PN-ABD-351

Best available copy -- page 22 missing

PN-ABD-351

THE SIZE OF THE STATE, ECONOMIC GROWTH AND THE EFFICIENT UTILIZATION OF NATIONAL RESOURCES

By Gerald W. Scully

Professor
School of Management
University of Texas at Dallas
Richardson, Texas 75083

I thank K. Hayes, D. Slottje, and Gordon Tullock for comments on an earlier draft.

Paper prepared for presentation for the conference on "Government and Growth," Institute for the Study of Free Enterprise Systems and the U. S. Agency for International Development, Buffalo, September 15-16, 1989.

Most of this paper is forthcoming in Public Choice.

THE SIZE OF THE STATE, ECONOMIC GROWTH AND THE EFFICIENT UTILIZATION OF NATIONAL RESOURCES

by Gerald W. Scully

I. INTRODUCTION

The size of the state, measured conventionally as government expenditures as a fraction of national output, has grown enormously in modern times.[1] During this century, among developed nations, government spending has risen from under a tenth to more than a third of a share of GNP. The rise of government control over national resources is ubiquitous.[2] Is this substitution of public choice for private choice beneficial or harmful to society based on some objective criterion? Obviously, an array of criteria must be specified and their interrelationships modeled before an definitive, overall judgment can be made. The objective in this paper is more limited. Evidence is offered on the effect of the size of the fiscal sector, net of resource growth, on economic growth and on the efficiency of resource allocation for 115 market economies for the period 1960 to 1980. The overall conclusion is that for these criteria at least the growth in the size of the state has been harmful.

II. INCREASES IN THE SIZE OF GOVERNMENT: BENEFICIAL OR HARMFUL?

Several caricatures of the state are found in the literature. In the English speaking public finance tradition the democratic state is characterized as benevolent. The agents

(politicians and bureaucrats) benignly serve the polity in performing the Musgravian (1959, Chap. 1) fiscal functions. From a public choice perspective, the bureaucratic state in majoritarian, representative democracies is fiscally expansionist, redistributive, and self-serving, with public resources being allocated in a political market [Downs (1957), Buchanan and Tullock (1962), Tullock (1965), Olsen (1965), and Niskanen (1971)]. In the Italian public finance tradition (Buchanan, 1960) and in Buchanan (1975) and Brennan and Buchanan (1980) the state is characterized as malevolent. Unshackled of constitutional rules, revenue maximizing Leviathan drives the polity to penury (Brennan and Buchanan, 1980, p. 40).

While malevolence for its own sake cannot be ruled out, political self-seeking with guile naturally is linked with rent seeking (Tollison, 1982). In majoritarian, representative democracies logrolling politicians redistribute public income by concentrating net benefits (benefits minus taxes) among the majority coalitions electing them. This tends to lead to a growth of the public sector (Buchanan and Tullock (1962) and toward a redistribution of public resources toward the middle class [Stigler (1970), Tullock (1983, 1986). In non-representative governments the public sector is a source of rents to the ruling class and a source of much mischief. Tullock's (1967) important theoretical insight on rent seeking identifies tariff induced rents as a prize up for grabs (also, see Krueger, 1974). In a

laissez-faire, free trade, market economy, competition erodes rents. State command of resources through its fiscal function and government rules, regulations, licensing, etc. give rise to political markets for rents. Resources flow into the pursuit of those rents. Buchanan (1980, p. 9) argues that the level of rent seeking and the resources devoted to this socially unproductive pursuit are directly related to the relative size of the public sector in the economy. Therefore, the increased size of government is harmful. Resources are reallocated from productive activities into directly unproductive, rent seeking pursuits. A consequence of the rent-induced distortions in resource allocation is a decline in economic growth and in efficiency.

Traditional arguments also plausibly link the size of the government sector with a reduction in national economic performance. Value added in the government sector is lower than in the private sector. Resources are not allocated to highest valued use but on political (bureaucratic) criterion. High taxes, tax progressivity, and the substitution in consumption of politically priced public goods for market priced private goods reduces the incentives of economic actors.

The secular rise in the size of the state and the near universal appeal of the relatively large government sector suggests that large segments of these societies find this result desirable. Arguments that the increased size of the public sector is beneficial and may promote growth and efficiency briefly would

be of the following sort. (1) The larger the government sector, the greater the macroeconomic stability, since government expenditures exhibit less variance than private sector expenditures. Ceteris paribus, economies with low variance in GNP grow at a higher rate than those with a high variance in GNP. (2) The larger the size of the government, the greater is the scope for income redistribution. Too much income inequality may create incentives for the low income types to seek another social order. Redistributions may reduce work incentives, but may be an inexpensive (efficient) means of preserving the social order. Satisfying the demand for income redistribution promotes political and social stability, which are preconditions for growth and efficiency. Thus, the income distribution partly may reflect the opportunity cost of rebellion. (3) Traditional public goods-externalities (market failure) arguments and the effect of reduced transaction costs are associated with the government supplied infrastructure. (4) In a less developed country context a belief that the private sector is incapable of modern transformation of the economy.

