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Review and Econometric Results for Fiji**

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PUBLIC FINANCE AND THE SIZE OF GOVERNMENT: A LITERATURE REVIEW AND ECONOMETRIC RESULTS FOR FIJI

D.P. DOESSEL* and ABBAS VALADKHANI*

Explaining Public Expenditure in Fiji: Theory and Econometric Results

ABSTRACT

This paper analyses current government expenditure in Fiji using annual time series data for the period 1969-1999. Alternative theories of government expenditure are reviewed and a distinction is made between economic/apolitical determinants and institutional/political determinants. Categorising the literature in this way suggests the application of non-nested tests in empirical work. The first step is to estimate the two models separately. All four test statistics for non-nested hypotheses lead to the conclusion of double rejection. A parsimonious comprehensive model, encompassing both economic and institutional variables, is preferred as it passes all diagnostic tests and involves the acceptance conclusion from pairwise non-nested tests.

I. INTRODUCTION

Fiji became independent in 1970 with Ratu Sir Kamisese Mara as Prime Minister after nearly a century as a British colony. Fiji had a population of 801000 in 1999 and has been classified as a lower middle income country by the World Bank, with a per capita annual income of US\$2310 [World Bank, 2001]. Although it is one of the most developed of the Pacific island economies, it still has a large subsistence sector and the economy can be regarded as dualistic. Sugar and clothing are the main (commodities) export industries. Political uncertainties have created economic uncertainties. *Coups* in 1987 and more recently in May 2000 have created an economic environment which is not conducive to long-term investment as a result of poorly-defined property rights and migration of skilled workers [Gani, 1998]. For an account of recent economic events see Chand (1998) and for political and constitutional events see Lal and Lamour [1997].

Given this turbulent recent history concerning governance it is relevant to apply contemporary public finance theories on the determinants of the size of the government sector. The objective of this paper is to do just that.

Since the pioneering studies by Borcharding and Deacon [1972] and Bergstrom and Goodman [1973] the analysis of the size of the government sector has ceased to be characterised by the

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atheoretical or *ad hoc* analyses that were dominant until then. For bibliographies of the early literature see Pryor [1968, pp. 46-51] and Borcharding [1977, pp. 67-70]. Essentially the modern analysis of the demand for goods and services provided by government involves an application of the median voter hypothesis, associated with Downs [1957].

In essence the demand for public goods is conceived of as the outcome of the demand for public goods by the median voter, or as Borcharding [1985] puts it, by “the Fiscal Everyman”. Put otherwise, the demand for government expenditure is to be seen as a function of the characteristics of the median voter. This conceptual framework leads to a relatively parsimonious specification of the explanatory variables in the demand equation. Those factors are as follows: prices, income and population, as well as some other relevant variables. For an exposition see, *inter alia*, Larkey, Stolp and Winer [1981], Mueller [1989] and Brown and Jackson [1986].

This conceptual framework is, by no means, the only theory of government expenditure. For instance, Wagner [1883] had argued that the public sector expands as the structure of the economy changes and as income rises through time; Peacock and Wiseman [1967] have argued that government expenditure is subject to a “displacement effect” associated with some crisis such as war; and Nordhaus [1975] has argued that government expenditure (and other macroeconomic variables) are subject to “political business cycles”. It is not our purpose here to enumerate these numerous theories and/or create a new classification scheme. See for example Lybeck [1988] for a 12-fold classification of such theories, Henrekson [1988] for a categorisation of demand and supply side determinants and Mueller [1989, pp. 320-47] for a five-fold classification scheme.

The approach adopted in this paper is to categorise explanatory variables of government expenditure as being of an economic/apolitical kind or of an institutional/political nature. This dual scheme has been employed by Borcharding [1985] and Halsey and Borcharding [1997]. Such a formulation suggests a means by which an indication of the relative importance of these two models can be established. Viewing explanatory variables in this way invites the application of non-nested econometric tests.

The structure of this paper is as follows: the next section presents a theoretical framework for the analysis. Then a brief account of the structure of the government sector in Fiji and some relevant time series data on the phenomena to be explained are provided. The penultimate section provides the econometric results of multiple regression equations and the non-nested tests applied to discriminate between the models. The final section presents a summary.

II. THEORETICAL FRAMEWORK AND ESTIMATION PROCEDURE

It is useful to employ Borcharding’s [1985] and Halsey and Borcharding’s [1997] categorisation of the explanatory variables as “economic/apolitical” variables and “institutional/political” variables. This dual categorisation is preferable to the multi-categorisation employed by, *inter alia*, Neck and Schneider [1988]. They employ a five-fold classification, *viz.* economic determinants; interest groups and bureaucracy; elections, ideologies and centralisation of power; stabilisation; and fiscal illusion. Mueller [1989] also employs a (different) five-fold classification scheme.

Another dimension to this two-fold classification is that it is relevant to the following question: “What is the relative importance of economic/apolitical and institutional/political

variables in determining government expenditure?” Borcharding [1977] had this question in mind and he provided an answer by calculating a growth equation of government expenditure through time using estimated coefficients of relevant explanatory variables. This procedure was repeated by Borcharding [1985] in which he concluded that a-institutional variables explain “almost 40 per cent of the growth rate of the US public budgets over the nearly eight decades following 1902. Put another way, these three changes [price, income and population] explain why government absorbed 18 per cent of GNP in 1978, not the actual share, 35 per cent” [Borcharding, 1985, p. 368]. Needless to say, for Borcharding “institutions do matter”, but he is unable to determine the relevant importance of the institutional variables as “the range of parameter and variable estimates is too wide or imprecise” [Borcharding, 1985, p. 370).

