Spend More or Tax Less: Which Way to State Economic Growth?

Zulal S. Denaux
Assistant Professor of Economics
Langdale College of Business
Valdosta State University
Valdosta, Georgia 31698
Email: zsdenaux@valdosta.edu
Phone: (229) 219-1217
Fax: (229) 249-2248

Donna J. Cunningham
Assistant Professor of Management
Langdale College of Business
Valdosta State University
1500 N. Patterson St.
Valdosta, Georgia 31698

Ralph C. Allen
Professor of Economics
Langdale College of Business
Valdosta State University
Valdosta, Georgia 31698

Keywords:
growth, taxation, government spending

JEL classification codes:
O47, H20, H50

Economic growth is a top priority for state fiscal policy makers; however, the fiscal policy tools of choice to achieve this goal are a subject of controversy. Previous studies have measured the effect on economic growth of either lower marginal tax rates or higher spending, but these studies have not attempted to measure the effect of both simultaneously. This study analyzes the effects of changes in both government infrastructure spending and the marginal tax rate on economic growth in an exogenous growth framework. Using a panel-data framework for the 48 contiguous United States for 1969-1988, we found that a lower marginal tax rate has a statistically significant positive effect on economic growth but an increase in government infrastructure spending has no statistically significant effect.

Every state government wants to achieve higher economic growth. Growth allows companies to hire more workers and improve compensation to existing workers, and it provides citizens more opportunities to succeed and prosper. Theoretically, a state government can promote economic growth by increasing government spending or lowering the marginal tax rate. Some state fiscal policy makers embrace lower taxes and the creation of tax incentives as their principal economic development tools; others propose an increase in government spending to promote economic growth. However, the question to ask is, "What is the empirical effect of lower taxes versus higher government spending on economic growth?" Since tax and spending policies are the principal policy tools to promote state economic growth, their relative effectiveness is of practical interest to state fiscal policy makers.

Economic theory indicates that taxation and government spending policies affect economic growth through different mechanisms. Some studies in the literature only analyze the effects of taxes on economic growth. For example, the study by Padovano and Galli (2001), found that a reduction in the tax rate has a powerful positive impact on business investment decisions, thus leading to long-run growth. A lower tax rate lowers the costs of production, which can translate into higher profits for private businesses. Ultimately, higher profits attract or retain businesses and create jobs, leading to increased production levels and income in the economy. Lower marginal tax rates also increase work incentives, encourage saving, and reward entrepreneurship, each leading to a higher growth rate (Zee, Stotsky and Ley 2002). In contrast, using panel data on 18 OECD countries, Mendoza, Milesi-Ferretti, and Asea (1997) find that the tax mix has no statistically significant effect on economic growth.

The effects of government expenditures on economic growth may be mixed. Munnell (1990) states that economic growth increases if government revenue is used to finance productive government infrastructure, such as roads, highways, and mass transit facilities, that facilitate private entrepreneurship. On the other hand, government spending has a tendency to bid up the price of resources, causing production costs to increase. Higher costs will make many entrepreneurial projects unprofitable, thereby reducing private-sector growth. . Using panel-data over 20 years for 43 developing countries, Devarajan, Swaroop, and Zou (1996), who address all government expenditures but not taxation in their regression, find that an increase in the government's share of current expenditure has a statistically significant positive effect on growth. However, they also state that if productive government expenditures are used in excess, the relationship between the capital component of public expenditure and economic growth is both negative and statistically significant.

When only infrastructure spending is considered, the expected effect is positive; however, the actual causal link to economic growth is uncertain. Although the construction of public infrastructure may itself generate economic growth, the interrelationship between public investment and private investment is a key component in the link to growth. Public capital may act as an unpaid input into the production process or may increase the productivity of private resources. Either role would cause public infrastructure to increase profitability and return to resources, attracting capital and labor to a region. The effect of public investment on growth may also depend on the initial level of private capital, and the causal effect may be both from private capital to public capital expenditures as well as from public capital to private capital expenditures. Eberts (1990) provides an excellent review of these theoretical issues and the results of empirical tests.