Empirical testing of the hypothesis of a rent seeking Leviathan is difficult. The relatively little empirical evidence that exists is conflicting.[3] Ideally, the vector of government policies (tariffs, quantitative restrictions, licenses, export marketing boards, foreign exchange controls, etc.) that give rise to rent seeking and that yield negative net social benefits would

be identified and their effects estimated. Data limitations preclude wide testing of this proposition.

Alternatively, but, less adequately, the effect of the size of the state sector on economic growth and efficiency can be tested. Utilizing IMF, World Bank and United Nations sources Landau (undated) found that the size of government was negatively correlated with the compound growth rate of per capita gross domestic product for a sample of 65 less developed countries over the period 1960 to 1980. A weakness of the Landau study is that a multiplicity of regressors (frequently more than 20) appear in the equations without concern for a theoretical specification of relationships and interrelationships among the variables. Using an earlier version of the data set employed here (i.e., Summers and Heston, 1984) Landau (1983) found for a sample of 104 developed and less developed countries over the period 1961-76 a negative relationship between size of government and the growth rate of per capita GDP. Marlow (1986) found a negative relationship between the size of the state sector and the compound growth rate of real gross domestic product for the industrialized countries over the period 1960-70. In sharp contrast, Ram (1986) using the Summers and Heston data for the period 1960-80 concluded that the size of the public sector had a positive effect on growth. Ram's dependent variable is the country specific trend (per capita growth) regression coefficient; the independent variables measuring the growth rate

of government expenditure and population are also trend regression coefficients. This procedure violates the normality assumption of the underlying distribution of the estimators. In the Ram specification the growth rate of the government sector and the growth rate multiplied by the size of the government sector are entered as separate regressors, when in fact they are not independent. Econometric difficulties of this sort weaken his findings.

A major limitation of these empirical studies on the effect of the size of the public sector on the economy is that a growth model has not been specified, nor has the effect of state allocation of resources on economic efficiency been studied. The growth rate of inputs such as the capital stock and the labor force affect the growth rate of output. Failure to adjust for input growth may render inaccurate the estimates of the effect of the size of the state sector on economic growth.

III. DATA AND VARIABLE CONSTRUCTION

The cross country economic data employed in this study comes from Robert Summers and Alan Heston (1984) (in collaboration with Irving Kravis). Summers and Heston have constructed internationally comparable economic series for a large number of countries over time. The economic data used as variables in this study is for the period 1960 to 1980. The Summers and Heston data are made comparable across countries through the employment of a

common set of world average prices. Intercountry per capita income figures suffer from the intractable index numbers problem, differences in national accounting systems and in the coverage and statistical reliability of the accounts data, and in exchange rate conversion problems in translating income data in different national currencies to the US dollar, the conventional, common numeraire. The Summers-Heston-Kravis technique tackles some of these problems and provides the only available comparable set of international product and product composition data.[4] The World Bank now uses this approach.

Economic Growth and the Size of the State

Let an economy be described by a simple, aggregate, neoclassical production function homogeneous of degree one in the inputs.[5] In intensive form the production function is $y = f(k)$, where y is output per capita and k is capital per capita. Differentiating the production function with respect to time and dividing by y yields $g_y = e_k \cdot g_k$, where g_y is the growth rate of output per head, g_k is the growth rate of the capital-labor ratio and e_k is the elasticity of output per head with respect to the capital-labor ratio.

Given data on output and inputs in the private and government sectors, production functions could be estimated separately for each sector. The economy wide growth rate would be a weighted average of the growth rates of each sector and the effect of the increased size of the government sector on growth

would be simply measured. This approach is not feasible, since the data is not available. The alternative is to adopt the traditional approach in the literature and add the size of the government sector as a regressor in the stochastic version of the growth equation. Since the effect of the growth rate of the input ratio on the growth rate of per capita output has been held constant, the coefficient of relative government size on economic growth is unbiased. Since the dependent variable is the growth rate of per capita output, the appropriate specification of the relative government size variable would include its initial or starting value and the interperiod change in the variable.

