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STATE ECONOMIC PROSPERITY AND TAXATION

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Abstract

This study investigates the relationship between various measures of economic performance and taxation in a longitudinal panel of American states. The study detects a pattern in how the effective average tax rate, the personal income tax, and personal income tax progressivity relate to different measures of state economic performance, which include real gross state product per capita and its growth rate, growth in the number of firms, and net immigration rate. The analysis of multiple indicators reveals that higher state taxes are generally associated with lower economic performance, even after controlling for tax endogeneity.

JEL codes: H2, H3, O4

Keywords: state taxes, effective average tax rate, tax progressivity, gross state product, GSP, state economic performance, state economic growth, immigration rate, income per capita, personal income tax

State Economic Prosperity and Taxation

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The causal relationship between economic growth and taxation has been difficult to ascertain empirically. Using a longitudinal panel of American states, this study attempts to identify broad empirical patterns in how the average tax rate, the personal income tax, and its progressivity relate to different measures of state economic performance. These measures include real gross state product (GSP) per capita and its growth rate, growth in the number of firms, and net immigration rate. Each measure has its strengths and weaknesses, but an analysis of multiple economic indicators can reveal whether taxes have a systematic effect on economic performance. This study also controls for the potential endogeneity of the tax variables, improving the odds of capturing a genuine causal relationship. The average tax rate is one of the key variables this study examines because it is a good approximation of the overall state tax burden. Personal income tax and its progressivity have also been added to the analysis.

The next section reviews the economic growth literature and presents my estimates on the effect of state taxes on income per capita and its growth rate. The two subsequent sections contain estimates of the effect of state taxes on the growth in the number of firms and on the net immigration rate, respectively. The last section summarizes my findings.

Gross State Product and Taxation

Real gross domestic product (GDP) is the premier indicator of national economic prosperity and the standard of living. Not surprisingly, the growth in real GDP per capita is one of the most studied variables in the social sciences. Two models of economic growth have come to dominate the economics discipline: the neoclassical growth model developed by Solow (1956) and the endogenous growth model developed by Romer (1986, 1990) and Lucas (1988). The neoclassical growth model predicts income convergence, *ceteris paribus*, and views exogenous technological progress as the primary source of long-run economic growth. In contrast, the endogenous growth model does not guarantee income convergence. There are three main sources of economic growth in the endogenous model: new knowledge (Romer 1990, Grossman and Helpman 1991), innovation (Aghion and Howitt 1992), and public infrastructure spending (Barro 1990). In Barro's model in particular, taxes that fund productive government spending can have a positive effect on growth. Yet all these models have their supporters and detractors.

The empirical literature on economic growth has only added more controversy to this already contentious field. A cross-country analysis of economic growth produces different conclusions depending on the model specification, countries, and time periods used.[1] Studies of economic growth in the United States also yield mixed results.[2] Several attempts have been made to build a more "robust" empirical model in search of the "true" determinants of economic growth.[3] Reed (2009), for example, uses extreme bound analysis and identifies the following robust determinants of state economic growth: labor force productivity, state industrial composition, government size, structure of government spending, and taxes, among others. Specifically, Reed finds that a larger federal and state government presence reduces state economic growth, more federal aid increases it, higher corporate and sales taxes increase it, and a higher average state tax rate reduces it.

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[1] See, for example, Levine and Renelt (1992), Sala-i-Martin (1997), Fernandez et al. (2001), Hendry and Krolzig (2004), and Hoover and Perez (2004).
[2] See McGuire (1992), Phillips and Goss (1995), Carroll and Wasylenko (1994), Wasylenko (1997), and Crain and Lee (1999).
[3] See Fernandez et al. (2001), Granger and Uhlig (1990), Hendry and Krolzig (2004), Hoover and Perez (2004), Levine and Renelt (1992), Sala-i-Martin (1997), and Sala-i-Martin et al. (2004).

A survey of growth economists by Arvanitidis et al. (2007) points to human and physical capital, infrastructure, political and legal institutions, and demographic, geographic, and cultural factors as some of the key determinants of economic growth. Arvanitidis et al. argue that the causes of economic growth could be separated into proximate factors (capital, labor, and technology) and fundamental factors (institutions, legal and political systems, culture, demography, and geography). As for institutions, the meta-analysis of the existing studies by Doucouliagos and Ulubasoglu (2006) and Hall and Lawson (2013) indicates that economic freedom is positively associated with economic growth, although its effect on growth might be indirect. Several studies find a positive association between economic freedom and GDP per capita as well as economic growth (Dollar 1992, Sachs and Warner 1995, Edwards 1998, Dollar and Kraay 2000). In particular, Ayal and Karras (1998) argue that economic freedom enhances growth by increasing total factor productivity and capital accumulation. According to Ayal and Karras, specific elements of economic freedom such as low money growth rate, small government, trade openness, and free capital mobility have a significant positive effect on economic growth. Continuing with the political institutions analysis, Uppal and Glazer (2011) find that higher legislative turnover leads to higher taxation and public capital spending, which reduce economic growth.

