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THE IMPACT OF GOVERNMENT SPENDING LEVELS
ON MEDIUM TERM ECONOMIC GROWTH
IN THE OECD, 1960-1985

Frank G. Castles and Steve Dowrick

DISCUSSION PAPER NO. 199

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EXECUTIVE SUMMARY

Recent findings concerning the impact of government spending on economic growth have been as diverse as the underpinning theories. Some studies suggest that government spending in general, and social expenditures in particular, constitute a 'leaky bucket' which inhibits the growth of Gross Domestic Product whilst other studies, using similar data, have suggested that social expenditures constitute an 'irrigation system' which actually stimulates economic growth.

In this study we draw on the numerous methodological criticisms raised in recent studies to design rigorous tests using cross-section data from 18 OECD countries over four business cycles between 1960 and 1985. Government expenditure is decomposed into various categories and economic growth is corrected for cyclical disturbances,. We also control for the effects of technological catch-up, institutional sclerosis and population growth along with the mediating influences of investment and employment. A variety of diagnostic statistical tests are applied.

On the basis of this rigorous statistical analysis we reject the hypothesis that government expenditures reduce economic growth and indicate some areas of social expenditures which may possibly tend to increase growth, though not to the extent that some previous studies have suggested. We are able to demonstrate the variety of methodological omissions and restrictions which have led to previous contradictory findings.

1. Introduction

Whether the expansion of government spending in general, and social or redistributive expenditures in particular, is inimical to economic prosperity is a question central to contemporary economic and political debate. If, as postulated by the dominant strand of mainstream economic analysis and by contemporary neo-conservatism, government expenditure for redistributive purposes constitutes a 'leaky bucket' (Okun, 1975: 91) wasting scarce national economic resources, the case for progressive social reform is fatally flawed. If, however, as suggested by several recent contributions to the comparative public policy literature (Korpi, 1985a; Friedland and Sanders, 1985, Ram, 1986), a case can be made that public intervention actually facilitates economic growth, it would challenge the highly influential view that the external inefficiencies inherent in a much expanded public sector and welfare state are ultimately destructive of economic prosperity.¹

To the extent that it could be established that redistribution does not undermine, or, better still, actually promotes, economic activity, the traditional case for progressive reform, that redistribution, economic growth and efficiency can be combined as a set of mutually reinforcing, positive-sum outcomes (Crosland, 1956), escapes relatively unscathed from the theoretical attacks to which it has been subject in recent years (see Mishra, 1984). The demonstration that social expenditure for redistributive purposes enhances economic growth would make the welfare state not so much a leaky bucket as what Korpi describes as an 'irrigation system' (Korpi, 1985a). Government social programmes could be seen - as they have always been seen by moderate reformers - as a means of improving the condition of the poor whilst actually making society as a whole richer in the process.

The great problem with virtually all of the empirical research in this area - and presumably the reason that insofar as such research is noticed at all in the political debate, it is selectively quoted by polemicists in support of their particular ideological positions - is that it rests on extremely shaky methodological foundations. That is the substance of an important critique by Saunders (1986), who starts out to offer a rejoinder to Korpi, but rapidly broadens the thrust of his comments to include the vast mass of cross-national studies, which have come to conclusions - positive or negative - concerning the relationship between levels of government spending and growth. His view is that the substantial discrepancies between empirical findings are attributable to four basic methodological errors that occur singly or in combination in all these studies. These include (i) a failure to establish that the relationships under investigation are universal across the

time-periods investigated, (ii) a failure to disaggregate expenditure categories and to theorise the particular links between expenditure components and growth, (iii) a failure to control for other known or hypothesised determinants of growth and (iv) a failure to establish the sensitivity of results to the inclusion and exclusion of particular nations in the sample to be investigated. Because of these weaknesses in research design, "the simple cross-country regression approach" that has informed such research has been quite incapable of bearing the weight of conclusions asked of it (Saunders, 1986: 52).

Saunders' substantive findings are that government current consumption expenditures and current disbursements appear to have depressed economic growth over the period 1960-73, but the effect has been much weaker, and not statistically significant, since 1975. He rejects pooling of the two cross-sections on the grounds of model instability. This study, the methodological credentials of which are certainly far better established than its predecessors, is hardly one to give aid and comfort to those who might wish to demonstrate that government intervention for redistribution and other purposes goes hand in hand with efficient economic performance.

A number of studies published from the mid-1980s onwards are somewhat more methodologically sophisticated than those criticised by Saunders. Two in particular are rather more supportive of an optimistic interpretation of the impact of government spending. The first, by Friedland and Sanders (1985), investigates a different set of relationships: the impact of *changes* in government spending on *short-term* economic growth rates, covering periods of between one and three years. Although the focus is somewhat different, the methodology is relevant to our purposes : i) they lag the explanatory variables several years in order to minimise the simultaneous impact of economic growth on the growth of government; (ii) they pool cross-section and time-series data; (iii) they disaggregate government spending rather more comprehensively than in previous studies, their categorisation including current civil consumption, military expenditure, transfers to households and transfers to business and also the tax burden on household income. They find that an increasing tax burden tends to reduce economic growth but that an increase in transfers tends to improve economic performance.

The second study by Ram (1986) investigates the effects of government consumption on the growth of GDP using, separately, a cross-section of 115 countries and individual time-series. His cross-section results suggest that *levels* of government services had a negative effect on economic growth, the effect being weak in the 1960s but somewhat stronger in the 1970s. On the other hand, he finds that the *rate of growth* of government consumption tends to have a positive

impact on growth. We have doubts about the validity of cross-section results across such a large and diverse sample of developed and less-developed economies without tests for stability of the relationship, and further doubts about the direction of causality in the strong positive correlation between the rates of growth of GDP and government services. Nevertheless, there are several important methodological developments which need to be noted: (i) he uses the Summers and Heston (1984) data set which allows comparison of GDP, investment and government consumption across countries using constant international prices, i.e. a standard measuring rod for the economic development and growth of all countries; (ii) he makes explicit allowance in his regressions for the differences in GDP growth which are attributable to differences in rates of growth of population and investment.

In contrast to these findings, two studies by Weede (1986a and 1986b) suggest a strong negative impact of government spending, and, in particular, of social security transfers. He explicitly seeks to explain economic performance over the period 1960-82 in terms of disaggregated expenditure categories and economic and political control variables, such as the catch-up effect that results from diverse technological levels, and the possibly growth-inhibiting impact of institutional sclerosis and long-term democratic stability. He is aware of most of the methodological difficulties raised by Saunders and includes other desirable features, such as the pooling of cross-sectional data from different periods², examination of both GDP and per capita GDP growth rates and the use of lagged explanatory variables.

Saunders argued for a more rigorous approach to international comparisons of public sector size and economic performance, but, despite some greater methodological sophistication in recent studies, the diversity of empirical findings he complains of still persists. It is our intention here to provide an analysis of the impact of government spending on medium term economic growth which not only avoids the methodological failings of which he complained, but which also takes into account the more promising features of the research designs proposed by Friedland and Sanders, Ram and Weede. In addition, we borrow from a very recent study located in the mainstream economics literature and unconcerned with the effects of government spending, which argues that, if medium term growth is the object of analysis, GDP growth rates should have short term cyclical movements removed, points to the crucial importance of an adequate control for technological catch-up in all comparative analyses of economic performance and shows that cross-section data from various periods can be pooled to explain variations in *relative* growth rates even though the underlying absolute rate of economic growth may have changed over

time (Dowrick and Nguyen, 1989). Finally, we use some of the recent developments in diagnostic testing of econometric models (see Beggs, 1988) to examine the robustness of regression analysis to problems of sample selection, heteroscedasticity, endogeneity and functional form.

