THE GROWTH OF GOVERNMENT EXPENDITURE IN THREE CARIBBEAN COUNTRIES, 1955-85: A TEST OF TWO SUPPLY SIDE HYPOTHESES

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Introduction

In just over three decades, government expenditure as a percentage of GDP more than doubled in both Jamaica and Trinidad; the growth for Barbados was much less rapid. The phenomenon of government expenditure growing faster than national income has become world-wide in recent years, which has led to a proliferation of models designed to provide some kind of explanation. Most of the studies however emphasised demand side explanations[1], but newer approaches have focused on changes in the costs[2] of government.

For the Caribbean economies, two major empirical studies were conducted on government expenditure growth which employed time-series data but focused on the demand side. Goffman and Mahar (1971), whose study included five non-English speaking countries and Guyana, observed an income elasticity in excess of unity and concluded that it may not be a sufficient condition for income to be the cause of government expenditure increases.

The other study conducted by Sackey (1980) for twelve countries in Latin America and the Caribbean which included

[1]They have to do with the benefits of government activity, whereas the supply side is concerned with changes in cost. Usher (1985)

[2]Usher (1985) suggests that one such explanation is that improvements in the technology of tax collections have lowered the marginal deadweight loss per unit of tax revenue. This will prove a key feature of the Kau and Rubin model which is developed in the literature review section.

Barbados and Jamaica, also found income elasticities in excess of unity. In general, the results validated the postulates of the Wagner-hypothesis in the long-run. However, in the short-run the results were mixed which suggested that the Wagner "law" may not hold at all times - not a surprising result. For Barbados (1954-1978) and Jamaica (1953-1978), the income elasticity of government spending in constant prices was 1.49 and 1.47 respectively.

This study analyses the growth of government expenditure as a proportion of national income in Barbados, Jamaica and Trinidad between 1955 and 1985 using the two leading supply side theories in the literature - Baumol's differential productivity' model and the Kau and Rubin's 'declining welfare' model. Given the insights from these two theories, a single equation model is specified and a general to specific methodology along the lines of Hendry is employed to test the empirical validity of these supply side explanations.

Theory of Government Expenditure

There has been an evolution of ideas in the search for a general theory of government expenditure growth from demand side explanations to supply side explanations. Demand side explanations are variants of the Wagner hypothesis that the income elasticity of demand for the sort of goods the government supplies is greater than one. Supply side explanations emphasise changes in the costs of government, and this is the focus of this study.

Baumol (1967) argued that there is a relatively slower growth of productivity in the more labour intensive public sector as national income grows and technology improves. As a result the relative price of public sector output increases over time which gives rise to the growth of government's share of GNP. Kau and Rubin (1981) provided an alternative view that economic progress brings increasing flows of tax revenues as technological change reduces the welfare costs of tax collection, hence government's share of GNP increases.

West (1988) demonstrated that the two supply side models seem to point in opposite directions: Baumol, the growth of government expenditure by way of increases in government costs; Kau and Rubin, by way of decreases in government costs. This contrast of explanation will not be our focus; rather we will use both models to asssist us in our analysis.

Following the presentation of West (1988), we illustrate the two supply side approaches, using two simple diagrams. In figure 1, the price of public goods relative to all goods P is represented on the vertical axis.The quantity of public goods relative to the quantity of all goods G appears on the horizontal axis.

