

Whether State Fiscal Policy Affects State Economic Growth

June 1, 2006

Casey McCracken¹

Economics Department
Stanford University
Stanford, CA 94305
caseym@stanford.edu

Advisor: Michael J. Boskin

Abstract

Theory predicts that fiscal policy can affect economic growth by adjusting incentives for investment and labor as well as by distorting after-tax returns across sectors. This paper examines the effect of fiscal policy on growth rates first graphically, and then through two models, one of which disaggregates fiscal policy variables. I find evidence that increased size of government is negatively correlated with growth and that transfer payments and income taxes are especially harmful, while public capital expenditure can substantially increase growth.

Keywords: Fiscal Policy, Tax Climate, Business Climate, Solow Growth Model

¹ I would like to thank my advisor, Michael Boskin, for countless hours of his valuable time, constructive advice, and endless patience. Without his guidance, this thesis would not be what it is.

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1. Introduction

Managing fiscal policy is one of the most important responsibilities of any state government. States must decide which citizens they want to tax, how much to tax them and in what contexts, how much of the revenue to spend and what to spend it on. These fiscal decisions can have far-reaching consequences on the lives of millions. Taxes help determine the marginal benefit to an individual of working an extra hour, the marginal cost to a firm of undertaking a new R&D project, and the final price of everyday merchandise. Likewise, state government spending decisions directly affect the incomes of millions of state employees such as civil servants, fire fighters, police officers, nurses and teachers, and also affect many through income redistribution programs and state health care plans. In addition, spending programs indirectly affect productivity through provision of roads and port facilities. It thus seems almost obvious that state fiscal policy has a profound effect on the state economy and might likely have some effect on a state's economic growth rate.

This paper analyzes how state fiscal policy might affect economic growth. This is largely an open question, since while almost all state governments would agree that high economic growth is one of their primary goals, they do not agree on how to conduct fiscal policy. On the one hand, high tax rates give people less incentive to work hard, invest, and spend, putting dampening pressure on the economy and suppressing growth. Taxes might also cause distortions between various sectors of the economy causing firms to allocate capital suboptimally. On the other hand, taxes are necessary in order to have spending which can perhaps increase growth rates by investing in capital, providing

public goods and fixing market failures or externalities. Most would agree that some taxes and some spending are essential to economic growth, but nobody is clear on where the negative economic effects of increasing taxes start to outweigh the positive effects of increasing state spending. Some would even say that at current levels of state spending, additional spending may have a negative affect on the economy. Government transfers may warp incentives sufficiently to actually decrease productivity. Finally, some standard economic models predict that the levels of taxing and spending should have no effect whatsoever on economic growth and that only changes in taxing and spending will have some effects in the short term, with no long term effects.

In general, the two major political parties in America differ in their desirable levels of taxing and spending. Republican governments tend to favor low taxes and low spending on the basic premise that individuals know better what to do with their money than an inherently inefficient government does. On the other hand, Democratic controlled governments tend to demand higher levels of government services, in other words more government spending, which must be financed with higher taxes. Governments with high taxes and high expenditure are called “big” governments, while those with low taxes and low expenditure are called “small.”

Federal fiscal policy in the Reagan era is an example of Republicans favoring smaller government. The fundamental principle of Reaganomics was that lowering overall tax rates, especially quite high marginal tax rates would provide more incentive for work and investment, boosting economic development the benefits of which would trickle down to all citizens. While Reagan did manage to cut taxes, he failed for various reasons to curb spending perhaps showing that politically it is much more challenging to

lower expenditure than to lower tax rates. However, the point is that fiscal policy is a challenge faced by governments of all sizes, both at the federal and state levels. Nearly all the tenets of sound fiscal policy discussed in this paper should apply in principle to both realms.

Hardly anybody in the world enjoys paying taxes, yet they must be endured in order to fund government expenditure. Even the smallest government must provide public goods to its citizens. These include roads, airports, and schools, things which everyone desires to have but are too large a project for a private market to undertake given that the benefits are spread out among so many people. In addition, states must carry out functions that society has deemed too important to be left to private markets, such as provision of police protection, fire protection, a court system, and health care.

In 2003 U.S. state and local governments spent over two trillion dollars. The biggest share, over 29%, was spent on education, 13.7% was devoted to public welfare programs, 7.2% to hospitals and health care, 5.6% to highway maintenance and construction, 3.1% to police, 2.6% to corrections facilities, and 1.3% to fire protection. Numerous other spending categories took up smaller shares of the budget including judicial and legal provisions, public buildings, and waste management among others. The budget illustrates the wide variety of functions state governments carry out.

There are also a variety of taxes that fund the various expenditures listed above. In 2003, the most important category was sales tax, which generated 35.8% of state and local tax revenue. Property taxes accounted for 30.8%, individual income taxes for 22.4%, license taxes for 4.1% and corporate taxes accounted for 3.1% of total tax revenue. Not all states have the same distribution of taxes. For example, Florida has no

income tax. While income and corporate tax is collected primarily by state governments, property taxes are collected almost exclusively by local governments. In addition, states have various non-tax revenue generating measures such as federal grants in aid, and charges to schools, hospitals, waste management and other services. In 2003, about half of revenue generated came from taxes.

Tax rates in themselves are not very concrete. Sales and property taxes vary from city to city within a state. Income and corporate tax rates are not flat but progressive so that the marginal tax rate on high incomes is higher than on low incomes. This is important because, while this study largely ignores how progressive state tax structures are, other studies have shown a correlation between high progressivity and lowered economic growth (Sobel et. al 2004).

Assessing the impact of state fiscal policy on economic growth is a difficult task because there are many factors that affect growth much more than tax rates. Savings rates, the size and growth of the labor force, education levels, population, housing prices, ethnic diversity, global economic conditions, energy prices, and sectoral shifts are just some such factors. State governments can also affect economic growth through non-fiscal legislation such as environmental regulations and minimum wage laws that may have greater effects on business location decisions than tax rates.

Finally, the U.S. states are not closed economies. While fiscal policy can affect state economic growth by changing incentives for investment or labor or by possibly creating distortionary effects or by providing needed infrastructure, it can also affect fiscal policy by influencing the decisions of people and firms to enter or leave a state. All other factors being equal, businesses will prefer to operate in low tax states, so there is a

sense of competition between states for attracting job creating firms. Such competition has birthed a range of tax incentives various states have created in order to attract businesses to help one state grow at the expense of another. Many studies have been done on the effects of tax incentives on job creation and state growth including how a state's economic performance might be as affected by its own tax policies as the tax policies of its neighbors.

This paper will explore the effects of the overall size of government measured by the magnitude of its fiscal policies on economic growth. The following section reviews the literature in the field.

2. Literature Review

The Solow model, or neoclassical model, is the most common economic tool used to predict macroeconomic growth. The model assumes that output is a function of labor and capital accumulation and that the investment rate and the labor force growth rate are exogenous. Solow begins with a Cobb-Douglas production function

$$Y = AK^\alpha L^{1-\alpha}$$

where Y is output, K is capital, L is labor and A represents productivity or technological progress. Because we are usually interested not in total output but in output per worker, it is common to write the above equation in per worker terms by dividing through by L.

$$y = Ak^\alpha$$

In the Solow model, capital is constantly being created through investment and constantly destroyed through depreciation. It is assumed that there is a constant exogenous savings rate so that a set proportion of output is invested to contribute to capital accumulation.

Thus

$$\begin{aligned} I &= sY \\ \Delta K &= I - \delta K = sY - \delta K \end{aligned}$$

where I is investment, s is the exogenous savings rate and δ is the depreciation rate of capital. We use the above to find an expression for the change in capital per worker.

$$\begin{aligned} \Delta k &= \Delta\left(\frac{K}{L}\right) = \frac{L\Delta K - K\Delta L}{L^2} = \frac{\Delta K}{L} - \frac{K}{L}\left(\frac{\Delta L}{L}\right) \\ &= \frac{sY - \delta K}{L} - \frac{K}{L}\hat{L} \end{aligned}$$

The growth rate of capital per worker can then be derived by dividing through by k.

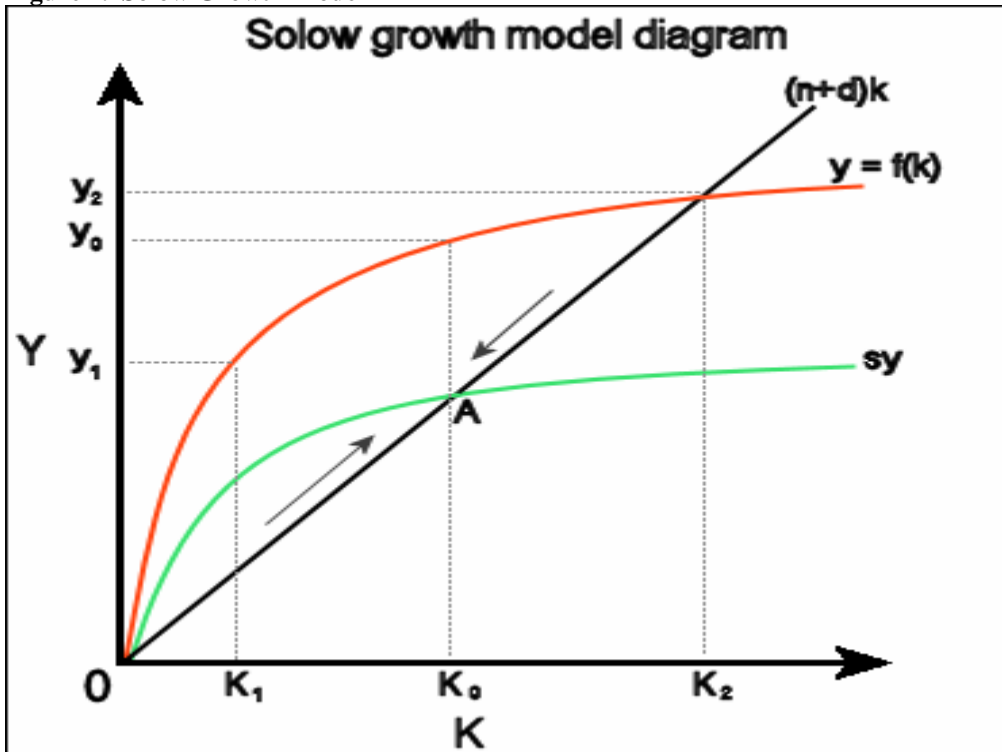
$$\hat{k} = \frac{\Delta k}{k} = \frac{\Delta k}{K/L} = s \cdot \frac{A}{k^{1-\alpha}} - \delta - n$$

where n is the exogenous growth rate of the labor force. The above can be more simply written as

$$\hat{k} = sf'(k) - (\delta + n)$$

This is one of the major results of the Solow model. Using this, we can analyze steady states of the economy in which capital per worker and output per worker remain constant, which happens whenever $sf(k) = (n+\delta)k$. There is an equilibrium because whenever $sf(k) > (n+\delta)k$, Δk is positive, resulting in an increase in k , which lessens $sf(k) - (n+\delta)k$. The steady state can be seen graphically below. When the economy is in steady state, the growth rate in output is constant and equal to the growth rate of the labor force.

