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Can State and Local Revenue and Expenditure Enhance Economic Growth? A Cross-State Panel Study of Fiscal Activity

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CAN STATE AND LOCAL REVENUE AND EXPENDITURE ENHANCE
ECONOMIC GROWTH? A CROSS-STATE PANEL STUDY
OF FISCAL ACTIVITY

By

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Bachelor of Arts in Economics

University of Nevada Las Vegas

2012

A thesis submitted in partial fulfillment of the requirements of the

Master of Arts -- Economics

Department of Economics

Lee Business School

The Graduate College

University of Nevada, Las Vegas

August 2013

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THE GRADUATE COLLEGE

We recommend the thesis prepared under our supervision by

Christopher Clarke

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Can State and Local Revenue and Expenditure Enhance Economic Growth? A Cross-State Panel Study of Fiscal Activity

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August 2013

Abstract

The slow economic recovery since the 2008 financial crisis and Great Recession requires state and local governments to continue to make difficult decisions concerning which taxes to raise and which expenditures to decrease in order to maintain a balanced budget. As expenditures usually raise economic growth and taxes generally hinder it, seeking the optimum combination of tax structures and expenditure options is necessary to encourage prosperity in a state. In this paper I study the effects of various expenditures and revenue combinations on growth in state personal income from 1977-2010 for 49 states and the District of Columbia. I find that state and local governments overfund education and parks, recreation, and natural resources while they underfund hospitals and health spending, once netted for charges. Corporate Income Taxes are underutilized as a source of revenue. I also estimate growth hills and find evidence in support thereof. (JEL E62, H21, H70, O40, R11)

Key Words:

Tax policy, fiscal policy, regional growth, state and local

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Table of Contents

Abstract.....	iii
Acknowledgements.....	iv
List of Tables.....	vi
Section I – Introduction.....	1
Section II – Overview of Previous Research.....	4
Section III – Theoretical Model.....	8
Section IV – Data.....	11
Section V – Results.....	19
Section VI – Conclusion.....	31
Appendix 1: Fiscal Variable Series Construction.....	34
Appendix 2: Variables Averages by State.....	36
Works Cited.....	42
Curriculum Vitae.....	44

List of Tables

Table 1: Summary Statistics 1977-2010.....	14
Table 2: Summary Statistics 2007-2008.....	15
Table 3: Summary Statistics 2009-2010.....	16
Table 4: The Effect of Aggregate Expenditure and Revenue on State Economic Growth 1977-2010.....	20
Table 5: The Effect of Disaggregate Expenditure and Revenue on State Economic Growth 1977-2010.....	21
Table 6: The Effect of Disaggregate Expenditure and Revenue on State Economic Growth 1977-2010.....	22
Table 7: Estimating Growth Hills for State and Local Revenues and Expenditure 1977- 2010.....	25
Table 8: Estimating Long-Run Effects of Aggregated Revenues and Expenditures on Growth 1977-2010.....	28
Table 9: Estimating Long-Run Effects of Disaggregated Revenues and Expenditures on Growth 1977-2010.....	29
Table 10 State and Local Revenues: 1977 - 2010 presented in order of growth rate of real per capita state personal income, lowest to highest.....	36
Table 11 State and Local Revenues: 1977 - 2010 presented in order of growth rate of real per capita state personal income, lowest to highest.....	38
Table 12 State and Local Revenues: 1977 - 2010 presented in order of growth rate of real per capita state personal income, lowest to highest.....	40

Section I - Introduction

The slow economic recovery since the 2008 financial crisis and Great Recession requires state and local governments to continue to make difficult decisions concerning which taxes to raise and which expenditures to decrease in order to maintain a balanced budget. Taxation divorces the price the seller receives from the price the buyer pays and, thus, causes distortions in market activity and dead-weight loss in the economy. At the same time, the private economy underprovides public goods. Higher taxes provide a higher level of public expenditure, which may foster economic growth. This study considers maintaining the optimum combination of tax structures and expenditure options to encourage prosperity in a state.

This paper analyzes the relationship between fiscal structures, including specific taxes and specific spending categories, and growth in real per capita personal income from 1977 to 2010. Key to this paper is the investigation into the effects of specific taxes and expenditures on growth. Since revenue minus spending equals the surplus, perfect multicollinearity occurs. This requires a regression to include all fiscal variables, except one. The coefficients are then interpreted as the effect on the growth rate of an increase in the independent variable caused by an appropriate offset of the omitted variable. For example, I compare the effect of raising corporate taxes or raising the deficit to fund more education spending, and so on. I then do this, in turn, for all structures. This enables the study to answer the question of which fiscal sources and expenditures the government over- or under-uses, for the average state.

As first noted in Bania, Gray and Stone (2007), focusing on linear incremental effects does not allow for decreasing returns to expenditure increases. When expenditures first increase they provide public goods enhancing economic growth. Once

privately under-provided public goods are sufficiently apportioned, additional government expenditure will crowd out the private economy, and therefore reduce growth. I will also incorporate squared fiscal variables to estimate these “growth hills”.

Last, I estimate the long-run effects. Using five-year intervals I estimate differenced variables as well as lagged variables. An added benefit to this is measurement error and serial correlation are reduced when the observations are further apart.

The object of this paper is to investigate what fiscal structures increase economic growth. The reader must keep in mind that there are other factors that affect fiscal policy. An example is providing public goods at the level that the public desires.

I find that, on average, reducing state and local governments’ revenues and expenditures enhance growth. Governments overfund education and parks, recreation, and natural resources while they underfund hospitals and health spending, once netted for charges. I find evidence in support of growth hills and estimate the optimal level of government expenditure to be between 18 and 30 percent of the economy, unless if used for unproductive expenditures, which do not enhance economic growth at any point. When estimating the long-run effect, I find continued evidence for additional government spending to be growth diminishing. Furthermore, I find that corporate income taxes are an underutilized source of revenue.

The paper proceeds as follows. The second section discusses the literature up to this point. The third section develops a theoretical framework by which to estimate the relationship between tax and spending vehicles on growth in state income. The fourth

section discusses the data and estimation methodology. The fifth section presents the estimated results. The sixth section concludes the findings.

Section II - Overview of Previous Research

The literature offers few conclusions as to the effects of taxes on economic growth. Most conclude that taxes used to fund transfer payments exert small, negative effects on economic activity. If used for productive purposes, oft times tax increases increase economic growth: Helms (1985); Phillips and Goss (1995); Miller and Russek (1997), Wasylenko (1997), and Bania, Gray and Stone (2007). Other studies, however, show a negative effect on growth: Mullen and Williams (1994); Besci (1996); Reed (2008). Even other studies show a weak effect of taxes on growth: Romans and Subrahmanyam (1979); Wasylenko and McGuire 1985); Stokey and Rebelo (1995); Lucas Jr. (1990); Tomljanovich (2004). Most studies focus on the overall tax burden, they do not study in great detail separate taxes and spending vehicles.

Helms (1985) is the first paper to incorporate a budget constraint. Spending must equal revenues plus deficit. This allows him to separate the effect of overall taxation and expenditure into subcategories. Without including multiple expenditure options, researchers must interpret the effects on growth as the effect of raising a tax to finance average expenditures. Helm's approach allows analyzing the different effects from raising a tax to finance, for example, transfer payments or education. Helms uses logged real state personal income as the dependent variable. The explanatory variables are the revenues and expenditures. The revenue variables include property taxes, other taxes, user fees, and federal source revenues. The spending variables include health, highways, local schools, higher education, and other expenditures. Helms omits the transfer payments variable. He finds positive effects from raising public service expenditure

financed by lowering transfer payments, and negative effects of raising taxes to increase transfer payments.

Mofidi and Stone (1990) study the effects of tax burden and expenditures on investment and employment. Like Helms, they omit transfer payments and find that transfers have a negative effect. Expenditures on health, education, and infrastructure have positive effects. Expanding the selection of fiscal variables even further Miller and Russek (1997), using fixed effects, investigated the effects of tax and expenditure structures on state GDP from 1978-92. They find that government overuses sales taxes and under uses corporate income taxes. Negative relationships between growth and education, transportation, and public safety are reported.

Stokey and Rebelo (1995) show, under most circumstances, a consumption tax does not affect the return on capital and, thus, does not affect investment, output and productivity. They also show that property taxation lowers the return on reproducible physical capital and on non-reproducible land. Therefore, increases in property tax rates that lower the return on capital will reduce growth.

Kneller, Bleaney and Gemmell (1999) distinguish between distortionary taxes defined as taxes on income and property, and non-distortionary taxes which include consumption taxes. They conclude that while the former reduces growth, the latter does not. Additionally, they find that productive government spending benefits growth. Similarly, Gemmell, Kneller and Sanz (2006) use annual data and take into account short-run dynamics and confirm the findings of Kneller, et al.

Widmalm (2001) finds that the proportion of tax revenues raised from taxing personal income negatively correlates with growth. Moreover, she documents a tendency for consumption taxes to enhance growth.

