IMF WORKING PAPER

WP/88/93

INTERNATIONAL MONETARY FUND

Fiscal Affairs Department

A Note on the Public Choice Approach to the Growth in Government Expenditure

Prepared by Jack Diamond *

Authorized for Distribution by Peter S. Heller

October 21, 1988

Abstract

The paper applies an empirical model, based on the economic theory of public choice, to the Group of Seven countries. It is discovered: (a) that deficit financing does appear to contribute to increased real government spending; (b) that the demand for government services as a whole does not appear to be income elastic; (c) that there is some evidence of a productivity lag in the government sectors of Canada, Japan, and the United States, but not those of France, Italy, or the United Kingdom; and (d) that in most countries there is some evidence of economies of scale in the provision of government services.

JEL Classification Numbers
1221, 3200, 3212, 3220

* The author acknowledges the helpful comments of Peter Heller, and remains responsible for any remaining errors.

Contents

Summary

Although primarily directed to clarifying factors influencing fiscal decision making, the economic theory of public choice also indirectly attacks the "Ricardian equivalence" thesis. The latter suggests that current taxpayers will take full account of the future tax liability entailed by debt financing, so that the latter will be indistinguishable from tax financing. Buchanan and Wagner (1977), among others, refute this suggestion, arguing that debt will differ from taxation in its economic impact and will increase public spending by reducing the perceived price of government services. Using a public choice approach to modeling government expenditure decisions, Niskanen has presented some empirical evidence based on U.S. Federal Government data to support the Buchanan-Wagner position.

In this paper, the evidence for the United States is re-examined using data for general government, and the findings are generalized to the other Group of Seven countries. The results are: (a) that deficit financing does appear to contribute to increased real government spending; (b) that the demand for government services as a whole does not appear to be income elastic; (c) that there is some evidence of a productivity lag in the government sectors of Canada, Japan, and the United States, but not in those of France, Italy, and the United Kingdom; and (d) that in most countries there is some partial evidence of economies of scale in the provision of government services, although these results are far from conclusive. The final section of the paper contains a general assessment of the significance of the findings and some cautionary remarks.

I. Introduction

In its analysis of the growth of government expenditure, the proliferating determinants literature has been criticized for employing ad hoc models with little basis in the theory of public choice. 1/ However, there has been an attempt to develop empirical models explaining government expenditure based on the theory of collective decision-making. (See, for example, Borcherding and Deacon (1972) and Bergstrom and Goodman (1973).) Such empirical models have been based on certain necessarily restrictive assumptions about voters' tastes, how their preferences can be aggregated, and the opportunity costs they face.

This approach has typically been based on the economic theory of democracy developed by Arrow (1963), Black (1958), Downs (1957), and Buchanan and Tulloch (1985), in which it is assumed that government is elected by majority rule, the voting franchise is general, and there are no barriers of entry into political activity. In such an environment, competition between political entrepreneurs leads to the election of a government that chooses a platform identical to the optimal position of the median voter. Citizens are assumed to be perfectly informed about the costs and benefits of government spending. The median voter chooses the level of spending by voting for candidates who offer the most efficient set of public services and taxes. Logrolling or side payments between voters are assumed to be inefficient because of high transaction costs. Similarly, bureaucracy is assumed to be no impediment to efficient production, so that each public output level is produced at least cost. Obviously, such idealized conditions are only likely to be approximated if at all in a small subset of developed countries.

Although primarily directed to providing insights into factors influencing the growth in government expenditure, the public choice approach also has some important policy implications. These have mainly arisen from its indirect attack on the Ricardian equivalence thesis, which suggests that current taxpayers will take full account of the future tax liability entailed by debt financing, so that the economic impact of the latter will be indistinguishable from tax financing. Buchanan and Wagner (1977), among others, refute this suggestion, denying that future taxes are fully discounted and that people act with an infinite life perspective. Under contrary assumptions, they argue that debt will differ from taxation in its economic impact, increasing public spending because of its effect in reducing the perceived price of government services.

Niskanen (1978) has presented some empirical evidence to support the Buchanan-Wagner position, based on a model of government expenditure that adopts a public choice approach to collective decision-making. Using data for the U.S. Federal Government, he found that a relative

---

1/ See, for example, Diamond and Tait (1988).

decrease in the importance of tax financing (i.e., a relative expansion in the use of debt financing) led to an increase in Federal Government spending with an elasticity of about 0.6. This implies that replacing US$100 of taxation by debt would increase public spending by about US$60.