On that foundation, we would hope to be in a position to isolate the crucial methodological assumptions or failings which lead to the diversity of findings in the recent literature. That in turn may allow us to advance a view on the compatibility of government expenditures and economic growth which can be sustained against methodological challenge and which is, therefore, worthy of serious consideration by those holding opposed views in the contemporary economic and political debate on the merits and demerits of government intervention.

The paper is organised as follows. In Section 2 we outline some of the diverse arguments concerning the relationships between various categories of government expenditure and appropriate measures of economic growth. Section 3 contains a detailed description of our research design, the results of which are presented and analysed in Section 4. In Section 5 we identify the essential reasons for differences between our results and the findings of other recent studies before presenting some concluding remarks.

2. Why government spending affects economic growth

Differences in growth rates may result in part from differences in rates of growth of employment and capital stock. Economic accounting of growth typically estimates the contributions of capital and labour (and other factors of production) and describes the residual as the growth in total factor productivity. An important distinction must be made, therefore, between theories which deal with the effects of government on (i) employment and the rate of capital accumulation, or the level of economic activity for short, and (ii) total factor productivity. For example, a particular form of government activity might tend to increase employment and investment whilst simultaneously decreasing innovation and productivity growth, in which case the net effect on economic output, either positive or negative, would be a matter for empirical measurement.

As Saunders notes, important distinctions need to be made between different categories of government expenditure. Government consumption comprises the direct employment and running costs of government services; government outlays include, in addition, capital expenditure and transfer payments. Each of these categories of expenditure can in principle be broken down by department or

function. Theories relating economic growth to government expenditures should specify clearly which categories of expenditure, or of revenue raising, are intended.³

A simple Keynesian argument is that high levels of government consumption will tend to raise employment and, possibly, profitability and investment through multiplier effects on aggregate demand. Others have argued that government consumption will 'crowd out' private investment, nullifying any economic stimulus in the short-term and reducing longer term capital accumulation. In either case, the hypothesised relationship is between levels of government consumption on the one hand and economic activity, rather than total factor productivity, on the other.

Critics of government intervention have gone further to argue that taxes and transfers may distort the signalling mechanism of market prices to such an extent as to reduce incentives for employment and investment. On the other hand, neo-Marxists and neo-Keynesians such as Kalecki (1971) and Baran and Sweezy (1966) suggest that inasmuch as taxes and transfers redistribute from the rich, who tend to save a significant portion of their income, to the poor who spend all they can, government expenditures and taxes stimulate economic activity. Here, the relationship under examination is between economic activity and the level (and redistributive targetting) of government revenues and outlays.

Other theories link government outlays and productivity. On the negative side of the relationship are predictions that the distortion of market signals occasioned by government intervention will direct resources of capital and labour into inefficient activities, implying lower levels of productivity, and possibly lower rates of growth of productivity, than would otherwise obtain. The counter arguments that government outlays may increase productivity rely on two distinct hypotheses. First, the state may provide infrastructural services and investment - in education, training, roads, railways, communications and energy, for example - which complement private sector activities, boosting their productivity, but which are provided inefficiently by the market sector because of the difficulties of private appropriation of the spin-off benefits. Second, the social insurance and redistribution provided by government transfers might both improve the morale, hence effort and commitment, of workers and also reduce incentives for workers and unions to resist the transfer of resources into new and more productive activities, which might otherwise involve, at least in the short term, significant losses and insecurity. The first of these counter arguments implies that productivity growth is stimulated by social and physical infrastructural expenditures; the second implies that the stimulus may come from

redistributive transfers.

It is fair to say that the counter-argument based on a need to minimise insecurity is more commonly found in discussions of economic growth in the sociology and political science literature than in mainstream economics.⁴ The key-term in such a notion is the concept of economic vulnerability, which at the micro level confronts individuals with costs arising from unforeseeable and unpreventable changes in their economic fortunes.⁵ The standard economics response is that such indeterminacy should serve as a spur to individual savings, but the counter-position implies that a collectivist response through government intervention is likely to be a more efficient guarantee against insecurity in the sense of allaying anxieties that are likely to feed into lessened productivity. On that argument, measures of social protection such as health care, benefits for unemployment and work-related injuries, and inflation-proofing of transfer payments may increase economic growth by decreasing economic vulnerability.

3. Constructing Empirical Tests

The object is to determine the effect, if any, of government spending on economic growth. We use regression analysis on a cross-section of OECD countries to investigate whether differences between countries in their levels of government spending have a systematic impact on differences in rates of growth of their economies between 1960 and 1985. This study differs from previous attempts to answer similar questions in the following respects :

i) *Definition and measurement of economic growth*

Our dependent variable is the *trend annual growth rate of real GDP* . We use trend growth rates because we are interested in medium-to-long term growth, rather than with fluctuations of the business cycle of the kind investigated by Friedland and Sanders; accordingly, we estimate the trend rate of growth over each cycle, which we approximate as 1960-68, 1968-73, 1973-79, and 1979-85.⁶ GDP data are the latest estimates at constant international prices from Summers and Heston (1988).

ii) *Controlling for other factors influencing growth*

As Saunders emphasises, some of the differences between countries' economic growth rates, probably a very substantial part of the differences, are the result of factors independent of government expenditures.⁷ We allow for such influences by including these factors as additional explanatory variables in multiple regression analysis.

a) Catching up

Recent economic analysis has stressed the importance of the tendency within the OECD for poorer countries to grow faster than their richer counterparts⁸. The dominant explanation is that countries operating on the frontiers of technological research find it more difficult to increase productivity than do those poorer countries which are relatively backward in technological development but are, nevertheless, sufficiently advanced in terms of technical and infrastructural capacity to copy and import technological developments. Alternatively, or additionally, it may be that catch-up occurs if consumers and workers in the richer countries opt for qualitative rather than quantitative improvements in living and working conditions, changes which are typically not captured in conventional measures of economic output implying a downward bias in the measured economic growth of richer countries. Other explanations suggest that sectoral differences in technical progress may give a growth advantage to those poorer countries which are moving resources out of agriculture and into industry in comparison with those richer countries moving resources from industrial production to services. There is some dispute whether such sectoral differences in productivity growth as appear in national accounting data reflect real differences as opposed to problems of measurement of both agricultural and service sector productivity. Since we are restricted to using national accounts data we must accept the sectoral change argument as a possible alternative, or complementary, explanation of the strong tendency for poorer countries within the OECD to catch-up on the richer countries' measured levels of per capita GDP in the post war period.

It is important, therefore, in comparing the effects of government spending on economic growth to allow for the differences in growth rates which are attributable to catching-up. In his influential work on the impact of political factors on economic growth Olson (1982, p.94) argues that : "*the United States has had the highest per capita income of all major nations ... This means that other countries have had the opportunity to catch up ... Thus the U.S. growth rate should probably be adjusted upward for a fair test of the model ...*". This is precisely what we do here, following in part the example of Korpi (1985b) by including as an explanatory variable the natural logarithm⁹ of per capita GDP in each country at the beginning of the period of growth. We are fortunate in being able to use newly published estimates of international per capita GDP levels from Summers and Heston (1988); these estimates are based on purchasing power parities, that is to say GDP is measured in each country against a single standard bundle of commodities and services, so comparisons between countries are not influenced by the vagaries of international exchange rates.

b) The Olson thesis of institutional sclerosis

Olson (1982) has further argued that economic growth will be slowed by the competing activities of distributional coalitions of interest groups which wield economic and political influence to further narrow sectional interests at the expense of a more encompassing interest in greater aggregate levels of production. In this view, a lack of significant change in institutional arrangements after the advent of political modernisation - effectively, for the countries in this sample, their degree of democratic stability - is likely to facilitate the accretion of selfish distributional coalitions, leading to an 'institutional sclerosis' progressively destructive of collective economic advance.

