Do State and Local Taxes Affect Relative State Growth?

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The South has experienced a remarkable economic awakening over the past thirty years, with southern states growing at phenomenal rates. At the same time, these states have had, on average, low state and local taxes, and it seems reasonable to infer that tax policies may have contributed to their relative success. However, while policymakers may believe that taxes matter for growth, until recently economic theory suggested otherwise. It was believed that much of long-term growth is determined by automatic forces of convergence, which moved southern states toward catching up with the rest of the nation. But as theoretical growth models have grown more sophisticated, it has been increasingly recognized that the two explanations for the South's strong showing may not be mutually exclusive.

In brief, growth models once assumed that long-term growth was exogenous, or determined by demographic and technological factors but not subject to policy influence. In particular, under this assumption taxes could have only short-term effects on growth rates.[1] Given the same resources and access to technology and mobile inputs of production for all states, the models implied that all should converge over time to a common long-run, steady-state growth rate. More recent models of economic growth allow growth rates to be endogenous, or, simply put, see shocks, including tax policy, as influencing demographic and technological variables. Under certain conditions, taxes may have permanent effects on growth, and convergence is not automatic. Because policies can affect long-term growth, economists are again taking this research seriously. And since convergence need not be automatic, researchers are developing models that go beyond convergence to explain the different growth experiences of regions.

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The empirical literature has tried to resolve the question of whether growth is exogenous or endogenous. Much testing has focused on one particular implication of the simplest exogenous growth models, namely, convergence. Within this framework, some studies have examined the growth effects of taxation, mostly across countries. Evidence that taxes have long-term growth effects is sometimes thought to be evidence against convergence. However, less work has been devoted to determining whether state and local taxes affect relative state growth in the United States and, if so, how strong the effects are. So far the evidence for negative and significant tax effects on growth across countries and across U.S. states has been mixed.

To sort out the main issues, this article presents an overview of relative state growth and relative state and local taxation from 1960 to 1992.[2] After a brief discussion of the theoretical issues, the article surveys simple—but revealing—correlations across states and across time that characterize states' experiences. The correlations indicate convergence, but they also imply that shocks matter for long-term growth. Tax rates are negatively related to growth and are sufficiently variable over time to reasonably explain variations in growth rates. This observation holds true when using average tax rates (ATRs), which describe the relative size of state and local revenues, and, more importantly, for marginal tax rates (MTRs), which measure the effects of a tax system on individuals' choices and ultimately on growth. Since aggregate marginal tax rates for each state are difficult to obtain, they are estimated using a method by Reinhard B. Koester and Roger C. Kormendi (1989).

While the simple correlations are revealing, they are not conclusive. Correlations do not separate out the effects of other influences on growth rates and taxes. For instance, while convergence affects growth rates it may also have a separate effect on tax rates. Because they control for the effects of other explanatory variables, multivariate regressions are useful for separating out, or identifying, the growth effects of taxes. A survey of the empirical literature shows what researchers have done to isolate these effects.

This article argues that the evidence on the growth effects of taxes has been mixed because empirical models imperfectly separate the growth effects of other government policies that occur simultaneously with tax policies. Thus, the estimated tax effects are impure. While a few researchers have grappled with this problem, the solutions offered do not identify tax effects. One purpose of this article is to demonstrate a simple way to get a more nearly accurate specification. Application of the new insights yields regressions in which relatively higher tax rates are found to have a significant negative effect on relative growth rates. At the same time there is evidence for convergence. The final section reviews the results of the regressions performed and summarizes the underlying theoretical considerations.

*F*acts on Growth

Personal income is measured in nominal terms (not adjusted for inflation), which may overstate real (inflation-adjusted) differences if state prices and inflation rates differ. Unfortunately, while using a real measure would be preferable, price indexes for individual states do not span a sufficient amount of time.[3] Using a relative measure cancels the influence of inflation on nominal growth rates, assuming that state and national inflation rates do not deviate systematically. Because more recent personal income data are available, this article uses them to measure output rather than using gross state product (GSP). Personal income comprises labor and capital income received by individuals, such as wages, salaries, rent, dividends, interest payments, and transfer payments. Gross state product, which includes personal income data, has a more inclusive definition of capital income. Still, using personal income data should not obscure long-term growth trends because the two series tend to move in tandem.