A growing number of studies suggest that taxes may have a negative effect on growth.[4] However, the empirical literature on economic growth and taxation has produced somewhat of a paradox (Tomljanovich 2004). On the one hand, there is no overwhelming evidence that higher tax rates reduce long-run economic growth. On the other hand, a consensus is forming that the tax-induced reductions in investment and innovation hurt economic growth. How can this be? In the neoclassical growth model, saving and investment are exogenous, which means that taxation

[4] See, for example, Plaut and Pluta (1983), Benson and Johnson (1986), Canto and Webb (1987), Vedder (1990, 2001), Berry and Kasermman (1993), Bahl and Sjoquist (1990), Hines (1996), and Besci (1996).

does not affect the long-run growth rate (Lee and Gordon 2005). Therefore, taxation may affect the *level* of income and have only a transitory impact on economic growth. Tomljanovich's (2004) finding that higher tax rates negatively influence only short-run economic growth supports this conclusion.

Meanwhile, the endogenous growth model suggests that taxation may influence the endogenously determined saving and investment decisions, thereby affecting the long-run growth rate. Arin et al. (2011) find that an increase in the marginal tax rate has a significant negative impact on economic growth in Scandinavian countries, the United States, and the United Kingdom. Jaimovich and Rebelo (2012) modify the endogenous growth model to show that under entrepreneurial heterogeneity and mobility, tax rate increases have a small impact on growth when tax rates are low or moderate, but when tax rates are high, further tax hikes have a large negative impact on growth rates. In addition to the conventional determinants of economic growth that are usually measured in shares or differences, Reed (2008) also examines the growth effects of variables measured in levels, which is consistent with an endogenous growth model with scale effects. Several other studies have also examined the effects of variables in levels of economic activity (Kocherlakota and Yi 1997, Miller and Russek 1997, Mendoza et al. 1997, Lee and Gordon 2005). Reed finds that a larger federal government sector and a higher average tax rate (in levels and differences) are associated with lower state economic growth.

Several studies at the state level show a negative effect of taxation on economic growth. Helms (1985), for example, finds that state taxes have a significant negative impact on state personal income, but he also finds that tax-financed spending on health, highways, and education has a significant positive impact on state personal income that cancels out the negative effect from taxation. Mofidi and Stone (1990) find that higher state taxes as a share of income have a significant negative impact on the growth of manufacturing employment even after controlling for state government spending on health, education, and highways. Controlling for tax regressivity, convergence, and regional influences, Poulson and Kaplan (2008) find that higher marginal tax rates have a significant negative impact on state economic growth. In a policy report, Laffer et al. (2012) point out that states without personal income taxes tend to have higher growth in GSP, population, employment, and even tax revenues.

Bartik (1991) conducts a thorough review of the literature (48 studies) and concludes that a 10 percent decline in business taxes, holding everything else constant, is associated with increased state economic activity of about 3 percent, on average. However, increases in tax revenue may pay for the improvements in public services, potentially lowering the 3 percent estimate (Bartik 1994). Wasylenko (1997) points out that the median values tend to cluster between 0 and 2.6 percent, placing the estimated impact of business tax changes probably below the 3 percent mean estimate suggested by Bartik. Reed's (2009) extreme bound analysis, on the other hand, suggests that a 1 percentage point increase in the average state tax rate reduces economic growth by 0.63 percentage points or more.

Several researchers argue that the findings on growth and taxation should be treated with caution. Alm and Rogers (2011), for example, find that the correlation between economic growth and state taxation and expenditure policies is often statistically significant, but in the case of taxation the relationship is sensitive to the specific regressor set and time period being used. Similarly, Pjesky (2006) finds that results depend on the time period and dependent variable selected. Carroll and Wasylenko (1994) argue that a structural change in the US economy during the 1970s may account for a stronger negative effect of business taxes on economic activity before the 1980s and a weaker one afterward.

Many empirical studies examine the effect of the marginal income tax rate (i.e., the tax rate on the next dollar earned) on economic growth because this tax rate represents a more pertinent measure of the disincentives to work and invest than does the average tax rate. One of the popular approximations for the combined marginal tax rate used in the previous literature (see Koester and Kormendi 1989, for example) is obtained by estimating the following equation:

$$Tax\ revenue = \alpha + \beta(GDP) + \varepsilon, \tag{1}$$

where α is the y-intercept, β serves as a linear approximation for the effective marginal tax rate ($\beta > 1$ indicates a progressive tax system), and ε is the error term. This approach assumes that the tax rate remains constant over time, which is definitely not the case for the time period examined in this study. Another fundamental problem here is that state economic performance may factor into the determination of the marginal tax rate (β). In the statistical jargon, the marginal tax rate is likely to be endogenous. This means that either good or poor economic performance may force policymakers to change the marginal tax rate, obfuscating the empirical estimates of how taxes impact economic growth. Solving the above equation for the marginal tax rate (β) demonstrates that the set tax rate depends on the desired amount of tax revenue, GDP, and other factors captured by the error term (ε):

$$\beta = \frac{Tax\ revenue}{GDP} - \frac{\alpha}{GDP} - \frac{\varepsilon}{GDP}. \tag{2}$$

Notice that tax revenue divided by GDP is essentially the average tax rate,[5] and unlike the marginal tax rate, it can be easily observed and tracked over time. Solving the above equation for the average tax rate shows that it is a function of the marginal tax rate, GDP, and some other factors captured in the error term (ε):

$$\frac{Tax\ revenue}{GDP} = \beta + \frac{\alpha}{GDP} + \frac{\varepsilon}{GDP}. \tag{3}$$

[5] This is the effective (actual) average tax rate: a ratio of taxes paid to total income.