Figure 1. Solow Growth Model



Courtesy of Wikipedia.org. K_0 represents the steady state level of capital. If the level of capital is less than K_0 , say at K_1 , then it will increase until it reaches K_0 . Similarly, if the level of capital is above K_0 , it will decrease until it approaches K_0 from the left.

Thus the main implication of the Solow growth model is that very little can affect the long run growth rate of output. Change in levels of K or L, or changes in the exogenous savings rate, s , can only have effects on short run growth or steady state *levels* of output. They cannot affect the long run, steady state growth of output.

Many studies have confirmed that the Solow model is decent at predicting long run differences in the level of output across countries, although often instead of using labor as an input into the Solow model, economists use effective labor, which is labor weighted by other factors such as education which could have a bearing on how effective each unit of labor is at producing output. Mankiw Romer and Weil (1992) studied the

implications of the Solow model at a time when it was being written off as inferior to endogenous growth models which allowed for interactions between labor and capital. Endogenous growth models, unlike the Solow model, predict that differences in capital across countries can affect long run output growth rates rather than just long run levels of growth. However, Mankiw, Romer and Weil conclude that Solow should be taken seriously. The Solow model has clear, concrete and testable predictions about how the investment rate and population growth affect long run steady state output, and testing these predictions, Mankiw et al. find that those two variables alone account for over half the variability in output across countries. Furthermore, when the authors use effective labor in the Solow model by taking education levels into account, they find that the model predicts nearly eighty percent of the variation between countries. Thus, this study suggests to us both that the Solow model is satisfactory for predicting macroeconomic growth and that education should be accounted for in an accurate model.

Holtz-Eakin (1993) studies the effects of capital investment on state growth in the context of the Solow model. The Solow model predicts that the long run level of output per worker should depend on the investment rate, but that the long run growth rate of output per worker should not. He finds using panel data from 1973 to 1986 that a state's investment rate affects that state's economic output in a manner consistent with the Solow model. In addition, he also finds along with Mankiw et. al (1992) that human capital plays an important role in predicting growth in the augmented Solow model.

Because there are diminishing returns to capital in the Solow model, the model predicts that countries with high levels of output per worker should grow more slowly than countries with low levels of output per worker. In addition, if there can be

movement of capital or labor across borders, both should move from countries with high levels of capital and labor to countries with lower levels because the rate of return to those factors of input is higher in countries with lower levels. Thus, we should observe evidence for convergence in levels of output per worker; we should see rich countries growing more slowly than poor countries.

Barro and Sala I Martin (1990) check for evidence of convergence across the U.S. states from the 1840s through the 1970s. They find that indeed there is strong evidence for convergence, but in order for their data to match quantitatively with the neoclassical model, they must assume a capital share of .8, which is much higher than standard levels. However, the authors argue that that figure can be thought of as encompassing a broad range of capital including human capital which would make it not so unreasonable to have a capital share that high. Hence Barro and Sala I Martin find further evidence to support the Solow model as it applies to growth in the U.S. states and remind us again of the importance of controlling for education levels.

While the rest of this paper will be concerned with the neoclassical growth model, the other leading growth model deserves mention. Endogenous growth models do not assume as the Solow model does that the investment rate and the labor force growth rate are exogenous nor that labor and capital enter into the production function in a separable, Cobb-Douglas manner. As a consequence, it is not necessary that there be diminishing returns to capital, and because there are no diminishing returns, there is no reason that poor countries or states should grow faster than rich ones. Barro (1990) provides an interesting extension of endogenous growth models to include government taxation and spending and finds some empirical support for them.

Tomljanovich (2004) points out that the troubling aspect of the Solow model for those who wish to study the effects of state fiscal policy is that the model predicts that taxes and spending should have no effect at all on long run growth rates. Even if taxes can affect factor inputs such as labor or capital or if they can have an effect on the investment rate, this should only have an effect on long run levels of output and short run growth rates. However, it is important to stop and consider just how short the short run may be in terms of state growth. Holtz-Eakin (1993) estimates that on average it takes 15.1 years for a state to adjust half of the way toward its steady state. Mankiw, Romer and Weil (1992) estimate that for countries in their data set it takes 38 years to adjust halfway to the steady state, the extra time probably due to less mobility of capital, labor and technology across borders as compared to U.S. states. In any case, the time it takes to converge to a steady state is much greater than the office stays of governors or state legislators and greater than the duration of business cycles or macroeconomic shocks. And because various shocks or some policies might change the steady state, it is possible that states never actually reach steady states and thus short and medium run growth rates are important.

Engen and Skinner (1996) outline five ways in which fiscal policy may affect economic growth through the Solow model. They begin with a standard Solow model that is log-linearized to relate growth rates.

$$\dot{y} = \alpha \dot{k} + \beta \dot{l} + \mu$$

In the above expression, α represents the marginal productivity of capital, β represents the marginal productivity of labor and μ represents growth in overall productivity.

The first way in which taxes can affect the above equation is by affecting growth in the capital stock, \dot{k} . High corporate taxes, income taxes, or capital gains taxes could all discourage investment and lower growth in the capital stock. Likewise, low depreciation allowances in the tax code can discourage investment and effect the equation through this variable.

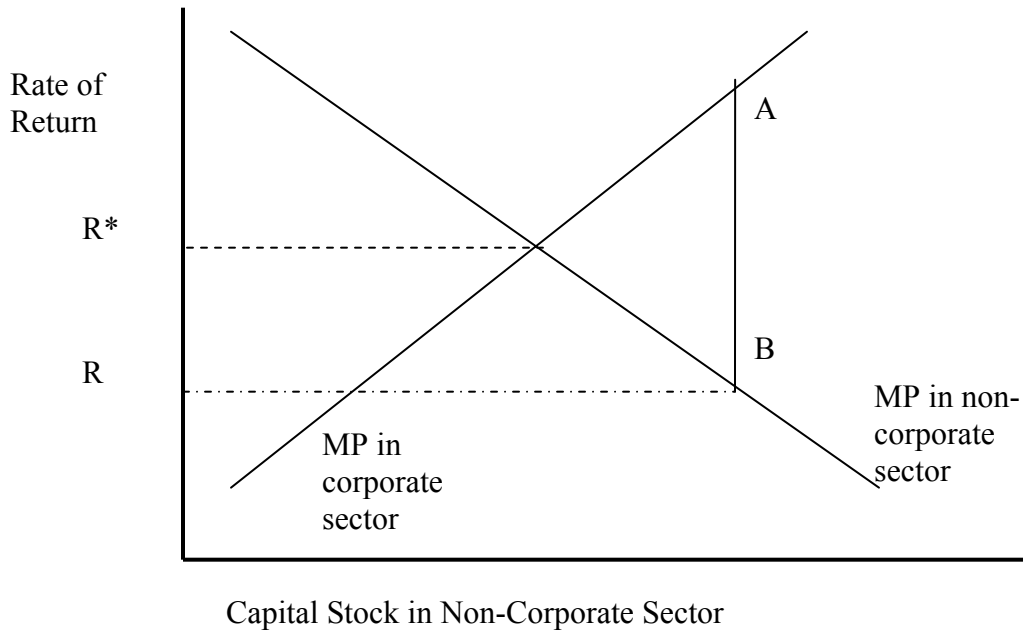
Secondly, taxes can affect output growth through an affect on the labor force. High income taxes might discourage people from working, pushing them to cut back on hours or retire early. In addition, if we think of \dot{l} as the growth in the *effective* labor force, then taxes can have an effect on people's decisions to pursue education or training.

Furthermore, Engen and Skinner point out that taxes can have a negative impact on productivity or technological growth, μ . Corporate taxes might discourage research and development in high-tech businesses which may have an effect on overall growth in technological development throughout the state. Government spending toward public research in development might increase μ .

The final two ways in which tax policy can affect output growth involve ways in which taxes distort the efficient allocation of factors of production across sectors. Engen and Skinner use as an example a hypothetical case in which there is a corporate and a non-corporate sector. In the absence of taxes, capital will be distributed between the two sectors so that the marginal return to capital between them is equal. This corresponds to a rate of return R^* in figure 2 below. If instead, there is a tax on the corporate sector in the amount AB , the after-tax marginal productivity of capital in the corporate sector falls. When the after-tax rate of return to capital in the two sectors is equalized, a greater share of capital is allocated to the non taxed sector as compared to the situation with no taxes.

We see that in this circumstance, the rate of return to capital is R , which is less than R^* . The taxes have distorted returns to encourage suboptimal allocations of factor goods. Distortionary effects in the labor market occur in similar fashion. Thus, tax policy can affect the coefficients α and β in the basic Solow equation.

Figure 2. Distortionary Effects of Taxes



Engen and Skinner (1993) outline three different methods for analyzing the effects of fiscal policy on economic growth in the context above. They look at anecdotal evidence, cross-country analysis, and sectoral studies.

The easiest way to analyze the effects of fiscal policy is to look throughout history for periods of high growth and see what taxes were like in those periods. Similarly, look for periods with abnormally high or low taxes and see what growth was like in those periods. For example, Engen and Skinner (1993) point out that the 1964 Kennedy-

Johnson tax cuts were followed by a five year period of over 4.5% growth, perhaps suggesting that lowering taxes might stimulate economic growth. However, Engen and Skinner rightly point out that growth was very high in the two years prior to the Kennedy-Johnson tax cuts as well. Thus it is very hard to point to changes in the tax rate as causing changes in growth.

