The Truth on Spending: How the Federal and State Governments Measure Up

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I. Introduction

"The federal government has assumed so many responsibilities that it no longer has the ability to do anything well" (Lee 1994). The past century has witnessed great debate over the role of government spending in the economy. Government spending is often regarded as negative and something that should be minimized whenever possible. Although some traditional economic thought in the United States has argued that government spending results in federal deficits and a depressed economy, there are many opposing views on the effects of government spending. Most notably, David Alan Aschauer (1989) addressed the issue of government spending and its effects on productivity. He finds that

> "significant weight should be attributed to public investment decisions – specifically, additions to the stock of nonmilitary structures such as highways, streets, water systems, and sewers – when assessing the role the government plays in the course of economic growth and productivity improvement" (Aschauer 1989 197).

Aschauer himself points out that "government deficits are thought to have a variety of effects on the private economy, ranging from forcing up real interest rates and 'crowding out' private investment in additional plants and equipment to raising wealth and stimulating household consumption demand" (Aschauer 1989 177). While there are many studies that support Aschauer's claim, there are also quite a few that disagree with him. "Aschauer's results merited some skepticism because 'the statistical results are not robust [and] there is a lack of corroborating evidence'" (Cullison 1993 19). There are also studies that point to specific

problems with Aschauer's work. The main complaint is that he does not convincingly distinguish the component of government capital that is productive. It is also unclear from his work if his component of government capital is biased or if it can be trusted (Finn 1989). Many of the studies that agreed with Aschauer have also been doubted and "some of the studies found the effects of public investment on economic growth to be smaller than Aschauer found them to be" (Cullison 1993 20).

The role that government spending plays in the economy is often a central issue in political debate. The last six Presidents of the United States have promised to cut government spending or deficit at some point in their political careers and the political parties are in constant debate over how government spending affects productivity. Moreover, many politicians call for greater power to be given to the state and local governments. Reagan's Administration claimed that the power of the federal government in investment should be based on "government services that benefit people throughout the Nation, such as national defense and the protection of constitutional rights" (Economic Report of the President 1982 37). This has become a common belief among politicians and economic experts alike. According to the director of the Office of Management and Budget, Alice Rivlin,

> "the United States 'cannot afford a cumbersome national government, overlapping responsibilities between the federal government and the states, and confusion over which level is in charge of specific domestic government functions'… 'Washington not only has too much to do, it has taken on domestic responsibilities that would be handled better by the states'" (Lee 1994).

It has become a popular claim that more power should be granted to the states when it comes to investment. "As indicated earlier, there are economic reasons for this increased reliance on State governments. States are generally more responsive to voters in their jurisdiction than is the Federal Government and can make better judgements about local

conditions" (Economic Report of the President 1982 44). It is a common economic thought that government investment is bad because it crowds out other components of GDP such as consumption and private investment, which hinders productivity. Many politicians declare that by giving more power to the state governments, this crowding out effect is minimized. These politicians claim that giving more control to the states will ensure that the people of the United States are better represented by their government.

This paper will address these questions first by attempting to reproduce Aschauer's regressions, and then by looking at different components of government investment to examine the effects they have on productivity. Based on the idea that state governments are more efficient when it comes to investment, it is hypothesized that state government spending will have a positive effect on productivity while federal government spending will not.

To better analyze the role of state government investment, the regression component of government capital will be divided into two categories: federal government capital and state government capital. Economic and historic evidence can be used to analyze the various effects that certain types of government spending have on the economy. The majority of federal investment is devoted to military spending, while the state governments allocate the majority of their investment towards education. State spending leads to new and improved schools and playgrounds, the hiring of more teachers, the purchasing of new computers, and to creating better futures for our children. As Ronald Reagan pointed out in 1982,

> "Government services that provide benefits only or predominately to residents of a specific region, such as urban transit and sewer systems, can probably be provided more efficiently by State or local governments and financed by State and local taxes or user charges on those persons directly benefited" (Economic Report of the President 1982 37).