Brown, Hayes and Taylor (2003) study the effects of taxation and expenditure for state and local governments across states for the years 1977 to 1997. Using a one-year lag structure for the fiscal variables, they find corporate taxes to be underutilized, sales and property taxes to be over utilized. They also find welfare spending to enhance growth if funded by corporate income taxes, but to diminish growth if funded by sales taxes. They find both elementary and higher education to be overfunded. Additional health and hospital spending diminish growth in state GDP if funded by sales or property taxes. Transportation and housing both grow the economy if income taxes fund them.

Yamarik (2000) using pooled OLS to estimate the effects of taxes on state GDP from 1977 to 1995 finds the average tax rate to have a significantly negative relationship. Specifically he concludes that marginal personal income and average property taxes have negative relationships with growth. In a later paper, Ojede and Yamarik (2012) estimate long-run and short-run relationships using pooled mean group estimators. Welfare expenditure is left out of the equation. Their short-run findings include a negative effect on growth if expenditures or property taxes are raised with the appropriate coinciding response from welfare payments. Raising the deficit to pay for welfare expenditures exhibits a positive effect on growth. In the long run, state and local expenditures demonstrates a positive relationship with growth if raised by lowering welfare payments. Deficit, sales tax, and property tax financing of welfare payments all show a negative effect on growth.

Recently, Reed (2008) in a thorough and robust study, examined growth across states from 1970 to 1999. Using five-year differences, he consistently finds a negative effect of the tax burden on state economic growth. He estimates under different time periods, different geographical regions, and various estimation techniques. In imitating Helm's style, but contrary to his findings, Reed finds that raising total taxes to fund non-welfare expenditure exerts a negative effect on growth both in the long run and short run. Reed did not, however, distinguish between the types of taxes, nor the types of non-welfare spending.

Section III - Theoretical Model

This paper employs an adaptation of the Bania, Gray, and Stone (2007) and Bleaney, Gemmell, and Kneller (2001) presentation of the public-policy endogenous growth model from Barro and Sala-i-Martin (1992). In the model, fiscal policy can determine both the level of the output path and the steady-state growth rate. This differs from the neoclassical growth model, which only allows for fiscal policy to affect the level of the output path. The production process involves, n producers, each producing output, y ,

$$(1) \quad y = Ak^{1-\alpha}[\sum_{i=1}^k g_i]^\alpha,$$

where A is a positive constant, k is private capital and g_i is a group of publicly provided inputs, and α is a parameter between zero and one. State and local governments fund its budget with a proportional tax on output at the rate τ_i , a group of tax rates (sales, property, income, other). Thus, the budget constraint is presented as

$$(2) \quad n \sum_{i=1}^k g_i + \sum_{j=1}^m C_j + b = ny \sum_{i=1}^k \tau_i,$$

where C_j is a group of government-provided consumption (or “non-productive”) goods and b is the budget surplus. A utility function, for the representative, infinite-lived household is given as,

$$(3) \quad U = \int_0^\infty ((c^{1-\theta} - 1)/(1 - \theta))e^{-\rho t} dt, \quad \theta > 0$$

where the marginal utility has a constant elasticity $-\theta$, c is consumption per person, and $\rho > 0$ is the constant rate of time preference. Households hold real assets, $a(t)$, the real rate of return on these assets is denoted by $r(t)$. The household’s budget constraint determines the change over time in assets to be

$$(4) \quad da/dt = ra - c.$$

The first-order condition for maximizing utility subject to the budget constraint requires the real rate of return to be

$$(5) \quad r = \rho + \theta \cdot \kappa_c,$$

where κ_c is the growth rate of consumption per person.

Firms seek to maximize net revenues. Barro and Sala-i-Martin (1992) show the first-order optimization condition includes the relationship

$$(6) \quad r = (1 - \sum_{i=1}^k \tau_i)(dy/dk)/\eta,$$

where dy/dk is the marginal product of capital and η is the constant cost of capital. I calculate the constant growth rate of the per capita consumption by combining equations (5) and (6)

$$(7) \quad \kappa_c = [(1 - \sum_{i=1}^k \tau_i)(dy/dk)/\eta - \rho]/\theta.$$

The growth rate of c is equal to the growth rate of y as long as the appropriate transversality conditions are met. The marginal product of capital is determined from equation (1)

$$(8) \quad dy/dk = (1 - \alpha)A([\sum_{i=1}^k g_i]/k)^\alpha.$$

This can be transformed into

$$(9) \quad dy/dk = (1 - \alpha)A^{\frac{(1-\alpha)}{(1-\alpha)}}[\sum_{i=1}^k g_i]^{\frac{\alpha(1-\alpha)}{(1-\alpha)}}k^{-\alpha}.$$

Eventually, by more algebraic manipulation, the equation becomes

$$(10) \quad dy/dk = (1 - \alpha)A^{\frac{1}{1-\alpha}}([\sum_{i=1}^k g_i]/y)^{\frac{\alpha}{1-\alpha}}.$$

Finally, plugging this into equation (7), the growth rate of the economy, V , is

$$(11) \quad V = w(1 - \sum_{i=1}^k \tau_i)(1 - \alpha)A^{1/(1-\alpha)}([\sum_{i=1}^k g_i]/y)^{\alpha/(1-\alpha)} - m,$$

where $w = 1/\theta$ and $m = \rho/\theta$. Private capital is endogenously determined in the model, and therefore, does not appear in equation (11). Output growth in the steady state depends only on structural parameters for production and utility w , m , α , and A , the tax rates, τ , and the ratio of productive government expenditures to output, $[\sum_{i=1}^k g_i]/y$.

For empirical testing, suppose that growth, V_{st} , at time t in state s is a function of, X_{ist} , the fiscal variables from equation (2), φ_s , state fixed effects (which control for time-invariant characteristics such as culture, geography, natural amenities, distance from markets, and time-invariant government regulation), γ_t , time fixed effects (which control for macroeconomic forces and federal government activity), and, u_{st} , the unemployment rate, which allows for the finding that regional variation in unemployment rates can be persistent and explained in equilibrium Neumann and Topel (1991). That is,

$$(12) \quad V_{st} = a + \sum_{i=1}^k B_i X_{ist} + u_{st} + \varphi_s + \gamma_t + \omega_{st}.$$

In practice, this equation is similar to the reduced form equation found in Brown, Hayes, and Taylor (2003). The linear budget constraint in (2) indicates that

$$(13) \quad X_{kst} = -\sum_{i=1}^{k-1} X_{ist}.$$

Hence, one fiscal variable must be omitted. Equation (12) then becomes,

$$(14) \quad V_{st} = a + \sum_{i=1}^{k-1} (B_i - B_k) X_{ist} + u_{st} + \varphi_s + \gamma_t + \omega_{st}.$$

The interpretation of the fiscal coefficients should be the effect of a unit change in the variable offset by the corresponding change in the omitted variable from the regression.

For example, if corporate income taxes are omitted, the coefficient for welfare, unemployment, and housing are interpreted as the expected increase in the growth rate due to a one unit increase in welfare, unemployment, and housing spending funded by the corporate income tax.

Section IV - Data

Personal income for each state and the District of Columbia, population, and fiscal variables for each state come from U.S. Department of Commerce, Bureau of the Census' *Government Finances* database. Unemployment rates for each state come from the U.S. Department of Labor, Bureau of Labor Statistics. Real per capita personal income is calculated using the national GDP deflator, as state level price indices are unreliable for the years studied.

The Census did not collect data for local finances and consequently state & local finances for the years 2001 and 2003. It did, however, collect state data for these two years. Using these data, I interpolate the state and local fiscal variables by estimating the following equation,

$$(15) \quad S\&L_{st} = State_{st} + u_{st} + t + t^2 + \varphi_s + e_{st}$$

where $S\&L$ is the state and local fiscal variable, $State$ is the state fiscal variable, u is the unemployment rate, t is time, φ are state fixed-effects, and e is the error term. The predicted values of $S\&L$ for the years 2001 and 2003 are then included in the original series.¹

The dependent variable is defined as $V_{st} = \ln(y_{st}) - \ln(y_{st-1})$ where y is real per capita personal income. Use of per capita measurement is consistent with Yamarik (2000); Bleaney, Gemmell and Kneller (2001); Bania, Gray and Stone (2007); Miller and Russek (1997); Reed (2008). Dividing personal income by population allows the coefficients to measure the effect of differences in growth not caused by population increases, and can be a proxy for quality of life increases.

¹ Level variables are used because a few of the variables have negative observations and thus they cannot be logged.