The obvious problem is that many factors affect growth, not just fiscal policy. For example, Engen and Skinner point out that the period in U.S. history that saw the highest growth rates was 1940-1945, a time when taxes were very high. Yet it would be silly to conclude simply from those data that increases in taxes caused the high growth.

Furthermore, changes in the tax rate are likely to produce changes in growth rates on the order of .5 percentage points in a given year. This might be too small to observe looking at short term case studies, since these small effects are dwarfed by macroeconomic shocks. The problem is made even worse when analyzing state level data because changes in state fiscal policy have an even smaller effect on growth rates compared to the larger effects of shocks or federal fiscal policy.

Genetski and Chin (1978) wrote one of the earliest papers studying the correlations between tax policy and economic performance in the U.S. states. They simply plotted each state's relative economic growth measured by personal income against the state's average tax burden for the years 1969-1976. They found no relationship between economic growth and average tax rates, but they did find a relationship between growth and *changes* in tax rates. They found that states with higher than average increases in tax rates had lower than average growth and similarly that states with higher than average growth had lower than average increases in tax rates. Genetski

and Chin's study in no way proves that changes in tax rates cause changes in growth rates, but it shows a correlation that perhaps we can explain using more advanced statistical methods.

The second type of study Engen and Skinner (1993) analyzed were studies of cross-country regressions that try to explain why some countries grow faster than others. Genetski and Chin's 1978 study falls somewhere between this category and the category of anecdotal evidence since although it does compare a cross-section of states, it fails to control for any other factors that might affect growth. The advantage to cross-country or cross-state analysis is that there is often much larger variation in both fiscal policy and growth rates across countries than there is within a country over time. The problem with cross-sectional studies, however, is that it is unclear exactly what the equation should be for relating growth and fiscal policy. Most studies have tax rates and government spending enter linearly into a regression equation, but it is unclear whether this is necessarily the correct model.

Helms (1983) was one of the first to explore such a linear model. Using panel data from the 48 contiguous U.S. states over the period 1965 to 1979, Helms regresses growth in personal income on various sources of revenue such as property taxes, various expenditures such as health and highways, and various demographic characteristics such as education level. Because he includes in the regression every category of revenue, every category of expenditure except transfer payments, and the annual deficit, the coefficients in his regression represent the effects of reallocating money to transfer payments. For example, Helms finds a coefficient of -0.121 on his measure of property taxes and concludes that raising the property tax by 1 dollar per thousand dollars of

personal income and spending the revenue on government transfers results in a .121% decrease in the growth rate of personal income for that year. Likewise, the coefficient on health expenditure for example represents how growth changes if expenditures were allocated to transfer payments rather than health.

Helms (1983) concludes that fiscal policy does have a measurable effect on state economic growth and further that the effectiveness of tax policy depends crucially on how the revenue is spent. A balanced budget increase in taxes used to finance infrastructure has a positive net effect on growth, while a balanced budget tax increase used to finance transfer payments has a negative impact on growth.

Helms (1983) uses two staged instrumental variables with lagged personal income as instruments to account for potential endogeneity of tax and expenditure variables. However, Helms' model omits many factors that presumably have strong effects on growth rates such as investment and labor levels or rates, which suggests that there may be some misspecification error.

Tomljanovich (2004) explores panel data from the U.S. states between years 1972 and 1998. Using a dynamic time-series model, he concludes that although average tax rates can have an affect on short run economic growth for one to two years, they have no effect on long run growth. Only in one specification does he find taxes to have a significant negative effect on long run growth and that specification ignores state and time effects that probably should not be ignored. Including dummies for state and time effects makes all tax variables insignificant. When Tomljanovich disaggregates tax and expenditure categories, he finds that the only significant tax variable is the corporate tax rate and that the coefficient is positive, meaning that increases in the corporate tax rate

yield long run increases in state growth rate, a confusing result in light of the theory we have just seen. On the expenditure side, Tomljanovich finds that only welfare expenditure is significant and has a very negative impact on growth rates.

Exploring the idea that fiscal variables might not enter linearly into a cross-country estimation, Engen and Skinner (1993) develop a growth model including fiscal policy using a generalized production function, the advantage of which is that they do not need to take a stance on whether there are diminishing returns to capital. In addition, they do not need to assume that the economies they study are in a steady state. The central idea behind Engen and Skinner's model is that government spending and taxation will affect growth rates through modifications of the returns to capital and labor, distortionary effects. They estimate that growth is mainly determined by the labor force growth rate and the investment rate, and that the marginal rates of return to these two factors are functions of government spending and taxation. They estimate the model

Equation 1:

$$\frac{\dot{Y}}{Y} = \bar{\alpha}\left(\frac{I}{Y}\right) + \bar{\beta}\left(\frac{\dot{L}}{L}\right) + \bar{\Theta}(\dot{g}) + \bar{\omega}(i) + \delta_1\left(g\frac{I}{Y}\right) + \lambda_1\left(t\frac{I}{Y}\right) + \delta_2\left(g\frac{\dot{L}}{L}\right) + \lambda_2\left(t\frac{\dot{L}}{L}\right) + \delta_3(ti) + \lambda_3(gi) + \delta_4(g\dot{g})$$

where I is investment, Y is gross state product, g is government share of expenditure, t is the tax rate and a dot on a variable represents the change in that variable. Furthermore, the coefficients on the first two variables are expressed as functions of fiscal variables as follows.

Equation 2:

$$\begin{aligned}\alpha_i &= \bar{\alpha} + \lambda_1 t_i + \delta_1 g_i \\ \beta_i &= \bar{\beta} + \lambda_2 t_i + \delta_2 g_i \\ \omega_i &= \bar{\omega} + \lambda_3 t_i + \delta_3 g_i \\ \Theta_i &= \bar{\Theta} + \delta_4 g_i\end{aligned}$$

Equation 3:

$$\frac{\dot{Y}}{Y} = \alpha(g, t) \frac{\dot{K}}{Y} + \beta(g, t) \frac{\dot{L}}{L} + \Theta(g) \dot{g} + \omega(g, t) \dot{t}$$

Applying the above specification to purely cross-sectional data on 107 countries using average variables over the years 1970-1985, Engen and Skinner (1992) calculate long run affects of fiscal policy on growth by plugging estimated coefficients from equation 1 into equation 2 and then using mean values of investment and labor to calculate the effects on growth in equation 3.

Engen and Skinner (1992) add to their specification the literacy rate and the average fraction of the population enrolled in secondary school to account for human capital that may be correlated with the error term in their model. In addition, they include the log of GDP in the year 1970 to control for convergence, that countries with low levels of GDP will have higher growth rates. In addition, to control for possible simultaneity bias or endogeneity problems, they include the tax rates and expenditure shares in 1970 as instruments.

Although Engen and Skinner (1992) find very few coefficients to be significant beyond the 10% level, they estimate that a 10 percentage point balanced budget increase in the average tax rate will decrease output growth by 1.4 percentage points.

A final way to go about estimating the effects of fiscal policy on state economic growth is to calculate individually the effects fiscal policy has on the investment rate, the labor force, and technological progress, then sum the disaggregated effects. This

approach, while perhaps being the most theoretically sound, is not without its problems. To begin with, it ignores completely the distortionary effects of taxation on the economy. Secondly, instead of estimating one parameter, this method involves separately estimating three different ones, each of which has measurement error. Also, the parameters aren't always very easy to estimate. For example, nobody really knows how changes in fiscal policy affect changes in human capital formation even if we have some notion of how they might affect narrowly defined capital formation. Surveying the literature of this approach, Engen and Skinner (1993) report that a rise in the tax rate of 2.5 percentage points decreases long run growth rates on the order of .25 percentage points.

I have not mentioned time series analysis because such analyses are rarely done except in the context of panel data where cross-sectional variation is used as well. Engen and Skinner (1993) suggest that time series methods are best suited for assessing short-term effects, but that in the case of assessing fiscal policy they fail because policy effects are small relative to unmeasured economic factors.

There has been no mention as of yet of the effects of running a budget deficit on growth rates. It seems plausible that countries in high debt might grow at slower rates than countries with no debt. However, in analyzing state data we may be able to skirt this issue as most states do not run large deficits and tend to have balanced budgets. Poterba (1995) reports that 49 out of 50 states have some kind of balanced budget requirement and that 37 of those require the legislature to enact a balanced budget. In a separate article, Poterba (1994) submits that when unexpected deficits arise, states react quickly

with lowered expenditure in the same year followed by raised taxes in the next year.

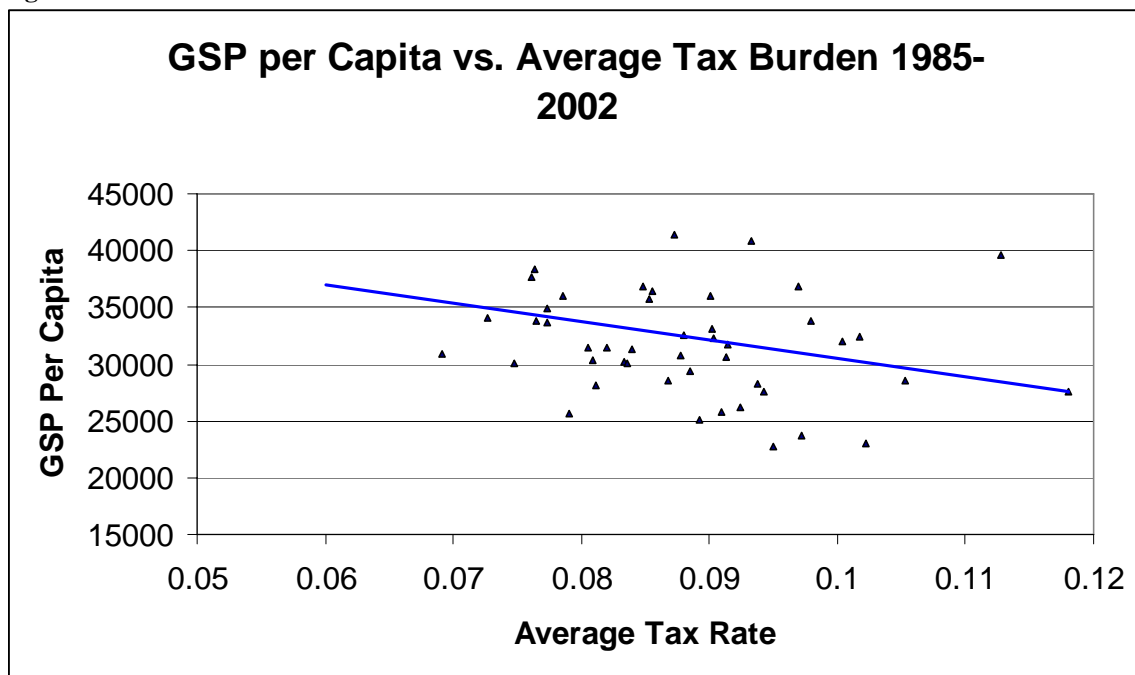
Thus for the most part, deficits do not play a huge part in state fiscal policy.

