

The Endogeneity of State Appropriations and the Economic Impact of Proposed Budget Cuts

Elliott Parker, Ph.D.

Professor and Chair, Department of Economics

University of Nevada, Reno

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Executive Summary: The Economic Forum's revenue forecast is an input into decisions on state budget allocations, but state and local government expenditures can have a significant effect on the state's economy in turn. Thus, the revenue forecast depends on those budgetary decisions. This analysis estimates the effect of changes in state and local government value-added on real Gross State Product in the following year, and finds that it depends on the stage of the business cycle. On average, a 10% cut in state and local spending causes a net 2% decline in the state economy in the following year, but at Nevada's current stage of the business cycle, such a budget cut could lead to more than a 5% decline in Gross State Product. These estimations are statistically significant and reasonably robust.

Introduction:

The Economic Forum is tasked with the unenviable charge of predicting state revenues in a highly uncertain economic environment. Some of these uncertainties – such as Congressional budget cuts, the rising price of fuel, the status of the Dollar, and the overall national recovery – are effectively exogenous, and out of our control. There is, however, a significant uncertainty that is endogenous, in that the choices the Legislature makes can affect the economy.

For the past several years, Nevada has been in a depression. The continuing decline of housing prices in a state that once had the relatively largest construction sector in the nation turned the fastest-growing economy into the nation into the fastest-declining one. With the nation's highest share of underwater mortgages and foreclosures, continued tightness in the lending market and reduced consumer spending have dampened our recovery. Meanwhile, Nevada's state government relies heavily on taxes from gaming, which has gone from being a Nevada monopoly to an internationally competitive industry, along with a sales and use tax that depends too much on tourism, construction, and the purchases of durable goods. These declining revenues in turn affect state expenditures, and the impact on the state's economy from the resulting budget cuts is significant.

Estimations:

Can we quantify the effects of budget cuts on the state economy? Using Gross State Product (GSP) data from the Bureau of Economic Analysis (BEA), I estimated the following model:

$$G_{GSP}(i,t) = \alpha_i + [\beta_{SLG} - \gamma_{RTT} RTT(i,t-1)] G_{SLG}(i,t-1) + \varepsilon(i,t),$$

where $G_{GSP}(i,t)$ is the annual growth rate of GSP for state i and year t , deflated by the Consumer Price Index (CPI), and G_{SLG} is the annual CPI-deflated growth rate of the State & Local Government (SLG) contribution to GSP, for the prior year. The coefficient for G_{SLG} includes a variable (RTT) for the prior year's actual GSP relative to the state's GSP trend. This model tests whether changes in SLG production, the gross value-added contribution to GSP, affect total GSP. Total GSP is used in order to capture both changes in productivity and changes in state population that may result from job creation in the private sector. The error term $\varepsilon(i,t)$ is assumed to be independently and identically distributed.

The BEA GSP data includes the goods and services produced by state and local governments (SLGs), in terms of gross value-added. Thus, it includes wages and salaries for all government employees, but excludes transfers that flow through government to private individuals and firms. These data are available for all fifty states plus the District of Columbia, for all years since 1963. The ratio of SLG production to GSP is shown in Figure 1, for the maximum, minimum, and weighted mean of the 1963-2009 sample, along with the ratio for Nevada specifically. The ratio of SLG production to the underlying trend is shown in Figure 2. Both figures follow the summary section.

There is a redefinition of GSP in 1997, from SIC to NAICS, which does not affect growth rates because both measures are provided for the transition year. The average change from the redefinition, to both GSP and SLG value-added, is about 1%, and the weighted SLG/GSP share falls from 8.66% to 8.64%, so this difference is trivial.

This model is estimated both in OLS form, where $\alpha_i = \alpha_0$ for all i , and using a fixed effects model for which each state's α_i is estimated separately. In addition, the model is estimated using OLS for the small subsample of Nevada only, to test whether Nevada is significantly different from the other states. Results follow in Table 1.

The t-statistics for the null hypothesis that the parameters equal zero are shown, and for the OLS and FE models indicate that the parameters are significant at the 99.99% confidence level. The Adjusted R^2 for the OLS models, and the Buse Raw Moment R^2 for the FE model, suggests a large

amount of variance in the growth performance of the states, but the coefficients are nonetheless very similar. The α_i value reported for the FE model is the specific value for Nevada, and the shared value in the first OLS model.