We allow for the Olson thesis by using as an explanatory variable Choi's (1983) adjusted index of institutional sclerosis.¹⁰ We note that this variable is likely to be highly correlated with the measure of catch-up potential, since the positive association of economic level and democratic political stability is amongst the oldest and best established findings of comparative research (see Lipset, 1959).

c) Population growth

Recent economic studies have found that a given proportional increase in population leads typically to a somewhat smaller rise in GDP - see Ram (1986) and Dowrick and Nguyen (1989) who estimate the elasticity to lie in the range 0.5 to 0.8. An increase in population will typically increase the size of the labour force, allowing economic expansion without tightening the labour market, which will, *ceteris paribus*, reduce the capital-labour ratio (including both private and public infra-structural capital). Thus whilst GDP growth is stimulated by population growth, GDP per capita tends to be reduced. Studies which do not control for the growth of either population or employment tend to overestimate the economic performance of countries with fast growing populations (particularly Canada and Australia within the OECD) if economic growth is measured in terms of absolute GDP, and they tend to underestimate their economic performance measured in terms of per capita GDP.

d) Growth of employment and capital stock

A substantial part of the differences between countries' growth rates is likely to be due to differences in the rates of growth of employment and of capital accumulation. Accordingly we include as explanatory variables in some regressions the rate of growth of employment and the ratio of gross investment to GDP, this latter variable proxying the growth rate of the capital stock.

Government expenditures may, however, have some indirect effect on economic growth through their influence on employment and investment. We estimate *the net effect of government on economic growth* by removing employment and investment from the set of explanatory variables and

substituting the rate of growth of population. We can then infer the effect of government on factor input growth as the difference between the net effect and the productivity effect.

Our full model can be set out formally as follows, assuming linear relationships:

$$(1) \text{ GDP} = a_0 + a_1Y + a_2\text{Choi} + a_3G + a_4E + a_5I$$

where GDP is the growth rate of real GDP, Y is the logarithm of initial per capita GDP, Choi is the Choi index of institutional sclerosis, E is the rate of growth of employment, I is the ratio of gross investment to GDP, and G is a vector of government expenditure variables. The relationships between employment or investment and the other independent variables (including population growth P) are hypothesised to be:

$$(2) E = b_0 + b_1Y + b_2\text{Choi} + b_3G + b_4P$$

$$(3) I = c_0 + c_1Y + c_2\text{Choi} + c_3G + c_4P$$

Substitution of (2) and (3) into (1) gives the reduced form equation :

$$(4) \text{ GDP} = d_0 + d_1Y + d_2\text{Choi} + d_3G + d_4P$$

$$d_0 = (a_0 + a_4b_0 + a_5c_0)$$

$$d_1 = (a_1 + a_4b_1 + a_5c_1)$$

$$d_2 = (a_2 + a_4b_2 + a_5c_2)$$

$$d_3 = (a_3 + a_4b_3 + a_5c_3)$$

$$d_4 = (a_4b_4 + a_5c_4)$$

In equation (1) the coefficient a_3 on the government variable(s) measures the impact of government on economic growth given the rate of growth of employment and capital, that is to say it measures the impact of government on the growth rate of total factor productivity. In the reduced form equation (4) the coefficient d_3 is a combination of the productivity effect and the effects of government on economic growth mediated through its impact on employment and investment.

iii) *Sample selection*

a) Country selection

Our selection of countries is dictated largely by the availability of data on government expenditures broken down by relevant categories. We have relied heavily on OECD (1985) which gives such data on a fairly consistent basis for 19 member countries¹¹. These form a reasonably coherent grouping of the advanced capitalist economies, most of which are similar enough in their unmeasured characteristics to make comparisons meaningful, but disparate enough in both economic performance and government size to allow the possibility of capturing any causal relationship between these variables.

The major sample selection problem with which we are faced, as are most investigators of cross-country economic performance, is whether or not to include Japan in our sample. We might argue for its exclusion on the *a priori* grounds that Japan is the only member of the sample which is non-European in both geography and colonial history; our statistical analysis is unable to distinguish which effects are due to our measured variables and which are due to non-European-ness. Furthermore, we know that Japan's economic performance in the 1960s far outstrips that of any other member of our sample, so any unusual Japanese characteristic such as its level of government expenditure is likely to have very substantial leverage on our regression coefficients. This latter point is adduced by Korpi (1985a) in his reasons for excluding Japan from the sample.

Saunders (1986) argues forcefully against this position, partly because of a reluctance to discard the information which is potentially contained in the Japanese data and partly because of his clear demonstration of the strong impact its inclusion has on the nature of the resultant findings. The position we have taken is to report regression results which alternately exclude and include any observations which appear as significant outliers on a formal statistical test. Any meaningful relationship which is apparent in the larger sample should also be apparent in the reduced sample¹². If this is not so, and if there are *a priori* reasons for regarding the outlier as a special case, we prefer the estimates which do not rely on the unique and unexplained contribution of one observation.

b) Selection and pooling of time periods

OECD data on government expenditures is available for the period from 1960-85. We take this 25 year period as our starting point for analysis. We can go further, however, by examining the data for four sub-periods, breaking at 1968, 1973 and 1979 - years which correspond roughly to cyclical peaks for most of the OECD. The advantages of this subdivision are several. We can test whether relationships identified for the 25 year period are stable over time. If they are stable, we can have somewhat more confidence that we have identified something more than a transient correlation; moreover, we can pool the data from the 4 periods, as do Friedland and Sanders, allowing us to analyse the effects of changes in the variables over time as well as differences across countries, thus giving many more degrees of freedom to the statistical analysis and improving the power of the statistical tests.

We suggest that when cross-section data from different periods are pooled it is important to test separately for the stability of the coefficients on the explanatory variables and the stability of the regression intercepts. The intercept terms represent the unexplained, underlying rate of economic growth. If the explanatory variables do not adequately explain the slump in OECD growth rates since the 1960s, the imposition of a constant intercept term may seriously bias the

results.¹³ On the other hand, despite a failure to explain changes in underlying growth rates, it may still be valid to pool cross-sections as long as the slope coefficients are stable over time, in which case we must interpret the statistical analysis as an explanation of variations in *relative* rather than *absolute* economic growth.