Measuring Efficiency

One or more of the economies described by the production function will have values of output per capita that are greater than those of other economies with similar values of the input ratio. These economies are the most technically efficient in converting inputs into output. Such economies are said to be frontier efficient. Designate the efficient economies y^*--the efficiency frontier. Economies can be compared to the efficiency frontier, and a measure of efficiency, EFF, is defined as $EFF = y/y^*$, with $0 < EFF \leq 1$.[6]

Econometric Specification

The estimation technique for the production function depends on the nature of the assumption regarding the error term in the stochastic version of the production function. Three

specifications are employed here: (1) the deterministic frontier function of Aigner and Chu (1968); (2) the stochastic frontier function of Aigner, Lovell, and Schmidt (1977), as extended by Huang (1984); and (3) the maximum likelihood Gamma frontier function by Green (1980).

The deterministic frontier function is estimated by minimizing the sum of the absolute residuals. The approach, therefore, considers all deviations from the efficient, frontier function as arising from technical inefficiency. A criticism is that only part of the error may be deterministic; part may be truly stochastic. The error term may be of the form $\delta = u + v$, where u is a one-sided disturbance term representing the degree of technical inefficiency and v is a symmetric, normally distributed random influence.

The EM (expected maximization) algorithm is a general approach for computing maximum likelihood estimates from incomplete data and is given by Dempster, Laird, and Rubin (1977). Huang (1984) utilizes the algorithm as a method of decomposing the estimated error, δ, into separate components, u and v. The Huang approach is an extension of Aigner, Lovell, and Schmidt (1977).

The EM algorithm technique consists of a two-step iterative procedure. The first procedure is to estimate the sufficient statistics of the stochastic frontier function. The estimation step utilizes the predicted sufficient statistics to estimate the

parameter θ by maximum likelihood. Once the estimated θ is obtained the EM algorithm, the individual stochastic efficient frontier can then be estimated by the conditional mean. Huang (1984, 848-50) can be consulted for further details.

A second criticism of the deterministic frontier approach is the assumption that the error term is normally distributed. Green (1980) has worked through the estimation of stochastic frontier functions with the assumption that the stochastic disturbance is Gamma distributed. Assume that the density function follows the two parameter probability law: $f(\delta) = G(\Omega,p) = \Omega^p \delta^{p-1} e^{-\Omega e}/\Gamma(p)$, where $\delta \geq 0$, $\Omega > 0$, $p > 2$, and, where $\Gamma(p)$ is the Gamma function evaluated at p. This disturbance has $\mu = p/\Omega$ and $\sigma^2 = p/\Omega^2$ is always positive. The parameters of the log likelihood function are estimated using a Newton-Raphson algorithm. The Gamma function and its derivatives are approximated utilizing a SAS subroutine known as the LIFEREG procedure. Following Green (1980), the starting value for the frontier function is obtained by OLS.

Data on real gross domestic product per capita, population, and the percentage of real gross domestic product devoted to gross domestic investment were available annually for 115 market economies for the period 1960 to 1980. From these data the following variables were calculated (the procedures of calculation are discussed subsequently):

CAPGWTH = the compound growth rate of real per capita

gross domestic product from 1960 to 1980;

L = the estimated labor force (population) annually from 1960 to 1980;

K = the estimated capital stock (buildings and machinery and equipment) annually from 1960 to 1980; and,

KLGWTH = the compound growth rate in the capital-labor (K/L) ratio from 1960 to 1980;

GOVT60 = government expenditures as a percent of gross domestic product, 1960;

GOVT80 = government expenditures as a percent of gross domestic product, 1980;

CHGGOVT = GOVT80-GOVT60.

Labor Force

The use of population as a proxy for the labor force is disagreeable but conventional. Data on labor force participation rates is available for the OECD countries and Greece, Iceland, Luxembourg, and Turkey. Data for some non-OECD countries is available from United Nations sources. These labor force participation rates generally are not very reliable.[7]

Capital Stock

The construction of the series on the annual capital stock by country over the period 1960-80 is based on the methodology suggested by Arnold C. Harberger (1978). The Summers and Heston annual data series on real gross per capita domestic product,

population, and the percentage of real domestic product devoted to gross domestic investment provide the basic data for the construction of the capital stock series.

