E C O N O M I C S   B U L L E T I N

Do alternative measures of government result in alternative explanations for government size?

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Abstract

This note extends the work of Borcherding, Ferris and Garzoni (2003) on government size by considering how traditional tests respond to alternative definitions of government size. An error correction format is used to show that a) qualitatively all measures of size perform well, b) government consumption (plus transfers) works best when explaining short run (long run) changes and c) public choice and Kau/Rubin variables often perform differently with respect to the short and long run.

Citation: Ferris, J. Stephen, (2003) "Do alternative measures of government result in alternative explanations for government size?." *Economics Bulletin,* Vol. 8, No. 4 pp. 1−11
Submitted: August 15, 2002. **Accepted:** January 12, 2003.
URL: http://www.economicsbulletin.com/2003/volume8/EB−02H10001A.pdf

I. Introduction

This note extends the empirical work of Borcherding, Ferris and Garzoni (2002, hereafter, BFG) on alternative hypotheses explaining government size by comparing the responsiveness of the different measures of government used in these tests. The reasons are twofold. First, there is no particular agreement on what is the appropriate coverage for hypothesis testing[1] and, second, the acceptance or rejection of any particular hypothesis designed to the growth of government size may depend on the particular items included in the definition of government size.

In this note, then, the responsiveness of three measures of government is investigated. In each case, size is defined by a particular definition of government spending divided by gross domestic product (GDP). The first defines size as government consumption expenditure (GC) divided by GDP. Here GC is the sum of expenditure on wages and salaries (roughly two thirds of the total) and other non-wage consumption expenditure (roughly the remaining third). This was the measure used in BFG. The second measure uses current disbursements (CD) defined as GC (roughly sixty per cent of the total) plus subsidies, social benefits, current transfers, and property income paid by government (roughly forty per cent). This measure adds subsidies and transfers to the service dimension of government's activities. The third measure of government is total disbursements (TD). TD adds government investment expenditures and consists of CD (roughly ninety per cent) plus government gross investment minus both consumption of fixed capital and net capital transfers received (roughly ten per cent). The three measures are increasingly expansive with GC < CD < TD.

The data on the alternative measures of government was collected from Source OECD an online service from the OECD. The explanatory variables come from the BFG database which in turn came from the OECD Statistical Compendium for 1997 (CDRom). The data was collected for twenty countries for the years 1970 through 1997 (see BFG for more detail). Changes in the way the data was collected and revisions to some data series since BFG was written mean that the new time series differs slightly from that used in BFG.[2] For this reason we present the equivalent form of the BFG data (for Table 1) together with our new results for the three government measures.

The starting point for our comparison is the growth equation developed by Borcherding (1977, 1985) to explain variations in the growth rate of government size . In particular, a medium voter model was used to derive

$$\dot{g} = (\eta+1)\,\dot{p} + (\delta - 1)\,\dot{y} + (\alpha - 1)(\eta + 1)\,\dot{N} + \delta\,\dot{k} + \varphi\,\dot{m},$$

where the dots above the variables signify rates of growth and where g is the share of government spending in aggregate real output, p is the relative price (cost) of government services, y is mean real income, N is population size, k is the ratio of median to mean income, and m is a set of political control variables. The parameter η represents the price elasticity of demand; α, the degree of publicness of the output of the government sector; δ, the income elasticity of demand; and φ, the set of elasticities for the effects of various political controls on demand.

II. Testing for the influence of traditional economic variables on Government Size

I begin by assuming that m and k are constants so that $\dot{m}$ and $\dot{k}$ fall out of the growth equation. This leaves a small subset of variables as determining government size that can be thought of as traditional demand side variables. Before proceeding to re-estimate this equation of growth rates it should be noted that this form of test is typically used to circumvent the stationarity issues present in the levels of time series variables. That is, by first differencing the logarithms of these variables in levels stationary growth rates can be derived and, corresponding to this form of the test, the analysis is then reinterpreted as an explanation of differing growth rates. The cost of this procedure, however, is that useful information that can be derived from the levels of the variables if the levels of the variables were themselves cointegrated is foregone. Hence before simply rerunning this test in growth rates, the equations were first run in levels and the residuals tested for stationarity. In all four cases the hypothesis of a unit root in the residuals can be rejected.[3] This means that the variables in levels give evidence of cointegration or, alternatively, give evidence of a long equilibrium relationship amongst the variables.[4] In such cases, the lagged residuals from the level equations can be included within the growth rate equation to capture how temporary departures from this long run relationship (an error correction term) affect the growth rate of government size. In Table 1 then I present the error correction model of the influence of traditional demand side variables on government size, first using the original BFG database followed by the three alternative measures of government size. Finally, in the table I also present the implied income and relative price elasticities estimated from the cointegration equation (of levels).

