

The demand for public expenditure in Fiji

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This paper analyses current government expenditure in Fiji using annual data from 1969 to 1999. Alternative theories of government expenditure are reviewed and a distinction is made between economic/apolitical determinants and institutional/political determinants. Both types of variables appear to be necessary to explain government expenditure. Demand for government goods and services is estimated to be price inelastic and income elastic, consistent with estimates for other countries.

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Fiji is classified as a lower middle-income country with a per capita annual income of US\$2,310 (World Bank 2001) and a population of 801,000 (in 1999). 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, with sugar and clothing as the main commodity export industries. Political instability has created economic uncertainties in Fiji, for example, coups in 1987 and 2000 have created an economic environment that is not conducive to long-term investment because of the resulting migration of skilled workers and poorly-defined property rights (Gani 1998).

The objective of this paper to apply contemporary public finance theories to the

determinants of the size of the government sector.

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 atheoretical or *ad hoc* analyses. Essentially, the modern analysis of the demand for goods and services provided by government involves an application of the median voter hypothesis, the economic/apolitical model, associated with Downs (1957).

The demand for public goods is conceived of as the outcome of the demand for public goods by the median voter. The demand for government expenditure is 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. These factors include prices, income and population, as well as some other relevant variables. (See also Larkey, Stolp and Winer 1981; Mueller 1989 and Brown and Jackson 1986.)

A second important approach to explaining government expenditure is the 'institutional model'. This approach covers a wide range of issues such as the political business cycle (Rogoff 1990), political unrest/revolt (such as the coups of 1987 and 2000), macroeconomic variables such as unemployment and inflation, the power of pressure groups (Tullock 1969; Stigler 1970; Olson 1982; Mueller and Murrell 1986, and Marlow and Orzechowski 1996), fiscal illusion (Buchanan 1967), and incrementalism (Wildavsky 1964). Exogenous shocks, such as the oil embargo of 1973 and 1974, can also have important repercussions on government expenditure.

These conceptual frameworks are, by no means, the only theories of government expenditure. For instance, Wagner (1958 [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 crisis, such as war; and Nordhaus (1975) has argued that government expenditure (and other macroeconomic variables) are subject to political business cycles.

This paper categorises 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 economic/structural model

Following Gemmell (1990), the demand for real government expenditure can be stated as follows

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

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 deflator, Y_t is real GDP; POP_t is population, and β_1 , β_2 , β_3 and β_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). Our estimating equation is as follows

$$\begin{aligned} \ln = & \beta_0 + \beta_1 \ln(P_{gt}/P_{yt}) + \beta_2 \ln(Y_t/POP_t) \\ & + \beta_3 \ln(POP_t) + \beta_5 \ln(AGEMR_t) \\ & + \beta_5 DV(coup)_t + \varepsilon_{1t} \end{aligned} \quad (2)$$

where $AGEMR$ is the ratio of agricultural employment to total employment; $DV(coup)$ is an intercept dummy variable which takes the value of 1 for the coups of 1987–88, and zero otherwise, and ε_{1t} is a well-behaved error term.

The institutional model

An important advance in the study of the public sector occurred in the 1950s, when some economists applied economic theory to non-market decision-making, which had previously been in the domain of political science. This development is now generally



referred to as 'public choice'. See Mueller (1989) for a comprehensive account of this approach.

An important conclusion from the public choice school is that institutions, their procedures and the people working in them can determine public sector outcomes. This seemingly trite point, that institutions matter, is central to the public choice literature. As Buchanan and Wagner note, 'we are institutionalists in the sense that we think that arrangements or rules do affect outcomes' (1977:636).

The estimated institutional model is specified as follows

$$\begin{aligned} \ln(G_t) = & \alpha_0 + \alpha_1 EDV_t + \alpha_2 \ln(U_t) \\ & + \alpha_3 \ln(SEREMR_t) + \alpha_4 \ln(OPEN_t) \\ & + \alpha_5 \ln(HHIT_t) + \alpha_6 \ln(DTAXR_t) \quad (3) \\ & + \alpha_7 \Delta \ln(P_{yt}) + \alpha_8 DV(coup) + \varepsilon_{2t} \end{aligned}$$

where EDV is an intercept dummy variable which equals unity when there was an election, and zero otherwise; 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; U is the rate of unemployment; HHIT is the Hirschman-Herfindahl index (Hirschman 1964) of tax complexity; DTAXR is the ratio of direct taxes to total taxes, and $\Delta \ln(P_y)$ is the inflation rate using the GDP price deflator.