Equation 3 suggests that the average tax rate is also endogenous.[6] The likely endogeneity of both the marginal and average tax rates requires going beyond the conventional ordinary least squares (OLS) regression in order to obtain more reliable estimates. One such popular method called the within fixed-effects estimator involves using cross-sectional dummy variables to capture some unobserved factors that are correlated with the regressors. While this estimator is very good at correcting for certain kind of omitted variables that give rise to the endogeneity bias, it does not address the other source of endogeneity: the reverse causality from economic performance to tax rates. Fortunately, this form of endogeneity can be dealt with using the instrumental variable (IV) method.

While both the marginal and average tax rates are likely to be endogenous, the average tax rate is easily observed and does not require the assumption that it is constant over time. Therefore, this study uses the average tax rate as a practical approximation of the overall state tax burden. Also, this study examines the impact of the personal income tax and its progressivity (top minus bottom marginal tax rate) on state economic growth. The impact of these tax variables on economic growth is first estimated using the conventional OLS estimator with state (u_i) and year (v_t) fixed effects and Driscoll and Kraay (1998) standard errors:[7]

$$\begin{aligned}(GSP\ growth)_{it} &\qquad\qquad (4)\\ = \alpha + \gamma \left(\frac{GSP}{capita}\right)_{i,t-5} &+ \beta_1 (tax\ rate)_{it} + \beta_2 (income\ tax)_{it}\\ &+ \beta_3 (income\ tax\ progressivity)_{it} + X_{it}\beta_j + u_i + v_t + \varepsilon_{it}.\end{aligned}$$

[6] Koester and Kormendi (1989) argue that the average tax rate is endogenous in income, which complicates the estimation of the true relationship between economic growth and the average tax rate. In an analysis of 63 countries, they find that neither marginal nor average tax rates have any effect on economic *growth*, but they do find that higher marginal tax rates (assuming revenue neutrality) reduce the *level* of economic activity.

[7] Driscoll and Kraay (1998) standard errors are robust to the general forms of autocorrelation, heteroskedasticity, and spatial correlation, all of which were detected in the error term.

The regression model in equation 4 follows the conventional Solow-type growth specification (see, for example, Mankiw et al. 1992, Yakovlev 2007). It contains the convergence factor (five-year lag of GSP per capita), which captures the tendency of richer states to grow more slowly than poorer states. The model also contains a typical set of control variables in X_{it} such as human and physical capital, demographics, fiscal variables, and other robust growth determinants as found by Reed (2008). Table 1 shows the variable definitions, summary statistics, and data sources used in this study.

Missing observations for some key control variables for Florida and the use of lagged variables reduce the usable sample to 49 states from 1977 to 2000. Choosing the control variables required striking a balance between having too few control variables and losing too many observations or time periods. Changing the number of control variables may change the results, as pointed out by previous studies.

If the tax variables in equation 4 are endogenous (i.e., if they depend on the level of economic activity), the OLS estimates with fixed effects could overstate the tax effect on economic growth. To address this issue, I estimate the following model using the system general method of moments (GMM) developed by Arellano and Bover (1995) and Blundell and Bond (1998):

$$\begin{aligned}\Delta(GSP\ growth)_{it} \\ = \alpha + \delta\Delta(GSP\ growth)_{i,t-1} + \gamma\Delta\left(\frac{GSP}{capita}\right)_{i,t-5} + \beta_1\Delta(tax\ rate)_{it} \\ + \beta_2\Delta(income\ tax)_{it} + \beta_3\Delta(income\ tax\ progressivity)_{it} + \Delta X_{it}\beta_j + \Delta v_t + \Delta\varepsilon_{it}.\end{aligned} \tag{5}$$

The regression model in equation 5 includes a one-year lag of the dependent variable in addition to the variables mentioned before. The first-differencing procedure of the GMM estimator removes time-invariant, unobserved heterogeneity (i.e., state fixed effects and invariant