iv) *Simultaneous causation*

A major problem of interpretation and possible statistical bias concerns the direction of causation between the level of government spending and the rate of economic growth. We are trying to identify any impact of the former on the latter, but our estimates may be affected by the simultaneous impact of growth on government. In particular, we expect that richer countries may be able to afford greater expenditures, especially on those categories of social expenditure which might be described as public 'luxury' goods, using the term in its technical economic sense which denotes a good for which demand rises more than proportionally in line with income. If these categories of public expenditure are significant, we may expect to find a positive correlation between levels of per capita GDP and government expenditures,¹⁴ implying also a positive correlation between *rates of growth* of GDP and *rates of growth* of government. This does not necessarily imply, however, any correlation between the variables in which we are interested: *rates of growth* of GDP and *levels* of government expenditure. For instance, a fast-growing country may be increasing the size of its government sector, but if it starts off relatively poor and with a correspondingly small government sector the average level of government over the period may be small. Nevertheless, it is important to check for simultaneous interactions. Using the sub-period data we can perform statistical tests of the independence of the level of government expenditures. If the hypothesis of independence is rejected, we estimate by two-stage least squares, using the level of the variable at the beginning of the period as an 'instrumental variable'. This technique is virtually identical to substitution of the beginning-of-period value for the endogenous variable. The validity of this technique rests on the assumption that the initial level of government expenditure cannot be influenced by subsequent economic growth.¹⁵

v) *Alternative categories and sub-divisions of government expenditure*

In line with the discussion in Section 2 on theories linking government expenditures to economic growth we have obtained measures for the following categories, all measured as a proportion of GDP: government consumption; total expenditure disaggregated either into consumption and non-consumption or into social and other expenditure; and a disaggregation of social expenditure into

health, education and transfers. Unfortunately, breakdowns of the functional categories of expenditure into current consumption, transfers and capital investment are not available for all countries in all periods. Nevertheless, this subdivision of government expenditures is rich enough to allow us to explore a variety of interesting hypotheses. Health and education may, for instance, be seen as investments in human capital, which are more likely to contribute directly to economic growth than redistribution through transfers which is likely to distort the incentives structure established through the market. Almost in total contradiction to that hypothesis, it may be suggested that transfers are inherently less likely to waste resources than public consumption expenditure of the kind involved in the provision of health and education services through centralised bureaucracies. Finally we use a measure of total government revenues to test the hypothesis that it is the act of raising taxes, rather than the use to which such revenues are put, that influences economic growth.

Previous studies, with the exception of Ram (1986), have tended to measure government expenditures as a proportion of GDP measured at current domestic prices. If, however, our hypotheses concern the relationship between government funded activities rather than the raising of revenue, we should try to eliminate differences in expenditures which merely reflect differences in *relative prices* (eg relatively higher or lower salaries paid to public employees). To this end we have used constant price series for government expenditures within each country. In order to make these series comparable across countries, we have converted these constant domestic price series to constant international prices. Details of the construction of these series are given in Table 1.

vi) *Diagnostic tests*

The validity of ordinary least squares regression analysis rests on, amongst others, two important assumptions: a) *homoscedasticity* - that the size of the error terms, the unexplained differences in the dependent variable, do not vary systematically; b) *functional form* - that the underlying relationship between the variables is correctly specified as linear. We report diagnostic tests of the validity of these assumptions.

4. Analysis of results

Single period analysis

We first analyse the relationship between government spending and economic growth over the period 1960-85. Table 2 reports single cross-section estimates of the impact of each of the explanatory variables on the trend annual rate of growth of GDP. Our primary sample is of the 18 countries for which we have breakdowns on government expenditure and for which Choi has estimated

his index of institutional sclerosis.¹⁶

Examination of the diagnostic statistics suggests that the regressions on the samples which include Japan are unsatisfactory. We report the *df* fits tests (explained in the Table footnotes) for the significance of outliers in influencing the regression predictions. The only country which emerges as a consistent outlier, statistically significant in terms of the regression predictions, is Japan. We report, accordingly, regression results which alternately include and exclude Japan.

The test for outliers is also reported for three other countries which emerge as potentially significant outliers in reduced samples. Further test-statistics - the *df* betas - allow us to assess the direction and statistical significance of the change in the estimated coefficient on government expenditures which would result from the exclusion and replacement of each country. The *df* beta *t*-statistics reported in brackets test the hypothesis that the regression coefficient from the full sample is the same as the coefficient from the sample which excludes that country. As we might expect, the inclusion in the sample of Japan, with its exceptionally high economic growth and low government expenditures, lowers the coefficients on all measures of government expenditure, particularly total revenues, non-consumption expenditure and social expenditure. The inclusion of Switzerland, with its low growth and low government expenditures, raises most of the coefficient estimates. Weede (1986b) argues that if Japan is to be excluded as an outlier, so too should be Switzerland with its countervailing effect on the estimated relationship between government and growth. Switzerland is not, however, a statistically significant outlier on the *df* fits test even when Japan has already been excluded (except where government consumption is an explanatory variable). Moreover, if Japan is excluded, New Zealand also becomes a significant outlier with an opposite effect on the government consumption coefficient. If Switzerland is excluded, Ireland becomes in turn another significant outlier. In other words, the government consumption estimate is highly unstable with respect to sample selection.

All three regressions which use the full sample, including Japan, display significant heteroscedasticity and functional form mis-specification. The importance of controlling for heteroscedasticity in these samples is highlighted by comparison of the unadjusted and the heteroscedasticity-adjusted *t*-statistics on non-consumption expenditures in the full sample. The level of statistical significance rises from under 10% to 1% when heteroscedasticity is taken into account. Note, however, that the evidence of significant heteroscedasticity and functional mis-specification disappears when Japan is dropped from the sample.

Table 1

Data Definitions and Sources

All variables are measured 1960-85, and 1960-68, 1969-73, 1974-79 and 1980-85.

GDP Per Capita : the trend annual percentage rate of growth of GDP measured at constant (1980) international prices. Source: Summers and Heston (SH) (1988) RGDP1, regressed on an exponential time trend spliced at 1968, 1973 and 1979.

Population : the average annual percentage rate of growth of population. Source: SH(1988).

GDP : GDP per capita plus population growth.

Catch-up : the logarithm of real per capita GDP, expressed as a proportion of the sample average at the beginning of each period. Source: SH(1988).

Choi : Choi's (1983) adjusted index of institutional sclerosis divided by 100.

Employment : the annual percentage rate of growth of employment. Source: OECD Labour Force Statistics and Historical Statistics.

Investment : the average percentage share of gross investment in GDP, measured at constant (1980) international prices. Source: SH (1988).

Growth of government consumption : the average annual proportional growth of real government consumption per capita. Source: SH(1988).

Revenue¹ : total government revenues . Source: OECD Historical Statistics. (For New Zealand, government expenditures. Source: OECD, 1985, and National Accounts.)

Consumption¹ : government consumption measured at constant (1980) international prices. Source: SH(1988).

Total expenditure¹ : total government expenditures, disaggregated into:

social : education, health, and transfers²
non-social

all measured at constant (1970) international prices.³ Sources: OECD (1985), OECD National Accounts, SH(1988).

1. Levels of Government expenditure and revenue are all measured as ratios to GDP, averaged over the period.

2. Transfers are total social expenditures less health and education. They consist mainly of social security benefits and pensions, but also include welfare services.

3. The constant international price series are derived from OECD (1985) series for the period 1960-81 measured at constant (1970) domestic prices. These series have been extended to 1985, and gaps in the series have been filled, using OECD National Accounts current price data on expenditures or outlays, splicing these current price series to match the constant price series at an overlap year. Where breakdowns into education, health and transfers are not available, the ratio to total government expenditure (or GDP) is assumed to be the same as in the nearest year for which OECD (1985) data is available. These extended constant (1970) domestic price series for total government expenditure, education and health are converted to constant (1970) international price series by multiplying by the Summers and Heston (1988) ratios of shares of government consumption in GDP measured at 1970 domestic and international prices.

Table 2

Single cross-section analysis of the effects of Government Revenues and Expenditures on GDP Growth 1960-85

The dependent variable is the trend growth rate of real GDP. The table reports OLS coefficient estimates with t-statistics in brackets. Where a second t-statistic is reported underneath a coefficient estimate this is White's heteroscedasticity consistent measure. The samples are of 18 OECD countries, or of 17 (excluding Japan). A variety of diagnostic tests are reported. They are described briefly in the footnotes. For fuller explanation see White and Horsman (1986) and Beggs (1988).