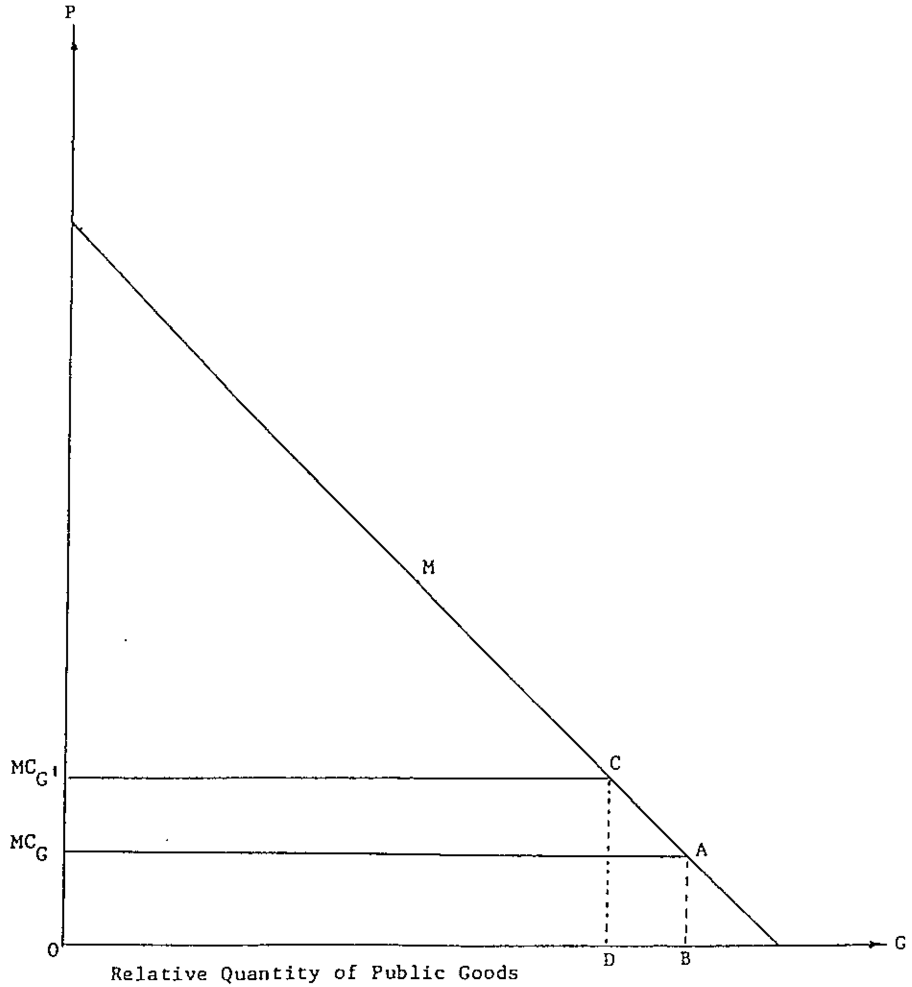

Figure 1. Illustration of the Baumol Model: The diagram is reproduced from West's(1988) paper with a slight change in terminology.

Deacon's (1978) estimate of the price elasticity for government output was 0.40. This implies that the relevant part of the demand curve in the supply side models is the price inelastic portion to the right of the mid-point M. Assume a relative price of public goods at a level equal to the (constant) relative marginal cost MC_G. With the passage of time and positive growth the price of public goods relative to all goods increases to $MC_G{}^1$. This follows from the "cost disease" reasons given by Baumol (1967). Government revenue then increases both absolutely and relatively because we are expanding along the price inelastic part of the demand curve. The quantity of public goods relative to all goods G however decreases from OB to OD.

In figure 2, the linear demand curve again represents marginal valuations of public goods. The height of the cost curve MC represents constant resource cost per unit of public good and it equals P. The height of the supply curve S^0 is the sum of the resource cost P and the marginal welfare cost associated with the deadweight losses from taxation and tax evasion. S^0 is upward sloping to reflect the usual finding in the public finance literature that the marginal deadweight loss of taxation increases with tax revenue collected(Browning, 1976). By analogy with this increasing deadweight loss argument, Usher (1986) demonstrates that the marginal cost of tax evasion also rises with the tax revenues collected. Consistent with Kau and Rubin's argument is the assumption that, over time, public expenditure to forestall tax evasion will become more effective.

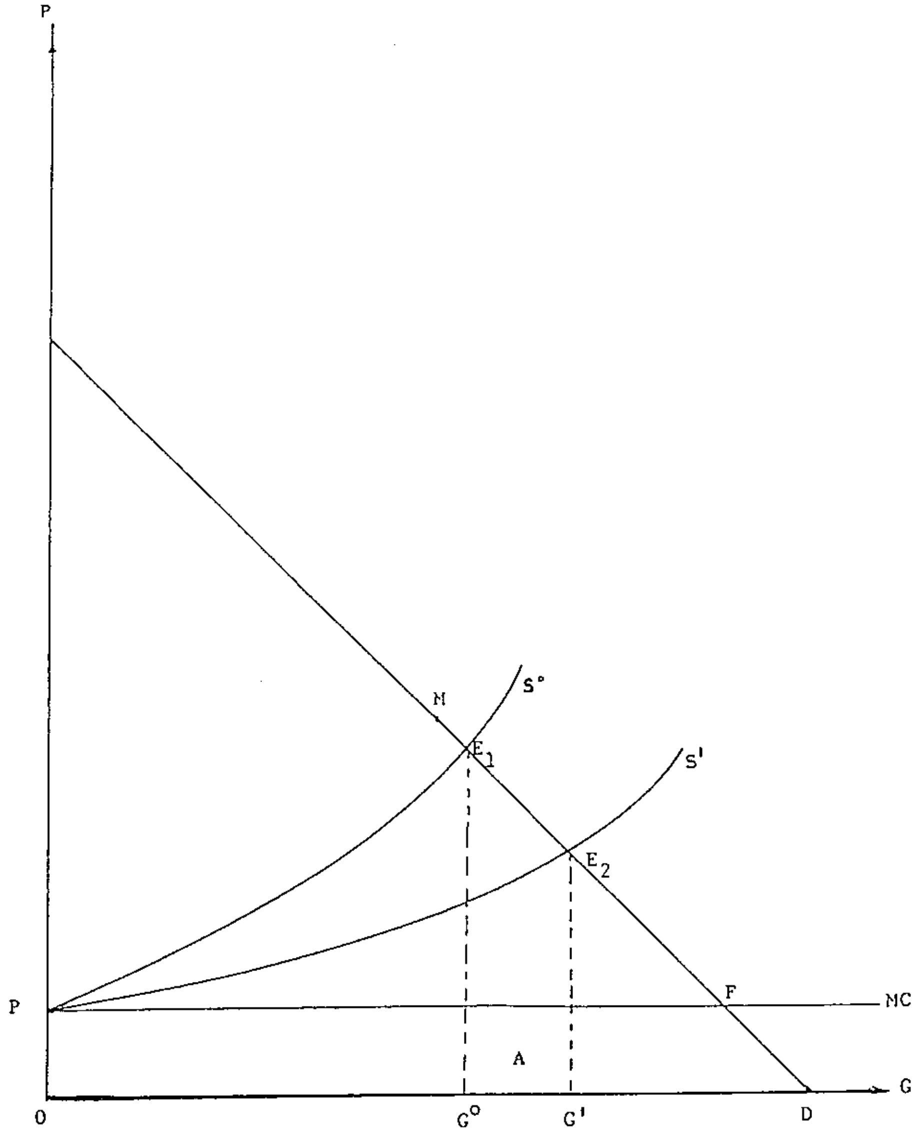

Figure 2. Illustration of the Kau and Rubin Model: The diagram is reproduced from West's(1988) paper with a slight change in terminology.