Table 1: Regression Estimates for the Impact of SLG Growth on GSP

Parameter	Ordinary Least Squares		Fixed Effects		OLS for Nevada Only	
	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic
α_i	0.025	[24.4]	0.023		0.046	[4.2]
β_{SLG}	0.270	[11.4]	0.235	[11.9]	0.201	[1.2]
γ_{RTT}	1.203	[8.4]	2.063	[10.4]	1.719	[0.7]
Obs.	2,295		2,295		45	
R^2	7.7%		57%		8.9%	
β_{SLG}/γ_{RTT}	+22%		+11%		+12%	
$\beta_{SLG} - 0.2*\gamma_{RTT}$	0.51		0.65		0.55	

In each of these regressions, the real growth rate of value-added from state and local governments has a positive effect on the state's real GSP growth rate in the succeeding year, but it depends on how the economy is performing relative to the trend. The ratio (β_{SLG}/γ_{RTT}) indicates the level at which the net effect of SLG spending changes equals zero. That is, the OLS estimates indicate that if the state economy was 22% above its average trend (or 11% for the FE model), changes in SLG spending would have no net effect on state GSP. When the economy is producing at its trend, the β_{SLG} parameter is the elasticity estimate, so that on average, a 10% rise (or fall) in SLG increases (or decreases) GSP by 2.7% in the OLS model, or 2.4% in the FE model.

Nevada's real Gross State Product was actually 7% above trend in 2005, but 16% below trend in 2009. Though the 2010 figures are not yet available from the BEA, it is reasonable to assume this GSP figure for Nevada will be more than 20% below the trend. At that level of economic performance, the elasticity equals $\beta_{SLG} - 0.2*\gamma_{RTT}$, and we can calculate that a 10% drop in inflation-adjusted state and local government production should reduce the real growth of real Gross State Product by 5.1% in the OLS model, or 6.5% in the FE model, relative to baseline growth. There is, however, limited data coverage at such a low value for the RTT index.

The third set of estimates, for Nevada only, needs to be taken with a grain of salt. With only 45 observations instead of $45 \times 51 = 2,295$, the standard errors are high and so the t -statistics are relatively insignificant. Nonetheless, in spite of a higher trend growth rate, the parameter estimates for Nevada are well within the confidence interval for the first two estimates, so Nevada is clearly not an outlier as far as these estimates indicate.

These estimates indicate that if Nevada's Gross State Product was 12% above its 1965-2009 inflation-adjusted trend, the effect of changes to state and local government budgets would be zero, as any change in the public sector would be offset by changes in the private sector. But with GSP 20% below the trend, a 10% cut in inflation-adjusted SLG budgets should reduce the real growth of Nevada's real GSP by 5.5%. Subtracting out the untaxed portion of GSP produced by the public sector, it is clear that the remaining impact of these cuts on the private sector would still be significant, and the tax revenues collected would decline as Nevada's recovery slowed even more.

Robustness:

Macroeconomic data such as these usually have substantial inertia, in that factors such as SLG production may affect GSP growth over several years. Estimates of Granger causality (not shown here) strongly support the hypothesis that SLG production cause changes in real GSP in both the short run and the long run, but not the other way around. One way of adjusting for this inertia is to include prior-year GSP growth as an explanatory factor for current GSP growth, so I estimate the following regression:

$$G_{GSP}(i,t) = \alpha_i + [\beta_{SLG} - \gamma_{RTT} RTT(i,t-1)] G_{SLG}(i,t-1) + \Theta G_{GSP}(i,t-1) + \varepsilon(i,t),$$

and these estimates are shown in Table 2.

Table 2: Regression Estimates with Lagged Dependent Variable

Parameter	Ordinary Least Squares		Fixed Effects		OLS for Nevada Only	
	Estimate	t -Statistic	Estimate	t -Statistic	Estimate	t -Statistic
α_i	0.019	[17.2]	0.016		0.004	[0.3]
β_{SLG}	0.193	[8.1]	0.163	[8.5]	0.280	[2.2]
γ_{RTT}	1.474	[10.5]	2.424	[12.8]	5.321	[3.0]
Θ	0.261	[12.9]	0.277	[13.7]	0.780	[6.2]
R^2	14%		61%		48%	
β_{SLG}/γ_{RTT}	+13%		+7%		+5%	
$\beta_{SLG} - 0.2 \times \gamma_{RTT}$	0.49		0.65		1.34	

These estimates show that even accounting for macroeconomic inertia does not affect the basic results for the OLS and FE models, and that even though current growth is positively and significantly related to past growth, changes in the growth of SLG production have a significant effect on GSP growth that depends on the business cycle. In essence, the estimates in this study are robust to substantial changes in specification. Nevada, however, appears to have experienced even greater inertia than the average state, with the result that it appears to be even more sensitive to the effect of changes of SLG production (i.e., at 5% above trend, SLG growth has no net effect on GSP growth, but at 20% below trend, a 10% cut to state and local government budgets would reduce Gross State Product by 13.4%). With only 45 observations, these particular results only suggest that the estimates in Table 1 are not overestimates for Nevada.

