp; tobacco</td>
<td>7.1</td>
<td>23.3</td>
</tr>
<tr>
<td>2. Textiles</td>
<td>7.4</td>
<td>19.9</td>
</tr>
<tr>
<td>3. Clothing &amp; footwear</td>
<td>5.0</td>
<td>20.0</td>
</tr>
<tr>
<td>4. Wood products</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&amp; furniture</td>
<td>6.5</td>
<td>5.9</td>
</tr>
<tr>
<td>5. Paper, printing &amp; publishing</td>
<td></td>
<td>7.7</td>
</tr>
<tr>
<td>6. Chemicals</td>
<td>12.2</td>
<td>3.7</td>
</tr>
<tr>
<td>7. Stone, clay &amp; glass</td>
<td>8.5</td>
<td>6.7</td>
</tr>
<tr>
<td>8. Basic metal industries</td>
<td>17.4</td>
<td>0.4</td>
</tr>
<tr>
<td>9. Metal manufacture, engineer &amp; electric goods</td>
<td>8.2</td>
<td>10.4</td>
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<td>10. Transport equipment</td>
<td>10.0</td>
<td>2.4</td>
</tr>
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<td>11. Miscellaneous</td>
<td>6.8</td>
<td>3.2</td>
</tr>
<tr>
<td>Total</td>
<td>7.8</td>
<td>100.0</td>
</tr>
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</table>

Source: National Accounts of Greece, various issues.

Note: The growth rates were calculated by applying

\[ r = \left( \text{antilog} \frac{\log X_n - \log X_0}{n} - 1 \right) \times 100\% \]

to data from the above source.

the small size of the National economy, low level of development, and lack of certain primary commodities and of fuel. The openness of the economy, as shown by the percentage sum of imports and exports over GNP, in Table III-5, was approximately doubled between 1950 and 1980. As it can also be derived from columns (1) and (2) of
### Table III-5

<table>
<thead>
<tr>
<th>Year</th>
<th>Imports per capita</th>
<th>Exports per capita</th>
<th>Openness</th>
<th>Exports per 100 drs. of imports</th>
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<td>49211.38</td>
<td>43133.91</td>
<td>87.65</td>
<td>87.65</td>
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</table>

Source: National Accounts of Greece, various issues

Note: (1) = Total purchases of goods & services from the rest of the world and income payments to the rest of the world, per capita, in current drs.

(2) = Total sales of goods & services to the rest of the world and income payments from the rest of the world, per capita, in current drs.

(3) = Openness of the economy; (1)+(2)/GNP x100%.

(4) = (2) for every 100 drs. of (1), percent.

the same Table, the process of increasing dependence was relatively stable until 1972, when the first oil crisis
caused a sudden jump of the relative sizes. Actually, we could distinguish between three sub-periods in the post-war trade situation of Greece. The first one covers the period from 1950 to 1952, when the repercussions of WW-II and the Civil War were still very strong; the country was in a phase of reconstruction, the price level was increasing rapidly, the drachma was overvalued, and restrictions on imports had been imposed. In 1953, these restrictions were relaxed, a devaluation of the currency took place, while from 1955 we enter a period of monetary stability. The above can be seen in Table III-3, col. (3), where the current account of the balance of payments, as a percentage of GNP, showed a significant decrease in 1953 and 1954.

During the period 1954 to 1972, some remarkable changes in the structure of trade took place, as well. The import of consumption goods reduced its share, while the import of machinery more than doubled its own share. As far as the exports were concerned, the traditional agricultural products presented a declining contribution to total exports, while the share of more dynamic agricultural products and industrial products increased; actually, the former increased their share from 7.6% in 1954 to 12.8% in 1970 (about 70%), while the latter increased their share from 6.5% in 1954 to 37% in 1970 (about 470%).

From 1973 onwards, i.e. during the third sub-period, and following the oil crisis, a marked increase in the prices of both imported and exported goods took place, which was followed by a devaluation of
the drachma. This caused an increase in the trade balance deficit, which, however, kept on being covered by the shipping and tourist sectors. In fact, invisible receipts from travel and transportation rose more than 15-fold from 1954 to 1972, a trend that was continued until 1980, with a short break in 1973 and 1974 because of the recession and the political events in Greece.

C. The Greek polity, 1950-1980

After the war, monarchy in Greece was restored, and a period of political instability was initiated again, with a succession of right, centre and coalition governments. In the mid-1950's we had a dominance of the conservative party, which lasted for almost a decade, but the political strife continued, mainly through the antagonism of the two main parties, the conservative and the centrist, and the constant interference of the palace and the American foreign policy in domestic affairs. There were several complaints from the opposition, for unfair electoral systems, rigged ballots, political assassinations and violence, directed to the government, and in 1963 the Centre party took over from the conservatives. It hold on to power until 1965, when things began to deteriorate; the government was destabilized, and finally overthrown, being succeeded by a variety of governments until the spring of 1967, when a military junta took over. The dictatorship lasted until 1974, when it collapsed under the stress of the Cyprus crisis. Greece and Turkey, just
as had happened in 1964, were again ready for war. Finally, the war was avoided, and the country found some political stability, after the return to normal parliamentary life and the elections that ensued. From 1974 to 1980, the conservative party was in power, and the restored political life of Greece seemed to have been toned down, at least in relation to the years before the dictatorships. What follows below is a political map of the events in Greece during the 1950-1980 period.

Table III-6
The main political events in Greece, 1950-1980


1951  Elections. Centre coalition government. Greece joins NATO.

1952  New constitution. Elections. Right-wing government (with 49% of the vote and 80% of the seats).

1953  Measures for the liberalization of the economy. Devaluation of the drachma. Serious earthquakes in the Ionian Islands.

1954  Another serious earthquake in Volos.

1955  Turkish government inspired riots against the Greeks in Istanbul. NATO crisis. Death of the PM.

1956  Elections. The biased electoral system gives to the conservatives 47% of the vote and 55% of the seats, while the centre coalition receives 48% of the vote and 44% of the seats.

1958  Elections. Right-wing government, but the left-wing party is elected in second place, despite the continuing outlaw status of the Communists.
1961
Elections. Right-wing government is elected amidst uproar by the opposition parties for bogus votes, rigged ballot-boxes, and physical and psychological violence exercised before and during the elections.

1963
Assassination of a left-wing MP. The 'para-state' and the government are directly accused by the opposition. Clash between the PM and the palace, and resignation of the former. Elections. The Centre Party wins the majority. Fight between the Greek and Turkish communities in Cyprus.

1964
Elections. Overwhelming majority of the Centre party. Culmination of the crisis in Cyprus.

1965
Clash between the PM and the King. Resignation of the former. A succession of short lived governments and care-taker administrations, until 1967.

1967
Imposition of military dictatorship. The King flees the country.

1968
Greece 'withdraws' from the Council of Europe.

1973
University students uprising. Martial law is reimposed. A shift of power within the junta.

1974

1977
Elections. Conservative majority.

From the above Table, it becomes quite clear that Greece, during the thirty years of our sample, hardly enjoyed any political stability, with the possible exception of the post-1974 years. Until the imposition of the dictatorship, we had elections every two years on average, and a plethora of different administrations.
This and the overall process of changing regimes hardly guaranteed any real continuity of government policies. Therefore, when we deal with the Greek public sector, we should bear in mind that the political element comes in very strong. This view would probably favour the analysis of the public sector in Greece, in terms of a politico-economic model. But since the political life of the country has been more turbulent than such a model can possibly provide for, and the relevant statistical data hardly exist, we think that such an approach, plausible as it may be, objectively must stay in the background, than be the focus of our empirical investigation.

Similarly, we could argue that any displacement effect would be equally difficult to quantify exactly. Events which can be deemed as possible sources of displacements, are of a much diverse nature and chronologically very near, so that we can not readily identify the individual effects of possible displacements, at least within the framework of a simple demand model. Also, there could be some doubt, as to what extent we could identify events, such as the imposition and fall of the dictatorship, the oil crises, or elections, as global displacements; the character of such events is not as clear-cut as, for example, that of the events between 1914 and 1923.
IV-18


Some general indicators

The public sector in Greece has functioned, more or less, like its counterparts in Europe. Thus, in Greece, the public sector consists of the central government, the local authorities, the Social Insurance Funds (SIF), the legal entities of public law (LEPL), and the public enterprises, which can be legal entities of either public or private law. The central government, the local authorities, and the LEPL primarily produce non-traded goods, and perform the allocation functions of the public sector. They provide services, such as administration, defence, health, education, etc., and these functions are mainly financed by tax revenues. The SIF are financed through the social security contributions, and, it can be said, their economic function is distributional. Finally, the public enterprises, which in Greece cover sectors, such as telecommunications, electricity, mail, public transportation, etc, strictly speaking, do not fulfill the requirements for inclusion in the 'narrow' concept of public sector, since they sell their products at a price and, therefore, their revenues come from sales and not from taxation. However, it should be noted that public enterprises may operate according to some social criteria (mainly distributional), while they are definitely connected to the central government, because it is the latter which traditionally manages them (directly or indirectly), and
finances their deficits.

From now on, then, our definition of the public sector will be that of the National Accounts of Greece, which includes the central government, local authorities, LEPL and SIF, but not public enterprises; the terms 'general government' and 'public sector' will be used interchangeably, having the meaning above, unless it is otherwise explicitly stated.

Below we give some general indicators for the activities of the Greek public sector.

The first two columns in Table III-7 show the ratio of total government expenditure to GNP, in current and constant prices respectively. They can be seen as indicators of the overall activities of the government within the economy. Although the growth of government expenditure to GNP can be characterized, in general, fairly gradual, we notice that the first three years show markedly higher ratios than the immediately following years. This should be attributed mainly to the effect of public investment, which because of the reconstruction phase of the country was very much needed. This can be seen also in Table III-8 below, where, both in current and constant prices, in 1950 government investment was 74.06% and 67.67% of private investment, respectively, falling gradually to lower levels after 1953. From 1953 onward, public expenditure gradually rose as a percentage of GNP from 19% in 1953 to 34.5% in 1980, in current prices, while in constant prices the increase was from around 23% to around 33%. This divergence indicates a significant relative price
### Table III-7

<table>
<thead>
<tr>
<th>Year</th>
<th>([G/Y])</th>
<th>([G/Y]_70)</th>
<th>([T/Y])</th>
<th>([GC/Y])</th>
<th>([GC/Y]_70)</th>
<th>([TR/Y])</th>
<th>([WG/Y])</th>
<th>([LG/L])</th>
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<td>12.34</td>
<td>11.35</td>
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</table>

(1) \([G/Y]\) : Total Public Expenditure as a percentage of GNP - Current Prices.

(2) \([G/Y]_70\) : As in (1) - Constant Prices of 1970.

(3) \([T/Y]\) : Total Tax Revenues as a percentage of GNP - Current prices.

(4) \([GC/Y]\) : Total Current Public Expenditure as a percentage of GNP - Current prices.

(5) \([GC/Y]_70\) : As in (4) - Constant prices of 1970.

(6) \([TR/Y]\) : Transfer payments to households and abroad and interest payments on the Public Debt as a percentage of (GNI+transfers+interest) - Current prices.

(7) \([WG/Y]\) : Wage bill of civil servants as a percentage of GNI - Current Prices.

(8) \([LG/L]\) : Public sector employees as a percentage of total civilian employment in the economy.

Source (1) to (7) : National Accounts of Greece.

Source (8) : Various issues of Public Finance Statistics (National Statistical Service of Greece), Personnel Statistics for the Public Services (Ministry to the Presidency), and own estimates.
The claim on real resources, as it can be seen in Table III-7, col.(5), and Table III-8, col. (6), remained fairly constant, although an increase can be observed when current instead of constant prices are used. Finally, a definite upward trend is obvious in Table III-7, col. (6), indicating the increasing role of the public sector as a redistributor. Transfer payments increased their share to GNI from around 5% in the 1950’s to more than 11% in 1980. If we would like to look at the role of the public sector as a producer, then we could take the ratio of the total wage bill to national income, as presented in Table III-7, col. (7). However, such a proxy is problematical, as pointed out in Chapter II, since it utilizes the value of input to indicate that of the output. Nevertheless, there was an increase in that ratio of approximately 50% As far as the role of the public sector as an employer is concerned, Table III-7, col. (8), indicates a more or less stable share of the employment in the public sector. It is true that the data we used involved own estimates for both the public sector and the total employment in the economy, but because they are based on more recent data than most other studies, we feel that they are quite reliable. The constancy of the aforementioned ratio is of great significance, since on the one hand, for the first time such a high estimate (around 12%) is produced (mainly because of the inclusion of LEPL employees), while on the other hand, and again for the first time, constancy is indicated. From the data provided in Tables III-7 and III-8,
one can gather that, in general, the public sector in Greece has increased its share in the economy over the years. This growth, however, was due not to exhaustive expenditure but to the growth of transfer payments. Therefore, one might conclude that it is the redistributional role of the state that was more pronounced between 1950 and 1980, rather than its role as a consumer or even a producer (always in relative terms).

It should be also noted that Greece, despite her lower level of development than the rest of the Western European countries, has lagged very little behind them, as far as the relative size of the public sector is concerned, while, if government consumption alone is examined, there were many years when Greece produced higher ratios.

Now we shall proceed to examining government expenditure in more disaggregate forms, and how various categories of public spending relate to each other and to the economy. The categorization of public expenditure which is followed by the National Accounts is the following:

Total expenditure consists of total current expenditure and gross fixed asset formation. Total current expenditure consists of public consumption and all transfers (to households, intragovernmental, subsidies, interest on the public debt and transfers

\footnote{For example, Provopoulos (1981) provides data which show a definite upward trend, and an implied maximum value of around 8%.}
### Table III-8

<table>
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<th>Year</th>
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<th>[GI/PI]</th>
<th>[G/P]</th>
<th>[GC/PC]70</th>
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(1) [GC/PC] : Government consumption expenditure as a percentage of private consumption expenditure - Current prices.
(2) [GI/PI] : Government investment as a percentage of private investment - Current prices.
(3) [G/P] : Total government exhaustive expenditure as a percentage of total private expenditure - Current prices.
(4),(5),(6) : Same as (1), (2), and (3), respectively, expressed in constant (1970) prices.

expenditure can be functionally divided in expenditure for the administration, defence, law and order, health, education, social security, and miscellaneous. Also, total current expenditure is shared between the central government, the LEPL and the SIF. Consumption and investment expenditure comprise the exhaustive payments as opposed to the transfer (non-exhaustive) payments. Investment expenditure includes investment in agriculture etc., mining and quarrying, manufacturing, energy, water, transportation and communication, administration and other service industries.

Government consumption presented a more or less constant ratio to the private consumption during the 1950's and early 1960's, taking a decisive upward trend from the late 1960's onwards. This turn was quite less impressive in constant prices, as Table III-8, col. (4), shows. On the other hand, government investment showed a decisive decline as a percentage of private investment. From a massive 74% following the end of the civil war, the ratio shows a dramatic decline, which was checked temporarily during the early 1960's, to reach below 30% during the late 1970's. The need for extensive government investment after the war was dictated by the poor state of the economy and the technical and financial inability of the private sector to undertake such a task. After the initial investment programmes and the recovery process of the economy in the 1950's, the private sector was able to invest more than the public sector, whose emphasis was shifted to investment through the public corporations rather than the central
government. Therefore, what was observed was a parallel growth of both private and government investment.

The distribution of government total current expenditure between categories of exhaustive and non-exhaustive payment is given below in Tables III-9 and III-10 (current and constant prices respectively). The data on the distribution between exhaustive and non-exhaustive payments show a pronounced shift from consumption and investment expenditures to transfer payments both in current and constant terms. Table III-10 below shows that government consumption expenditure declined steadily until 1974 when defence spending caused an upward jump while, on the other hand the rising investment share decreased dramatically from over 25% to less than 25%, reaching a poor 14% in the subsequent years. This shift of importance combined with the rising share of all forms of transfers as seen in cols. (3), (4), and (5) of Table III-10 to produce an overall declining ratio of exhaustive to non-exhaustive payments. Col. (6) of the same Table shows how exhaustive expenditure as a percentage of total declined from around 80% in the 1950's to less than 60% in the late 1970's.

Table III-11 presents the functional distribution of total current expenditure. In cols.(1) and (2) we observe that administration expenditure was rising while defence expenditure was falling (both as percentages) from 1950 to 1974. From then on we had an inversion of the trends because of the political events that took place. On the other hand we can also see the rising
### Distribution of Expenditure for Exhaustive and Non-Exhaustive Payments - Current prices

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(1) : Government consumption as a percentage of total expenditure.
(2) : Government investment as a percentage of total expenditure.
(3) : Net transfer payments as a percentage of total expenditure.
(4) : Subsidies as a percentage of total expenditure.
(5) : Interest payment on public debt as a percentage of total expenditure.
(6) : Exhaustive expenditure as a percentage of total expenditure [(1)+(2)=(6)].

Source: National Accounts of Greece.

It should be also noted that current expenditure is mainly carried out by the central authorities, which,
### Distribution of Expenditure for Exhaustive and Non-Exhaustive Payments - Constant prices

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(1)-(6) : As in the above table - Constant prices.

Source: National Accounts of Greece (except (3) to (6) - see note below).

Note: Deflation of Transfers, Subsidies, and Interest was made by using the deflator of private consumption.

For example, in 1958 accounted for 77.5% of the total current expenditure and exceeded 80% during the 1970's.