In this paper, the evidence for the United States will be re-examined using data for general government, and the findings will be generalized by an application of the model to the other Group of Seven countries. 1/ A model based on the public choice approach to expenditure growth is described in Section II. The method of estimation is discussed in Section III, and the results are reviewed in Section IV from various policy perspectives. The final section of the paper contains a general assessment of the significance of the findings and some cautionary remarks.

II. The Model

Attempts to provide empirical support for the public choice approach to expenditure growth have concentrated on the estimation of a demand function for government services. To do this, the model first developed by Borcherding and Deacon (1972) and by Bergstrom and Goodman (1973), and later adopted by Niskanen (1978) can be employed. This model postulates a demand function for government services by the average voter-taxpayer and takes the following form:

$$Q = a\ (FC)^{b}\ Y^{c}\ A^{d}\ , \qquad (1)$$

where Q is the number of units of government services consumed by the average voter-taxpayer, F is the perceived share of the unit cost of government services paid by the average voter-taxpayer, C is the unit cost of the bundle of government services, Y is the income of the average voter-taxpayer, and A denotes autonomous conditions affecting the demand for government services.

The product FC represents the perceived tax price to the average voter-taxpayer of a unit of government services supplied. Although the variables Q and C are not directly measurable, the product QC, government spending per voter-taxpayer, is observable, allowing the individual average voter-taxpayer demand function for government expenditure to be specified by:

$$QC = a\ F^{b}C^{1} + b\ Y^{c}\ A^{d}\ . \qquad (2)$$

1/ The Group of Seven countries comprise Canada, France, the Federal Republic of Germany, Italy, Japan, the United Kingdom, and the United States. For an application of the model to Greece, see Provopoulos (1982).

With N voter-taxpayers, this leads to a demand function for total government spending:

$$QCN = a\, F^{b}\, C^{1+b}\, Y^{c}\, A^{d}\, N\,. \tag{3}$$

Following Niskanen's specification, the variable F is assumed to be a "function of the fraction of [public] spending (G) financed by current taxes (T) and the total number of voter-taxpayers": 1/

$$F = (T/G)\,(1/N), \tag{4}$$

where T denotes total government tax revenues, and G is total government spending (QCN). 2/

Since the variable C is not measurable, it is assumed to be a function of the average wage rate (W) in the private sector and the number of voters:

$$C = e\, W^{f} N^{g}. \tag{5}$$

Substituting equations (4) and (5) into (3) yields the following test equations:

$$QCN = a\,[\,(T/G).(1/N)\,]^{b}\,(e\, W^{f}\, N^{g})^{1+b}\, Y^{c} A^{d} N \tag{6}$$

$$\text{or} \quad QCN = (a\, e^{1+b})\,(T/G)^{b}\, Y^{c}\, A^{d}\, W^{(bf+f)}\, N^{(1-b+bg+g)}. \tag{6'}$$

In this way, the derived equation provides direct estimates of the tax price (coefficient b) and income elasticities of demand for government services (coefficient c), and indirect estimates of the rate of growth of productivity in the government sector (coefficient f) and the degree of publicness of government services (coefficient g).

III. Estimation

The logarithmic transformation of equation (6') was estimated by ordinary least squares using time series data for the Group of Seven countries. The time period varied between countries, but maximally

---

1/ See Niskanen (1978, p. 593). This implies that if the budget is balanced, so that T = G, then the perceived share is inversely proportional to the number of taxpayers--that is, F = 1/N. There is thus an underlying assumption of nondiscrimination in taxation, in which each voter pays an equal share of taxes to finance each unit of government services.

2/ In this model the unit cost of the bundle of government services is assumed constant with respect to the number of units supplied to each person--that is, this specification does not permit C to be a function of Q.

covered the period 1955-85 on an annual basis. At the risk of specification bias but in order to concentrate solely on the public choice elements in the model, no variables were included for "autonomous" influences on government expenditure, as represented by variable A in the model.