Table 1. Variable Definitions and Summary Statistics

Variable	Mean (Std. Dev.)	Min. (Max.)
Growth in the number of firms per capita[a]	0.0012 (0.011)	−0.053 (0.047)
Physical capital investment per capita[b]	156,784 (47,908)	85,150 (668,134)
Farmland value per capita[b]	13,353 (11,789)	833 (73,442)
Educational attainment (workforce's average years of schooling)[b]	12.26 (0.96)	9.31 (14.44)
Average age of state population between 16 and 65 years old[b]	37.26 (1.54)	30.46 (41.65)
Net immigration rate = (inflow − outflow)/population[c]	0.51 (0.05)	0.35 (0.65)
Gross state product (GSP) per capita[d]	31,672 (8,408)	16,346 (111,227)
Growth in GSP per capita[d]	0.03 (0.04)	−0.29 (0.43)
Federal civilian government workers as a share of all employed[d]	0.013 (0.007)	0.005 (0.06)
Average tax rate = tax revenue/GSP[e]	0.05 (0.01)	0.01 (0.11)
Working-age people (between 16 and 65) as a share of population[e]	0.60 (0.03)	0.22 (0.85)
Public education spending per capita[e]	1,002 (390)	279 (3,899)
Public health spending per capita[e]	219 (93)	52 (736)
Public welfare spending per capita[e]	602 (325)	74 (2,156)
Public infrastructure spending per capita[e]	351 (188)	121 (2,083)
Natural resource value (millions of dollars per capita)[e]	81.22 (77.44)	2.21 (923)
Unemployment rate (%)[e]	5.86 (2.02)	2 (18)
Federal aid to states per capita[e]	902 (406)	103 (4,042)
Population growth[e]	0.01 (0.01)	−0.03 (0.1)
Population density (people per square mile) [e]	139 (183)	0.45 (998)
Real interest rate = federal funds rate − inflation rate (%)[f]	1.86 (2.34)	−3.31 (6.08)
Consumer price index (CPI)[g]	114 (49.46)	36.7 (195.3)
Personal income tax dummy = 1 if a state has personal income tax[h]	0.82 (0.39)	0 (1)
Personal income tax progressivity = top − bottom marginal tax rate[h]	3.52 (3.38)	0 (14.4)

Sources: (a) Computed from Small Business Administration data. (b) Obtained from Turner et al. (2007, 2011). (c) Computed from Statistics of Income, IRS. (d) US Bureau of Economic Analysis. (e) Statistical Abstracts, US Census Bureau. (f) Federal Reserve Bank of St. Louis. (g) Bureau of Labor Statistics. (h) Computed from the Book of States data.

Notes: All monetary variables are adjusted for inflation.

Table 2. Determinants of Real GSP Growth

Estimator	Ordinary least squares, fixed effects	General method of moments
Average tax rate	−1.16** (0.55)	−0.82** (0.38)
Personal income tax	0.01 (0.01)	−0.01 (0.01)
Personal income tax progressivity	−0.0002 (0.001)	0.00002 (0.0008)
Physical capital investment (share of GSP)	−0.01 (0.02)	−0.01 (0.01)
Public infrastructure spending (share of GSP)	−0.03*** (0.01)	−0.03*** (0.01)
Farmland value (share of GSP)	0.04 (0.02)	−0.03 (0.03)
Natural resource value (share of GSP)	−12.83*** (3.8)	−6.72*** (2.47)
Federal aid (share of GSP)	−1.59*** (0.55)	−1.52*** (0.5)
Federal workers (share of employed)	5.2*** (1.49)	4.92*** (1.03)
Working-age people (share of population)	0.07 (0.06)	0.08 (0.06)
Log of average age	−0.14 (0.09)	−0.21** (0.09)
Log of educational attainment	0.12** (0.05)	0.29** (0.14)
Population growth	−0.05 (0.11)	−0.31 (0.31)
Population density	0.0001 (0.0002)	0.0001 (0.0001)
GSP per capita ($t-5$)	−0.16*** (0.04)	−0.09*** (0.02)
Dependent variable ($t-1$)	–	0.09 (0.05)
Arellano-Bond AR1/AR2 tests (P-value)	–	0.35/0.63
Sargan overidentification test (P-value)	–	1.00
Observations	1,176	1,176

*** Indicates significance at 1%, ** at 5%, and * at 10%. Estimators: (1) ordinary least squares with state and year fixed effects and Driscoll and Kraay (1998) robust standard errors in parentheses, and (2) dynamic system general method of moments where tax variables are instrumented with their own lagged levels and first differences. Constant and fixed-effects coefficients are not reported. Florida is omitted from the sample due to missing capital and natural resource data.

variables).[8] The three tax variables and the lagged dependent variable are instrumented with their own lagged levels ($t - 2$ and deeper) and first differences ($t - 1$ and deeper). The use of valid instruments can improve the odds of capturing a real causal relationship in the tax coefficients.

Table 2 shows the estimates for equations 4 and 5. The coefficient of average tax rate is negative and statistically significant in both models, suggesting that a higher tax burden as a share of income reduces state economic growth. These results are also economically (quantitatively) significant given the elasticity estimates of −2.6 and −1.9 derived from the OLS and GMM models, respectively. Elasticity of −2.6, for example, implies that a 1 percent increase in the tax rate decreases economic growth by 2.6 percent, not percentage points.[9] In contrast, the effect of state personal income tax and its progressivity on economic growth is not significantly different from zero in either model. Both the OLS and GMM models yield statistically significant negative coefficients for public infrastructure spending, farmland, federal aid, and lagged GSP per capita (suggesting convergence), and significant positive coefficients for educational attainment and share of federal workers.