In terms of figure 2, this will result in a change in the supply curve from S^0 to one like S^1 as society's welfare costs of tax collection and evasion fall. A fall from S^0 to S^1 leads to an expansion of relative resource cost from PG^0 to PG^1 shown as the rectangle A.

Figures 1 and 2 therefore demonstrate why government expenditure as a share of national income can increase over time, given that government output is price inelastic and that there is positive growth. However the Kau and Rubin model does not require the assumption of price inelasticity; this makes the model more generally applicable, and as we will see later, this is confirmed by the empirical findings.

Model and Empirical Testing

In the diagrammatic expositions of the three partial equilibrium models presented on the following page, the demand curve is interpreted as representing marginal valuations of public goods which are derived by plotting the slope of successive indifference curves as they intersect the budget line for a given price ratio. For the supply curve, it is assumed that at a given price ratio the quantity of public goods demanded is automatically supplied. The Wagner model posits that the income elasticity is in excess of unity, therefore we expect that a change in income will shift the demand curve for public goods to the right. As a result the quantity of public goods relative

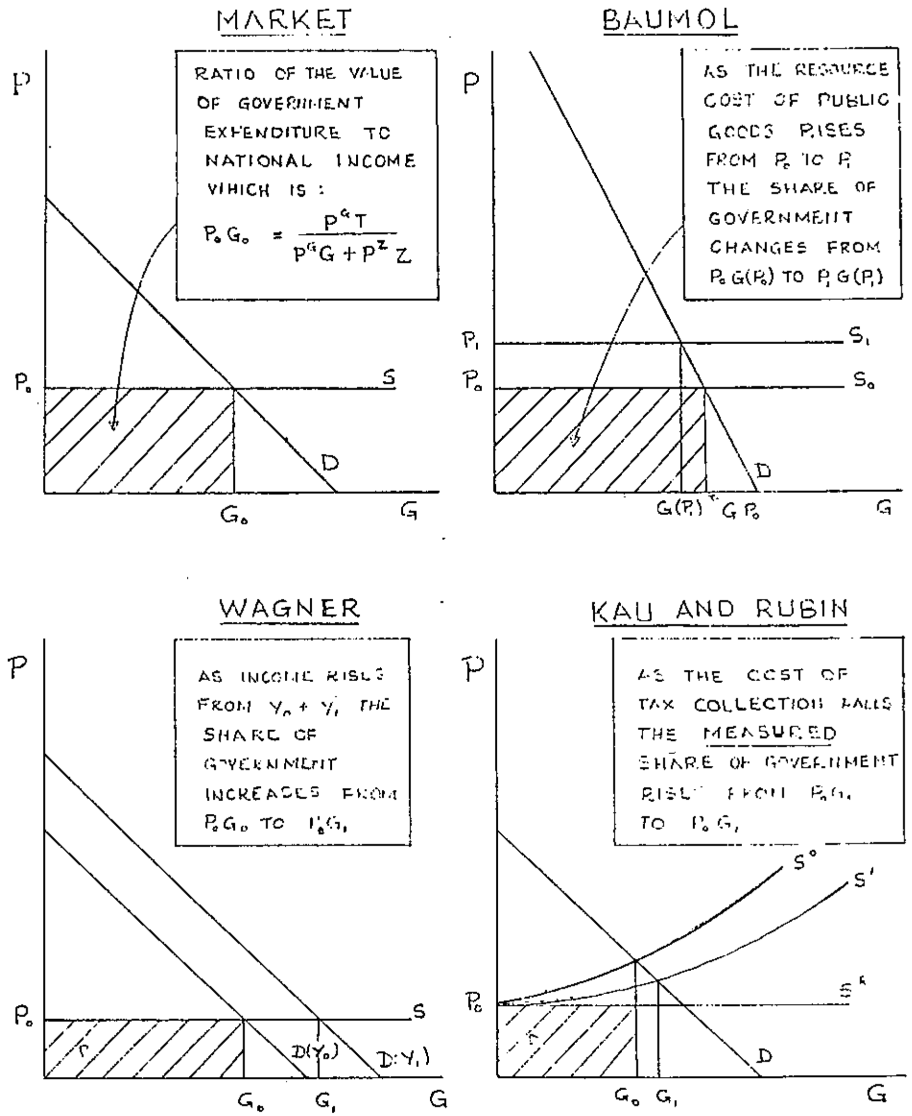

Figure 3. Illustration of Partial Equilibrium Models: An explanation of the notation is presented on the following page.

