Is Government Size Optimal in the Gulf Countries of the Middle East?

An Answer

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Abstract

The size of government consumption relative to national output is examined to see if it is optimal in five Gulf countries of the Middle East. We follow the methodology suggested in Barro (1990) and Karras (1996, 1997) and examine the marginal productivity of government consumption. The "Barro rule" states that government services are optimally provided when the marginal product of government consumption is one. Regression tests are undertaken for each country, and then in panels created by pooling data from all countries. Results find government consumption is productive, but the size of government is too large to be optimal.

Keywords: Optimal government size, Gulf countries

JEL Classification: E6, H1, and O53

1.Introduction

Due to downward movements in the price of oil and huge expenditures relating to the second Gulf war, in recent years, the countries of the GCC (Gulf Cooperation Council) have tried to find new ways to secure and diversify government revenue. In addition, expenditures are also under scrutiny. Overall, the need to alter fiscal policies and re-examine the size of government is now a practical necessity in these countries. In addition, the new wave of economic literature calling for a general diminishing role of government in the development process has reinforced and encouraged this position. The Gulf countries have distinct characteristics ranging from their financial dependence on oil revenues for development plans, to the percentage of expatriate workers in their labor force. These characteristics have implications relating to the size and role of government.

Recent research by Barro (1990) and Karras (1993, 1996, 1997) provides a framework to examine whether the size of government consumption relative to national output is optimal.[1] Barro suggests that government size is optimal when the marginal product of government consumption equals one. Using panel data, Karras examines the "Barro rule" for 118 countries and European economies, respectively. He finds that in all country groups, government services are productive in the sense that their marginal product is positive and significantly different from zero. Karras was unable to reject the hypothesis that government services are optimally provided in some world regions, but not in others. Overall, his findings indicate that government services are overly provided in Africa, under provided in Asia, and optimally provided everywhere else.

The focus of this paper will be on a smaller group of countries than was examined by Karras. We examine the productivity and relative size of government in five Gulf countries of the Middle East. An important characteristic of these countries is their heavy reliance on oil exports as their major source of income and government revenue. Following oil price increases in the early 1970s, the Gulf countries have seen significant growth in the size of their governments. In the early 1980s, the price of oil peaked and has mostly fallen since. The rate of economic growth in these countries has generally slowed in recent years and government budget deficits have become more common. Lack of available macroeconomic data has

prevented empirical research on most of these countries. Fortunately, we have been able to obtain data that is not readily available; allowing us to examine the major countries of the GCC.

As noted in the literature, testing a large number of countries in panel data can improve the efficiency of estimation, but it can also obscure results for individual countries. Karras examines two of the five Gulf countries examined here (Kuwait and Saudi Arabia) by including them in large panels of world and Asian countries respectively. This makes it difficult to draw conclusions specific to the Gulf countries from the averages estimated in these large panels. Contrary to this, we examine only the Gulf countries. The countries are first tested individually and then in panels of four and five countries respectively. Our sample period also varies from other research. We examine the period 1970-1992. This period may be more appropriate for the Gulf countries, as it encompasses major fluctuations in oil revenues.

The paper proceeds as follows. Section 2 discusses the literature relating to optimal government size and notes the average government size in the Gulf countries. Section 3 describes the model. Section 4 discusses the data. Section 5 estimates the model and tests the hypotheses that government services are productive at the margin and optimally provided. Section 6 summarizes, makes some concluding remarks, and suggests topics for future research.

2. Background

Barro (1990) derives an endogenous growth model that specifically analyzes the role of government. An implication derived from the model is that the size of government consumption relative to national output is optimal when its marginal product equals one. This is true under a variety of conditions. Karras derives conditions for testing the Barro rule, as well as some related hypotheses, and proceeds with testing using large panels of data from many countries. Karras finds that government services are significantly productive, over provided in Africa, under provided in Asia, and optimally provided elsewhere.

Table 1 shows the average size of government consumption relative to national output over the sample period for each Gulf country and for all the countries together. Average government size for the period examined ranges from a low of 17% in Saudi Arabia to a high of 29% in Oman and with a group average of 22%.

3. The Model

The model utilized for testing is derived in Karras (1996, 1997) and can be described as follows. Assume a production function for national output:

(1) $Y = F(K, L, G/L)$,

where Y is national output, K is the capital stock, L is employed labor, and G is government consumption of goods and services. Differentiating equation (1) with respect to time and dividing through by Y, equation (2) can be derived as follows:

(2) $(\Delta Y/Y) = \alpha (\Delta L/L) + MPK (\Delta K/Y) + MPG [(\Delta g/g)(G/Y)]$

where α is the output elasticity of labor employment, MPK is the marginal product of capital, and MPG is the marginal product of government services. g is defined as G/L, G/Y is the size of government consumption relative to national output, and Δ denotes the first derivative with respect to time. ΔK is convenient, as this is equal to investment spending which is more readily available for testing than a measure of the capital stock. Equation (2) allows testing the hypothesis that government services are productive. The hypotheses to be tested with equation (2) can be described as follows:

Null hypothesis: MPG = 0, implying that government services are not productive at the

margin.