Gross investment is decomposed into three components: buildings, machinery and equipment, and inventories. The United Nations provides country data on the composition of gross domestic investment.[8] The series on the composition of gross investment hardly covers all countries in all years, but the coverage is fairly extensive. To avoid annual anomalies the composition share data by country was averaged over the period 1965-75, and this average was used for the country specific composition of gross domestic investment. For those countries lacking data on the composition of capital formation, regionally averaged data was utilized. While there is intercountry dispersion in these sectoral shares of gross domestic investment, it is not so extensive as to render a regional average an unreasonable substitute for the missing data. The largest regional coefficient of variation was 23 percent.[9] Inventories are ignored in this study. Therefore, the gross investment series employed here is gross capital formation in buildings and in machinery and equipment.[10]

Size of Government

The variable chosen to capture the effect of the presence of the state on economic growth and economic efficiency is

government expenditure as a share of gross domestic product. Peltzman (1980, p.209) points out that the role of government is far more pervasive in economic life than is implied by this variable (e.g., statutes and administrative rules, regulation, etc. reallocate resources as much as fiscal activities), but data limitations dictate the choice. Not withstanding this caveat the size of the government sector so measured represents a substitution of public choice for private choice in the allocation of resources, and this substitution is hypothesized to adversely affect economic growth and efficiency. The three government expenditure variables measure the initial, terminal and comparative static absolute percentage point change in government share over the period of study.

IV. EMPIRICAL EVIDENCE ON THE RELATIONSHIP BETWEEN GOVERNMENT EXPENDITURE AND ECONOMIC GROWTH AND ECONOMIC EFFICIENCY.

The Size of the State and Economic Growth

The relationship between economic growth, as measured by the compound growth rate of real gross domestic product over the period 1960-80, and the share of government in the national economy (GOVT60) and the interperiod change in the share of government (CHGGOVT) was estimated by linear OLS. The error term is assumed to be normally distributed.[11] The regression results appear in Table 1. In equation (1) in the table only the government share variables appear as regressors. In equation (2)

in the table the compound growth rate of the capital-labor ratio over the period is included as a regressor. As the size of the state sector grows, government plays a more direct role in the allocation of physical capital.[12] While state investment may be less productive than private investment, such investment (positively) affects growth. Hence, due to the absence of the compound growth rate in the capital-labor ratio, the negative effect of government share on growth may be overstated.

Both GOVT60 and CHGGOVT are of the correct sign and are statistically significant in a one-tail test at better than the one percent level. Setting all of the independent variables in equation (2) in the table equal to zero, the compound growth rate is 3.7 percent. Each one percentage point increase in the compound growth rate of the capital-labor ratio (mean CHGKL = .0104, st. dev. = .0245) adds about a half of a percentage point to the growth rate. Each one percentage point increase in government expenditures as a fraction of GDP in 1960 (GOVT60) or in the interperiod change in the fraction reduces the growth rate by roughly one-tenth of a percentage point. The average value of GOVT60 is .162 percent (st. dev. = .066), the average value of CHGGOVT is .0308 percent (st. dev. = .0756), and the average real per capita growth rate is .0251 (st. dev. = .0209).

The negative effect of government expenditure on economic growth can be seen more clearly in Table 2 where average predicted growth rates based on equation 2 in Table 1 for a

range of values of GOVT60 and CHGGOVT across these 115 market economies are presented. At one standard deviation below the mean the least interventionist states have values of GOVT60 = .0955 and CHGGOVT = -.0448. Such hypothetical economies would have real per capita growth rates of 3.76 per annum. The most interventionist states (at one standard deviation above the mean) have values of GOVT60 = .2278 and CHGGOVT = .1064. Such hypothetical economies would have real per capita growth rates of 1.26 per annum. Obviously, the negative impact of the size of government on growth is of an important order of magnitude.

An objection to the analysis is that the sample of economies contains developed and developing countries, where the objectives of government expenditures may differ. Among developed countries a larger fraction of government expenditure is directly redistributive, while in developing countries a larger fraction may be for "productive", development purposes. The equations were re-estimated for the sample of less developed countries (n = 93). The results appear in Table 1. Naturally, there are changes in the size of the coefficients and standard errors, but these changes are trivial. The signs of the coefficients remain unchanged and the results remain statistically significant.

The Barro Hypothesis on the Productivity of Government Expenditures

Barro (1988) has developed a model which theorizes that the level of government expenditures up to a fairly substantial level

(e.g. 25 percent of GDP) contributes positively to economic growth and that there is an optimal size of the public sector. Following Romer, (1986), but employing a constant returns to scale model of economic growth, Barro assumes that private and social rates of return to investment diverge, so that the rate of savings and economic growth are sub-optimal. He assumes that the quantity of public services (roads, public goods, defense, protection of property, etc.) enters the production function as a separate factor of production and that the expenditures raise the marginal productivity of capital. Obviously, by raising the marginal product of capital, savings and economic growth increase. At levels of relative government expenditure beyond the optimal level, government expenditures constitute a negative externality and result in a decline in the savings rate and in economic growth.