	1a	1b	2a	2b	3a	3b
exclusions	none	Japan	none	Japan	none	Japan
coefficient estimates						
catch-up	-2.34 (-3.3)(-3.6)	-1.48 (-2.5)(-3.6)	-2.20 (-3.6)(-3.3)	-1.14 (-2.5)(-3.3)	-2.56 (-3.6)(-4.3)	-1.61 (-2.6)(-4.3)
choi	-0.51 (-0.3)(-0.5)	-0.58 (-0.5)(-0.7)	-0.13 (-0.1)(-0.1)	-0.17 (-0.2)(-0.3)	-0.41 (-0.3)(-0.4)	-0.45 (-0.4)(-0.6)
employment	0.68 (3.2)(5.1)	0.54 (3.2)(4.5)	0.72 (4.0)(5.5)	0.57 (4.8)(5.2)	0.77 (3.4)(6.3)	0.64 (3.7)(6)(6)
investment	0.043 (1.2)(1.2)	0.022 (0.8)(1.0)	0.033 (0.9)(1.4)	0.022 (1.0)(1.5)	0.029 (0.7)(0.9)	0.017 (0.6)(0.7)
Government revenues	0.87 (0.4)(0.7)	2.38 (1.4)(1.6)				
consumption expenditure			-6.76 (-2.1)(-3.5)	-6.17 (-3.0)(-3.4)		
non-consumption expenditure			4.56 (1.5)(2.7)	6.76 (3.4)(5.4)		
social expenditure					2.10 (0.7)(1.1)	4.52 (1.8)(2.8)
non-social expenditure					-2.75 (-1.1)(-1.7)	-1.94 (-1.0)(-1.2)
summary statistics						
n	18	17	18	17	18	17
s.e.	0.53	0.40	0.46	0.29	0.52	0.38
R ²	0.78	0.63	0.85	0.83	0.81	0.69
R-2	0.69	0.45	0.76	0.72	0.70	0.51
diagnostic tests						
reset test ⁽¹⁾	**	-	***	-	***	-
heteroscedasticity ⁽²⁾	***	-	**	-	***	-
outliers⁽³⁾ t-statistics						
Japan : dffits	3.69***	-	5.19***	-	3.93***	-
(dfbetas)	(-0.93)		(-0.3)(-1.2)		(-1.0)(-0.4)	
Ireland	-1.63 (0.12)	-1.17 (0.27)	-1.70 (-0.3)(0.4)	-1.1 (-0.1)(0.3)	-1.60 (0.5)(-0.3)	-0.79 (0.3)(0)
Switzerland	-0.37 (0.23)	-0.76 (0.43)	-1.61 (0.7)(0.4)	-4.4*** (1.8)(1.0)	-0.60 (0.4)(0.1)	-0.69 (0.5)(0.1)
New Zealand	-1.29 (0.40)	-1.82* (0.57)	-1.13 (-0.6)(0.3)	-2.3** (-1.2)(0.7)	-1.20 (0.3)(-0.5)	-1.97* (0.4)(-0.9)

1. The Ramsey reset tests for functional form are carried out by adding to each regression the squared and cubed values of the residuals. Asterisks indicate that the test F-statistics for the explanatory power of the added variables are significant at the 5% (**) or 1% (**) level, suggesting that the linear specification is not satisfactory.

2. The heteroscedasticity tests are carried out by regressing the squared residuals (and the logarithm of the squared residuals) on the predicted values (and their squares, and the logarithm of their squares) and the explanatory variables. Asterisks indicate significant heteroscedasticity which implies that the unadjusted t-statistics are not reliable.
3. The outlier test reports the t-statistics for the $dfits$ and $dfbetas$ tests which are carried out by excluding each country in turn from the sample and testing the null hypothesis that the predicted value for that country is the same for the reduced and full samples ($dfits$) and that the coefficient estimates are the same ($dfbetas$). The statistics are reported for the four principal outliers. The first figure reported is the $dfits$. Asterisks indicate if that country is a significant outlier. The figures in brackets are the $dfbeta$ t-statistics which are reported only for the government revenue and expenditure variables in the order in which they are presented in the table above; a positive sign indicates that the inclusion of that country in the sample increases the coefficient estimate.

Taken together with our a priori concern about the uniqueness of the Japanese economy, the diagnostic tests for outliers, for heteroscedasticity and for functional form suggest that we should treat as more reliable the results from the reduced sample.

Taking account of those differences in growth rates which are due to catch-up, institutional sclerosis and population growth, we find evidence that economic growth is reduced by the provision of direct government services - current consumption. This putative negative effect appears to be counter-balanced by a positive effect of other government expenditures. The net effect of taxation and other government revenue-raising appears to be insignificant. We can tentatively locate the source of positive effects of government in the area of social expenditures. Note, however, that these estimates are sensitive to sample selection and heteroscedasticity assumptions, and that we have not tested for endogeneity. Given the scarcity of degrees of freedom with such a small sample we feel that these results are merely indicators of possible relationships which can be analysed adequately only in a larger sample of pooled cross-sections.

Pooled cross-section analysis

By pooling four cross-sections we obtain additional information on variations over time as well as across countries. We introduce a further statistical test in order to investigate the direction of causation, in particular the hypothesis that our estimates of the impact of government expenditures on economic growth may be biased by the impact of growth on government expenditures. There is, for example, a weak tendency for the richer countries to have higher levels of social expenditures - the simple correlation coefficients between the logarithm of per capita GDP and the share of social expenditures in GDP, for the sample excluding Japan, are 0.08 for 1960-68, 0.21 for 1968-73, 0.30 for 1973-79 and 0.31 for 1979-85. So we may expect economic growth to have some, albeit weak, effect on social expenditure. We investigate the problem of reverse causation by testing whether the level of government expenditures at the beginning of each period perform better as independent explanators of economic growth than do the levels averaged over the whole period.

Regression results for the effects of government consumption and non-consumption expenditures based on the pooled cross-sections are reported in Table 3. The only observation which emerges as a statistically significant outlier is Japan for the period 1960-68, so we report results for the samples which alternately include and exclude this observation. Functional mis-specification and heteroscedasticity do not appear to be significant at even the 10% level when this one observation is excluded so we prefer the reduced sample estimates. Note that Japan is included for the three periods after 1968. We report both our full equation (1) estimates and the reduced form (4) estimates, the latter substituting

population growth for investment and employment growth.

Our tests for endogeneity suggest that employment and investment are independent explanators but that government consumption levels are simultaneously influenced by economic growth. In our preferred specification, excluding the one outlying observation, we estimate the independent effect of government consumption by the two stage least squares technique, using the beginning-period value as an independent proxy. Controlling for endogeneity in this way reduces the magnitude of the estimated negative impact of government consumption. We may infer that the share of government consumption in GDP tends to fall when economic growth is rapid, perhaps because there are delays in increasing government services at the same rate as a fast expanding economy. Such reverse causation appears to bias downwards the estimated impact of government consumption on economic growth. We are left then with the conclusion that evidence for a negative impact of government consumption on economic growth is suggestive rather than compelling.

A further difficulty in interpreting even this suggestive evidence lies in the problems of measurement of the output of government services. National accounting methods are often unable to measure non-marketed government output adequately and have to use the level of inputs as a proxy for output. Such practice discounts any real, but unmeasured, improvement in the productivity of government service provision. and may bias downwards estimates of the true impact of government services on the rate of growth of GDP.¹⁷

Non-consumption expenditures by government appear to have a positive impact on total factor productivity growth (see regression 4b which controls for employment and investment) but the net effect on GDP is weaker and statistically insignificant (see the reduced form regression 5b) implying that there is some crowding out of private investment or employment.