As a result, by separating the components of government capital into state and federal it can be inferred whether or not placing more power in the hands of the states could lead to greater productivity.

II. Theoretical Framework

The growth model developed by Robert Solow (1956) can be used to examine how changes in labor, capital, and technology lead to changes in certain types of output. Aschauer uses an adapted version of the Solow growth model to test his claims on government spending and productivity. The Solow model states that a percent change in output (GDP) is a result of a percent change in technology plus a percent change in capital times .3 plus a percent change in labor times .7,

$$\frac{DY}{Y} = \frac{DA}{A} + \frac{DK}{K}(.3) + \frac{DN}{N}(.7). \quad (1)$$

Aschauer (1989) simply adds another component to the basic Solow growth model, government investment. This can be done because technology is a factor that cannot be tangibly measured and therefore represents the 'everything else'. By adding government investment to the model, Aschauer has not actually changed anything he has just used the Solow model to explain more. Aschauer's model is represented by

$$Y_t = A_t * f(N_t, K_t, G_t), \quad (2)$$

where Y_t is a measure of real aggregate output of goods and services of the private sector, N_t equals aggregate employment of labor, K_t represents aggregate stock of nonresidential capital, A_t is a measure of productivity or technological change, and G_t represents a flow of services from the government sector.

Employing both Solow's and Aschauer's models further, this paper will continue to test the data by separating out the variables for state government investment and federal government

investment since it is possible that state and federal government expenditures have different impacts on productivity. The federal government is often responsible for infrastructure expansion and other such development. This component can make total government capital seem positive; when in reality it is not. State government spending is often on local improvements such as new schools and better educational programs. Such investments are likely to result in long-term benefits for states. When federal and state capital components are separated it will be easier to see if one component has a greater influence on the total measure of government capital than the other. The model used in this paper addresses this possibility and is represented by

$$Y_t = A_t * f(N_t, K_t, SG_t\, FG_t), \tag{3}$$

Where the variables Y_t, A_t, N_t, and K_t represent the same measurement as Aschauer's variables did, and SG_t represents a flow of services from the state government and FG_t measures a flow of services from the federal government.

III. Empirical Analysis

The empirical analysis focuses on data taken from two sources: *Fixed Reproducible Tangible Wealth in the United States 1959-97* and from *Basic Economics* database (1999). Aschauer's data also came from the former source, however his data was from the 1925-85 sample and he used the years 1949-85. Aschauer also used the Bureau of Labor Statistics, National Income and Product Accounts, and the Federal Reserve Bulletin.

A. Aschauer Reconsidered

In order to more closely reassemble Aschauer's model the data taken from *Fixed Reproducible Tangible Wealth* will be tested twice, once including all years and once omitting the years from 1985-97. (The regressions using the years 1958-1985 will be numbered the same

as the regressions using the years 1959-1997, but will be denoted with ".2"). Each subset of data will be tested twice, once for affect on output (GDP) and once for the affect on productivity. Productivity is defined as the relationship between the output (GDP) and the level of labor input. Because productivity includes labor in the outcome, the labor variable will not be used in any regression using productivity as the dependent variable.

The first regressions were modeled after Aschauer's regressions and the equations are estimated as follows:

$$ln\,(Y_t) = b_1 + b_2\,(ln\,K_t) + b_3\,(ln\,G_t) + b_4\,(ln\,N_t) + b_5\,(CU) + u_t \qquad (4)$$

and

$$ln\,(P_t) = b_1 + b_2\,(ln\,K_t) + b_3\,(ln\,G_t) + b_4\,(CU) + u_{t.} \qquad (5)$$

The linear time variable that Aschauer uses was omitted because of high multicollinearity and autocorrelation. The variable K_t represents private capital, G_t represents government capital, and N_t represents labor. The capacity utilization (*CU*) "is employed to control for the influence of the business cycle as well as to allow comparison with previous productivity studies which ascribed importance to declining capacity use in explaining the productivity slowdown of the 1970's and 1980's" (Aschauer 1989 182).