Another way to shed some light on this issue of the significance of economic/apolitical and institutional/political determinants of government expenditure is to apply tests of non-nested or **separate** hypotheses. To apply such tests requires the specification of several models to explain the same dependent variable.

III. THE ECONOMIC/APOLITICAL MODEL

Following Gemmell [1990], the demand for real government expenditure can be stated as follows:

$$G_t = A P_{gt}^{\beta_1} P_{yt}^{\beta_2} \left(\frac{Y_t}{POP_t} \right)^{\beta_3} POP_t^{\beta_4} \quad (1)$$

where G_t is real government consumption expenditure,

A is a constant,

P_{gt} is the price of government-provided goods and services, as measured by the government price deflator,

P_{yt} is the price of private goods and services as measured by the GDP price deflator,

Y_t is real GDP,

POP_t is population, and

$\beta_1, \beta_2, \beta_3, \beta_4$ are elasticities to be estimated.

This equation bears a close resemblance to the formulations in Borcharding and Deacon [1972] and Bergstrom and Goodman [1973]. For details see Gemmell [1990]. In the literature applying the median voter conception, it is noteworthy that prices have been proxied by a number of different measures. In this study, following Henrekson [1988] and Gemmell [1990], prices are measured by relevant price deflators.

However, there may be a problem associated with Equation (1). This relates to (possible) multicollinearity between P_g and P_y . One solution to this problem is to use a ratio of relative prices by forming the ratio P_g/P_y . The expected sign of this coefficient is negative, however the procedure involves a restriction on the two coefficients to be equal in (absolute) magnitude.

Rising government expenditure can occur as a result of rising prices for the inputs (particularly labour) employed by government. In this context it is relevant to consider “Baumol’s disease” [Baumol, 1967]. Baumol’s conception is of an economy with two

sectors, one being “progressive” in the sense that productivity advances characterise production, and the other sector being “non-progressive” in that there are few economies of scale or advances in technology applicable to this sector’s production. Baumol suggests that the production of services, in general, falls into the latter sector. Often quoted examples are the services of hairdressers, the performing arts etc. It is also often argued that much of the government sector falls into this “non-progressive” category. The point is that the price of labour in the former sector rises as a result of the productivity advances, and the price of labour will have to rise in the latter sector to attract labour. This process brings about a rise in the relative price of the services of the “non-progressive” sector.

Generally, the existing empirical literature indicates that the price elasticity of demand is of the order of -0.5 . In other words, demand for public goods/services has been found to be inelastic. For discussions of the empirical literature see Borcharding [1985] and Brown and Jackson [1986]. Gemmell’s [1990] results confirm this order of magnitude in general but indicate that demand is elastic for some developing countries.

The expected sign on the income variable (Y/POP) is positive. In the usual interpretation of Wagner’s law [Wagner, 1983], it is expected that the magnitude of the income elasticity will be greater than unity. See Gemmell [1993]. There are various empirical estimates of the income elasticity of demand, and Borcharding [1985] takes 0.75 as the appropriate order of magnitude. Gemmell [1990] obtains a coefficient for his full sample of 0.98 with some elasticities for developed countries exceeding unity. However, those elasticities are not significantly greater than unity. Thus there is little support for Wagner’s law, which implies that the income coefficient is greater than unity.

As to the coefficient on the population variable, β_3 , it can be argued that this coefficient measures the degree of “publicness” of goods and services produced by the government sector. This interpretation is to be found in both Borcharding and Deacon [1972] and Bergstrom and Goodman [1973]. If in fact β_3 is equal to zero, it can be concluded that the goods and services produced by government are “pure” (Samuelsonian) public goods. If β_3 is equal to unity, then it suggests that when population grows, the demand for the goods and services provided by government increases proportionally. Under such circumstances, the public goods and services are perfectly substitutable by privately produced goods and services. Put otherwise, the goods and services produced by government are pure private goods. Values for this coefficient between zero and unity are interpreted to be “mixed” goods. However, Mueller [1989, pp. 193-4] points to some complications in the interpretation of this parameter. See also Gonzalez, Means and Mehay [1993].

The general consensus in the empirical literature is that the degree of publicness coefficient is approximately unity, thus indicating that the goods and services provided by government are private in nature, although Deacon [1978] reports that this coefficient is 0.75 for local government. Gemmell’s [1990] results indicate that in all cases (sub-samples of developing countries and developed countries, and all countries) β_3 (in our notation) is always greater than zero (thus rejecting the hypothesis that government provides pure public goods).

Another important problem relates to the specification of Equation (1). There may be structural changes occurring in the economy through time which lead to increased demands of existing government services or demands for new government services. To take account of

this “structural” issue, Equation (2), a modification of Equation (1), written in log form, is as follows:

$$\ln (G_t) = \mathbf{b}_0 + \mathbf{b}_1 \ln \left(P_{gt} / P_{pt} \right) + \mathbf{b}_2 \ln \left(Y_t / POP_t \right) + \mathbf{b}_3 \ln \left(AGEMR_t \right) \quad (2)$$

where AGEMR is the ratio of agricultural employment to total employment.