Obviously, Barro's theory of a positive effect of government spending on economic growth and the empirical evidence of a negative effect are in conflict. There is little doubt that some government spending on protection of private property, enforcement of the constitutional agreement, and the provision of public goods is necessary to exploit the gains from exchange. But, the economies of 18th century and mid-19th century Great Britain and America grew steadily with relative government expenditures in the one to three percent range (Cato, Fall 1988 p. 556). In more recent times Hong Kong, Switzerland, Singapore,

Thailand, and Japan have had solid economic growth rates with average relative government expenditures over the period 1950-85 in the 4.3 to 11.7 percent range. Government spending beyond some minimum level is a substitution of public for private consumption and for purposes of income redistribution. The allocation of these government expenditures takes place in a political market. It is difficult to imagine how the modern high relative levels of government spending for these purposes contributes to the efficient allocation of resources and to economic growth.

Barro (equation (9), p. 8) specifies a Cobb-Douglas production function in intensive form. Output per capita is a function of capital per capita and government expenditures per capita. Since cross-section, time series on capital stock is unavailable, gross investment is utilized in the empirical results below (in the growth form of the model, which is estimated also, investment is the correct specification). Barro's equation was estimated with the Summers and Heston data for the period 1960-85. There were 115 countries with complete data for the period. All of the variables are average values over the period. The results of equation (1) in table 3 confirm Barro's hypothesis of a positive correlation between per capita government spending and per capita economic growth. But, there is a problem of spurious correlation. There is a significant correlation ($r = -0.37$) between the growth rate of per capita

real GDP and population growth. High population growth rate countries produce a path of per capita real GDP below that of low population growth countries. The path of investment and government expenditures out of GDP is more steeply sloped in the high population growth countries. The simple correlations between the trend in government expenditures and the population growth rate is 0.33. The simple correlation of population growth and the trend in the investment share is 0.28. To remove the spurious effect of population, the independent variables are average investment and average government expenditure over the period. The sign of government expenditures on per capita average real gross domestic product is negative and statistically significant.

Barro's model yields an optimal relative size of government spending (Figure 1, p. 12a). Equation (3) in table 3 confirms Barro's hypothesis. Solving for the optimal relative size of government spending utilizing the coefficients in equation (2) yielded a government share of GDP of 32.3 percent and a per capita real growth rate of 3.97 percent. This size of the state surely is beyond a level of productive public expenditure, no matter how loosely defined. A difficulty with this specification is that it assumes economic growth emanates exclusively from public spending. Capital formation clearly affects economic growth. Both per capita investment and per capita investment squared are statistically significant.

Equation (5) in table 3 incorporates the effects of investment and government spending on the per capita growth rate. When both sets of variables are specified in the equation, relative government spending is not significant as an independent explanation of the pattern of economic growth.

The Size of the State and Economic Efficiency

Efficiency measures were calculated for each economy utilizing the various production function specifications discussed above. The technical efficiency measures obtained are for 1980 and the best of these were regressed against the share of government expenditures in GDP for 1980 (GOVT80). The conclusions are not sensitive to the choice of the efficiency specification. The result appears in Table 4. Setting GOVT80 = 0, the technical efficiency of the average economy among the 115 countries is EFF80 = 0.84. Thus, on average such an hypothetical economy produces 84 percent of its potential or frontier real GDP per worker with its observed capital-labor ratio. For each one percentage point increase in the size of the state sector there is a loss of technical efficiency of about 1.8 percentage points. The coefficient relating GOVT80 to EFF80 is very highly statistically significant. At one standard deviation above and below the mean, the difference between the most interventionist and the least interventionist state is 12.5 percentage points. This difference yields a 23 percentage point difference in technical efficiency. Alternatively, the least interventionist

state hypothetically produces 62 percent more output per worker with the same input ratio as the most interventionist state.

Restricting the sample of countries to the less developed countries does not change the conclusion that government expenditures and economic efficiency are inversely related and that this tradeoff is statistically significant. On the whole, the less developed countries are less technically efficient in transforming inputs into output (i.e., the intercept in equation (3) in Table 4 is 0.1660 less than that of equation (1)). While there may be other reasons for this difference, most of the difference in terms of the model is due to the fact that the less developed countries are more interventionist than the developed economies. There is a 7.1 percentage point difference in the size of the government sector in 1980 between these two groups of countries. The higher mean GOVT80 for the LDC's and the lower variance yields the somewhat smaller coefficient relating GOVT80 to EFF80 in equation (3).