The first regressions were run using the data from the period of 1959-97 and the results are summarized in Table 1. The results differed somewhat from Aschauer's, presumably because of the differences in years. In an attempt to correct for the differences in Aschauer's regression and the new regression, the years from 1985-97 were omitted and the regressions were run again. These results are also presented in Table 1.

Table 1

Equation	*Years and Measure*	*Method*	*Constant*	*Private Capital (K)*	*Government Capital (G)*	*Labor (N)*	*Capacity Utilization (CU)*	*R-Squared*	*DW*	*Rho (r)*

4.1	1959-1997 GDP	OLS	-10.985 (--11.519)**	1.462 (10.788)**	-0.187 (-4.610)**	-0.075 (-0.586)	0.0047 (7.179)**	0.9973	1.385	0.64
4.2	1959-1985 GDP	OLS	-10.772 (-8.746)**	1.558 (10.17)**	-0.183 (-3.831)**	-0.235 (-1.286)	0.005 (6.163)**	0.991	1.269	0.561
5.1	1959-1997 Productivity	OLS	-7.568 (-3.73)**	0.926 (4.381)**	-0.166 (-1.929)*	__	0.0009 (1.207)	0.9315	1.16	0.78
5.2	1959-1985 Productivity	OLS	-9.822 (-4.128)**	1.123 (4.603)**	-0.219 (-2.289)*	__	0.001 (1.255)	0.9484	0.977	0.659

T-statistics in parenthesis. ** Denotes significance at .05 level and * denotes significance at .10 level. Recall that the variable for labor (N) is omitted in productivity regressions.

The first set of regressions suffered from autocorrelation. There are several approaches to correcting the autocorrelation problem, however, according to Granger and Newbold (1974) the usual recommendations are to either include a lagged dependent variable or take first differences of the variables involved in the equation or to assume a simple first-order autoregressive form for the residual of the equation. Therefore, to correct for autocorrelation, lag variables were initially used. However, the regression required 28 lagged variables to make the Durbin-Watson test significant. Since this number was so high, the first difference test was used instead to correct for autocorrelation. The regressions that were used to correct for autocorrelation are as follows:

$$DIFFY_t = b1 + b2\,(DIFFK_t) + b3\,(DIFFG_t) + b4\,(DIFFN_t) + b5\,(DIFFCU) + u_t \quad (6)$$

and

$$DIFFP_t = b1 + b2\,(DIFFK_t) + b3\,(DIFFG_t) + b4\,(DIFFCU) + u_{t.} \quad (7)$$

The results from these regressions are summarized in Table 2.

Table 2

Equation	*Years and Measure*	*Constant*	*Private Capital (K)*	*Government Capital (G)*	*Labor (N)*	*Capacity Utilization (CU)*	*R-Squared*	*DW*
6.1	1959-1997 GDP	0.007 (1.633)	1.137 (5.336)**	-0.170 (-4.013)**	0.0352 (0.263)	0.004 (6.631)**	0.8762	2.137
6.2	1959-1985 GDP	0.011 (1.218)	1.042 (2.841)**	-0.169 (-3.434)**	0.0244 (0.128)	0.0042 (5.225)**	0.8821	1.996
7.1	1959-1997 Productivity	1.172 (1.907)*	40.794 (1.64)	-14.946 (-2.565)**	__	0.076 (1.511)	0.2258	2.056

7.2	1959-1985 Productivity	2.383 (2.442)**	7.166 (0.215)	-13.372 (-2.265)**	__	0.104 (1.981)*	0.3574	1.835

T-statistics in parenthesis. ** Denotes significance at .05 level and * denotes significance at .10 level. Recall that the variable for labor (N) is omitted in productivity regressions.

