Original Research Article

Modeling the Relationship Between Tax Revenue, Public Spending, and Economic Growth Across U.S. States

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ABSTRACT

This study examines the relationship between state tax revenue, public spending, and economic growth across U.S. states using a quantitative financial-health framework. State-level data were obtained from federal resources, including the U.S. Census Bureau's Annual Survey of State Government Tax Collections and Annual Survey of State Government Finances, and state gross domestic product (GDP) data reported from the Bureau of Economic Analysis. Economic growth was measured as the annual percentage change in real state GDP. Employing a linear regression model, the association between fiscal variables and economic growth was assessed. The regression results showed that normalized tax revenue and public spending explained a small portion of variation in 2021 state GDP growth, but neither predictor was statistically significant. This suggests that the relationship between fiscal capacity, public investment, and short-term economic growth is weak and should be interpreted cautiously. Although the analysis does not establish causal relationships, the findings did not provide strong statistical support for the proposed hypothesis. This study provides an accessible exploratory state-level analysis using authoritative federal data and evaluates revenue and expenditure together as related indicators of fiscal capacity and economic performance.

Keywords: Tax revenue; public spending; economic growth; U.S. states; fiscal policy; regression analysis; state-level data

INTRODUCTION

State governments play an important role in determining economic outcomes through fiscal policies. Importantly, taxation and public spending constitute a significant portion of them. In the United States, state-level governments are responsible for providing finances to main public services, including education, transportation infrastructure, healthcare, and social welfare programs. All of them are frequently cited as contributors to economic performance in a long-term perspective. Since states operate with balanced budget requirements, state fiscal decisions are constrained by balanced-budget requirements that shape revenue generation and expenditure allocation. This makes the relationship between tax revenue, public spending, and economic growth especially outstanding at the state level (1).

According to economic theory, there are competing perspectives as to how fiscal policy influences growth. Based on neoclassical growth models, capital accumulation, labor supply, and technological progress are emphasized as the main determinants of economic expansion. This suggests that growth may be reduced

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by taxation by distorting private investment and labor incentives (2). However, according to endogenous growth theories, it argues that government spending on productivity-enhancing public goods, including education, research, and infrastructure, may generate positive externalities leading to long-run growth rates (3). In the perspective of these theoretical frameworks, there is an implication that the growth effects of fiscal policy may depend on the balance between productive public investment and distortionary taxation. Because these theoretical perspectives predict both potential benefits and potential costs of fiscal policy, empirical studies are required to examine how these relationships appear in observed state-level data.

Empirical research dealing with the relationship between taxation and economic growth has generated mixed results. There are several studies, providing findings that higher overall tax may serve as a tax burden that is associated with slower economic growth, especially when taxes are imposed heavily on income and capital (4). Other works imply that the structure of taxation is more important than its overall level. Broad-based consumption taxes are less harmful to growth than narrow or highly progressive tax systems (5). These findings imply that economic outcomes are not determined solely by tax revenue, but are also affected by how revenue is raised and used.

Public spending has similarly turned out to have heterogeneous effects on economic performance. According to prior research focusing on government expenditure composition indicates how spending on education, infrastructure, and health is often positively associated with productivity and growth. However, unproductive or inefficient expenditures may generate limited or even negative economic effects (6). However, at the aggregate level, total public spending is still a useful proxy for fiscal policy, especially in the perspective of cross-state consumption where disaggregated spending categories may not be available over time in a consistent manner (7).

The interaction between tax revenue and public spending is important especially in the perspective of U.S. state governments. Unlike the federal government, there exist legal and institutional constraints in states that require expenditures to track revenues closely. This amplifies fiscal trade-offs during economic expansions and recession (8). Rising tax revenues may make it feasible to increase public investment during the periods of economic growth, while economic downturns often force states to decrease spending or raise taxes. Because of this, states may face potentially reinforced cyclical fluctuations (9). These dynamics particularly suggest that causal interpretation may be complicated, making careful quantitative modeling a necessary component as fiscal variables and economic growth may be jointly determined.

Recent empirical studies have been increasingly employing panel data methods to assess fiscal policy outcomes in various U.S. states over time. With variation across jurisdictions and years, researchers were able to control for unobserved state-specific characteristics and national economic trends through panel analyses (10). State gross domestic product (GDP) is a commonly used measure of economic output and growth that standardized indicator of economic performance is provided across states (11). Prior state-level analyses indicated how fiscal variables, such as tax revenue and government expenditures, provided a meaningful share of variation in economic growth. However, estimated effects turned out to vary across model specifications and time periods (12).

In spite of an extensive amount of literature on fiscal policy and growth, there has not been consensus in terms of the joint relationship between tax revenue, public spending, and economic growth at the state level. There are several studies emphasizing how there exists negative growth effect of high taxation, while other studies underscore the growth-enhancing potential of public investment. At the same time, there are relatively few studies that frame policy particularly in terms of overall financial health by considering both revenue and expenditure at the same time as interrelated components of state economic systems (13).