It is clear from these results that increments in the relative amount of resources allocated by the government sector reduce the efficiency of the economy in transforming inputs into output. Symmetricality of argument requires that the greater the share of private sector allocation in the economy the greater the efficiency by which inputs are transformed into output. To test this proposition the efficiency measure was regressed against the share of gross investment out of GDP in 1980 (I80). Since some

government investment in state-owned enterprises is included in the gross investment data, the coefficient of I80 on efficiency will be biased downward to some unknown degree. The results appear as equations (1) and (3) in Table 5. The coefficient of I80 on EFF80 is positive and very highly significant. Moreover, the size of these coefficients are on the same order of magnitude as the absolute value of the coefficients of GOVT80 on EFF80 in equations (1) and (3) in Table 4. As such, bearing in mind the potential bias in the coefficient, each unit of resource converted from private sector allocation to public sector allocation is associated with a unit proportional loss of efficiency for the economy.

It is well known that bounded variables such as EFF80 may have distributions that are truncated, which limits the power of the tests on the hypothesis. The appropriate solution econometrically is to transform the dependent variable into the logit of the variable.[13] The dependent variable then is interpreted as the logarithm of the ratio of the odds of the event and the coefficient, the signs of which change naturally, is interpreted as the effect of the independent variable on changing the log of the relative odds. The empirical results appear in Table 4 as equations (2) and (4). OLS estimation of the logistic specification is a maximum likelihood estimate of the parameters. The results of equation (2) and (4) in the table confirm that the negative relationship between the size of the

0.1433). For the most interventionist hypothetical state (i.e., at one standard deviation above the mean) interperiod economic efficiency declined (predicted CHGEFF = -0.0267).

If the increase in the size of the government sector between 1960 and 1980 resulted in a reduction in efficiency, symmetricality of argument requires that an increase in private sector allocation of resources result in an increase in interperiod efficiency. To test this proposition, CHGEFF was regressed against the share of gross domestic investment out of GDP in 1960 (I60) and the absolute interperiod change in the share of gross investment (CHGI = I80 - I60). The results appear as equations (2) and (4) in Table 5. The coefficients are positive and highly significant. Economies with relatively high levels of gross domestic investment as a share of GDP in 1960 and with increases in that share during the period of study, increased their efficiency in transforming inputs into output. Economies with relatively high levels of government expenditure as a fraction of GDP in 1960 and with increases in the size of the government sector during the period experienced a decline in the efficiency in transforming inputs into output.

Further Research

This paper has treated the effect of the size of government on economic growth and on efficiency as exogenous. A next step is to examine the effect of the size of the state endogenously within the context of a general macro-economic model. In a cross-

section (or cross-section, time series) model the issue of whether the same macro-econometric model applies for all countries will have to be addressed, as will the mix of government expenditures by category of expenditure. Certainly, government expenditure is not homogeneous. Some categories of government expenditure (and policy; e.g., regulation, state ownership of industry, etc.) may have positive, neutral, or negative effects on economic growth. A similar problem exists for a time series analysis, since the composition of government expenditure changes over time. Additionally, the recent development literature has shown the importance of human capital and disembodied technology to economic growth. Attempts should be made to incorporate this literature into the analysis of the effect of government size on economic growth. However, empirical measures of aggregate human capital and disembodied technology are limited.

V. SUMMARY AND CONCLUSIONS

The motives of the state in projecting a more than minimal presence in the economy may be conceived of as benevolent or malevolent. Whatever the characterization of the motivation, increases in the size of the government share of the economy adversely affect economic growth and the allocation of resources. Nations with relatively large government shares in 1960 on the whole grew more slowly than nations with relatively small state sectors. Interperiod increases in the size of government were

associated with lower growth rates over the period. The size of the government share coefficients in the regressions were of sufficiently large magnitude to conclude that the rise in the size of the government has had a substantial depressing effect on economic growth. These results are consistent with those reported by Landau (1983) and Marlow (1986). Landau did not adjust economic growth for the growth in factor endowment. Consequently, his results overstate the adverse effect of government size.

Government allocation of resources is thought to be less efficient than private allocation. For the first time in the literature, this hypothesis was tested directly by comparing efficiency measures with the measures of the size of the government sector. It was found that the size of the government share in the economy was negatively correlated with economic efficiency and with the interperiod change in economic efficiency. Nations with relatively large state sectors produced less output per head with the same input ratio than nations with relatively small government sectors.

REFERENCES

Aigner, Dennis J., and Chu, S. F. "Estimating the Industry Production Function." A.E.R. 58 (September 1968): 826-39.

_____., Lovell, C. A. Knox, and Schmidt, Peter. "Formulation and Estimation of Stochastic Production Models." Journal of Econometrics. (January 1977): 21-37.

Brennan, Geoffrey and Buchanan, James M. The Power to Tax: Analytical Foundations of a Fiscal Constitution. Cambridge: Cambridge University Press, 1980.