The first columns of Table 1 compare relative per capita personal income in 1960, 1976, and 1992 and states' rankings in these years. Comparing relative per capita personal income in 1960 with 1992 figures, the correlation is 0.84 with the rank of the states having a correlation of 0.86. Thus, states' relative per capita personal income tended to be persistent, suggesting a lack of mobility. However, for some states dramatic changes did occur, both up and down. For instance, in 1960 the poorest ten states were among the twelve states in the southeastern region, and on average (unweighted), per capita personal income in those states was 34 percent below the national average. (The two exceptions were Virginia and Florida.) By 1992, only seven of the lowest-ranking ten states came from the Southeast, and the region as a whole stood just 17 percent below the nation. In the interim, Georgia, North Carolina, and Tennessee had leapfrogged out of the bottom ten. While there were these big upward movers

Table 1
Relative Incomes and Growth Rates by State[a]

Region[b]	States	Relative State Per Capita Personal Income (PCPI) (Percent) 1960	Rank	1976	Rank	1992	Rank	Average Annual Differential Growth Rates of PCPI over Different Intervals (Percent) 1961-92	Rank	1961-76	Rank	1977-92	Rank
Far West	AK	22.1	3	56.0	1	10.0	7	–0.38	46	2.12	1	–2.87	50
	CA	21.1	5	14.1	3	7.0	11	–0.44	47	–0.44	45	–0.44	42
	HI	4.1	14	11.8	7	11.0	6	0.22	16	0.48	15	–0.05	27
	NV	23.4	2	11.9	6	8.7	8	–0.46	49	–0.72	49	–0.20	32
	OR	0.6	18	1.7	16	–7.6	28	–0.25	41	0.07	25	–0.58	47
	WA	7.2	10	6.1	11	5.8	12	–0.04	33	–0.07	33	–0.02	26
Great Lakes	IL	17.4	8	12.8	5	7.9	10	–0.30	43	–0.29	41	–0.31	35
	IN	–2.6	21	–3.4	23	–8.9	31	–0.20	38	–0.05	30	–0.34	39
	MI	5.2	11	5.0	13	–2.2	19	–0.23	40	–0.01	28	–0.45	43
	OH	4.8	13	–0.4	18	–6.1	25	–0.34	44	–0.33	43	–0.35	40
	WI	–1.0	19	–2.6	21	–5.3	23	–0.13	36	–0.10	35	–0.17	29
Mideast	DE	21.3	4	8.0	10	5.2	13	–0.50	50	–0.83	50	–0.18	30
	MD	5.0	12	9.4	9	14.1	5	0.29	12	0.28	20	0.29	14
	NJ	19.6	7	13.9	4	26.0	2	0.20	18	–0.36	44	0.75	3
	NY	19.9	6	10.9	8	18.1	3	–0.06	34	–0.56	47	0.45	9
	PA	1.0	17	0.8	17	2.3	15	0.04	26	–0.01	29	0.10	20
New England	CT	25.4	1	15.6	2	30.6	1	0.16	23	–0.61	48	0.94	1
	MA	10.0	9	5.3	12	15.8	4	0.18	20	–0.30	42	0.66	4
	ME	–16.9	36	–16.6	38	–10.5	33	0.20	17	0.02	27	0.39	11
	NH	–2.9	22	–6.2	29	8.1	9	0.34	10	–0.20	40	0.89	2
	RI	–1.7	20	–4.5	25	0.3	18	0.06	25	–0.18	39	0.30	13
	VT	–16.5	34	–15.6	36	–6.8	27	0.30	11	0.06	26	0.55	5
Plains	IA	–9.4	28	–3.3	22	–10.4	32	–0.03	31	0.38	17	–0.44	41
	KS	–4.1	23	–0.5	19	–4.7	21	–0.02	28	0.23	22	–0.27	33
	MN	–5.4	25	–0.9	20	1.7	17	0.22	15	0.28	19	0.16	18
	MO	–5.3	24	–6.4	30	–6.1	24	–0.02	29	–0.06	32	0.02	22
	ND	–21.7	40	–11.0	33	–16.4	38	0.17	21	0.67	12	–0.34	38
	NE	–6.0	26	–4.7	26	–4.8	22	0.04	27	0.08	24	–0.01	25
	SD	–19.1	39	–21.4	46	–15.3	37	0.12	24	–0.14	38	0.38	12