Summary:

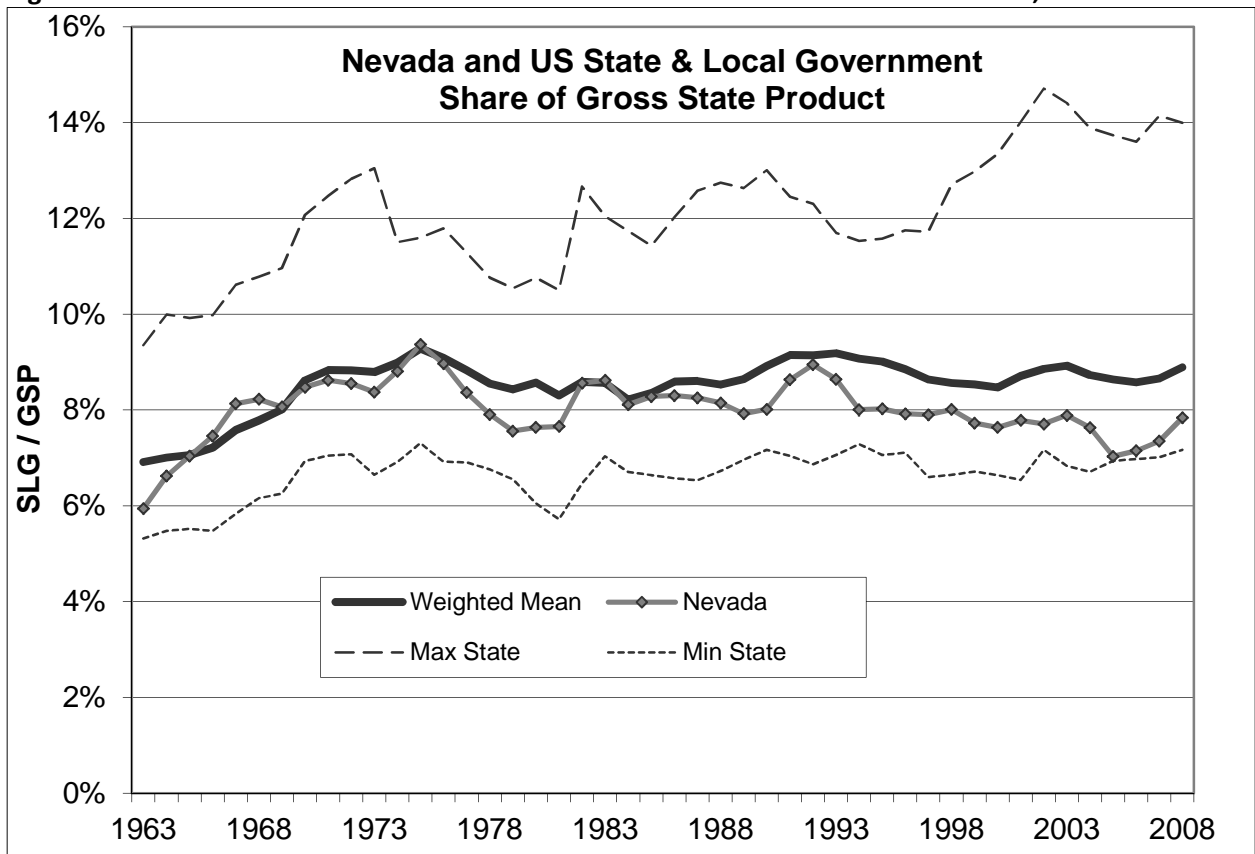
Many in the private sector think of the public sector as a competitor for resources, and prefer public spending cuts to tax increases because they imagine that this will be better for their pocketbook, and better for business. When the economy is booming, they may have a point. This analysis indicates that when a state's economy is producing substantially above its trend, the net effect of changes in the growth of state and local spending appear to cancel out, and so the public sector and the private sector are substitutes.

In a serious recession, however, this changes. When consumption and investment spending in the private sector falls, this hurts those who produce those goods and services. It also reduces tax collections while increasing the need for public spending, creating a difficult choice for public budgeting. While increasing taxes to make up for shortfalls has some negative consequences, cutting public spending has an even bigger impact, on the private sector even more than the public sector. If states stop funding road construction, this hurts the private sector. If local governments fire teachers or police officers, this means that the private firms who once sold them goods and services are also hurt.

In essence, public sector spending supports and complements the private sector in a recession such as the one Nevada currently faces, and the estimates in this analysis show that the effects can be very substantial. In the short run, a one dollar cut in public spending leads to an even larger fall in private spending, with predictable negative consequences for the chances of economic recovery. With a significant inertial effect, the effects continue in the long run too.