Tables 4 and 5 report results of similar analysis on the effects of government revenues and the effects of social and other expenditures. We do not report the estimates for the control variables since they are much the same as those in Table 3. We find no evidence of endogeneity of these variables, suggesting that non-consumption expenditures, as a share of GDP, are more easily adjusted and do not tend to lag behind economic growth. Japan 1960-68 is again the only significant outlier. We find that government revenues have no significant impact on economic growth and that it is social transfer payments which seem to have a positive effect on the growth of total factor productivity, through perhaps improvements in morale and security of workers afforded enhanced protection by the welfare state. The positive effect is much diminished in the reduced form

Table 3

Pooled Cross-Section Analysis of the effects of Government Consumption Levels

The dependent variable is the trend rate of growth of real GDP in each period. There are four cross-sections, each of 18 countries. Variables and tests are as defined in Tables 1 and 2 and in the footnotes. The figures in square brackets are t-statistics testing for endogeneity⁽¹⁾, i.e. whether the explanatory variable is simultaneously influenced by the dependent variable. Estimation is by Ordinary Least Squares (OLS) or by Two Stage Least Squares (2SLS). Regressions 4b and 5b are on samples which exclude Japan for the period 1960-68. The slope coefficients have been constrained to be equal across all four periods, but the intercept terms have been allowed to vary by including three period dummies. Our preferred specifications are shown in bold.

	4a OLS	4b 2SLS ⁽²⁾	5a OLS	5b 2SLS ⁽²⁾
coefficient estimates				
<u>Period dummies</u>				
1968-73	-0.37 (-1.16)	-0.17 (-0.55)	0.01 (0.01)	0.25 (0.75)
1974-79	-2.22 (6.89)	-2.09 (-6.75)	-1.79 (-4.66)	-1.59 (-4.50)
1980-85	-2.16 (-6.66)	-2.05 (-6.63)	-2.22 (-5.72)	-2.00 (-5.63)
catch-up	-2.52 (-4.00)	-1.74 (-2.73)	-1.39 (-2.01)	-0.53 (-0.80)
choi	-0.61 (-0.53)	-0.62 (-0.58)	-2.15 (-1.91)	-2.23 (-2.19)
employment	0.73 (5.38)[0.72]	0.63 (4.76)		
investment	0.051 (1.73) [-0.18]	0.062 (2.16)		
population			0.79 (2.71)	0.87 (3.30)
government consumption	-6.32 (-2.09)[-3.87]	-4.08 (-1.38)	-4.81 (-1.40)[-2.81]	-3.19 (-1.00)
non-consumption	4.45 (1.74)[0.73]	5.04 (2.06)	2.04 (0.70)[0.46]	3.73 (1.39)
summary statistics				
n	72	71	72	71
s.e.	0.92	0.87	1.07	0.97
R ²	0.75	0.73	0.66	0.66
R ⁻²	0.72	0.69	0.62	0.62
diagnostic tests				
reset test	***	-	**	-
heteroscedasticity	***	-	*	-
<u>outliers</u> : dffits t-statistics				
Japan 1960-68 ⁽³⁾	1.93*	-	2.15**	-
<u>stability tests</u> ⁽⁴⁾ : chi ² statistics				
slope coefficients		27.8* (28.9)		28.4** (25.0)
plus intercepts		122.4*** (32.7)		99.5*** (28.9)

1. The endogeneity test is carried out by adding to the regression the residuals from the regression of each variable (suspected of endogeneity) on a set of independent variables - in this case the beginning of period values for the government expenditure variables, catch-up, choi, population growth and the growth of the working age population. If this additional variable is significant on a t-test endogeneity is confirmed. This test is equivalent to the Hausman test - see Beggs (1988). Note that government consumption is the only variable which appears to be endogenous.
2. Two Stage Least Squares estimation is carried out treating government consumption as an endogenous variable. The instrumenting variable, which predicts the level of the endogenous variable, is the beginning of period level of government consumption. This is virtually equivalent to direct substitution of the instrument in OLS estimation.
3. The dffits test is described in the notes to Table 2. Only Japan 1960-68 is significant at even the 10% level.
4. The stability test is for the restriction that all slope coefficients (and the intercept terms) are stable across the four periods. Chi-square statistics are reported with the 5% critical values in brackets.

Table 4

The effects of government revenues

Regressions 5 and 6, reported in Table 3, have been repeated substituting government revenues for the government expenditure variables. Only the coefficient estimates for revenues, and the summary statistics and diagnostic tests, are reported here.

	6a	6b	7a	7b
	ols	ols	ols	ols
controlling for employment and investment	yes	yes	no	no
coefficient estimates				
government revenues	0.91 (0.54) [0.65]	1.18 (0.74)	0.03 (0.02) [-0.66]	1.10 (0.59)
summary statistics				
n	72	71	72	71
s.e.	0.95	0.89	1.08	0.97
R ²	0.73	0.71	0.65	0.65
R-2	0.70	0.68	0.61	0.62
diagnostic tests				
reset	***	-	**	-
heteroscedasticity	***	-	**	-
outliers : dffits t-statistics				
Japan 1960-68	1.67*	-	1.93*	
stability: chi ² statistics				
slope coefficients		9.2 (25.0)		10.3 (21.0)
plus intercepts		69.7*** (28.9)		62.9*** (25.0)

Table 5

The effects of social and other expenditures

Regressions 5 and 6, reported in Table 3, have been repeated substituting social and other expenditures for the government consumption variables. Only the coefficient estimates for social and other expenditure variables, and the summary statistics and diagnostic tests, are reported here.

	8a	8b	9a	9b
	ols	ols	ols	ols
controlling for employment and investment	yes	yes	no	no
coefficient estimates				
<u>government expenditures</u>				
non-social	0.60 (0.18) [-0.48]	2.23 (0.69)	-2.54 (-0.75)	-0.32 (-0.10)
education	-2.26 (-0.14) [-0.47]	-12.84 (-0.82)	24.44 (1.47)	16.23 (1.05)
health	-6.41 (-0.48) [-0.54]	-7.10 (-0.56)	-7.84 (-0.51)	-8.45 (-0.60)
social transfers	5.24 (1.42) [-1.48]	7.45 (2.11)	-1.01 (-0.27)	1.93 (0.56)
summary statistics				
n	72	71	72	71
s.e.	0.94	0.88	1.08	0.99
R ²	0.75	0.73	0.67	0.66
R-2	0.70	0.68	0.61	0.60
diagnostic tests				
reset	***	-	**	-
heteroscedasticity	***	-	**	-
outliers : dffits t-statistics				
Japan 1960-68	2.12**	-	2.09**	
stability : chi ² statistics				
slope coefficients		17.4 (36.4)		25.6 (32.7)
plus intercepts		58.6*** (40.1)		62.8*** (36.4)

equation, suggesting that any positive impact of high social transfer spending on productivity growth, is offset by reductions in employment or investment.

We cannot rely on these pooled cross-section results unless we are satisfied that the relationships are stable over time. The hypothesis of coefficient stability over time is not rejected at even the 10% level for the regressions including revenues or social expenditures. There is, however, some evidence of instability in the government consumption regressions, significant at the 10% level for the full specification and at the 5% level for the reduced form regression. We infer that it is the effects of government consumption which may be somewhat unstable over time, but note that regression 4b does pass the stability test at the usual 5% level of significance. The hypothesis that the underlying rate of growth is the same over all periods is rejected decisively for all specifications. The dummy variables capturing differences (relative to the period 1960-68) in underlying rates of growth are negative and highly significant for the periods after 1973. In other words, our explanatory variables are incapable of providing any adequate explanation of the growth slowdown, but they do provide consistent explanation of the *differences* between countries' growth rates.