Notation in Figure 3

P^G - the price of public goods.

P^Z - the price of private goods.

P - the relative price of public goods, that is $P=P^G/P^Z$.

T - the quantity of public goods.

Z - the quantity of private goods.

Q - the real national income, that is $Q=(TP^G + ZP^Z)/P^Z$.

G - the relative quantity of public goods, that is $G=T/Q$.

D - the demand curve for public goods.

S^R - the supply curve of public goods as it would be if there were no deadweight loss in taxation. The curve S^R is flat because the marginal resource cost of public goods is assumed constant.

S - the supply curve of the public goods where the height of the supply curve is the marginal cost of public goods, inclusive of both the resource cost and the marginal social cost associated with deadweight loss and tax evasion.

S^0 and S^1 are the original and final locations of S.

to private goods increases; this phenomenon is expected to be more valid in the long run. In the Baumol model, income is held constant, but the cost of public goods relative to private goods increases because of lower productivity in the public sector which leads to a decline in the relative quantity of public goods demanded. However given that the price elasticity is assumed to be less than unity, the ratio of government expenditure to national income must increase if the public goods demanded are to be supplied.

In the Kau and Rubin model, a marginal welfare cost associated with the deadweight loss from taxation and tax evasion provides an added dimension to the analysis of the two previous models. In this model it is argued that over time public expenditure to reduce tax evasion becomes more effective and also that society's welfare costs of tax collection falls. As a consequence the relative quantity of public goods increases. A major concern of this analysis is the difficulty of calculating deadweight loss and indeed published data do not provide us with any indication of the magnitude of such a loss.

The implications of the supply side models - the Baumol model and the Kau and Rubin model - are the same in the event that the price elasticity of demand for government output is less than unity. Although the two models approach the growth of government from different directions - Baumol via increases in the relative price of public goods and Kau and Rubin via increases in the relative quantity of public goods - they both depend on published evidence of the share of government expenditure in GDP. This makes it difficult to disentangle the two effects since the published data are in terms of value. Therefore, the increase in government's share of GDP could be just as much the consequence of the Baumol effect as the Kau and Rubin effect.

The Kau and Rubin and the Baumol models can both be incorporated into one regression if statistical counterparts can be found for the Baumol effect and the Kau and Rubin effect. The natural counterpart of the Baumol effect is real wages in the private sector of the economy; higher real wages in the private sector as a result of higher productivity will result in an increase in the relative cost of supplying public goods. When we incorporate the assumption of the price elasticity of demand for public goods being less than one into the analysis we expect government expenditure as a share of national income to rise. The counterpart of the Kau and Rubin effect is the terms of trade; given that trade is easy to tax we argue that society's welfare costs of tax collection in the external sector have fallen over time; in addition it is more difficult to evade taxes in this sector. As a consequence an improving terms of trade position will increase government's share of national income as the Kau and Rubin effect takes place.

From the above, we formulate a single equation model such that

$$\frac{\text{(government expenditure)}}{\text{(national income)}} = f(\text{real wage, terms of trade, time}). \quad (1)$$

Let us consider equation 1 to be an adequate representation of government expenditure as a proportion of GDP. Following Hendry's methodology - Hendry (1980), Hendry and Richard (1983) and Hendry (1982); for a more recent exposition, see Gilbert 1986) - we can write the above as a distributed lag function,

$$G/Q_t = \sum_{j=0}^{1} \alpha_j G/Q_{t-j} + \sum_{j=0}^{1} (\beta_j RW_{t-j} + \theta_j TOT_{t-j}) + \tau_k TIME_t + \mu_s + U_t \quad (2)$$

where

G/Q - government expenditure/national income

RW - real wage rate in the private sector

TOT - net barter terms of trade

μ - is the intercept term

U - the error term is assumed to be normally and independtly distributed.

Equation (2) (the least restricted equation) can be simplified and various diagnostics can be invoked to test the adequacy of the simplified form versus the least restricted specification. It is apparent that for j = 1, the static specification

$$G/Q_t = \mu + \beta RW_t + \theta TOT_t + \tau TIME + U_t \quad (3)$$

with an AR(1) correction can be thought of as incorporating two common factor restrictions on the distributed lag model. We have restricted j to be equal to one because of the size of the sample; of course, we are concerned about the "degrees of freedom" problem.

Model Evaluation

We estimate[3] a log-linear model for the period 1955 - 85 using OLS and where necessary the Cochrane-Orcutt procedure is used to estimate the models assumed to have serial correlation. The coefficient estimates and diagnostic tests of the various versions of the model estimated are presented in the appendix - tables A, B and C for Barbados, Trinidad and Jamaica respectively. The normality test (LMN) is based on Bera and Jarque (1980). MS1 is an F-test of omitted lags, while CFR is an F-test for common factor restrictions based on the unrestricted distributed lag and the AR(1) model. SC1 is a lagrange multiplier test for serial correlation up to first order, attributed to Godfrey (1978). Three lagrange multiplier tests for heteroscedasticity are reported: HT1 is the nR-squared from regressing the squared residuals on the fitted values, HT2 is the Breusch-Pagan-Godfrey test which assumes normality of the errors and HT3 is Harvey's (1976) test for models with multiplicative heteroscedasticity. PC1 is a split sample test

[3]We used the real wage in the overall economy as a proxy for the real wage in the private sector. The real wage is the nominal wage divided by the Consumer price index.

for parameter constancy using a conventional F-test which is distributed F (K, N-2K). We also report the Akaike (1973) applied to both linear and non-linear regression models without any modification.