While the aforementioned income growth results are insightful, the impact of taxation on the *level* of income is also important. The next set of models, in equations 6 and 7, details the effect of the three tax variables and other regressors on real GSP per capita:

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[8] The first-differencing procedure removes the constant, which is added back into the model during the estimation process. The Sargan IV and Arellano-Bond autocorrelation tests shown in table 2 support the validity of the instruments and the use of first-differencing, respectively. The GMM estimation was performed in STATA using the following general command: xi: xtdpdsys growth l5.gsp controls i.year, lags(1) endog(average tax rate, income tax dummy, tax progressivity, lagstruct(0,.)) vce(robust).

[9] Elasticity is the percentage change in one variable divided by the percentage change in another variable. This elasticity was computed using the estimated coefficient (i.e., the slope) times the ratio of the average values of the two variables.

$$(GSP/capita)_{it} \tag{6}$$
$$= \alpha + \beta_1(tax\ rate)_{it} + \beta_2(income\ tax)_{it}$$
$$+ \beta_3(income\ tax\ progressivity)_{it} + X_{it}\beta_j + u_i + v_t + \varepsilon_{it}.$$

$$\Delta(GSP/capita)_{it} \tag{7}$$
$$= \alpha + \delta\Delta\left(\frac{GSP}{capita}\right)_{i,t-1} + \beta_1\Delta(tax\ rate)_{it}$$
$$+ \beta_2\Delta(income\ tax)_{it} + \beta_3\Delta(income\ tax\ progressivity)_{it}$$
$$+ \Delta X_{it}\beta_j + \Delta v_t + \Delta\varepsilon_{it}.$$

These equations are basically a reformulation of the previous growth models but in levels and without the growth convergence factor. Equation 6 is estimated via OLS with two-way fixed effects and Driscoll and Kraay (1998) standard errors, while equation 7 is estimated via system GMM. The OLS estimates in table 3 reveal that the average tax rate has no significant relationship, the state personal income tax dummy has a significant positive relationship, and income tax progressivity has a significant negative relationship with real GSP per capita. The positive coefficient for the personal income tax variable is notable, as it indicates that the presence of a personal income tax in a state leads to a higher average income. This estimate could, however, suffer from the endogeneity problem discussed earlier: better economic performance can cause some states to enact a personal income tax.

The GMM-IV estimates, which show that the personal income tax dummy loses statistical significance when treated as endogenous, support that notion. The only statistically significant tax variable in the model is the average tax rate, which is negative. While the GMM coefficient for the average tax rate is many times greater in absolute value than its insignificant OLS counterpart, it carries the elasticity of only 0.07, in absolute value. This indicates a rather weak response of income to taxation. The OLS and GMM models also yield conflicting

Table 3. Determinants of Real GSP per Capita

Estimator	Ordinary least squares, fixed effects	General method of moments
Average tax rate	−1,304 (25,029)	−43,272*** (11,710)
Personal income tax	3,926*** (957)	304.8 (655)
Personal income tax progressivity	−338.4*** (73)	−7.3 (30)
Physical capital investment per capita	0.1*** (0.01)	0.05* (0.03)
Public infrastructure spending per capita	6.92*** (2.40)	−4.13*** (1.13)
Farmland value per capita	0.03* (0.02)	0.04 (0.03)
Natural resource value per capita	21.12*** (7.68)	−3.52 (5.50)
Federal aid per capita	−5.19*** (1.08)	1.41* (0.81)
Federal workers (share of employed)	309,125*** (86,483)	187,526*** (55,551)
Working-age people (share of population)	45,100** (20,686)	7,269* (3,748)
Educational attainment	−761 (501)	−5 (906)
Average age	1,089*** (207)	574 (481)
Population density	113.2*** (19.73)	1.19 (3.84)
Dependent variable (t − 1)	–	0.8*** (0.13)
Arellano-Bond AR1/AR2 tests (P-value)	–	0.18/0.35
Sargan overidentification test (P-value)	–	1.00
Observations	1,176	1,176

*** Indicates significance at 1%, ** at 5%, and * at 10%. Estimators: (1) ordinary least squares with state and year fixed effects and Driscoll and Kraay (1998) robust standard errors in parentheses, and (2) dynamic system general method of moments where tax variables are instrumented with their own lagged levels and first differences. Constant and fixed-effects coefficients are not reported. Florida is omitted from the sample due to missing capital and natural resource data.

estimates for some control variables. Yet the GMM model is more appealing because it is consistent with the previous growth regressions where the average tax rate is also negative and statistically significant. It is important to note that the GMM model also passes the Arellano-Bond autocorrelation and Sargan IV tests (see table 3).

While the aforementioned estimates suggest that higher average tax rates reduce state economic growth and possibly GSP per capita, they are based on just one metric of economic activity: state GDP. This metric is not without its flaws. Some of the relevant criticisms of GDP as a measure of economic activity include its failure to account for household production, underground markets, environmental quality, and the true value of government spending (a dollar spent by the government may not generate as much value as a dollar spent by a private party, yet both are automatically and equally counted in GDP). Therefore, it might be useful to examine how state taxes impact other measures of economic activity.