Alternative hypothesis: MPG > 0, implying that government services are productive at the margin.

Estimating equation (2) can also test the hypothesis that government size is optimal. The Barro rule says that government size (G/Y) is optimal when MPG = 1. If government size is too large to be optimal then MPG < 1. If government size is too small to be optimal then MPG > 1. The hypotheses of optimal government size can be summarized as follows:

Null hypothesis: MPG = 1, implying G/Y is optimally provided.

Alternative hypotheses: MPG < 1, implying that the size of government is too large to be optimal; MPG > 1, implying that the size of government is too small to be optimal.

Estimation of the optimum government size can be made as follows. MPG = γ/s, where γ = (∂ F/∂ G)(G/Y) is the output elasticity of G, and s = G/Y. When MPG = 1 and government size is optimal, s = γ. To estimate γ, the optimal government size, we re-write equation (2) substituting the above expressions and estimate equation (3) as follows:

(3) $(\Delta Y/Y) = \alpha\,(\Delta L/L) + MPK\,(\Delta K/Y) + \gamma\,(\Delta g/g)$.

4. The Data

Annual data is examined for the following five Gulf countries: Bahrain, Kuwait, Oman, Saudi Arabia, and the United Arab Emirates. Data is available for real measures of GDP, investment, government consumption, and employment for the years 1970-1992. Data for Bahrain, Kuwait, and the United Arab Emirates is from Gulf country government sources (mainly *government yearbooks, ministries of planning publications, and Central Banks publications, various issues*). Data for Oman and Saudi Arabia is from the *International Financial Statistics Yearbook 1996* published by the International Monetary Fund. Government consumption includes spending on both consumption and investment goods by all levels of government. Investment spending is gross private domestic spending. A price deflator was not required for Bahrain, Kuwait, and the United Arab Emirates as real values were available. The price deflator used for Oman and Saudi Arabia is the GDP Deflator. Employment data comes from *World Development Indicators, 1998* published by the World Bank, and is equal to the total labor force. All data is available from the authors upon request.

5. Estimation

Estimation of equation (2) and (3) is undertaken for each individual country and then in panels created by pooling time series from each country. Results of testing are shown in Table 2 and 3. Table 2 shows results of estimating equation (2), which tests the hypotheses that government services are productive at the margin and whether or not the size of government is optimal. For all individual countries, the estimated marginal product of government services (MPG) is positive, but insignificant. These estimates imply that government services are not productive on the margin. Also, by examining the individual country estimates of MPG in Table 2, it appears that in no country are government services optimally provided, except perhaps in the U.A.E. In all countries, the MPG is less than one, suggesting that government services are over provided. To test the null hypothesis that MPG = 1 an F-test was performed with results shown in the bottom lines of the top half of Table 2. Only two of the five countries, Oman and Saudi Arabia, reject the null hypothesis that government services are optimally provided at 5%. In the remaining three countries of Bahrain, Kuwait, and the U.A.E. we cannot reject the null hypothesis that government services are optimally provided, at the usual significance levels. Results of estimating the output elasticity of labor (α) and the marginal product of capital (MPK) are less clear. Estimates of α and MPK range from negative to positive, and from significant to

insignificant with no clear order. All estimates of R-bar squared are relatively low.

Overall, there are a number of difficulties with interpreting the individual country results in Table 2. One possibility is that these results are affected by the relatively short sample period available for each country. Thus, to increase the number of observations in the regression, pooling of data from each country was undertaken to create panels of all five countries. Results of testing equation (2) with panel data are shown in the bottom half of Table 2. Results are shown with and without Kuwait in the panel.[2]

Results of testing equation (2) in panels are more encouraging. The estimate of MPG for the panel of all countries is positive and significant at the 10% level. These results support the first alternative hypothesis shown above; namely, that the MPG > 0, implying that government services are productive on the margin. This is also the result found by Karras for a panel of Asian countries and for the world as a whole. In addition, Karras found that government services were under provided in Asia. Contrary to this, we find the MPG < 1, suggesting that government services are productive, but over provided in the Gulf countries. The F-statistic testing the null hypothesis that the MPG = 1 is clearly rejected at the 5% level in the panel of all countries, again confirming that government services are not optimally provided. Removing Kuwait from the panel only modestly alters the results. After removing Kuwait from the panel, the MPG remains positive and less than one, but is now significant at the 1% level.[3] Overall, the Gulf countries appear to differ from the average Asian country in terms of optimal government size.