Aschauer claimed that government spending did not have a negative impact on productivity and output. However, when the original regressions were run again, the results indicated just the opposite. This is most likely a result of the difference in years used in the two samples. The decade of 1949 to 1959 that was included in Aschauer's sample represents post-World War II years when the government was investing immensely in infrastructure and the interstate highway system. The government investment in infrastructure and highways, "influences output in the private sector through the provision of transportation service… from 1965 to 1989, this share exhibits a downward trend" (Finn 1993 55-56). If we assume that this downward trend continued after 1989 into the 1990's it would help explain why Aschauer's results were positive, while the results here as well as the results from other studies have been negative.

B. State v. Federal Capital

Since the autocorrelation problem has been accounted for, the difference between state and federal government spending on output and productivity can now be examined. This can be done in several ways, two of which were employed. First, state and federal government spending were separated out and the regressions were run again with the necessary corrections. Second, a new variable was created which represents the ratio of state government spending as a proportion of all government spending. These regressions were also performed using the first difference test to correct for autocorrelation. The equations for these regressions are as follows and the results are summarized in Tables 3 and 4:

$$DIFFY_t = b1 + b2\,(DIFFK_t) + b3\,(DIFFSG_t) + b4\,(DIFFFG_t) + b5\,(DIFFN_t) + b6\,(DIFFCU) + u_{t,} \quad (8)$$

$$DIFFP_t = b1 + b2\,(DIFFK_t) + b3\,(DIFFSG_t) + b4\,(DIFFFG_t) + b5\,(DIFFCU) + u_t, \quad (9)$$

$$DIFFY_t = b1 + b2\,(DIFFK_t) + b3\,(DIFFG_t) + b4\,(DIFF\underline{SG_t}) + b5\,(DIFFN_t) + b6\,(DIFFCU) + u_t, \quad (10)$$
$$G_t$$

and

$$DIFFP_t = b1 + b2\,(DIFFK_t) + b3\,(DIFFG_t) + b4\,(DIFF\underline{SG_t}) + b5\,(DIFFCU) + u_t, \quad (11)$$
$$G_t$$

The variable SG_t represents state government capital, the variable FG_t represents federal government capital and the variable SG_t/G_t represents the ratio of state capital to total government capital. The regression results from equations (8) and (9) are summarized in Table 3 and the results from equations (10) and (11) are summarized in Table 4 below.

Table 3

Equation	*Years and Measure*	*Constant*	*Private Capital (K)*	*Federal Government Capital (FG)*	*State Government Capital (SG)*	*Labor (N)*	*Capacity Utilization (CU)*	*R-Squared*	*DW*
8.1	1959-1997 GDP	0.0059 (1.292)	1.055 (4.831)**	0.106 (1.180)	-0.22 (-3.550)**	0.0772 (0.571)	0.004 (6.667)**	0.8799	2.108
8.2	1959-1985 GDP	0.0066 (0.662)	1.063 (2.913)**	0.1065 (0.953)	-0.222 (-2.872)**	0.039 (0.204)	0.004 (5.287)**	0.8838	1.932
9.1	1959-1997 Productivity	1.01 (1.584)	36.38 (1.432)	9.933 (0.808)	-19.577 (-2.306)**	__	0.088 (1.688)	0.2233	2.060
9.2	1959-1985 Productivity	2.111 (1.879)*	9.238 (0.271)	5.337 (0.389)	-15.71 (-1.659)	__	0.108 (1.995)*	0.334	1.813

T-statistics in parenthesis. ** Denotes significance at .05 level and * denotes significance at .10 level. Recall that the variable for labor (N) is omitted in productivity regressions.