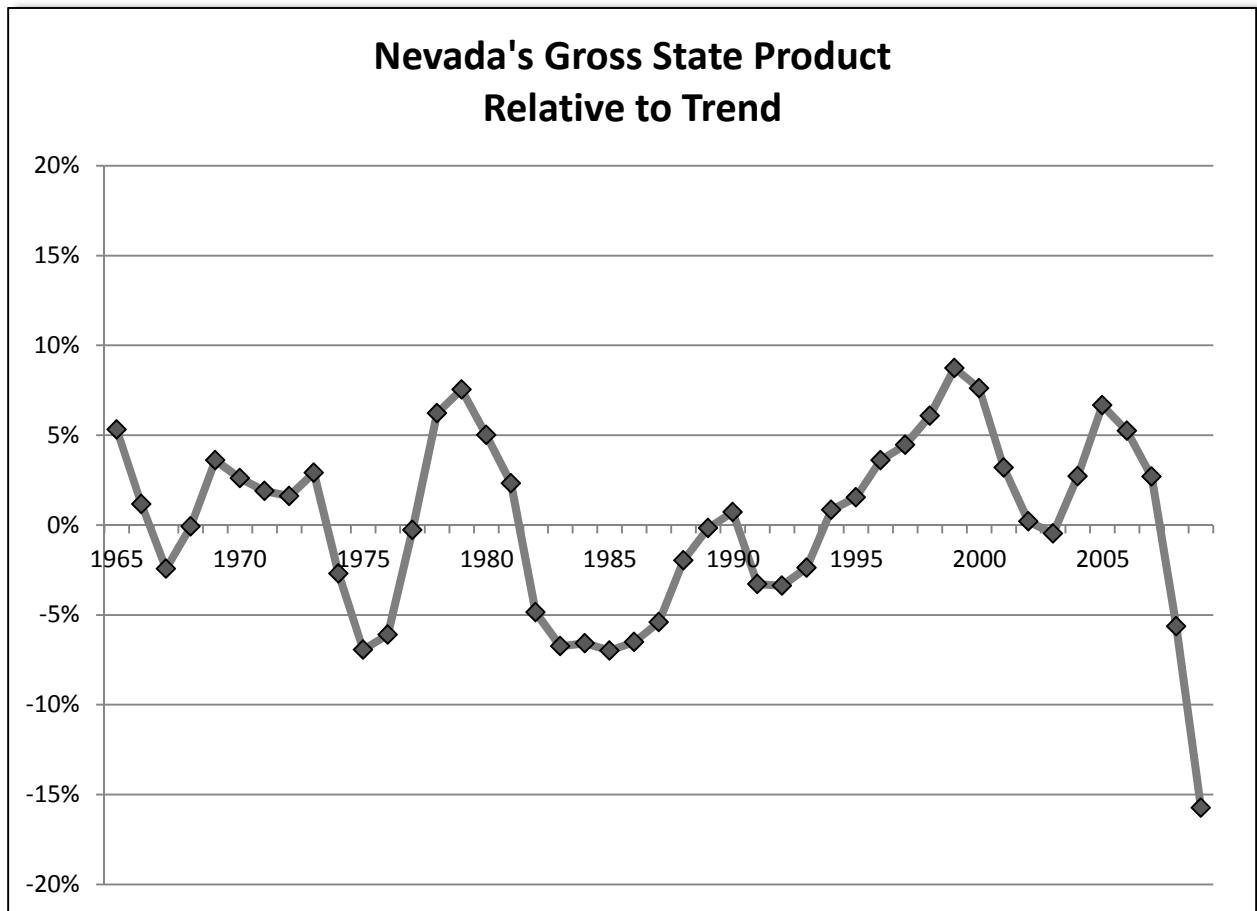
Of course, these are only very rough approximations for short-run changes in spending. The actual cuts to state and local government budgets are still unknown, and may be much greater than 10% in real terms. This analysis aggregated state and local government production, or gross value-added, but there are many different budgets involved, and not all have the same effects. In the Executive Budget, the Nevada System of Higher Education is once again receiving disproportionately large cuts, and this can have a much bigger short-run impact on the economy because many NSHE units leverage their state-supported operating budgets into external grant-funded research and other self-supporting budgets. Cuts to education also are likely to have an even larger long-run impact, to the extent they discourage more productive residents from remaining in Nevada, and discourage productive investment from private firms looking for a qualified labor pool, but that will likely be a problem for future biennial revenue forecasts, not this one.

Figure 1: The Ratios of State & Local Government Production to Gross State Product, 1963-2009



Source: Bureau of Economic Analysis, Department of Commerce. <http://www.bea.gov/regional/index.htm>.

Figure 2: Nevada's Gross State Product, Relative to Trend, 1965-2009



Appendix Figure: Nevada State and Local Government (SLG) Production, Share of Gross State Product (GSP), Both Actual and Trend, 1963-2008