The Number of Firms and Taxation

An alternative way to measure economic activity is to look at the number of private firms that operate in each state. A state with more economic activity should also have more firms. The basic logic here is that higher taxes may discourage business start-ups and slow down economic growth. Grossman and Helpman (1991) and Aghion and Howitt (1992) develop the microfoundations for the productivity process that governs macroeconomic models of endogenous economic growth. The main growth mechanism is Schumpeter's (1934) creative destruction: firms with lower production costs replace firms with higher production costs. Bartelsman et al. (2009) show that the net entry of firms accounts for 20–50 percent of the overall productivity growth and that a sizable fraction of new entrants use external financing in order to access the market. Nofsinger and Wang

(2011) calculate that 45 percent of the start-ups in their 27-country sample use external funding. These findings suggest that corporate and personal income taxation can reduce the net entry of firms by lowering the after-tax returns paid to investors and entrepreneurs.

Several studies show that higher marginal tax rates on personal income and capital gains can stifle entrepreneurship.[10] Kotlikoff and Summers (1981) show that intergenerational transfers are the primary source of aggregate capital accumulation. Poterba (1997) argues that the estate tax can be viewed as a tax on capital income because it reduces the effective rate of return on small business investment. A growing number of studies now find that estate taxes reduce business activity and investment (Wagner 1993, Fleenor and Foster 1994, Brunetti 2006, Yakovlev and Davies 2014), especially among family-run businesses (Astrachan and Aronoff 1995).

This section presents the estimates on the relationship between the growth in the number of firms and the same three state tax variables:[11] average tax rate, personal income tax, and its progressivity. The growth in the number of firms is modeled as a function of lagged firms per capita, state taxes, and control variables in X_{it}:

$$\begin{aligned}(firms\ growth)_{it} &= \alpha + \gamma\left(\frac{firms}{capita}\right)_{i,t-5} + \beta_1(tax\ rate)_{it} + \beta_2(income\ tax)_{it} \\ &+ \beta_3(income\ tax\ progressivity)_{it} + X_{it}\beta_j + u_i + \varepsilon_{it}.\end{aligned} \tag{8}$$

$$\begin{aligned}\Delta(firms\ growth)_{it} &= \alpha + \delta\Delta(firms\ growth)_{i,t-1} + \gamma\Delta\left(\frac{firms}{capita}\right)_{i,t-5} + \beta_1\Delta(tax\ rate)_{it} \\ &+ \beta_2\Delta(income\ tax)_{it} + \beta_3\Delta(income\ tax\ progressivity)_{it} + \Delta X_{it}\beta_j + \varepsilon_{it}.\end{aligned} \tag{9}$$

[10] See Bruce and Mohsin (2006), Carroll et al. (2000), Poterba (1989), Keuschnigg and Nielsen (2004), Gentry and Hubbard (2000, 2004).

[11] Data on the number of private firms in each state come from the U.S. Small Business Administration.

The list of regressors in X_{it} includes GSP growth, consumer price index (CPI), real interest rate, and several other variables used in the economic growth models. The choice of these variables is based, in part, on Rose et al. (1982), who find that macroeconomic factors can predict business failures. Equation 8 is estimated via OLS with state fixed effects and Driscoll and Kraay (1998) standard errors, while equation 9 is estimated via system GMM. A careful reader will notice that the above models omit the year fixed effects. The reason is that CPI and the real interest rate variables in the model do not vary across states, similar to year dummies. Therefore, these variables simply embody the year fixed effects.

The above models are fitted to a longitudinal panel of 50 American states from 1987 to 2005 (some observations are lost due to lags and missing values for some control variables). Table 4 shows the estimates for both models. The main conclusion from the two regression models is that only personal income tax progressivity seems to have a significant negative effect on the growth in the number of firms. The estimated elasticity of −5.7 in OLS and −1.2 in GMM models indicates that the growth in the number of firms is rather sensitive to income tax progressivity. The variables that appear significant in reducing firm growth in either OLS or GMM regressions include CPI, real interest rate, population density, natural resources, and working-age population.

While firm growth is a useful measure of private economic activity, it may not fully account for the level of employment, output per capita, and the overall level of economic activity in each state. The pursuit of happiness is probably the main reason why people do what they do. It is in pursuit of happiness that people vote with their feet and move to places that best meet their needs and desires. The next section examines this idea.

Table 4. Determinants of the Growth in the Number of Firms

Estimator	Ordinary least squares, fixed effects	General method of moments
Average tax rate	0.03 (0.03)	−0.02 (0.04)
Personal income tax	−0.004 (0.006)	−0.001 (0.003)
Personal income tax progressivity	−0.005** (0.002)	−0.001* (0.001)
GSP growth	0.014 (0.01)	0.004 (0.01)
Natural resource value (share of GSP)	−3.45*** (0.70)	−1.39* (0.74)
Federal workers (share of employed)	0.30 (0.65)	0.61** (0.29)
Federal aid (share of GSP)	0.04 (0.15)	−0.09 (0.16)
Working-age people (share of population)	−0.035*** (0.01)	−0.02 (0.02)
Log of average age	0.05 (0.03)	−0.05 (0.05)
Population density	−0.0002*** (0.00005)	−0.00002 (0.00002)
CPI	−0.0006*** (0.0001)	−0.00018* (0.0001)
Interest rate	−0.001 (0.0007)	−0.002*** (0.0005)
Number of firms (t − 5)	−5.50*** (0.69)	−0.99** (0.48)
Dependent variable (t − 1)	–	0.4*** (0.07)
Arellano-Bond AR1/AR2 tests (P-value)	–	0.00/0.21
Sargan overidentification test (P-value)	–	1.00
Observations	397	397