Table 4

Equation	*Years and Measure*	*Constant*	*Private Capital (K)*	*Government Capital (G)*	*Ratio State:All Government Capital (SG:G)*	*Labor (N)*	*Capacity Utilization (CU)*	*R-Squared*	*DW*
10.1	1959-1997 GDP	0.006 (1.262)	1.075 (4.99)**	-0.121 (-2.188)**	-0.864 (-1.348)	0.073 (0.54)	0.004 (6.617)**	0.8791	2.111
10.2	1959-1985 GDP	0.007 (0.696)	1.07 (2.924)**	-0.125 (-1.926)*	-0.827 (-1.055)	0.0377 (0.198)	0.004 (5.232)**	0.8827	1.94
11.1	1959-1997 Productivity	1.023 (1.585)	38.315 (1.521)	-10.848 (-1.403)	-71.265 (-0.812)	__	0.084 (1.627)	0.2179	2.058
11.2	1959-1985 Productivity	2.192 (1.945)*	9.181 (0.267)	-11.509 (-1.45)	-34.623 (-0.36)	__	0.106 (1.966)**	0.3309	1.818

T-statistics in parenthesis. ** Denotes significance at .05 level and * denotes significance at .10 level. Recall that the variable for labor (N) is omitted in productivity regressions.

IV. Discussion

Consistent with the results in Tables 1 and 2, both private capital and the capacity utilization rate are positive and significant in the regression results presented in Tables 3 and 4. In the first sets of regressions (Tables 1 and 2), government capital is always negative and is also significant. As was pointed out before, this is inconsistent with Aschauer's (1989) results, which indicate that government spending has a positive impact on productivity. However, the purpose of this paper is to individually examine the federal and state components of government capital, which was done in the regressions presented in Tables 3 and 4.

When the components of government capital were separated into state government capital and federal government capital, federal government capital is positive but insignificant and state government capital is negative and usually significant (Table 3). This is surprising because the hypothesis of this paper is that state government capital would have a positive effect on productivity. It is uncertain why federal government spending would be positive and insignificant, unless it is necessary to incorporate military spending to see the true effects of federal government capital. Regardless, the results suggest that neither state nor federal government capital have a positive impact on productivity.

The component for government capital was also tested by separating the variable into total government capital (the same measurement used in Tables 1 and 2) and a ratio of state government capital out of total government capital. The results are again surprising and do not support the hypothesis of this paper. The ratio component is always negative, but is insignificant and the measure of total government capital is negative and significant in the measurements for GDP. These two variables do not seem to explain anything more than separating federal and

state government capital did. It is strange that total government capital is negative and only significant in the tests for GDP in these regressions when it was always negative and significant in the earlier regressions. It is also puzzling that the ratio would be negative but insignificant when state government capital on its own was significant and negative.

V. Conclusion

David Aschauer (1989) claimed that government investment had a positive effect on productivity, and found the relationship between government investment and productivity between the years of 1949 to 1985 to be positive and significant. However, when the same regressions were re-tested, omitting the post-World War II decade of 1949-1959, the relationship between government investment and productivity is still significant, but is negative. One possible reason for this difference is that the decade from 1949 to 1959 represents huge amounts of government investment in infrastructure with the construction of the interstate highway system. This investment was made by the federal government and had such a large impact that it is possible that it made the relationship between government capital and productivity positive regardless of other government capital investment in Aschauer's sample.

Concurrent with popular economic and political debate, it was the hypothesis of this paper that investment in capital by state governments would have a positive effect on productivity, while federal government capital would have a negative effect. The Reagan Administration claimed that state government investment was more efficient in representing smaller regions around the country, while the federal government should have the responsibility of matters that affected the entire country. The popular claim is that federal investment leads to

crowding out while state investment boosts productivity, therefore more investment power should be placed with the states.

This study has attempted to determine if there is a productive component of government investment and has looked for that component in state investment. It seems as though neither Aschauer nor the politicians are correct in their claims; the results of this study indicate that neither federal investment nor state investment increase productivity. When state and federal capital were separated, the relationship was quite surprising; federal investment became insignificant and state investment was negative and significant. This indicates that it is state, not federal, investment that negatively affects productivity. From these results, it is evident that government investment, on any level, does not boost productivity. Perhaps the traditional economic claim that government investment crowds out the productive components of the economy is right after-all. Specifically, we should look critically at all government investment, particularly state investment, and search for ways to better allocate government funds in order to promote productivity growth.

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