I study the fiscal variables both at an aggregate level and a disaggregated level. The aggregate variables are total revenue, total expenditure, net intergovernmental revenue (intergovernmental revenue minus intergovernmental expenditure), and surplus. Net intergovernmental revenue can be thought of federal taxes brought back to the state. The disaggregated revenue variables are property taxes, sales taxes (which includes sale of property, but excludes the public utility sales tax), individual income tax, corporate income tax, and other revenues. The expenditure variables are police, fire, and correction facilities; transportation; higher education; secondary education; hospitals and health; parks, recreation, and natural resources; welfare, housing and community, and unemployment expenditures; and other expenditures. Net utility expenditures are also included². In *Government Finance*, public transit is categorized in the total utilities. In my analysis, I move it to the transportation section. Solid waste and sewerage services are self-classified. I include these expenditures in utilities.

Because this paper addresses the issue of the effects of tax distortion, revenue charges are netted out. For instance, parks and recreation charges include revenues gathered from the use of facilities operated by the government (swimming pools, community recreation centers, museums, etcetera) U.S. Bureau of the Census (2006). These revenue streams are not distortionary³. Therefore, in evaluating the effect of tax collection to provide public services, the corresponding charges must be removed from the expenditure. The remaining portion of the expenditure is financed by different revenue sources. The charges recorded by the Census are air transportation, highways, water transportation, parking, education, hospital, parks and recreation, natural resources,

² Utilities are net expenditures are positive for 65% of the observations.

³ Assuming the charge is equal to the marginal cost of providing the service.

housing and community, and other charges. In addition, utility revenues and liquor store revenues are subtracted from their respective expenditures. Brown, Hayes and Taylor (2003) incorporate net utilities and subtract tuition from education, but they do not do this for all applicable variables. They also include total charges and tuition as separate revenue variables. The disadvantage of this is that it allows tuition to be spent on other expenditures. In reality, if the state did not provide education, tuitions would not be collected. My approach of netting charges from expenditure is unique in the literature. More information on fiscal variable series is given in the appendix.

I divide the fiscal variables by state personal income and multiply them by 100. Therefore, they can be thought of as “effective average tax rates” in a state (Helms, 1985). The descriptive statistics for each variable for all observations is given in table 1.

The growth rate has averaged 1.94% and ranges from -14.54% (Wyoming in 2009) to 17.64% (North Dakota in 1981). The unemployment rate has averaged 6.61%. Total revenue average 18.23 percent of state personal income. Tennessee in 2009 has the minimum observation at 10.08% and Wyoming in 2001 has the maximum at 43.62%. Total expenditure ranges from 10.71% (North Dakota in 1985) to 32.38% (D.C. in 1977). It averages 17.46%. Sales taxes are the principle form of revenue (3.54%) and property taxes are a close second (3.11%). Secondary education is the largest single expenditure (4.27%). Welfare, unemployment compensation, and housing and community expenditure is second (3.36%). The means by state are presented in appendix 2.

Table 1: Summary Statistics 1977-2010

Variable	Mean	Stand. Dev.	Min	Max
Growth	1.94	2.61	-14.54	17.64
Unemployment Rate	6.61	2.19	2.30	19.30
Total Revenue	18.23	3.56	10.08	43.62
Total Expenditure	17.46	3.16	10.71	32.38
Net Intergov. Revenue	4.08	1.64	1.77	17.86
Surplus	4.86	2.74	-3.43	28.70
Property Tax	3.11	1.10	0.97	8.42
Sales Tax	3.54	1.14	0.70	7.47
Indiv. Income Tax	2.03	1.15	0.00	4.93
Corp. Income Tax	0.41	0.24	0.00	1.36
Other Revenue	9.15	3.09	1.84	36.08
Net Utility Expenditure	0.13	0.42	-0.64	5.50
Police, Fire, Correction Facilities	1.34	0.45	0.62	4.92
Transportation	1.78	0.79	-0.64	11.07
Higher Education	1.08	0.38	0.16	2.74
Secondary Education	4.27	0.69	2.56	8.65
Health & Hospital	0.79	0.33	-0.21	2.78
Parks, Recreation, Natural Resources	0.51	0.23	0.13	1.70
Welfare, Unemployment, Housing & Community	3.36	1.23	0.94	8.82
Other Expenditure	4.20	1.10	1.58	9.57

Pre- and post-financial crisis

The Great Recession began with the financial crisis in autumn of 2008. In tables 2 and 3, I investigate the difference in government fiscal activity from before and after the crisis. The Census Classification Manual defines a year to be “each individual government fiscal year that ended between July 1 of the previous year and June 30 of the survey year.” Table 2 has the average descriptive statistics for 2007 and 2008. Table 3 displays them for 2009 and 2010.

Table 2: Summary Statistics 2007-2008

Variable	Mean	Stand. Dev.	Min	Max
Growth	2.05	1.92	-2.18	9.94
Unemployment Rate	4.93	1.07	2.40	7.70
Total Revenue	19.41	3.85	12.88	29.87
Total Expenditure	18.38	2.57	13.76	26.09
Net Intergov. Revenue	4.45	1.62	2.14	11.24
Surplus	5.48	3.56	-0.58	16.65
Property Tax	3.09	0.98	1.38	5.26
Sales Tax	3.54	1.18	0.70	6.04
Indiv. Income Tax	2.30	1.19	0.00	4.89
Corp. Income Tax	0.44	0.27	0.00	1.36
Other Revenue	10.04	3.58	3.76	20.52
Net Utility Expenditure	0.06	0.29	-0.64	1.51
Police, Fire, Correction Facilities	1.50	0.32	0.92	2.59
Transportation	1.61	0.49	0.79	3.73
Higher Education	1.07	0.40	0.16	2.32
Secondary Education	4.43	0.53	3.43	5.63
Health & Hospital	0.84	0.30	0.30	1.92
Parks, Recreation, Natural Resources	0.51	0.26	0.13	1.62
Welfare, Unemployment, Housing & Community	3.98	1.09	2.27	7.43
Other Expenditure	4.38	0.93	2.52	6.56

Table 3: Summary Statistics 2009-2010

Variable	Mean	Stand. Dev.	Min	Max
Growth	-2.30	4.28	-14.54	6.23
Unemployment Rate	8.84	2.12	4.80	14.50
Total Revenue	16.30	3.08	10.08	29.10
Total Expenditure	20.60	2.80	15.31	28.76
Net Intergov. Revenue	5.42	1.66	2.54	10.01
Surplus	1.11	2.63	-3.30	9.59
Property Tax	3.41	1.06	1.60	5.78
Sales Tax	3.45	1.08	0.78	5.70
Indiv. Income Tax	2.06	1.10	0.00	4.93
Corp. Income Tax	0.32	0.21	0.00	1.16
Other Revenue	7.05	2.81	1.84	18.06
Net Utility Expenditure	0.05	0.22	-0.62	0.86
Police, Fire, Correction Facilities	1.63	0.38	0.97	2.59
Transportation	1.78	0.60	0.96	4.25
Higher Education	1.15	0.48	0.27	2.74
Secondary Education	4.73	0.62	3.63	6.80
Health & Hospital	0.20	0.18	-0.21	0.78
Parks, Recreation, Natural Resources	0.53	0.27	0.16	1.70
Welfare, Unemployment, Housing & Community	5.04	1.19	2.74	8.82
Other Expenditure	5.49	1.10	3.68	8.39

The mean of the growth rate of real per capita personal income completely reversed, from a 2.05% to -2.30%. The unemployment rate doubled from 4.93% to 8.84%. Revenues decreased from 19.41% of personal income to 16.30%. At the same time, expenditures increased from 18.38% to 20.60%. This results in the surplus dropping from 5.48% to state personal income to just 1.11%. Interestingly, for a recession starting with the bursting a housing a bubble, property taxes rose from 3.09% to 3.41%, indicating the drop in total property tax revenue to be less than the drop in state personal income. Sales taxes remained mostly unchanged, while the income taxes decreased modestly.

On the expenditure side, net utilities remained constant as a share of personal income. Police, fire, and correction facilities, transportation, education, and parks, recreation, and natural resources increased modestly. Health and hospital decreased 76% from a share of 0.84% to 0.20%. Welfare, unemployment compensation, and housing and community spending increased dramatically from 3.98% to 5.04%.

Estimation

The theoretical model suggests that some revenues and expenditures are distortionary while others are not. Rather than judging a priori the nature of each variable, I will omit each variable in turn. It should be noted, because of collinearity that each of these regressions are, in essence, the same regression.

The study covers the years 1977 to 2010 over 49 states⁴ and the District of Columbia. This makes 1700 observations. (The data for the personal income includes 1976). Because the personal income data run over the calendar year, and the budget data run over the fiscal year, there is an implied six month lag in the regression. I ran the estimates with a year (i.e. year and a half) lag and the results were not overly sensitive to the change.

Regressions are run in a two way fixed effect model with robust panel-corrected standard errors. I first estimate the aggregated equation to test the level of overall spending and revenues. Next, I follow with the disaggregated equation. I then estimate growth hills for both the aggregate and disaggregate equations. Last, I estimate long-run effects for both the aggregate and disaggregate fiscal variables.