continued

Table 1 (*continued*)

Region[b]	States	Relative State Per Capita Personal Income (PCPI) (Percent)						Average Annual Differential Growth Rates of PCPI over Different Intervals (Percent)					
		1960	Rank	1976	Rank	1992	Rank	1961-92	Rank	1961-76	Rank	1977-92	Rank
Rocky Mountains	CO	3.1	15	2.3	15	2.2	16	–0.03	30	–0.05	31	–0.00	24
	ID	–17.7	37	–10.5	31	–18.8	39	–0.04	32	0.45	16	–0.52	46
	MT	–9.2	27	–10.7	32	–20.8	43	–0.36	45	–0.10	34	–0.63	48
	UT	–11.5	31	–18.9	39	–26.2	49	–0.46	48	–0.46	46	–0.45	44
	WY	1.9	16	3.9	14	–6.4	26	–0.26	42	0.12	23	–0.64	49
Southeast	AL	–37.9	47	–24.5	47	–19.8	40	0.57	8	0.84	6	0.29	15
	AR	–47.3	49	–27.7	49	–25.7	46	0.67	3	1.22	4	0.13	19
	FL	–11.4	30	–5.5	28	–2.4	20	0.28	13	0.37	18	0.20	17
	GA	–28.9	41	–16.4	37	–8.5	29	0.64	6	0.79	8	0.49	6
	KY	–33.0	45	–21.2	45	–20.4	42	0.39	9	0.74	11	0.05	21
	LA	–29.0	42	–19.2	40	–23.8	45	0.16	22	0.61	13	–0.29	34
	MS	–60.3	50	–35.8	50	–35.9	50	0.76	1	1.53	2	–0.00	23
	NC	–33.0	43	–19.6	41	–12.2	34	0.65	4	0.84	7	0.47	8
	SC	–45.7	48	–26.1	48	–21.8	44	0.75	2	1.23	3	0.27	16
	TN	–33.7	46	–20.0	42	–13.2	35	0.64	5	0.86	5	0.43	10
	VA	–16.2	33	–3.9	24	3.9	14	0.63	7	0.77	9	0.48	7
	WV	–33.0	44	–20.9	44	–25.8	47	0.22	14	0.76	10	–0.31	36
Southwest	AZ	–9.8	29	–11.7	34	–14.2	36	–0.14	37	–0.12	37	–0.16	28
	NM	–19.1	38	–20.9	43	–25.9	48	–0.21	39	–0.11	36	–0.32	37
	OK	–16.6	35	–12.3	35	–20.2	41	–0.11	35	0.27	21	–0.49	45
	TX	–14.6	32	–5.5	27	–8.7	30	0.18	19	0.57	14	–0.20	31
United States[c]								6.84		6.73		6.94	

[a] States with highest PCPI or highest growth rates receive highest ranking.
[b] States are grouped into eight standard regions defined by the Bureau of Economic Analysis, U.S. Department of Commerce.
[c] Average U.S. growth rate of Per Capita Personal Income.