As far as the financing of government expenditure is concerned, this is carried out mainly through taxation. Non-tax revenues made up for 18.4% of total
### Table III-11
**Functional Distribution of Total Current Expenditure**

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<td>15.14</td>
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<td>8.11</td>
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<td>13.21</td>
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<td>39.19</td>
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<td>14.19</td>
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<td>3.91</td>
<td>10.06</td>
<td>1.37</td>
<td>14.73</td>
<td>1.88</td>
</tr>
</tbody>
</table>

(1) : Administration as a % of total current government expenditure.
(2) : Defense 
(3) : Law 
(4) : Health 
(5) : Social security 
(6) : Education 
(7) : Miscellaneous 

Source : National Accounts.

revenues in 1950, which by the then government was considered not a particularly good figure yet satisfying under the circumstances, given the total collapse of the economy less than a decade ago. From then on, non-tax revenues made up for 16.4% of total revenues in 1955,
15% in 1960, 12% in 1965, 9% in 1970, 12% in 1975 and 9% in 1980. This is mainly attributed to the recovery of the economy, and as we can see in Table III-12, col.(2), tax revenue rose from 14.7% to 27.5% of GNP within thirty years. Also, it is worth noticing that although a centralization process was observed for government expenditure, tax revenues appear to be decentralizing slowly, which means that the central government has concentrated more activities over the years which are financed by absorbing resources from the LEPL and SIF. Last but not least we should point out the decreasing significance of indirect tax revenues (col.(4)), which from 66.8% in 1950 came to account for less than 50% of total tax revenues for the first time in 1980.

E. Income elasticities of Government expenditures

In the following tables we present various forms of income elasticities of government expenditure. The breakdown of government expenditures is not complete, distinguishing, mainly, between exhaustive and non-exhaustive expenditures, with or without the inclusion of defence. Thus, we have taken government consumption (GC) and investment (GI), their sum (G, which represents total exhaustive expenditure), transfer payments to households (TR), subsidies (SUB), the sum of all the above items (GT, total government expenditure), and from G and GT we subtracted defence expenditure to obtain non-defence exhaustive and total expenditure (GD and GTD, respectively). As income we considered private
## Table III-12
The Financing of Government Expenditure

<table>
<thead>
<tr>
<th>Year</th>
<th>(1)</th>
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<td>64.59</td>
<td>57.98</td>
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<td>10510</td>
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<td>67.71</td>
<td>57.28</td>
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<td>1955</td>
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<td>67.11</td>
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<td>69.09</td>
<td>57.49</td>
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<td>18192</td>
<td>18.38</td>
<td>63.96</td>
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<td>1968</td>
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<td>66.37</td>
<td>52.72</td>
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<td>1980</td>
<td>485737</td>
<td>27.48</td>
<td>62.55</td>
<td>47.86</td>
</tr>
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</table>

(1) : Total Tax Revenues in million drachmas.
(2) : Total Tax Revenues as a percentage of GNP.
(3) : Percentage of Central Government Tax Revenues to Total.
(4) : Percentage of Indirect Tax Revenues to Total.

Source: National Accounts of Greece.

consumption expenditure (PC), private investment (PI), their sum (P), and G.N.P. All the above variables were taken both in current and constant prices (the latter indicated by -70), and we used their logs in running simple regressions to obtain the elasticities. Because
the Durbin-Watson statistics, however, were very low, the same regressions were rerun after correcting for serial correlation, and this yielded D-W statistics invariably between 1.75 and 2.23.

Table III-13a
Simple regression elasticities / Current prices

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<th>P</th>
<th>GNP</th>
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</thead>
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<td>1.136</td>
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<tr>
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Table III-13b
Simple regression elasticities / Constant prices

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From the above elasticities we observe that, in general, transfers and subsidies are the more income elastic sizes, while investment presents higher elasticities. The high elasticities of the transfer payments also make the elasticities of the aggregate sizes (e.g. total government expenditure and GNP) to appear much higher than unity, which implies a growing public sector with respect to the rest of the economy. For this kind of elasticities, however, we keep our reservations,
### Table III-13c

**AR\(^a\) regression elasticities / Current prices**

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</table>

\(a\) Corrected for first order serial correlation.

### Table III-13d

**AR regression elasticities / Constant prices**

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</thead>
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<td>.709</td>
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<tr>
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<td>.862</td>
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<td>.343**</td>
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<td>1.397</td>
<td>.984</td>
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</table>

The figures in smaller print are the relevant Q's, after correction for serial correlation.

* Indicates that the figure is not significantly different from one at the 5% level, at least.

** Indicates that the figure is not significantly different from zero at the 5% level, at least.

which we shall expose analytically in the next chapter.
Nevertheless, this is the kind of elasticities which have usually been reported for Greece. We repeat that no conclusions should be drawn from them, since they serve a mere demonstrative role. Notice that although most of them are significantly different from unity, the ones that refer to constant prices are significantly lower than the ones that correspond to current prices, and rather marginally different from unity.
CHAPTER IV

A) Causal analysis and the determinants of Public Expenditure

1) Identification & Estimation problems with regard to regression analysis

In the field of public finance a plethora of variables has been used in numerous empirical tests, in an attempt to shed some light on the issue of the determinants of government expenditure growth. The usual procedure has been to speculate as to the theoretical explanatory value of a certain variable and then empirically test the proposition; usually this is done by employing the ordinary least squares (OLS) method.

However, there is a logical gap in this procedure. Despite the fact that causal inferences are eventually drawn from such tests, they are in conclusion of a basically correlational technique, such as the OLS. Regression equations can not and should not be viewed routinely as structural equations, directly representing causal processes. The fact that a pair of variables may be highly correlated does not necessarily establish the fact that there is a causal pattern between them. If the variables are connected through a non-linear relationship, then the ensuing low correlation does not necessarily mean that the variables are functionally unrelated. At the other end, two variables can be causally unrelated, despite high correlation, if they have a common association with a set of other variables.
Therefore, we are faced with an identification problem, since an OLS regression could reject 'good' variables or accept the wrong ones on the grounds of their correlations. Moreover, the OLS method might or might not give statistically 'good' coefficient estimates, but in either case they could be biased and unreliable (and even worse, not obviously so), unless the variables entered the regression according to their true causal priorities.

Let us take for example the case where there is feedback between two variables X and Y. In terms of path analysis this causal relationship can be denoted as

\[ X \leftarrow \frac{a_1}{a_2} Y, \]

where the arrows show the causal direction, and \( a_1, a_2 \) represent the true structural coefficients of the system. If we have wrongly assumed that only X is the causal factor with respect to Y, and run a regression such as \( Y_t = b_0 + b_1 X_t + e_t \), then the coefficient \( b_1 \), which we may or may not accept according to its statistical properties, is in fact an irrelevant quantity,

\[ b_1 = \frac{a_1 + a_2 (c_1^2/c_2^2)}{(1+a_1 a_2)}, \]

where \( c^2 \)'s are variances

(D.R. Heise, 1979, p.159).

A regression is, in fact, an attempt to describe and quantify a causal relationship. Yet, before proceeding to the actual estimation, two principles should always be borne in mind. In some empirical or theoretical way one must establish that, first, a causal
relationship between the dependent and independent variables does exist, and, second, that the causal pattern is such that it will allow for an OLS regression; otherwise, other techniques, such as two or three stage least squares, for example, which also have their own limitations, must be applied. Unfortunately, this has hardly been common practice in the analysis of public expenditure growth, or to put it better, these principles are usually assumed to be satisfied implicitly and at a theoretical level only.

Naturally, there is a reason for the omission of empirical tests on causal relations. Such tests, relatively new in economics, are not yet clear cut processes and they may involve some cumbersome quantitative work with ambiguous results. It is difficult to find in the relevant literature such tests, which have been definitely conclusive or free of controversy. This, however is not good enough an excuse for not trying, at least, to test for causal patterns. The rewards can be very high, since such testing can help in recognizing true causal variables and applying more efficient econometric techniques.

The necessity of such tests in the field of government expenditure growth can be demonstrated by using Wagner's law as an example. Let us consider the simplest of cases, where $\ln G_t = a_0 + a_1 \ln Y_t$ ($G_t$ and $Y_t$ stand for government expenditure and income, respectively). The value that the coefficient of $\ln Y_t$ takes has its well known implications, $a_1$ being the income elasticity of government expenditure. Yet, theory
fails to ensure a definite non-feedback relationship between $G_t$ and $Y_t$, or show towards a unique unidirectional pattern between the two. This means that conclusions can be drawn from a possibly unreliable value of the coefficient $a_1$, which in fact is not the elasticity we are looking for! In support of the above let us quote two opinions, which demonstrate the extent of the problem:

"...It is clearly a methodologist's nightmare to specify essentially the same model and to then proceed as if causation were exactly reversed. On the one hand we have macroeconomists estimating models on the assumption, that, say, the government budget is exogenous and on the other we have estimates of government responses to a given state of the economy. One or both must be an incorrect statistical specification."

(Alt & Chrystal, 1977).

"On a priori reasoning it seems plausible that government expenditure as a whole is in some ways correlated with the stage of development (...) But the exact path of the causal relationship is far from clear. Government expenditure may be the motive force behind economic growth in a country; it may be directly governed by the state of economic growth; both may be caused by other factors and thus unrelated to each other."

(Schmedtje & Lall, 1968). (Emphasis provided by the authors).

These two quotations are, I think, illustrative of
the seriousness of the issue and the prevailing uncertainty. In a recent article, Singh and Sahni (1984) give rise to more worries, when their test of causality between public expenditure and income finds a feedback pattern between the two variables.

2) What causality and what test?

Before carrying on with an empirical test for causality, a certain theoretical framework will be necessary, as to the concept of causality that will underly this analysis. To define what 'cause' or 'causality' is, is essentially a philosophical problem, and numerous definitions have been given through the years (for a thorough review see Zellner, 1979). It has been a highly controversial issue, and, of course, in no conceivable way an attempt to provide an answer will be made here. We rather intend to adopt certain principles, which will satisfy the needs of the present study, by providing an operational framework. This framework will be governed by the Granger concept of causality, as it is referred to, usually. According to it, causality is defined such that "X causes Y", if knowledge of past X helps to forecast Y better than using Y's past alone (Granger, 1969).

In the core of this concept, Wienerian in essence, we find the pattern of chronological sequence of events as its vital feature. This feature appears to be redundant in other theories of causality. For scientists like Simon, Feigl, Srotz, Wold and Basman (a critical discussion in Zellner, op. cit.), asymmetry in time is
not a necessary condition for the definition of a causal relationship. This hardly appears to be detrimental to our analysis, since it seems that, by adopting the Granger-Newbold (1977) thesis, namely that "The future can not cause the past. Strict causality can occur only with the past causing the present or future", we scarcely introduce any serious distortions in the world we are to examine. The same authors also suggested that "it is sensible to discuss causality only for a group of stochastic processes. It is not possible to detect causality between two deterministic processes". This thesis received a lot of criticism, especially from A. Zellner, as ruling out economic laws, without making an inductive case to support it. Actually, Zellner's polemics stem from his favouring the Feigl concept of causality, namely that causality is predictability, according to a law or a set of laws. However, as Simon (1953) put it, we seem to live in a probabilistic rather than a deterministic world. In more practical terms, we can assume rather safely that the variables to be considered here are indeed stochastic, that is, not pure functions of time, and disregard the above criticism as irrelevant within the present context. Apt to this issue is the question of control variables, which we shall consider later on.

Finally, by no means the empirical testing to follow will be a mere normative excercise. The theoretical background will always be present when we evaluate and interpret our results, and conclusions are drawn. Very correctly Zellner pointed out that
measurement without theory and theory without measurement are extremes to be avoided. Granger’s concept of causality seems to be compatible with the purposes of this study, and moreover, it is the one in whose context most of the empirical work on causality has been conducted.

At this point, let us elaborate for a while on Granger’s thesis. He suggested that if $X_t$ and $Y_t$ are a pair of stationary \(^1\) time-series then $X$ causes $Y$ if the variance of the errors in forecasting $Y$, using knowledge of both past $X$ and past $Y$, is less than the variance of the errors in forecasting $Y$ by using past $Y$-values only. If we let $U_t$ represent all the available information (the "universe"), then $(U_t - X_t)$ denotes all the available information, except for that provided by variable $X_t$. Granger (op. cit.) gave the following definitions of causality:

**Definition 1. Simple causality ($X \rightarrow Y$).**

$X$ causes $Y$, when

$$\sigma^2(Y|\bar{U}) < \sigma^2(Y|\bar{U}-X) \quad (\sigma^2 \text{ represents residual variance, and the bar-lines indicate 'past values'.})$$

**Definition 2. Feedback ($X \leftrightarrow Y$).**

$X$ causes $Y$ and $Y$ causes $X$, when

$$\sigma^2(Y|\bar{U}) < \sigma^2(Y|\bar{U}-X) \quad \text{and}$$

---

\(^1\) A time-series is considered to be stationary, if the time period in which it is observed bears no relevance to its statistical properties.
Definition 3. Instantaneous causality (X→→Y).
X causes Y instantaneously, when

\[ \sigma^2(X|U) < \sigma^2(X|U-Y) \]

(double bar-line indicates 'current value'), i.e. when the current value of Y is better predicted with the use of the current value of X.

Granger draws our attention to the fact that spurious causality may appear in the case of inadequate breakdown of the data. If, for example, X→→Y with a lag of one period, but X and Y have been sampled in two-period intervals, then their causal pattern will appear to be X→→Y, since relevant information - the missing data - has been ignored. Also, Pierce & Haugh (1977) showed that, if instantaneous causality is present, then it is impossible to identify a unidirectional causal pattern; hence, from now on, instantaneous causality between two variables X and Y will be denoted as X→→Y.

Definition 4. Causality lag (X→→k Y).
Causality lag k is said to be the least value of m, when

\[ \sigma^2(Y|U-X(m)) < \sigma^2(Y|U-X(m+1)) \]

where knowing the values of \( X_{t-j} \) (j=0,1,...,k-1), will not help in improving the prediction of \( Y_t \).

Granger remarked that, "the one completely unreal aspect of the above definitions is the use of the series \( U_t \), representing all available information" (emphasis by
Granger). If we have two time-series $X_t$ and $Y_t$, we can assume that they comprise a vector set of all relevant information, and that all other information is irrelevant, i.e. has no causal consequences. In that case $U_t$ is replaced by $X_t$ and $Y_t$, on the one hand, while $(U_t - X_t)$ is replaced by $Y_t$, on the other. For example, definition 1 would then read as

$$\sigma^2(Y|\overline{Y},\overline{X}) < \sigma^2(Y|\overline{Y}).$$

If, however, relevant information has been omitted from the information set made up of $X_t$ and $Y_t$, then spurious causality might arise, by the existence, say, of a third variable $Z_t$, which has been causing both $X_t$ and $Y_t$.

Granger suggested the following test for causality: If $X_t$ and $Y_t$ are two stationary time-series with zero mean, then we can construct a simple causal model, such as

$$X_t = \sum_{j=1}^{m} a_j X_{t-j} + \sum_{j=1}^{m} b_j Y_{t-j} + e_t \quad (1)$$

$$Y_t = \sum_{j=1}^{m} c_j X_{t-j} + \sum_{j=1}^{m} d_j Y_{t-j} + \nu_t \quad (2),$$

where $e_t$ and $\nu_t$ are two uncorrelated white-noise series, and $m$ is the maximum number of lags (for all practical purposes, it is assumed that $m < n$, where $n$ is the number of observations). If some $c_j \neq 0$, then we say that $X$ causes $Y$; if some $b_j \neq 0$ then $Y$ causes $X$; and if some $c_j \neq 0$ and some $b_j \neq 0$, then we have feedback between $Y$ and $X$.

Instantaneous causality is traced analogously by using current values for our variables (e.g., in (1) and (2), for $Y_{t-j}$, $j=0,1,\ldots$) and examining if the goodness of
fit has been improved.

In the same sense, Sims (1972) tested for causality between money and income by estimating regressions of the kind

\[ y_t = a + \sum_{j=1}^{m} b_j x_{t-j} + e_t \quad (k,m>0) \]  

That is, Sims proposed to use both leads and lags, and lags alone, and then on the basis of the joint significance of the lead coefficients and the lag coefficients from each regression (as shown by F-tests), to draw conclusions accordingly.

At this stage we should deal with some problems that such tests present. One problem is the choice of the number of lags (or leads and lags). Sims contended that he imposed no 'smoothness' restrictions, and that he kept the length of the estimated lag distributions 'generous'. This methodology, however, can not be regarded as satisfactory since there might not be a safe way to guess which lag can be the last significant one. The problem becomes more serious, when samples are relatively small and one tries to keep a high number of degrees of freedom at the same time.

Another problem was pointed out by Roberts & Nord (1985), who showed that using a test, such as described by (1) and (2), can yield different results from a test such as (3). That is, a Granger-type causality test is very sensitive to the functional form that is used, and can be misleading, since different functional forms lead to different conclusions for the same data set.

As we saw before, Granger rejected the inclusion of
deterministic processes in his analysis, contending that it would be difficult to find testable definitions, alternative to his, in order to include them. If $X_t$ and $Y_t$ are two deterministic processes, which can be precisely predicted by their own past, i.e. they are functions of time ($t$), then if, for instance, $X_t = bt$, and $Y_t = c(t+1)$, $X_t$ can be predicted accurately by using either $(b + X_{t-1})$, or $[(b/c)Y_{t-1}]$. This leaves no way to decide whether $Y_t$ is a causal factor of $X_t$. It was this post hoc ergo propter hoc issue that lead to heavy criticism, mainly by Zellner. One of the main issues in the present analysis is the definition of the causal relationship between income and government expenditure. We would like to close this case by paraphrasing Sims (op.cit.), where "government expenditure" substitutes Sims' "money":

"If one of the two relations in a bivariate system is chosen optimally, then the innovations of the variables become structural elements of the system. This fact is important for government expenditure and income, since it is easy to imagine that government expenditure may have been controlled to influence or to conform to income. It can be shown that in a bivariate system, with optimal control of one variable, there will be in general two-way causality by the Granger criterion (...). But then the only way optimal control would be likely to hide income-to-government expenditure feedback would be if income were controlled to hold variance in government expenditure. This
The test we are going to use in the present analysis is the one proposed by Pierce and Haugh (1977), and to which they refer as "causality detection via cross-correlating univariate residual series". To conduct such a test one must first fit ARIMA models to the two series \( X_t \) and \( Y_t \), and obtain the white noise residuals \( u_t \) and \( v_t \), respectively. Then the cross-correlations of \( u_t \) and \( v_t \) are calculated and the statistical significance of them and the corresponding lags at which they occur help us in drawing our conclusions about the indicated causal pattern.