The first thing that is apparent from Table 1 is that the error correction formulation works quite well for all definitions of government size.[5] Using the five per cent confidence interval, the error correction term is significantly negative in all equations. In addition the size and significance of the lagged dependent and (some of the) independent variables indicates an adjustment process to the long run equilibrium that is both varied and protracted. This is consistent with the low Durbin-Watson statistic found when the equations are run in levels.

When we look across columns to compare how the alternative definitions of government size conform to the specified model, the first two columns can be seen to be essentially identical. This is expected since the difference in explanatory power and slight difference in coefficient estimates arise only from differences in sample size. There are, however, differences between the first and final two columns. In particular both the CD and TD measures of government size conform less well to the error correction formulation and the estimated adjustment process suggests less importance to the lagged explanatory variables than does the GC equation. In relative terms, the consumption measure of government size seems to perform best and the total disbursement measure worst, with the regression constant and Akaike criterion both rising and the adjR^2 falling as one moves across the final three columns of the table.

With respect to the individual coefficient estimates, there appears to be a remarkable amount of consistency across equations. The exception appears to be the coefficients on population that are small and insignificant for all definitions except for current disbursements. However even here, however, the large positive contemporaneous effect estimated is cancelled immediately by an equivalently large negative coefficient. For all definitions of government size there is no discernable permanent effect coming from population growth on government size.

Especially striking is the uniformity of the estimates of the effect of real GDP per capita on government size. For all definitions of government size a short run income elasticity of roughly 0.4 is found. In terms of the precision of the estimates, all coefficients are insignificantly different from each other and also significantly less than one. In terms of the literature, then, all equations of government size present evidence inconsistent with Wagner's Law (i.e., $\delta \geq 1$). But whereas the short run income elasticities are all significantly less than one, all equations in levels give evidence of an income elasticity greater than one ($\delta > 1$). That is, the equations are consistent with Wagner's Law in the long run.[6] Note that this implies that the use of the traditional Borcherding growth equation coefficient as a test of Wagner's Law generally underestimates the role of income on government size by arbitrarily truncating the protracted adjustment process indicated by the data.

The estimates of the effect of increases in the relative cost of government services are also similar across definitions of government size. In this case the coefficient size suggests that the demand curves are inelastic with a price elasticities of demand (η = coefficient - 1) that are all insignificantly different from zero. The point estimates also suggest that government size becomes somewhat more responsiveness to changes in relative cost as the definition of government becomes more comprehensive. Lastly, as a point of caution, the long run estimates from the levels equations do suggest that the finding of inelasticity may not persist into the longer run. While the results are consistent with the inelasticity requirement that underlies Baumol's Cost Disease hypothesis, the rising (absolute) value of elasticity over the long run does suggest caution in believing that continuing productivity differences between the private and public sectors will automatically result in a larger sized government.

Collecting these comments, it would appear that if only a small set of traditional economic variables are used to explain and test reasons for the variation of government size, then the particular definition of government size chosen (at least among these three) will not fundamentally alter any of the conclusions to be derived with respect to income, price, and population. On the margin, however, there is some evidence in the data that the GC measure of government size is best explained by this set of explanatory variables. The fall off in explanatory power of the second and third equations suggests that other factors may play more of a role in explaining the growth rate of the larger, more inclusive measures of government size.