The ratio of agricultural employment to total employment is included as an additional explanatory variable to take account of temporal changes in the structure of the economy. As the economy grows and the agriculture sector becomes less important, there is an increased demand for existing services, and/or a demand for new services provided by government. A number of studies have employed similar structural variables such as population density and females as a percentage of the total workforce. See, for example Borchering [1985]. In this study this structural variable is measured by the single variable AGEMR, as defined above. To include more than one such measure in a regression equation is to invite multicollinearity of a severe kind. It should be noted that this type of variable also appears in the much-discussed Wagner [1883] argument about the growth of the public sector through time. For a detailed discussion of Wagner’s arguments see Bird [1971] and Gemmell [1993]. However, the rationalisation of this structural variable in this study is not derivative from Wagner’s writing but rather from the more modern conceptions such as externalities. Similarly Wagner emphasised the role of increasing income through time as a determinant on the size of government sector, and income is an explanatory variable in this study. However the rationale for income here does not emanate from Wagner’s *pot-pourri* of descriptive and normative economics. The income variable finds its justification in the theoretical developments associated with Borchering and Deacon [1972] and Bergstrom and Goodman [1973].

IV. THE INSTITUTIONAL/POLITICAL MODEL

An important advance in the study of the public sector occurred in the 1950s, when some economists applied the tools of their trade to non-market decision making, *i.e.* economic theory was applied to issues which had previously been in the domain of political science. This development, initiated by, *inter alia*, Black [1948], Downs [1957], and Buchanan and Tullock [1962], is now generally referred to as “public choice”. See Mueller [1989] and Mueller [1997] for comprehensive accounts of this approach.

An important conclusion from the public choice school is that the outcomes of the public sector are determined, in part, by institutions, their procedures and the people working in those institutions. In other words, fiscal institutions can determine outcomes. This seemingly trite point, *i.e.* that institutions matter, is central to the public choice literature. As Buchanan and Wagner [1977, p.636] put it “We are institutionalists in the sense that we think that arrangements or rules do affect outcomes.”

An obvious starting point is to recognise that temporal government expenditures may be affected by elections. An incumbent government may increase expenditure to “buy” votes and decrease the probability of re-election. This argument is a part of the literature on “the political business cycle” which also analyses other macroeconomic dimensions such as unemployment, inflation, etc. See Nordhaus [1975] and, for more recent developments, Alesina [1989] and Rogoff [1990]. Paldam [1997] provides a comprehensive review. This

factor will be measured by an intercept dummy variable (EDV) which takes the value of unity for an election year and zero otherwise.

Another obvious factor to consider is the ideological affiliations of competing political parties and/or factions. In many studies of western societies this variable is often measured on a left-right political spectrum. In the context of Fiji this left-right conception is not meaningful. Furthermore there are no relevant data whereby an ideological disposition can be measured. Typically governments are not indifferent to macroeconomic variables such as unemployment and inflation. Government expenditure, the variable to be explained in this study, is often used as a macroeconomic instrument. Whether such factors (unemployment and inflation) are at work in Fiji is an empirical matter to be determined.

Another dimension of human activity that can affect government is the formation and power of interest or pressure groups. This factor has been given some prominence by Olson [1982] in the context of economic growth, but public choice writers have been concerned with this issue since Tullock's [1959] analysis of majority rule. See also Stigler [1970] and his argument, "Director's Law", that redistribution of income, mainly via the provision of private goods rather than the supply of public goods, is directed to particular groups. Mueller and Murrell's [1986] empirical analysis of the symbiotic relationship between government and interest groups indicates a positive relationship, *ceteris paribus*, between government size and the number of interest groups. Similarly Lybeck [1986] has found that the size of government in Sweden is positively related to the proportion of employees who were members of interest groups.

Two measures that have been employed in a number of studies are the extent of unionisation of the workforce and public employment as a percentage of total employment [Hackl, Schneider and Withers, 1993]. Another measure is the extent of unionisation in the public sector [Marlow and Orzechowski, 1996]. Data on such variables are not available for Fiji, however given that government employees are categorised in being in the service sector, we proxy this by the ratio of service employment to total employment (SEREMR).

An offsetting factor which can counteract the influence of interest groups on the size of government is the extent to which the economy is subject to general competitive forces via international trade. This factor can be measured by an index of openness to trade (OPEN), which can be defined as the ratio of the sum of exports and imports to GDP. Whether such a factor is significant or not is an empirical matter to be determined.

Another important dimension of the public choice literature relates to fiscal illusion, an issue that was emphasised by Buchanan [1960, 1967] but first argued by Amilare Puviani. Writing in a positivistic style not dissimilar from Machiavelli's *The Prince*, Puviani sees the state as "monopolistic", in that it is an "agency through which one group of persons, those possessed with power, exerts its will upon persons in another group, those who are dominated" [Buchanan, 1967, p. 129]. Given this conception, fiscal structures will be designed in such a way that the ruling class can extract resources from the ruled class so as to provide the goods and services that the ruling class wants produced. To achieve this objective, government will create "fiscal illusions, and these will have the effect of making taxpayers think that the taxes to which they are subjected are less burdensome than they actually are" [Buchanan 1967, p 131]. The effect of fiscal illusion is to have a public sector larger than the citizens want.

Brennan and Buchanan's [1977, 1980] arguments about fiscal leviathans are also relevant in this context. See Oates [1988] for a survey of five manifestations of fiscal illusion.