Pierce and Haugh proved that \( u_t \) and \( v_t \) will yield identical conclusions, as to the causal direction, to those that the transformed series \( X_t \) and \( Y_t \) would; in other words, the innovations \( u_t \) and \( v_t \) are causality preserving.

The Pierce-Haugh test was chosen for a number of reasons. First, it involves no regressing, and therefore, no a priori restrictions on the number of lags are relevant. Also, in this way it is independent of the functional form. Second, it improves on Sims’ methodology, in the sense that both time-series are prewhitened, through separate filters, which have been

---

2 AutoRegressive Integrated Moving Average.

3 A standardized measure of association between one time-series and the past, present and future values of another. It has a range from -1 to +1.
determined empirically. Sims was criticized for employing a single arbitrary filter for both of his variables. Third, the use of univariate instead of bivariate processes reduces the problem of control variables. Fourth, the problem of economizing on degrees of freedom does not arise, and fifth, this test is relatively less time consuming.

The basis on which the causality patterns are decided upon is a table (Table IV-1), which Pierce and Haugh provide, relating the cross-correlations outcomes to causal directions. This table is given below and it includes the most important causality events out of the possible 256!

**Table IV-1**

Conditions on cross-correlations for causality events

<table>
<thead>
<tr>
<th>Relationship</th>
<th>Restrictions on $\varphi_{uv}(k)$ *</th>
</tr>
</thead>
<tbody>
<tr>
<td>$X \rightarrow Y$ **</td>
<td>$\varphi_{uv}(k) \neq 0$ for some $k &gt; 0$</td>
</tr>
<tr>
<td>$X \leftarrow Y$</td>
<td>$\varphi_{uv}(k) \neq 0$ &quot; &quot; $k &lt; 0$</td>
</tr>
<tr>
<td>$X \leftarrow Y$</td>
<td>$\varphi_{uv}(k) \neq 0$ &quot; &quot; $k &gt; 0$ and &quot; &quot; $k &lt; 0$</td>
</tr>
<tr>
<td>$X \leftarrow Y$</td>
<td>$\varphi_{uv}(k) \neq 0$ for $k = 0$</td>
</tr>
<tr>
<td>$X \leftarrow Y$</td>
<td>$\varphi_{uv}(k) = 0$ for all $k$</td>
</tr>
</tbody>
</table>

* $\varphi_{uv}(k)$ is the correlation of the whitened series $(u_t$ and $v_t$) at lag $k$.

** "\(\rightarrow\)" reads "causes", "\(\leftarrow\)" reads "has feedback with", "\(\leftarrow\)\(\leftarrow\)" reads "is instantaneously causally related to", and "\(\leftarrow\)\(\leftarrow\)\(\leftarrow\)" reads "is unrelated to".
3) Methodology of the test

The following steps were followed in order to conduct the Pierce-Haugh causality test:

A.1. Transform the data into logarithms.

2. Check the autocorrelation Function (ACF), the standard errors of the autocorrelations (Bartlett test), and the Ljung-Box Q-statistic to ensure stationarity.

3. If both series are stationary, then proceed to B.1., otherwise to A.4. and start again from A.2.

4. Take differences of the series, as indicated by the ACFs.

B.1. Using the ACF and the partial ACF (PACF) identify the appropriate ARIMA model.

2. Estimate the ARIMA model.

---

4 The process of removing the 'pattern' from the data.
5 The combination of one or more parameters for the purpose of weighting a time-series in an optimal way to eliminate randomness.
6 This a non-linear transformation, which does not affect the character of the series, while it reduces its variance.
7 The autocorrelation function describes the association of the observations of a series at different lags.
8 Test of hypotheses similar to the F- and t-tests, developed to determine whether some autocorrelation $r_k$ comes from a population whose value is zero at k lags.
C.1. Examine the significance of the parameters using the t-test, and check for their correlation (i.e. if there are more than one; this is necessary in order to discover possible over-parameterization of the model).

2. Ensure that the residuals are white noise, by following the procedure described in A.2..

3. Perform a historic simulation of the data by using the relevant parameters and then find the Mean Absolute Percentage Error (MAPE)\textsuperscript{11} of the simulation.

D.1. If the model fails in some way return accordingly to A.2., A.3., or B.1..

E.1. Find the cross-correlations of the innovations for each relevant pair of variables.

2. Consult Table IV-1 to draw conclusions about

\footnotesize
\textsuperscript{9} Test developed for the same purpose as the Bartlett test. The Ljung-Box Q-statistic is given by:

\[ Q(r) = n(n+2) \sum_{k=1}^{m} \hat{r}_k^2 / (n-k) \]

where \( \hat{r}_k \) is the autocorrelation at lag \( k \), \( m \) is the maximum number of \( k \), and \( n \) the number of observations. \( Q \) is assumed to follow the \( \chi^2 \) distribution and is compared to the \( \chi^2_{m-p-q} \) statistic, where \( p \) and \( q \) are orders of an ARIMA\((p,d,q)\) process.

\footnotesize
\textsuperscript{10} Measure of correlation, which is used to identify the extent of relationship between a current and a past value of the same variable, while holding the effects of all other lags constant.
the indicated pattern of causality.

4) The variables and their transformations

The variables used to conduct the tests were drawn from the extensive literature on the determinants of government expenditures. The data cover the 1950-1980 period for Greece.

1. GC : General Government Consumption Expenditure.
2. GI : General Government gross fixed capital formation.
4. TR : Net current transfers to households.
5. SUB : Subsidies.
6. GTR : General Government total expenditure. (GTR=G+TR+SUB+ net current transfers to the rest of the world)
7. GD : General government non-defence exhaustive expenditures (GD=G-DEFENS -see var.33)
8. GTD : General Government total non-defence expenditure (GTD=GTR-DEFENS).

---

11 A measure of accuracy given by:

\[
\text{MAPE} = \frac{1}{n} \sum_{j=1}^{n} \left( \frac{|\text{Actual} - \text{Forecast}|}{\text{Actual}} \right) \times 100%
\]
10. PC : Private Consumption expenditure.
12. P : Total private expenditure (P=PC+PI).
13. PRICE : Ratio of the 'prices' of the 'goods' of the two sectors (PRICE=deflator G/deflator P).
14. PRICEC: As in 13 (PRICEC=deflator GC/ deflator PC).
15. PRICEI: As in 14 (PRICEI=deflator GI/ deflator PI).
16. PROD : Proxy for the productivity differential of the two sectors (PROD=capital stock per unit cost of labour in the government sector / Capital cost per unit cost of labour in the private sector).  
17. DEBT : Public debt.
18. IMP : Imports/GDP %.
19. EXP : Exports/GDP %.
20. OPEN : Proxy for the openness of the economy (OPEN=[IMP+EXP]/GDP %).
21. CONC : Degree of centralization of the government (CONC=total expenditure of central government/GTR %).
22. WHO : Wholesale price index.
23. FISCAL: Proxy for fiscal illusion. (FISCAL=Indirect tax revenues/TAX %).
24. UNEMP : Rate of unemployment %.
25. INDU : Proxy for industrialization. It is the

12 Where labour force and (un)employment in either sector are involved, the data were partially based on own estimates, obtained by using ARIMA models to fill in the values for missing official data.
percentage ratio of manufactured GDP to GDP.

26. EQUIP : Proxy for technological progress in the economy. It is the percentage ratio of investment on (non-transport) machinery and equipment to total investment.

27. EVA : Proxy for tax evasion. It is the percentage ratio of unreported to actual private income.

28. GOECD : Public current expenditure of the OECD European countries.

29. DENS : Population density.

30. URBAN : Proxy for urbanization. It is the percentage of the Greek population in cities of over 10,000.

31. YOUNG : The percentage of the population in the 0-14 age bracket.

32. OLD : The percentage of the population in the 60+ age bracket.

33. DEFENS: Defence expenditure.

All variables are in current drachmas (GOECD in current U.S.$ and current exchange rates). Subscript '70' will denote the conversion of the variable into constant prices (base year is 1970); separate deflators were used throughout. Finally EVA covers the shorter 1959-1980 period due to lack of data.

The following ARIMA models were identified and estimated for the above variables, except for DEFENS, where intervention analysis was applied by using the
dummy variable DUM for periods of crisis. $X_t$ or $Y_t$ indicate the original variable, $B$ is the lag operator, and $u_t$ and $v_t$ are the respective white noise residuals. Ljung-Box Q-statistics are given in the parentheses under $u_t$ or $v_t$, corresponding at lag 10, although lags 1 to 10 were examined. The t-statistics for the coefficients are given in parentheses below them. Finally, the correlation of the coefficients - when they were more than one - was always less than 6.5%, while MAPE did not exceed 5.2% in any case. The estimation was done by using the backcasting method\textsuperscript{14}.

<table>
<thead>
<tr>
<th>Variable name</th>
<th>Estimated model</th>
</tr>
</thead>
</table>
| GC | $u_t = (1-B)(1-.418B)X_t - .088$
| | $(5.0) (2.43) (3.13)$ |
| GI | $u_t = (1-B)(1+.499B^2)X_t - .208$
| | $(7.4) (-4.11) (7.68)$ |
| G | $u_t = (1-B)X_t - .208$
| | $(13.) (12.47)$ |
| TR | $u_t = [(1-B)X_t -.165]/(1 + .886B^3)$
| | $(1.8) (7.65) (-17.83)$ |
| SUB | $u_t = [(1-B)X_t -.191]/(1 -.534B)$
| | $(9.6) (3.49) (3.66)$ |

13 An extension of multivariate ARIMA models, used to determine the effects of unusual changes in a variable.

14 A method of estimation involving the calculation of starting values by staring at the end of the series and 'forecasting' to the origin.
<table>
<thead>
<tr>
<th>Variable name</th>
<th>Estimated model</th>
</tr>
</thead>
<tbody>
<tr>
<td>GTR</td>
<td>$u_t = (1-B)X_t - .155$</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>GD</td>
<td>$u_t = (1-B)X_t - .151$</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>GTD</td>
<td>$u_t = (1-B)X_t - .159$</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>TAX</td>
<td>$u_t = (1-B)^2 (1+.342B)X_t$</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>PC</td>
<td>$v_t = (1-B)(1-.649B^3)Y_t - .045$</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>PI</td>
<td>$v_t = (1-B)Y_t - .169$</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>$v_t = [(1-B)Y_t + .896]/(1 + .128B^3)$</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>PRICE</td>
<td>$v_t = [(1-B)Y_t -.013]/(1 -.614B)$</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>PRICEC</td>
<td>$v_t = [(1-B)Y_t -.014]/(1 -.509B)$</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>PRICEI</td>
<td>$v_t = (1-B)^2 Y_t - .926$</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>PROD</td>
<td>$v_t = (1-B)(1-.481B)Y_t$</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>DEBT</td>
<td>$v_t = (1-B)Y_t - .206$</td>
</tr>
<tr>
<td>Variable name</td>
<td>Estimated model</td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>OPEN</td>
<td>$v_t = (1 - B)(1 - .471 B)Y_t$</td>
</tr>
<tr>
<td>IMP</td>
<td>$v_t = (1 - B)Y_t - .102$</td>
</tr>
<tr>
<td>EXP</td>
<td>$v_t = (1 - B)(1 - .365 B)Y_t - .075$</td>
</tr>
<tr>
<td>CONC</td>
<td>$v_t = (1 - B)^2 (1 + .713 B + .696 B^2)Y_t$</td>
</tr>
<tr>
<td>WHO</td>
<td>$v_t = [(1 - B)Y_t - .084]/(1 + .462 B)$</td>
</tr>
<tr>
<td>FISCAL</td>
<td>$v_t = [(1 - B)^2 Y_t]/(1 - .979 B)$</td>
</tr>
<tr>
<td>UNEMP</td>
<td>$v_t = [(1 - B)Y_t]/(1 - .633 B)$</td>
</tr>
<tr>
<td>INDU</td>
<td>$v_t = (1 - B)^2 (1 + .529 B)Y_t$</td>
</tr>
<tr>
<td>EQUIP</td>
<td>$v_t = (1 - B)(1 + .425 B^2)Y_t$</td>
</tr>
<tr>
<td>EVA</td>
<td>$v_t = [(1 - B)Y_t - .034]/(1 - .767 B)$</td>
</tr>
<tr>
<td>GOECO</td>
<td>$v_t = (1 - B)Y_t - .108$</td>
</tr>
<tr>
<td>Variable name</td>
<td>Estimated model</td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>DENS</td>
<td>$v_t = \frac{[1-B] (1 - .77B^2) Y_t - .003]}{1 + .996B}$</td>
</tr>
<tr>
<td></td>
<td>(7.5) (5.74) (1.48) (-39.44)</td>
</tr>
<tr>
<td>URBAN</td>
<td>$v_t = (1-B)^3 (1 + .549B) Y_t$</td>
</tr>
<tr>
<td></td>
<td>(8.8) (-4.27)</td>
</tr>
<tr>
<td>YOUNG</td>
<td>$v_t = (1-B) Y_t + .005$</td>
</tr>
<tr>
<td></td>
<td>(12.) (-3.67)</td>
</tr>
<tr>
<td>OLD</td>
<td>$v_t = \frac{[1-B]^2 (1 + .462B) Y_t}{1 - .578B^3}$</td>
</tr>
<tr>
<td></td>
<td>(3.) (-2.88) (4.22)</td>
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<tr>
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<td>$v_t = \frac{[1-B] Y_t - .072 - .195DUM}{1 + .854B}$</td>
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<tr>
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<td>(6.9) (3.72) (11.32) (-16.47)</td>
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<tr>
<td>GC70</td>
<td>$u_t = (1-B) (1 + .53B^3) X_t - .089$</td>
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<tr>
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<td>(7.4) (4.06) (8.56)</td>
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<tr>
<td>GI70</td>
<td>$u_t = (1-B) X_t - .05$</td>
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<td>(3.5) (2.02)</td>
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<td>G70</td>
<td>$u_t = (1-B) X_t - .057$</td>
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<td>$u_t = (1-B) (1 - .393B - .616B^2) X_t - .068$</td>
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<td>(1.8) (3.1) (6.91) (2.67)</td>
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<tr>
<td>SUB70</td>
<td>$u_t = (1-B) (1 + .411) X_t - .414$</td>
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<td>(9.4) (-2.85) (3.44)</td>
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<td>$u_t = (1-B)^2 (1 + .544) X_t$</td>
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<td>(5.9) (-3.65)</td>
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</table>
5) **Empirical results and their discussion**

In order to facilitate the reader to follow through the discussion, the empirical results were grouped, each group being followed by the relevant comments. Furthermore, each test has been numbered and these numbers will appear in brackets, whenever there is a reference to a certain result (only the correlations which were significant at the 10% level are given below; "#" means that there were none).
## I. Income and government expenditure

<table>
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<tr>
<th>Variable</th>
<th>Cross-cor</th>
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<tr>
<td>40b</td>
<td>.418</td>
<td>1</td>
<td>X Y</td>
<td>+</td>
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</table>
The choice of private expenditure expressions (PC, PI, P), as opposed to sizes like GDP or GNP, was made on the basis that any possible bias (especially towards feedback) should be eliminated, since the latter variables include both sectors. The general picture of the relationship between the two sectors, as shown by the above tests, is far from simple. More analytically, we were able to identify feedback between PC and GC (1a,b,c), PC and TR (4a,b,c), and P and G(35a,b,c), TR (36a,b), GTR (38a,b), and GTD (40a,b); also a possible feedback might be (33a,b) between GC and P. This leads us to believe that the instantaneous causality patterns, which were obtained when constant prices were used (especially 43, 46, 47 and 48), are likely to be feedbacks, not able to show up through the annual data used, although, formally, they are indeterminate cases. Obviously, the appearance of feedback seriously questions any attempt to use OLS regressions for the variables involved, and renders the use of either sector's variables as exogenous non-operational. Yet, regressions involving variables such as in (3), (25),

15 An unfortunate omission in the afore mentioned Singh and Sahni study.
(30), or (39), where unidirectional causality appears should be valid in this context. At this point we should mention the fact that, if two variables, say X and Y, have a certain causal relationship and if $x_1 + x_2 + \ldots + x_i = X$ and $y_1 + y_2 + \ldots + y_j = Y$, then the sort of relationship between X and Y does not rule out different causality events between their components x and y (Pierce & Haugh, 1977). Thus, we can see, for instance, that although GC $\rightarrow$ PC (1a,b,c) and PC $\rightarrow$ GI (2a,b), the relationship between G and PC is unidirectional PC $\rightarrow$ G (3) -where GC+GI=G-, or similarly, PC $\rightarrow$ GI (2a,b) and PI $\rightarrow$ GC (17), while (PC+PI=)P $\rightarrow$ G(=GC+GI) (35a,b,c).

It is interesting to notice the unidirectional causal relationship between GI and PC (PC $\rightarrow$ GI (2a,b)), which presents an alternation of signs. Taking into account the length of the lags involved ($k=-6,-1$), it looks as if private consumption has an adverse effect on public investment in the short run (2b), although a positive relationship is kept in the longer run (2a). This might be explained that by the fact that increased welfare (as indicated by PC) may render obsolete some public investment in the short-run (e.g. demand may be too small for some investment and met by the private sector at first), until some build-up of demand and new standards appear in the longer run. We could also say that this alternation of signs might imply the changing structure of public investment. One more case, where a negative sign was encountered, was when transfer payments and income in real terms were examined (28,44). In current prices, their relationship was a feedback
characterized by positive signs (4a,b,c, 36a,b), indicating the rising importance of transfers in nominal terms; the same evidence appears when constant prices are used (see for example (44a,b)).

Strangely enough, finally, in real terms the various forms of public expenditure (execptTR70) and private consumption seem to be causally unrelated ((9) to (16)). We can attribute this either to inadequate modelling or weaknesses of the tests, or conclude that GC70 and PC70 are not causally related in a direct and temporally constant manner, i.e. their causal relationship through time is the indirect and changeable product of the interaction with other variables.