Examining additional results of Table 2 for the panel of all five countries, we see that the output elasticity of labor (α) is relatively large, positive, and significant at the 1% level, indicating that labor is highly productive in the Gulf countries. This seems consistent with the labor importing conditions of these countries. The marginal product of capital (MPK) is small and statistically insignificant, with an unexpected negative sign. After removing Kuwait from the panel tests in Table 2, we see no significant change in the estimated output elasticity of labor, α. The MPK is now positive, but remains insignificant. The estimated MPK suggests that capital is not productive on the margin and is likely over provided. The R-bar squared increases from 0.15 to 0.49. The null hypothesis that government services are optimally provided is now rejected at the 1% significant level instead of at 5%.

Table 3 reports results of testing equation (3). Equation (3) provides an estimate of γ, the optimal government size. Equation (3) is first estimated for each individual country, and then in panels created by pooling time series from all countries. Results of testing individual countries again appear problematic. Only for the U.A.E. is the estimated value of the optimal government size (γ) significantly different from zero, at the 10% level of significance. In one of the five countries, Oman, the estimate of γ is negative, but approximately zero. Individual country estimates of α and the MPK again appear unclear, as they contain estimates that are positive and negative, with most insignificant. As in Table 2, problems of testing individual countries may result from the relatively small time series for each country. To increase the number of observations and expand the degrees of freedom, panel tests were performed for equation (3) with results shown in the bottom half of Table 3. Results are shown first testing the panel of all five countries. The output elasticity of labor employment (α) is, as in Table 2, relatively large and significant at the 1% level. Also as in Table 2, the marginal product of capital (MPK) is negative, but insignificant. These results again suggest that, on the margin, labor is highly productive relative to capital. Again, the results are in line with the conditions of labor shortage-capital surplus economies of the Gulf. The estimate of γ, the optimal size of government, is positive but insignificant.

After removing Kuwait from the panel, the estimate of γ is positive and significant at the 5% level. The implied average optimal government size for the Gulf countries is 0.12 or 12%.[4] The estimated optimal government size of 12% is about half the actual size of government shown in Table 1. In addition, after removing Kuwait from the panel, the MPK becomes positive, but remains insignificant. The output elasticity of labor remains unchanged and significant at 1%. This again suggests that labor is highly productive in the Gulf countries while capital, on the margin, is not.

6. Conclusion

To summarize, results shown above provide evidence that government services are productive in the Gulf countries of the Middle East, but the size of government, on average, is too large to be optimal. The Barro rule states that government services are optimally provided when their marginal product is equal to one. Employing the methods of Barro and Karras, a simple production function is utilized where national output is a function of capital, labor, and government services. After differentiating the aggregate production function with respect to time, several hypotheses were tested. Individual country results were mostly inconclusive, due likely to relatively small samples. Testing was then undertaken with panels created by pooling time series from each country. Panels were tested with and without Kuwait. Results of estimation revealed that government services were productive on the margin, but the average size of government is about twice the optimal size. Additional results revealed labor to be highly productive, while (additional) capital is not.

Future work could attempt to enlarge the data set, both by extending the length of the time series, and by including a larger number of Middle Eastern countries. A modification of Barro's rule to fit special conditions of a developing economy might also be undertaken. For instance, the model could be expanded to include both elements of demand and supply regarding the transmission of government spending shocks. Also, government spending might be decomposed into consumption and investment. Spending on education, health, and basic infrastructure could be lumped together to constitute government investment components, whereas government spending on social programs (early pension, housing subsidies, and other citizenship rights, along with spending on armaments) might be termed government consumption. Finally, direct analysis of the effects of government size on the growth process of the GCC countries would be a logical extension of the current research.

End Notes

[1] A related body of research that examines the role of government size in the economic growth process may be found in Bairam (1990), Barro (1997), Guseh (1997), and Levine and Renelt (1992).

[2] Individual country results appear most problematic for Kuwait. Estimates of both ? and MPK are negative and insignificant. In addition, the R-bar squared for Kuwait is small and negative. Needless to say, the Iraqi invasion of Kuwait in 1991 has also impacted the reliability of data in this country.

[3] Country-specific fixed effects were found to be significant in both panel tests and were therefore included in the results shown in Table 2. Time-specific fixed effects were not significant and were therefore excluded. The panel test regression without Kuwait was adjusted for first-order serial correlation, as the estimated value of rho was significant at the 1% level.

[4] Country-specific fixed effects were found to be significant in both panel tests and were therefore included in the results shown in Table 3. Time-specific fixed effects were not significant and were therefore excluded. The panel test regression without Kuwait was adjusted for first-order serial correlation, as the estimated value of rho was significant at the 1% level.