The estimated equation for growth hills is as follows,

⁴ Alaska is omitted due to the extreme nature of their government's fiscal behavior, much of which is due to the pipeline built in 1977.

$$(16) \quad V_{st} = a + \sum_{i=1}^k (B_i X_{ist} + S_i X_{ist}^2) + u_{st} + \varphi_s + \gamma_t + \omega_{st}.$$

Each fiscal variable is left out, in turn, for each regression. The squared term of net intergovernmental revenue is insignificant and the point estimate close to zero, therefore I omit it in the regression.

Section V – Results

Table 4 presents the results from the aggregated estimation. Unemployment has an expected negative significant effect on growth. For each additional percentage rise in the unemployment rate, growth is expected to slow by -0.16%. Higher total revenue and higher total expenditure are shown to have a negative impact on growth. The exception is when revenue is raised to increase the surplus. This indicates that state and local governments raise too much and spend too much, on average. From theory, this would indicate that the average state spends too much on unproductive expenditures. Another possibility, noted by Miller and Russek (1997), is total expenditure and total revenue have less cyclical volatility than personal income, implying that cyclical effects cause the negative correlation. There are two things to keep in mind concerning these results. First, I only look at what will affect economic growth in per capita income, and not the public's desired level of public good provision. Second, these results can only be interpreted in a broad sense; it does not give us information on which particular government activities are growth diminishing.

The coefficients in tables 4, 5, and 6 are symmetric. For example, in the first column of table 4, when a state raises total expenditure by one percent of state personal income, the only way to do so is by raising total revenue. The growth rate of the economy is expected to decrease by -0.43 percentage points. In the second column, when one increases revenues by one percent of the share in personal income, again, the only way to do so is by raising total expenditure by the same. It is the same phenomena being measured from the other side of the coin and, hence, will have the same coefficient. When a pair of fiscal structures are both revenues or are both expenditures, the signs will

be opposite. When one is a revenue, and the other an expenditure, the sign remains the same.

Tables 5 and 6 display the disaggregated results. Again, unemployment has a significant negative effect. Parks, recreation, and natural resource spending appear to have the most drastic effect. 13 out of the 15 fiscal tradeoffs possible are found to have a significant effect on growth in state personal income. Funding it by any source of revenue uniformly brings a negative effect. The significant effects range from a -1.79% (property taxes) decrease in growth to -2.01% (other revenues). Increasing spending elsewhere by lowering spending on parks, recreation, and natural resources produces growth enhancements from 1.11% (secondary education) to 2.54% (hospitals). The implication of these findings is that spending on parks, etcetera does not add to the growth in income. This does not imply that spending on parks is bad policy, but illustrates the economic tradeoff that exists.

Table 4: The Effect of Aggregate Expenditure and Revenue on State Economic Growth 1977-2010

	Total Revenue	Total Expenditure	Net Intergov. Revenue	Surplus
Unemployment Rate	-0.16***	-0.16***	-0.16***	-0.16***
Total Revenue		-0.43***	0.18	0.31***
Total Expenditure	-0.43***		-0.62***	-0.75***
Net Intergov. Revenue	-0.18	-0.62***		0.13
Surplus	0.31***	0.75***	0.13	
Constant	9.78***	9.78***	9.78***	9.78***

Note: * p<0.1; ** p<0.05; *** p<0.01. The omitted variable is labeled above the column.

Table 5: The Effect of Disaggregate Expenditure and Revenue on State Economic Growth 1977-2010

	Property Tax	Sales Tax	Ind. Income Tax	Corp. Income Tax	Other Revenue	Net Utility Expenditure	Police, Fire, Correction	Transportation
Unemployment Rate	-0.18***	-0.18***	-0.18***	-0.18***	-0.18***	-0.18***	-0.18***	-0.18***
Property Tax		0.36	0.05	-0.2	0.22	0.67**	-0.58	-0.49**
Sales Tax	-0.36		-0.31	-0.56	-0.14	0.31	-0.94†	-0.85**
Indiv. Income Tax	-0.05	0.31		-0.25	0.17	0.62**	-0.63	-0.54*
Corp. Income Tax	0.2	0.56	0.25		0.42	0.88†	-0.38	-0.29
Other Revenue	-0.22†	0.14	-0.17	-0.42		0.46*	0.46*	-0.71**
Net Utility Expenditure	0.67**	0.31	0.62**	0.88†	0.46*		1.25**	1.16***
Police, Fire, Correction Facilities	-0.58	-0.94†	-0.63	-0.38	-0.8	-1.25**		-0.09
Transportation	-0.49**	-0.85**	-0.54*	-0.29	-0.71**	-1.16***	0.09	
Higher Education	-1.39**	-1.74**	-1.44***	-1.18*	-1.60***	-2.06***	-0.81	-0.90†
Secondary Education	-0.69***	-1.04***	-0.74**	-0.48	-0.90***	-1.36***	-0.11	-0.20
Health & Hospital	0.75**	0.39	0.69**	0.95†	0.53*	0.07	1.32*	1.24***
Parks, Recreation, & Natural Resources	-1.79**	-2.15**	-1.84**	-1.59†	-2.01**	-2.47***	-1.21**	-1.30*
Welfare, Unemployment, Housing & Community	-0.23	-0.59†	-0.28†	-0.02	-0.44***	-0.90***	0.35	0.26
Other Expenditure	-0.13	-0.48	-0.18	0.08	-0.34*	-0.80**	0.45	0.37
Net Intergov. Revenue	-0.11	0.25	-0.06	-0.31	0.11	0.56**	-0.69	-0.60**
Surplus	0.50***	0.14	0.45***	0.71†	0.29***	-0.17	1.08*	0.99***
Constant	11.98***	11.98***	11.98***	11.98***	11.98***	11.98***	11.98***	11.98***

Note: * p<0.1; ** p<0.05; *** p<0.01; † p<0.1 one-tail. The omitted variable in each regression is labeled above the column.

Table 6 : The Effect of Disaggregate Expenditure and Revenue on State Economic Growth 1977-2010

	Higher Education	Secondary Education	Health & Hospital	Parks, Recreation, & Natural Resources	Welfare, Unemp, Housing & Community	Other Expenditure	Net Intergov. Revenue	Surplus
Unemployment Rate	-0.18***	-0.18***	-0.18***	-0.18***	-0.18***	-0.18***	-0.18***	-0.18***
Property Tax	-1.39**	-0.69***	0.75**	-1.79**	-0.23	-0.13	0.11	0.50***
Sales Tax	-1.74**	-1.04***	0.39	-2.15**	-0.59†	-0.48†	-0.25	0.14
Indiv. Income Tax	-1.44***	-0.74**	0.69**	-1.84**	-0.28†	-0.18	0.06	0.45***
Corp. Income Tax	-1.18*	-0.48	0.95†	-1.59†	-0.02	0.08	0.31	0.71†
Other Revenue	-1.60***	-0.90***	0.53*	-2.01**	-0.44***	-0.34*	-0.11	0.29***
Net Utility Expenditure	2.06***	1.36***	-0.07	2.47***	0.90***	0.80**	0.56**	0.17
Police, Fire, Correction Facilities	0.81	0.11	-1.32*	1.21**	-0.35	-0.45	-0.69	-1.08*
Transportation	0.90†	0.20	-1.24***	1.30*	-0.26	-0.37	-0.60**	-0.99***
Higher Education		-0.70	-2.13***	0.41	-1.16**	-1.26***	-1.50***	-1.89***
Secondary Education	0.70		-1.43***	1.11*	-0.46	-0.56†	-0.80***	-1.19***
Health & Hospital	2.13***	1.43***		2.54**	0.97***	0.87***	0.63*	0.24
Parks, Recreation, & Natural Resources	-0.41	-1.11*	-2.54**		-1.57*	-1.67*	-1.90**	-2.30**
Welfare, Unemployment, Housing & Community	1.16**	0.46	-0.97***	1.57*		-0.1	-0.34***	-0.73***
Other Expenditure	1.26***	0.56†	-0.87***	1.67*	0.1		-0.24	-0.63***
Net Intergov. Revenue	-1.50***	-0.80***	0.63*	-1.90**	-0.34***	-0.24		0.39***
Surplus	1.89***	1.19***	-0.24	2.30**	0.73***	0.63***	0.39***	
Constant	11.98***	11.98***	11.98***	11.98***	11.98***	11.98***	11.98***	11.98***

Note: * p<0.1; ** p<0.05; *** p<0.01; † p<0.1 one-tail. The omitted variable in each regression is labeled above the column.

Higher education has 11 fiscal tradeoffs that are found to be negatively significant. All 11 have effects greater than one percent. Funding hospitals instead of higher education expects a 2.13% increase in growth. Increasing funding for higher education by way of the corporate income tax has the smallest effect (-1.18%). Increasing secondary education expenditure also has a negative effect, ranging from -0.69% (property taxes) to 1.43% (hospitals). Secondary education is preferred to parks, recreation, and natural resources (-1.11%). The evidence suggests that education financed by taxes is overfunded, for the average state⁵. This agrees with the findings of Brown, Hayes and Taylor (2003) and Miller and Russek (1997), but contrary to Mofidi and Stone (1990) and Helms (1985). This may be due to a lack of correlation between the quality of education and the money spent on education. Furthermore, Miller and Russek (1997) suggest that it may be due to a disincentive for states to invest in human capital. “Better to let someone else exhaust resources on education and then hire the improved product away.” Because education spending may not affect personal income in the short run, the long-term effects of education spending will be explored later in this paper.