The empirical results are mixed. Niskanen [1978] finds some support for the Buchanan and Wagner [1977] argument concerning debt finance; Wagner [1976] shows that tax complexity is positively associated with the size of government; and Oates [1975] has shown that state governments with more income-elastic tax structures increased expenditure more than did those with less elastic tax systems.

In this study we employ several variables to test for fiscal illusion in Fiji. First, we have calculated Hirschman-Herfindahl indices (HHI) [Hirschman, 1964] of complexity of the tax system (HHIT) for Fiji. See Martin [1994] for an explanation of the HHI. Second we have calculated a ratio of direct taxes to total taxes (DTAXR).

Another institutional factor we consider is inertia or incrementalism, measured by the lagged value of the dependent variable (G_{t-1}). This argument about government size is associated with Wildavsky [1964, p. 13] who argues that "the largest determining factor of the size and content of this year's budget is last year's budget."

As mentioned previously Fiji's recent history has involved several *coups* (two in 1987 and more recently in 2000). The 2000 *coup* is beyond our sample period and therefore does not appear in this analysis. To test for the impact of the 1987 *coups*, an intercept dummy variable is inserted in the regression equations to take account of this phenomenon by assigning 1 for 1987 and 1988, and zero otherwise. The effect of this political instability on real GDP and government expenditure can be discerned in Figure 1, which provides a plot of both real GDP and real government current expenditure for the period 1969-1999.

It should be noted that, although our explanatory variables seem comprehensive, they are somewhat restricted in both interest groups and bureaucratic influences. This restriction arises from the lack of appropriate data.

The institutional/political model can be stated as follows:

$$\ln(G_t) = a_0 + a_1 EDV_t + a_2 \ln(U_t) + a_3 (SEREMR_t) + a_4 \ln(OPEN_t) + a_5 \ln(HHIT_t) + a_6 \ln(DTAXR_t) + a_7 \Delta \ln(P_{yt}) + a_8 \ln(G_{t-1}) + a_9 DUM(Coup) \quad (3)$$

where EDV is an intercept dummy variable which equals unity when there has been an election, and zero otherwise,

U is the unemployment rate,

SEREMR is the ratio of service employment to total employment,

OPEN is an index of openness as defined by total exports and imports divided by GDP,

HHIT is the Hirschman-Herfindahl index of tax complexity,

DTAXR is the ratio of direct taxes to total taxes,

$\Delta \ln(P_y)$ is the inflation rate using the GDP price deflator,

G_{t-1} is lagged government expenditure as a proxy for bureaucratic inertia or incrementalism, and

DUM(*Coup*) is an intercept dummy variable which takes the value of 1 for 1987 and 1988, and zero otherwise.

Table 1 summarises this discussion by indicating the potential explanatory variables in both the economic/apolitical model and the institutional/political model. This Table also indicates the expected signs of the coefficients when estimated. The econometric procedure adopted here is not only to examine the goodness-of-fit statistics but also the t-statistics of individual coefficients. In addition to the above, other dimensions of the general to specific methodology have been adopted. In particular, omitting insignificant variables by applying several maximum likelihood tests by imposing joint restrictions on explanatory variables in the economic/apolitical and/or the institutional/political models to obtain the most parsimonious and robust equations in the estimation process. Also we have undertaken exhaustive diagnostic tests.

TABLE 1
ECONOMIC/STRUCTURAL AND INSTITUTIONAL EXPLANATORY VARIABLES
APPLIED IN THE REAL DEMAND FOR GOVERNMENT EXPENDITURE IN FIJI

Variable name	Variable definition	Expected sign
Economic/Apolitical		
P_g	Government price deflator	-
P_y	GDP price deflator	+
P_g/P_y	Relative price ratio	-
Y/POP	Real per capita GDP	+
POP	Population	zero or +
AGEMR	Ratio of agricultural employment to total employment	-
Institutional/Political		
G_{t-1}	Lagged real government expenditure (bureaucratic inertia or incrementalism)	+
SEREMR	Ratio of service employment to total employment	+
OPEN	Index of openness defined as total exports plus imports, divided by GDP	-
$\Delta \ln(P_{yt})$	Inflation rate using GDP price deflator	+
U	Unemployment rate	+
HHIT	Hirschman-Herfindahl index of tax complexity	-
DTAXR	Ratio of direct taxes to total taxes	-
EDV	Election dummy variable	+
DUM(<i>Coup</i>)	<i>Coup</i> dummy variable (1987 and 1988)	-

V. ESTIMATION PROCEDURE

Equations (2) and (3) are non-nested hypotheses to explain the size of government in Fiji. Non-nested models require “that each of the two regression functions contain at least one regressor that is not in the other” [Davidson and MacKinnon 1993, p. 381]. It should be noted that the economic literature is littered with non-nested hypotheses. For example, the macroeconomic literature on consumption is an obvious example. Pesaran and Deaton [1978] and Fisher and McAleer [1981] have applied non-nested tests to these separate theories. Other issues analysed include the policy “ineffectiveness” proposition. See Pesaran [1982], Rush and Waldo [1988], Pesaran [1988], and McAleer and McKenzie [1991].

Another area of economics in which non-nested tests have been applied is consumer demand theory. Deaton [1978] has analysed an early version of the AIDS model and the linear expenditure system. Deaton's application of the non-nested tests indicates that **both** models fail. "Double rejection" is an important characteristic of non-nested tests: one or both of the models may be characterised as false. For Deaton double rejection does not lead to despair: "it is perfectly possible, that in a particular case, economists are not possessed of the true model" [Deaton, 1978, p.535). Other outcomes of non-nested tests are that both models can be accepted and that one model can be accepted and the other rejected.