II) The relative price effect

| Variable | Cross-cor | Lag | Causal Pattern | Sign of | | | | |
|----------|----------|-----|---------------|---------| | | | |
| X_t (u_t) | Y_t (v_t) | q_{uv}(k) | (k) | | q_{uv}(k) | | | |
| GC | PRICEC | .423 | -7 | X+---Y | + | | |
| PRICEI | .429 | -5 | | | | | |
| PRICE | .356 | 0 | X---Y | + | | |
| GC70 | .428 | -5 | X+---Y | + | | |
| PRICEI | .392 | -1 | | | | | |
| PRICE | .369 | 0 | X---Y | + | | |
| PRICEC | .434 | -7 | X+---Y | + | | |
| PRICEI | .487 | -5 | | | | | |
| PRICE | .449 | 0 | X---Y | + | | |
| PRICE | PROD | -.343 | -1 | X+---Y | - | | |

Variables PRICEC, PRICEI and PRICE were used in order to investigate the relationship between exhaustive government expenditure and the relative price effect, as Baumol's (1967) thesis suggests. Baumol asserted that the 'non-progressive' sector in an economy, being
characterized by lower technology and productivity, is likely (or bound) to be presenting higher unit costs and gradually absorb more resources relative to the 'progressive' sector. As the cross-correlations (49) to (54) show, the price differential is indeed a causal factor to government expenditure, exerting a positive influence on its growth. The results are supported by (55), where it is demonstrated that the productivity differential has an adverse effect on the relative price ratio. It is worth noticing the cumulative character of the relative price effect, as shown by the length of the lags, a point also made by Baumol.

Although we keep our reservations for the suitability of the variable PROD as a proxy, and admit that this test is far from exhaustive, nevertheless, there seems to be a strong indication for the existence of 'Baumol's disease' in the Greek public sector. Here it should be noted that the public sector purchases goods and services from the private sector and, according to Provopoulos (1981), the private sector accounted for just over the production of public goods between 1970 and 1977. In our case it seems that the other half of current expenditure on goods and services was enough to let the afore mentioned causal relationship to appear, while we must emphasize that purchases from the private sector are conducted through the bureaucratic mechanism, which, allegedly, does not usually achieve the best possible deals.
III) The absolute price effect

By 'absolute price effect' we mean the impact of inflation on the growth of the nominal government expenditures, and it should not be confused with the relative price effect. Using the wholesale price index (WHO) to measure the price level, we obtained the results below:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Cross-cor</th>
<th>Lag</th>
<th>Causal Pattern</th>
<th>Sign of</th>
</tr>
</thead>
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<td>$Y_t$ ($v_t$)</td>
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<td>($k$)</td>
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<td>b</td>
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<td>+</td>
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As it follows from the above cross-correlations, not only does inflation affect government spending, but there are strong indications that there is feedback between inflation and government expenditure, the positive signs stressing the inflationary role of the Greek public sector (Similar conclusions are reached in, among others, IOBE (1979)).
IV) Public debt and government expenditure

<table>
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<td>X→→→Y</td>
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</table>

The results from the tests which involve the absolute level of the public debt seem to be quite straightforward. The negative cross-correlations at negative lags seem to suggest that the public debt acts as constraint to public consumption (62) and transfer payments (65). Government investment, which shows a positive cross-correlation at a positive lag seems to be the main contributor to the level of the public debt (63). On the other hand, SUB is caused positively by DEBT (66), probably in the sense, that their increase, following an increase in the (substantial) foreign part of DEBT, is in order to protect the home markets from adverse effects of the rising public debt. The overall situation is summarized in (69a,b), where, by interpreting arbitrarily $X----Y$ as $X→→Y$, public spending increases the level of public debt, which in turn acts as a constraint to the growth of the former.
V) The openness of the economy and government expenditure

<table>
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<td>EXP (v_t)</td>
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<td>+</td>
</tr>
<tr>
<td>GTR (u_t)</td>
<td>OPEN (v_t)</td>
<td>#</td>
<td>X→Y</td>
<td>#</td>
</tr>
</tbody>
</table>

Hinrichs (1965) first suggested that in a developing country the growth of the foreign trade sector would be of primary importance to the growth of the government sector (revenue-side); first, it would mean more company and personal income tax revenues and second, spill-over effects would make the collection of other taxes easier.

The 'openness' of the economy was approximated by the ratio of imports, exports or their sum to GDP (IMP, EXP, and OPEN respectively). The impact of these variables on the tax revenues can be seen in (70), (71) and (72), where OPEN did not indicate any pattern, but EXP and IMP appeared to have an instantaneous causality.
pattern with respect to TAX. If (71) and (72) were interpreted as unidirectional causal patterns running from IMP and EXP to TAX, then Hinrichs's thesis is supported; yet, it was probably aggregation that did not let the negative effect of income taxation on imports appear. By examining, therefore, the revenue side, it seems that there might be good reasons for the Hinrichs's thesis to be justified, the government sector growing alongside and because of the foreign trade sector.

An altogether different picture appears, when the expenditure side of the public sector is examined. Government consumption (GC) is instantaneously causally related to IMP (73) in a positive way, but that is not the case for GI, which seems to have an adverse effect on them (74), probably lending this characteristic to relationship (75), as well. On the other hand, GI has a positive effect on exports (78), while from (76a,b,c) one can see the feedback relationship between SUB and IMP, which is probably reflected in (85a,b,c), as well. This could be interpreted as follows: higher levels of imports generate more subsidies to the domestic production for import substitution, which subsidies in turn tend to produce an adverse effect on imports.

From the above discussion it seems that, although government consumption tends to increase imports (73), government expenditure, in general, has a positive effect on import substitution (74, 75, 76c) and stimulates exports (78). Vartholomeos (1984) also drew the same conclusions in his study, where by using seventeen
different government instruments, he showed that the increase in the balance of payments deficit is less than the increase in imports and that subsidising domestic goods and changing the structure of government expenditure have the same to the ones found here effects on imports and the trade deficit.

VI) Fiscal illusion

<table>
<thead>
<tr>
<th>Variable</th>
<th>Cross-cor</th>
<th>Lag</th>
<th>Causal Pattern</th>
<th>Sign of $q_{uv}(k)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$X_t$</td>
<td>$Y_t$</td>
<td>$q_{uv}(k)$</td>
<td>$-1$</td>
<td>$X \rightarrow Y$</td>
</tr>
</tbody>
</table>

To test for the existence of fiscal illusion (see Wagner and Weber, 1977), that is, whether, if the 'price' of the public 'good', being hidden in indirect taxation, facilitates the growth of tax-revenues, we used FISCAL, the percentage of indirect to total tax revenues (TAX). As it can be seen, causality was found to run from FISCAL to TAX, with a positive sign for the relevant cross-correlation, stressing the fact that fiscal illusion has facilitated the growth of government in Greece. Taking into account that indirect taxation is a falling share of total tax revenues (from around 70% in the late 1940's to around 48% in the early 1980's, i.e. a reduction in FISCAL of approximately 30%), then this tendency must have been a constraint to the growth of the Greek public sector.
VII) The concentration process

Peacock and Wiseman (1967) suggested that in the process of growth of an economy, improvements in transportation and communication result into a desire for uniform standards of public services, which, in turn, would tend to increase the technical efficient size of government organs and cause central government expenditure to rise faster than total expenditure. On the other hand, it has been suggested that centralization means higher levels of expenditure to the degree that produces diseconomies and fiscal immobility and is sought after by the bureaucracy (for recent evidence on this thesis see Oates, 1985). This ratio is here represented by CONC, and the results from our tests are given below:

<table>
<thead>
<tr>
<th>Variable (u_t)</th>
<th>Y_t (v_t)</th>
<th>Cross-cor (u^v)</th>
<th>Lag (k)</th>
<th>Causal Pattern</th>
<th>Sign of (u^v)</th>
</tr>
</thead>
<tbody>
<tr>
<td>88 GC</td>
<td></td>
<td>.408</td>
<td>2</td>
<td>X---Y</td>
<td>+</td>
</tr>
<tr>
<td>89 GI</td>
<td></td>
<td>#</td>
<td>#</td>
<td>X••••••Y</td>
<td>#</td>
</tr>
<tr>
<td>90 G</td>
<td>CONC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>91 TR</td>
<td></td>
<td>#</td>
<td>#</td>
<td>X••••••Y</td>
<td>#</td>
</tr>
<tr>
<td>92 SUB</td>
<td></td>
<td>#</td>
<td>#</td>
<td>X••••••Y</td>
<td>#</td>
</tr>
<tr>
<td>93 GTR</td>
<td></td>
<td>#</td>
<td>#</td>
<td>X••••••Y</td>
<td>#</td>
</tr>
</tbody>
</table>

As it can be seen from the above table, only government consumption seemed to follow the pattern indicated in the beginning. A reservation we have about this test is that CONC actually refers to the centralization of GTR, and it would be more appropriate to use separate centralization ratios for each category of public expenditure. Nevertheless, the data that were
available did not allow for it, although such a grouping would probably yield similar results, at least for exhaustive consumption expenditures, which are traditionally carried out by the central government. Despite this deficiency we can still say that it was changes in the level of expenditures that gave rise to greater centralization, i.e. as the public sector in Greece grew the central government was absorbing more resources with relation to the rest of the public sector.

IX) The demonstration effect

The rising degree of contact between people and between nations gives grounds to believing that levels of public spending outside someone's community may play a role in shaping the demand for public expenditures within the community. This demonstration effect may influence a number of specific demands for public spending, ranging from defence to welfare. In our case, to test whether such a proposition is true, we used the aggregate level of government expenditure of a wide group of countries, namely the European members of O.E.C.D. The results are presented below.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Cross-cor</th>
<th>Lag</th>
<th>Causal Pattern</th>
<th>Sign of</th>
</tr>
</thead>
<tbody>
<tr>
<td>$X_t$ ($u_t$)</td>
<td>$Y_t$ ($v_t$)</td>
<td>$q_{uv}(k)$</td>
<td>(k)</td>
<td>1</td>
</tr>
<tr>
<td>94a G</td>
<td>95a GTR</td>
<td>.414</td>
<td>.463</td>
<td>-.3</td>
</tr>
<tr>
<td>b</td>
<td>GOECD</td>
<td>.504</td>
<td>.553</td>
<td>-.2</td>
</tr>
<tr>
<td>b</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

The strong positive cross-correlations, in the
above table, indicate that the growth of public spending in other countries, with which Greece has close relations, has had an impact on the growth of the Greek public sector. Unfortunately, this as much as we can say, since the degree of aggregation does not really permit further elaboration.

### IX) Unemployment

<table>
<thead>
<tr>
<th>Variable</th>
<th>$X_t$ ($u_t$)</th>
<th>$Y_t$ ($v_t$)</th>
<th>Lag $(x)$</th>
<th>Causal Pattern</th>
<th>Sign of $g_{uv}(k)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>96 GC</td>
<td>#</td>
<td>#</td>
<td>X-------Y</td>
<td>#</td>
<td></td>
</tr>
<tr>
<td>97 GI</td>
<td>#</td>
<td>#</td>
<td>X-------Y</td>
<td>#</td>
<td></td>
</tr>
<tr>
<td>98 G</td>
<td>#</td>
<td>#</td>
<td>X-------Y</td>
<td>#</td>
<td></td>
</tr>
<tr>
<td>99 TR</td>
<td>.340</td>
<td>0</td>
<td>X--------Y</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>100 SUB</td>
<td>#</td>
<td>#</td>
<td>X-------Y</td>
<td>#</td>
<td></td>
</tr>
<tr>
<td>101 GTR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>102 GC70</td>
<td></td>
<td>UNEMP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>103 GI70</td>
<td>-.375</td>
<td>1</td>
<td>X--------Y</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>104 G70</td>
<td>-.373</td>
<td>1</td>
<td>X--------Y</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>105 TR70</td>
<td>.350</td>
<td>0</td>
<td>X--------Y</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>106 SUB70</td>
<td>#</td>
<td>#</td>
<td>X-------Y</td>
<td>#</td>
<td></td>
</tr>
<tr>
<td>107 GTR70</td>
<td>#</td>
<td>#</td>
<td>X-------Y</td>
<td>#</td>
<td></td>
</tr>
</tbody>
</table>

The rate of unemployment was found to have a positive relationship to transfer payments (99, 105), being unrelated to other forms of public spending, when current prices were used. The actual patterns between TR and UNEMP were actually ones of instantaneous causality, but it might not be too arbitrary to assume that causality runs from UNEMP to TR (or TR70), since our yearly data would not be able to capture the usually weekly or monthly payment of unemployment benefits and it is plausible to assume that unemployment benefits are not attractive enough to be an alternative to employment. Such an assumption is realistic in our case,
because, during the 1950-1980 period, Greece did not suffer at any time of extensive unemployment, while there had been quite a differential between wages and the corresponding unemployment benefits.

Finally, it is very interesting to see that, in real terms, the government investment expenditure is a significant generator of jobs, as shown by the negative cross-correlation in (103), which probably indicates a very strong tendency, which appears in (104), as well.

X) Defence expenditure

<table>
<thead>
<tr>
<th>Variable</th>
<th>Cross-cor</th>
<th>Lag</th>
<th>Causal</th>
<th>Sign of</th>
</tr>
</thead>
<tbody>
<tr>
<td>X (u_t)</td>
<td>Y (v_t)</td>
<td>( \hat{e}_{uv}(k) )</td>
<td>( (k) )</td>
<td>( \delta_{uv}(k) )</td>
</tr>
<tr>
<td>108 GD</td>
<td>DEFENS</td>
<td>-.353</td>
<td>-2</td>
<td>X---Y</td>
</tr>
<tr>
<td>109 GTD</td>
<td>DEFENS</td>
<td>-.349</td>
<td>-2</td>
<td>X---Y</td>
</tr>
</tbody>
</table>

(108) and (109) indicate that defence expenditure has affected non-defence government expenditure in a negative way. The 1950-1980 period in Greece has to show the end of the civil war, the joining with NATO, at least two serious crises with Turkey over Cyprus and the Aegean and a seven-year military dictatorship. All these events underline the high priority that defence expenditure must have had. Bacon and Karayiannis-Bacon (1980) contended that defence expenditure has never acted as a constraint, since it has been greatly financed from abroad. Yet, the case is that the financing of defence from foreign free aid and contributions has fallen significantly from 60% (1948) to 33% (1959) to 11% (1964) to less than 1% (1976),
while there has been an almost 100-fold increase in the absolute level of such expenditure (current prices). Therefore, we think that DEFENS must be seen as a constraint to the growth of non-defence expenditures.

**XI) Tax evasion**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Cross-cor</th>
<th>Lag</th>
<th>Causal</th>
<th>Sign of</th>
</tr>
</thead>
<tbody>
<tr>
<td>$X_t$ ($u_t$)</td>
<td>$Y_t$ ($v_t$)</td>
<td>$\rho_{uv}(k)$</td>
<td>(k)</td>
<td>$\epsilon_{uv}'(k)$</td>
</tr>
<tr>
<td>110 TAX</td>
<td>EVA</td>
<td>-.434</td>
<td>-1</td>
<td>X$\leftarrow$Y</td>
</tr>
</tbody>
</table>

Our proposition is that government expenditure growth must be affected by tax evasion to the degree that the latter is a constraint to the growth of revenues (in this context it is also implicitly recognized that expenditures for the capture of evaded revenues forms an infinitesimal part of government spending). The relationship shown in (110) fully supports our view by presenting a negative cross-correlation at a negative lag. Taking into account that our measure of direct tax evasion shows an overall decline of approximately 30% for the 1959-1981 period, we could say that (in a case analogous to that of FISCAL), public expenditure growth has been assisted by the reduction in tax evasion.

**XII) Industrialization and technological progress**

The two variables we used here (INDU and EQUIP) were employed in an effort to capture possible effects of the modernization of the economy on the public sec-
New techniques of production and more complex patterns in industry can potentially lead to increased demand for public services, such as legal, educational, and communication, and public investment (mainly infrastructure). Writers, as early as A. Wagner, spoke about the increasing interventionist role of the state as a product of changing technologies. The results we obtained are given below.