*** Indicates significance at 1%, ** at 5%, and * at 10%. Estimators: (1) ordinary least squares with state fixed effects and Driscoll and Kraay (1998) robust standard errors in parentheses, and (2) dynamic system general method of moments where tax variables are instrumented with their own lagged levels and first differences. Constant and fixed-effects coefficients are not reported.

Migration and Taxation

People usually move across states in pursuit of better opportunities. By voting with their feet, people send a clear signal about where they prefer to live and work. Recent research shows that economic factors play a large role in self-reported happiness (Deaton 2008, Stevenson and Wolfers 2008, Yakovlev and Leguizamon 2012, Sacks et al. 2013). Several studies find that migration rates can communicate an area's relative attractiveness (Douglas and Wall 1993, Douglas 1997, Ashby 2007). If higher state taxes lead to lower economic activity and employment, it is conceivable that people will move to the states with better economic prospects. When a state loses population year after year, it probably means that not all is well there; high taxes might be a part of the problem. Therefore, an empirical analysis of migration may show, indirectly, how taxes affect the flow of economic activity across states.

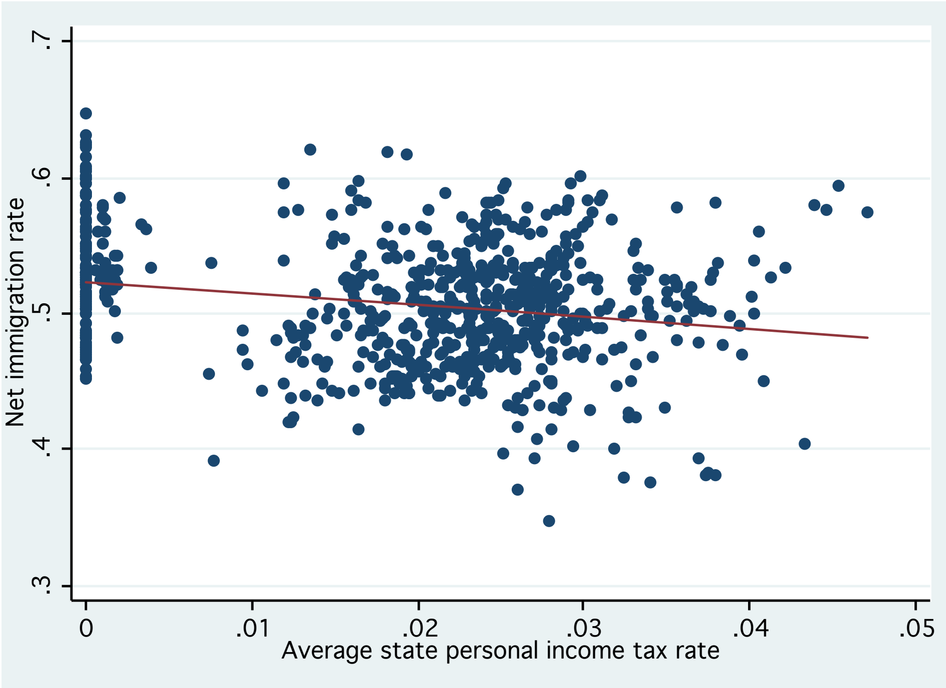
Several studies suggest that people take taxes into account when choosing where to live. Vedder (2003) finds that high-tax states tend to lose more of their population than low-tax states. Bakija and Slemrod's (2004) estimates suggest that elderly estate owners tend to flee the states with high estate taxes. Lai et al. (2011) find that increases in the state marginal tax rate have a positive and statistically significant effect on emigration. More exotic evidence comes from Kleven et al. (2012), who find positive and large emigration of the top soccer players in response to tax rate increases in Europe. However, not everyone agrees that taxes are all that important in migration decisions. For instance, Young and Varner (2011) find that the recent 2.6 percentage point rise in New Jersey's income tax has produced at most a very small emigration response.

The relationship between migration and taxation is complicated by the fact that people are both the consumers and financiers of public services. In a celebrated paper, Tiebout

(1956) postulates that people move to localities that best match their public-good and tax preferences. In other words, some people might be willing to pay more in taxes to receive a higher amount or quality of public goods. While the tax price of public services might be easy to measure, their quality is not. Furthermore, taxpayers might be more sensitive to visible taxes such as income, property, estate, and sales taxes, making the average tax rate in a state less relevant.

