The Demand for Current Public Expenditure in Fiji: Theory and Empirical Results

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THEORY AND ECONOMETRIC EVIDENCE EXPLAINING PUBLIC EXPENDITURE: THE CASE OF IRAN*

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A**bstract**

The purpose of this paper is to analyse government expenditure in Iran using annual time series data for the period 1963-2000. Various theories of the size of government are reviewed and a distinction is made between economic/structural determinants and institutional determinants. Categorising the theories of government expenditure in this way suggests the application of non-nested tests as a mechanism whereby the relative importance of the two broad theoretical categories can be determined. The empirical results, indicating "double rejection", reveal that neither the economic/structural determinants nor the institutional determinants alone are sufficient to explain government expenditure in Iran. A comprehensive, incorporating explanatory variables from both models provides a robust explanation of the data. This paper presents the first empirical estimates of the own-price elasticity of the demand, and income elasticity of the demand, for current government expenditures in Iran.

Keywords: Government expenditure, Non-nested tests, Iran, Economic determinants, Institutional determinants.

1. Introduction

Since the pioneering studies by Borcherding and Deacon (1972), Bergstrom and Goodman (1973) and Deacon (1978), the analysis of the growth of government expenditure has ceased to be characterised by the atheoretical or *ad hoc* analyses that were dominant until then. 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). This conception will be referred to below as “the economic/structural model” .

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 Borcherding (1985) puts it, by "the Fiscal Everyman". Put otherwise the demand for government expenditure is regarded 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 and exposition see, *inter alia*, Larkey, Stolp and Winer (1981), Mueller (1989) and Brown and Jackson (1986).

Other theories have been postulated: Wagner (1883) points to structural change and rising incomes; Peacock and Wiseman (1967) argue for “displacement associated with some crisis, such as war; and Nordhaus (1975) has argued a political business cycle. 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: 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/structural kind and of an institutional nature. This dual scheme has been employed by, *inter alia*, Borcherding (1985). 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 tests (Pesaran and Deaton, 1978)

A second important approach to explain government expenditure is what is referred to below as "the institutional model". This approach covers a wide range of issues such as the political business cycle (Rogoff, 1990), political revolution (such as the overthrown of the House of Pahlavi in 1979 and the establishment of the Islamic Republic of Iran), macroeconomic variables such as unemployment and inflation, the power of pressure groups (Tullock, 1959, Stigler, 1970, Olson, 1982, Mueller and Murrell, 1986, and Marlow and Orzechowski, 1996), fiscal illusion (Buchanan, 1967, and incrementalism (Wildavsky, 1964). Also, it should be recognised exogenous shocks, such as Iraqi war can have important repercussions on government expenditure.

The structure of this paper is as follows: Section 2 briefly presents a theoretical framework for our analysis. Section 3 presents a short account of the structure of the government sector in Iran and some relevant time series data on the phenomena to be explained. Section 4 provides the econometric results of a comprehensive multiple regression equation. Section 5 presents a summary of the analysis.

2. Theoretical Framework and Estimation Procedure

It is not our purpose here to provide a comprehensive review and evaluation of the theoretical and empirical literature on the demand for public goods: such a review is provided recently in Doessel and Valadkhani (2002). We provide here only a brief outline of the estimating procedure we have adopted.

2.1. The economic/structural model

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

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

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 Borcherding and Deacon (1972) and Bergstrom and Goodman (1973). For details see Gemmell (1990). Our actual estimating equation is as follows:

$$\ln(G_t) = \beta_0 + \beta_1 \ln(P_{gt} / P_{yt}) + \beta_2 \ln(\ln(Y_t / POP_t) + \beta_3 \ln(POP_t) + \beta_4 \ln(INDUEMR_t) + \beta_5 WDV_t + \varepsilon_{1t} \qquad (2)$$

where INDUEMR is the ratio of industrial employment to total employment, and

WDV is an intercept dummy variable which takes the value of 1 for the Iraq-Iran war (1980-1988) period, and zero otherwise.

A brief explanation for including these explanatory variables was provided above.

2.2. The institutional 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) for a comprehensive account 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: 636) put it "We are institutionalists in the sense that we think that arrangements or rules do affect outcomes."