Of the three countries, only the original model for Barbados is not rejected against the distributed lag model. The other two original models are plagued with serial correlation as detected by both the D-W statistic and Godfrey's SC1 test. The original model for Barbados passes the parameter constancy test PC1, while both models for Jamaica and Trinidad fail. For the parameter constancy test, we divided the sample period into 1955-72 and 1973-85, to capture the influence of the first oil crisis in 1973 on government expenditure growth in the three Caribbean economies. With the exception of Barbados, the distributed lag model also performs better than the original model on the basis of the Akaike information criterion.

The results for the common factor restrictions are mixed. For Barbados, the restrictions are valid and also prove valid for Jamaica; serial correlation may be a convenient simplification. There is therefore reason to simply estimate the static regression model with an AR(1) disturbance term. However the results for the original model for Barbados, with an AR(1) disturbance, indicate that there is no first-order serial correlation. For Trinidad, the common factor restrictions seem to be invalid and thus serial correlation cannot be a convenient simplification. The results for the original model with an AR(1) disturbance term,although indicating first-order serial correlation, do not suggest statistical significance for any of the other explanatory variables. Thus the source of mis-specification may be elsewhere.

We estimate the original model with an AR(1), AR(2) disturbance error process, but the results are no more encouraging than with the simple AR(1) process. However the results confirm that there is definitely first-order serial correlation for the Trinidad and Jamaica equation; while there is some evidence of second-order serial correlation for the Barbados equation.

Having adopted the Hendry-type specification search to dynamic regression modelling, we eventually identify models for Barbados and Trinidad with one exception, which satisfied the various diagnostic tests. We are not that fortunate with Jamaica; though the original model with an AR(1) process satisfies all the diagnostic tests the two critical explanatory variables are both highly insignificant. In this case, we believe that we have omitted some political variables, to capture the impact of politics on government expenditure growth, in what is regarded as a highly politically active country - Jamaica.

We must point out that the adequacy of the model's design for Barbados does not preclude from being encompassed by another model. Indeed model F for Barbados passes the diagnostic tests and performs better than the original model on the basis of the Akaike information criterion, but the real wage variable is not statistically significant. Notwithstanding the AIC statistic, we opted for the original model as it is more parsimonious and the real wage variable is statistically significant.

However of greater significance is the fact that the original model for Barbados does not reject the underlying classical assumptions and model G for Trinidad passes all but the test for parameter constancy. In addition, the slope coefficients reflect their theoretical priors, but inference in the models can only be tentative; specifically the assumption of fixed regressors may not be valid. Nevertheless, the model for Barbados permits us to make conclusions about the theoretical constructs which are employed. (See previous section).

Before we are able to make tentative conclusions about the adequacy of our theoretical models in explaining the growth of government expenditure in Trinidad, we must resolve the problem of parameter non-constancy in the parsimonious model G. The result of parameter non-constancy is not surprising as it is believed that the Trinidad economy underwent structural adjustment after the first oil crisis in 1973. This belief may be justified from our descriptive analysis in chapters 3 and 4, as the dominance of the oil sector can be observed, particularly elsewhere. The results indicate that the preferred model is superior to the parsimonious model G, in that it passes all the diagnostic tests including the one for parameter constancy and has a larger absolute value for the Akaike information criterion.

We now consider the original model for Barbados and the preferred model for Trinidad to be the best representatives of their respective Data Generating Processes. The two models are not rejected against the distributed lag models - this is assessed by the size of the test statistics for MS1 (an F-test for omitted lags), or as is reported, the P-Values. The models also perform better on the basis of the Akaike information criterion and of course on the F-test. Given that both models pass the normality test (LMN), we are inclined to go with the Breusch-Pagan-Godfrey (HT2) for heteroscedasticity which suggests that there is no heteroscedasticity; the two other heteroscedasticity tests however support the finding.

As a matter of empirical proposition, we re-specified the model for Jamaica to take account of two major political actions - the impact of elections on government spending as well as the impact of the International Monetary Fund (IMF). To assess the effect of these events on the growth of government expenditure as a proportion of GDP, we constructed two dummy variables; assigning ones to the year preceding the election year and the election itself, and zeros elsewhere, for the election dummy (dummy1); and for the IMF dummy (dummy2), we assign zeros to the assigning ones to the year preceding the election year and the election itself, and zeros elsewhere, for the election dummy (dummy1); and for the IMF dummy (dummy2), we assign zeros to the years between 1955 and 1976, and ones to the remaining years to 1985.

The results shown in table C in the appendix, indicate that the two political dummies are statistically significant, and in general the model is better specified than the original model. This better performance is based on the acceptable Durbin-Watson statistic, the bigger absolute value of the Akaike information criterion statistic and of course the F-criterion. In addition, the model passes the normality test and according to the Breusch-Pagan-Godfrey test, there is no heteroscedasticity. The critical parameter constancy test is also passed but there is some evidence of omitted lag variables which indicates that the preferred model may be encompassed by some other model.