Only a few studies have simultaneously estimated the effect of both government spending and taxation on economic growth. Taking full account of a wide range of government expenditures and taxes in a regression using panel data on 22 OECD countries, Kneller, Bleaney, and Gemmell (1999) determine that an increase in productive expenditures and a decrease in distortionary taxation (defined as taxation that negatively affects investment decisions as to physical or human capital) have a statistically significant positive effect on growth. The study by Helms (1985) extensively looks at the relationship between economic growth and fiscal policy at the state and local level. He finds the influence of state and local taxes on economic growth crucially depends on the way in which government expenditures are financed. Helms (1985) argues that state and local taxes have a negative effect if revenues are allocated to transfer payment programs, but increases in government expenditures in areas such as health, education, and highways have a positive effect on economic growth. Therefore, previous attempts to estimate empirically the effect of these two fiscal policies on economic growth have provided a very wide range of estimates.

One of the shortcomings of these empirical studies is the absence of a theoretical framework that links the effects of these two fiscal policies to economic growth. This study provides such a framework in an exogenous growth model. Using state level data from the 48 contiguous United States over the period between 1969 and 1988, inclusive, the theoretical model is estimated to specifically examine the relationship between economic growth and both government infrastructure investment and the marginal tax rate. In addition to the theoretical framework, this paper is unique in its use of: (1) a three-stage estimation technique (3SLS) designed to correct for the simultaneity problem in the panel data framework; and (2) state data from within the United States rather than aggregate data from various countries.

The next section briefly describes the exogenous growth model that links both marginal income tax rates and government infrastructure expenditures to growth and provides the predictions of the theoretical model. Section III presents the data and methodologies used in this study. Section IV summarizes and concludes.

An Exogenous Growth Model with Taxation and Infrastructure Expenditures

A growth model that incorporates the effects of government capital investment and tax financing can be built from Mankiw, Romer and Weil's (1992) human-capital augmented version of Solow's (1956) growth model and from Holtz-Eakin and Schwartz's (1995) extension to incorporate public infrastructure. The following is the Cobb-Douglas production function version of the augmented model:

$$Y = K^{\alpha} G^{\beta} H^{\gamma} (A\,L)^{1-\alpha-\beta-\gamma}. \qquad (1)$$

Y is total production and real income; K is private physical capital; G is public infrastructure (public capital); H is human capital; L is raw labor; and A is the level of labor-augmenting technology. The production function exhibits constant returns to scale but diminishing returns to each factor: $0 < \alpha, \beta, \gamma < 1$. In this model, the growth rate of raw labor (n) and technological progress (λ) and the deprecation rate of capital (δ) take place at constant, exogenous rates.

Assuming that total government tax revenue in any period is equal to total government spending in that period, the government budget constraint is given as:

$$\tau Y = \theta\tau Y + (1-\theta)\tau Y. \qquad (2)$$

The fraction of government revenue devoted to government infrastructure spending is $(0 < \theta < 1)$, with the remaining share of spending $(1-\theta)$ allocated to public consumption. The marginal income tax rate is τ. Therefore, τY is the total government revenue and is used to finance infrastructure spending $\theta\tau Y$ and public consumption $(1-\theta)\tau Y$, respectively. Both τ and θ are parameters determined by the government. The tax rate variable τ is the measure of government's overall involvement in the economy, and the infrastructure variable θ is the measure of the allocation of tax revenue between public infrastructure and public consumption spending. Assuming that all income earners invest constant fractions *sk* and *sh* of their net after tax income, $(1-\tau)Y$, in physical and human capital, respectively; and if *INITIAL* is the state's initial level of real per capita product, then the general form of a state's steady state growth rate (*GROWTH*):[1]

$$GROWTH = F\{INITIAL, (n+\lambda+\delta)\, sk, sh, \tau, \theta\tau\} \qquad (3)$$

Determining the theoretical effect of each variable in equation 3 is straightforward. The initial level of per capita income (*INITIAL*) influences the length of time the state needs to reach its long-run economic growth. If all state economies converge to a long-run economic growth path, states that have a higher initial level of real per capita income would need less time to reach to their desired levels of economic growth. Therefore, a negative relationship between *INITIAL* and *GROWTH* is expected.