The institutional model we are estimating can be stated as follows:

$$\begin{aligned}\ln(G_t) = {} & \alpha_0 + \alpha_1 EDV_t + \alpha_2 PRDV_t + \alpha_3 \ln(U_t) + \alpha_4 \ln(SEREMR_t) + \\ & \alpha_5 \ln(OPEN_t) + \alpha_6 \ln(HHIT_t) + \alpha_7 \ln(DTAXR_t) + \alpha_8 \Delta \ln(P_{yt}) + \\ & \alpha_9 \ln(G_{t-1}) + \varepsilon_{2t}\end{aligned} \tag{3}$$

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

PRDV is pre-revolutionary dummy variable,

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,

$\Delta ln(\text{Py})$ is the inflation rate using the GDP price deflator, and

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

A rational for these explanatory variables was considered above. For a detailed account of the literature see Doessel and Valadkhani (2002).

Table 1 summarises both the notation to be employed in this study and the expected theoretical signs of the relevant explanatory coefficients in both the economic/structural model and the institutional model. **[Table 1 about here]**

2.3. Some relevant background and time series data for Iran

Before considering the public sector in Iran it is useful to sketch some institutional and non-economic factors (for example political and constitutional) within which decision making takes place. Privatization of fiscally hemorrhaging public enterprises is one of the key objectives of "total restructuring" of the Iranian economy accommodated in the Third Five-Year Development Plan (2000/01-2004/05, fiscal year ending March 20). Therefore it is very important to know the determinants of government expenditure. In addition to economic factors, the conduct of fiscal policy in Iran has also been affected by a number of non-economic or external factors associated with the upheavals consequential to the 1979 Islamic Revolution, the destructive eight-year war with Iraq (1980-1988), the freezing of the

country's foreign assets, a volatile international oil market, international economic sanctions, and constitutional and institutional bottlenecks.

For example, in September 1999 the government made an attempt to privatize several major industries, including communications, post, rail, petrochemicals, and even upstream oil and gas. However it is highly unlikely that the government can succeed in its reform agenda because the conservative party supports monopolies, and those interest-groups who enjoy an under-taxed economy. Karbassian (2000) believes that the economic activities of the tax-exempt revolutionary organizations (*Bonyads*) account for about 11 per cent of Iran's GDP. In the third plan the ratio of tax to GDP is assumed not to exceed 6 per cent. This assumption clearly implies that the government, for political reasons, is not going to launch a major tax reform during the course of plan.

Another non-economic and non-quantifiable factor in explaining the size of government and the success of recent privatisation policies pertains to a conservative and outdated constitution. Iran's third Plan expects private investment to grow at 8.5 per cent per annum while the private sector in Iran's constitution has been treated as "residuals". Article 44 of Iran's constitution states that:

"The economy of the Islamic Republic of Iran is to consist of three sectors: state, cooperative, and private, and is to be based on systematic and sound planning. The state sector is to include all large-scale and mother industries, foreign trade, major minerals, banking, insurance, power generation, dams, and large-scale irrigation networks, radio and television, post, telegraph and telephone services, aviation, shipping, roads, railroads and the like; all these will be publicly owned and administered by the State. The cooperative sector is to include cooperative companies and enterprises concerned with production and distribution, in urban and rural areas, in accordance with Islamic criteria. The private sector consists of those activities concerned with agriculture, animal husbandry, industry, trade, and services that supplement the economic activities of the state and cooperative sectors. …The scope of each of these sectors as well as the regulations and conditions governing their operation, will be specified by law"(source: http://www.uni-wuerzburg.de/law/ir00000_.html#A044_)

For a concise discussion of these developments see the following:: Pesaran (1992, 1995), Akhavi-Pour, (1994), Karshenas and Pesaran (1995), Sundararajan, Marston and Shabsigh (1998), Amuzegar (1992, 2000), Alizadeh (2000), Valadkhani (2001). Also for the impact of various types of government expenditure on the economy see Valadkhani (1997, 1998).