This section examines how the average tax rate, personal income tax, and its progressivity affect the migration flows among the 50 US states from 1989 to 2005. The dependent variable in this analysis is state net immigration rate, calculated as migrants in minus migrants out and divided by state population. State migration flows are based on IRS tax-return data. A quick look at the numbers reveals that four of the top 10 population-gaining states have no personal income tax (these states are Florida, Nevada, Washington, and Tennessee). To put this finding into perspective, consider that there are only nine states without a personal income tax. This relative overrepresentation of the no-income-tax states in the top 10 list may suggest that migrants care a lot about whether or not a state has a personal income tax. Confirming this notion is the scatter plot in figure 1, which shows that the state net immigration rate is negatively related to the personal income tax rate (significant at the 1 percent level). The net immigration rate also seems to have a significantly negative correlation with the average tax rate and income tax progressivity (results available from the author). These initial observations suggest that higher taxes may cause states to lose population, *ceteris paribus*.

Figure 1. Net Immigration Rate and State Personal Income Tax Rate



The next step is to show how the three tax variables affect the net immigration rate, while controlling for other relevant factors. The following two models are estimated via OLS with two-way fixed effects and Driscoll and Kraay (1998) standard errors and system GMM, respectively:

$$(net\ immigration)_{it} = \alpha + \beta_1(tax\ rate)_{it} + \beta_2(income\ tax)_{it} + \beta_3(income\ tax\ progressivity)_{it} + X_{it}\beta_j + u_i + v_t + \varepsilon_{it}. \tag{10}$$

$$\Delta(net\ immigration)_{it} = \alpha + \delta\Delta(net\ immigration)_{i,t-1} + \beta_1\Delta(tax\ rate)_{it} + \beta_2\Delta(income\ tax)_{it} + \beta_3\Delta(income\ tax\ progressivity)_{it} + \Delta X_{it}\beta_j + \Delta v_t + \Delta\varepsilon_{it}. \tag{11}$$

The dependent variable in equations 10 and 11 is the state net immigration rate. The variables in X_{it} include GSP per capita, average age, unemployment rate, population density, state government spending on education, health care, welfare, and infrastructure. These variables intend to capture the relative attractiveness of a given state to migrants.

Table 5. Determinants of State Net Immigration Rate

Estimator	Ordinary least squares, fixed effects	General method of moments
Average tax rate	0.03 (0.12)	0.26 (0.26)
Personal income tax	−0.017* (0.01)	0.001 (0.01)
Personal income tax progressivity	−0.0051*** (0.002)	−0.0031* (0.002)
Public education spending per capita	0.000014* (0.00001)	0.000015* (0.00001)
Public infrastructure spending per capita	−0.00001 (0.00001)	−0.00003 (0.00002)
Public health spending per capita	−0.00003 (0.00003)	−0.00008*** (0.00003)
Public welfare spending per capita	−0.00003*** (0.000005)	−0.00003** (0.000016)
GSP per capita	0.000001 (0.000001)	0.000001* (0.000001)
Unemployment rate	−0.016*** (0.002)	−0.008*** (0.003)
Average age	0.004 (0.004)	0.001 (0.003)
Population density	0.0002 (0.00036)	−0.00006* (0.00004)
Dependent variable (t − 1)	–	0.465*** (0.12)
Arellano-Bond AR1/AR2 tests (P-value)	–	0.15/0.98
Sargan overidentification test (P-value)	–	1.00
Observations	597	547

*** Indicates significance at 1%, ** at 5%, and * at 10%. Net immigration rate = (inflow − outflow)/population. Estimators: (1) ordinary least squares with state and year fixed effects and Driscoll and Kraay (1998) robust standard errors in parentheses, and (2) dynamic system general method of moments with year fixed effects and where tax variables are instrumented with their own lagged levels and first differences. Constant and fixed-effects coefficients are not reported.

Conclusion

This study estimates the associative impact of the state average tax rate, the personal income tax, and its progressivity on several different measures of state economic performance. These measures include real GSP per capita and its growth, growth in the number of firms, and state net immigration rate. Advanced panel-data econometric techniques are used to control for endogeneity, autocorrelation, heteroskedasticity, and spatial correlation. These attempts improve the odds of capturing a genuine causal relationship between economic performance and the selected tax variables.

The estimates reveal that the average tax rate is negatively and significantly related to state economic growth. The picture is less clear when it comes to GSP per capita: the personal income tax dummy has a significant positive coefficient and the income tax progressivity measure has a significant negative coefficient in the OLS model. However, both of these variables lose statistical significance, while the coefficient for the average tax rate reverts to being negative and significant in the GMM model that treats all three variables as endogenous. In contrast, the growth in the number of firms responds negatively and significantly only to personal income tax progressivity. Finally, the net immigration rate appears to be negatively related to the presence of a personal income tax (significant only in the OLS model) and its progressivity, but these effects are rather weak. The growth in GSP per capita and the number of firms, however, appears to be rather sensitive to some tax variables.

As noted in previous studies, these findings can be sensitive to the time period, statistical methods, and variables used. Nevertheless, the estimates presented in this study still lead to a general conclusion: not all tax variables exhibit a significant correlation with the selected measures of economic activity, but when they do, the relationship is usually negative.

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