Contrary to the findings of Brown, et al. but agreeing with Helm’s findings, spending on health and hospitals increases growth. My variable differ from these two previous studies in that government spending is net the charges hospitals receive either from individuals, or, as most likely the case, from insurance companies. 11 of the combinations are statistically significant. They range from 0.53% (other revenue) to -2.54% (parks, etcetera).

⁵ To test the theory whether too many “buildings” were being built, the calculations were also made using education minus capital outlays. The coefficients for higher education were slightly less negative, while the coefficients for secondary education were slightly more negative.

Increasing the budget surplus indicates a benefit to growth in state personal income. Increasing net utility expenditure also shows positive effects. Both variables are consistently statistically significant for 11 combinations. The coefficients for surplus/utilities range from 0.29%/0.46% (other revenue) to -2.30%/-2.47% (parks, etcetera).

The last expenditure to show mostly consistent results, is transportation with nine significant fiscal tradeoffs. Publicly provided transportation is overfunded. However, spending on transportation is preferred over parks, etcetera (-1.30%). The other coefficients range from -0.49% (property taxes) to 1.24% (health and hospitals).

The rest of the variables display mixed results. Welfare, unemployment, and housing & community expenditures shows to be a more growth enhancing than higher education (-1.16%), parks, etcetera (-1.57%), but not to utilities (0.90%), health (0.97%), and the surplus (0.73%). This implies that subsidizing health spending is a more growth effective way to assist than direct welfare, unemployment, or housing subsidies. The revenue options were all negative with two significant at the 1% level and two others significant with a one-tail test.

Growth Hills

In an effort to explain the variety of econometric results for the effect of taxation on economic growth among the literature, Bania, Gray and Stone (2007) explain that all could be accurate according to Barro-style growth models. According to this model, taxes can have a negative, none, or a positive effect on growth. The effect relies on the initial level of taxes and how the tax revenues are spent. When taxes are low, revenue

increases spent on productive expenditure will exhibit a positive effect on growth. When taxes are high this effect may turn negative.

The theory differentiates between productive and nonproductive expenditures in their effect on economic growth. Rather than judging a priori which expenditures are productive and which not, I will incorporate the findings from tables 5 and 6. I define nonproductive expenditure as parks, recreation, and natural resources; higher education; secondary education; welfare, unemployment, and housing & community; and transportation. Productive is defined by hospital; net utility; police, fire, and corrections facilities; and other expenditures. Table 7 displays the results.

Table 7: Estimating Growth Hills for State and Local Revenues and Expenditure 1977-2010

	Total Revenues	Prod. Expend.	Unprod. Expend.	Net Intergov. Revenue	Surplus
Unemployment Rate	-0.17***	-0.14***	-0.16***	-0.15***	-0.15***
Total Revenues		0.49**	-0.44***	0.66**	1.01***
Total Revenues Squared		-0.013***	-0.01**	-0.016***	-0.02***
Productive Expenditure	-1.08***		-0.622**	-1.23***	-1.56***
Productive Expenditure Squared	0.07***		0.08***	0.07***	0.07***
Unproductive Expenditure	-1.30***	-1.91***		-1.78***	-2.12***
Unproductive Expenditure Squared	0.02	0.051***		0.045***	0.046***
Net Intergov. Revenue	0.05	-0.06	-0.65***		0.31**
Surplus	0.49***	0.43***	1.14***	0.33*	
Surplus Squared	-0.014**	-0.01	-0.01	-0.001	
Constant	16.23***	11.46***	11.10***	13.45***	13.36***

Note: * p<0.1; ** p<0.05; *** p<0.01. The omitted variable is labeled above the column.

From the results, I estimate the peak of a growth hill for total revenue where $Total\ Revenue = -B_1/2S_1$. For the four equations the estimated growth maximizing level of revenue are respectively: 18.17, -7.88, 21.38, and 30.87. Revenue raised to fund unproductive expenditures are growth diminishing. For the states in the time period in the sample, increasing unproductive expenditures decreases growth at an increasing rate. Unproductive expenditure will be growth diminishing at any point in the sample. The other three estimates give an idea as to where the ideal revenue to personal income ratio should be. The higher point estimate for revenue funding surplus, suggests the negative impact state budget deficits have on the economy.

Long-Run Effects and Measurement Error

Annual data are particularly vulnerable to measurement error bias. Reed and Rogers (2006) estimate the roughly one-half of the annual variation in tax burden is due to factors other than tax policy. According to Evans and Karras (1994), annual state-level income data are characterized by substantial serial correlation. In order to help correct for these problems, I use multi-year interval data. Measurement error is more likely to cancel out over longer time periods and serial correlation is less severe when observations are distanced further apart. An additional advantage is that the variables have different calendar dates. State's fiscal years vary and the calendar year is utilized for unemployment and personal income.

For a further robustness check, and to inquire over the long-run relationship between revenues, expenditures, and growth, I estimate the regression using 5 year intervals and incorporating a 5 year lag into the fiscal variables. Consistent with Reed (2008), the data

now include observations for the years 1977-1981, 1982-1986, ... , 2002-2006, for 300 observations. The estimated equation now is

$$(17) \quad V_{st} = a + \sum_{i=1}^k [D_i(X_{ist} - X_{ist-4}) + L_i X_{ist-4}] + u_{st} + \varphi_s + \gamma_t + \omega_{st}.$$

Another mathematically equivalent specification of the fiscal variables is

$$(18) \quad \sum_{i=1}^k [D_i X_{ist} + (L_i - D_i) X_{t-4}].$$

Results are displayed in table 8. The estimated coefficients continue to tell a similar story as those found in table 2. Revenues spent on general expenditure appear to be too great. If expenditures as a share of personal income increase by one percent over 5 inclusive years, the growth rate is expected to decrease by -0.41%. The long run effect of an increase in expenditure financed by general revenues is -0.15%. However, own-source revenues are preferential to federal government income with significance in the differenced (0.80%) and lagged (0.68%) variables. Increasing the surplus is growth enhancing. When state and local governments raise revenue a growth rate increase of 0.33% is expected five years later. If over five years revenues increased a growth rate rise of 0.49% is estimated. Lowering expenditure to increase the surplus enhances growth, both in the long run (0.48%) and short run (0.90%).

Table 9 displays the estimates the long-run effects of disaggregated revenues and expenditures. For convenience, only select columns are shown.⁶ Recall that because of perfect multicollinearity, each regression is the same. I included the columns with the most statistically significant results. Since there are only 300 observations, in contrast to the 1700 observation before, there are less statistically significant relationships. In general, the coefficients are larger. This could illustrate the lag in the effect that fiscal

⁶ Corporate income tax, other revenues , net utility expenditure, higher education, welfare, and net governmental revenues

activity has on economic growth. It could also reflect correction for the biases mentioned previously.

The most influential fiscal variable from the analysis displayed in tables 3 and 4, parks, recreation, and natural resources, now is statistically insignificant and has mixed signs. Net Utilities have 12 significant fiscal trade-offs. Increasing spending on utilities generally enhances growth. The only directional change from table 3 is raising hospital spending by lowering utility spending has a negative insignificant relationship with growth.

Table 8: Estimating Long-Run Effects of Aggregated Revenues and Expenditures on Growth 1977-2010

	Total Revenues	Total Expenditure	Net Intergov. Revenue	Surplus
Unemployment Rate	-0.40***	-0.40***	-0.40***	-0.40***
Δ Total Revenue		-0.41***	0.80**	0.49***
Lag Total Revenue		-0.15**	0.68**	0.33***
Δ Total Expenditure	-0.41***		-1.21***	-0.90***
Lag Total Expenditure	-0.15**		-0.83***	-0.48***
Δ Net Intergov. Revenue	-0.80**	-1.21***		-0.31
Lag Net Intergov. Revenue	-0.68**	-0.83***		-0.34
Δ Surplus	0.49***	0.90***	-0.31	
Lag Surplus	0.33***	0.48***	-0.34	
Constant	8.47***	8.47***	8.47***	8.47***

Note: * p<0.1; ** p<0.05; *** p<0.01. The omitted variable is labeled above the column.