In terms of the World Bank's classification of countries on the basis of per capita income, Iran is categorised as a lower middle income country. Unlike federations such as the U.S., Canada, Australia and Germany, Iran 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 expenditure (1982 prices) for the period analysed in this study, 1963-2000. It is clear that GDP has not experienced steady growth through time. The early period (1963-1978), associated with steady oil exports, can be characterised as one of steady growth. It should be noted that Iran has been subject to the various economic forces associated with the oil industry, as described in Adelman (1995). But with the invasion of Iraq in 1979 GDP fell and continued to fall until 1981. The period of the late 1970s and the 1980s is dominated by internal political events and the Iraq-Iran war. In this period oil exports fell dramatically. With the cessation of war in 1988 oil exports resumed and ushered in another period of steady growth in the period 1988-1993. Per capita income in Iran mirrors these general movements, reaching a high of 397,603 rials (constant 1982 prices) in 1976, and a low of 201,137 rials in 1988, and then recovery to a level of 269,713 rials in 2000.

[Figure 1 about here]

As indicated in Figure 1, the government sector has also exhibited fluctuations during the 1963-2000 period. As a percentage of GDP, government consumption expenditure (constant 1982 prices) has increased from 5.4 per cent in 1963 to a maximum of 21.2 per cent in 1981. Relative size then fell to a low of 10.7 per cent in 1989 and rose to 13.1 per cent in 2000. For further details on the structure of the Iranian economy see, *inter alia*, Karshenas (1990), and Valadkhani (2001).

The measure of government for this study is real government consumption expenditure (1982 prices). It would be desirable if we could separate expenditure on the security system and defence, given that governments may make decisions on defence expenditure in a quiet different way from civilian expenditure. However, such a disaggregation of the data is not available as Iranian government accounts combine both capital and current expenditures on defence (MPO, 2000). This creates an apples-and-oranges problem which we cannot resolve. Table 2 presents descriptions of the data employed and summary statistics.

[Table 2 about here]

3. Estimation Procedure

The empirical procedure has been to estimate equation (2) and equation (3) separately. These two equations performed quiet well in terms of goodness-of-fit, most of the coefficients being statistically significant (at the 5 per cent level), and having the expected theoretical signs. However, there were some diagnostic tests which indicated mis-specification in the structural model and the violation of the normality assumption in the institutional model's residuals. Furthermore, the application of non-nested tests [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)], to these separate models explaining government expenditure, indicate **rejection** of each model. Essentially these results signify that an explanation of government expenditure in Iran cannot be found in either a solely institutional/political model or a pure economic/structural model. These non-nested test results, not reported here, are available from the authors on request.

4. Empirical Results

An important step before estimating government current expenditure is to determine the time series properties of the data. This is an important issue 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 has been adopted to examine the stationarity, or otherwise, of the time series data. It was found that all the time series variables in equations (2) and (3) were I(1), or stationary after first differencing. Therefore if the resulting residual (ε_t) in an equation containing these variables is white noise, or I(0), according to the Engle-Granger representation theorem (Engle and Granger, 1987), it can be argued that there is a long-term relationship between real government expenditure and its major determinants. Due to lack of space, the ADF test results are not reported but are available from the authors upon request.

As pointed out in the previous section some diagnostic tests indicated the inadequacy of the separate equations to explain government expenditure. Therefore, 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 Table 3.

[Table 3 about here]

Table 3 presents the econometric results for such an equation, which incorporates both categories of explanatory variables in Equations (2) and (3), if they are statistically significant. This equation performs well in terms of goodness-of-fit statistics as well as diagnostic tests: the adjusted R^2 is 0.992 and the equation clearly passes the overall *F* test. Note that this model passes each and every diagnostic test without any exception, and, as a result, this is our preferred equation.

There are a number of important points that can be drawn from the estimated coefficients of the comprehensive model. First, the relative price coefficient (-0.43) indicates that the demand for government goods and services in Iran is inelastic. This coefficient is of the same magnitude reported in the prior literature.

Second, the coefficient on per capita income (+0.69) 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 Iran.

Third, the measure of structural change employed here (INDUEMR), has a positive estimated coefficient. This means that as the Iranian economy becomes more

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

Fourth, the estimated coefficient for the intercept dummy variable for the Iraqi war (WDV) is positive and significant, indicating that during the war government current expenditure was higher than in the non-war periods.