3. Preliminary Analysis

I begin by making some initial observations about state growth and taxation over the period 1985 to 2002. I use GSP data from the Bureau of Economic Analysis, population data from the U.S. Census Bureau, and state financial data from the U.S. Census Bureau's State and Local Government Finances database.

First, an initial plot of GSP per capita against the average tax burden, measured as the average over the observed years of tax revenue divided by gross state product (GSP), shows a slightly negative relationship.

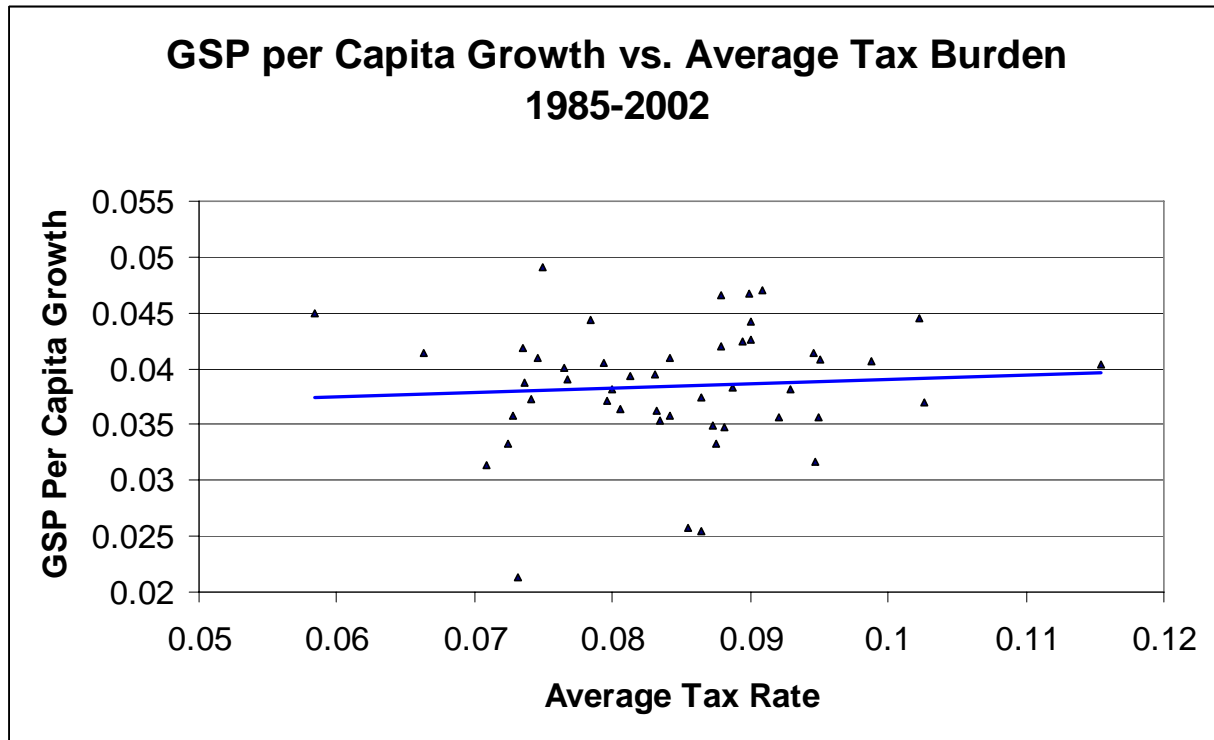
Figure 3.



On average, states with high tax rates over the period 1985-2002 tended to have lower GSP per capita than states with low tax rates. This suggests, as the Solow model predicts, that tax rates might have some effect on long run output levels.

We can then take a look at the correlation between GSP growth rates over this period and tax rates to see if there seem to be any long run effects of fiscal policy on growth.

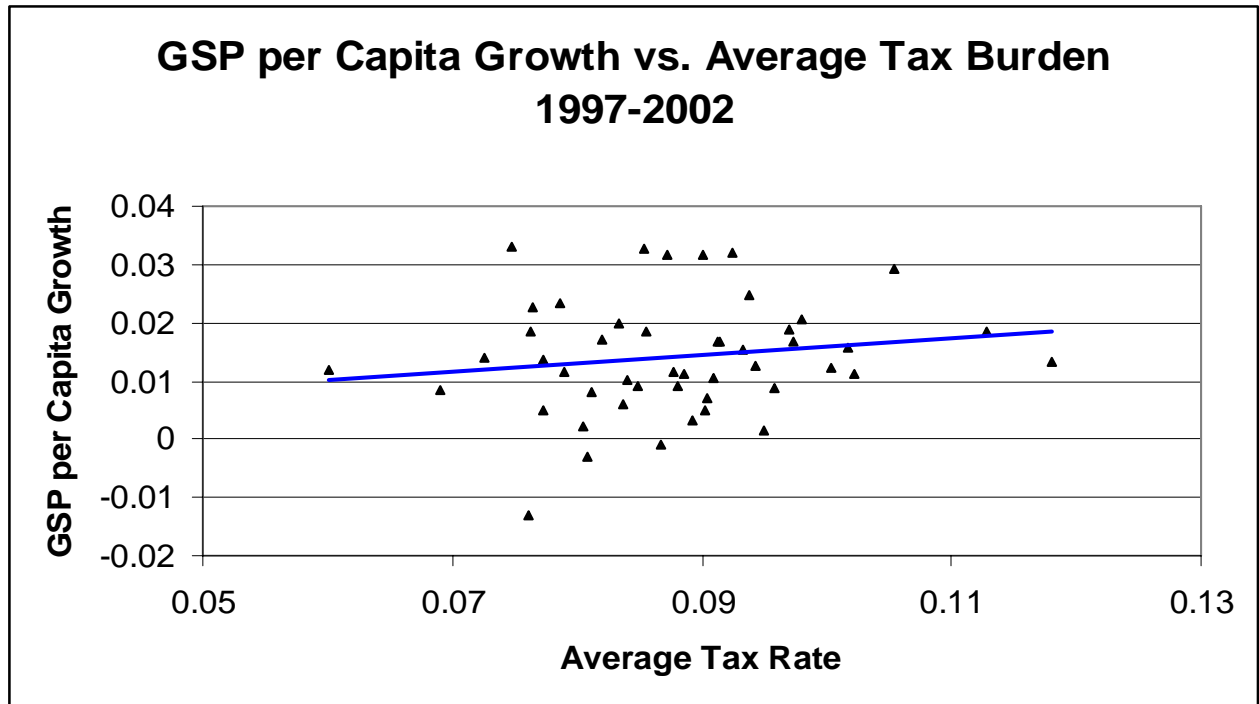
Figure 4.



There appears to be very little correlation between growth rates and tax rates, or possibly even a small correlation in the unexpected direction that higher taxes tend to be associated with higher growth rates. This is perhaps again evidence in favor of the Solow model, which predicts that there should be no long run effects of fiscal policy on growth rates. However, this is a bit puzzling since most of the literature finds there to be at least some negative effect of tax rates on growth. It is possible that the 18 year period of 1985-2002 is long enough that all states are on an equilibrium, steady state path, and that perhaps there is a correlation between growth and taxation for shorter time periods. We

investigate the possibility of a short-term effect by looking at data from the period 1997-2002.

Figure 5.



Again, we find surprisingly that there is a small *positive* correlation between the average tax rate and GSP per capita growth over the period. This result is not consistent with growth theories that predict that all else being equal, taxes should dampen growth. Of course, in these simple plots all things are not equal. States with higher tax rates almost undoubtedly spend more and perhaps this spending is causing us to see high growth rates.

However, there is an even more interesting wrinkle that isn't obvious at first glance. While many studies reporting negative effects of fiscal policy on growth in GDP per capita study data from a sample of countries, this study is focusing on data from the U.S. states. There is a key difference in the mobility of people in the two different data

sources. There are extensive barriers to moving between countries as languages, customs, values and governments are largely different across borders. However, very few obstacles hinder migration between U.S. states. Thus, we can expect that there might be a flock of people migrating from high tax states to low tax states, which could make high tax states artificially seem better off since their output per person is higher with fewer people. Whereas in cross country analyses there is presumably only a small difference between effects on GDP and effects on GDP per capita, in a cross-state analysis mobility might suggest a larger dispersion between the two measures of growth.

Figure 6.