An increase in either labor growth, the depreciation of capitals, or technological progress, $(n + \delta + \lambda)$, would lower the amount of private capital per capita. Therefore, a negative relation is expected between the measure for $(n + \delta + \lambda)$ and economic growth.

An increase in the rate of saving devoted to either physical (*sk*) or human capital (*sh*) would increase the level of economic growth. A larger investment in physical capital translates into a higher level of production, which leads to a higher level of economic growth. Human capital investment increases worker productivity, causing higher economic growth.

The terms involving the tax rate and the share of government spending on infrastructure are of particular interest in the theoretical model. Because it lowers after tax income and thus private physical and human capital investment, an increase in the marginal income tax rate (τ) reduces economic growth. Finally, because it improves the efficiency of private capital and labor resources, an increase in the share of government spending for infrastructure ($\theta\tau$) is expected to increase economic growth.

Data and Methodology

The empirical analysis covers the period 1969-1988 for the 48 contiguous United States. The dependent variable (*GROWTH*) is the growth rate of real gross state product (GSP) per capita over the sample period for each state. The GSP data are obtained from the Bureau of Economic Analysis, an agency of the United States government.

Initial output per worker, *INITIAL*, is the initial level of GSP per capita in 1969. Following Holtz-Eakin and Schwartz (1995), we assume that the annual rates of technical progress, λ, and depreciation, δ, are 2% and 5%, respectively. The measurement for the term, $(n + \delta + \lambda)$, is obtained by adding 0.07 $= (\lambda + \delta)$ to the average annual growth rate of labor force (n) for each state. The share of income invested in private infrastructure, *sk*, for each state is obtained from Munnell (1990). The data on human capital investment, *sh*, for each state is measured by the proportional change in the average numbers of years of schooling obtained from Mulligan and Sala-i-Martin (1995a) and Mulligan and Sala-i-Martin (1995b). The average marginal income tax rate for each state, τ, is obtained from the following regression for each state: *TAX REVENUE* = a + τGSP.[2] The data on *TAX REVENUE* are taken from the Census Bureau's publication Governmental Finances. Data on the share of income invested in public infrastructure, θ, for each state are constructed using Holtz-Eakin's (1993) data on the stock of highways, sewerage, and utilities. Table 1 presents summary statistic of the variables used in the analysis. Equation 3 is written in linear form:

$$GROWTH_{i,t} = \mu_i + \eta_t + B_1 INITIAL_{i,t} + B_2\,(n + \delta + \lambda)_{i,t} + B_3\, sk_{i,t} + B_4\, sh_{i,t} + B_5\,\tau_{i,t} + B_6\,(\theta\tau)_{i,t} + \varepsilon_{i,t} \qquad (4)$$

Both μ_i and η_t can be viewed as a decomposition of the constant term and represent state and time-specific effects, respectively. The subscripts *i* and *t* represent each state and time period, respectively; $\varepsilon_{i,t}$ it is the error term. This study adopts the panel data framework because this framework takes account of unobservable time invariant differences among the states in the form of the individual "state-specific effects" devoted in the model by μ_i .

Since the data set is annual, an important econometric issue in such a panel data set concerns the presence of endogenous explanatory variables. Theoretically, both the tax and government expenditure variables are likely to change with higher growth rates. For example, during periods of rapid growth, the government may commit itself to new spending programs such as an arena, children's museum, expanded convention center, and other public infrastructure. To finance them, government may allow local government to impose new taxes on restaurant meals and hotel visits. However, on the other hand, the higher economic growth rate may allow government to lower taxes and still finance new spending programs. This inverse causation would lead to a misstatement of the effects of each of the two policy variables on growth. The source of the problem is the business cycle. To remove the business cycle effect, the analysis begins by arranging the twenty-year sample period into four five-year sub-periods, namely 1969-1973, 1974-1978, 1979-1983 and 1984-1988. Therefore, the period subscript, *t*, in Equation 4 is defined over values [1, 2, 3, and 4]. Taking 5-year averages eliminates the business cycle-induced correlation and reveals the real effects of taxes and government spending on economic growth.