Variable QCN, total government spending, was deflated by the consumer price index (CPI). The variable (T/G) represents the ratio of total government tax revenues to total government expenditures. Variable Y is measured by real gross national product (GNP), per voter, where the number of voters is approximated by N, and for most countries W is average wage in the manufacturing or private sector deflated by the consumer price index. Variable N is the estimated number of adults, which for most countries was defined as those older than 18 years of age and for the remaining countries as older than 21 years of age. Details of country definitions and data sources are contained in Appendix II.

Following Niskanen, the final equation (5) was estimated both as levels and first differences, allowing some differentiation between short- and long-run effects. Since there was evidence of multicollinearity in the explanatory variables, partly due to common trending, a trend variable was introduced in the level form of the estimation equation. Although the latter proved statistically significant for a number of countries, the improvement in the Durbin-Watson statistic was not so marked as to warrant a report of the results with the trend variable included. An exception was the estimated equation in first differences for Japan, in which a constant term significantly aided interpretation of the coefficients. The empirical results for the test equation for each country, and the corresponding structural equations, are summarized in Appendices I and II, respectively, with t-statistics of the coefficients shown in parentheses. A summary of the structural coefficients derived from these results is shown in Table 1.

IV. The Empirical Results

1. Does deficit financing contribute to increased real government spending?

Buchanan and Wagner (1977) argue that deficit financing increases government spending because it reduces the perceived price of government services to the current generation of voters. Niskanen (1978, p. 592) points out that this effect will hold under any one or a combination of the following conditions: (1) voters are unaware of the future tax liabilities implied by current deficits; (2) voters discount this future tax liability at a higher rate than the interest rate on government debt; and (3) voters with finite lives put a higher value of future tax liabilities during their own lifetimes than the liabilities of future generations.

Table 1. Estimated Structural Equations

Country	(1) Based on Levels	(2) Based on First Differences
Canada	$Q = a(FC)^{-0.41}\ Y^{0.43}$	$Q = a(FC)^{-0.47}\ Y^{0.42}$
	$C = e\ W^{0.92}\ N^{-1.33}$	$C = e\ W^{0.66}\ N^{3.35}$
France	$Q = a(FC)^{-0.63}\ Y^{1.02}$	$Q = a(FC)^{-0.74}\ Y^{0.26}$
	$C = e\ W^{0.02}\ N^{1.42}$	$C = e\ W^{0.67}\ N^{6.6}$
Germany, Fed. Rep. of	$Q = a(FC)^{-0.82}\ Y^{0.68}$	$Q = a(FC)^{-0.40}\ Y^{0.36}$
	$C = e\ W^{4.4}\ N^{11.4}$	$C = e\ W^{1.7}\ N^{2.5}$
Italy	$Q = a(FC)^{-0.38}\ Y^{0.55}$	$Q = a(FC)^{-0.47}\ Y^{0.51}$
	$C = e\ W^{0.01}\ N^{6.5}$	$C = e\ W^{0.16}\ N^{5.16}$
Japan	$Q = a(FC)^{-0.56}\ Y^{0.8}$	$Q = a(FC)^{-0.55}\ Y^{0.52}$
	$C = e\ W^{1.01}\ N^{-3.5}$	$C = e\ W^{0.94}\ N^{-2.1}$
United Kingdom	$Q = a(FC)^{-0.3}\ Y^{1.17}$	$Q = a(FC)^{-0.8}\ Y^{0.25}$
	$C = e\ W^{0.28}\ N^{-1.3}$	$C = e\ W^{0.47}\ N^{-2.7}$
United States	$Q = a(FC)^{-0.59}\ Y^{0.62}$	$Q = a(FC)^{-0.53}\ Y^{0.10}$
	$C = e\ W^{1.08}\ N^{-2.34}$	$C = W^{1.28}\ N^{-1.97}$

Under these conditions, it is argued that government spending would increase if there is any negative elasticity of demand for government services as a function of the perceived tax price, which thus refutes the Ricardian equivalence thesis.

As can be seen from Table 2, the direct estimates of the tax price elasticity of the demand for government services proves to be negative for all Group of Seven countries. This relationship also appears to be highly significant for all countries (with the exception of France when levels rather than first differences are used for estimation). Although the magnitude of the elasticity varies widely between countries from 0.3 for the United Kingdom to 0.8 for the Federal Republic of Germany, for the United States it does appear to be very close to the magnitude reported by Niskanen. The results would thus lead one to support the Wagner-Buchanan argument that substantial government deficits have indeed contributed to excessive government spending in real terms.