To fill this literature gap, this study aims to contribute to the literature by examining how tax revenue, public spending, and economic growth are related across U.S. states by using publicly available federal data. By applying state tax collections, government expenditure measures, and GDP data, this study has conducted analysis by adopting a financial health perspective to underscore fiscal capacity and economic performance as interconnected outcomes. Instead of focusing on particular tax instruments or spending categories, this study adopts aggregate fiscal measures to provide a broad and comparative assessment that is appropriate for empirical research. To achieve the goal in filling the literature gap, this study particularly seeks to answer the research question about what the relationship between state-level tax revenue, public spending, and economic growth among U.S. states is. This study hypothesized

that states with higher revenue and public spending levels would be associated with higher economic growth rates, although the analysis was designed to identify associations rather than causal effects.

METHODS AND MATERIALS

Data Sources

This study used publicly available, secondary data that were obtained from authoritative federal agencies in the United States. Economic growth data were obtained from the Bureau of Economic Analysis state GDP dataset (10). State-level revenue data were collected from the U.S. Census Bureau's Annual Survey of State Government Tax Collections (11), providing comprehensive information on total tax revenue for each state in the U.S. by year. Public spending data were obtained from the U.S. Census Bureau's Annual Survey of State Government Finances (12).

This study used a cross-sectional observational design using state-level data from 2021. Each observation represented one U.S. state. There were a total of 50 U.S. states in the initial dataset. Tax revenue and public spending data were matched with Bureau of Economic Analysis real GDP data by state name. GDP growth was calculated as the percentage change in real GDP from 2020 to 2021. States were included if tax revenue, public spending, real GDP in 2020, and real GDP in 2021 were all available. Since all 50 states had complete data for the variables used in the final model, no states were excluded. 50 state-level observations were included in the final analytic sample.

Python was used to perform data cleaning, merging, descriptive statistics, correlation analysis, figure generation, and ordinary least squares regression. The main Python packages used were pandas, NumPy, matplotlib, and statsmodels.

Variables

The dependent variable in the model proposed in this study was economic growth that was measured as the annual percentage in real state GDP. GDP growth was computed by using GDP values in consecutive years to identify changes in overall economic performance.

State tax revenue and public spending were main independent variables in this study. Tax revenue was measured as total tax collections in the states, showing the fiscal capacity of each state. Public spending was measured as total state government expenditures that identified the level of public investment and service provisions. To improve comparability across states with different fiscal scales, tax revenue and public spending were normalized using min-max scaling. For each fiscal variable, the lowest observed state value was assigned 0, and the highest observed state was assigned 100. Therefore, the regression model used normalized fiscal indicators rather than raw aggregate dollar values.

Analytical Approach

A quantitative, regression-based approach was used to evaluate how tax revenue, public spending, and economic growth were related. To summarize the distribution of all variables across states and years, descriptive statistics were calculated. In addition, basic relationships among variables were assessed by examining scatter plots and correlation coefficients before generating formal mathematical model.

To assess the association between fiscal variables and economic growth, this study estimated a simple linear regression model. This approach was chosen because of its interpretability, suitability for the research, and also frequent use in empirical studies for economic performance in the level of states.

Mathematical Model

The relationship between fiscal variables and economic growth was demonstrated by the following linear model.

$$\text{GDP Growth}_{s,t} = \beta_0 + \beta_1 (\text{Tax Revenue}_{s,t}) + \beta_2 (\text{Public Spending}_{s,t}) + \varepsilon_{s,t}$$

Where $\text{GDP Growth}_{s,t}$ denotes the economic growth rate of state s in year t; $\text{Tax}_{s,t}$ denotes total state tax revenue for state s in year t; $\text{Public Spending}_{s,t}$ denotes the total government expenditures in state s in year t; β_0 is the intercept term; β_1 and β_2 are the coefficients of regression model that measured the association between fiscal variables and economic growth; and $\varepsilon_{s,t}$ is the error term capturing unobserved factors. To estimate the model parameters, ordinary least squares (OLS) estimation was used. Standard significance level of $\alpha = 0.05$ was used to evaluate statistical significance.

RESULTS

To summarize state-level tax revenue, public spending, and economic growth across the study period, descriptive statistics were first examined. For both fiscal capacity and economic performance, considerable variation was

observed across states. Normalized fiscal values varied across states. This indicated differences in relative tax revenue and public spending levels after rescaling the variables to a common 0-100 scale. Economic growth rates were measured as annual percentage changes in state GDP, and they varied across years and states. This reflected differences in regional economic conditions and broader national economic cycles.