A more detailed account of the literature on the theoretical underpinning of these explanatory variables is given in Doessel and Valadkhani (2002). Table 1 summarises both the notation employed and the expected theoretical signs of the relevant explanatory coefficients in both the economic/structural model and the institutional model.

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_y/P_g	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} or ΔG_{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	-
$\Delta \ln(P_y)$	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	+
DV(coup)	Coup dummy variable (1987 and 1988)	-



Estimation procedure

Equations 2 and 3 were estimated separately, and both performed well in terms of goodness-of-fit, with most of the coefficients being statistically significant (at the 5 per cent level) and having the expected theoretical signs. However, some diagnostic tests indicate misspecification in the institutional model and serious autocorrelation in the economic model. Furthermore, the application of non-nested tests to these separate models explaining government expenditure, indicate rejection of each model (that is, the Cox test, the Ericsson Instrumental Variable (IV) test, the Sargan restricted/unrestricted reduced form test, and the encompassing (F) test, Hendry and Doornik 1999). These results suggest that an explanation of government expenditure in Fiji cannot be found in either a solely institutional/political model or a pure economic/apolitical model. These non-nested test results and estimated Equations 2 and 3 (not reported here) have been published elsewhere (Doessel and Valadkhani 2002). Therefore, attention was directed to the specification and estimation of a comprehensive model including all the variables in both models. We have applied general-to-specific econometric methodology to estimate the following comprehensive model, which captures the long-run determinants of public expenditure

$$\begin{aligned} \ln(G_t) = & \lambda_0 + \lambda_1 \ln(P_{gt}/P_{yt}) + \lambda_2 \ln(Y_t/POP_t) \\ & + \lambda_3 \ln(POP_t) + \lambda_4 \ln(AGEMR_t) \\ & + \lambda_5 DV(coup)_t + \lambda_6 EDV_t \\ & + \lambda_7 \ln(U_t) + \lambda_8 \ln(SEREMR_t) \\ & + \lambda_9 \ln(OPEN_t) + \lambda_{10} \ln(HHIT_t) \\ & + \lambda_{11} \ln(DTAXR_t) + \lambda_{12} \ln(P_{yt}) + \varepsilon_t \end{aligned} \quad (4)$$

Before estimating Equation 4 the time series properties of the data was determined,

since the use of non-stationary data in the absence of cointegration can result in spurious regression results. To this end, the augmented Dickey-Fuller (ADF) test was adopted to examine the stationarity, or otherwise, of the time-series data. It was found that all the time-series variables in Equation 4 were $I(1)$, or stationary, after first differencing. The lowest value of the Akaike Information Criterion (AIC) was used as a guide to determine the optimal lag length in the ADF regression. These lags were added to the ADF regression to ensure that the error-term was white noise. Since there are only 31 annual observations for the variables studied, the unit-root test results are unrepresentative as the ADF test is appropriate only for large samples.

Let us assume that all the variables in Equation 4 are $I(1)$ and the resulting residuals are $I(0)$. According to Engle and Granger (1987), it can then be stated that there exists a corresponding error-correction mechanism (ECM or ε_{t-1}) model of the following form

$$\begin{aligned} \Delta \ln(G_t) = & \gamma_0 + \sum_{i=0}^p \gamma_{1i} \Delta \ln\left(\frac{P_g}{P_p}\right)_{t-i} + \sum_{i=0}^p \gamma_{2i} \Delta \ln\left(\frac{Y}{POP}\right)_{t-i} \\ & + \sum_{i=0}^p \gamma_{3i} \Delta \ln(POP)_{t-i} + \sum_{i=0}^p \gamma_{4i} \Delta \ln(AGEMR)_{t-i} \\ & + \sum_{i=0}^p \gamma_{5i} \Delta \ln(U)_{t-i} + \sum_{i=0}^p \gamma_{6i} \Delta \ln(SEREMR)_{t-i} \\ & + \sum_{i=0}^p \gamma_{7i} \Delta \ln(OPEN)_{t-i} + \sum_{i=0}^p \gamma_{8i} \Delta \ln(HHIT)_{t-i} \\ & + \sum_{i=0}^p \gamma_{9i} \Delta \ln(DTAXR)_{t-i} + \sum_{i=0}^p \gamma_{10i} \Delta^2 \ln(P_{yt})_{t-i} \\ & + \gamma_{11} DV(coup)_t + \gamma_{12} EDV_t + \sum_{i=0}^p \delta_i \Delta \ln(G)_{t-i} \\ & + \theta \varepsilon_{t-1} + v_t \end{aligned} \quad (5)$$