III. The Addition of Public Choice Variables

One set of factors that may better explain the transfer and subsidy activities of government and hence the more comprehensive measures of government size are variables that capture the relative strength of different special interest groups. Public choice considerations would then suggest expanding the traditional set of economic determinants to include demographic and other variables that would account for the strength of interest groups as well as other factors that would reflect the political and economic (other than production) costs of raising taxes etc. For example, the recent growth in the proportion of the population that is sixty five and older (OLDPOP) has increased the political power of that interest group and their ability to transfer resources from government. Since social security and other income transfers appear in CD relative to GC, we might expect that the transfer inclusive measure of government size would show greater responsiveness to these types of variables. In general, increases in OLDPOP would be expected to increase government expenditure and hence the size of government. A second set of public choice factors (sometimes called Kau/Rubin variables) focuses on the broader cost to government of raising tax revenues. In this sense, any growth in the proportion of the labour force that is self employed (SELF), working on farms (FARMPOP) and/or working outside of formal labour markets (e.g. a reduction in the female participation rate) rasies the cost of collecting taxes and so constrains the size of government. Third, the degree to which an economy is open to foreign trade is a more recent characteristic of the economy that has elicited attention in relation to government size. Rodrik (1998), for example, has argued that the greater is the percentage of GDP in foreign trade (OPENNESS), the more unstable and uncertain is domestic income and knowledge of that greater insecurity leads the community to place greater reliance on government, increasing government size. From a more traditional public choice perspective, on the other hand, would argue that the more open is any economy to foreign competition, the greater is the constraint on the ability of government to tax relative to its neighbours (Ferris and West, 1996). This then diminishes rather than increases the rate at which government can expand. Finally, Baumol's cost disease hypothesis suggests that because the government sector is relatively labour intensive, technical innovation will leave the government sector at an increasing disadvantage relative to the private sector through time. In combination with an inelastic demand for government services, this implies the growth of government size through time. In the absence of a better measure for productivity change, this suggests that the constant in our growth equation will be positive.

The effect that these variables have on the growth rate of government size across the three definitions of government (GC, CD and TD) is presented in Table 2. In the error correction model presented in this table, the full equation was first run in levels and the residuals tested for stability.[7] For all the residuals the adjusted Dickey Fuller test statistic allowed rejection of the null hypothesis of a unit root.[8] The growth rates of the three sizes of government were then regressed against the growth rates of the traditional and public choice variables and the lagged residual of the equation in levels.

Inspection of the three competing columns again suggests that the GC definition again provides a better explanation of the short run variation in government size about its longer run equilibrium than do either the CD or TD measures, but now only marginally so. All equations perform well, explaining roughly fifty per cent of the variation in the growth rate while suggesting the same pattern of long and persistent adjustment to long run equilibrium appearing in Table 1. The results also confirm the usefulness of the error correction form of the test. Compared to our earlier set of findings is that differences across equations are now smaller and, with the addition of the set of public choice explanatory variables, the lagged values of the traditional variables have tended to lose their additional explanatory power. On the other hand, while the short run formulation works best with the GC measure, the long run equation continues to explain the CD measure best in the long run (see footnotes 5 and 7). The explanatory power of the cointegrating equation peaks when the public choice variables are used to explain the long run variation in the larger, more comprehensive measure of government size. In relative terms, the public choice and Kau-Rubin variables seem to be particularly important for explaining the long run variation in the transfer inclusive (CD) measure of government size.

The introduction of the public choice variables leave the coefficient estimates on the traditional economic variables virtually unchanged. In absolute terms, the short run income and price elasticities are found to be slightly larger so that all the price elasticities are now significantly negative as well as significantly less than one. Once again the implied long run elasticities are found to be much larger, with the absolute value of the point estimates of both income and price exceeding one. The inclusion of these additional variables has not changed our earlier finding that Wagner's Law is more likely to hold in the long run than the short run.

Interpretation of the effect of the public choice variables on government size is somewhat more challenging. In particular, many of the variables have quite different effects in the short run as opposed to the long run. OPENNESS is one such example. All of the short run estimates of the effect of greater openness are negative and consistently so, whereas in only one of the three long run equations was OPENNESS FOUND to be significantly negative.[9] In relative terms, however, our data provides more support for the public choice hypothesis than for Rodrik's income instability hypothesis. The exact opposite pattern of finding arises with FEMPART. In none of the short run adjustment equations is the effect of a change in the female participation rate found to be neither significant nor even negative (as predicted) in its effect on government size. In the level equations, however, FEMPART is always found to be negative and significantly so. For both these variables, then, the long run consequences for size are often at odds with their immediate or short run effect.[10] The pattern of significance may suggest that some variables such as OPENNESS say more about short-run or business cycle effects on government size while variables like FEMPART may better reflect structural changes in society that become increasingly relevant to government size over the longer run.