Source: DRI/McGraw-Hill

in the region, most southern states saw only gradual changes over time. Although most states lacked mobility, the fact that the range of relative per capita personal incomes narrowed over the period suggests convergence. For instance, in order to eliminate outliers, compare the range of relative per capita personal incomes from the fifth-ranked state with that of the state ranked forty-fifth: this range narrowed from 54.1 percent in 1960 to 34 percent in 1976 and then to 26.3 percent in 1992.

Convergence. Before looking at the data more closely for evidence of convergence, what does theory have to say about convergence in exogenous or endogenous growth models?[4] Factors of production are usually classified into broad categories such as land, labor, capital, and raw materials. Capital goods are inputs into production that are themselves produced goods or reproducible. A narrow conception of capital includes only physical capital while a broader definition includes human capital, intangible capital such as knowledge, and other things that enhance the quality of inputs. In exogenous growth models, no matter what the source of reproducible capital is, output is increased with diminishing returns. In other words, output increases become successively smaller when the amount of an input rises. Thus, investment-led sustained growth is not possible because as the stock of capital rises over time, the returns to capital will fall until investment is no longer profitable.

If only initial capital stocks differed across states, diminishing returns to capital in the exogenous growth model would cause convergence of outputs. The driving force for convergence is mobile inputs flowing to areas in which they have the highest returns. States with higher initial capital stocks and lower returns to capital will have an outflow of capital toward capital-poor states, raising returns in the low-return states and lowering them in high-return states. Over time, return differentials will equalize as states adjust to a common long-run, steady-state growth rate. This rate of growth is determined by technology and demographics, both of which are assumed to be exogenous. However, access to different resources or technology or barriers to factor flows may prevent equalization of returns and lead to different steady-state growth rates and nonconvergence.

In endogenous growth models, by contrast, there are no diminishing returns to the expanded notion of capital although there may still be diminishing returns to each individual capital input. Thus, as capital rises the return to reproducible inputs will not fall to the point where investment becomes unprofitable; rather, investment continues, and sustained growth is possible.

The endogenous growth literature has explored several forces that offset the propensity for diminishing returns to reproducible inputs that causes returns to fall. Explanations that have received recent attention involve technology. One explanation considered is that technology and capital broadly defined may have spillover effects. Spillovers occur when one firm's investments unintentionally raise the productivity of other firms' capital, a classic example being that knowledge gained from investing spills over to other firms. Such spillovers may prevent private returns from falling when investment rises. Another explanation is that imperfect competition induces firms to produce innovative goods in order to capture above-normal profits. The technological progress that comes from innovations or quality improvements may keep the productivity of capital high. High returns to investment in capital broadly defined in turn induce additional investments, causing sustained growth.

Because in endogenous growth models returns need not fall to a point at which capital investment is unprofitable, nor will returns necessarily equalize, long-term growth rates need not equalize either. Also, the equilibrating mechanism of factor flows is still possible in endogenous growth models (see Assaf Razin and Chi-Wa Yuen 1995). Endogenous growth models allow a tension between equilibrating transitional forces for convergence and long-run forces for divergence that may or may not yield convergence over extended periods of time. In addition, shocks may occur frequently and be large enough to put a state continually on an adjustment path to new steady-state growth paths. It may therefore be hard to distinguish among the models on empirical grounds.

But what can be inferred from the data about states' growth experiences? Table 1 also shows long-term average growth rates of per capita personal income relative to national growth. For example, from 1961 to 1992, Alabama grew on average 0.57 percentage points faster than the national average annual growth rate of 6.84 percent. Over the period, it was the ninth-fastest-growing state. In fact, most of the Southeast grew faster than the nation. Some of this rapid growth can be explained as a catching-up phenomenon given southern states' lower-than-average per capita personal incomes at the beginning. For instance, in 1960, Alabama had a per capita personal income that was almost 38 percent below the national average and was ranked forty-seventh. By 1992, this rank improved to 40 and per capita personal income improved to slightly less than 20 percent below that of the nation. Even though Mississippi was ranked last in 1960 and 1992,

it grew at the highest rate, or 0.76 percentage points above the national average.