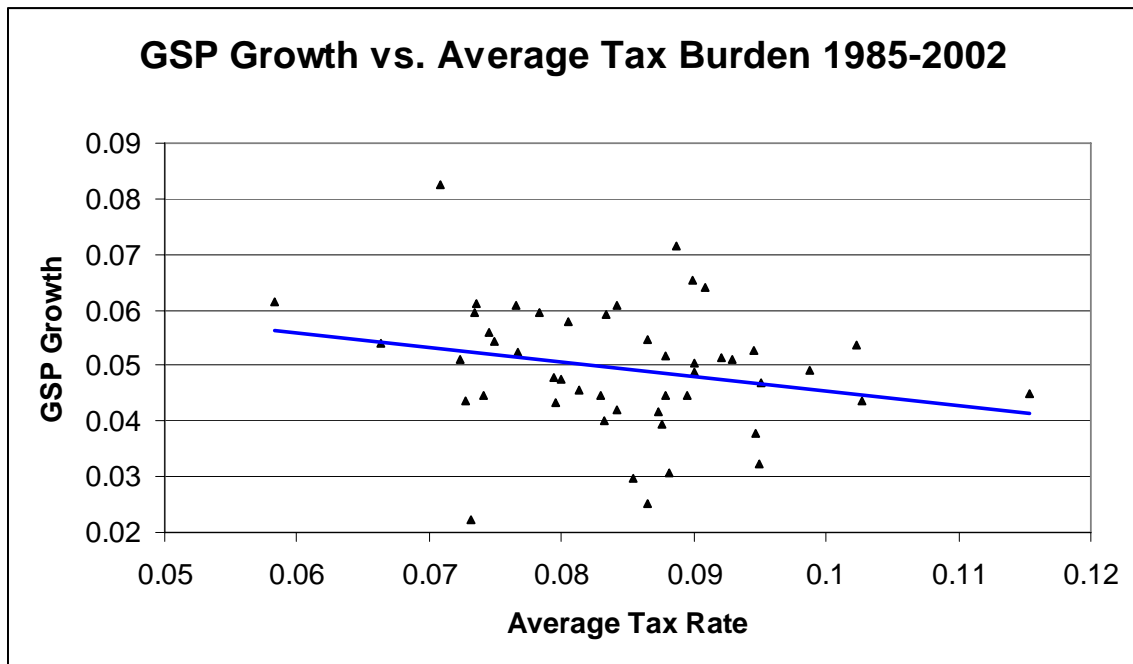
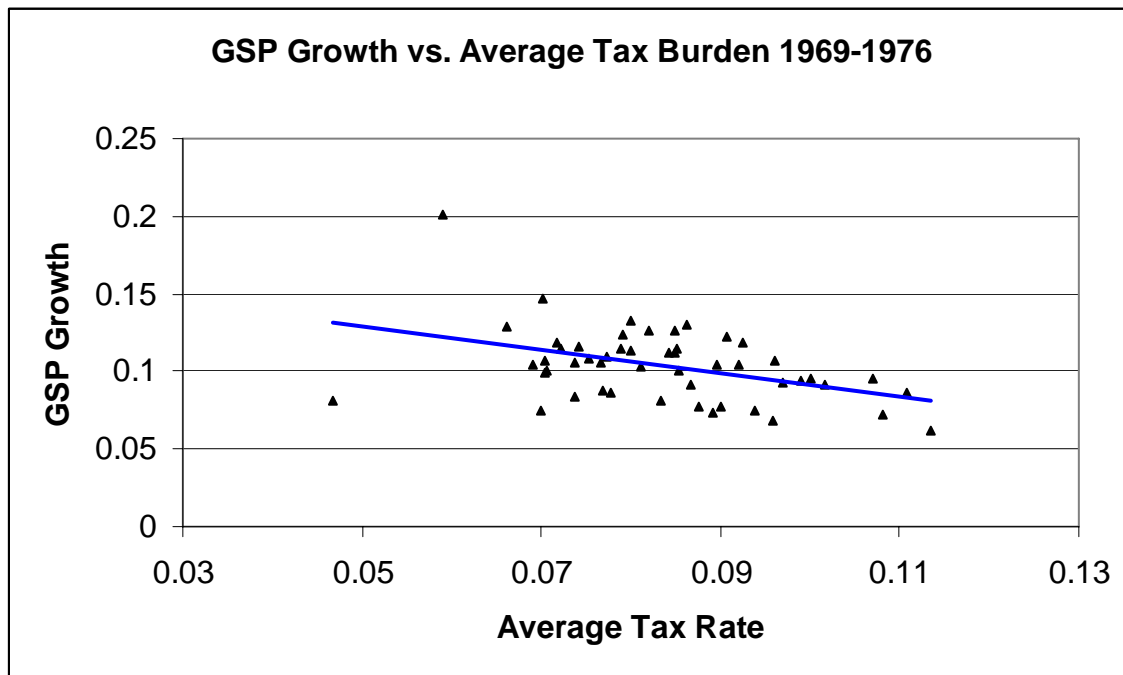


Figure 6 shows a negative correlation between long run GSP growth rates and average tax rate in stark contrast to the slightly positive correlation we saw with GSP per capita growth rates. Factor mobility makes our analysis quite a bit more complex as it is clear we might have to separate out effects of fiscal policy on the usual determinants of growth and effects of fiscal policy on migration across state borders.

Figure 6 is at odds with Genetski and Chin (1978) who find no correlation between economic growth (as measured by growth in personal income) and average tax rates over the period 1969-1976. Figure 7 shows a plot of average tax rates and GSP growth for the period Genetski and Chin examined.

Figure 7.



There appears to be a nontrivial correlation, contrary to Genetski and Chin's findings. Although Genetski and Chin (1978) use personal income instead of gross state product in their analysis, these two measures of output should not be sufficiently different to change the result, especially when looking at growth rates. More likely the difference stems from a discrepancy in the definition of average tax burden. I calculate the average tax rate to be total state revenue from taxes divided by gross state product for any given year. This purposefully ignores revenue from state college tuition, school lunch sales, sewerage and waste management fees, hospital fees, and the like, because I claim these indirect collections do not have the same distortionary effects as direct taxes. It is,

however, quite unnerving that different definitions of overall tax burden can lead to different qualitative results.

The main result of Genetski and Chin (1978) is that changes in tax rate are much more heavily correlated with growth than levels of the tax rate. Because I use a different, less inclusive definition of average tax rate, it is worthwhile to check whether their results can be reproduced with my data.

Figure 8.

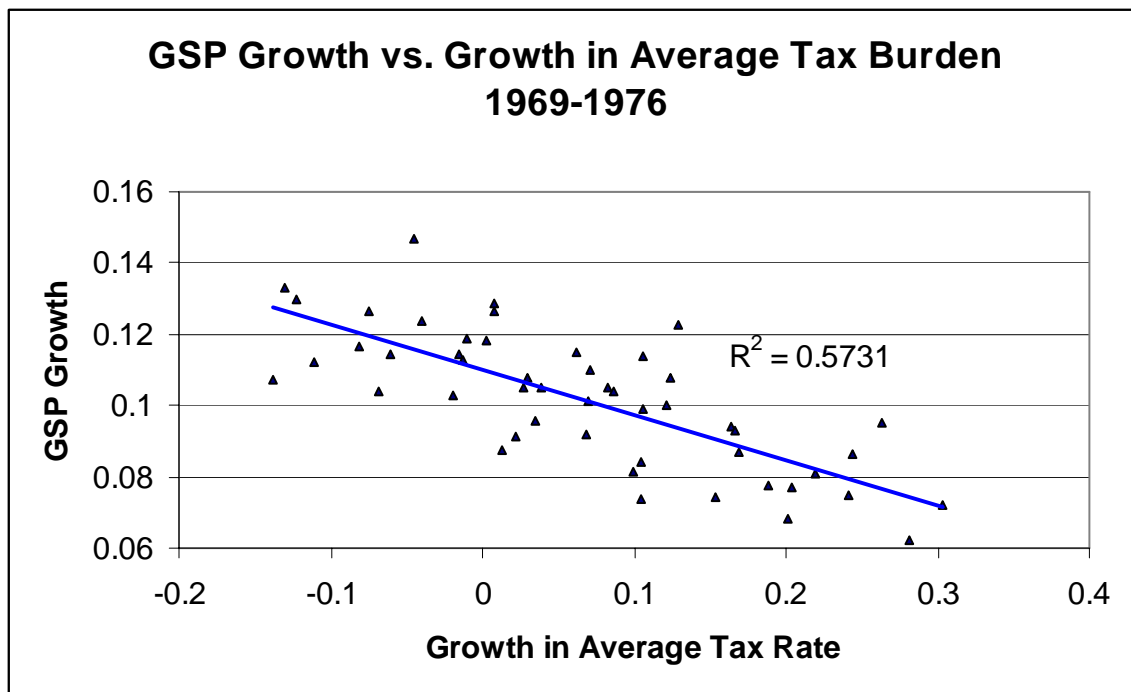
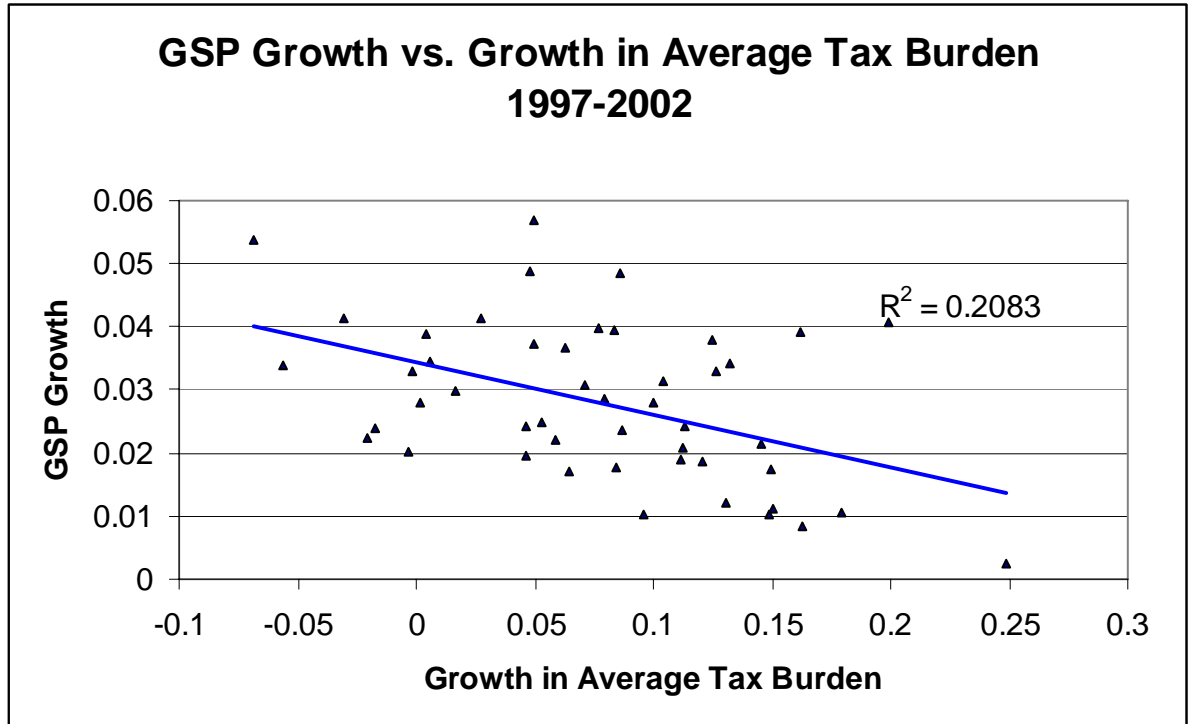


Figure 8 shows an obvious negative relationship between changes in the tax rate and growth rates over the period Genetski and Chin studied, using a strict definition of the average tax rate. Changes in the average tax rate account for over half of the variation in growth rates.