2. Is the demand for government services income-elastic?

One of the reasons typically given for the relative expansion in government expenditure is the high income elasticity of demand that is thought to exist for public services. This reasoning is not borne out by direct estimates of income elasticities as summarized in Table 3. The demand for government services appears to have a long-run elasticity ranging from 0.43 for Canada to as high as 1.17 for the United Kingdom. These results suggest that, with the possible exception of France and the United Kingdom, the growth of income is not a sufficient explanation for the long-run growth in government spending in the Group of Seven countries--a conclusion also reached by Niskanen.

When one examines the estimated elasticity from first differences, it is evident that, without exception, the short-run effect of income on government expenditure is much less significant, both statistically and in absolute size. Indeed, the poorer results obtained with first differences may point to the income effect being overestimated when data on levels are employed, due to the high collinearity that is observed between real income, real wage rates, and the size of the adult population.

3. Is there a productivity lag in the government sector?

In terms of the above model, if the coefficient $\underline{f} > 0$, then the rate of growth of private sector productivity exceeds that of the government sector. At the limit, if $\underline{f} = 1$, there is no increase in government sector productivity, so that a 1 percent increase in real wages in the private sector increases the real unit cost of government by 1 percent in the long run.

Table 4 summarizes the estimated impact of private sector wages on the unit cost of government services. In the long run, an increase in real private sector wage rates appears to increase the real unit cost of

Table 2. Estimates of the Tax-Price Elasticity of Demand for Government Services

Country	Level	Differences
Canada	-0.41 (2.11)	-0.47 (3.97)
France	-0.37 (1.11)	-0.72 (4.61)
Germany, Fed. Rep. of	-0.82 (5.11)	-0.40 (4.56)
Italy	-0.38 (3.68)	-0.47 (3.00)
Japan	-0.57 (10.81)	-0.55 (4.65)
United Kingdom	-0.30 (1.55)	-0.82 (5.93)
United States	-0.59 (4.30)	-0.53 (5.14)

Note: t-statistics in parentheses.

Table 3. Estimates of Income Elasticities for Government Services

Country	Level	Differences
Canada	0.43 (4.61)	0.42 (2.58)
France	1.02 (5.26)	0.26 (2.03)
Germany, Fed. Rep. of	0.68 (3.04)	0.36 (2.59)
Italy	0.55 (7.76)	0.51 (3.19)
Japan	0.80 (8.90)	0.52 (2.61)
United Kingdom	1.17 (6.84)	0.25 (1.00)
United States	0.62 (2.13)	0.13 (0.50)

Note: t-statistics in parentheses.

Table 4. Estimates of Productivity Growth in the Government Sector

Country	Level	Differences
Canada	0.92**	0.66
France	0.02	0.67
Germany, Fed. Rep. of	4.4*	1.7*
Italy	0.01	0.16
Japan	1.01**	0.94**
United Kingdom	0.28*	0.47
United States	1.08*	1.28**

Note: A single asterisk (*) denotes significance at 5 percent in the test equation; a double asterisk (**) denotes significance at 1 percent in the test equation.

government services with an elasticity close to unity in the case of Canada, Japan, and the United States, and an elasticity close to zero in the case of France, Italy, and the United Kingdom. This suggests that for the first group, government productivity has not increased, and that for the latter group, the rate of increase in government sector productivity is roughly in line with the private sector. 1/ The results for the first group of countries are consistent with the Baumol (1967) unbalanced growth argument, which implies that the growth in the relative size of the government sector has depressed the average growth of the economy as a whole. It should also be noted that Niskanen estimated an equivalent elasticity of about 0.75 for U.S. Government services, which would suggest a significant productivity lag of 25 percent.

The case of Germany is difficult to interpret. The size of the estimates is too large and may perhaps be explained by the high collinearity between explanatory variables. Certainly the high statistical significance shown for the private wage coefficient contrasts markedly with the nonsignificance of the coefficients of the adult population, suggesting that the latter effects are being captured by the real wage rate variable. It is also evident that for most countries the short-run impact of private sector wage rates as estimated by first differences is much greater than the longer-run impact. However, caution must be used in interpreting the results for first difference data, since the coefficient of real private sector wages was never significant at the 1 percent level and was significant at the 5 percent level in only three countries.