Our other public choice and Kau-Rubin variables are more consistent in their effect on size. In particular, decreases in the percentage of the population that is self employed (SELF) and on the farm (FARMPOP) are consistently associated with a larger government size (as predicted) in the short run as well as in the long run. The coefficient on SELF is always significantly negative while the coefficient on FARMPOP is only sometimes significant in its effect. In the short run increases in OLDPOP do appear to have a positive effect on government size, although only one of the three coefficients is significantly positive and that a the five per cent significance level. The long run coefficients, however, are much more robust –consistently and significantly positive for all size measures. This suggests a longer run demographic effect, perhaps similar to what is happening with the female participation rate, that is not particularly related to short run phenomenon.

IV. Conclusion

What then can we conclude from this exercise? First, there seems to be no particular measure of government size that varies in a qualitatively different way than do the others in response to changes in traditional economic, public choice or Kau/Rubin variables. Despite some individual differences in coefficient size, the explanatory power of the different forms of the tests are roughly comparable. Second, in terms of relative performance, the exogenous variables seemed to best account for the short run adjustment process around a longer run equilibrium for the government consumption (GC) measure of size. Current and total disbursements can in second and third. However, the variable that produced the strongest long run, cointegrating, relationship among the variables was the transfer inclusive measure of government size (CD). It resulted in the best fit with the data both in the case of the tradition variables and following the addition of the public choice variables. Finally, when considering the influence of the public choice and Kau/Rubin variables, there was often found a considerable difference between the way the same variables affect the adjustment process as opposed to the long run equilibrium. In this sense the error correction formulation has been useful in suggesting that the way different types of interest group, organizational issues may affect government size may relate to distinctly different short or longer run theories of government size.

Table 1
Error Correction Form for Growth of Government Size
Twenty OECD Countries: 1970-1997
(standard errors in brackets below estimated coefficients)

Growth rate of government size where G means:	Government Consumption (BFG)	Government[1] Consumption (GC)	Current Disbursements (CD)	Total Disbursements (TD)
Constant	0.007* (0.002)	0.008* (0.003)	0.013* (0.004)	0.012* (0.004)
growthrypc	-0.616* (0.053)	-0.561* (0.057)	-0.626* (0.053)	-.557* (0.059)
growthrelprice	1.010* (0.080)	0.958* (0.095)	0.866* (0.136)	0.788* (0.118)
growthpop	-0.012 (0.221)	-0.095 (0.307)	-1.242 (0.763)	0.048 (0.487)
error correction coefficient	-0.010* (0.004)	-0.022* (0.007)	-0.020** (0.009)	-0.024** (0.011)
lagged depend. variable	0.306* (0.047)	0.279* (0.059)	0.314* (0.066)	0.207* (0.064)
growthrypc(-1)	0.192* (0.063)	0.115 (0.069)	0.087 (0.079)	-0.003 (0.073)
growthrelp(-1)	-0.274* (0.099)	-0.197** (0.105)	-0.097 (0.145)	0.177 (0.125)
growthn(-1)			1.217** (0.648)	
LR Elasticity from level eq.: Income Relative Price	 1.42 -1.161	 1.42 -.787	 1.45 -.858	 1.51 -.822
sample size	520	459	445	456
AdjR^2	.599	.498	.453	.314
Akaike Criterion	-4.63	-4.37	-4.10	-3.92

SourceOECD
Notes: * (**) significantly different from zero at one (five) per cent.
[1] Differs from BFG in that early observations from Portugal, Switzerland and the U.K. are missing.