where γ_{ji} are the estimated short-term coefficients; θ represents the feedback effect or the speed of adjustment whereby short-term dynamics converge to the long-term equilibrium path formulated in Equation 4;



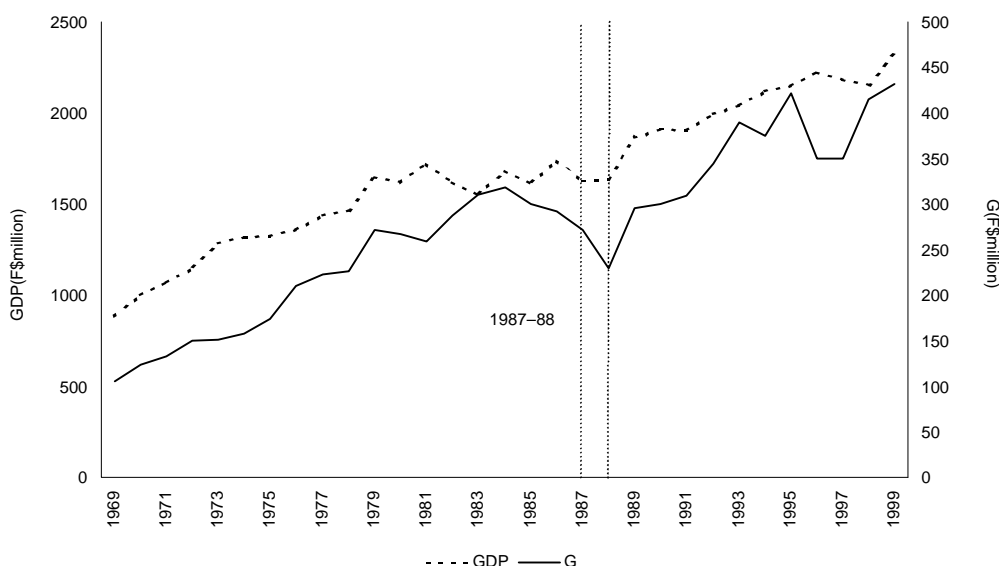
δ_i denotes the estimated coefficients of the lagged dependent variable to ensure that v_t or the disturbance term is white noise; e_t or the ECM, is obtained from Equation 4; and Δ indicates the first-difference operator.

The general-to-specific methodology can be used to omit insignificant variables in Equation 5 on the basis of several maximum likelihood tests. In this method, joint zero restrictions are imposed on explanatory variables in the unrestricted (general) model to obtain the most parsimonious and robust equation in the estimation process. However, the two-step Engle-Granger method may not be appropriate if there are more than two variables in the cointegrating equation because it is possible that there could exist more than one cointegrating relationship

between the variables. To address this issue, the multivariate Johansen cointegration technique was initially used to determine the number of cointegrating vectors. However, given the lack of long and consistent time-series data (that is, only 31 observations), the Johansen method is also inappropriate, as the cointegration results were very sensitive to the lag length, the inclusion of the intercept term, or a trend in the cointegration equation, and/or the VAR specification. It should be noted that the max-eigenvalue and trace tests on Equation 4 indicate that there is one cointegrating vector at the 1 per cent level. In these tests we have allowed only one lag and an intercept term in the cointegrating vector and the VAR but with no trend in the cointegrating vector and the VAR model. The

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Figure 1 Fiji: GDP and real government consumption expenditure, 1969–99 (F\$ million, constant 1989 prices)