4. How "public" are government services?

In the above model the coefficient g serves as an indicator of the "publicness" of government services. If $g = 1$, the unit cost is proportional to the population served, whereas if $g = 0$, the cost does not vary with the population (i.e., implying the goods are pure public goods). It must be admitted that the derived estimates of what Niskanen terms "the crowding coefficient" are the most difficult to interpret.

In most countries, except Italy, an increase in the adult population in the long run tends to decrease the unit costs of government services. These results support the idea of economies of scale in the provision of government services. However, although these results are suggestive, they are far from conclusive. Estimates from first differences, which give a better measure of the short-term impact of the size of the adult population indicate a positive influence on unit costs in the case of Italy, Canada, and France, suggesting a strong

---

1/ In the latter group it should be noted that for the United Kingdom the coefficient of real private sector wage rates, although close to zero, is significantly different from zero at the 5 percent level in the test equation.

crowding effect. On the whole, the derived estimates of the "crowding coefficient" are the least satisfactory, and contrast markedly with Niskanen's findings, which are also difficult to interpret. He estimates an exceptionally strong crowding effect on the unit cost of U.S. Federal Government services of about 2.4 in the long run and 6.4 in the short run and admits these estimates are too high to be credible.

V. Concluding Remarks

In assessing the significance of these empirical results, one should not forget the assumptions on which they are based. In particular, two problems with the public choice approach are worth noting. The first concerns its theoretical assumptions, and the second, its empirical application to the experience of the Group of Seven countries.

The public choice approach is a very individualistic explanation of the growth of government spending, resting on a fundamental assumption of the absence of self-interest. Namely, politicians are viewed as passively serving the decisions of others, so that the size and composition of government services are the products of the translated preferences of voters. Similarly, bureaucrats have no other objective function but to produce outputs in conformity with the preferences of their political masters. This is a rather idealized view of the democratic process, and one may doubt whether the intervening political and bureaucratic institutions are capable of so perfectly translating voter preferences into actions. Certainly, there is a growing literature on the many ways bureaucrats can influence the spending process. 1/

Further, by relying on the primacy of individual preferences, the theory does assume that citizens are well informed about the costs and benefits of government spending. Can we really be sure that citizens have an idea of the implicit tax price involved in expenditure decisions, or indeed know their tax share? 2/ Perhaps it is not just the aggregate tax burden that is important in the context of fiscal illusion. Rizzo and Peacock (1987, p. 286) have pointed out that voters' perceptions are likely to vary with the degree of complexity of the tax system, its degree of elasticity, and the composition of revenues (i.e., nontax versus tax). If these factors are important, it is not legitimate to focus solely on the debt-tax mix. Certainly, it would seem that the conditions for making the public choice assumptions

---

1/ For a review of this literature, see Mueller (1987) and Heymann (1988).

2/ As Bergstrom and Goodman (1973, p. 284) admit, "If one were to ask several individuals what their tax shares are, we suspect that few would be able to answer the question sensibly without more reflection than usually takes place before voting."

Table 5. Estimates of the "Crowding Coefficient" on Government Services

Country	Level	Differences
Canada	-1.33**	3.35*
France	1.42	6.6*
Germany, Fed. Rep. of	11.4	2.5
Italy	6.51**	5.16**
Japan	3.53	2.11
United Kingdom	-1.27*	-2.67**
United States	-2.34**	-1.97*

Note: A single asterisk (*) denotes significance at 5 percent in the test equation; a double asterisk (**) denotes significance at 1 percent in the test equation.

operational are only likely to exist when the government is small enough to enhance the individual's degree of control and to allow him or her to know what government is doing. It could be argued that such preconditions are unlikely to exist at the central or general government level in the Group of Seven countries.

Given such considerations, one might be tempted to apply the public choice model at the lowest levels of government or at a disaggregated level of expenditure. 1/ Also, in the model estimated here the focus has been only on the public choice variables; however, the low $\bar{R}^2$ exhibited for some countries would certainly suggest that other variables are relevant in explaining the growth in aggregate expenditure. In any case, as Niskanen (1978) recognizes, government deficits are typically small relative to government spending, and one would thus not expect the deficit to exert a large impact on the level of spending. He found, for example, that the number of U.S. armed forces committed overseas was a significant explanatory variable of aggregate federal spending. This result also suggests the possible need to disaggregate different components of total spending. One could question, a priori, the legitimacy of trying to develop demand curves and supply functions for a heterogeneous bundle of goods and services when some government services could be expected to show relatively high income elasticities (e.g., education), whereas others may behave as inferior goods (e.g., public transport). Disaggregation, however, may not be the answer, since attempting to explain the growth in components of expenditure entails the questionable process of isolating individual components that are clearly interrelated as well as related to their growth in aggregate terms.