Table 2

Traditional Plus Public Choice Variables as Determinants of Gov't Size: 1970-1997

(Standard error in brackets below coefficient estimate)

Growth rate of government size where G means:	Government Consumption (GC)	Current Disbursements (CD)	Total Disbursements (TD)
constant	0.009* (0.003)	0.014* (0.004)	0.014* (0.004)
growthrypc	-0.511* (0.048)	-0.572* (0.058)	-0.580* (0.063)
growthrelprice	0.776* (0.068)	0.815* (0.080)	0.754* (0.090)
growthpop	0.087 (0.278)	0.145 (0.333)	0.294 (0.370)
D(openness)	-0.165* (0.026)	-0.164* (0.031)	-0.174* (0.034)
D(selfemployment)	-0.247*** (0.131)	-0.389* (0.154)	-0.338** (0.170)
D(oldpop)	0.744 (0.750)	1.478*** (0.897)	1.133 (0.985)
D(farmpop)	-0.560*** (0.298)	-0.235 (0.363)	-0.566 (0.392)
D(Female participation)	0.182 (0.134)	0.069 (0.441)	0.002 (0.013)
Error correction coefficient	-0.029* (0.008)	-0.022** (0.010)	-0.030** (0.013)
lagged dependent variable	0.254* (0.045)	0.321* (0.041)	0.198* (0.049)
growthrypc(-1)	0.003 (0.056)	-0.035 (0.066)	-0.083 (0.073)
growthrelprice(-1)	-0.062 (0.077)	0.023 (0.020)	0.117 (0.098)
LR Elasticities income relative price	 1.202 -.820	 1.419 -1.203	 1.225 -1.169
Sample size	399	383	393
AdjR^2	.520	.510	.431
Akaike Criterion	-4.602	-4.291	-4.078

Source: SourceOECD. *(**)[***] significantly different from zero at one (five) [ten] per cent.

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Endnotes

1. Indeed there are some (such as Niskannen) who question whether it is meaningful to analyze any particular aggregated measure of government size. His preferred approach would be to analyze each budget item separately.

2. In that work all data came from the 1997 OECD Statistical Compendium on CD Rom.

3. For the residuals of the equations in levels corresponding to columns one through four in Table 1, the augmented Dickey Fuller test statistics were, respectively, -4.39, -4.09, -4.31, and -3.91. At one per cent the MacKinnon critical value for rejection of a unit root is -3.45.

4. The level equations found for GC (CD) [TD] were:

LNGSIZE = -5.02(-6.35)[-4.81] + .213*(.142)[.179]LNRELPRICE +.424*(.684*)[.509]*LNRYPC

-.076*(-.124*)[-.100*] LNPOP.

R^2 = .482 (.652)[.512] DW = 0.139 (0.132)[.094]. * significantly different from zero at 5%

5. When panel estimation allowed for fixed country effects, significant differences across countries were indicated–for example, eight of nineteen countries had a significantly higher regression constant than did the U.S. (for the equation in column (1) of Table 1). Nevertheless, accounting for these fixed effects left unaltered the size and significance of the income and relative price elasticities. Their presence in the model, however, does appear to diminish somewhat the significance of the lagged independent variables in the short run adjustment process.

6. Income elasticities greater than one are also implied by the long run coefficient implicit in the estimated equations. For example in the BFG estimate of column (1), the long run elasticity implied is [(-.616 + .192 + 1.000)/.306] 1.9 > 1.

7. The levels equations estimated for GC (CD) [TD] were:

LNGSIZE = 2.81(4.21)[-2.65] +.180(-.203)[-.169]LNRELPRICE +.203*(.419*)[.225*] LNRYPC

-.077*(-.100*)[-.070*] LNPOP +.038 (-.132*)[.054] OPENNESS -.410*(-.734*)[-.634*]SELF

+ 2.39*(5.44*)[5.51*]OLDPOP -1.24*(-.280)[-.278]FARMPOP -.199*(-.598*)[-.578*]FEMPART

-.007*(-.007*)[-.005*]TIME

R^2 = .614 (.773)[.746] DW = .093 (.121)[.129] * significantly different from zero at 5%.

8. The augmented Dickey Fuller test statistics of the residuals of the equations in levels corresponding to columns one through three of Table 2 are, respectively, -3.48, -3.87, and -4.12. The MacKinnon critical value for rejection of a unit root at one per cent is -3.45.

9. This is the level regression for current disbursements (which is significantly negative), the other two equations have one positive and one negative point estimate (neither significantly different from zero.

10. One other puzzling feature is that the time coefficients in the levels equation are always significantly negative while the constant in the growth equation is always significantly positive.