Concluding Remarks

Given the adequacy of the preferred models - based on the diagnostic tests - some tentative inferences can be made. Below is a summary table containing the estimated coefficients of the terms of trade variable and the real wage variable from the best model for each country.

Coefficients	**Barbados**	**Jamaica**	**Trinidad**
Terms of Trade	0.140	0.296	0.506
't' statistic	(2.066)	(2.194)	(3.269)
Real wage	0.254	0.051	0.539
't' statistic	(2.257)	(0.441)	(3.435)
Time	0.014	0.037	
't' statistic	(4.628)	(6.506)	

expenditure as a proprotion of national income in the three Caribbean countries. In proposing to test the Kau and Rubin model, we recognised that the trade sector is not only a major earner of foreign exchange in Caribbean-type economies, but also a major source of revenue for the government from the import side, as well as the export side in the case of Trinidad with its oil and Jamaica with its bauxite. Our results confirm the likelihood of the Kau and Rubin model being able to partly explain the growth of government expenditure as a proportion of GDP in the three Caribbean economies over the period 1955-1985.

We tested an "amended" Baumol model primarily because of the difficulty, if not impossibility, of determining productivity in the government sector. A major concern of the Baumol model is that the relative quantity of public goods is required to fall for government expenditure as a proportion of GNP to rise, but this cannot be identified from the published data on government expenditure and national income, which are in terms of value.

Notwithstanding the obvious difficulties, we used the insights from the Baumol model to test the impact of real wages

Notwithstanding the obvious difficulties, we used the insights from the Baumol model to test the impact of real wages in the private sector on government expenditure growth. The results indicate that real wages in the private sector are statistically significant in partly explaining the growth of government expenditure as a proportion of GDP in Barbados and Trinidad, but not Jamaica.

The rise in government expenditure as a proportion of GDP could result from the fact that the income elasticity of demand for public goods and services is greater than unity. Sackey's (1980) income elasticities for Jamaica and Barbados provide evidence that as incomes rise these economies are willing to spend more on public goods such as education, health, roads and transfer payments of various sorts. However Boadway and Wildasin (1984) identify three reasons why such an explanation in the rise of public expenditures is incomplete. First, "many government services are of the nature of capital expenditures which serve to a great extent as factors of production, or intermediate inputs for industry" (p.74).

In addition, they cited the change in the relative costs of public versus private goods and services which is what the Baumol model suggests. If the price elasticity of demand for public goods were low, this would also contribute to the rising share of public expenditures in the GDP. This is definitely an area that needs to be investigated for Caribbean countries. However there may be a data constraint.

Thirdly, Boadway and Wildasin noted that the rise in population may also contribute to the relative rise in public expenditures"As the number of users of a public good rises, the effective price per person of public goods may fall, and the demand would then be expected to rise" (p.76). This effect was not analysed in our study; again the necessary data are not available for the three Caribbean countries.

Of the three factors identified, we paid particular attention to the cost argument of Baumol and along with the insights of the Kau and Rubin model, attempted to provide an explanation of the relative rise in government expenditure in the three countries over the period 1955 - 85. However it must be noted that the statistical significance of the time varible for Barbados and Jamaica indicates that other economic and possibly some political factors could be partly responsible for some of the growth in government expenditure relative to national income.

The study provides a first step towards analysing the growth of public expenditures in Caribbean economies within a modern paradigm rather than the over-used frameworks of Wagner's Law and the displacement effect. As expected there is lots of scope for investigating the growth of government in these countries using the modern approaches of public choice theory - an agenda that should prove both interesting and intellectually challenging in the future.

BIBLIOGRAPHY

Afxentiou, P.C. (1980), "Government revenue and expenditure and the developing countries: A survey", **Developing Economies**, 18 (1): 116 - 139.

Arrow, K. (1970), **Social Choice and Individual Values**, New Haven: Yale University Press, 2nd edition.

Baumol, W. J. (1967), "Macroeconomics of unbalanced growth: The anatomy of urban crisis", **American Economic Review**, Vol. LVII, LVII (3): 415 - 426.

Boadway, R. W. and D. W. Wildasin (1984), **Public Sector Economics**, Little, Brown and Company.

Browning, E. K. (1976), "The marginal cost of public funds", **Journal of Political Economy**, 283 - 298.

Buchanan, J. M. and G. Tullock (1962), **The Calculus of Consent: Logical Foundations of Constitutional Democracy**, Ann Arbor: University of Michigan Press.

Deacon, R. T. (1978), "A demand for the local public sector", **Review of Economics and Statistics**, 60: 184 - 192.

Gilbert, C. L. (1986), "Professor Hendry's econometric methodology", **Oxford Bulletin of Economics and Statistics**, 48 (3): 283 - 307.

Goffman, I. J. and D. J. Mahar (1971), "The growth of public expenditure in selected developing nations: Six caribbean countries 1940 - 65", **Public Finance**, 26: 57 - 74.

Hendry, D. F. (1980), "Econometrics - alchemy or science?", **Economica**, 47: 387 - 406.

Hendry, D. F. (1983), "Econometric modelling: The consumption function in retrospect", **Scottish Journal of Political Economy**, 30: 193 - 220.