<table>
<thead>
<tr>
<th>Variable</th>
<th>( X_t ) (( u_t ))</th>
<th>( Y_t ) (( v_t ))</th>
<th>Cross-cor ( \rho_{uv}(k) )</th>
<th>Lag ( (k) )</th>
<th>Causal Pattern</th>
<th>Sign of ( \rho_{uv}(k) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>111 GC</td>
<td>( X )</td>
<td>0.382</td>
<td>-2</td>
<td>( X \rightarrow Y )</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>112 GI</td>
<td>INDU</td>
<td>0.342</td>
<td>0</td>
<td>( X \rightarrow Y )</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>113 G</td>
<td>#</td>
<td>#</td>
<td>#</td>
<td>( X \rightarrow Y )</td>
<td>#</td>
<td></td>
</tr>
<tr>
<td>114 GC70</td>
<td>INDU70</td>
<td>#</td>
<td>#</td>
<td>( X \rightarrow Y )</td>
<td>#</td>
<td></td>
</tr>
<tr>
<td>115 GI70</td>
<td>#</td>
<td>0.377</td>
<td>0</td>
<td>( X \rightarrow Y )</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>116a G70</td>
<td>b</td>
<td>0.440</td>
<td>0</td>
<td>( X \rightarrow Y )</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>117 GC</td>
<td>EQUIP</td>
<td>0.444</td>
<td>4</td>
<td>( X \rightarrow Y )</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>118 GI</td>
<td>#</td>
<td>#</td>
<td>#</td>
<td>( X \rightarrow Y )</td>
<td>#</td>
<td></td>
</tr>
<tr>
<td>119 G</td>
<td>EQUIP70</td>
<td>0.500</td>
<td>0</td>
<td>( X \rightarrow Y )</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>120 GC70</td>
<td>#</td>
<td>0.362</td>
<td>2</td>
<td>( X \rightarrow Y )</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>121 GI70</td>
<td>#</td>
<td>0.482</td>
<td>0</td>
<td>( X \rightarrow Y )</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>122 G70</td>
<td>#</td>
<td>0.383</td>
<td>2</td>
<td>( X \rightarrow Y )</td>
<td>+</td>
<td></td>
</tr>
</tbody>
</table>

It can be seen from the above tests that government consumption, vis a vis services, have a positive relationship with both INDU and EQUIP in nominal and real terms. GC is clearly caused in (111) by INDU, which leads us to interpret (114), (116a), (117) and (120) similarly. On the other hand, government investment seems to have been a causal factor to industrialization and technological progress. This stresses the leading role of the public sector in the Greek economy. Overall, the tests support the theoretical views exposed in the beginning.
### XIII) Demographic variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Cross-cor</th>
<th>Lag</th>
<th>Causal Pattern</th>
<th>Sign of</th>
</tr>
</thead>
<tbody>
<tr>
<td>$X_t$ ($u_t$)</td>
<td>$Y_t$ ($v_t$)</td>
<td>$g_{uv}^k(k)$</td>
<td>$g_{uv}^k(k)$</td>
<td>$g_{uv}^k(k)$</td>
</tr>
<tr>
<td>123 GC70</td>
<td>#</td>
<td>#</td>
<td>X----Y</td>
<td>#</td>
</tr>
<tr>
<td>124 G70</td>
<td>.394</td>
<td>0</td>
<td>X----Y</td>
<td>+</td>
</tr>
<tr>
<td>126 TR70</td>
<td>#</td>
<td>#</td>
<td>X----Y</td>
<td>#</td>
</tr>
<tr>
<td>127 SUB70</td>
<td>#</td>
<td>#</td>
<td>X----Y</td>
<td>#</td>
</tr>
<tr>
<td>128 GTR70</td>
<td>#</td>
<td>#</td>
<td>X----Y</td>
<td>#</td>
</tr>
<tr>
<td>129 GC70</td>
<td>.345</td>
<td>-1</td>
<td>X+---Y</td>
<td>+</td>
</tr>
<tr>
<td>130 GI</td>
<td>#</td>
<td>#</td>
<td>X----Y</td>
<td>#</td>
</tr>
<tr>
<td>131 G70</td>
<td>#</td>
<td>#</td>
<td>X----Y</td>
<td>#</td>
</tr>
<tr>
<td>132 TR70</td>
<td>#</td>
<td>#</td>
<td>X----Y</td>
<td>#</td>
</tr>
<tr>
<td>134 GTR70</td>
<td>#</td>
<td>#</td>
<td>X----Y</td>
<td>#</td>
</tr>
<tr>
<td>135 GC70</td>
<td>#</td>
<td>#</td>
<td>X----Y</td>
<td>#</td>
</tr>
<tr>
<td>136 GI70</td>
<td>#</td>
<td>#</td>
<td>X----Y</td>
<td>#</td>
</tr>
<tr>
<td>137 G70</td>
<td>.366</td>
<td>0</td>
<td>X----Y</td>
<td>+</td>
</tr>
<tr>
<td>138 TR70</td>
<td>#</td>
<td>#</td>
<td>X----Y</td>
<td>#</td>
</tr>
<tr>
<td>139 SUB70</td>
<td>#</td>
<td>#</td>
<td>X----Y</td>
<td>#</td>
</tr>
<tr>
<td>140 GTR70</td>
<td>.391</td>
<td>-1</td>
<td>X+---Y</td>
<td>+</td>
</tr>
<tr>
<td>141 GC</td>
<td>.473</td>
<td>-2</td>
<td>X+---Y</td>
<td>+</td>
</tr>
<tr>
<td>142 GI</td>
<td>.348</td>
<td>-3</td>
<td>X+---Y</td>
<td>+</td>
</tr>
<tr>
<td>143 G70</td>
<td>.447</td>
<td>-2</td>
<td>X+---Y</td>
<td>+</td>
</tr>
<tr>
<td>144 TR70</td>
<td>#</td>
<td>#</td>
<td>X----Y</td>
<td>#</td>
</tr>
<tr>
<td>145 SUB70</td>
<td>#</td>
<td>#</td>
<td>X----Y</td>
<td>#</td>
</tr>
<tr>
<td>146 GTR70</td>
<td>#</td>
<td>#</td>
<td>X----Y</td>
<td>#</td>
</tr>
<tr>
<td>147 GC70</td>
<td>#</td>
<td>#</td>
<td>X----Y</td>
<td>#</td>
</tr>
<tr>
<td>148 G70</td>
<td>.442</td>
<td>-3</td>
<td>X+---Y</td>
<td>+</td>
</tr>
<tr>
<td>149 TR70</td>
<td>.472</td>
<td>-3</td>
<td>X+---Y</td>
<td>+</td>
</tr>
<tr>
<td>150 SUB70</td>
<td>#</td>
<td>#</td>
<td>X----Y</td>
<td>#</td>
</tr>
<tr>
<td>152 GTR70</td>
<td>.347</td>
<td>-2</td>
<td>X+---Y</td>
<td>+</td>
</tr>
</tbody>
</table>

Surprisingly enough, population density (DENS) was found to be unrelated to any form of government expenditure, and does not appear in the above table. This could be attributed to the fact that the examined period just manages to cover one generation, and also that population in Greece\footnote{Population density and population level are equivalents and can be used interchangeably, since (Footnote continued)} has been rising during the...
same period at less than 1% annually, on average.

On the other hand, urbanization, which rose from 37.5% in 1948 to 58.1% in 1981, was found to have a positive effect on public spending, especially investment (124, 125).

The age distribution of the population, as indicated by YOUNG and OLD, was also found to affect public spending positively. Especially OLD had an impact on almost every aspect of it, and it should be stressed that elderly people make up for a growing share of the Greek population.

6) General conclusions

The preceding analysis makes very clear the extremely complex roles that the public sector plays in Greece. As far as the determinants of its change are concerned, we can conclude that developmental aspects of the economy (as indicated by the income variables, foreign trade growth, unemployment and price levels, industrialization and technological progress), institutional features (fiscal illusion, tax evasion, the demonstration effect), demographic variables, production costs, and defence expenditure, all play a significant part in the formulation of the growth pattern of government expenditure in some level of

\[ \text{DENS} = \text{population/area}, \text{ and the area of Greece has remained unchanged during the examined period.} \]
aggregation or other.

Their influence is far from simple and straightforward as was indicated by the various feedbacks and the different relationships in direction and sign that can occur when different degrees of (dis)aggregation are used. This should make one cautious in both the theoretical and quantitative approaches to be used, when any of the issues examined here are under consideration.

The above tests and many of the results may provoke scepticism but their chief purpose is to stress the importance of empirically identifying causal relationships as a bridge between the theoretical background and the usual econometric work. It is hoped that an empirical causal analysis, like the one presented here, puts the issue on the right basis and it can facilitate further studying of the government sector.
B) Income elasticities and transfer functions.

The causality tests which preceded this section indicated that simple OLS regression coefficients should not be relied upon as expressing elasticities. We found out that we do have bias in the elasticities presented at the end of Chapter III, mainly because of feedback. Given a correct identification of causality, the question that is posed is how can we obtain some reliable estimates of elasticities. Such estimates can, of course, be derived from models which follow a correct specification or, as we shall suggest here, from the use of transfer functions.

Transfer functions are multivariate modeling procedures developed by Box and Jenkins (1970). A transfer function model describes the dynamic distribution of the effect of a variable (the input variable) on another variable (the output variable). Although we referred to a multivariate technique we shall restrict ourselves to the bivariate case, which is simpler. Thus, the relationship between government expenditure and income could be described by a relationship such as

\[ G_t = \nu(B)Y_t + N_t \]

where \( G_t \) = the output series (government expenditure),
\( Y_t \) = the input series (income),
\( N_t \) = the combined effects of all other factors influencing \( G_t \) (the "noise"), and
\( \nu(B) = (\nu_0 + \nu_1 B + \nu_2 B^2 + \ldots + \nu_k B^k) \), where \( k \) is the order of the transfer function.

To understand the above expression, let us write it in a
more parsimonious form

\[ g_t = \frac{w(B)}{\delta(B)} y_{t-b} + \frac{\theta(B)}{\varphi(B)} \alpha_t \]

where

\[ w(B) = \omega_0 - \omega_1 B - \omega_2 B^2 - \ldots - \omega_s B^s, \]
\[ \delta(B) = \delta_0 - \delta_1 B - \delta_2 B^2 - \ldots - \delta_r B^r, \]
\[ \theta(B) = \theta_0 - \theta_1 B - \theta_2 B^2 - \ldots - \theta_q B^q, \]
\[ \varphi(B) = \phi_0 - \phi_1 B - \phi_2 B^2 - \ldots - \phi_p B^p, \]

\( g_t \) = the transformed and differenced series \( G_t \),
\( y_t \) = the transformed and differenced series \( Y_t \),
\( \alpha_t \) = the random noise component, and
\( r, s, p, q, \) and \( b \) are constants.

The significance of the above symbols can be described in short as follows: The \( w \) function of degree \( s \) shows for how long the output series continues to be influenced by new values of the input series; the \( \delta \) function indicates that the output function is related to its own past values until the period \( (t-r) \); and \( b \) is simply the period at which the input series begins influencing the output series, i.e. \( g \) is not influenced by \( y \) until period \( (t+b) \). The ratio of the two functions is the function \( \nu(B) \), where the coefficients \( \nu_1 \) to \( \nu_k \) are called the transfer function weights and their sum represents the gain of the output series. The gain is what we are going to regard as the 'elasticity' of government expenditure with respect to income. Finally, the remaining functions \( \theta(B) \) and \( \varphi(B) \) are the moving average and autoregressive components of the combined effect of other factors on our input series.

We shall not go into any details about the actual identification, estimation, and diagnostic checking.
procedures of the transfer functions, because they are quite lengthy. Suffice to say that they resemble very much the procedures we followed for the causality tests, and that the identification contains a certain element of subjectivity (checked by the principle of parsimony) exactly like the univariate (ARIMA) models, which are special cases of the transfer functions. A satisfactory exposition of this issues can be also found in Makridakis et al (1983).

The elasticities were estimated by using transfer functions on the logs of the original variables. It should be mentioned that our estimations involved values of $b, s$, and $r$ equal to 0, and an error term which included a first degree autoregressive component. This, we think, is not without significance. It means that income changes have an effect on changes in government expenditure within the period that they happen, while additional (outside the period changes) leave government expenditure unaffected. On the other hand, past changes in government expenditure also seem to have no effect on present levels. The above suggest that the government's response to changes in income is quite fast, although rigid to further changes once it happens, while the non-appearance of past expenditure levels seems to indicate that the incrementalistic process can not explain the growth of public expenditure, at least at the margin.

The elasticities we estimated were all with respect to private income in current and constant prices and are given below (t-statistics against 0 at 5% are given in
parentheses— '*' means that the coefficient is not significantly different from 1 at 5%):

### Constant prices

\[
\begin{align*}
G_{C70_t} &= -1.820 + 0.9997P_{70_t} + (1 - 0.703B)^{-1}u_t \\
& (2.97) (19.73) (4.92) \\
G_{I70_t} &= 0.921P_{70_t} + (1 - 0.873B)^{-1}u_t \\
& (4.87) (9.38) \\
G_{70_t} &= -1.817 + 1.029P_{70_t} + (1 - 0.458B)^{-1}u_t \\
& (-6.27) (43.00) (2.87) \\
T_{R70_t} &= -10.006 + 1.611P_{70_t} + (1 - 0.514B)^{-1}u_t \\
& (-15.81) (30.67) (3.12) \\
G_{D70_t} &= -2.379 + 1.048P_{70_t} + (1 - 0.816B)^{-1}u_t \\
& (-2.51) (13.31) (7.36) \\
G_{TD70_t} &= -5.352 + 1.331P_{70_t} + (1 - 0.564B)^{-1}u_t \\
& (-9.60) (28.92) (4.18)
\end{align*}
\]

### Current Prices

\[
\begin{align*}
G_{C_t} &= -3.468 + 1.127P_t + (1 - 0.667B)^{-1}u_t \\
& (-11.25) (44.44) (4.75) \\
G_{I_t} &= -2.459 + 0.979P_t + (1 - 0.900B)^{-1}u_t \\
& (-2.27) (10.47) (10.53) \\
G_{t} &= -2.692 + 1.094P_t + (1 - 0.802B)^{-1}u_t \\
& (-7.77) (38.40) (7.52) \\
T_{R_t} &= -5.679 + 1.246P_t + (1 - 0.769B)^{-1}u_t \\
& (-10.10) (26.91) (6.05) \\
G_{D_t} &= -2.889 + 1.084P_t + (1 - 0.894B)^{-1}u_t \\
& (-5.72) (24.97) (10.08) \\
G_{TD_t} &= -3.156 + 1.147P_t + (1 - 0.879B)^{-1}u_t \\
& (-5.23) (22.40) (9.25)
\end{align*}
\]

Comparing the elasticities obtained from the transfer functions to those which were estimated by using simple regressions we find out—not without surprise—that they are very alike. This, we think, is coincidental for the following reason. In section A) of this chapter we showed that the relationship that connects the true structural coefficients of a feedback
system and the coefficient obtained from an OLS regression is

\[ b_1 = \frac{a_1 + a_2 (\sigma_Y^2 / \sigma_X^2)}{1 + a_1 a_2} \]

where \( \sigma \)'s are variances.

We propose that the elasticity estimates from OLS regressions and transfer functions will be more alike (i.e. OLS estimates will not be biased because of the feedback) the closer the true coefficient and the ratio of the standard deviations of the two variables are closer to unity. If all of them are 1, then the above expression yields \( b_1 = 1 \) and there is no bias. Moreover, we see that the elasticities obtained from the regressions corrected for serial correlation and the transfer functions are almost identical. To explain this we can only assume that the source for serial correlation was the feedback between the variables and that was corrected by the dynamic structure of the regression which functionally is very closely related to that of the transfer function.

In conclusion, we can say that income elasticities of exhaustive government expenditures in Greece can be safely assumed to be of unitary values, while any expenditure that involves some kind of transfer payments has an elasticity of greater than one. These results seem to support Beck's thesis. Another view on estimating income elasticities is presented in the following section.
C) The Henning and Tussing elasticity

Henning and Tussing proposed the following model for the estimation of the income elasticity of government expenditure.

\[ G^e_t = a + bY_t \]  \hspace{1cm} (1)

\[ G_t - G_{t-1} = k(G^e_t - G^e_{t-1}) + l\Delta D_t + mZ_t \]  \hspace{1cm} (2)

where all variables are in log form and

\[ G_t = \text{real non-defense exhaustive expenditures, per capita} ; \]

\[ G^e_t = \text{desired (or equilibrium) level of } G ; \]

\[ Y_t = \text{real per capita private GNP} ; \]

\[ D_t = \text{real per capita defense expenditure} ; \]

\[ Z_t = \text{ratio of full employment to actual real per capita private GNP} ; \]

\[ t = \text{time period} ; \]

\[ a, b, k, l, m \text{ parameters} ; \]

The above model assumes that the desired level of government expenditure is a function of income, while the change in non-defense expenditure is a function of the degree to which the equilibrium level of G was reached the period before, the degree to which full employment income is achieved during the current period, and the change in defence expenditure. This model is reduced, so that the unobserved \( G^e_t \) is eliminated, into

\[ G_t = ak + bkY_t + l\Delta D_t + mZ_t + (1-k)G_{t-1} \]  \hspace{1cm} (3).

Thus, by means of (3) Henning and Tussing take into account not only the 'standard' income effect on public expenditure, but the need for counter-cyclical spending, as well, together with the effect of defence spending.
These short-run influences are also completed with the short-run income elasticity, which is given by $bk$, where $b$ is the long-run elasticity, and $k$ is what Henning and Tussing call the measure of the speed of response, and can take values between 1 (i.e. during the time-period all of the difference between desired and actual spending was travelled) and 0 (none of it was covered)).

For the estimation of the above equation we used the variables exactly as defined above, save for $Y_t$, which is private expenditure, rather than GNP, and $Z_t$, which is not the ratio of full-employment to actual income (vis private expenditure), but rather of trend-income to actual. This was done so, because the full employment income has no meaning in developing countries, such as Greece, since resources are frequently under-utilized due to the presence of severe structural bottlenecks. Also, following the suggestion of Henning and Tussing, we should use correction for possible autocorrelation, since the inclusion of the lagged dependent variable would yield a biased Durbin-Watson statistic, but eventually such a need did not arise, since the autocorrelation function of the residuals indicated that the error term is random. Our empirical estimates of the coefficients of (3), and for the 1950-1980 period, are as follows:

$$
\begin{array}{cccccc}
 a & k & b & l & m \\
 -2.23 & 0.358 & 0.961 & -.095 & -0.471 \\
 (-13.12) & (2.92) & (22.23) & (-1.83) & (-1.96)
\end{array}
$$

(t-statistics in parentheses ; $R^2 = .9937$)

The above results indicate that the implied
short-run elasticity $bk$ is 0.344, while the implied long-run one is .961 but not statistically different from 1 ($t-st = -0.9$). This implies a GNP elasticity of $G$ equal to .968, but taking also into account that $b$ is not statistically different from unity, we can then see that the extracted elasticity does not differ significantly from those shown in Tables III-8,9,10,11. Also it is worth noticing that the business cycle variable $Z$ yielded a negative sign, a strong indication of the Keynesian character of public spending in Greece, while defence spending seems to displace civilian public expenditure, although we should admit that neither the size of the coefficient, nor that of its $t$-statistic support this thesis in a definite way.