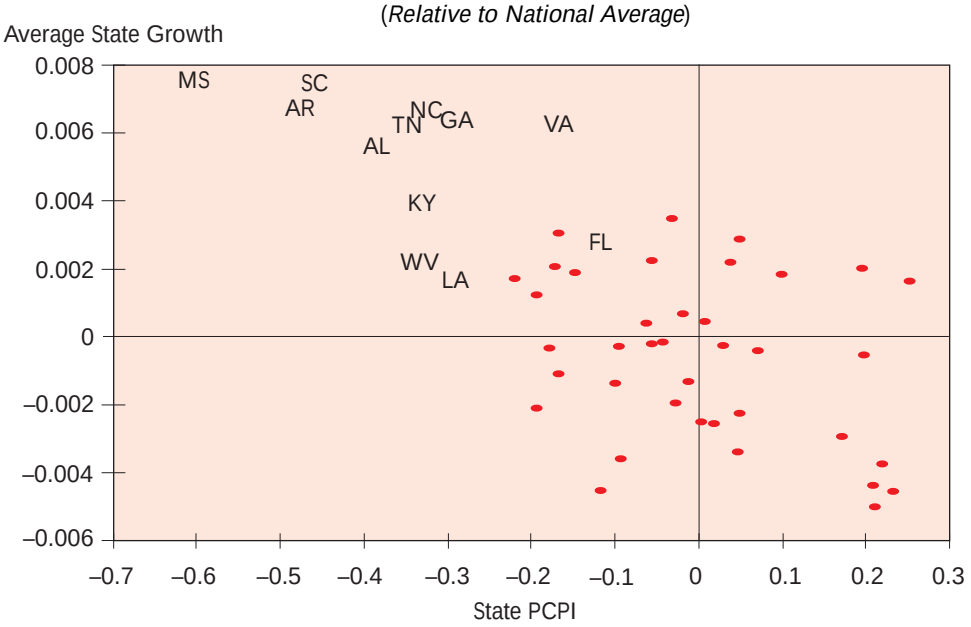
Chart 1 plots the relationship between initial relative per capita personal incomes in 1960 and the average of subsequent annual growth rates from 1961 to 1992. Almost all the fastest-growing states are in the upper left-hand quadrant. States from the Southeast with low initial incomes grew faster and produced nine out of the ten fastest-growing states over this period. In fact, the correlation between initial incomes in 1960 and growth rates is negative across all states, –0.71.

Simple cross-section regressions of long-term state growth rates on initial income generally find a negative relationship between the two variables.[5] In other words, the poorer the state is initially, the faster it grows. Such regressions have been called Barro regressions and are seen as a test for convergence (or "beta-convergence," as popularized by Robert J. Barro and Xavier Sala-i-Martin 1991). The result of beta-convergence is robust to inclusion of other explanatory variables such as population growth rates and savings rates and other, exogenous characteristics that theoretically affect growth rates. Tests of convergence after controlling for other factors in cross-section regressions are called tests of conditional convergence. According to this definition, on balance the average growth rate is greater for poor states that have lower initial incomes than for rich states. Thus, Barro regressions can determine whether there exist states that are catching up and others that are losing ground. But as Andrew B. Bernard and Steven N. Durlauf (1994) have noted, the regressions cannot determine whether states are running the same race or racing to the same point even after controlling for state characteristics. In other words, the cross-section test cannot detect whether there are multiple long-run equilibria or multiple growth paths. Nor can these regressions identify which states are converging and which are not (Danny Quah 1995).

While Barro regressions do not necessarily distinguish between competing models of growth, they are useful for capturing a particular type of convergence. They are also useful because a large body of literature has explored their pitfalls (see, for instance, Ross Levine and David Renelt 1992).[6] More relevant for this discussion, however, is that Barro-type regressions are well suited for finding the growth effects of taxes because, as discussed below, there are good reasons for controlling for initial income in regressions of growth rates on tax rates.