Although the business cycle effect is largely removed by using five-year periods, this adjustment may not be enough to address the simultaneity problem (Kneller *et al*., 1999 and Fölster and Henrekson, 1999). Therefore, a three-stage least square estimation technique

TABLE 1
Cross-State Descriptive Statistics

Variables	Mean	Standard Deviation
GROWTH	0.002	0.02
INITIAL	0.34	0.15
$(n + \delta + \lambda)$	0.023	0.024
Sk	0.027	0.022
Sh	0.92	0.025
$\theta\tau$	0.003	0.002
τ	0.095	0.029

TABLE 2
3SLS Panel Estimation of Cross-State Growth Regressions
Dependent Variable: Growth in GSP per Worker

Variable	Coefficient	Whites' Standard Error#
INITIAL	-0.02**	0.012
$(n + \delta + \lambda)$	-0.07*	0.005
sk	0.045*	0.005
sh	0.12	0.01
$\theta\tau$	0.003	0.019
τ	-0.02*	0.003

Adjusted R^2: 0.65
Number of Observations: 144
Whites' heteroskedasticity-consistent standard errors.
* and ** denote significance at the 5% and 10% levels, respectively.
The independent variables are in logarithm form; and the regression has a constant term.

(3SLS) has been used to address these empirical issues (Hsiao 1986, chapter 4.5).[3] Before applying the 3SLS estimation technique, the four-period panel data are first differenced to eliminate the unobservable individual state-specific effects μ_i. Then, to eliminate the time effect η_t, variables used in the estimation are taken as deviations from the period means.

Table 2 presents the results of 3SLS estimation. The coefficients for initial income (*INITIAL*) and the share of income invested in private infrastructure (*sk*) have the expected signs and are statistically significant at the ten-percent level. The coefficient for $(n + \delta + \lambda)$, which reflects differences in the state's labor growth rates (n), is also the expected sign and statistically significant at the ten percent level. The coefficient for the share of income invested in human capital (*sh*) is positive but statistically insignificant. However, such a finding is not surprising. As mentioned by Islam (1995), this finding is directly attributed to the discrepancy between the theoretically defined human capital (H) and the actual variable used in the empirical analysis.

The coefficient for the government infrastructure investment ($\theta\tau$) variable is positive but statistically insignificant. The lack of a statistically significant government investment effect is consistent with Holtz-Eakin (1993, and Holtz-Eakin and Schwartz (1995). In contrast, the coefficient on the marginal income tax (τ) variable is negative and statistically significant at the five percent level, which is consistent with the study by Kneller et al. (1999). This tax effect suggests that holding everything else constant, a decrease by one percentage point in the marginal income tax rate would increase economic growth by 0.02 percentage points. The adjusted R^2 for this model reported in Table 2 is 0.65.[4]

Conclusion

This paper addresses the importance of state fiscal policy on economic growth. By utilizing a model including both infrastructure spending and taxation, we theoretically evaluate and empirically estimate the impact of state infrastructure investment and tax policies on economic growth. Moreover, we do so in the context of the economic policy of United States, considering data from the 48 contiguous United States over a period of 20 years.

The common practice in the growth literature is to use a panel-data framework in studies of cross-country growth. We apply a panel-data study across the 48 contiguous United States for the period from 1969-1988. After correcting for state-specific effects and time trends along with any simultaneity problem using 3SLS estimation technique in a panel data framework, results suggest that state infrastructure expenditure has no statistically significant effect on economic growth. In contrast, the state's marginal tax rate provides significant effects on economic growth; specifically, a one percentage point decrease in the marginal income tax rate increases economic growth by 0.02 percentage points.

This empirical result has important policy implications. Although increased government infrastructure spending does not affect economic growth, a state's ability to grow by attracting, retaining, and encouraging business activity, as well as increasing and retaining the level of the work force is significantly affected by tax policy. Therefore, public decision makers must evaluate the factors that directly affect tax structure.

Endnotes

1. For details of the model and a formal analysis of the effects of each variable, see Stephenson's unpublished dissertation (1999).