This correlation is not specific to the period. Figure 9 plots the same variables for the recent period 1997-2002. The same negative correlation is readily apparent although

growth in tax rates is less explanatory in this period than in the period Genetski and Chin analyzed, only accounting for a fifth of the variation in growth.

Figure 9.



Though the analysis so far has not involved any statistical techniques nor accounted for any confounding factors, an initial look at the relationship between tax policy and economic growth seems to suggest that states with higher taxes grow more slowly than states with low taxes, and perhaps more strongly that changes in tax rates slow economic growth. That changes in the average tax rate should have a negative effect on growth is consistent with the neoclassical growth model. A rise in taxes may depress investment rates causing a change in the long run steady state level of output, thus leading to a short run growth slowdown. It is less easy to explain the effect of the level of taxation on growth rates in the context of the Solow model, but presumably states that live with distorted markets due to high taxes may have more difficulty growing than

states with low tax rates. Also, as we have seen, in the U.S. states tax rates seem to have an effect on inter-state migration. Since the Solow model predicts that steady state output grows at the rate of labor force growth, it is not surprising to see higher growth in low tax states to which people are immigrating. Finally, in further statistical analysis it seems prudent to look at both levels of fiscal variables and changes in those levels.

Initial correlation plots are helpful for orienting oneself with the data, but they do not control for many other factors that could be correlated with both economic growth and tax rates. In addition, there are endogeneity problems such as the fact that states with high growth rates might tend to have lower average tax rates simply because average tax rates are calculated as revenues divided by gross state product. Having a higher gross state product with revenues held constant will mean lower average tax rates. To correct for some of these problems to gain a deeper understanding of the effects of fiscal policy variables on growth, we turn to some statistical models.

4. Data and Estimation

We now turn to more rigorous statistical models to determine more accurately the effects of fiscal policy on state economic growth. I analyze two models. In the first, I put purely cross-sectional data from 1997 to 2002 into the model estimated by Engen and Skinner (1992). Engen and Skinner found their model to be robust in their analysis of 107 countries, so it is hopeful that a similar model could accurately represent growth in the U.S. states.

Secondly, I try to separate out the effects of different types of taxes and expenditure by estimating a linear model using time series data from 1977 to 2002. Time series provides many more observations than pure cross-sectional data which allows for precise estimation of disaggregated tax policy variables.

Cross-Sectional Model

In a 1992 study, Engen and Skinner examined the growth of 107 countries, modeling output growth as a function of taxed and untaxed capital, taxed and untaxed labor, and government expenditure. From this assumption they derive an estimable equation in which fiscal policy variables enter nonlinearly. While most studies add fiscal policy variables into a linear equation, there is no theory to support doing so, which motivated Engen and Skinner to develop the following equation from their initial assumption. Variable symbols and descriptions are given in table 1.

Equation 1:

$$\frac{\dot{Y}}{Y} = \alpha(g, t) \frac{\dot{K}}{Y} + \beta(g, t) \frac{\dot{L}}{L} + \Theta(g) \dot{g} + \omega(g, t) \dot{t}$$

We see immediately that this growth equation closely resembles the neoclassical growth model although with added terms consisting of the growth in government spending and the growth in taxes. In addition, Engen and Skinner assume that the usual coefficients α and β representing the marginal productivity of capital and labor respectively, are not constants but in fact functions that depend on fiscal variables g and t . Fiscal policy may distort markets in a way that changes the rate of return to capital or labor, and these functional coefficients seek to encompass those effects. Explicitly, the coefficients are represented as linear functions as follows.

Equation 2:

$$\begin{aligned}\alpha_i &= \bar{\alpha} + \lambda_1 t_i + \delta_1 g_i \\ \beta_i &= \bar{\beta} + \lambda_2 t_i + \delta_2 g_i \\ \omega_i &= \bar{\omega} + \lambda_3 t_i + \delta_3 g_i \\ \Theta_i &= \bar{\Theta} + \delta_4 g_i\end{aligned}$$

Plugging equation 2 into equation 1 and simplifying yields the final estimable equation.

Equation 3:

$$\frac{\dot{Y}}{Y} = \bar{\alpha} \frac{I}{Y} + \bar{\beta} \frac{\dot{L}}{L} + \bar{\Theta} \dot{g} + \bar{\omega} t + \delta_1 g \frac{I}{Y} + \lambda_1 t \frac{I}{Y} + \delta_2 g \frac{\dot{L}}{L} + \lambda_2 t \frac{\dot{L}}{L} + \delta_3 t t + \lambda_3 g t + \delta_4 g \dot{g}$$

The coefficients of interest are δ_1 , δ_2 , λ_1 , and λ_2 , but they cannot be interpreted except in the context of equation 2. Looking at equation 2, we can see that the sum $\lambda_1 + \delta_1$ represents the effect on α of a balanced budget increase in taxes and spending. Similarly, $\lambda_2 + \delta_2$ is the effect of a balanced budget increase in fiscal activity on the marginal product of labor, β . The effect of fiscal policy on growth is then the combined changes in α and β multiplied by the growth in their respective factor inputs.

Equation 4:

$$\Delta \frac{\dot{Y}}{Y} = \Delta \alpha \cdot \frac{I}{Y} + \Delta \beta \cdot \frac{\dot{L}}{L}$$

Since Engen and Skinner's work suggest that this model works well for international data, it may work well for state data as well. We might expect coefficients in the same ballpark or at least with the same signs. Also, this model was robust to adding a variety of explanatory variables such as literacy rate, percentage of people completing secondary school, and percent of the population that is of working age, which suggests that it works well. If it is to be a good model for the U.S. states, it must be robust to small changes in specification as well.

Instead of using literacy or secondary schooling rates which are roughly the same across all U.S. states, I measure human capital with the variable *EDUC*, the percentage of people over 25 years old who have completed a bachelor's degree. In addition, I include *UI8* and *O65*, variables representing the percent of the population under 18 years old and older than 65 respectively. Finally, I add a final explanatory variable, *LOG95*, the natural log of gross state product in 1995 to control for convergence effects. We should expect a slightly negative coefficient on *LOG95* as states with high initial GSP should grow more slowly than other states.

Table 1. Variable Descriptions for Cross-Sectional Analysis

$\frac{\dot{Y}}{Y}$	Real Gross State Product (GSP) Growth Rate 1997-2002
$\frac{I}{Y}$	Investment / GSP
$\frac{\dot{L}}{L}$	Labor Force Growth Rate
\dot{g}	Change in Government Expenditure Share
\dot{t}	Change in Average Tax Burden
g	Government Expenditure Share (Total Expenditure / GSP)
t	Average Tax Burden (Total Taxes Collected / GSP)
$LOG95$	Natural Log of GSP in 1995
$EDUC$	Percentage of Population Over 25 Years Old with a Bachelor's Degree in the Year 2000
$U18$	Percentage of Population Under 18 Years Old in 2000
$O65$	Percentage of Population Over 65 Years Old in 2000
POP	Population in Millions in Year 2000

There is a potential endogeneity problem with the estimation of equation 3 and its variants. For starters, the right hand side tax and spending variables are constructed using GSP which is influential on the left hand side. In addition, there may be reason to suspect simultaneity bias on some of the coefficients. While we are trying to analyze the effects of tax and spending variables on GSP growth, it is possible that GSP growth has an effect on tax rates or spending policy. For example, in times of slow growth, state

governments might increase taxes to avoid financial deficits, biasing a tax coefficient downward. Or perhaps state governments may introduce intensive spending regimes in slow periods to bring their economies out of recession biasing spending coefficients downward. In addition, there might be unobserved variables correlated with both fiscal variables and growth, a hypothetical example being that states with very stable entrenched government officials might grow faster than other states due to their stability, but these officials who do not fear being replaced in an upcoming election might have an easier time raising taxes.

I attempt to control for possible endogeneity and simultaneity bias by using a two stages least squares estimation. As instruments I use the tax burden and expenditure share in 1990 as they are correlated with their respective fiscal variables, but presumably do not have any effect on growth so far into the future. While there may be lag times in fiscal policy effects, it is unlikely that tax or spending shares will have an effect on average growth 7 years down the line. Engen and Skinner (1992) use similar fiscal variables from before the sample period as instruments and find them to be satisfactory.

There are a variety of reasons why Engen and Skinner's model may not work for state data. For one thing, the model is fairly unconventional in that it allows fiscal variables to enter nonlinearly. It could be that although it was robust when explaining international data from 1970-1985, it may not work as well for other time periods. Also, unlike countries, states are open economies that allow for facile movement of capital, labor and technology. And finally, state fiscal policy is dwarfed by federal fiscal policy. We should expect smaller or perhaps different effects from state fiscal policy considering

that a U.S. resident pays many times more taxes to the federal government than he does to his state government.

Time Series Model

In addition to the cross sectional model, I estimate a separate model using time series data with the intention of separating out the effects of different categories of taxes and spending. The extra observations of time series allow for precise estimation even when presented with more variables, each with smaller coefficients than the aggregate.

The model consists of various tax and spending measures entering linearly with growth as the dependent variable in the manner of equation 5.