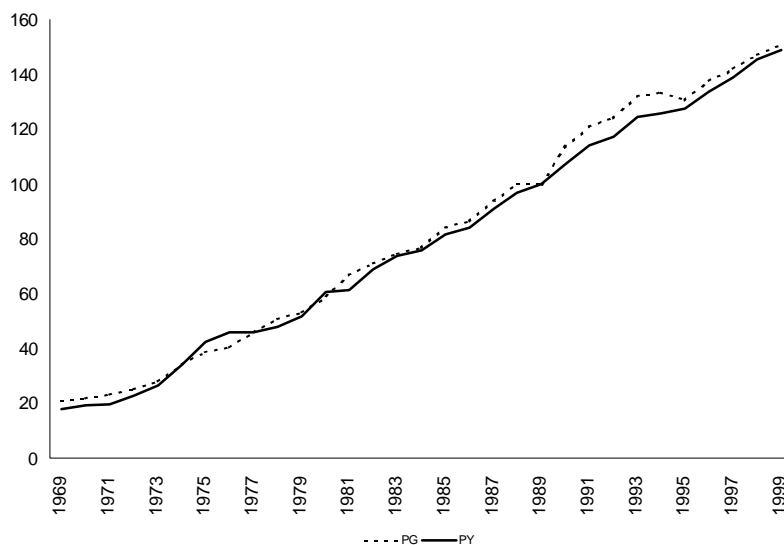


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Source: World Bank, 2001. *The 2001 World Development Indicators CD-ROM*, World Bank, Washington, DC.



Figure 2 Fiji: plot of government and GDP deflators, 1969–99 (1989=100)



Source: World Bank, 2001. *The 2001 World Development Indicators CD-ROM*, World Bank, Washington, DC.

Figure 3 Fiji: graph of real GDP per capita, 1969–99 (1989 F\$)



Source: World Bank, 2001. *The 2001 World Development Indicators CD-ROM*, World Bank, Washington, DC.



multivariate cointegration test results not reported here are available from the authors.

Some relevant time-series data on government in Fiji

This study employs aggregate data on all public expenditure. It would be desirable if we could separate government expenditure (say) on the security system and defence, given that governments may make decisions on defence expenditure in a different way from civilian expenditure. However, such a disaggregation of the data is not available for the 1969–99 precluding a disaggregated analysis.

Figure 1 presents time series data on real GDP and real government current expenditure for 1969–99. It is clear that GDP has experienced some significant fluctuations through time. Note the decrease in GDP and government expenditure in 1987

and 1988. Figure 2 plots government and GDP deflators while Figure 3 presents a graph of real GDP per capita. The impact of the 1987–88 military coups on real GDP per capita is clear. Table 2 gives descriptions of the data employed and summary statistics.

Empirical results and policy implications

It is very important to examine the time-series properties of the data, as mentioned above. The empirical results of the ADF unit-root test are summarised in Table 3. According to the test results, all of the variables appearing in the estimated parsimonious equation reported in Table 4 are integrated of order one, $I(1)$, and they become stationary after first-differencing. Since all the variables in Equation 4 are $I(1)$, the Engle-Granger two-step procedure can be used to examine if this equation represents a long-term relationship.

Table 2 **Fiji: summary statistics and description of the data employed, 1969–99**

Variables	Unit	Mean	Standard deviation	Minimum	Maximum
G	F\$ million (1989 prices)	272	91	106	431
P_g/P_y	Ratio	1.03	0.08	0.83	1.17
Y/POP	F\$ (1989 prices)	2,457	276	1,747	2,900
POP	Persons	669,627	91,121	508,000	801,000
AGEMR	Ratio	3.50	1.50	1.77	7.40
U	Unemployment rate (per cent)	3.90	3.30	0.10	9.40
SEREMR	Ratio	64.00	5.00	52.20	72.00
OPEN	Ratio	1.04	0.15	0.80	1.30
HHIT ^a	$1 > HHIT > 0$	0.38	0.03	0.33	0.42
DTAXR ^a	Ratio	0.50	0.06	0.37	0.58
$\Delta \ln(P_{yt})$	Inflation rate (per cent)	7.10	6.10	-	25.9

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

Sources: World Bank, 2001. *The 2001 World Development Indicators CD-ROM*, World Bank, Washington, DC; Asian Development Bank (various). *Key Indicators of Developing Asian and Pacific Countries*, Oxford University Press, Singapore; International Monetary Fund, (various). *Government Financial Statistics*, International Monetary Fund, Washington, DC; and International Labour Organization (various). *Yearbook of Labour Statistics*, International Labour Organization, Geneva.