Examination of the control variables reported in Table 3 suggests that the Choi index and the catch-up variable alternate as significant explanators as employment and investment are included or excluded from the regressions; unreported regression analysis suggests that institutional sclerosis dampens growth by reducing investment, whereas catch-up is a technological phenomenon which operates on total factor productivity. The coefficients on employment and investment can be interpreted in relation to the technological coefficients of a Cobb-Douglas production function, see Dowrick and Nguyen (1989), but the investment coefficient appears to be lowered by the inclusion of the Choi variable (which explains some of the differences in investment rates) and by the element of double-counting involved when the government variables include investment expenditures.

Finally, we return to the problem of sample selection. In Table 6 we report the estimates for the impact of social transfer expenditures - as in Table 5 - on samples which exclude each country in turn. Our formal test for outliers suggests that Japan 1960-68 is the only significant outlier, but it is still of interest to examine the sensitivity of our results to the choice of sample since other authors have adopted ad hoc selection criteria. It is apparent that the exclusion of Switzerland, or of Japan after 1968, can alter the coefficient estimates from 5.5 to 10.9, and the t-statistics from 1.5 to 3.2. Although these estimates are not significantly different at the 5% level from our preferred sample estimates, they do highlight the need for caution in interpreting t-statistics from samples which

Table 6

Testing the sensitivity of results for social transfers to sample selection

The pooled regressions reported in Table 5, regression 8, are repeated for different country samples. Only the coefficients and t-statistics on the social transfers variable are reported.

<u>sample excluding</u>	<u>number of observations</u>	<u>estimated coefficient</u>	<u>t-statistic</u>
-	72	5.24	1.42
Japan 1960-68	71	7.45	2.11
<u>Japan 1960-68 and</u>			
Australia	67	7.82	2.23
New Zealand	67	6.12	1.78
Austria	67	8.29	2.03
Belgium	67	6.84	1.89
Denmark	67	7.39	2.09
Finland	67	7.51	2.18
France	67	7.93	2.28
Germany	67	7.79	2.08
Ireland	67	6.32	1.78
Italy	67	7.68	2.14
Netherlands	67	7.83	2.01
Norway	67	6.84	1.93
Sweden	67	7.42	2.10
Switzerland	67	5.56	1.46
UK	67	7.73	2.23
Japan 1969-85	68	10.94	3.20
Canada	67	8.88	2.48
USA	67	7.62	2.14

have not been drawn by random selection from a large population, as classical statistical inference would require.

It remains to indicate the magnitude of the positive and negative impacts of government expenditures on economic growth. Levels of government consumption, for example, average 16% of GDP with a standard deviation across our pooled cross-sections of 5 percentage points, whilst non-consumption expenditures average 19% of GDP. The coefficient estimates of -4 and +5 from regression 4b in Table 3 suggest that a country where government consumption is substantially lower than average, say 11% of GDP, and non-government expenditure is correspondingly higher than average at 24% of GDP will tend to have an annual rate of economic growth 0.5 percentage points above average if there is no impact on employment and investment, or 0.3 percentage points above average if we take the reduced form estimates. This hypothetical example of the effects of the composition of government expenditure indicates a small, but not trivial, explanation of the variation in annual growth rates which range between 1 and 7 % p.a. for our sample.

5. Reconciliation with previous results

An important test of our analysis is whether we can identify the crucial methodological assumptions which explain previous results. We have carried out such tests by amending some of the specifications of the pooled cross-section model detailed in Tables 3,4 and 5.

We start in Part A of Table 7 with a variety of specifications of the regression estimating the impact of social expenditure on economic growth. Comparison of our preferred specification 1, with specifications 2. and 3, shows that the omission of catch-up and employment have the effect of substantially reducing the estimated positive impact of social expenditures. The omission of the catch-up variable reduces the estimated impact of social expenditures on economic growth in general, and on total factor productivity growth in particular, because part of the reason that rich, high public spending economies grow slowly is their lack of opportunity to catch-up with the world's technological leaders. Thus those studies which do not control adequately for catch-up are likely to underestimate the positive impact of social expenditures on growth. Omission of the Choi index has the opposite effect on regressions which do not control for employment and investment.

On the other hand, the use of per capita GDP growth as the dependent variable without control for population or employment growth (as in Korpi, 1985, Table 2) has the effect of raising the estimated positive impact. The rate of growth of population is correlated negatively with social expenditures, especially transfers, presumably since fast growing populations tend to be younger and less

Table 7
A partial reconciliation with results of previous studies

A. Reporting the OLS coefficient estimates and t-statistics on social expenditures under a variety of alternative specifications. All specifications are based on the pooled regression format detailed in Table 3, with **social expenditures** as the government variable.

<u>specification</u>	<u>n</u>	<u>coefficient</u>	<u>t-statistic</u>
1. excluding Japan, controlling for catch-up, choi, employment, investment and period dummies	68	6.00	2.49
2. as 1., but excluding catch-up	68	4.86	1.94
3. as 2., but excluding employment	68	2.29	0.93
4. as 1., but with per capita GDP as the dependent variable, excluding employment	68	8.00	3.33
5. as 2., but excluding period dummies	68	-8.46	-2.87

B. Pooled cross-section estimates of the effects of the **growth in government consumption expenditures per capita**. The three cross-sections are 1960-68, 1969-73 and 1974-79.

<u>specification</u>	<u>n</u>	<u>coefficient</u>	<u>t-statistic</u>
6. all 18 countries, controlling for catch-up, choi, employment, investment and period dummies	54	5.74	0.63
7. as 6., but omitting catch-up and choi	54	16.35	1.54

in need of social security support. We have shown that per capita GDP tends to decline with fast population growth, while total GDP tends to increase, so it is not surprising to find that when population growth is omitted as an explanatory variable the coefficient on social expenditures drops towards zero if the dependent variable is the growth of total GDP and rises to (apparently) very high levels of significance when the dependent variable is per capita GDP (see specification 4.). This finding may explain in part Korpi's (1985) strong result on the beneficial effects of social expenditures.

We have already demonstrated how the inclusion of Japan (particularly for the period before 1968) can influence the regression estimates. A further important consideration concerns the method of pooling cross-sections from different periods. The parameter stability tests tell us that it is invalid to require the cross-section regression intercepts to be constant over the four periods; the data is incapable of providing an adequate explanation of the decline in growth which has occurred in all OECD countries since the 1960s. However, it is this finding which leads Saunders (1986) to reject the pooling of cross-section data. Nevertheless, tests of the stability of the slope coefficients suggest that pooling is acceptable so long as we restrict the analysis to the explanation of cross-country differences in growth rates. Imposing the invalid restriction on the intercept terms causes the coefficient estimate for social expenditures to switch from positive to negative - compare specifications 1. and 5. in Table 7. This is, we believe, a crucial feature of the results of Weede (1986a & b)¹⁸. Constraining the period dummies to zero illegitimately places the burden of explanation for the secular decline in growth rates on the growth of government expenditures.

Finally, we report in Part B of Table 7 our preferred estimate of the impact of the *growth* in government consumption expenditures per capita (see specification 6.). The estimate is positive but statistically insignificant. If, however, we omit catch-up and Choi, as does Ram (1986) the coefficient estimate and t-statistic are trebled. - see specification 7. We can infer that countries which are growing fast because they are catching-up fast tend to have fast expanding government consumption (per capita), but we suspect that Ram's strong positive result is a case of reverse causation.