The point is that non-nested tests can produce four possible outcomes since each or both models may or may not be rejected. As such they are specification tests which "may well tell us that neither model seems to be compatible with the data" [Davidson and MacKinnon, 1993, p.384]. If acceptance of one model and rejection of the other is the outcome of the test, it will provide an indication of the relative importance of the two models of government expenditure. This is the alternative way of shedding some light on the Borcharding [1985] question as to the importance of institutional determinants of government expenditure. However, if double rejection is the outcome, then an obvious step to take is the estimation of an equation with both categories of explanatory variables.

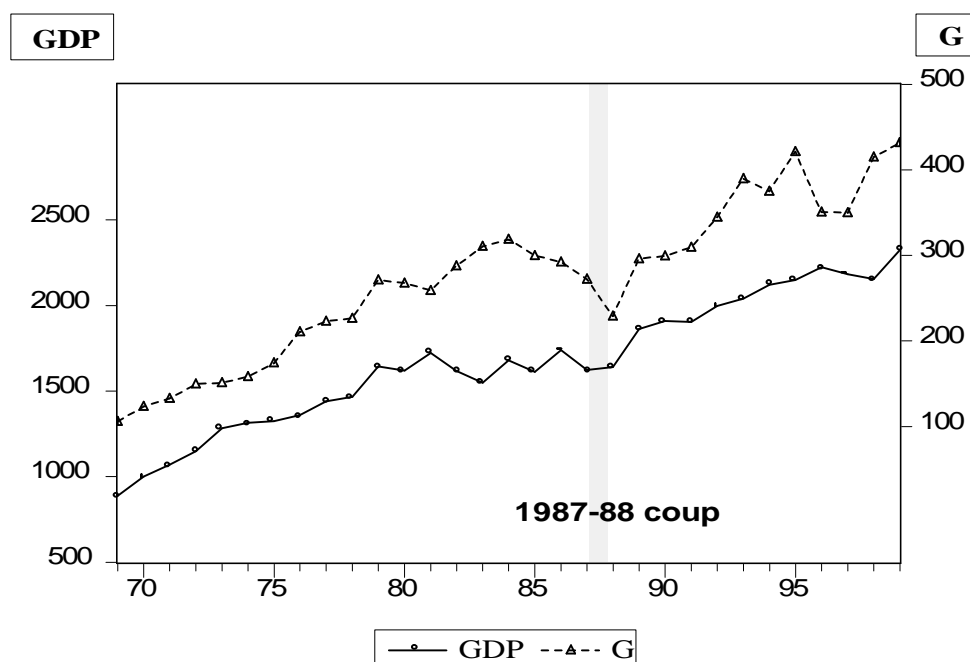
To the best of our knowledge there is only one application [Turnbull and Djoundourian, 1994] of non-nested tests in this general area of public expenditure analysis.

VI. SOME RELEVANT TIME SERIES DATA ON GOVERNMENT IN FIJI

As mentioned previously Fiji is categorised as a lower middle income country by the World Bank. Unlike federations such as the US, Canada, Australia and Germany, Fiji has a government structure which consists of only a central government and a (relatively small) local government sector. In this respect it is similar to the United Kingdom and New Zealand.

Figure 1 presents time series data on real GDP and real government current expenditure (in 1989 constant prices) for the period analysed in this study, 1969-1999. It is clear that GDP has experienced some fluctuations through time. Note the decrease in GDP and government expenditure in 1987 and 1988. For further details on the structure of the Fiji economy see *inter alia*, Kasper, Bennett and Blandy [1988] and Treadgold [1992]. Table 2 presents descriptions of the data employed and summary statistics.

FIGURE 1
GDP AND REAL GOVERNMENT CONSUMPTION EXPENDITURE (G),
FIJI, 1969-1999, F\$ MILLION (1989 PRICES)



Source: World Bank (2001).

Note: The left-hand scale indicates GDP (F\$ million) and the right-hand scale measures government current expenditure (F\$ million), both in constant 1989 prices.

TABLE 2
SUMMARY STATISTICS AND DESCRIPTION OF THE DATA EMPLOYED, FIJI,
1969-1999

Variables	Unit	Mean	Standard deviation	Minimum	Maximum
G	Fijian \$ (1989 prices)	272000000	91083667	106000000	431000000
P_g/P_y	Ratio	1.03	0.08	0.83	1.17
(Y/POP)	Fijian \$ (1989 prices)	2457	276	1747	2900
POP	Person	669627	91121	508000	801000
AGEMR	Ratio	3.5	1.5	1.77	7.4
U	Unemployment rate (%)	3.9	3.3	0.1	9.4
SEREMR	Ratio	64.0	5.0	52.2	72.0
OPEN	Ratio	1.04	0.15	0.80	1.30
HHIT ^a	$1 > \text{HHIT} > 0$	0.38	0.03	0.33	0.42
DTAXR ^a	Ratio	0.50	0.06	0.37	0.58
$\Delta \ln(P_{y,t})$	inflation rate (%)	7.1	6.1	0	25.9

Sources: World Bank (2001), Asian Development Bank (1995), International Monetary Fund (various) and International Labour Office (various).