Recently, Shibata and Kimura (1986) have raised questions about the legitimacy of the econometric tests employed by Niskanen. Their criticism focuses on the problem of moving from correlation to causation: the least-squares test is consistent with reverse causation--namely, that increases in government spending contribute to higher deficits. To examine the causation problem, they take the time series of changes in the tax expenditure ratio and changes in expenditures per head of adult population and apply tests based on the Granger-Sims methodology, which examines the lag structure between time series to test for causation. 2/ They found, when testing the null hypothesis that increases in the proportion of debt to expenditures

---

1/ It is probably significant that this type of model has been developed for and has proved most successful in explaining local government expenditures on quite specific categories of public services (e.g., police, parks and recreation, and education). See Bergstrom and Goodman (1973).

2/ A fuller discussion of this methodology, with its application to government expenditure growth, is contained in Diamond and Tait (1988), Appendix II.

causes increases in government spending, that the null hypothesis was not rejected in any period in the United States or Japan. They then tested the alternative null hypothesis that government spending is not causing increases in the proportion of public debt to expenditures, which again was not rejected for either country. As a result, they conclude that the Buchanan-Wagner hypothesis is not consistent with the data. Unfortunately, there is a serious problem of interpretation in this approach. Usually, these time series tests are employed to distinguish between equally plausible assumptions about the direction of causality. Thus, while Niskanen can provide a causal interpretation of why changes in the debt-tax mix increase spending, Shibata and Kimura fail to provide a reason why the debt-tax mix changes with increases in government spending. Another problem with the approach is the sensitivity of the statistical tests to the length of time series and the way in which the series is filtered to reduce the random error to "white noise." Certainly in the case of the Japanese data sample and subsamples of the U.S. data, one can question whether the time series is long enough to legitimately apply these tests.

With these qualifications in mind and notwithstanding the results of alternative testing procedures, the application of empirical models based on public choice assumptions still seems worthwhile. These preliminary results should be considered as just that, suggesting that further work is required, such as introducing other explanatory variables, exploring different lag structures, and disaggregating government expenditures into more homogeneous components.

Table 6. Summary of Estimated Structural Coefficients

Country	Coefficient	Level	Differences
Canada	b	-0.41*	-0.47*
	c	0.43**	0.42*
	f	0.92**	0.66*
	g	-1.33**	3.35*
France	b	-0.63	-0.74**
	c	1.02**	0.26*
	f	0.02	0.67
	g	1.42	6.6*
Germany, Fed. Rep. of	b	-0.82**	0.40**
	c	0.68**	0.36**
	f	4.4*	1.7*
	g	11.4	2.5
Italy	b	-0.38**	-0.47**
	c	0.55**	0.51**
	f	0.01	0.16
	g	6.51	5.16
Japan	b	-0.56**	-0.55**
	c	0.80**	0.52**
	f	1.01**	0.94**
	g	-3.5	-2.1
United Kingdom	b	-0.3	-0.8**
	c	1.17**	0.25
	f	0.28*	0.47
	g	1.3*	-2.7**
United States	b	-0.59**	-0.53**
	c	0.62*	0.10**
	f	1.08*	1.28**
	g	-2.34**	-1.97*

Note: A single asterisk (*) denotes significance at the 5 percent level in the test equation; a double asterisk (**) denotes significance at the 1 percent level in the test equation.