Table 9: Estimating Long-Run Effects of Disaggregated Revenues and Expenditures on Growth 1977-2010

	Corp. Income Tax	Other Rev.	Net Utility	Higher Educ.	Welfare	Net Int'gov. Rev.	Surplus
Unemp. Rate	-0.33***	-0.33***	-0.33***	-0.33***	-0.33***	-0.33***	-0.33***
Property Tax Δ	-1.84*	-0.05	1.15**	-0.38	-0.71*	1.04**	0.36
Lag	-0.48	0.38	1.97***	-1.14	0.13	0.94	0.53
Δ Sales Tax	-2.37**	-0.59	0.62	-0.91	-1.24**	0.50	-0.18
Lag	-0.97	-0.12	1.47**	-1.64*	-0.37	0.45	0.03
Δ Ind. Inc. Tax	-2.47**	-0.68	0.52	-1.00	-1.34**	0.41	-0.27
Lag	-0.14	0.71	2.30**	-0.81	0.46	1.27	0.86
Δ Corp. Inc. Tax		1.79	2.99**	1.46	1.13	2.88**	2.20*
Lag		0.85	2.44*	-0.66	0.61	1.42	1.00
Δ Other Rev.	-1.79		1.20**	-0.33	-0.66**	1.09*	0.41**
Lag	-0.85		1.59***	-1.52*	-0.25	0.57	0.15
Δ Net Utility	2.99**	1.20**		1.53	1.86***	0.11	0.79*
Lag	2.44*	1.59***		3.11***	1.84**	1.02*	1.44***
Δ Pol., Fire, & Corr.	1.73	-0.06	-1.26	0.27	0.60	-1.14	-0.47
Lag	2.78	1.92	0.33	3.44**	2.17	1.36	1.77
Δ Transportation	1.42	-0.37	-1.57*	-0.04	0.288	-1.46*	-0.78
Lag	0.30	-0.56	-2.15***	0.96	-0.31	-1.12***	-0.71
Δ High. Educ.	1.46	-0.33	-1.53		0.33	-1.41	-0.74
Lag	-0.66	-1.52*	-3.11***		-1.27	-2.08**	-1.67**
Δ Second. Educ.	1.49	-0.30	-1.50***	0.03	0.36	-1.38***	-0.71
Lag	0.77	-0.08	-1.67***	1.43	0.16	-0.65	-0.23
Δ Hospital	1.88	0.09	-1.11	0.41	0.75	-1.00	-0.32
Lag	1.14	0.29	-1.30	1.81	0.54	-0.28	0.14
Δ Parks, Rec., & Nat. Res.	1.92	0.13	-1.07	0.46	0.79	-0.95	-0.28
Lag	-1.33	-2.18	-3.77	-0.66	-1.93	-2.75	-2.33
Δ Welfare	1.13	-.66**	-1.86***	-0.33		-1.75***	-1.07***
Lag	0.61	-0.25	-1.84**	1.27		-0.81	-0.40
Δ Other Exp.	1.14	-.65*	-1.85**	-0.32	0.01	-1.73**	-1.06***
Lag	-0.09	-.95**	-2.54***	0.57	-0.70	-1.51*	-1.10**
Δ Net Int. Rev.	-2.88**	-1.09*	0.11	-1.41	-1.75***		-0.68
Lag	-1.42	-0.57	1.02*	-2.08**	-0.81		-0.41
Δ Surplus	2.20*	0.41**	-0.79*	0.74	1.07***	-0.68	
Lag	1.00	0.15	-1.44***	1.67**	0.40	-0.41	
Constant	8.81***	8.81***	8.81***	8.81***	8.81***	8.81***	8.81***

Note: * p<0.1; ** p<0.05; *** p<0.01. The omitted variable is labeled above the column.

Welfare expenditure has 7 statistically significant fiscal trade-offs. Raising welfare spending by taxes has a negative effect. The differenced variables are significant while the lags are not. The effects range from -0.71% (property tax) to 1.75% (net intergovernmental revenue). Interestingly, corporate income tax has a positive, statistically insignificant coefficient. Net utility is preferred over welfare spending. The coefficients for differenced and lagged effects are 1.86% and 1.84%, respectively.

Higher education spending continues to display growth reduction qualities. Although the revenue coefficients are not as statistically significant as before, they are all still negative with the exception of the differenced corporate income tax coefficient. Lagged sales (-1.64%), other revenue (-1.52%), and net intergovernmental revenue (-2.08%) are significant. Police, fire, and correction facilities now shows a strong (3.44%) lagged effect on growth if spending is allocated there rather than at net higher education.

The corporate income tax now has many significant relationships. If revenues are raised by property taxes, sales taxes, or individual income taxes expected effects on growth for the differenced variables are -1.84%, -2.37%, and -2.47%, respectively. This is consistent with the findings of Miller and Russek (1997) and Brown, Hayes and Taylor (2003). On the expenditure side, net utilities has significant effects (2.99% and 2.44%), most other expenditure options have positive coefficients.

Section VI - Conclusion

This paper has examined the effect of state and local revenues and expenditures on growth in real per capita personal income across 49 states and the District of Columbia for the years 1977 – 2010. I investigated the issue under the framework of a constant government budget constraint: revenues equal expenditures plus surplus.

Policy makers have more goals than simply to grow state personal income. Certain desirable aspects are not reflected in how high the personal income is. Therefore, the results need to be understood in the framework of what they are intended for: the strict effect on growth in the economy.

I found state and local government revenues to be too high. If revenues are raised by one percent as a share of personal income and spent on general expenditure the growth rate of the economy is expected to shrink by -0.43%. I then study which particular revenue sources and expenditures are growth reducing. Spending on parks, recreation, and natural resources has the most pronounced effect. Most fiscal tradeoffs are statistically significant and coefficients range from 1.11% (secondary education) to 2.54% (hospitals and health) when spending on parks, etcetera decreases. Agreeing with the later literature Brown, Hayes and Taylor (2003) and Miller and Russek (1997), I find that government subsidized education spending to be overfunded for the average state. This holds true for contemporaneous and lagged effects. The estimates range from an effect of -0.69% if property taxes increase to fund secondary education to a lagged effect of 3.44% if police, fire, and correction facilities are funded by reducing higher education expenditure.

I find that increasing health and hospital spending net of charges magnifies growth. The expected increases in the growth rate range from 0.53% (other revenue) to -2.54% (parks, etcetera). Increasing the budget surplus increases growth. These results hold true both in the contemporaneous and long-run frameworks. Effects range from 0.41% (other revenue) to -2.30% (parks, etcetera). Net utility expenditures improve growth when increased. Under the long-run framework, the effects range from -0.79% (contemporaneous surplus) to 3.11% (lagged higher education).

Welfare, unemployment compensation, and housing and community spending increases reduce growth. The estimated effects range from -0.66% (other revenue) to 1.86% (net utility). There is evidence that health spending and increasing the surplus is preferred to welfare spending. Assuming much of net utility expenditure is used in assistance to the needy, both health and utility assistance are more efficient avenues to help the poor than through direct welfare, unemployment compensation and housing and community spending.

State and local governments underutilize the corporate income tax. Relying more on a corporate income tax reduces market distortions caused by property taxes, individual income taxes, sales taxes, and federal tax sources. The estimated increases in growth range from 1.84% (property tax) to 2.88% (net intergovernmental revenues).

Starting at zero, increasing revenues to fund productive expenditures, surplus, or replace net intergovernmental revenue, growth increases. Eventually, the growth rate starts to decrease as diminishing returns set in. For spending on productive services, I estimate the optimal point to be between 18.17 and 30.87. The average level of spending

for the sample is near this at 18.23% of total state personal income. Yet recall that this includes spending on productive as well as unproductive expenditure.

The goal of a government taxation and expenditure is to provide public goods that are underprovided by the private economy with minimal tax distortion. As state and local government move from overprovided expenditures to more underprovided expenditures and implement optimal taxation, state economies will grow at higher rates.

Appendix 1: Fiscal Variable Series Construction

All variables are multiplied by 100 and divided by personal income. For further reading of variable definitions, refer to the Government Finance and Employment Classification Manual U.S. Bureau of the Census (2006).

Total Revenue = property tax + sales tax + individual income tax + corporate income tax + other revenue

Property Tax = property tax

Sales Tax = total sales and gross receipts tax + property sales tax – public utility tax

Individual Income Tax = individual income tax

Corporate Income Tax = corporate income tax

Other Revenue = total revenue - (property tax + sales tax + individual income tax + corporate income tax) – liquor stores expenditure – total general charges – total utility revenue - public utility tax¹⁵

Net Intergovernmental Revenue = total intergovernmental revenue – total intergovernmental expenditure

Net Utility = total utility expenditure + solid waste management direct expenditure + sewerage direct expenditure – transit utility expenditure – (public utility tax + sewerage charges + solid waste management charges + total utility revenue – transit utility revenue)

Total Expenditure = net utility + police, fire, and corrections facilities + transportation + higher education + secondary education + hospital + parks recreation and natural resources + welfare + other expenditure

Police, Fire, and Corrections Facilities = police and fire protection expenditure + total corrections expenditure

Transportation = air transportation expenditure + total highways expenditure + water transportation expenditure + transit utility expenditure + parking expenditure - (air transportation charges + highways charges + water transportation charges + transit utility revenue + parking charges)

Higher Education = total higher education expenditure – total higher education charges

Secondary Education = elementary education expenditure – elementary school lunch charges

Hospital = health and hospitals expenditure - hospitals and health charges

Parks Recreation and Natural Resource = parks and recreation expenditure + total natural resources expenditure - (parks and recreation charges + natural resources charges)

Welfare = public welfare expenditure + unemployment compensation expenditure + housing community expenditure – housing and community charges

Other Expenditure = total expenditure - (police and fire protection expenditure + total corrections expenditure + total higher education expenditure + elementary education expenditure + health and hospital expenditure + total natural resources expenditure + parks and recreation expenditure + public welfare expenditure + housing community expenditure + unemployment compensation expenditure – liquor stores expenditure – total utility revenue – sanitation expenditure – all other charges - (transit utility expenditure + air transportation expenditure + total highways expenditure + water transportation expenditure + parking expenditure)

Surplus = total revenue – total expenditure + net intergovernmental revenue

Appendix 2: Variables Averages by State

Table 10: State and Local Revenues: 1977 - 2010 presented in order of growth rate of real per capita state personal income, lowest to highest.