D) The Peacock & Wiseman Hypothesis

To test whether any government expenditure growth occurred as a result of a displacement effect we considered the period 1974 to 1978 as the most likely period that could have had such an impact. This period, following the first oil shock, is distinguished by the fall of the dictatorship in Greece, the crisis in Cyprus, and a nadir in the Greek-Turkish relations which subsequently led to a rise in defence expenditure. A simple test à la Bonin would be to run a simple regression of the form

$$G = a_0 + d_0 \text{DUM} + (a_1 + d_1 \text{DUM}) Y$$

where $G$ is non-defence government expenditure and $Y$ is income, and check whether either or both $d_0$ and $d_1$ are statistically significant. Thus we ran a regression of
non-defence exhaustive expenditure on income by using a dummy variable (DUM) which takes the value 1 after 1974 (0 otherwise) and is tested for its effect on both the intercept and the elasticity. By using private income and non-defence exhaustive expenditure in constant prices (GD70 and P70 respectively) the equation we estimated was (t-statistics in parentheses)

\[
GD70 = (-3.819) + 3.439 \text{DUM} + (1.169 \text{DICT}) \text{TIME}
\]

The above results suggest that the afore mentioned period of crisis did not have any significant effect on non-defence government expenditure as indicated by the statistical insignificance of the coefficients of DUM both in the intercept and the elasticity. However, we suggest that we did have a permanent downward displacement of non-defence exhaustive expenditure after 1974 because of increased defence expenditure. This can be seen from the regressions estimated below.

\[
\begin{align*}
\text{DEFENS} &= 8.549 + 0.514 \text{DUM} + (0.037 + 0.007 \text{DICT}) \text{TIME} \\
&(159.85) \quad (5.287) \quad (8.512) \quad (2.327) \\
\text{GD70} &= -3.786 + 4.841 \text{DUM} + (1.276 - 0.341 \text{DUM}) \text{P70} - 0.434 \text{DEFENS} \\
&(-12.95) \quad (1.319) \quad (24.37) \quad (-1.321) \quad (-5.551)
\end{align*}
\]

The first equation shows defence expenditure (DEFENS) as a function of time and of two dummy variables: DUM, which is the same as defined above, and DICT, which takes the value 1 for the years 1967 to 1974, i.e. for the years of the military dictatorship. In the preliminary tests it was found that the events following the fall of the dictatorship in 1974 had a one-out impact on the level of defence spending and none on the trend, while the seven years of the junta had a definite though
small upward effect on the trend. This equation was combined with the equation of government expenditure used before with the addition of DEFENS as an independent variable. Solving the two equations simultaneously we found out that non-defence expenditure was indirectly rather than directly affected by the crisis since the coefficient of DEFENS is negative and significant. The same sort of results were obtained from the estimation of an alternative model, where the non-defence government expenditure equation was substituted by an equation of the share of GD70 in GNP as a function of time, DUM, and DEFENS. These results were

\[
\begin{align*}
\text{DEFENS} &= 8.646 + .605 \text{DUM} + (.029 + .008 \text{DICT}) \text{TIME} \\
&\quad (170.11) (7.903) (7.34) (3.309) \\
(\text{GD70/GNP70}) &= .549 + .351 \text{DUM} + (.0191 - .0135 \text{DUM}) \text{TIME} - .308 \text{DEFENS} \\
&\quad (.669)(.926) (4.467)(-1.076) (-2.980)
\end{align*}
\]

Again we can see that DEFENS is the variable that directly affects GD70 (negatively) rather than DUM. Therefore it seems that the Cyprus crisis and the tension in the Aegean caused a displacement of defence expenditure which in turn had a negative impact on the growth of non-defence spending (similar results were obtained when total expenditure, GTD70, was used). Hence in our case we can accept the presence of a displacement effect in the P&W sense. We did have a displacement which is attributed to the growth of defence expenditure. This displacement has had an impact on the absolute level of government expenditure with respect to GNP but not on the time trend of this size. Also, this impact was negative and this suggests a trade-off situation between defence and non-defence expenditure, the
balance being against the latter. It is worth noticing that after 1974 the defence budget has always been approved by the Parliament unanimously. This shows a change of attitudes from past years, the rigidity of defence expenditure displacing other expenditures.

E) Tax evasion and the growth of government expenditure

If tax evasion is a constraint to the available public revenues, then it is reasonable to assume that it can act as a constraint to the growth of government expenditure. Even if tax evasion was to be eradicated to some extent, it would be unlikely that the government would restrain itself from higher levels of expenditures, resulting from higher levels of revenues, and limit itself to earlier levels of spending, since revenue and expenditure decisions are connected. That is to say that we think that it is unlikely that a government collecting higher level of revenues, because of stemming tax evasion, will reduce the tax rates in return.

In the following analysis, we intend to give a mere display of how expenditures are affected, using some crude concepts and measures of tax evasion. As a measure of tax evasion, we used the expression \[1-(\text{reported income/actual income})\] x 100 \%, that is, the percentage of income that is failed to be declared to the tax authorities. Actual income is the non-agricultural income, as it appears in the national accounts, and reported income is the income reported to the tax authorities by households and corporations. The actual
number of tax payers as a percentage to total population in Greece increased from 3% in 1959 to 18% by 1981. In absolute numbers this is a five-fold increase of taxpayers, as compared with a 13% increase of the population. Subsequently, the percentage of unreported to actual income was reduced from around 85% to 65% during the same period (see Table IV-2).

Table IV-2

<table>
<thead>
<tr>
<th>Year</th>
<th>(1) Actual Income (Total)</th>
<th>(2) Income</th>
<th>(3) Report</th>
<th>(4) Corporate Income (Total)</th>
<th>(5) Tax evasion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1959</td>
<td>83929</td>
<td>12566</td>
<td>400</td>
<td>12966</td>
<td>84.55</td>
</tr>
<tr>
<td>1960</td>
<td>89880</td>
<td>13345</td>
<td>478</td>
<td>13823</td>
<td>84.62</td>
</tr>
<tr>
<td>1961</td>
<td>101407</td>
<td>15732</td>
<td>590</td>
<td>16322</td>
<td>83.90</td>
</tr>
<tr>
<td>1962</td>
<td>107026</td>
<td>16841</td>
<td>681</td>
<td>17522</td>
<td>83.63</td>
</tr>
<tr>
<td>1963</td>
<td>120036</td>
<td>17066</td>
<td>721</td>
<td>17787</td>
<td>85.18</td>
</tr>
<tr>
<td>1964</td>
<td>135270</td>
<td>19740</td>
<td>948</td>
<td>20688</td>
<td>84.71</td>
</tr>
<tr>
<td>1965</td>
<td>154699</td>
<td>21963</td>
<td>1191</td>
<td>23154</td>
<td>85.03</td>
</tr>
<tr>
<td>1966</td>
<td>171436</td>
<td>25457</td>
<td>1314</td>
<td>26771</td>
<td>84.38</td>
</tr>
<tr>
<td>1967</td>
<td>186099</td>
<td>30932</td>
<td>1480</td>
<td>32412</td>
<td>82.58</td>
</tr>
<tr>
<td>1968</td>
<td>199982</td>
<td>43794</td>
<td>1372</td>
<td>45166</td>
<td>77.44</td>
</tr>
<tr>
<td>1969</td>
<td>224225</td>
<td>49240</td>
<td>1346</td>
<td>50586</td>
<td>76.11</td>
</tr>
<tr>
<td>1970</td>
<td>250561</td>
<td>58172</td>
<td>1685</td>
<td>59857</td>
<td>74.47</td>
</tr>
<tr>
<td>1971</td>
<td>281691</td>
<td>66870</td>
<td>2123</td>
<td>68993</td>
<td>75.51</td>
</tr>
<tr>
<td>1972</td>
<td>319416</td>
<td>79176</td>
<td>2376</td>
<td>81552</td>
<td>74.47</td>
</tr>
<tr>
<td>1973</td>
<td>410859</td>
<td>91653</td>
<td>4611</td>
<td>96264</td>
<td>76.57</td>
</tr>
<tr>
<td>1974</td>
<td>486353</td>
<td>118390</td>
<td>10405</td>
<td>128795</td>
<td>73.52</td>
</tr>
<tr>
<td>1975</td>
<td>522357</td>
<td>140717</td>
<td>6810</td>
<td>147527</td>
<td>71.76</td>
</tr>
<tr>
<td>1976</td>
<td>636590</td>
<td>167123</td>
<td>8881</td>
<td>176004</td>
<td>72.35</td>
</tr>
<tr>
<td>1977</td>
<td>749863</td>
<td>205065</td>
<td>9933</td>
<td>214998</td>
<td>71.33</td>
</tr>
<tr>
<td>1978</td>
<td>906486</td>
<td>255998</td>
<td>9315</td>
<td>265313</td>
<td>70.73</td>
</tr>
<tr>
<td>1979</td>
<td>1105900</td>
<td>367390</td>
<td>11359</td>
<td>378749</td>
<td>65.75</td>
</tr>
<tr>
<td>1980</td>
<td>1385478</td>
<td>458672</td>
<td>12897</td>
<td>471569</td>
<td>65.96</td>
</tr>
<tr>
<td>1981</td>
<td>1703399</td>
<td>559383</td>
<td>18919</td>
<td>578302</td>
<td>66.05</td>
</tr>
</tbody>
</table>

Our hypothesis then is that tax evasion affects

1 Actual and reported income refer to the non-agricultural private sector, and include the relevant data for wages and salaries, income from property and entre-

(Footnote continued)
government expenditure indirectly through taxation and in a negative way. To test this hypothesis we constructed a very simple model, which was estimated by the Full Information Maximum Likelihood method (FIML). The model stands as follows:

\[
G = a_0 + a_1 T \quad (1),
\]

\[
T^i = b_0 + b_1 P \quad (2),
\]

\[
T^d = c_0 + c_1 P + c_2 EV \quad (3),
\]

\[
T = T^d + T^i \quad (4),
\]

where \(G\) is total government expenditure, \(T\) is total tax revenues, \(T^d\) and \(T^i\) are direct and indirect tax revenues, respectively, \(P\) is actual income, and \(EV\) represents tax evasion as defined earlier. All variables are in natural logs, while identity (4) was constructed using the same method, as in the relative price effect model earlier. Finally, we used current prices throughout. The model yielded the coefficients shown in Table IV-3, while its fit is judged as very good, and is shown analytically in Appendix 1.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Estimate</th>
<th>t-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a_0)</td>
<td>-0.160</td>
<td>-1.778</td>
</tr>
<tr>
<td>(a_1)</td>
<td>1.031</td>
<td>138.3</td>
</tr>
<tr>
<td>(b_1)</td>
<td>-2.904</td>
<td>-11.74</td>
</tr>
<tr>
<td>(b_0)</td>
<td>1.087</td>
<td>56.87</td>
</tr>
<tr>
<td>(c_1)</td>
<td>-1.798</td>
<td>-1.924</td>
</tr>
<tr>
<td>(c_0)</td>
<td>1.193</td>
<td>33.76</td>
</tr>
<tr>
<td>(c_2)</td>
<td>-0.625</td>
<td>-2.073</td>
</tr>
</tbody>
</table>

The above estimates show that for every unit of

\(^1(\text{continued})\)

entrepreneurship, and pensions, excluding savings (the latter and their interest are non-taxable in Greece).
reduction in tax evasion, direct tax revenues would rise by .625 units, resulting to an almost equal increase in expenditure (.625x1.031=.644). This elasticity is significantly lower than the initial estimate by OLSQ, which was found to be -2.22, but it still is important, since it implies that the decrease in tax evasion by 27% during the examined period has accounted for 17% of the increase in government expenditure. This refers to tax evasion of direct taxes only; taking into account that direct taxes account for around 30% of total tax revenues on average, and that indirect tax evasion is expected to have been quite extensive, as suggested by officials and the innumerable court convictions for indirect tax evasion, then we should suspect that the impact of reducing overall tax evasion would be far greater, at least in absolute terms.

However, the above figures, suggestive as they may be, should not be taken at face value. Our measure of tax evasion is very restrictive and crude, while we failed to take into account many factors, such as changes in tax brackets and tax rates, exemption levels, and the effect of reduced tax evasion on incentives. Our purpose was merely to demonstrate the importance of relaxing an important fiscal constraint, such as tax evasion, and its effect on the growth of government expenditure. We ignored completely any direct demand considerations, and our data could be effortlessly questioned, although, the fact that we conducted the discussion in terms of elasticities means that if the 'true' level of tax evasion is proportional to the one
suggested here, then our results stand.
F) An empirical model of the Relative Price effect

In order to investigate and demonstrate the mechanism and consequences of the relative price effect, and its relevance to the Greek economy, we intend to use a simple model, which derives from the Jackson & Ulph (1973) model. The proposed model reflects the division of the economy into a 'progressive' (the private) sector, and a 'less progressive' (the public) sector. The present analysis imposes no a priori restrictions to the size of the technological progress and returns to scale in either sector. Therefore, we allow for factors other than differential rates of technical progress to influence the relative price ratio of the two sectors.

These prices are assumed to belong to a good privately produced, and a good provided through the public sector. Both sectors involve only labour as their factor of production. Capital is assumed away, in the sense that the two sectors do not compete for it, and it is embodied into the technical progress factor, in order to improve the manageability of the model. Following the aforementioned Jackson & Ulph model, we also introduce some assumptions on distribution and demand to make it a small scale general equilibrium model. While all variables are expressed in real terms, for the estimation of the model we make a distinction between real output and real expenditure of the public sector.
1. The structural model

The interpretation of the symbols used below is as follows:

\( P \) : Consumption expenditure of the private sector, net of transfers from the public sector. It can be seen as representing the private sector output.

\( G \) : Consumption of the public sector good. It can be seen as representing the public sector output.

\( L_p \) : Labour force employed in the private sector.

\( L_g \) : " " " " public " ".

\( L \) : Total labour force. It is the sum of \( L_p \) and \( L_g \).

\( W_p, W_g \) : The wage rates in the private and public sector respectively.

\( W \) : Private sector profits.

\( Y \) : Earned income (i.e. net of transfers) available to the private sector (to be defined precisely later).

\( p \) : The price of the public sector 'good' relative to the price of the private sector 'good'. The latter will serve as the numeraire.

\( E \) : Public sector exhaustive expenditure.

\( \alpha, \gamma \) : Steady rates of technical progress in the private and public sectors respectively.

\( \beta, \delta \) : Returns to scale in the private and public sector respectively.

\( f, g \) : Steady rates of growth of labour in the private and public sectors respectively.

\( k \) : Coefficient of 'adjustment'. It measures the actual discrepancy between \( W_p \) and \( W_g \). When it takes the
value of 1 this discrepancy is zero.

σ : Own-price elasticity of demand for the public sector 'good'.

τ : Income elasticity of demand for the public sector good.

φ : Steady rate of growth of public expenditure (E).

\[ L_0, L_0, A, B, \phi, \zeta : \text{Constants.} \]

\[ t : \text{Time.} \]

The model stands as follows:

\[ P = A e^{\alpha t} L_P^\beta \] (1) \( \alpha > 0, \alpha > 0, 0 < \beta < 1 \). This is the production function for the private sector.

\[ G = B e^{\gamma t} L_G^\delta \] (2) \( B > 0, \gamma > 0, 0 < \delta < 1 \). The production function for the public sector.

\[ W_P = A \phi e^{\alpha t} L_P^{\beta - 1} \] (3).

\[ W_G = pB \phi e^{\gamma t} L_G^{\delta - 1} \] (4). The usual relationships for determining wage rates/demand for labour by the two sectors. (3) and (4) are connected by

\[ W_G = e^{1-k} t W_P \] (5).

\[ \Pi = (1-b)A e^{\alpha t} L_P^\beta \] (6). This is the usual definitional relationship for profits, obtained by using (1) and (2) ¹.

\[ L_P = L_0 e^{\alpha t} \] (7).

\[ L_G = L_0 e^{\gamma t} \] (8).

\[ L = L_P + L_G \] (9). Growth of employment in the

¹ \[ \Pi = \text{revenue} - \text{cost} = A e^{\alpha t} L_P^\beta - A \phi e^{\alpha t} L_P^\beta, \text{or} \]

\[ \Pi = (1-\beta)A e^{\alpha t} L_P^\beta \]
two sectors and the market clearing identity.

\[
\frac{Y}{L} = W_0 \frac{L_0}{L} + W_p \frac{L_p}{L} + \frac{\Pi}{L} \quad (10).
\]

This relationship defines per capita income as a weighted average of income earned in both sectors, where profits are assumed equally distributed. Therefore, since \(Y/L\) will be used later in the demand function for the public good, we have allowed civil servants to express their demand, as part of the private sector, from this respect.

\[
\frac{G}{L} = \varphi_p \sigma \left( \frac{Y}{L} \right) \quad (11). \text{This is the household demand function for the public sector 'good', expressed in per capita terms, and depending on own-price and income.}
\]

\[
E = \varsigma e^{\varphi t} W_0 L_0 \quad (12). \text{This expression defines exhaustive public expenditure, growing at a steady rate } \varphi, \text{ as a linear function of the wage bill, and its use will become apparent later on in the empirical estimation.}
\]

2. Analysis of the model

From (3), (4), and (5) we have that

\[
e^{(1-k)t} A \beta e^{\alpha t} L_p^{\beta - 1} = p \varphi e^{\gamma t} L_0^{\delta - 1},
\]

which yields
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\[ p = \frac{A}{B} \beta \delta \left[ \alpha - \gamma + (1-k) \right] t \frac{L_P^{\beta-1}}{L_0^{\delta-1}} \]  \hspace{1cm} (13a) \]

Substituting (7) and (8) into (13a) yields:

\[ p = \frac{A}{B} \beta \delta \left[ \alpha - \gamma + (1-k) \right] t \frac{e^{f(\beta-1) t}}{e^{g(\delta-1) t}} \frac{L_P^{\beta-1}}{L_0^{\delta-1}}, \]

or

\[ p = \frac{A}{B} \beta \delta \frac{L_P^{\beta-1}}{L_0^{\delta-1}} \left[ (\alpha - \gamma) + (1-k) + f(\beta-1) - g(\delta-1) \right] t \]  \hspace{1cm} (13b) \]

We can rewrite (13b) in two forms. The first one is

\[ p = \frac{A}{B} \beta \delta \frac{L_0^{1-\delta}}{L_P^{1-\beta}} \left[ \alpha - \gamma + (1-k) + f(1-\delta) - g(1-\beta) \right] t \]  \hspace{1cm} (14) \]

The second one is

\[ p = \frac{A}{B} \beta \delta \frac{L_0^{1-\delta}}{L_P^{1-\beta}} e^{(f' - g' - k')} t \]  \hspace{1cm} (15) \]

From (14) we can see that the relative price ratio is related positively to the productivity differential \((\alpha - \gamma)\), the rate of labour absorption by the public sector \(f\), and the returns to scale in the private sector \(\beta\) (the latter means that, if, for example, returns were to rise then the price of the public sector good falls, which being the denominator causes \(p\) to rise). Also, \(p\) is related negatively to the rate of employment growth in the private sector \(g\), returns in the public sector \(\delta\), and the adjustment coefficient \(k\), i.e. the closer that \(W_0\) gets to \(W_P\), which means that \(|k|\) approaches 1, the more expensive the public sector good becomes relative
IV-63
to the private sector one.