Estimated Coefficients of Test Equation

A. Levels

Country	Constant	(T/G)	Y	W	N	$\bar{R}^2$	F (d.f.)	D.W.
Canada (1958-83)	0.0488 (7.041)	-0.4101 (2.106)	0.4324 (4.606)	0.5829 (2.929)	0.836 (14.309)	0.99	2,274 (4,22)	1.06
France (1958-83)	-16.3948 (1.032)	-0.6290 (1.655)	1.0244 (5.255)	0.0086 (0.041)	2.1548 (1.364)	0.98	305 (4,22)	1.07
Germany, Fed. Rep. of (1958-83)	5.0473 (1.523)	-0.8187 (5.105)	0.6808 (3.043)	0.7999 (4.756)	-0.2479 (0.874)	0.99	1,814 (4,22)	0.9
Italy (1958-83)	-52.5192 (10.145)	-0.3795 (2.331)	0.5537 (7.758)	0.0062 (0.827)	5.4159 (10.568)	0.99	2,440 (4,22)	1.6
Japan (1959-83)	0.0421 (15.288)	-0.5649 (10.813)	0.7980 (8.899)	0.4389 (8.322)	0.0275 (1.001)	0.99	10,954 (4,21)	2.11
United Kingdom (1958-83)	6.6789 (2.835)	-0.2981 (1.554)	1.170 (6.844)	0.1952 (2.054)	0.4089 (2.185)	0.98	335 (4,22)	0.98
United States (1955-85)	-4.1563 (2.886)	-0.5926 (4.301)	0.6165 (2.132)	0.4401 (2.058)	0.6424 (2.932)	0.99	937 (4,26)	0.88

Note: t-statistics in parentheses; D.W. refers to the Durbin-Watson statistic.

B. First Differences

Country	Constant	(T/G)	Y	W	N	$\tilde{R}^2$	F (d.f.)	D.W.
Canada (1958-83)	--	-0.4681 (3.974)	0.4233 (2.577)	0.3499 (1.021)	3.2481 (6.055)	0.41	6.8 (3,21)	1.7
France (1958-83)	--	-0.7449 (4.673)	0.2618 (2.025)	0.1711 (0.839)	3.4276 (2.220)	0.40	6.5 (3,21)	1.1
Germany, Fed. Rep. of (1958-83)	--	-0.3978 (4.560)	0.3565 (2.591)	1.0371 (7.922)	-0.1081 (0.997)	0.74	25.2 (3,21)	1.2
Italy (1958-83)	--	-0.4653 (2.691)	0.5142 (3.192)	0.1576 (1.274)	4.225 (3.972)	0.10	29.4 (3,21)	2.3
Japan (1959-83)	0.0445 (3.304)	-0.5492 (4.647)	0.5235 (2.614)	0.4237 (2.499)	0.5967 (0.709)	0.52	7.4 (4,20)	2.3
United Kingdom (1958-83)	--	-0.8211 (5.925)	0.2500 (1.002)	0.0838 (1.384)	1.3434 (3.657)	0.69	19.4 (3,21)	1.2
United States (1955-85)	--	-0.5337 (5.139)	0.1281 (0.497)	0.5987 (2.504)	0.6137 (2.087)	0.23	3.95 (3,26)	1.2

Note: t-statistics in parentheses; D.W. refers to the Durbin-Watson statistic.

APPENDIX II

Data Sources

Canada

G = Total general government expenditure, T = total general government tax revenues, UN National Accounts
W = Average wages in manufacturing, Yearbook of Labour Statistics 1/
N = Population over 21 years of age, Statistics Canada (various issues)
Y = Real GNP, IFS 2/
Deflator = CPI, IFS

France

G = Total general government expenditure, T = total general tax revenue on National Accounts
W = Average wages in manufacturing, Yearbook of Labour Statistics
N = Population over 20 year of age, Eurostat, Demographic Statistics
Y = Real Gross Domestic Product (GDP), IFS
Deflator = CPI, IFS

Federal Republic of Germany

G = Total general government expenditure, T = total general government tax revenues, UN National Accounts
W = Average hourly wages in manufacturing, Yearbook of Labour Statistics
N = Population over 20 years of age, Eurostat, Demographic Statistics
Y = Real GNP, IFS
Deflator = CPI, IFS

Italy

G = Total general government expenditure,
T = total general government tax revenue, UN National Accounts
W = Average hourly wages in manufacturing, Yearbook of Labour Statistics
N = Population over 20 years, Eurostat, Demographic Statistics
Y = GDP 1980 prices, IFS
Deflator = CPI, IFS

1/ Published by the International Labour Office (ILO).
2/ International Financial Statistics.