Table 3 **Fiji: ADF test results of the data employed in Tables 4 and 5**

Variable	C (constant) and T (trend) in the equation	ADF test	
		ADF statistics	Optimum lag
$\ln(G)_t$	C & T	-2.56	0
$\Delta \ln(G)_t$	C	-5.87*	0
$\ln(P^g/P^v)_t$	C & T	-2.25	1
$\Delta \ln(P^g/P^v)_t$	C	-5.51*	0
$\ln(Y/POP)_t$	C & T	-3.34	0
$\Delta \ln(Y/POP)_t$	C	-6.21*	0
$\ln(AGEMR)_t$	C & T	-3.09	0
$\Delta \ln(AGEMR)_t$	C	-7.00*	0
$\ln(U)_t$	C & T	-1.53	0
$\Delta \ln(U)_t$	C	-5.15*	0
$\ln(SEREMR)_t$	C & T	-2.81	0
$\Delta \ln(SEREMR)_t$	C	-5.79*	0
ECM_t	C & T	-5.38*	0

* indicates that, based on the MacKinnon critical values, the corresponding null hypothesis is rejected at the 1 per cent significance level.

Source: Author's calculations.

Table 4 presents the results of estimating the comprehensive long-run model of public expenditure in Fiji using the 1969–99 data. All the estimated coefficients are significant at least at the 5 per cent level and have the expected theoretical signs. This equation performs very well in terms of goodness-of-fit (adjusted $R^2 = 0.945$) and passes the overall F test at the 1 per cent level. In addition, the equation passes all diagnostic tests.

There are a number of important points that can be drawn from the estimated long-run coefficients of the public expenditure 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 literature. Second, the coefficient on per capita income ($+0.94$) 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. Third, this comprehensive model includes the measure of structural change (AGEMR) with the expected (and significant) negative coefficient (-0.34). In the long run, as the agricultural sector of the Fijian economy declines in relative importance, an increased demand for existing services, and/or a demand for new services, provided by government is indicated.

The variable (SEREMR), measuring interest group influence, is highly significant with a relatively larger long-run elasticity of 1.17. This is not counter-intuitive given the nature of government decision-making processes in Fiji. 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 DV(coup), have exerted a highly significant adverse impact on government expenditure in Fiji.

Insignificant variables—the taxation variables concerning fiscal illusion (that is, HHIT and DTAXR), EDV, OPEN and inflation—were omitted by applying several maximum likelihood tests involving joint restrictions on explanatory variables, in order to obtain the most parsimonious and robust estimates. The estimated results were obtained using *PcGive 9.21* (Hendry and Doornik 1999).

Attention is directed to the second stage of the Engle-Granger representation procedure. Table 5 presents the estimated results of an error correction model (ECM) capturing short-run dynamics of public expenditure as formulated in Equation 5. The general-to-specific methodology was adopted in estimating Equation 5 by omitting insignificant lagged variables and undertaking a battery of maximum likelihood tests. Joint zero restrictions were imposed on insignificant explanatory variables in the unrestricted (or general model) to obtain the most parsimonious and robust equation in the estimation process. The parsimonious short-term model of public expenditure includes all of the long-term determinants of

Table 4 Fiji: empirical results for the long-run, $\ln(G)_t$ model, 1969–1999

Variable	Estimated elasticities	<i>t</i> -statistics*	Probability	Expected signs
Intercept	7.575	2.7	[0.01]	
$\ln(P_g/P_v)_t$	-0.668	-2.2	[0.04]	-
$\ln(Y/POP)_t$	0.940	2.9	[0.01]	+
$\ln(AGEMR)_t$	-0.345	-2.7	[0.01]	-
$\ln(U)_t$	0.043	2.5	[0.02]	+
$\ln(SEREMR)_t$	1.174	2.2	[0.03]	+
DV(coup)	-0.176	-2.9	[0.01]	-