Buchanan, James M. "La Scienza Della Finanze': The Italian Tradition in Fiscal Theory," in Buchanan (Ed.): Fiscal Theory and Political Economy. Chapel Hill: University of North Carolina Press, 1960, pp. 24-74.

_____., and Tullock, Gordon. The Calculus of Consent. Ann Arbor: The University of Michigan Press, 1962.

_____. The Limits of Liberty. Chicago: The University of Chicago Press, 1975.

_____. "Rent Seeking and Profit Seeking," in: James M. Buchanan, Gordon Tullock, and Robert D. Tollison (Eds.): Toward a Theory of the Rent-Seeking Society. College Station: Texas A and M University Press, 1980, pp. 3-15.

Caves, Douglas W., Christensen, Laurits R., and Diewert, W. Erwin "Multilateral Comparisons of Output, Input, and Productivity Using Superlative Index Numbers." The Economic Journal. 92 (March 1982): 73-86.

Dempster, A. P., Laird, N. M., and Rubin, D. G. "Maximum Likelihood from Incomplete Data via the EM Algorithm." Journal of the Royal Statistical Society. Series B 39 (1977): 1-38.

Downs, Anthony. An Economic Theory of Democracy. New York: Harper and Row, 1957.

Greene, William H. "Maximum Likelihood Estimation of Econometric Frontier Functions." Journal of Econometrics. 13 (1980): 27-56.

_____. "The Estimation of a Flexible Frontier Production Model." Journal of Econometrics. 13 (1980): 101-15.

Harberger, Arnold C. "Perspectives on Capital and Technology in Less-Developed Countries." In Contemporary Economic Analysis edited by M. J. Artis and A. R. Nobay. London: Croom-Helm, 1978.

Huang, Cliff J. "Estimation of Stochastic Frontier Production Function and Technical Inefficiency Via the EM Algorithm." Southern Economic Journal. 50(3) (1984): 847-56.

Krueger, Anne O. "The Political Economy of the Rent-seeking Society." American Economic Review. 64 (June 1974): 291-303.

Landau, Daniel. "Government Expenditure and Economic Growth: A Cross-Country Study." Southern Economic Journal. 49 (January 1983): 783-92.

_____. "Government and Economic Growth in the Less Developed Countries." mimeographed.

Marlow, Michael L. "Private Sector Shrinkage and the Growth of Industrialized Economies." Public Choice. 49 (1986): 143-54.

Musgrave, Richard A. The Theory of Public Finance. New York: McGraw Hill, 1959.

Nelson, Michael A."Searching for Leviathan: Comment and Extension." American Economic Review. 75 (September 1985): 198-204.

Niskanen, William A., Jr. Bureaucracy and Representative Government. Chicago: Aldens and Atherton, 1971.

Oates, Wallace. "Searching for Leviathan." American Economic Review. 75 (September 1985): 748-57.

Olsen, Mancur. The Logic of Collective Action. Cambridge: Harvard University Press, 1965.

Peltzman, Sam. "The Growth of Government." Journal of Law and Economics. 23(2) (October 1980): 209-87.

Ram, Rati. "Government Size and Economic Growth: A New Framework and Some Evidence from Cross-section and Time Series Data." American Economic Review. 76 (March 1986) :191-203.

Scully, Gerald W. "The Institutional Framework and Economic Development."Journal of Political Economy. 96 (June 1988): 652-62.

Short, R. P. "The Role of Public Enterprises: An International Statistical Comparison," in R. Floyd, C. Gray and R. P. Short, Public Enterprise in Mixed Economies: Some International Aspects. Washington: International Monetary Fund, 1984, 99. 110-94.

Stigler, George J. "Director's Law of Public Income Redistribution." Journal of Law and Economics. 13 (April 1970): 1-10.

Summers, Robert, and Heston, Alan. "Improved International Comparisons of Real Product and its Composition: 1950-1980." Review of Income and Wealth. (June 1984): 207-62.

Tollison, Robert D. "Rent Seeking: A Survey." Kyklos. 35 (1982): 575-602.

Tullock, Gordon. "The Welfare Costs of Tariffs, Monopolies and Theft." Western Economic Journal. 5 (June 1967): 224-32.

_____. The Politics of Bureaucracy. Washington: Public Affairs Press, 1965.

_____. Economics of Income Redistribution. Boston: Kluwer-Nijhoff, 1983.

_____. The Economics of Wealth and Poverty. New York: New York University Press, 1986.

United Nations. Yearbook of National Accounts Statistics. New York: United Nations, various years.