2. Average marginal income tax rates for each state are obtained by using simply the technique of Koester and Kormendi (1989). The *TAX REVENUE* used in this study is at both state and local level.

3. Equation 4 with state and time-specific effects can be estimated using the least squares dummy variable (LSDV) method. However, the presence of a lagged dependent variable (*INITIAL*) in Equation 4 makes the LSDV estimator inconsistent when the number of sample periods is small (Hsiao 1986, Chapter 4.2).

4. As suggested by anonymous referee, instead of using five-year averaged panel data, we used yearly panel data (1969-1988) with dummies for each year to capture the time effects. We then applied the 3SLS estimation technique. The results were similar except the tax coefficient, while negative, was statistically insignificant. However, we believe that 5-year averaging technique used in the text produces more accurate results because it corrects better for endogenous factors.

References

Devarajan, S., Swaroop, V. and Zou, H., 1996, The Composition of Public Expenditure and Economic Growth. *Journal of Monetary Economics*, 37, 313-344.

Eberts, R.W., 1990, Public Infrastructure and regional Economic Development, *Economic Review*, Federal Reserve Bank of Cleveland, 26(1), 15-27

Holtz-Eakin, D., 1993, State-Specific Estimates of State and Local Government Capital. *Regional Science and Urban Economics*, 23, 185-209.

_________, and Schwartz, E., 1995, Infrastructure in a Structural Model of Economic Growth. *Regional Science and Urban Economics*, 25, 131-151.

Fölster, S. and Henrekson, M., 1999, "Growth and the public sector: a critique of the critics", *European Economic Review*, 15(2), 359-366 .

Helms, L., 1985, "The Effects of State and Local Taxes on Economic Growth: A Time series-Cross Section Approach" *The Review of Economics and Statistics*, 67, 574-582.

Hsiao, C., 1986, Analysis of Panel Data. Cambridge University Press.

Islam, N., 1995, Growth Empirics: A Panel-data Approach. *Quarterly Journal of Economics*, 110, 1127-1170.

Kneller, R., Bleaney, M. and Gemmell N., 1999, Fiscal Policy and Growth: Evidence from OECD Countries. *Journal of Public Economics*, 74, 171-190.

Koester, R.B and Komendi, R.C., 1989, Taxation, Aggregate Activity and Economic Growth: Cross-Country Evidence on Some Supply-Side Hypotheses. *Economic Inquiry*, 27, 367-386.

Mankiw, N. G., Romer, D. and Weil, D. N., 1992, A Contribution to the Empirics of Economic Growth. *Quarterly Journal of Economics*, 107, 407-37.

Mendoza, E. G., Milesi-Ferretti, G. M. and Asea, P., 1997, On the Ineffectiveness of Tax Policy in Altering Long-Run Growth: Harberger's Superneutrality Conjecture. *Journal of Public Economics*, 66, 99-126.

Mulligan, Casey B., and Sala-i-Martin, X, 1995a, Measuring Aggregate Human Capital., *National Bureau of Economic Research Working Paper* 5016.

Mulligan, Casey B., and Sala-i-Martin, X, 1995b, A labor-income-based measure of the value of human capital: An application to the states of the United States, *National Bureau of Economic Research Working Paper* 5018.

Munnell, A. H., 1990, Why has Productivity Growth Declined? Productivity and Public Investment. *New England Economic Review*, 1990, 1-22.

Padovano, F. and Galli, E., 2001, Tax Rates and Economic Growth in the OECD Countries (1950-1990). *World Development*, 30 #9 (September), 1497-1516.

Solow, D. L., 1956, A Contribution to the Theory of Economic Growth. *Quarterly Journal of Economics*, 70, 64-94.

Stephenson, E. F., 1999, Essays on the Construction and Use of Average Marginal Tax Rates. *Unpublished dissertation*, North Carolina State University.

Zee, H. H., Stotsky, J. G. and Ley, E., 2002, Tax Incentives for Business Investment: A Primer for Policy Makers in Developing Countries. *World Development*, 30 # 9 (September), 1497-1516.