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Table 1: Average Government Size by Country and Group 1970-1992

Bahrain	21%
Kuwait	18%
Oman	29%
Saudi Arabia	17%
United Arab Emirates	22%
All five countries	22%

Notes. Average government size is calculated as the average ratio of real government consumption to real GDP using annual data from 1970-1992. Data for Bahrain, Kuwait, and the United Arab Emirates comes from various Gulf country government sources. Data for Oman and Saudi Arabia comes from the *International Financial Statistics Yearbook 1996* published by the IMF. Data is available from the authors upon request.

Table 2. Marginal Product of Government Services: Individual Country Tests and Panel Tests using Equation (2) for 1970-1992

	Bahrain	Kuwait	Oman	S. A.	U.A.E.
Constant	0.02	0.07	-0.05	0.33***	0.01
	(0.17)	(0.76)	(-0.31)	(2.84)	(0.09)
α	1.66	-0.55	-0.72	-1.92	1.04***
	(1.50)	(-0.49)	(-0.19)	(-1.08)	(3.03)
MPK	-0.29	-0.28	0.68**	-0.71**	-0.24
	(-0.92)	(-0.82)	(2.07)	(-2.44)	(-0.70)
MPG	0.36	0.58	0.11	0.11	0.89
	(0.18)	(0.33)	(0.26)	(0.32)	(1.59)
R-bar^2	0.19	-0.10	0.10	0.20	0.33
DW	2.32	1.97	1.75	1.21	2.03
F	0.10	0.06	4.47**	6.89**	0.04
(Null MPG=1)	[0.75]	[0.82]	[0.05]	[0.02]	[0.85]

	Panel of all countries	Panel excluding Kuwait
Constant	0.01	-0.07
	(0.19)	(-1.19)
α	0.84***	0.82***
	(3.14)	(2.53)
MPK	-0.18	0.10
	(-1.29)	(0.59)
MPG	0.42*	0.50***
	(1.65)	(2.52)
R-bar^2	0.15	0.49
DW	1.78	2.13
F	5.13**	6.26***
(Null MPG=1)	[0.03]	[0.01]

Notes. Dependent variable is real output growth ($\Delta Y/Y$). S.A. and U.A.E. denote Saudi Arabia and the United Arab Emirates respectively. Country-specific intercept terms were significant at the 1% level and were therefore included in the tests shown above. Time-specific intercept terms were not significant and were therefore excluded from the tests shown above. The panel test without Kuwait corrects for first-order serial correlation in the error term, as the estimated value of rho was significant at the 1% level. t-statistic is shown in parentheses. The significance level of the F-test is shown in brackets. *, **, and *** denote significant at the 10%, 5%, and 1% levels respectively.

Table 3. Optimal Government Size: Individual Country Tests and Panel Tests using Equation (3) for 1970-1992

	Bahrain	Kuwait	Oman	S. A.	U.A.E.
Constant	0.02 (0.16)	0.08 (0.79)	-0.04 (-0.28)	0.33 (2.88)	0.02 (0.23)
α	1.68 (1.53)	-0.63 (-0.59)	-0.90 (-0.24)	-1.99 (-1.14)	1.10*** (3.24)
MPK	-0.29 (-0.93)	-0.27 (-0.80)	0.71** (2.14)	-0.70** (-2.41)	-0.29 (-0.88)
γ	0.09 (0.25)	0.08 (0.21)	-0.00 (-0.01)	0.02 (0.19)	0.22* (1.85)
R-bar^2	0.19	-0.10	0.09	0.19	0.36
DW	2.33	2.01	1.85	1.22	2.06
Optimal G/Y	9%	8%	0%	2%	22%

	Panel of all countries	Panel excluding Kuwait
Constant	0.01 (0.19)	-0.07 (-1.18)
α	0.84*** (3.12)	0.82*** (2.52)
MPK	-0.18 (-1.27)	0.10 (0.60)
γ	0.09 (1.43)	0.12** (2.33)
R-bar^2	0.14	0.48
DW	1.80	2.13
Optimal G/Y	9%	12%

Notes. Dependent variable is real output growth ($\Delta Y/Y$). S.A. and U.A.E. denote Saudi Arabia and the United Arab Emirates respectively. Country-specific intercept terms were significant at the 1% level and were therefore included in the panel tests shown above. Time-specific intercept terms were not significant and were therefore excluded from the panel tests shown above. The panel test without Kuwait corrects for first-order serial correlation in the error term, as the estimated value of rho was significant at the 1% level. t-statistic is shown in parentheses. *, **, and *** denote significant at the 10%, 5%, and 1% levels respectively.