Table 1. Regressions Relating the Effects of Government Expenditures on Economic Growth, 1960-80.[a]

	All Economies		Less Developed Economies	
(Eq. No.) Variable	(1) CAPGWTH	(2) CAPGWTH	(3) CAPGWTH	(4) CAPGWTH
CONSTANT	.0467	.0372	.0466	.0361
	(7.04)	(6.70)	(5.14)	(4.73)
KLGWTH		.4752		.4571
		(7.61)		(6.58)
GOVT60	-.1123	-.0889	-.1129	-.0842
	(3.16)	(3.05)	(2.47)	(2.22)
CHGGOVT	-.1140	-.0871	-.1159	-.0856
	(3.66)	(3.41)	(3.05)	(2.70)
R**2(Adj.)	.1007	.1617	.0758	.3713
(N)	(115)	(115)	(93)	(93)

[a] Student-t values are in parentheses below the coefficients.

Table 2. Predicted Average Growth Rates for Various Levels of GOVT60 and CHGGOVT.[a]

CHGGOVT \ GOVT60	0	10	20	30	40
0	4.2	3.3	2.4	1.5	0.6
5	3.8	2.9	2.0	1.1	0.2
10	3.3	2.5	1.6	0.7	-0.2
15	2.9	2.0	1.1	0.2	-0.6
20	2.5	1.6	0.7	-0.2	-1.1

[a] Based on equation (2) in Table 1 with KLGWTH set equal to its mean value.

Table 3
Barro-Type Equations on the Productivity of Government Expenditures and on the Optimal Size of the State

Eq. No. Variables	(1) RGDP	(2) RGDP	(3) Growth Rate	(4) Growth Rate	(5) Growth Rate
Constant	2.8733 (15.98)	4.4772 (8.45)	0.5612 (1.77)	0.8187 (3.41)	0.7939 (2.59)
Investment/Pop.	0.5353 (10.80)			0.5406E-02 (7.82)	0.5523 (4.47)
Govt Exp/Pop.	0.2772 (3.85)		0.7653E-02 (6.29)		0.2041E-03 (0.09)
Investment		1.0589 (10.54)			
Govt Exp		-0.8553 (7.36)			
(Govt Exp/Pop)**2			-0.4273E-05 (5.94)		-0.7908E-06 (0.78)
(Invest/Pop)**2				-0.2128E-05 (7.17)	-0.1945E-05 (4.63)
R^2	0.9293	0.6235	0.2466	0.3444	0.3813
N	115	115	115	115	115

Note: All of the variables in eqs. (1) & (2) are in logarithms.

Table 4. Regressions Relating the Effect of Size of the Government Sector on Economic Efficiency.[a]

(Eq. No.) Variable	All Economies (1) EFF80	All Economies (2) Logit EFF80	Less Developed Economies (3) EFF80	Less Developed Economies (4) Logit EFF80
CONSTANT	.8426	-2.1152	.6766	-1.6082
	(12.83)	(4.56)	(8.41)	(2.61)
GOVT80	-1.8477	10.6936	-1.2183	8.9630
	(5.65)	(4.67)	(3.25)	(3.12)
R**2(Adj.)	.2136	.1542	.0939	.0866
(N)	(115)	(115)	(93)	(93)

[a] Student-t values are in parentheses below the coefficients.

Table 5. Regressions Relating the Effects of Gross Investment Share on Economic Efficiency in 1980 and the Change in Economic Efficiency, 1960-80.[a]

	All Economies		Less Developed Economies	
(Eq. No.) Variable	(1) EFF80	(2) CHGEFF	(3) EFF80	(4) CHGEFF
CONSTANT	.1407 (2.74)	-.1315 (3.88)	.1542 (3.05)	-.1621 (4.35)
I60		.9481 (5.72)		1.2197 (6.07)
I80	1.7438 (7.40)		1.4379 (5.85)	
CHGI		.8215 (5.10)		.8892 (5.15)
R**2(Adj.)	.3204	.2333	.2655	.2912
(N)	(115)	(115)	(93)	(93)

[a] Student-t values are in parentheses below the coefficients.

Table 6. Regressions Relating the Effects of Size of the Government Sector and Changes in Size to Changes in Economic Efficiency, 1960-80.[a]

(Eq. No.) Variable	All Economies (1) CHGEFF	Less Developed Economies (2) CHGEFF
CONSTANT	.1769 (3.74)	.2256 (3.57)
GOVT60	-.6324 (2.49)	-.8383 (2.63)
CHGGOVT	-.5986 (2.70)	-.7692 (2.90)
R**2(Adj.) (N)	.0533 (115)	.0721 (93)

a Student-t values are in parentheses under the coefficients.