Correlation analysis showed a positive association between tax revenue and public spending. This suggested that states with larger economies had greater revenue capacity and also higher levels of expenditure. There was a weaker but positive correlation between economic growth and both fiscal variables (Figure 1). Because correlation analysis does not consider the overlap between tax revenue and public spending, the next step was to estimate a regression model that both fiscal variables were included simultaneously. This suggested a weak descriptive relationship, but the regression model was needed to test whether each fiscal variable remained associated with GDP growth after controlling for the other.

The relationship between tax revenue, public spending, and economic growth was examined in the main regression analysis by using the linear model specified in the Methods section. The regression model explained a small portion of the variation in state-level GDP growth. A total of 50 state-level observations were included, producing an R^2 of 0.051 and an adjusted R^2 of 0.011. This indicated that normalized tax revenue and public spending together explained around 5.1% of the variation in 2021 state GDP growth. The overall model was not statistically significant, F(2,47)=1.269, p=0.291 (Table 1).

Tax revenue did not show a statistically significant association with state GDP growth in multivariable regression model. The coefficient for normalized tax revenue was slightly negative, β = -0.005, SE = 0.069, 95% CI [-0.143, 0.133], p=0.939. This shows that tax revenue was not a meaningful predictor of 2021 GDP growth in this cross-sectional model after controlling for public spending.

Public spending indicated a positive but statistically non-significant association with state GDP growth.

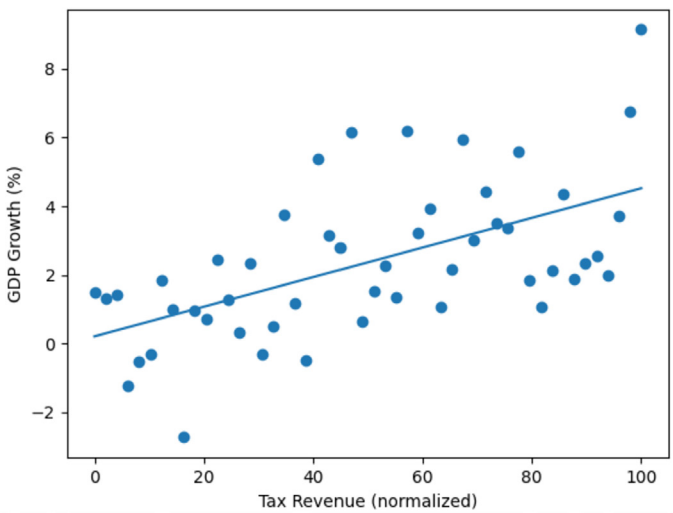

Figure 1. *Relationship between normalized tax revenue and 2021 real GDP growth across states in the U.S. The x-axis indicates tax revenue normalized on a 0-100 scale, and the y-axis indicates real GDP growth measured as the percentage change from 2020 to 2021. Each point shows one U.S. state, and the fitted line summarizes the bivariate association.*

Table 1. *Ordinary least squares regression results for the association between normalized fiscal variables and 2021 real GDP growth across 50 U.S. states. Tax revenue and public spending were normalized on a 0–100 scale, and GDP growth was measured as the percentage change in real state GDP from 2020 to 2021.*

Predictor	Coefficient	Standard Error	95% Confidence Interval	p-value
Intercept	5.171	0.386	[4.394, 5.947]	<0.001
Tax revenue, normalized	-0.005	0.069	[-0.143, 0.133]	0.939
Public spending, normalized	0.031	0.059	[-0.086, 0.149]	0.594
N	50			
R^2	0.051			
Adjusted R^2	0.011			
Model p-value	0.291			

The coefficient for normalized public spending was β = 0.031, SE = 0.059, 95% CI [-0.086, 0.149], p = 0.594. The direction of the coefficient was positive, but the confidence interval included zero. This means that the model did not provide sufficient evidence to conclude that higher public spending was substantially associated with higher GDP growth in 2021 (Figure 2).

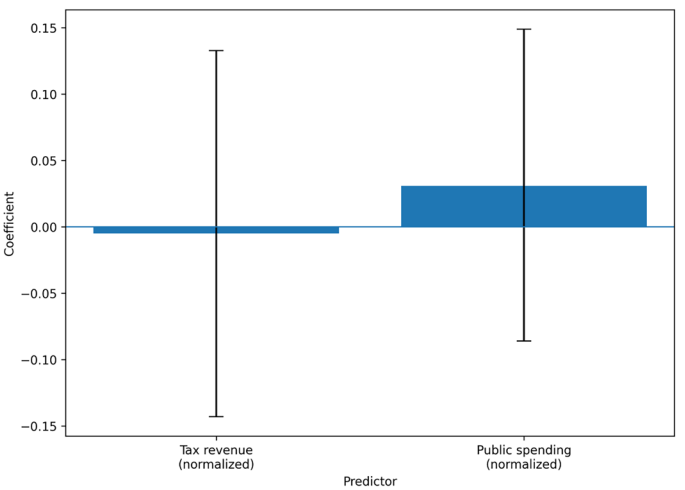

Figure 2. *Estimated regression coefficients for normalized fiscal predictors of 2021 state GDP growth. Bars indicate ordinary least squares coefficients for normalized tax revenue and normalized public spending. GDP growth was measured as the percentage change in real state GDP from 2020 to 2021.*

Public spending had a positive coefficient, while tax revenue had a slightly negative coefficient. However, neither predictor was statistically significant. Therefore, the regression results should be interpreted as weak exploratory associations.