Hendry, D. F. and J. F. Richard (1982), "On the formulation of empirical models in dynamic forcasts", **Journal of Econometrics**, 20: 3 - 33.

Kau, J. B. and P. H. Rubin (1981), "The size of government", **Public Choice**, 37 (2): 261 - 274.

Sackey, J. A. (1980), "Underdevelopment disequilibrium and growth in government expenditures: Some empirical generalization", **Social and Economic Studies**, 29 (4): 125 - 151.

Usher, D. (1985), "The growth of the public sector in Canada", in: D. Laidler (ed.) **Responses to Economic Change**, University of Toronto Press.

Usher, D. (1986), "Tax evasion and the marginal cost of public funds", **Economic Inquiry**, 24 (4): 563 - 586.

West, E. G. (1988), **Towards a Generalized Theory of Government Growth**, unpublished manuscript.

TABLE A

BARBADOS GOVERNMENT EXPENDITURE EQUATIONS 1955-1985

DEPENDENT VARIABLE G/Q	ORIGINAL MODEL	DISTRIBUTED LAG(1)	ORIGINAL MODEL WITH AR(1)	ORIGINAL MODEL WITH AR(1) AR(2)
	O	B	E	F
CONSTANT	1.285 (2.757)	0.944 (1.678)	1.279 (2.325)	1.433 (4.502)
RW	0.254 (2.257)	0.133 (0.520)	0.277 (2.189)	0.159 (1.771)
TOT	0.140 (2.066)	0.021 (0.184)	0.122 (1.692)	0.190 (3.291)
TIME	0.014 (4.628)	0.012 (2.505)	0.013 (4.025)	0.016 (6.581)
RW(-1)		0.081 (0.266)		
TOT(-1)		0.127 (1.310)		
G/Q(-1)		0.154 (0.778)		
AR(1)			0.187 (1.062)	0.192 (1.265)
AR(2)				-0.536 (-3.533)
S-E	0.072	0.072	0.071	0.062
$\bar{R}^2$	0.757	0.729	0.765	0.820
f-statistic	32.208	14.005		
D-W	1.643	1.939	1.842	2.330
S·S·R	0.140	0.121	0.135	0.104
Log Likelihood	39.728	40.147	40.215	43.990
LMN[$\chi^2(2)$]	[0.275]	[0.160]	[0.293]	[0.318]
PC1	[0.367]			

TABLE A Continued

DEPENDENT VARIABLE G/Q	ORIGINAL MODEL	DISTRIBUTED LAG(1)	ORIGINAL MODEL WITH AR(1)	ORIGINAL MODEL WITH AR(1) AR(2)
	O	B	E	F
CFR		[0.286]		
MS1 F[(r,N-K)]	F_{BO}=[0.336]			
HT1[$\chi^2(1)$]	[0.799]	[0.467]	[0.858]	[0.370]
HT2[$\chi^2(K-1)$]	[0.594]	[0.621]	[0.714]	[0.710]
HT3[$\chi^2(K-1)$]	[0.528]	[0.384]	[0.840]	[0.406]
SC1[$\chi^2(1)$]	[0.339]	[0.517]	[0.624]	[0.327]
AIC	-5.143	-5.048	-5.175	-5.440
N	31	30	31	31
K	4	7	5	6

NOTES:
1) 't' statistics are in round brackets, ( ).
2) 'P' values are in square brackets, [ ].
3) N = number of observations; K = number of regressors; r = number of restrictions.
4) Sources of Data: Central Bank of Barbados Database
: Handbook of International Trade and Development Statistics, Yearbook 1972, 1987, (UNCTAD).
: International Financial Statistics, Yearbook, 1975, 1987, (IMF).

TABLE B

TRINIDAD GOVERNMENT EXPENDITURE EQUATIONS 1955-1985

DEPENDENT VARIABLE G/Q	ORIGINAL MODEL	DISTRIBUTED LAG(1)	ORIGINAL MODEL WITH AR(1)	ORIGINAL MODEL WITH AR(1) AR(2)	PARSI-MONIOUS MODEL	PREFERRED MODEL
	O	B	E	F	G	P
CONSTANT	0.725 (0.985)	0.014 (0.019)	1.202 (1.347)	1.096 (1.248)	-0.216 (-0.771)	-0.882 (-1.757)
RW	0.406 (1.243)	0.098 (0.235)	0.356 (0.899)	0.244 (0.608)	0.451 (2.988)	0.539 (3.435)
TOT	0.461 (2.750)	0.003 (0.011)	0.344 (1.680)	0.384 (1.916)	0.333 (2.964)	0.506 (3.269)
TIME	0.016 (1.581)	0.006 (0.540)	0.019 (1.593)	0.021 (1.701)		
RW(-1)		0.295 (0.644)				
TOT(-1)		0.377 (1.537)				
G/Q(-1)		0.387 (2.322)			0.534 (4.113)	0.510 (4.007)
DUMMY						-0.114 (-1.579)
AR(1)			0.487 (3.103)	0.593 (3.355)		
AR(2)				-0.173 (-0.978)		
S-E	0.107	0.089	0.094	0.093	0.088	0.086
$\bar{R}^2$	0.904	0.934	0.926	0.927	0.935	0.939
f-statistic	95.555	69.299			140.216	111.828
D-W	1.061	1.981	1.873	2.088	1.987	2.111
S·S·R	0.309	0.182	0.240	0.235	0.202	0.184
Log Likelihood	27.419	34.022	31.213	31.512	32.449	33.876