Attention is now directed to the interpretation of the coefficients of the institutional variables. The positive coefficient on EDV, albeit not very significant, indicates that the government has increased expenditure in election years. It appears from the significant (positive) coefficient of the index of openness that government size is positively related to this variable. However the expected sign for this variable is negative, as it is an offset to the effect of interest groups. The variable (SEREMR), measuring interest group influence was also highly significant, yet the offset variable is significant but with an unexpected sign. In the context of Iran the openness variable is dominated by oil exports sold within the OPEC cartel, and it should be recognised that the oil and gas sector is a nationalised industry. Thus the variable (OPEN) indirectly represents a major component of government revenue rather than an offset to interest group pressure. As a result, the positive sign of this variable is not a counsel of despair.

Fiscal illusion, measured by DTAXR, was significant but had the wrong expected sign. A final institutional factor which was statistically significant in our final model, was inertia or incrementalism, measured by the lagged value of the dependent variable (G_{t-1}) (Incrementalism, of course, could manifest itself by statistically significant lagged dependent variables for several years. A two-year, three-year and a four-year lag were introduced but were found to be insignificant). It seems that the Wildavsky (1964)

argument is relevant in that the size of this year's budget depends upon last year's budget. All remaining institutional variables, as considered earlier in this paper, for example PRDV and HHIT, are not significant and consequently excluded from the comprehensive model.

5. 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 the first such study of a middle east 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 Iran: it should be recalled that Pryor (1968) succeeded in analysing government behavior of countries with markedly different systems, and that Wagner and Weber (1975) successfully analysed governments with different organisational and behavioral (competition or monopoly) characteristics.

The central focus of this paper is to provide an answer to the question posed by Borcherding (1985) concerning the relative importance of economic/structural and institutional factors in determining government expenditure. 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 tests, that "double rejection" is the universal outcome for the separate theories: this means that an adequate explanation of government expenditure in Iran requires considering both economic/structural and institutional explanatory variables.

The significance of this paper may lie in the fact that it has reported the first estimates of own-price and income elasticities for current public expenditure in Iran. The empirical results obtained (-0.43 and +0.69, respectively) in this paper indicate that, in terms of government decision making, the outcomes are not abnormal in comparison with the results of other countries. See Gemmell (1990).

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Table 1. Economic/structural and institutional explanatory variables applied in the real demand for government expenditure (G) in Iran

Variable name	Variable definition	Expected sign
Economic/Structural		
P_g	Government price deflator	-
P_y	GDP price deflator	+
P_g/P_y	Relative price ratio	-
PERY	Real per capita GDP	+
POP	Population	+
INDUEMR	Ratio of industrial employment to total employment	+
Institutional		
G_{t-1}	Lagged real government expenditure	+
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	-
WDV	War dummy variable	+
PRDV	Pre-revolutionary period dummy variable	?
EDV	Election dummy variable	+

Table 2. Summary statistics and description of the data employed, Iran, 1963-2000

Variables	Unit	Mean	Standard deviation	Minimum	Maximum
G	billion rials (1982 prices)	1529	687	207	2379
P_g/P_y	Ratio	1.3	0.4	0.91	2.02
Y/POP	Million rials (1982 prices)	0.2522	0.0566	0.1399	0.3976
POP	Thousand	43338	13224	24249	65604
INDUEMR	Ratio	0.287	0.029	0.244	0.342
U	Unemployment rate	9.6	4.5	3.2	16.2
SEREMR	Ratio	0.39	0.08	0.26	0.51
OPEN	Ratio	0.36	0.16	0.09	0.76
HHIT	1>HHIT>0	0.29	0.03	0.23	0.36
DTAXR	Ratio	0.51	0.14	0.25	0.77
$\Delta(P_{yt})/P_{yt-1}$	Inflation rate (%)	17.2	14.2	-4.2	57.4

Sources: Management and Planning Organisation (2000); Iran's Central Bank (2002); and Tabibian, *et al.* (2001).