Note: ^a HHIT and DTAXR variables are calculable only for the period 1974-1996 due to the lack of data.

VII. EMPIRICAL RESULTS

The first step in the econometric analysis is to enter P_g and P_y as separate explanatory variables in the economic/apolitical model. However, the estimated equation is subject to severe multicollinearity. To address this problem the relative price ratio was substituted, and Equation (2) was estimated. The results are obtained using PcGive 9.21 [Hendry and Doornik, 1999].

Column (A) of Table 3 presents the results of estimating the economic/apolitical model (M1). As seen, all the estimated coefficients are significant at least at the 10 per cent level and have the expected theoretical signs (Given the multiplicative form of our equation, all coefficients are elasticities). This equation performs very well in terms of goodness-of-fit (adjusted $R^2 = 0.935$) and passes the overall F test at the one per cent level.

In addition, this equation passes a battery of diagnostic tests with the only exception being the Durbin Watson (DW) test and the serial correlation test of order 1 and 2. Given that annual data are used in this study, we have re-estimated this equation (see column (B) of Table 3) by applying the Cochrane-Orcutt iterative procedure to correct for first order autocorrelation. This is indicated by the AR(1) term in column (B) of Table 3. Since the AR(1) term is highly significant the equation in column (B) is preferred to the equation in column (A). Note also that the stochastic residuals are stationary which suggests that the estimated coefficients are consistent.

There are a number of important points that can be drawn from the estimated coefficients of the economic/apolitical model. First, the relative price coefficient (-0.67) indicates that the demand for government goods and services in Fiji is inelastic. This coefficient is in the relevant range reported in the prior literature. Second, the coefficient on per capita income ($+0.55$) indicates that the demand for public goods and services is normal: given that this coefficient is less than unity, there is no evidence that Wagner's law applies in the context of Fiji.

TABLE 3
REGRESSION RESULTS FOR THE ECONOMIC/APOLITICAL MODEL (M1) AND THE
INSTITUTIONAL MODEL (M2) OF THE DEMAND FOR GOVERNMENT CURRENT
EXPENDITURE, 1969-1999

Explanatory variables	Economic/ Apolitical model (M1) (A)	Economic/ apolitical model [M1 corrected for AR(1)] (B)	Institutional/ political model (M2) (C)	Comprehensive Model (M3) (D)
Intercept	-5.19 (-1.1)	-4.58 (-0.8)	4.54 (2.1)*	13.5 (8.2)*
$Ln(P_g/P_y)_t$	-0.45 (-1.7)**	-0.67 (-2.4)*	-	-0.90 (-5.5)*
$Ln(Y/POP)_t$	0.96 (3.5)*	0.55 (1.7)**	-	-
$Ln(POP)_t$	1.29 (3.6)*	1.48 (3.3)*	-	-
$Ln(AGEMR)_t$	-0.22 (-1.9)**	-0.16 (-1.7)**	-	-0.49 (-6.6)*
$AR(1)$	-	0.63 (3.8)*	-	-
$Ln(U)_{t-1}$	-	-	0.04 (1.5)*	0.03 (2.1)*
$Ln(SEREMR)_t$	-	-	3.57 (6.8)*	1.56 (4.1)*
$LOG(OPEN)_t$	-	-	0.48 (2.6)*	0.20 (2.0)*
$DUM(Coup)$	-	-	-0.24 (-2.8)*	-0.26 (-5.9)*
Goodness-of-fit statistics				
Adjusted R ²	0.935	0.949	0.859	0.965
F- Statistic	F(4,26) = 109*	F(5,25) = 110*	F(4,25) = 45*	F(6,23) = 133*
Diagnostic tests				
DW	0.906*	1.63	1.60	2.34
AR ^a 1- 2	F(2, 24) = 5.6*	F(2, 23) =4.02*	F(2, 23) = 0.5	F(2, 21) =0.7
ARCH ^b 1	F(1, 24) = 1.2	F(1, 23) = 0.01	F(1, 23) = 0.1	F(1, 21) =0.9
Normality ^c Chi ² (2)	0.70	3.8	0.80	2.2
White Heteroskedasticity				
Xi	F(8, 17) =1.0	F(8, 16) = 0.6	F(7, 17) = 0.9	F(11, 11) =0.8
Xi*Xj	F(14, 11) =0.7	F(14, 10) = 0.5	F(12, 12) = 0.6	Not calculable
RESET ^d	F(1, 25) =1.5	F(2, 24) =1.5	F(1, 24) =13*	F(1, 22) =0.00
Order of integration of stochastic residuals ^e	I(0)	I(0)	I(0)	I(0)

Notes: Data in parentheses are *t* statistics. * and ** indicate that the relevant null hypotheses are rejected at 5 and 10 per cent significance levels, respectively.

a) Lagrange multiplier test of residual serial correlation up to orders 1 and 2; b) Autocorrelation conditional heteroskedasticity test using one lag; c) Normality test of residuals based on the skewness and kurtosis of the residuals; d) Ramsey's RESET test using the square of the fitted values; and e) Based on the Augmented Dickey-Fuller (ADF) test (Akaike information criterion is used to determine the optimal lag length in the corresponding ADF regression).