TABLE B Continued

DEPENDENT VARIABLE G/Q	ORIGINAL MODEL	DISTRIBUTED LAG(1)	ORIGINAL MODEL WITH AR(1)	ORIGINAL MODEL WITH AR(1) AR(2)	PARSI-MONIOUS MODEL	PREFERRED MODEL
	O	B	E	F	G	P
LMN[χ^2(2)]	[0.163]	[0.712]	[0.329]	[0.132]	[0.579]	[0.587]
PC1	[0.012]				[0.028]	[0.158]
CFR		[0.041]				
MS1 F[(r,N-K)]	F_{BO}=[0.006]				F_{BO}=[0.482]	F_{BP}=[0.340]
HT1[χ^2(1)]	[0.224]	[0.903]	[0.162]	[0.174]	[0.719]	[0.510]
HT2[χ^2(K-1)]	[0.409]	[0.659]	[0.494]	[0.644]	[0.628]	[0.609]
HT3[χ^2(K-1)]	[0.621]	[0.411]	[0.907]	[0.966]	[0.894]	[0.511]
SC1[χ^2(1)]	[0.009]	[0.166]	[0.340]	[0.332]	[0.302]	[0.181]
AIC	-4.349	-4.639	-4.602	-4.624	-4.734	-4.763
N	31	30	31	31	30	30
K	4	7	5	6	4	5

NOTES:
1) 't' statistics are in round brackets, ( ).
2) 'P' values are in square brackets, [ ].
3) N = number of observations; K = number of regressors; r = number of restrictions.
4) Sources of Data: Central Bank of Barbados Database
: Handbook of International Trade and Development Statistics, Yearbook 1972, 1987, (UNCTAD).
: International Financial Statistics, Yearbook, 1975, 1987, (IMF).

TABLE C

JAMAICA GOVERNMENT EXPENDITURE EQUATIONS 1955-1985

DEPENDENT VARIABLE G/Q	ORIGINAL MODEL	DISTRIBUTED LAG(1)	ORIGINAL MODEL WITH AR(1)	ORIGINAL MODEL WITH AR(1) AR(2)	PREFERRED MODEL
	O	B	E	F	P
CONSTANT	1.129 (1.646)	-0.624 (-0.940)	2.057 (2.664)	2.128 (2.746)	0.874 (1.340)
RW	-0.124 (-1.554)	0.077 (0.451)	0.129 (0.920)	0.152 (1.041)	0.051 (0.441)
TOT	0.424 (2.982)	0.099 (0.769)	-0.048 (-0.486)	-0.091 (-1.009)	0.296 (2.194)
TIME	0.049 (19.154)	0.017 (1.894)	0.040 (7.091)	0.040 (7.239)	0.037 (6.506)
RW(-1)		-0.074 (-0.424)			
TOT(-1)		0.231 (1.842)			
G/Q(-1)		0.636 (3.661)			
DUMMY1					0.068 (2.130)
DUMMY2					0.201 (2.384)
AR(1)			0.813 (7.765)	0.991 (5.643)	
AR(2)				-0.208 (-1.186)	
S-E	0.092	0.069	0.069	0.068	0.081
$\bar{R}^2$	0.952	0.971	0.973	0.974	0.962
f-statistic	198.289	165.173			154.160
D-W	1.263	1.969	1.723	2.016	1.633
S·S·R	0.227	0.109	0.129	0.125	0.165

TABLE C Continued

DEPENDENT VARIABLE G/Q	ORIGINAL MODEL	DISTRIBUTED LAG(1)	ORIGINAL MODEL WITH AR(1)	ORIGINAL MODEL WITH AR(1) AR(2)	PREFERRED MODEL
	O	B	E	F	P
Log Likelihood	32.187	41.701	40.426	40.919	37.203
LMN[χ^2(2)]	[0.954]	[0.556]	[0.816]	[0.718]	[0.544]
PC1	[0.140]				[0.673]
CFR		[0.141]			
MS1 F[(r,N-K)]	F_{BO}=[0.001]				[0.002]
HT1[χ^2(1)]	[0.098]	[0.842]	[0.037]	[0.049]	[0.349]
HT2[χ^2(K-1)]	[0.305]	[0.862]	[0.118]	[0.142]	[0.125]
HT3[χ^2(K-1)]	[0.045]	[0.128]	[0.204]	[0.355]	[0.071]
SC1[χ^2(1)]	[0.026]	[0.924]	[0.201]	[0.178]	[0.215]
AIC	-4.656	-5.151	-5.223	-5.259	-4.851
N	31	30	31	31	31
K	4	7	5	6	6

NOTES:
1) 't' statistics are in round brackets, ( ).
2) 'P' values are in square brackets, [ ].
3) N = number of observations; K = number of regressors; r = number of restrictions.
4) Sources of Data: Central Bank of Barbados Database
: Handbook of International Trade and Development Statistics, Yearbook 1972, 1987, (UNCTAD).
: International Financial Statistics, Yearbook, 1975, 1987, (IMF).