Finally, we note without reporting results in detail that the coefficient estimates reported in Tables 3, 4 and 5 are not altered to any substantial extent if we measure government revenues and expenditures per capita, rather than as shares of GDP, nor are the estimates altered significantly by the use of current, rather than constant, price, expenditure shares of GDP.

6. Conclusions

Our substantive findings are reported in our analysis of results and we do not intend to reiterate them in detail. We do, however, consider it worthwhile to highlight three points which emerge from the overall analysis. First, the evidence presented here is such as to rule virtually out of court any interpretation which argues for a statistically significant negative relationship between the level of government revenues or the components of government expenditure and medium-term economic growth. The nearest thing to an exception are the findings concerning the relationship between government consumption expenditure reported in equations 2a, 2b, 4a and 5a, but each of these findings occurs within the context of equations which fail crucial diagnostic tests. Otherwise, the only means of obtaining a significant negative finding are to fail entirely to control for catch-up and the rate of growth of employment or population or, in pooled regressions, to constrain the underlying rate of economic growth to be constant over diverse periods. Both moves clearly involve model misspecification and must be rejected. That being so, it is our view that the leaky bucket analogy simply does not hold as a statistically significant phenomenon for the period and countries under investigation in the present study. Given the problems involved in interpreting statistical tests on non-random samples and the possible biases in national accounts measurement of productivity in government services, any evidence that government consumption may inhibit economic growth (eg the consistent negative sign for consumption expenditure in all regressions) is, at most, merely suggestive.

Our second point is that there is, on the other hand, evidence from our preferred regressions - i.e. those pooled cross-sections which pass the diagnostic tests - of a modest, but statistically significant, positive effect of non-consumption expenditure, and especially social transfers, on medium-term growth. We do not contend that the evidence is particularly strong and certainly it is not of a magnitude that justifies a metaphor like 'irrigation system' (to get that impression, it is necessary to use per capita growth as the dependent variable). It should be noted, however, that the evidence concerning non-consumption expenditure does not have to be overwhelming to have important policy implications. One of the economic rationalist cases against redistribution via the welfare state is that government spending leads to economic inefficiency which is reflected in lower rates of growth. If it does not, and still more if it has even the mildest benign effects on economic growth, that case falls.

Our third and final point is a reaffirmation and reinforcement of Saunderson's plea for more methodological rigour in cross-national analysis of this type. How we approach questions of parameter stability across time and countries, of appropriate controls, of pooling data and of simultaneous causation can have very

major implications for our findings. Seemingly small methodological decisions taken in haste can have a vast impact on the substantive conclusions we feel justified to draw from our analysis as the results reported in Table 7 demonstrate. It is our hope that that the methodological techniques discussed and used in this paper will become standard practice in any future empirical investigations concerning the causes of differences in economic growth.

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Footnotes

¹For much the most measured account of the literature, see Ringen 1987.

²However, there is no explicit evidence that he actually tests for parameter stability across the different periods.

³A similar need to disaggregate categories of expenditure has also been noted in comparative studies of the determinants of public expenditure outcomes. (See Castles, 1982; Rose, 1984; Jones, 1985).

⁴The hypothesis that work effort is positively related to the social wage is, however, closely related to the idea, current in mainstream economics, that effort may be a positive function of real or relative wages paid by an employer. See Stiglitz (1987) for a recent review of this 'efficiency wage' hypothesis.

⁵In the cross-national literature this argument has been largely addressed by hypothesising that nations which are economically vulnerable in virtue of their position in the international division of labour or small population size will be more likely to adopt measures designed to enhance levels of social protection. As articulated by Cameron (1978), Katzenstein (1985) and Castles (1988), this argument points to the macroeconomic pay-offs of greater security in terms of lessened inflation and unemployment, rather than higher economic growth. Castles (1988: 54) notes a significant negative bivariate correlation between population size and per capita growth for 16 OECD countries in the crisis of the 1970s and a very much weaker one for 18 nations including Japan and Norway.

⁶Estimation of the trend was carried out by OLS regression of the logarithm of real per capita GDP on a spliced time trend.

⁷It is, of course, impossible to control for every factor that has been suggested as a possible determinant of growth and we concentrate on those the literature suggests are most influential. In particular, we do not discuss here the possible impact of Left participation in government and the (possibly interactive) effect of strong labour unions (see Lange and Garrett, 1985 and Hicks, 1988). That omission can be justified partly in terms of the highly contested nature of the findings (Jackman, 1986) and partly in virtue of the fact that the postulated causal effect of Left political control is presumed in part to work through the public expenditure variables that are the primary focus of this research. Nor do we examine the impact of democracy on economic performance, again partly because the findings are highly contentious (Marsh, 1979 and Weede, 1983) and still more because much of the debate has

tended to focus on a much wider cross-section of countries than we examine here.

⁸See Baumol (1986), Abramovitz (1986), Kormendi and Meguire (1985), Dowrick and Nguyen (1989).

⁹ Korpi (1985b) appears to have used the level rather than the logarithm of per capita income. Dowrick and Nguyen (1989) find that the logarithm has more explanatory power as well as being theoretically preferable.

¹⁰Choi (1983), Table 3.3, p.70, Column B. A recent analysis of interest group politics and economic growth in the U.S. States (Gray and Lowery, 1988) finds very little support for the Olson model. However, cross-national, multivariate studies by Lane and Ersson (1986 and 1987) have shown that for OECD countries institutional sclerosis (as measured by the Choi index) is much the strongest predictor of economic growth. At the same time, they note the largely negative impact of various components of public expenditure, including total outlays, final government consumption and social transfer payments. They fail, however, to control for catch-up or the growth of factor inputs (at least in the equations concerned with the impact of public expenditure) and they do not consider the impact of outliers.

¹¹Excluding from the full 24 OECD club Iceland, Luxembourg, Portugal, Spain and Turkey for which OECD (1985) has no data. Where there are gaps in the OECD (1985) data set we have used OECD National Accounts data for the nearest available years.

¹²This argument that parameters should be stable across country selection mirrors Saunders's (1986) argument that parameters should be stable across time.

¹³We infer from Saunders (1986) Table 1, note (c) and the discussion on p.56 that his stability tests include the stability of the intercept term as well as stability of the slope coefficients. We also note that in Weede's (1986a and 1986b) pooled cross-section regressions the intercept term is similarly constrained to be constant over time.

¹⁴The existence of a relationship of this nature has been the primary hypothesis of those who have argued that the level of GNP is an important determinant of welfare state expansion. Such a relationship has been demonstrated for large samples of nations at highly disparate economic levels (Wilensky, 1975), but not for a smaller sample of economically advanced nations (Castles & McKinlay, 1979).

¹⁵*Post hoc ergo propter hoc* is not an infallible argument. Economic agents may successfully anticipate future developments and be guided in their current actions by such expectations. This argument is particularly important where the time difference is short, but it is hard to imagine that decisions about the level of government expenditures would be significantly affected by anticipated growth rates six years or more ahead.

¹⁶The Choi index does not cover Greece.

¹⁷One partial solution to this problem could lie in adopting the approach of Falvey and Gemmell (1988) who adapt Ram's (1986) model by estimating the effects of government on private sector, rather than total, GDP. Lacking a breakdown of employment and capital stock by public and private sectors, however, this approach relies on the untested assumption of a constant productivity differential between the two sectors.

¹⁸Weede (1986a) does report in a footnote that when he allows the intercept term to vary he still finds a significant negative result. Without seeing his results it is difficult to interpret this statement, but we suspect that such a result may result from a failure to control for catch-up and for population growth.

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