Order of integration of the stochastic residuals: I(0)

Goodness-of-fit:

Adjusted $R^2 = 0.945$,

Overall F statistic $F(6,24) = 87$

Diagnostic tests

DW	1.79	
AR 1-2	$F(2, 22) = 1.27$	[0.30]
ARCH 1	$F(1, 22) = 0.55$	[0.47]
Normality	$\chi^2(2) = 0.09$	[0.96]
White χ^2	$F(11, 12) = 0.99$	[0.50]
RESET	$F(1, 23) = 0.76$	[0.39]

* indicates that the standard errors of the coefficients have been corrected by the White HAC method before calculating *t*-ratios.

Notes: Figures in square brackets show the corresponding probabilities; the estimated method is OLS.

Table 5 **Fiji: empirical results for the short-run, $\Delta \ln(G)_t$, model, 1971–99**

Variable	Estimated elasticities	<i>t</i> -statistics*	Probability	Expected signs
Intercept	–0.001	0.0	[0.96]	
$\Delta \ln(P_g/P_y)_t$	–0.616	–3.3	[0.00]	–
$\Delta \ln(Y/POP)_t$	0.914	2.3	[0.03]	+
$\Delta \ln(AGEMR)_t$	–0.224	–2.9	[0.01]	–
$\Delta \ln(SEREMR)_t$	0.811	2.3	[0.03]	+
$\Delta \ln(G)_{t-1}$	0.271	1.6	[0.11]	+
ECM_{t-1}	–0.873	–2.9	[0.01]	–

Order of integration of the stochastic residuals: $I(0)$

Goodness-of-fit statistics

Adjusted $R^2 = 0.332$

Overall F statistic $F(6,22) = 3.3$

Diagnostic tests:

DW	1.82	
AR 1-2	$F(2, 20) = 0.84$	[0.45]
ARCH 1	$F(1, 20) = 0.00$	[0.97]
Normality	$\chi^2(2) = 1.88$	[0.39]
White χ^2	$F(12, 9) = 0.20$	[0.99]
RESET	$F(1, 21) = 0.00$	[0.98]

* indicates that the standard errors of the coefficients have been corrected by the White HAC method before calculating *t*-ratios.

Notes: Figures in square brackets show the corresponding probabilities; the estimated method is OLS.

public expenditure except for U and $DV(coup)$.

The results reported in Table 5 indicate that the short-run sources of growth of public expenditure are changes in relative prices, per capita income, the ratio of agriculture employment to total employment, the ratio of service employment to total employment and the lagged growth rate of public current expenditure. All the estimated coefficients are statistically significant at least at the 5 per cent level, with the only exception being $\Delta \ln(G)_{t-1}$, and have the expected signs. The variable $\Delta \ln(G)_{t-1}$ is a proxy to capture bureaucratic inertia or incrementalism. This variable, with a coefficient of 0.27, is statistically significant at the 11 per cent level.

In terms of goodness-of-fit statistics, though expressed in $\Delta \ln$, with an adjusted R^2 of 0.332, the short-run dynamic equation performs reasonably well. As with Equation 4, this equation also passes all diagnostic tests. Table 5 also reveals that the feedback coefficient (or adjustment speed) is as high as –0.873, indicating that in every year 87 per cent of the divergence between the short-run public expenditure growth from its long-run path, as formulated in Equation 4, is eliminated.

Concluding remarks

The literature on 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 one of the first such studies of a middle-income country, with a (single) government sector providing services generally supplied by central and state governments in other countries. It should not be automatically concluded that economic analysis of this kind is not applicable to a country such as Fiji: 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 Borchering (1985) concerning the relative importance of long and short-run economic/apolitical and institutional/political factors in determining government expenditure in Fiji. It is found that variables from both the institutional/political model and the economic/apolitical model of the determinants of the demand for government services are necessary. This study provides not only further evidence that 'institutions matter', but indicates that conventional economic variables are also necessary to explain current government expenditure in Fiji.

This paper presents the first empirical estimates of the magnitudes of those factors that explain current government expenditure in Fiji. Policymakers (and their bureaucrats) now have a means whereby they can predict the effect on government expenditure of changes in important determining variables of that expenditure.

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