	Growth		Total Rev.	Property Tax		Sales Tax		Ind. Income Tax	Corp. Income Tax	
Average	1.89		18.70		3.13		3.50	1.96		0.45
(CV)	0.20		0.29		0.32		0.32	0.57		0.90
Alaska	0.42	L	51.00	H	4.76	H	1.83	L	0.33	2.92 H
Nevada	1.15	L	16.55		2.41		5.63	H	0.00	L 0.00 L
Michigan	1.28	L	18.73		3.97		3.08		2.35	0.84 H
Idaho	1.48	L	17.76		2.66		3.34		2.46	0.40
Hawaii	1.49	L	19.30		1.98		5.80	H	2.94	0.26
Oregon	1.50		20.82		3.78		0.83	L	3.71	H 0.38
Indiana	1.51		15.13	L	3.13		3.44		2.22	0.41
Ohio	1.56		18.92		2.94		2.88		2.78	0.31
California	1.58		18.71		2.88		3.38		2.65	0.72
D.C.	1.59		18.62		1.61	L	1.24	L	3.38	H 0.79 H
Illinois	1.67		15.85		3.64		2.98		1.68	0.44
Montana	1.69		22.45		4.51		1.46	L	2.20	0.46
Arizona	1.70		17.32		3.21		4.62		1.50	0.37
Utah	1.70		19.18		2.69		4.13		2.53	0.32
Wisconsin	1.76		19.73		4.01		3.11		3.19	0.50
Kansas	1.79		16.12		3.47		3.36		2.03	0.43
Iowa	1.79		17.28		3.67		3.14		2.39	0.33
Missouri	1.80		15.20		2.25		3.34		2.09	0.23
West Virginia	1.83		21.00		2.03		4.52		2.14	0.56
Washington	1.85		17.95		3.01		5.89	H	0.00	L 0.00 L
Oklahoma	1.89		16.55		1.72	L	3.64		2.00	0.26
Pennsylvania	1.89		17.15		2.79		2.79		2.38	0.53
Kentucky	1.89		18.29		1.84		3.65		2.85	0.47
New Mexico	1.90		24.13	H	1.60	L	5.52	H	1.41	0.40
Texas	1.93		15.55		3.52		4.07		0.00	L 0.00 L
Florida	1.93		14.40	L	3.11		4.07		0.00	L 0.29
Georgia	1.95		15.97		2.70		3.67		2.35	0.38
Colorado	1.97		16.41		3.11		3.33		2.04	0.22
Nebraska	1.97		16.19		3.85		3.38		1.94	0.30
South Carolina	1.98		16.94		2.58		3.55		2.20	0.34
North Carolina	2.01		16.31		2.21		3.22		2.83	0.50
Arkansas	2.05		17.09		1.72		4.40		2.12	0.40
Wyoming	2.05		28.82	H	5.15	H	4.01		0.00	L 0.00 L

Table 10: State and Local Revenues: 1977 - 2010 presented in order of growth rate of real per capita state personal income, lowest to highest.

	Growth	Total Rev.		Property Tax	Sales Tax	Ind. Income Tax	Corp. Income Tax	
Tennessee	2.06	14.88	L	2.05	4.92	0.11	0.44	
Minnesota	2.07	19.50		3.25	3.45	3.31	0.55	
Alabama	2.08	15.91		1.25	L 3.88	1.78	0.30	
Maine	2.12	20.05		4.35	3.62	2.52	0.36	
Maryland	2.13	15.84		2.64	2.48	3.63	H 0.28	
Mississippi	2.15	19.58		2.38	4.93	1.33	0.38	
New Jersey	2.17	16.37		4.68	H 2.44	1.85	0.56	
Rhode Island	2.18	19.93		4.35	3.03	2.24	0.37	
New York	2.19	23.11	H	4.33	3.37	4.15	H 0.94	H
Louisiana	2.24	20.06		1.68	L 5.20	H 1.23	0.42	
Virginia	2.26	14.08	L	2.75	2.48	2.51	0.25	
North Dakota	2.30	20.91		3.02	3.74	1.09	0.50	
Vermont	2.33	20.08		4.76	H 3.14	2.28	0.37	
New Hampshire	2.38	H 13.65	L	5.11	H 1.44	L 0.15	0.71	
Connecticut	2.38	H 15.27		4.05	3.25	1.70	0.56	
South Dakota	2.40	H 18.10		3.51	4.39	0.00	L 0.19	L
Massachusetts	2.50	H 17.11		3.81	2.24	3.38	0.69	
Delaware	2.82	H 26.88	H	3.91	3.43	3.80	H 0.76	H

Note: All numbers are percentages and averaged over the years covered. The first row presents the averages over all observations (states and time). The second row is the coefficient of variation (the standard deviation of the column divided by the average of the column). L means one of the lowest five states in this category (the exception of six for individual income tax). H means one of the highest five states in this category.

Table 11: State and Local Revenues and Expenditures: 1977 - 2010 presented in order of growth rate of real per capita state personal income, lowest to highest.

	Inter. Gov. Rev.		Other Rev.		Surplus		Total Exp.		Police, Fire, & Corr.		Trans.	
Average	4.13		9.65		5.08		17.75		1.32		1.77	
(CV)	0.35		0.54		0.49		0.24		0.31		0.46	
Alaska	6.78	H	41.16	H	16.12	H	41.66	H	2.20	H	4.82	H
Nevada	2.45	L	8.50		2.86	L	16.14		1.89	H	1.80	
Michigan	3.65		8.48		4.35		18.03		1.45		1.21	
Idaho	3.91		8.89		5.41		16.26		1.26		1.95	
Hawaii	4.07		8.32		4.46		18.91		1.21		1.26	
Oregon	4.49		12.12		5.94		19.38		1.58		1.78	
Indiana	3.12		5.92	L	3.77		14.48	L	1.06		1.17	L
Ohio	3.46		10.00		5.07		17.31		1.32		1.24	
California	3.15		9.09		3.93		17.92		1.75		1.15	L
D.C.	3.61		11.59		5.28		16.95		1.38		1.33	
Illinois	2.97		7.10		3.40		15.43		1.33		1.53	
Montana	5.86	H	13.82	H	7.76	H	20.55		1.20		2.71	
Arizona	3.29		7.61		3.12		17.49		1.79	H	1.75	
Utah	4.34		9.51		4.09		19.43		1.35		1.98	
Wisconsin	3.40		8.91		5.02		18.11		1.45		1.76	
Kansas	3.06		6.84		3.57		15.61		1.11		1.88	
Iowa	3.59		7.75		4.13		16.74		0.98	L	2.19	
Missouri	3.47		7.30		4.55		14.12	L	1.17		1.52	
West Virginia	5.55		11.76		6.47		20.09		0.87	L	2.33	
Washington	3.33		9.04		2.38	L	18.90		1.36		1.79	
Oklahoma	3.71		8.94		4.58		15.68		1.24		1.45	
Pennsylvania	3.45		8.66		3.96		16.64		1.12		1.41	
Kentucky	4.49		9.48		5.07		17.71		1.13		1.94	
New Mexico	5.49		15.20	H	7.62	H	22.00	H	1.75		2.50	
Texas	3.10		7.95		3.56		15.09		1.28		1.46	
Florida	2.68	L	6.92		2.94	L	14.15	L	1.65		1.30	
Georgia	3.63		6.88		3.62		15.98		1.36		1.62	
Colorado	2.89		7.72		3.51		15.80		1.38		1.64	
Nebraska	3.40		6.71	L	3.13		16.45		1.06		1.99	
South Carolina	4.20		8.27		3.93		17.21		1.26		1.14	L
North Carolina	3.72		7.55		4.37		15.66		1.28		1.33	
Arkansas	4.57		8.46		5.76		15.90		1.06		1.67	
Wyoming	7.00	H	19.65	H	12.13	H	23.69	H	1.52		3.42	H
Tennessee	4.04		7.38		4.12		14.81		1.22		1.43	
Minnesota	3.44		8.94		4.39		18.54		1.06		1.88	
Alabama	4.47		8.71		4.76		15.63		1.17		1.54	
Maine	4.93		9.19		5.72		19.25		1.07		1.68	
Maryland	2.95		6.81		3.68		15.11		1.43		1.28	
Mississippi	6.12	H	10.56		7.29		18.41		1.16		2.06	
New Jersey	2.63	L	6.84		3.35		15.65		1.30		1.04	L
Rhode Island	4.58		9.94		5.06		19.46		1.54		1.20	

Table 11: State and Local Revenues and Expenditures: 1977 - 2010 presented in order of growth rate of real per capita state personal income, lowest to highest.