Equation 5:

$$\frac{\dot{Y}}{Y_{it}} = c + \lambda_t + \beta_1 prop_{it} + \beta_2 sales_{it} + \beta_3 inc_{it} + \beta_4 corp_{it} + \beta_5 chrg_{it} + \beta_6 assist_{it} + \beta_7 educ_{it} + \beta_8 hosp_{it} + \beta_9 highway_{it}$$

Variable descriptions are given in table 2. λ_t is a time specific intercept. I include time specific dummy variables to control for economic shocks affecting all states. State growth rates will depend on many factors uninfluenced by fiscal policy such as world energy prices, federal fiscal policy, foreign economic crises, business cycles, or country-wide recessions. Time specific effects will attempt to control for these myriad factors.

Table 2. Variable Descriptions for Time-Series Analysis

$\frac{\dot{Y}}{Y}$	Growth Rate of Real Personal Income
<i>TOTAX</i>	Total Average Tax Rate (Total Taxes / PI)
<i>ΔTOTAX</i>	Change in Total Average Tax Rate
<i>TOTEXP</i>	Total Expenditure Share (Total Expenditure / PI)
<i>ΔTOTEXP</i>	Change in Total Expenditure Share
<i>CAPEXP</i>	Capital Expenditure Share (Capital Expenditure / PI)
<i>NONCAPEXP</i>	Non-Capital Expenditure Share
<i>AID</i>	Share of Federal Aid (Federal Aid / PI)
<i>PROP</i>	Property Tax Share
<i>SALES</i>	Sales Tax Share
<i>INC</i>	Income Tax Share
<i>CORP</i>	Corporate Tax Share
<i>CHRG</i>	Miscellaneous Charges Share
<i>ASSIST</i>	Welfare and Assistance Expenditure Share
<i>EDUC</i>	Education Expenditure Share
<i>HOSP</i>	Health and Hospital Expenditure Share
<i>HIGHWAY</i>	Highway Expenditure Share

Time series data presents a problem with contemporaneous effects. Canto et. al (1995) suggests that changes in fiscal policy have effects in the same year, but this is not necessarily the case. It could be that lagged fiscal policy variables are more influential. To be sure that time periods match up logically, I define the growth in personal income

for year t to be the percentage growth from year t to year $t+1$ rather than the growth from $t-1$ to t . This way it is conceivable that tax policy formed in year t could affect year t 's growth rate.

If the Solow model is correct that intrusive fiscal policies cause economic distortions and lower growth, we should expect negative coefficients on tax variables. It is unclear what to expect from expenditure variables. It is likely that expenditure increases economic growth when taxes are held constant, but it is also possible that some expenditure has no effect or even a negative effect on growth. Of the various tax variables, property taxes are least likely to affect growth because they are taxes on wealth rather than income or consumption. There are no distortionary effects to property taxes. Corporate taxes are likely to be the most harmful since they may affect firm location or cause discrepancies in after tax returns to various market sectors. On the expenditure side, it is likely that capital expenditure will increase growth since capital is a direct input into the Solow growth model. Transfer payments are the least helpful as they only redistribute wealth in ways that are not necessarily more productive.

Tomljanovich (2004) finds only that corporate taxes and welfare payments have significant negative effects on growth using a similar, dynamic time-series model. Because, unlike Tomljanovich, I am unconcerned with separating out short term and long term effects, it is possible my model will be able to more precisely estimate the contributions of disaggregated fiscal variables.

Data

While we are interested in understanding the effects of state fiscal policy on state growth for the practical purpose of optimizing state governments, we also study the states

as a helpful natural experiment that might shed some light on federal fiscal policy. While many have studied international data to surmise the effects of taxation and spending on growth rates, there are some advantages to state level data. Cross-country analysis is plagued by unobservable characteristics that affect growth. Various countries have different types of government, different cultures, different attitudes toward saving or working, different levels of respect for intellectual property, different capacities for trade and different levels of openness. It is nearly impossible to control for all these effects. However, with state level data, most of these unobservable factors are kept largely fixed throughout the cross section. All states abide by the same set of federal laws, have similar attitudes and business models.

There are of course disadvantages to using state data, the most important being that state fiscal policy has a much smaller affect on growth in the states than federal fiscal policy has on federal growth. A state's growth is influenced not only by its own fiscal policy, but by federal fiscal and monetary policy and perhaps by the policies of nearby states. Thus the effects we are looking for are potentially much smaller in magnitude.

For both models I restrict the regressions to the 48 continuous states. Not only is this the convention in the literature, but it is reasonable to think that Alaska and Hawaii might behave differently than other states. Their isolation makes them quite unique. Also, their economies are unlike most other states. Alaska, for example, thrives off of its oil production giving it very high growth rates in some years and making it an outlier. In addition, shocks such as high oil prices that would be a detriment to nearly every state economy are a boon to Alaska, potentially throwing off some results.

For the cross-sectional model I use state and local government data from 1997-2002. Output is measured by real gross domestic product normalized to 2000 dollars. Because the data are purely cross-sectional, each variable is an average of annual values. All growth rates are computed as the geometric mean. Data for gross state product come from the Bureau of Economic Advisors. Labor force data come from the Bureau of Labor Statistics local area unemployment statistics. Population data come from the Bureau of the Census's 2000 survey, and government financial data were obtained from the Census Bureau's state and local government finance survey. Summary statistics are provided in table 3.

Table 3. Descriptive Statistics for Cross-Sectional Analysis					
	Mean	Stand. Dev.		Mean	Stand. Dev.
$\frac{\dot{Y}}{Y}$	2.80	1.24	<i>t</i>	8.79	1.08
$\frac{I}{Y}$	1.73	.77	<i>LOG95</i>	11.40	1.04
$\frac{\dot{L}}{L}$	1.078	.93	<i>EDUC</i>	23.71	4.35
\dot{g}	.72	.25	<i>UI8</i>	25.60	1.63
<i>i</i>	.12	.11	<i>O65</i>	12.66	1.66
<i>g</i>	18.50	2.62	<i>POP</i>	5.74	6.16

Unfortunately, total investment data is not recorded for the fifty states. As a substitute, I use capital expenditure in the manufacturing industry provided by the Annual Survey of Manufactures. While investment in manufacturing is probably only about a

tenth of total investment, it is hopefully about the same portion of total investment in all states so that the data will not be affected too badly. Some states have economies much more focused on manufacturing than others, which will cause some bias, but in the absence of total investment data, this will have to do.

As a measure of tax burden, I choose to use total taxes collected divided by gross state product (or personal income in the time series analysis). I use total taxes collected instead of total revenue because revenue from college tuition, sewerage fees, hospital bills, and the like are less likely to affect investment and labor decisions or to distort rates of return across sectors than direct taxes.

For the time-series estimation I use panel data from 1977 to 2002. All data come from the Census Bureau state and local government finance survey. I normalized all data to an average of 1982-1984 dollars (CPI was obtained from the BEA) so that I could measure effects net of inflation. Summary statistics are presented in table 4. The reader should note that disaggregated tax variables are given not as tax rates, but as the share of revenues divided by personal income. Thus an increase of 1 in the variable *PROP* corresponds to an increase in tax revenue of 1% of personal income, an amount much greater than increasing the property tax rate by 1 percentage point. I use personal income as the measure of output growth rather than gross state product simply because it was provided in the complete data set. The difference between personal income and gross state product is that gross state product includes capital income while personal income does not. This amounts to a small difference, but does not significantly affect growth rates. Neither measure of output is more accurate or better than the other.

Table 4. Descriptive Statistics for Time-Series Analysis					
	Mean	Stand. Dev.		Mean	Stand. Dev.
$\frac{\dot{Y}}{Y}$	2.58	2.82	SALES	3.66	1.14
TOTAX	10.11	1.34	INC	1.91	1.13
Δ TOTAX	-.01	.44	CORP	.43	.24
TOTEXP	20.41	3.08	CHRG	4.46	1.44
Δ TOTEXP	.09	.87	ASSIST	.47	.23
CAPEXP	2.71	.92	EDUC	6.40	1.11
NONCAPEXP	17.81	2.72	HOSP	1.51	.62
AID	3.68	1.10	HIGHWAY	1.64	.62
PROP	3.12	1.16			

This study uses average tax rates although theoretically marginal tax rates should be more important. However, it is hard to determine exactly what is meant by marginal tax rates. One could take the highest marginal tax rate in a state for each type of income, but this is not necessarily the tax rate that most people pay. Average tax rates are the most convenient data, although perhaps not optimal. Studies of marginal tax rates are worth looking into in the future.

5. Results

Variants of equation 3 were estimated and the results are presented in table 5. That the interaction terms of fiscal variables with investment and labor growth are not significant is not troubling as they are jointly significant in every case at the 99% level. However, it is troubling that the labor force growth rate is not significant in any regression and the investment rate is rarely significant. These two variables should account for most of the variation in the sample, but are not estimated precisely at all.

We interpret, as do Engen and Skinner (1992), the coefficients on \dot{g} and \dot{t} to be the short term changes in growth rates associated with a 1 percentage point increase in the variable. \dot{t} is never significant, but the OLS regressions suggest that a 1 percentage point increase in the expenditure share results in 3.3 percentage point decrease in annual growth for the short term. This is simply too large an effect to be credible. Estimation by two stage least squares shows \dot{g} to be insignificant, but only because it is estimated imprecisely, not because its coefficient is small.

LOG95 is the only population variable to be significant at the 5% level albeit in only one of the specifications. Unfortunately, it has an unexpected sign implying that states with higher levels of output grow faster. It is widely accepted that state growth converges, so this coefficient is simply evidence that this model does not fit the data.