Growth rates used in Barro regressions are usually averaged over long time periods to smooth out short-term variations and to reveal trend behavior. The period from 1960 to 1992 should be sufficiently long to

Chart 1
1960 State PCPI and 1961–92 Average State Growth
(*Relative to National Average*)



● indicates nonsoutheastern states.

smooth out the temporary effects of shocks and leave only permanent effects. However, splitting the sample into two intervals provides additional insights about convergence dynamics as well as about other longer-term shocks to states' economies. The first thing to note is that the growth experiences of different states have been far from uniform. Growth rates for all states from 1961 to 1976 and from 1977 to 1992 had a negative correlation of –0.3. A negative correlation means that on average growth involved setbacks or that states reverted to the mean, and a small correlation suggests that growth was not too persistent. Part of the reason for differences in 1961-76 and 1977-92 relative growth is the oil shocks of the 1970s, which created winners in the 1970 and then losers in the 1980s when oil prices declined. Not only does this lack of persistence suggest that growth is affected by shocks but also that there may be room for state-specific shocks, including taxes. In addition, the variability of growth rates explains why the rankings of relative per capita personal incomes from 1961 to 1992 were so persistent. Growth rates, both positive and negative, would have to be sustained over long periods for rank correlations of relative per capita personal incomes to be lower and for states to show more mobility among rankings.

Convergence to long-run equilibrium in the exogenous growth model implies that initial incomes matter less as time passes and states become more equal. The data are consistent with this assumption. Growth rates over the various subintervals have been less and less correlated with incomes just prior to the start of the interval. For instance, dividing the sample in half shows that, while growth over the 1961-76 period had a –0.66 correlation with initial 1960 per capita personal income, subsequent growth from 1977 to 1992 had only a –0.41 correlation with per capita personal income in 1976. While a dampened relationship of growth with initial per capita personal income is consistent with convergence, it could also be due to large shocks that overwhelm the effect of initial conditions.

In sum, simple correlations involving growth rates and state incomes suggest convergence among the states. But low persistence in growth rates is evidence that shocks may have mattered, too. If shocks matter for growth rates averaged over fifteen years, then it is possible that taxes may have mattered for fifteen-year periods or even longer. Before looking at this possibility in the next section, the following facts about growth in the Southeast should be mentioned. Relative per capita personal incomes in the Southeast are just as persistent as in the nation when comparing 1960 and 1992. Also, because the correlation of initial income in southeastern states in 1960 and the growth rate from 1961 to 1992 is slightly lower than in the nation, convergence within the southeastern states appears to be less pronounced. Dividing the sample period in half shows that among the southeastern states growth rates over the two periods are virtually uncorrelated. This finding is consistent with the correlation of initial incomes with subsequent growth, a measure of convergence. From 1961 to 1976, convergence in the Southeast was faster than in the nation as a whole. However, during the period from 1977 to 1992, the correlation between initial per capita personal income and growth was positive, signaling divergence within the Southeast. So, while all states converged rapidly early on, later some states failed to sustain the pace, and two groups formed that diverged.

*F*acts on State and Local Taxes

What does theory identify as the effects of taxes on growth? Taxes raise the cost or lower the returns to a taxed activity. Taxes therefore create incentives for individuals or businesses to seek out activities that minimize their tax payments, substituting away from activities taxed at a higher rate to those taxed at lower rates. By inducing this substitution, taxes distort behavior in the economy. In turn, the distortionary effect of taxes is that resources are allocated less efficiently and growth may suffer. In particular, when taxes reduce the after-tax return to capital broadly defined, individuals have the incentive to substitute away from investing in physical and human capital or in technical progress, causing growth to slow. In exogenous growth models tax policies tend to have only temporary effects on growth along the adjustment path to long-run steady-state, but in endogenous growth models the effect on growth can be permanent.[7] With geographically mobile inputs to production, after-tax returns tend to be equalized across regions in exogenous growth models in the long-run but need not be in endogenous growth models.