Table 3. Regression results for government current expenditure, *ln*(G), Iran, 1963-2000

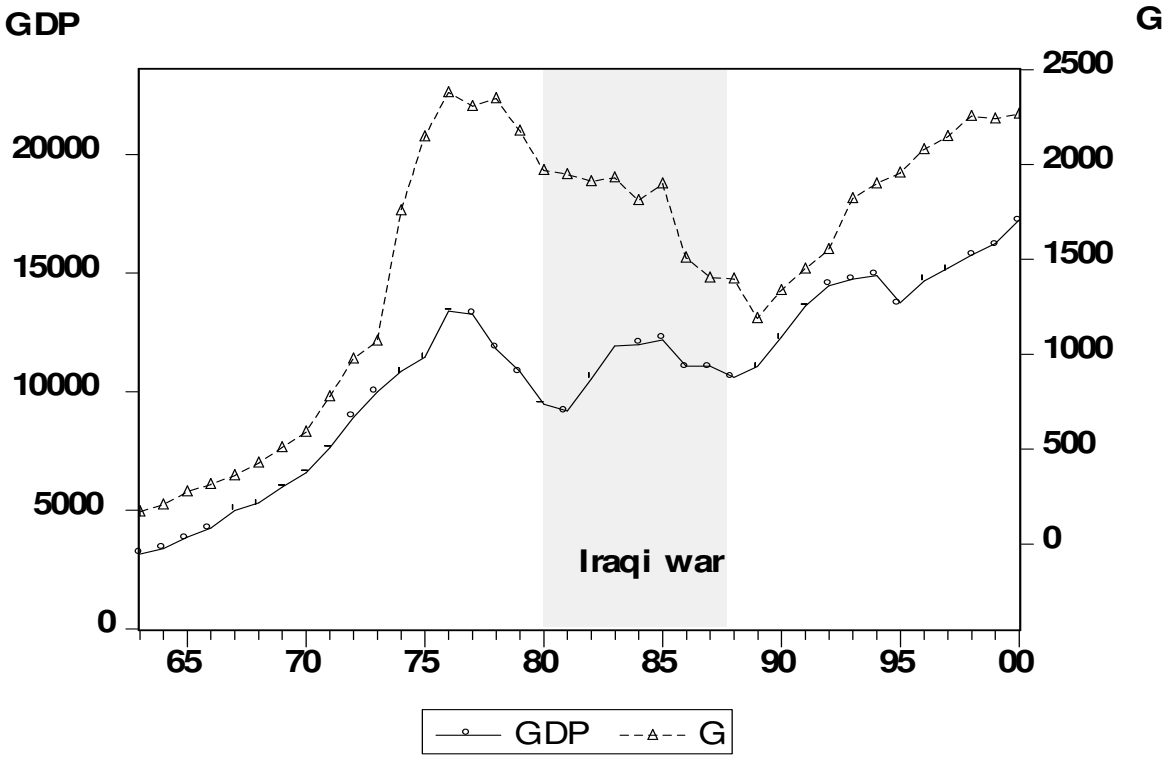
Explanatory variables	Results
Intercept	8.5 (8.2)*
$Ln(Pg/Py)_t$	-0.43 (-3.5)*
$Ln(Y_t/POP_t)$	0.69 (6.1)*
$Ln(POP_t)$	-
$Ln(INDUEMR_t)$	1.31 (5.5)*
$Ln(U_t)$	-
WDV_t	0.16 (4.1)*
EDV_t	0.04 (1.40)
$Ln(OPEN)_t$	0.06 (1.8)**
$Ln(DTAXR_t)$	0.26 (3.3)*
$Ln(SEREMR_t)$	0.67 (4.6)*
$Ln(G_{t-1})$	0.31 (3.7)*
Goodness-of-fit statistics	
Adjusted R^2	0.992
F- Statistic	F(9,32)=463*
Diagnostic tests	
DW	2.2
AR[a] 1- 2	F(2,30)=1.1
ARCH[b] 1	F(1,24)=2.8
Normality[c] Chi2(2)	1.51
White Heteroskedasticity	
Xi	-
Xi*Xj	F(16,9)=0.78
RESET[d]	F(1,31)=0.58
Stochastic residuals[e]	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.

F*igure 1.* GDP and government consumption expenditure (G), Iran, 1963-2000, (1982 prices)



Source: Tabibian, *et al.* (2001).