Japan

G = Total general government expenditure, T = total general government tax revenues, UN National Accounts
W = Average monthly wages in manufacturing, Yearbook of Labour Statistics
N = Adult population over 20 years, Economic Statistics Annual, Bank of Japan
Y = Real GNP, IFS
Deflator = CPI, IFS

United Kingdom

G = Total general government expenditure, T = Total general government tax revenues (including social society contributions); Annual Supplement, Blue Books, p. 153
W = Average wages of salaries per unit of output, private sector, Department of Employment Gazette 1/
N = Population over 18 years Statistical Abstract (various issues)
Y = GNP at factor cost, Statistical Abstract, Table 14.1 2/
Deflator = CPI , IFS (1980 = 100)

United States

G = Total general government expenditure; T = total general government tax revenues, National Income and Product Accounts of the U.S. 3/ 1929-82; Survey of Current Business, 1983-85. 4/
W = Wages in the private sector, National Income and Product Accounts of the U.S.
N = Population over 20 years; Actuarial Study, No. 88. 5/
Y = Real GNP, National Income and Product Accounts of the U.S.
Deflator = CPI, IFS

1/ Published by the ILO.
2/ Published by H.M. Stationary Office (CSO).
3/ Published by the U.S. Department of Commerce.
4/ Published by the U.S. Bureau of Economic Analysis.
5/ Published by the U.S. Department of Health and Human Services.

References

Arrow, K.J., Social Choice and Individual Values, 2nd ed. (New York: John Wiley, 1963).

Baumol, W.J., "Macroeconomics of Unbalanced Growth: The Anatomy of Urban Crisis," American Economic Review (Nashville, Tennessee) Vol. 57 (June 1967), pp. 415-26.

Bergstrom, T.C., and R.P. Goodman, "Private Demands for Public Goods," American Economic Review (Nashville, Tennessee), Vol. 63 (June 1973), pp. 280-96.

Black, D., The Theory of Committees and Elections (Cambridge: Cambridge University Press, 1958).

Borcherding, T.E., and R.T. Deacon, "The Demand for Services of Non-Federal Governments," American Economic Review (Nashville, Tennesse), Vol. 62 (December 1972), pp. 891-901.

Buchanan, J.M., and G. Tullock, Calculus of Consent (Ann Arbor, Michigan: University of Chicago Press, 1985).

_____, and R.E. Wagner, Democracy in Deficit: The Political Legacy of Lord Keynes (New York: Academic Press, 1977).

Deacon, R.T., "Private Choice and Collective Outcomes: Evidence from Public Sector Demand Analysis," National Tax Journal (Columbus, Ohio), Vol. 30 (December 1977), pp. 371-86.

Diamond, J., and A.A. Tait, "The Growth of Government Expenditure: A Review of Quantitative Analysis," IMF WP/88/17, February 18, 1988, pp. 1-46.

Downs, A., An Economic Theory of Democracy (New York: Harper and Row, 1957).

Heymann, D.B., "Input Controls in the Public Sector: What Does Economic Theory Offer?" (unpublished, International Monetary Fund, 1988).

Meltzer, A.H., and S.F. Richard, "A Rational Theory of the Size of Government," Journal of Political Economy (Chicago), Vol. 89 (October 1981), pp. 914-27.

Mueller, D.C., "The Growth of Government: A Public Choice Perspective," Staff Papers, International Monetary Fund (Washington), Vol. 34 (March 1987), pp. 115-49.

Niskanen, W.A., "Deficits, Government Spending, and Inflation: What is the Evidence?," Journal of Monetary Economics (Amsterdam), Vol. 4 (September 1978), pp. 591-602.

Pommerehne, W.W., and F. Schneider, "Unbalanced Growth Between Public and Private Sectors: An Empirical Examination," in Public Finance and Public Employment, ed. by R.H. Haveman (Detroit, Michigan: Wayne State University Press, 1982), pp. 309-26.

Provopoulos, G.A., "Public Spending and Deficits: The Greek Experience," Public Finance (Amsterdam), Vol. 37 (September 1982), pp. 422-26.

Rizzo, I., and A.T. Peacock, "Government Debt and Growth in Public Spending," Public Finance (Amsterdam), Vol. 42 (March 1987), pp. 283-91.

Shibata, H., and Y. Kimura, "Are Budget Deficits the Cause of Growth in Government Expenditures?" in Public Finance and Public Debt, ed. by B.P. Herber (Detroit, Michigan: Wayne State University Press, 1986), p. 241.

_____, "Government Debt and Growth in Public Spending: A Reply," Public Finance (Amsterdam), Vol. 42 (March 1987), pp. 292-96.