In (15) we have substituted \(a+f(\beta-1)=f'\), and
\(\gamma+g(\delta-1)=g'\), where \(f'\) and \(g'\) can be seen as measures of
the net rate of technical progress in the two sectors respectively. Their difference \((f' - g')\) gives the extent
to which advance in the private sector dominates that in
the public sector. \(k'\) is simply equal to \(1-k\), and the
lower it is, i.e. the more \(W_0\) approaches \(W_p\), the higher
ratio \(p\) will be.

From (2) we have that

\[
\frac{G}{L} = Be^{\gamma t} \left( \frac{Lg}{L} \right).
\]
or

\[
\frac{G}{L} = Be^{\gamma t} \left( \frac{Lg}{L} \right) Lg^{\delta-1}.
\]

If we let \(\frac{Lg}{L} = \mu\), i.e. \(\mu\) is the share of resources
going to the public sector, then the above equation
becomes:

\[
\frac{G}{L} = \mu Be^{\gamma t} Lg^{\delta-1} \quad (16).
\]

From (5) we also have

\[
\frac{\Pi}{L} = (1-\beta)Ae^{\alpha t} \left( \frac{Lp}{L} \right),
\]
or

\[
\frac{\Pi}{L} = (1-\beta)Ae^{\alpha t} \left( \frac{Lp}{L} \right) Lp^{\delta-1}.
\]

Let us define \(\lambda = \left( \frac{Lp}{L} \right)\), where obviously
\(\lambda + \mu = 1\). Then the
above expression becomes
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\[
(\pi/L) = (1-\beta)Ae^{at}L^{\beta-1} \quad (17).
\]

From (3) we have

\[
(Wp/\beta) = Ae^{at}L^{\beta-1},
\]

which we substitute into (17) to obtain:

\[
(\pi/L) = [(1-\beta)/\beta] \lambda WP \quad (18).
\]

(18) will be used in the transformation of (10), and therefore we proceed to the other two terms of (10), which are \([Wg (Lg/L)] + [WP (LP/L)]\), and can be written as \((\mu Wg - \lambda WP)\). Using (5) we then obtain:

\[
\begin{align*}
&[\mu e^{(1-k)t} WP + \lambda WP], \\
&[WP (1-\lambda)e^{(1-k)t} + \lambda] \\
&\{WP [(1-\lambda)e^{(1-k)t} + \lambda] \} \quad (19).
\end{align*}
\]

Substituting (18) and (19) into (10) yields:

\[
(Y/L) = WP[(1-\lambda)e^{(1-k)t} + \lambda] + [(1-\beta)/\beta] \lambda WP,
\]

which we rearrange into

\[
(Y/L) = WP\{[(1-\lambda)e^{(1-k)t} + \lambda] + [(1-\beta)/\beta] \lambda\},
\]

or

\[
(Y/L) = (WP/\beta) [\beta(1-\lambda)e^{(1-k)t} + \lambda] \quad (20).
\]

By using (16) and (20), (11) turns into
where \( Z \) includes the terms of (20) in the square brackets. By use of (5), the above expression is further analyzed into:

\[
\mu e^{\gamma t} L_{0}^{\delta-1} = \rho p^{\sigma} [\beta e^{(1-k)t}]^{-1} p^{\rho} t^{\beta e^{(1-k)t}} L_{0}^{\tau (\delta-1)t},
\]

which we rearrange into

\[
\mu = \rho B^{\tau-1} (\delta/b)^{\tau} Z^{L_{0}} (\gamma-1)(\delta-1) e^{[\gamma-\gamma-\tau(1-k)t] p^{\sigma + \tau} (21)}.
\]

Substituting (8) and (13b) into (21) yields:

\[
\mu = \rho B^{\tau-1} (\delta/b)^{\tau} Z^{L_{0}} (\gamma-1)(\delta-1) e^{\phi(\tau-1)(\delta-1)t} e^{[\gamma-\gamma-\tau(1-k)t] p^{\sigma + \tau} (21a)}
\]

which is finally reduced into

\[
\mu = \rho \left[ L_{0}^{\beta-(\delta-1)(1+\sigma)} \right] e^{[\alpha+g(\delta-1)-f(\delta-1)](1+\sigma)t} (22),
\]

or

\[
\mu = \rho \left[ L_{0}^{\beta-(\delta-1)(1+\sigma)} \right] e^{[f^{\prime}(1+\sigma)-(g^{\prime}-k^{\prime})(1+\sigma)]t} (23),
\]

which shows the movement of resources devoted to the
public sector. If we rewrite the last exponential term as
\[ e^{-g't} e^{[f'-\tau-(f'-g')|\sigma|]t} , \]
we can see that the first term \((-g't)\) shows how technical advance reduces the input requirements, while the second term expresses the demand and has two components: \((f'\tau)\), which shows how technical progress makes income rise at a rate \(f'\), thus increasing demand by \((f'\tau)\), while relative prices increase by \((f'-g')\), thus decreasing demand by \((f'-g')|\sigma|\).

3. The empirical model

In order to estimate the parameters appearing in the above model, modifications had to be made to the original model, mainly due to data limitations. The model that we estimated stands as follows:

\[
\begin{align*}
\ln L_p &= \ln L_{p0} + ft \\
\ln L_G &= \ln L_{G0} + gt \\
\ln W_P &= \ln A + \ln \beta + (\beta - 1)\ln L_P + at \\
\ln W_G &= \ln B + \ln \delta + (\delta - 1)\ln L_G + \gamma t + \ln p \\
\ln p &= \ln A - \ln B + \ln \beta - \ln \delta + (1 - \delta)\ln L_{G0} \\
&\quad - (1 - \beta)\ln L_{G0} + [(\alpha - \gamma) + (1 - k) + f(1 - \delta) - g(1 - \beta)]t \\
\ln \mu &= \ln \eta + (\tau \sigma)\ln A - (1 + \sigma)\ln B + \sigma \ln (\beta / \delta) \\
&\quad + \ln \{(1 - (L_P / L))e^{(1 - k)t + (L_P / L)} \\
&\quad + (\beta - 1)(\tau \sigma)\ln L_{P0} - (\delta - 1)(1 + \sigma)\ln L_{G0} \\
&\quad + [(\alpha + g(\beta - 1))(\tau \sigma) - \gamma f(\delta - 1) - (1 - k)](1 + \sigma)t\} \\
\ln \lambda &= \ln \{e^{\ln L_P} + e^{\ln L_G}\} \\
\ln (E / L) &= \ln \eta + \ln \zeta + \ln \delta + \psi t + (1 + \sigma)\ln p + \ln (Y / L)
\end{align*}
\]
The above model has seven equations and one identity. Equations (24) through to (29) are the logarithmic transformations of (7), (8), (3), (4), and (22) respectively. The linearization of a model through logarithmic transformation, however, poses the problem of how to transform the identity. Usually, in such cases, a Taylor's expansion series, or even more simply a set of coefficients and the vector of the residuals, derived from a regression involving the identity, is used. Yet, (30) seemed to us as a much simpler expression to handle. Finally, (31) was derived by using (11) and (12). Since no adequate output measures for the public sector are at our disposal, (31) permits to use the available expenditure data instead of output in the left-hand side of the demand function. Thus, output has remained implicit in the model, and expenditure was assumed to be a function of the wage bill. We have previously defined (12), into which we substitute (4) to yield:

\[ E = \zeta e^{\psi_p B \delta} e^{\gamma t L_0^{\delta - 1} L_0} , \]

or

\[ E = \zeta e^{\psi_p B \delta} e^{\gamma t L_0^{\delta}} , \]

which by using (2) turns into

\[ E = \zeta e^{\psi_p \delta} G , \]

which we divide by L, and we have

\[ \frac{E}{L} = \zeta e^{\psi_p \delta} \left( \frac{G}{L} \right) \]

or

\[ \frac{G}{L} = \left( \frac{E}{L} \right) \left[ \zeta e^{\psi_p \delta} \right]^{-1} , \]
which we substitute into (11) to obtain
\[(E/L) [\xi e^{\omega t}p_\delta]^{-1} = \phi \sigma (Y/L)^T\]
or
\[(E/L) = \phi \xi \delta p^{1+\sigma} e^{\omega t} (Y/L)^T \tag{32}\]
which is the antilog of (31). It is worth noting that, although (2) rather than (32) was used for the construction of (29), the term \((1+\sigma)\), which expresses demand elasticity in (32) appears in (29), as well.

The period covered by the data is 1950 to 1980, and all variables are in real terms by use of separate deflators. All the public sector variables are with respect to general government, and only exhaustive expenditures are taken into account, while by 'private sector' we mean all the non-agricultural non-public sector activities.

To estimate the model we used the Full Information Maximum Likelihood Method (FIML). FIML is an asymptotically efficient estimator for simultaneous models. The equations are solved simultaneously by minimizing the determinant of the covariance matrix associated with the residuals of the reduced form of the equations. To use FIML, the model must be exactly identified. The present model consists of seven equations and one identity, involving eight endogenous variables. The parameters were estimated by the Gauss iteration method, and the model converged after six iterations, after which one more iteration was taken with the Berndt, Hall, Hall, and Hausman method, in order to obtain consistent estimates of the standard errors. The starting values were obtained from a
combination of OLSQ regressions for (24),(25), (26), and (31), with a suitable suppression of the constants into one term, and some educated guesswork, wherever necessary. The estimates of the parameters are given in Table IV-4.

**Table IV-4**

Parameter estimates for the relative price model

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Estimate</th>
<th>t-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>$ln L_0$</td>
<td>6.725</td>
<td>1,341.6</td>
</tr>
<tr>
<td>$f$</td>
<td>.0209</td>
<td>83.684</td>
</tr>
<tr>
<td>$ln L_0$</td>
<td>4.841</td>
<td>841.840</td>
</tr>
<tr>
<td>$g$</td>
<td>.0247</td>
<td>86.377</td>
</tr>
<tr>
<td>$ln A$</td>
<td>5.918</td>
<td>53.645</td>
</tr>
<tr>
<td>$a$</td>
<td>.0403</td>
<td>50.419</td>
</tr>
<tr>
<td>$\beta$</td>
<td>.755</td>
<td>54.242</td>
</tr>
<tr>
<td>$ln B$</td>
<td>5.874</td>
<td>3.038</td>
</tr>
<tr>
<td>$\gamma$</td>
<td>.0261</td>
<td>3.329</td>
</tr>
<tr>
<td>$\delta$</td>
<td>.751</td>
<td>2.398</td>
</tr>
<tr>
<td>$k$</td>
<td>.998</td>
<td>-2.18* / 1,089.1</td>
</tr>
<tr>
<td>$(ln z + ln q)$</td>
<td>-.883</td>
<td>-1.605**</td>
</tr>
<tr>
<td>$\phi$</td>
<td>.012</td>
<td>1.478**</td>
</tr>
<tr>
<td>$\tau$</td>
<td>.959</td>
<td>-0.67*/ 14.821</td>
</tr>
<tr>
<td>$\sigma$</td>
<td>-.691</td>
<td>-4.855</td>
</tr>
<tr>
<td>$ln q$</td>
<td>-1.692</td>
<td>-3/052</td>
</tr>
</tbody>
</table>

* The first figure is the t-statistic from testing against the value of 1, and the second one the one against 0.
** Significant at the 10% level. All other coefficients are significant at 5% or better, with the exception of $\tau$, which is not significantly different from 1.

After the estimation the model was historically simulated. The historical simulation of the data was static. This procedure consists of 'forecasting' one period ahead for each endogenous variable, by using the estimated parameters and the actual (historical) value of the variable at one period before, until a set of simulated data is obtained, covering the same time period as the actual data. Then both sets of data, i.e.
actual and simulated are compared by means of plotting them together against time, and by using various measures for the simulation error. Thus, we have some indication of the goodness of fit of each equation. The results we obtained are regarded as satisfactory, in general, and an analytical description of their errors can be found in Appendix 2.

4. Discussion of the results

Table IV-4 shows that $\gamma$, the technical progress coefficient for the public sector, although non-zero, is considerably lower than its private sector counterpart $\alpha$. $\gamma$ was found to be about 35% lower than $\alpha$, while the returns in both sectors were found to be diminishing and practically the same ($b=.755, d=.751$). At the same time, the public sector was absorbing labour at an annual average growth rate of 2.47%, marginally faster than the 2.09% of the private sector. The growth rate of the relative price ratio, i.e. $\left(\frac{dp}{dt}/p\right)$ or $\frac{p}{p}$ is given by $[\alpha-\gamma+1-k+f(1-\delta)-g(1-\beta)]$ from equation (14), into which if we substitute the figures from Table 1, we obtain $\frac{p}{p}=1.72\%$, i.e. the public good has been becoming more expensive by an average 1.72% every year with respect to the private sector good.

Also, we found out that the income and price elasticities of demand for government output were $\tau=.959$ (which we can actually consider it as 1) and $\sigma=-.691$ respectively. This means that, since $\sigma+\tau=.3 > 0$, then the (positive) income effect overpowers the (negative) price effect on output. Given that, in the period we
examine, (Y/L) has risen at average rates higher than the 1.72% of p, then we know that public sector output has risen. On the other hand, however, we see that expenditures have risen at a much faster pace, as shown by the net effect \(1 + \sigma + \tau > 0 + \tau\). Therefore, we see that the fact that the public sector good is price inelastic (or its price elasticity is lower than its income elasticity), ensures that its production will not eventually diminish. Also, since expenditures react to a change in demand positively and always stronger than output, we see that expenditures are bound to rise (fall) faster (slower) than output.

An interesting question that arises here is that, if the public sector is viewed as a monopoly, then how is it possible to accept a long-run price elasticity lower than one, since a normal market monopoly would increase the price and/or decrease its output in order to maximize its revenues. Although we did not treat G as produced under monopolistic conditions, let us assume, for the sake of argument, that our estimates are valid. Let us further assume that, given a rise of real incomes, the Greek electorate presents a demand for public output for at least as much as they enjoyed last year. Then, to have \(G_t > G_{t-1}\) in the long-run, we must have \(\sigma + \tau > 0\), which for \(\tau = 1\), means that \(\sigma > -1\), i.e. \(\sigma\) must lie somewhere between 0 and -1. \(|\sigma|\) can be greater than 1, only if \(\tau > 1\), provided that \(|\sigma| < \tau\). In any other case the public sector output will diminish, while the same can not be said with certainty for expenditures.

From the point of view of the bureaucrats, then,
and if they derive 'profit' from expenditures (as Migue and Belanger suggested), it is to their advantage to face a price elasticity as close to 0 as possible, which in combination with a rising p will lead to higher levels of budget. The fact that the bureaucracy operates along the inelastic part of the demand curve can be shown in a more formal way, in terms of the analysis by Cullis and Jones (1984).

Cullis and Jones proposed a 'standard' model of bureaucracy, which demonstrates allocative and X-inefficiency. The bureau is assumed to be a public monopoly receiving funds from a certain political authority. The funding agency may have some idea about the level of output to be supplied by the bureau, and the total benefit that this level is associated with, but the bureau has information about the cost function, and probably the demand function, which is much superior to the information that the political authority possesses. This discrepancy is labeled as the asymmetric informational advantage.

Figure IV-1 starts the analysis with a comparison of output and pricing decisions by a private monopoly, a competitor, and a public monopoly.

For simplicity, constant returns to scale have been assumed, where the long-run average cost is equal to the long-run marginal cost (LRAC$_0$=LRMC$_0$). D is the market demand curve, which coincides with that of the median voter. AR and MWTP stand for average revenue and marginal willingness to pay, respectively. We also have that D=AR= a-bQ, and therefore the total willingness to
pay is given by $TWTP = \int (a-bQ) dQ$, or $TWTP = aQ - (b/2)Q^2$. This yields $MWTP = (dTWTP/dQ) = a-bQ$, and hence $D=AR=MWTP$.

According to Figure IV-1, a private monopolist will maximize profit by producing $Q_M$ units of output, which are sold at a price $P_M$ (and the equilibrium point is on the elastic part of $D$). The competitor, in contrast, will sell $Q_C$ units at a price $P_C$. On the other hand, the public monopolist, enjoying the asymmetric informational advantage, can not translate monopoly power into cash income (at least not all of it), and therefore associates utility with the budget size. The constraints that the bureau faces is that total cost cannot exceed
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total benefit. Thus, the bureaucrat will aim at as much output as possible, but again he is unlikely to operate at a level, say $Q_a$, where marginal diutility is generated, if enough pressure is exerted by the funding agency. Therefore, the bureau will aim at an output level as close to $Q_x$ as possible (where the elasticity is zero), and which involves a budget equal to $(OFC \cdot KQ_x)$, or $B_2$, and, generally speaking, all levels of output above $Q_c$ generate net gains for the bureau, and correspond to the inelastic part of the demand curve.