	Inter. Gov. Rev.		Other Rev.		Surplus		Total Exp.		Police, Fire, & Corr.		Trans.	
New York	4.38		10.33		5.61		21.89	H	1.76	H	1.77	
Louisiana	5.27		11.54		6.08		19.25		1.55		1.86	
Virginia	2.48	L	6.09	L	3.26		13.30	L	1.26		1.42	
North Dakota	5.49		12.56		7.54		18.86		0.85	L	2.76	H
Vermont	5.39		9.52		6.27		19.21		1.04		2.16	
New Hampshire	2.92		6.24	L	3.09	L	13.49	L	1.03	L	1.25	
Connecticut	2.64	L	5.70	L	2.98	L	14.92		1.13		1.10	L
South Dakota	4.90		9.99		5.97		17.03		0.98	L	2.76	H
Massachusetts	3.35		7.00		3.15		17.32		1.32		1.49	
Delaware	10.86	H	14.98	H	10.83	H	26.91	H	3.47	H	5.12	H

Note: All numbers are percentages and averaged over the years covered. The first row presents the averages over all observations (states and time). The second row is the coefficient of variation (the standard deviation of the column divided by the average of the column). L means one of the lowest five states in this category. H means one of the highest five states in this category.

Table 12: State and Local Expenditures: 1977 - 2010 presented in order of growth rate of real per capita state personal income, lowest to highest.

	High. Educ.		Elem. Educ.		Hosp.		Parks, Rec., & Nat. Res.		Welfare, Unemp., & Housing		Net Utility		Other Exp.	
Average	1.10		4.34		0.77		0.54		3.31		0.16		4.43	
(CV)	0.33		0.15		0.33		0.53		0.28		1.70		0.42	
Alaska	1.79	H	7.38	H	1.04	H	1.89	H	5.12	H	1.35	H	16.07	H
Nevada	0.82		3.62	L	0.53	L	0.71		2.08	L	0.14		4.54	
Michigan	1.16		4.78		0.95		0.35		3.89		0.26		3.97	
Idaho	1.31		4.14		0.56		0.62		2.85		0.10		3.47	
Hawaii	1.51		3.51	L	1.06	H	0.82	H	3.45		-0.05		6.14	H
Oregon	1.36		4.60		0.77		0.49		3.48		0.14		5.18	
Indiana	0.96		4.16		0.55	L	0.33		2.91		0.18		3.16	L
Ohio	0.78		4.29		0.88		0.29		3.77		-0.02		4.75	
California	1.17		3.80		0.87		0.51		3.54		0.14		5.00	
D.C.	1.14		4.09		0.80		0.51		3.07		-0.10		4.74	
Illinois	0.80		3.75		0.74		0.42		3.22		-0.21	L	3.86	
Montana	1.05		5.25	H	1.04		0.93	H	3.19		0.03		5.15	
Arizona	1.31		4.17		0.74		0.63		2.53		0.33		4.25	
Utah	1.82	H	4.80		0.58		0.68		2.76		0.75	H	4.70	
Wisconsin	1.35		4.68		0.69		0.51		3.81		0.20		3.66	
Kansas	1.31		4.16		0.64		0.43		2.51		0.01		3.56	
Iowa	1.37		4.36		0.67		0.51		3.24		0.19		3.24	
Missouri	0.73		3.88		0.80		0.39		2.78		-0.09		2.94	L
West Virginia	1.09		5.02	H	0.63		0.50		4.20		-0.12		5.57	
Washington	1.25		4.23		0.93		0.56		3.29		0.50	H	4.98	
Oklahoma	1.11		4.23		0.59		0.39		2.97		0.08		3.61	
Pennsylvania	0.57	L	4.16		0.71		0.28	L	4.22		-0.12	L	4.30	
Kentucky	1.21		3.85		0.58		0.44		4.04		0.06		4.45	
New Mexico	2.05	H	5.19	H	0.99		0.77		3.62		0.15		4.99	
Texas	1.19		4.43		0.76		0.36		2.32	L	0.11		3.18	L
Florida	0.76		3.65	L	0.77		0.70		2.22	L	-0.20	L	3.31	
Georgia	0.99		4.31		0.78		0.38		2.82		0.34		3.39	
Colorado	0.94		3.98		0.63		0.56		2.27	L	0.32		4.08	
Nebraska	1.32		4.43		0.48	L	0.59		2.70		0.64	H	3.23	
South Carolina	1.17		4.56		0.95		0.40		3.31		0.39		4.03	
North Carolina	1.45		3.95		0.91		0.45		2.89		0.17		3.24	
Arkansas	1.16		4.28		0.54	L	0.43		3.56		0.01		3.19	
Wyoming	1.76	H	6.06	H	0.94		1.26	H	2.37		0.39	H	5.95	H
Tennessee	1.01		3.46	L	0.74		0.35		3.33		0.25		3.02	L
Minnesota	1.05		4.50		0.69		0.60		4.33		0.18		4.25	
Alabama	1.40		3.91		0.86		0.39		3.02		-0.29	L	3.63	
Maine	0.80		4.60		0.82		0.50		4.97	H	0.28		4.53	
Maryland	0.88		3.75		0.65		0.48		2.69		0.05		3.90	
Mississippi	1.47		4.41		0.75		0.54		3.82		0.10		4.11	

Table 12: State and Local Expenditures: 1977 - 2010 presented in order of growth rate of real per capita state personal income, lowest to highest.

	High. Educ.	Elem. Educ.	Hosp.	Parks, Rec., & Nat. Res.	Welfare, Unemp., & Housing	Net Utility	Other Exp.
New Jersey	0.63	4.45	0.63	0.24	L 3.09	-0.21	L 4.48
Rhode Island	0.72	4.21	0.84	0.30	4.93	H 0.11	5.60 H
New York	0.79	4.83	1.34	H 0.30	5.07	H 0.22	5.80 H
Louisiana	1.00	4.29	1.14	H 0.71	3.57	0.20	4.94
Virginia	0.89	3.86	0.59	0.31	2.14	L -0.09	2.93 L
North Dakota	1.56	H 4.46	0.62	0.94	H 3.45	-0.01	4.23
Vermont	0.91	4.92	0.66	0.52	4.44	0.16	4.39
New Hampshire	0.43	L 3.74	0.52	L 0.23	L 2.91	0.16	3.21
Connecticut	0.56	L 3.64	L 0.83	0.20	L 3.01	0.02	4.43
South Dakota	0.91	4.21	0.71	0.78	2.58	0.32	3.79
Massachusetts	0.52	L 3.67	0.94	0.22	L 4.13	0.34	4.68
Delaware	0.48	L 4.08	2.02	H 0.46	6.76	H 0.19	4.33

Note: All numbers are percentages and averaged over the years covered. The first row presents the averages over all observations (states and time). The second row is the coefficient of variation (the standard deviation of the column divided by the average of the column). L means one of the lowest five states in this category. H means one of the highest five states in this category.

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AWARDS & PRESENTATIONS

- Graduate Assistantship, UNLV Economics Department. Fall 2012 through spring 2013.
- Clarke, Christopher A. *United States Federal Tax Progressivity: A Comparative Historical Analysis*. Poster presentation at the UNLV 2012 Undergraduate Research and Symposium. April 21, 2012.
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RELATIVE EXPERIENCE

UNLV Center for Business and Economic Research

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- Assisted in compiling 2013 Nevada KIDS COUNT Data Book
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UNLV Department of Economics, Teaching Assistant

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Williams Pest Control, Technician and Hiring Consultant

Oct 2005 – Aug 2006, Aug 2008 – July 2012

- Sought out, interviewed, and trained new employees.

LDS Church, Missionary

Aug 2006 – Aug 2008

- Weekly service which included interpreting for the US Army's service medical operations and Relief efforts for Hurricanes Noel and Olga. Dominican Republic

ZMicrosystems, Software Tester

June 2004 – Oct. 2005

Tutor and Translator

Intermittent

- Economics, Mathematics from elementary age to calculus, and Piano.
- Spanish both as a tutor of lower and upper division courses and a translator for local businesses.

SKILLS

- Spanish, fluent
- Stata, Microsoft Excel, Word, Power Point, Adobe InDesign