Overall, the regression results did not provide strong statistical support for the hypothesis that higher tax revenue and higher public spending were associated with higher state GDP growth in 2021. This also highlights the complexity of growth dynamics and the importance of cautious interpretation.

DISCUSSION

This study examined the relationship between state-level tax revenue, public spending, and economic growth across U.S. states using publicly available fiscal and economic data. The regression results did not provide strong statistical support for the hypothesis as neither normalized tax revenue nor normalized public spending was statistically significant. These findings also partly align with endogenous growth theory, suggesting that government spending on productivity-enhancing public goods can support long-term economic performance. However, the regression results were weaker than expected as neither tax revenue nor public spending was statistically significant in the final model. This differs from studies that find stronger relationships between fiscal policy and economic growth, especially when tax structure or specific spending categories are examined. One possible explanation is that aggregate fiscal indicators are used in this study rather than particular tax rates or disaggregated spending categories. Therefore, the current findings should be interpreted as a broad state-level analysis rather than the evidence about the effects of particular tax or spending policies.

Although tax revenue was positively related to GDP growth in the simple correlation analysis, it was not statistically significant in the regression model. Therefore, tax revenue should not be interpreted as an independent predictor of 2021 GDP growth.

In this perspective, the observed association between public spending and economic growth supports an idea about possible contribution of government expenditures on productivity and economic activity. In addition, labor productivity may be improved by public investments in areas, including education, infrastructure, healthcare, and public services. Further effects may include reduction of transaction costs and fostering a more efficient economic environment. In this study, spending was not disaggregated by category. However, because the public spending coefficient was not statistically significant, this result should be interpreted as theoretically consistent but not statistically conclusive.

Although this study provides an important insight about the relationship between public spending and economic growth, it is important to note several limitations of the analysis. First, this study used aggregate fiscal measures that may obscure variation in the effectiveness of different types of taxes and expenditures. Second, the model is vulnerable to simultaneity bias since tax revenue, public spending, and GDP growth may be jointly determined in the same period. Higher GDP may directly increase tax collections, while expanding the fiscal capacity available for public spending. In the meantime, fiscal policy may also influence economic growth. As a result, the ordinary least squares coefficients should not be interpreted as

causal effects, and even the direction of influence cannot be established from this model alone. Finally, there may be unobserved factors, including demographic trends, industrial composition, and policy differences across states that have a possibility of affecting the observed relationships.

Despite these limitations, this study contributes to fill the literature gap by providing an accessible analysis of state fiscal policy and economic growth by using authoritative data. It is recommended for future research to address aforementioned limitations by using lagged fiscal predictors, fixed-effect panel models, instrumental variables, or difference-in-differences designs when appropriate policy changes create clearer comparison groups. In addition, future study should also focus on extending this work by applying spending categories, lagged fiscal variables, or fixed-effects models to examine the dynamics between fiscal policy and economic performance.

CONCLUSION

In this study, the relationship between tax revenue, public spending, and economic growth across states in the U.S. was examined by using accessible federal data. With integration of state tax collections, government expenditure measures, and GDP growth, the analysis incorporated a financial health perspective to examine the relationship of fiscal capacity and public investment to economic performance at the state level. The results showed that normalized tax revenue and public spending explained only a small portion of variation in 2021 state GDP growth, and neither predictor was statistically significant. Therefore, the hypothesis was not strongly supported by the final regression model.

These findings suggest that revenue generation and public spending are related components of state fiscal systems, but the present model does not show that either variable independently predicts short-term GDP growth. States with higher levels of revenue capacity may be better positioned to sustain public investments in contribution to productivity and long-term growth. In addition, the results emphasize the importance of assessing fiscal policy in an integrated framework considering both revenue and expenditure instead of focusing on either dimension, separately.

While this study does not establish causal relationships, it provides a transparent exploratory analysis of how fiscal variables relate to short-term GDP growth across U.S. states. This research offers a replicable foundation for future studies by relying on transparent methods along with authoritative data sources. It is recommended for future research to focus on incorporating expenditure categories, dynamic effects, or policy-specific variables as they may deepen understanding of how economic outcomes may be influenced by state fiscal strategies over time.

CONFLICT OF INTEREST

The author declares no conflicts of interest related to this work.

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