Until now, we have seen that the bureaucrat, being allocationally inefficient will operate on the inelastic part of the demand curve, but will, probably, be unable to reach a point, where total cost and total benefit are equated, according to the traditional approach (Niskanen, 1971). This can be achieved by adopting X-inefficient methods, which will push the marginal cost curve up to a position, such as $LRMC_1$. In this particular diagram, $LRAC_1$ is located as high as the curve can move without violating the constraint, and without reducing the budget to a level, which can be increased by simply turning into allocationally and not X-inefficient. By pushing costs up to $LRAC_1$, the bureaucrat makes a net addition to the budget and reaches the equilibrium point of Cost=Benefit. By inflating costs, the bureau achieves a budget equal to $OB_1$, i.e. an increase of $OB_2 - OB_1$, which is still higher than $OB_0$, at which any how the demand constraint would be violated. At a level of output, such as $OQ_x$, the price elasticity with respect to output is unity, but
with respect to expenditure is (i.e. MWTP) is zero (see the parallel in equations (2) and (32)).

The bureaucrat, of course, might seek an output level such as $Q_x$, but we can not say that such a level can be definitely achieved. Our estimation yielded a price elasticity of less than one, which would correspond to an output level to the left of $Q_x$, although still to the right of $Q_c$, and consequently a budget below $B_1$, although still higher than $B_2$ or $B_0$. Such a deviation from the theoretical prediction exposed above is possible and may depend on non-linearities of the cost and demand functions, on how extensive the assymetric informational advantage of the bureaux is, and how unfettered the bureaucrats are in introducing X-inefficiency.

Let us turn now to the share of labour resources absorbed by the public sector. Its rate of growth can be derived from (22) or (23), as

$$\frac{\dot{\mu}}{\mu} = f'(\tau+\sigma) - g'(1+\sigma) + \left[\tau(1-\beta)\lambda\right]/\left[\beta+(1-\beta)\lambda\right] (33),$$

which we estimated it to be lower than 1% and much smaller than $p/p$.

From what we have found until now it seems that in Greece we did have a rising relative price ratio due to productivity differentials. This increase in $p$ was accompanied with an increase in $G$ and $E$ in absolute terms, but, as it can be seen from Table IV-5, $(E/Y)$ has more or less remained constant, which leads us to believe that public output in Greece has, in fact, been reduced with respect to private output. Also, the rise in the percentage of labour absorbed by the public
sector has also been increasing extremely slowly, at least more slowly than the increase of the relative price ratio would lead one to expect. Actually, in the thirty one years of our sample it showed an overall increase of about 10%, or an average growth rate of about .3% per year. This results seem to, largely, deny Baumol’s predictions. But why can this be so?

Baumol thought that the productivity differential is a product of the relative labour intensity of the unprogressive sector. However, Table IV-5, col.(4), shows that this is not true in our case. In 1950, capital per employee in the government sector was 153% higher than the capital per employee in the private sector, the difference having been reduced to about 115% by 1980. This comes in support of Orzecowski (1974) who similarly found a capital intensive public sector, and concluded that “rising costs in the public sector are due to behavioural differences between public agencies and private firms, rather than labour intensity”. Thus, we see that the basic assumption of Baumol is not valid in our case. The fact that bureaucrats may derive utility by being capital rather than labour intensive may be indicated by the estimated coefficients from the following regression (corrected for serial correlation), where
\[ \ln E = (4.95) + (0.69) f (\text{Rs/Lg}) \]

\( \phi = 0.931, \quad R^2 = 0.991, \quad F\text{-st} = 3.051.5, \quad D-W = 1.903 \]

(15.13)

<table>
<thead>
<tr>
<th>Year</th>
<th>( \text{Lg/Lp} \times 1000 )</th>
<th>( \text{Kg/Lp} \times 1000 )</th>
<th>( \text{E/Y} \times 1000 )</th>
<th>( \text{TR/Y} \times 1000 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>13.33</td>
<td>230.95</td>
<td>584.07</td>
<td>39.54</td>
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<tr>
<td>1951</td>
<td>13.34</td>
<td>230.23</td>
<td>582.47</td>
<td>39.53</td>
</tr>
<tr>
<td>1952</td>
<td>13.28</td>
<td>228.93</td>
<td>578.41</td>
<td>39.58</td>
</tr>
<tr>
<td>1953</td>
<td>13.27</td>
<td>227.12</td>
<td>572.30</td>
<td>39.69</td>
</tr>
<tr>
<td>1954</td>
<td>13.38</td>
<td>227.91</td>
<td>565.98</td>
<td>40.27</td>
</tr>
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<td>1955</td>
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KG and KP are capital stock in the public and private sectors respectively. TR is net transfer payments to the households.

Assuming that E makes up for a good part of the bureaucrats's utility, then the highly significant positive coefficient above indicates that bureaucrats prefer to use capital intensive methods. Capital
investment expenditure can achieve higher overall expenditures, in the sense that spending on overtime, trips, prestigious equipment is facilitated, and that sums of money can be transferred and diverted more easily. Also, capital expenditure by a bureau increases its relative status, and also gives more opportunities for not-too-legal transactions, as it has allegedly been the case in Greece. However, as we saw before, the public sector enjoys a positive technical progress growth rate. The cost at which this is achieved leads us to believe that productivity gains, if any, are very low. In other words, it seems that technical progress in the public sector is a by-product of the capital preference of the bureaucrats, as a way towards higher budgets.

Also, Buchanan and Tullock (1977) pointed out that public bureaux seek expansion in their size as long as they are relatively small, but as they become larger the bureaucrats favour increases in their real incomes. It seems that this was the case in Greece, where public employment almost doubled from 1950 to 1980. Having $k=1$, and $\gamma<\alpha$, it seems that the Greek public bureaucracy are happy to occupy a non-rapidly increasing share of total employment as long as their wages follow the wages of the private sector, real wages having risen by 70% during the examined period. In the same article, Buchanan and Tullock put forward their "Wagner Squared" hypothesis, which among other things, predicts that:

"... the share of population actually employed by the government may be reaching its maximum in
Western democracies. But this does not imply that the government budget is moving towards its own maximum share of G.N.P. or G.D.P."

Then they go on to suggest, similarly to Beck, that, in fact, the government expenditure that is likely to rise is not exhaustive but rather non-exhaustive. And this is precisely the case here. Although, in real terms, exhaustive expenditure (E), relative to the private sector expenditure, remained constant around 23%, transfer payments, as seen in Table IV-5, col. (6), rose from around 7% to almost 13%. This corresponds to an overall increase in the share of public spending (exhaustive plus non-exhaustive) from around 30% to around 45%.

In conclusion, we can suggest the following: In Greece, and for the 1950-1980 period, we observed an increasingly expensive public 'good', at least relative to the private 'good'. Such an increase did not lead to a relative increase in public production. Public output has been shrinking, as shown by $\sigma + \tau = .3$, while public expenditure compensates by increasing the price and just managing to follow the growth rate of income ($\tau = 1$). The bureaucrats are content to see their real wage increasing in accordance to the increases in the private sector wages, they do not favour an overexpansion of their employment share, and derive their utility from capital expenditure and non-exhaustive expenditure.
SUMMARY AND CONCLUDING REMARKS

As we mentioned in the introduction, the purpose of this thesis was to investigate why and how public expenditure has risen in Greece during the years from 1950 to 1980. Our intention was not just another descriptive study of government expenditure growth with low marginal contribution to our present state of knowledge. We rather tried to probe into some central issues, clear up a few points and raise a few others which, in our view, had not been adequately researched or received all due attention either in general terms or within the specific conditions of the Greek economy.

We started with an overview of the various theoretical approaches to the subject. The historical approaches, and in particular Wagner's and P&W's, were effectively the cornerstone of our ensuing analysis, not so much because of their perspicacious insights and appreciable precision, but rather because of the very essential issues they raised. The merits and disadvantages of these approaches were examined early in the thesis, and the problems we encountered with them were made clear by the definitional difficulties involved. Wagner's Law focused our attention on certain very important issues, yet we declared our disinterest in exploring its validity as trivial and irrelevant. We rather preferred to borrow the scheme of his analysis rather than his intentions. This is the reason that none of our results were interpreted in the light of the Law.
On the other hand, P&W's 'displacement effect' hypothesis was dealt with extensively at a theoretical level because of its appealing reasoning. Despite the definitional problems that were encountered here as well, we managed to assign different labels and exactly define the 'displacement' and 'inspection' effects in terms of the relative movements of G and Y. Leaving aside the problem of how can one exactly define and quantify a disturbance, we still think that this particular theory does not fully explain even the long-term trends of government expenditure growth. It does tell us about what and how is likely to happen during and after a period of crisis, but it determinedly refuses to extend into the 'peaceful' periods as if they are irrelevant to the long-run process of government growth.

P&W considered the very important supply side of expenditure growth but it was about ten years later that Baumol gave us a formulated theory that took supply factors explicitly into account. Concentrating on the cost aspect of the provision of goods by the government, Baumol's theory extended our horizon despite its imperfections and arguable theoretical conclusions, and it finally provided the starting point for part of our empirical analysis in Chapter IV, and contributed useful insights in reaching our conclusions. There the relative price effect was interpreted in the emphatic presence of the bureaucratic theories. Theories like Niskanen's and Migué and Belanger's helped in formulating some views on the workings of the bureaucratic mechanism. We consider the bureaucratic explanation(s) of government expenditure
growth as a *sine qua non* for the analysis of the government sector if one wants to lend some credibility to his analysis. Also, within the Niskanen theoretical framework we were able to discover that price inelastic demand means that the bureaucratic mechanism will always produce in the demand constrained domain, which in the Niskanen model automatically implies X-innefficiency.

Finally, the politico-economic models were not underestimated as to their theoretical power, but unfortunately, and taking into account their theoretical deficiencies and our data limitations, we were not able to take them into account explicitly. In an analogous manner we had to dismiss the use of the relative power models after a certain point in our analysis.

In the second chapter we dealt with some technical difficulties with respect to defining and measuring the public sector as well as conducting empirical tests, difficulties which we hope were confronted with some degree of success in the following chapters.

We also hope that Chapter III gave the reader some insight into the specific conditions of the Greek economy and society and showed the individual character and peculiarities of the system we examined. The description of the Greek economy in this thesis took place not because of some abstract need to talk about it or some specific requirement to fill in a few pages, but as an integral part of our understanding of the evolution of the public sector through the very turbulent Greek history. The description of the post-war public sector itself gave us the statistics that a researcher would
like to know but it also connected the evolution of the public sector to that of its environment.

Arriving at the final chapter of this thesis we started by stressing a very serious issue in our opinion; namely the causal relationships between variables and their particular significance in the present context. We showed that ignoring causal relationships or dismissing their explicit empirical testing with *ex ante* hypotheses is potentially a safe way of arriving at the wrong conclusions. Putting the cart before the horse, however, is not the way a research should be conducted, especially when uncertainty about causal relationships is so obviously dominant in the field. This thesis is not an econometric one and we do not claim to have conducted the test; but we feel strongly that we showed what a difference can make in one's analysis if the priorities are set correctly and definitional and theoretical issues have been tackled before any empirical estimation takes place. Far from exhaustive, our empirical causal tests gave us a notion of the complicated relationships of the public sector with the rest of the economy as well as demonstrated the particular relationships of various groups of government spending with certain sizes in the economy which were not exactly quantified later. Therefore, we now know, for example, about the precise causal relationships between industrialization and the various forms of government spending, although we avoided to exactly quantify it later on because of the statistical problems involved; if we were to include in a regression all causal independent vari-
ables, then their interdependence would make the results void of any true significance because of multicollinear-
ity. We are happy to know, however, what variables are true determinants of government expenditure growth which was one of our aims set out in the beginning.

After the results that we obtained from the causal tests we selectively concentrated on some issues we con­sidered as most important, namely the effect of income, price and some exogenous factors on government expend­iture growth. Our findings, in general, were the follow­ing. We found out that demand for publicly provided goods in Greece has been featuring unitary income elast­icity. The growth of government expenditure can be attr­ibuted to the following factors. First, we observed a growing role of the state as a redidistributor through the various forms of transfer payments. The growth of trans­fers, mainly to the private sector, has been quite phen­omenal and very consistent over the examined period. Second, we found out that the provision of public output must have been declining with respect to private provis­ion of goods, while on the other hand the relative price of the two sectors has been rising, favouring an expansion of expenditures. The increase in the price of the public good, combined with the decrease in output (always in relative terms) has led to a more or less constant share of public consumption to income. This means that it is rather the Migue-Belanger view that we should accept rather than Niskanen's, i.e. the bureau­cratic mechanism shows a priority for 'profits' rather than expansion (at least in Greece). Thus, we saw that
bureaucrats prefer 'fatter' budgets which does not necessarily combine with an expansion of the relative size of the bureaux in the economy, either in terms of output or employment. It seems also that bureaucrats prefer to handle money rather than actually produce output since we detected their possible preference towards transfers and handling of capital accounts, the latter being a possible explanation of the capital intensity in the public sector relative to the private sector despite its lower rate of technical progress.

Thus we found out that the income effect and the price effect, the latter being relevant to the bureaucratic way of production, are the two main causes for the growth of government expenditure. From the financing point of view we discovered that in Greece the tax constraint has been partially relaxed because of the decreasing tax evasion and the growing emphasis on direct rather than indirect taxation. We also found out that defence spending has been a constraint to the growth of non-defence expenditure, although we found no connection between non-defence expenditure and the period of crisis after 1974 in the P&W spirit.

We hope that this research put the issues on the right basis and gave some useful insights into the process of government expenditure growth. Knowing why and how expenditure grows can help the policy maker in using these sizes in intervening directly or indirectly in the economy, for providing goods with the knowledge of their consequences on the budget, and for monitoring better the production process within the public sector.
As a by-product from this study we also identified the consequences of various forms of expenditure on parts of the economy, which, of course, should be the subject of a separate study but, nevertheless, is an issue which is closely linked to the one we examined here.

We can not but stress the importance of the continuous study of the public sector, part of which is the analysis of expenditure growth. The task is extremely complex and requires constant updating of both the theoretical approaches and the empirical work, the use of interdisciplinary techniques and an open mind with respect to the peculiarities of different economies through time. We feel that the present study has contributed some specks of necessary information to the subject and we hope that the reader has shared this feeling.
APPENDIX 1

What follows is a list of plots comparing the actual and simulated data, accompanied by a set of statistical measures of goodness of fit, of which, MPE is the mean percentage error, MAPE is the mean absolute percentage error, and U is Theil’s inequality coefficient. If A denotes the actual data series and F the simulated series, then for $n$ observations we have:

$$\text{MPE} = \frac{1}{n} \sum_{1}^{n} \frac{F-A}{A}$$

$$\text{MAPE} = \frac{1}{n} \sum_{1}^{n} \frac{F-A}{A}$$

$$U = \sqrt{\frac{1}{n} \sum_{1}^{n} (F-A)^2}$$

where $0 < U < 1$. At $U=0$ we have perfect equality and at $U=1$ perfect inequality between the compared series.

In the plots, the (logs of the) actual data are indicated by ‘*’, while ‘+’ indicates the simulated values. ‘2’ indicates that the two coincide.
Government Expenditure

\[ R^2 = 0.995 \]

\[ \text{MPE} = 0.71\% \]

\[ \text{MAPE} = 0.90\% \]

\[ U = 0 \]

Regression coef. of actual on predicted
RCAP = 1

Indirect Taxation

\[ R^2 = 0.998 \]

\[ \text{MPE} = 1.3\% \]

\[ \text{MAPE} = 1.3\% \]

\[ U = 0 \]

Regression coef. of actual on predicted
RCAP = 1
Direct Taxation

R$^2 = .985$

MPE = 1.45%

MAPE = 1.11%

U= 0

Regression coef. of actual on predicted
RCAP = .99

Total Taxation (Identity)

R$^2 = .999$

MPE = 0.06%

MAPE = 0.08%

U= 0

Regression coef. of actual on predicted
RCAP = 1
APPENDIX 2

Equation (24): ln Lp

\[ R^2 = .995 \]

MPE = 1.3%

MAPE = 1.1%

U= 0

Regression
coef. of actual on
predicted
RCAP = 1

Equation (25): ln Lg

\[ R^2 = .996 \]

MPE = 1.2%

MAPE = 1.5%

U= 0

Regression
coef. of actual on
predicted
RCAP = 1
Equation (26): \( \ln WP \)

\[ R^2 = 0.991 \]

MPE = 2.85%

MAPE = 1.97%

U = 0

Regression
coef. of actual on predicted
RCAP = 0.985

Equation (27): \( \ln Wg \)

\[ R^2 = 0.99 \]

MPE = 3.16%

MAPE = 2.58%

U = 0

Regression
coef. of actual on predicted
RCAP = 1
Identity (30) : $\ln L$  
This one was treated as an equation, and simulated as such, in order to check the identity generation method described by (30).

$$R^2 = .9957$$
$$MPE = .95\%$$
$$MAPE = .84\%$$
$$U = 0$$
Regression coef. of actual on predicted
RCAP = 1

---

Equation (31) : $\ln (E/L)$

$$R^2 = .983$$
$$MPE = 1.74\%$$
$$MAPE = 1.41\%$$
$$U = 0$$
Regression coef. of actual on predicted
RCAP = .997
As it can be seen from the above simulation results, the model can be judged as satisfactory. The use of both MPE and MAPE was dictated by the fact that, the first one penalizes large individual errors, while the second one avoids the risk of large positive and negative errors cancelling each other. In no case any of them was higher than 4.48%, while thiel's inequality coefficient remained, somewhat surprisingly, 0 throughout. Also the $R^2$'s and the RCAP's are quite satisfactory. (28) and (29) presented the larger oscillations, which may be due to the static character of the model. The results for these two important equations are not as good as for the others, but then again we can not characterize them as bad, especially if we take into account a possible deception caused by the scaling of the plots. Although the model was defined in terms that may present spurious precision, and keeping this reservation, we can not find any other reasons serious enough not to accept our estimates.
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