Table 5. Cross Section Estimates (N=48) Dependent Variable Growth in GSP

Variable	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS	(5) OLS	(6) 2SLS
<i>C</i>	1.805 (1.14)	1.931 (1.351)	4.284 (4.096)	3.946 (5.260)	7.016 (4.301)	9.266 (8.260)
$\frac{I}{Y}$	-1.365* (.742)	-1.145 (1.505)	-1.368* (.719)	-1.269 (1.290)	-.9069 (.7506)	-.5779 (2.058)
$\frac{\dot{L}}{L}$	1.009 (.769)	1.049 (.836)	.8023 (.8068)	.8297 (.8405)	.8418 (.7861)	.8560 (.8578)
\dot{g}	-3.330*** (.571)	-2.690 (3.594)	-2.977*** (.5771)	-2.753 (2.934)	-2.554*** (.6145)	-1.708 (4.185)
<i>i</i>	-.660 (.520)	-1.500 (4.452)	-.8825 (1.085)	-.8771 (3.338)	-1.019 (1.060)	-2.530 (4.885)
$g \frac{I}{Y}$	.0939*** (.0339)	.7620 (.1051)	.0947*** (.0341)	.0906 (.0773)	.0838** (.0338)	.0584 (.1125)
$g \frac{\dot{L}}{L}$	.0212 (.0593)	.0160 (.0661)	.0031 (.0626)	.0046 (.0649)	-.0168 (.0621)	-.0298 (.0782)
$t \frac{I}{Y}$	-.0254 (.0741)	-.0168 (.0874)	-.0310 (.0716)	-.0331 (.0791)	-.0566 (.0713)	.0466 (.0804)
$t \frac{\dot{L}}{L}$	-.0799 (.152)	-.0709 (.1681)	-.0227 (.1591)	-.0273 (.1645)	.0143 (.1565)	.0407 (.1815)
<i>LOG95</i>	.2144** (.1039)	.1751 (.2501)	.1457 (.1037)	.1282 (.2322)	-.1522 (.2023)	-.2800 (.7270)
<i>EDUC</i>	-	-	.0205 (.0351)	.0282 (.0687)	.0345 (.0352)	.0317 (.0725)
<i>UI8</i>	-	-	-.0214 (.0834)	-.0187 (.0945)	-.0339 (.0815)	-.0598 (.1135)
<i>O65</i>	-	-	-.1383 (.0954)	-.1303 (.1249)	-.1365 (.0929)	-.1738 (.1345)
<i>POP</i>	-	-	-	-	.0488* (.0287)	.0620 (.0797)

Standard errors in parentheses. * indicates significance at the 10%, 5%, 1% level.

To calculate the implied long term effects of a balanced budget tax increase, we evaluate how α and β are affected using

$$\Delta \frac{\dot{Y}}{Y} = \Delta \alpha \cdot \frac{I}{Y} + \Delta \beta \cdot \frac{\dot{L}}{L}$$

Looking at specification (2) we see that a 10 percentage point balanced budget increase in the tax rate increases α by .0922 and decreases β by .087. We evaluate the effect this has on growth by plugging in mean values of $\frac{I}{Y}$ and $\frac{\dot{L}}{L}$ to the above equation.

The regression suggests that a 10 percentage point increase in taxes combined with an equal increase in expenditure will *increase* the long term growth rate by .65 percentage points. Other specifications suggest similar figures in the range of .2 to .7 percentage points. This is at odds with our theory which holds that increases in the size of government should decrease growth rates or perhaps keep them constant.

Because this model suggests short term growth rates too high by two orders of magnitude, is at odds with convergence theorists, finds long term effects in the direction opposite that which theory predicts, and most importantly is neither precise nor robust to small changes in specification, it is safe to reject this model for interpreting state data.

One reason why this model could have failed is because with only 48 observations and over a dozen variables to estimate, it is hard to estimate any parameters precisely. Engen and Skinner were able to get more precise estimates, but had more than twice as many observations. To have more observations, we turn to time-series analysis.

Time-Series Model

The results of the time-series estimation are much more in line with conventional wisdom.

Regression (1) suggests that a 1 percentage point balanced budget increase in the tax rate yields a .23 percentage point decrease in annual growth. This is a very plausible magnitude for the effects of state fiscal policy since a 1 percentage point increase in the tax rate amounts to nearly a ten percent increase.

The coefficients of regression (1) remain relatively unchanged when changes in the levels of tax and spending are added in regression (2). This is evidence that the level of taxation and expenditure significantly affects growth rates even when we control for changes in fiscal policy. That is, it is not merely the change in tax rates or spending that affects growth.

The negative coefficients on expenditure are a bit striking since we might expect spending to have a positive effect on growth holding taxes constant. To further investigate, I separate expenditure into capital expenditure and non-capital expenditure, finding that both are significant but that they have opposite signs. A balanced budget increase in taxes to pay for capital expenditure would result in a net increase in the growth rate. This is not surprising at all since it amounts to government actively forcing investment in capital, increasing a state's overall savings rate. Since capital factors directly into the Solow growth equation, we would expect increases in investment to have strong effects, so long as capital is not already saturated. Taxing people to pay for capital projects amounts to taking money out of the economy that would have mostly gone

Standard errors in parentheses. * indicates significance at the 10%, 5%, 1% level.

Table 6. Time Series Estimates (N=1200) Dependent Variable Growth in Personal Income

Variable	(1)	(2)	(3)	(4)	(5)
C	4.476*** (.6252)	6.031*** (.5691)	4.889*** (.6282)	3.808*** (.5267)	2.996*** (6.380)
TOTTAX	-.1861*** (.0634)	-.1752*** (.0596)	-.1226* (.0647)	-	-
ΔTOTTAX	-	-.8631*** (.1539)	-	-	-
TOTEXP	-.0580** (.0278)	-.1083*** (.0261)	-	-	-
ΔTOTEXP	-	-1.052*** (.0855)	-	-	-
CAPEXP	-	-	.2334*** (.0739)	.3001*** (.0909)	-
NONCAPEXP	-	-	-.1513*** (.0353)	-	-
AID	-	-	-	-	-
PROP	-	-	-	-	-.1416** (.0619)
SALES	-	-	-	-	.0490 (.0750)
INC	-	-	-	-	-.2072*** (.0734)
CORP	-	-	-	-	-.3577 (.3149)
CHRG	-	-	-	-	-.1877*** (.0478)
ASSIST	-	-	-	-1.713*** (.3136)	-
EDUC	-	-	-	-.2215*** (.0836)	-
HOSP	-	-	-	-.2012* (.1051)	-
HIGHWAY	-	-	-	-.5808*** (.1529)	-

toward consumption and forcing it into savings, moving a state to a higher steady state and increasing growth during the transition. Regression (3) shows strikingly that the amount of state spending is not nearly as important as what it is spent on in terms of growth.

In regressions (4) and (5) I look at disaggregated revenue and disaggregated spending separately. Looking at the two separately is justified because states in general operate close to a balanced budget. The data do not contain observations where spending increases but taxes fall or the other way around. Instead, the two move together with a fairly high covariance. Therefore, examining the coefficient on a spending variable essentially takes into account that the money must be raised from taxes. Likewise, the tax variables take into account that the revenue will be spent.

This context makes it easy to explain the negative coefficients in regression (4). The equations suggest that all expenditure other than capital expenditure is not worth the distortions brought about in generating the revenue. Assistance programs are exceptionally harmful to growth. The estimations predict that a 1 percentage point increase in the share of transfer payments decreases annual growth by 1.7 percentage points. That is staggering. However, it might be plausible since transfer payments cause the usual tax distortions when the revenue is generated, and then instead of providing services that might improve growth, they distort the economy even further by providing perverse disincentives to work or store assets.

This is not to say that welfare programs are bad policy and should be removed; it simply means they are bad for growth. Whether it is worth sacrificing some economic

prosperity in order to more equally distribute wealth and provide a safety net for the poor is a question beyond the scope of my analysis.

Regression (5) shows that income and property taxes are more harmful to growth than corporate or sales tax. It is not surprising that sales taxes are not terribly harmful since they tax consumption, not affecting labor market incentives, and even providing an incentive to save and invest. However, it is quite surprising that corporate taxes are not significant in the regression. If firms base location decisions in part on corporate tax rates, we would expect that states with high corporate taxes would have fewer start-up companies and thus slower growth rates. That corporate taxes are not significant perhaps speaks to the complexity of firm locating decisions, which depend on many factors, not just tax rates.

Finally, regression (5) suggests that hidden taxes in the form of sewerage fees, hospital bills, and college tuition are worse for growth than direct taxes, suggesting that perhaps it is more important to look at total revenue share as a measure of average tax rate rather than total taxes collected.

The equations in table 6 were all estimated using ordinary least squares (OLS) which does not control for endogeneity or simultaneity bias. Instrumental variables can be used to control for those confounding factors although I do not do that analysis here. It is important in instrumental variable approaches to find strong instruments that are correlated with the endogenous variables but not with the dependent variable. Often lags and leads of tax variables are used, but this isn't straightforward since it is very possible that fiscal policy variables might affect growth several years into the future, so that lagged variables are correlated with the dependent variable.

6. Conclusion

I find first that the nonlinear model relating fiscal policy to growth developed by Engen and Skinner in 1992 is not applicable to the U.S. states for the time period 1997-2002. Further, I find that there is a relationship between state fiscal policy and state economic growth so that on average a 1 percentage point balanced budget increase in tax rates results in decreased growth by .23 percentage points.

Furthermore, while I find most state spending to be correlated with lower growth, capital expenditure positively affects growth and the effect is strong enough that a balanced budget tax increase used to pay for new public capital will increase growth rates on net. Transfer payments are especially harmful to state growth, although they may serve other purposes. Finally, I find income taxes and non-tax charges to be the most economically harmful revenue generators, while sales tax seems to be the least harmful.

There are a variety of fiscal policy factors that I did not study in this paper. For starters, this paper uses average tax rates throughout its analysis. Further research might focus on marginal tax rates, either using the highest marginal tax rate in a state or perhaps a weighted average of marginal tax rates.

In addition, further research might consider non-financial aspects of fiscal policy. Many non-numerical factors affect business climate including tax laws that allow various deductions or depreciation schedules. Environmental regulations, minimum wage laws, unionization, and workers compensation might also play roles in business location decisions and hence affect growth rates.

States are different from countries in that factors are easily moveable across borders, suggesting that maybe a factor mobility model is more appropriate for modeling

states than traditional growth accounting models. It would be interesting to see if a state's growth is affected by its neighbors' fiscal policies and business climates as much as by its own.

The current literature, this paper included, only provides hints and innuendoes that fiscal policy negatively affects economic growth. A lot more work needs to be done to determine with certainty the mechanisms for those effects and their magnitude.

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