Third, the estimated coefficient for population (+1.48) is greater than unity. Thus there is absolutely no indication that the goods and services provided by government are pure (Samuelsonian) public goods. However, this coefficient is greater than unity, the value which is taken to be the measure of pure private goods. Put otherwise, the degree of publicness of government goods and services is measured by this population coefficient. As indicated previously there is some controversy in the literature concerning the interpretation of this coefficient. See Mueller [1989, p.193-4] and Gonzalez, Means and Mehay [1993]. It should also be noted that values for this parameter in the empirical literature often exceed unity, even in the pioneering studies of Borcharding and Deacon [1972] and Bergstrom and Goodman [1973]. More recently Gemmell [1990] found that for 86 of 117 countries this coefficient exceeded unity. Gemmell considered three possible explanations for this result, one of which relates to the fact that total population is a poor proxy for the consumers of goods and services provided by the government, particularly for a country such as Fiji which has a large proportion of its population of educational age. This demographic factor may explain why a one per cent increase in total population necessitates a 1.48 per cent increase in real government consumption expenditure. Fourth, the measure of structural change employed here (AGEMR) has a negative estimated coefficient. This means that as the agricultural sector of the Fijian economy becomes less important, there is an increased demand for existing services, and/or a demand for new services, provided by government.

The Lagrange multiplier test for residual serial correlation up to orders 1 and 2 for the equation reported in column (B) clearly indicates that the estimated equation is still subject to the problem of autocorrelation. In this context this diagnostic test lends support to the view that this equation is subject to misspecification.

Column (C) of Table 3 reports the econometric results for the institutional/political model (M2). It should be noted that the specification of this equation is different from that of Equation (3), as the insignificant explanatory variables have been excluded (with one exception) from Equation (3) by adopting the general to specific methodology. As mentioned earlier, insignificant variables were omitted by applying several maximum likelihood tests involving joint restrictions on explanatory variables in order to obtain the most parsimonious and robust estimates. Also we have undertaken exhaustive diagnostic tests.

The exception mentioned above is the lagged variable on government expenditure. This variable was highly significant, but when entered in the equation, all other coefficients became insignificant. This lagged dependent variable is dominant. This issue will be addressed below.

With an adjusted R^2 of 0.859, the equation reported in column (C) performs very well in terms of goodness-of-fit and passes the overall F test at the one per cent level. Furthermore, this equation passes all diagnostic tests (with the exception of the Ramsey RESET test) and the stochastic residuals are white noise.

As seen from Table 3, the estimated equation for the institutional/political model (M2) is rather simple. The variable (SEREMR), measuring interest group influence, is significant, but the offset variable (OPEN) is also significant with an unexpected sign. Based on the above procedure, the taxation variables concerning fiscal illusion, HHIT and DTAXR and all remaining institutional variables were not significant and consequently are not reported in

Table 3. Given that all equations reported in columns (A), (B), and (C) of Table 3 have not passed all diagnostic tests, the interpretation of the estimated coefficients should be taken with a pinch of salt.

This discussion of Table 3 has been confined to the econometric results reported in columns (A), (B) and (C). As yet no comment has been made on the results in column (D). The discussion of these results will be undertaken later in this section of the paper.

Attention is now directed to applying non-nested tests to these two models. Table 4 presents the results of four different non-nested test statistics. The four tests employed are as follows: the Cox test, the Ericsson Instrumental Variable (IV) test, the Sargan restricted/unrestricted reduced form test, and the encompassing (F) test, which is also referred to as the joint model test. For details see Hendry and Doornik [1999].

The structure of Table 4 manifests the procedure of undertaking non-nested tests, *i.e.* the null hypothesis (H_0) is arbitrarily determined, and the alternative hypothesis (H_1) is also arbitrary. Such arbitrariness is acknowledged by the reversal of the null and alternative hypotheses. This reversal explains why the economic/apolitical model (M1) and the institutional/political model (M2) appear in both the columns and the rows of Table 4.

The results of row (1) of this Table, in which M2 is the null, indicate rejection of the institutional/political model by the four tests. The results from the four non-nested tests as indicated in row (2) of Table 4, in which M1 is regarded as the null, also suggest rejection of the economic/apolitical model. In other words, we have a case of double rejection. More importantly the statistical inference drawn here is not subject to reversal by using different non-nested test statistics.

What do these results mean? Essentially these results signify that an explanation of government expenditure in Fiji can not be found in either a solely institutional/political model or a pure economic/apolitical model. However, it cannot be concluded that economic/apolitical or institutional/political variables are irrelevant. To analyse this issue, attention is now directed to the specification and estimation of a comprehensive model including all the variables in both models. As before we have applied general to specific econometric methodology to estimate this equation. The parsimonious equation thus obtained is indicated in column (D) of Table 3.

Compared with the other estimated equations, this equation performs better in terms of goodness-of-fit statistics as well as diagnostic tests: the adjusted R^2 is 0.965 and the equation clearly passes the overall F test. Note that, unlike the other equations reported in columns (A), (B), and (C), the comprehensive model passes each and every diagnostic tests without any exception, and, as a result, this is our preferred equation. The highly significant estimated coefficient of the relative price variable, which measures both the own-price elasticity of demand and the cross-price elasticity of demand, indicates that the demand for government goods and services is inelastic with a magnitude of -0.90 . The income coefficient had the expected positive sign but was not statistically different from zero and thus it has not appeared in our preferred comprehensive model. This comprehensive model includes the measure of structural change (AGEMR) with the expected (and significant) negative coefficient of -0.49 . This means that as the agricultural sector of the Fijian economy declines

in relative importance, there is an increased demand for existing services, and/or a demand for new services, provided by government.

It is noteworthy that all the explanatory variables in the institutional/political model in column (C) of Table 3 are also significant and included in the comprehensive model. In other words, the estimated institutional/political model (column C) is nested in our preferred equation (column D). Borchering's [1985] inability to specify the numerical importance of the institutional variables did not indicate that such variables were irrelevant: this econometric analysis shows conclusively that "institutions matter" in terms of explaining the growth of recurrent government expenditure in Fiji. It is also important to observe that the 1987-88 military coups, as measured by $DUM(Coup)$, have exerted a highly significant adverse impact on government expenditure in Fiji.

As pointed out earlier, the lagged dependent variable, when included, was a dominant variable in the institutional/political model, and made all the other variables insignificant. This has not occurred in the comprehensive model. Also the economic/apolitical model was plagued with serial correlation. Even the use of AR(1) could not fix the problem. It is interesting that in our comprehensive model neither AR(1) was required nor the lagged dependent variable was found to be significant. Furthermore, according to a battery of diagnostic tests reported in Table 3, our final equation does not show any sign of misspecification.

We have already compared the economic/apolitical model with the institutional/political model using four non-nested tests. As discussed earlier these four tests consistently indicated that neither model is adequate in explaining government expenditure. As seen from Table 3, the estimated institutional/political model is nested within the comprehensive model. Thus it is inappropriate to continue to consider applying non-nested tests in this pairwise comparison. However, how can we make sure that the comprehensive model is superior to the economic/apolitical model? Non-nested tests can answer this question. The results are presented in Table 5.

The results in row 1 of Table 5 reveal that the comprehensive model (M3) is preferred to the economic/apolitical model (M1). This conclusion holds for all four test statistics. Row 2 indicates when M1 is regarded as the null hypothesis against M3 the conclusion is unambiguous: according to the four test statistics M1 is rejected against M3. Therefore, it can be safely concluded that the comprehensive model is necessary to explain government current expenditure in Fiji.

TABLE 4
ALTERNATIVE TESTS OF NON-NESTED (ECONOMIC/APOLITICAL AND INSTITUTIONAL POLITICAL) MODELS OF
RECURRENT GOVERNMENT EXPENDITURE, FIJI 1969-1999

Hypotheses		Maintained Model (H ₀)							
		Economic/Apolitical (M1)				Institutional/Political (M2)			
		Cox (z value)	Ericsson IV (z value)	Sargan <i>Chi</i> ² (4)	Joint model <i>F</i> (4,21)	Cox (z value)	Ericsson IV (z value)	Sargan <i>Chi</i> ² (4)	Joint model <i>F</i> (4,21)
Alternative Model (H ₁)	Economic/Apolitical (M1)	–	–	–	–	–9.7* (reject H ₀)	5.2* (reject H ₀)	19.3* (reject H ₀)	17.8* (reject H ₀)
	Institutional/Political (M2)	–4.1* (reject H ₀)	3.0* (reject H ₀)	14.2* (reject H ₀)	6.9* (reject H ₀)	–	–	–	–

Note: * indicates that the relevant null hypotheses are rejected at 5 percent level of significance.

TABLE 5
ALTERNATIVE TESTS OF NON-NESTED (ECONOMIC/APOLITICAL AND COMPREHENSIVE) MODELS OF RECURRENT
GOVERNMENT EXPENDITURE, FIJI 1969-1999

Hypotheses		Maintained Model (H ₀)							
		Economic/Apolitical (M1)				Comprehensive (M3)			
		Cox (z value)	Ericsson IV (z value)	Sargan <i>Chi</i> ² (4)	Joint model <i>F</i> (4,21)	Cox (z value)	Ericsson IV (z value)	Sargan <i>Chi</i> ² (2)	Joint model <i>F</i> (2, 21)
Alternative Model (H ₁)	Economic/Apolitical (M1)	–	–	–	–	-0.59 (accept H ₀)	0.50 (accept H ₀)	0.26* (accept H ₀)	12 (accept H ₀)
	Comprehensive (M3)	-9.1* (reject H ₀)	5.3* (reject H ₀)	14.2* (reject H ₀)	6.9* (reject H ₀)	–	–	–	–

Note: * indicates that the relevant null hypotheses are rejected at 5 percent level of significance.

VIII. CONCLUDING REMARKS

The existing literature of the demand for government goods and services is dominated by studies of western countries and services provided by state or local governments. This study is “a little bit different” in that it is one of the first such studies of a low middle income country with a government sector comprising services generally provided by central and state governments. With respect to the first point it should not be automatically concluded that economic analysis of this kind is not applicable to a country such as Fiji: it should be recalled that Pryor [1968] succeeded in analysing government behaviour of countries with markedly different systems, and that Wagner and Weber [1975] successfully analysed governments with different organisational and behavioural (competition or monopoly) characteristics.

The central focus of this paper is to provide an answer to the question posed by Borcharding [1985] concerning the relative importance of economic/apolitical and institutional/political factors in determining government expenditure in Fiji. The unique feature of this analysis is to apply non-nested tests to shed some light on the issue. It is found, using a number of different non-nested tests, that variables from both the institutional/political model and the economic/apolitical model of the determinants of the demand for government services are necessary. Thus, this study provides, not only further evidence that “institutions matter”, but that the conventional economic variables are also necessary to explain current government expenditure in Fiji.

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