When talking about the distortionary effects of taxes, economists are really talking about marginal tax rates. Marginal tax rates are here defined as the additional taxes paid when personal income rises by a small amount. For example, for a personal income tax the marginal tax rate describes a person's tax bracket and shows how much taxes are paid on the last dollar earned from working and investing. Because they affect individuals' and firms' decisions on how to spend

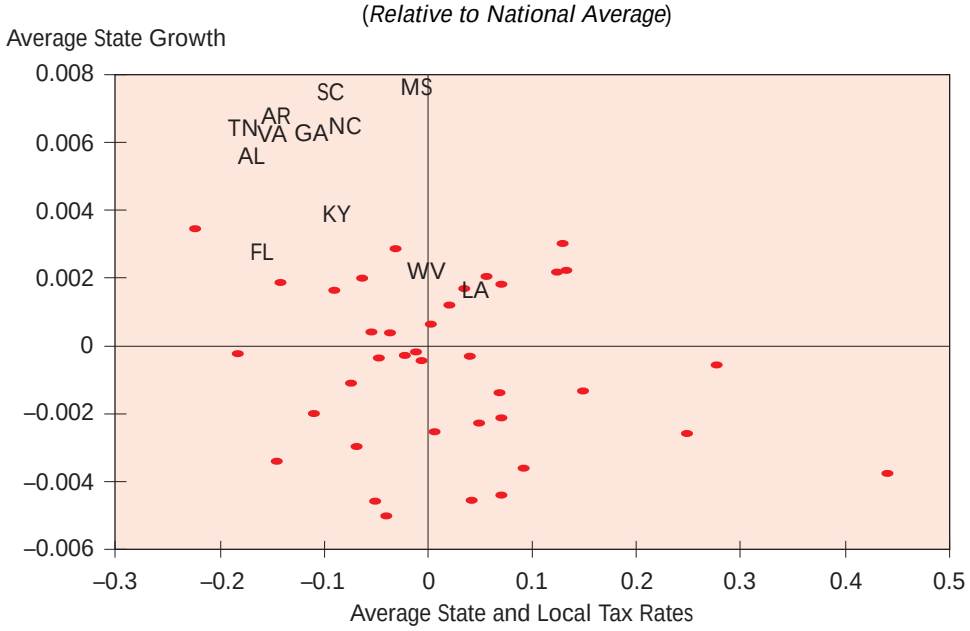
their last dollar, changes of marginal tax rates create distortions of economic decisions and impose burdens on society, including efficiency losses and lower growth. But because information to construct average state marginal tax rates is not easily available, average tax rates are sometimes used to measure the effects of taxation. While average tax rates describe the size of government collections, they may not be a good measure of the burden imposed on society, which depends on how much behavior is distorted.[8]

Average Tax Rates. The first column in Table 2 features average tax rates across states averaged over the 1961-92 period. Average tax rates are defined as the ratio of total state and local tax receipts to state personal income. With the principal exception of Louisiana, southeastern states tend to have much lower average tax rates than the nation. In fact, out of the lowest ten over the sample period, five—Alabama, Tennessee, Florida, Virginia, and Arkansas—are from the Southeast. Also, the (unweighted) average tax rate of the Southeast was 9.34 percent below the nation's. From 1961 to 1992, the average tax rate averaged across all U.S. states increased over time.

How persistent are average tax rates averaged over different time periods?[9] When the sample is divided into two periods, the correlations of average tax rates over the subintervals are positive but not very high. Average tax rates from 1961 to 1976 have a correlation of around 0.3 with average tax rates over the years from 1977 to 1992. Since average tax rates are not too persistent, taxes may be good candidates for shocks that cause growth rates to vary over the subintervals as well as over the longer term, a point made by William Easterly and others (1993). However, the rank correlation of states' tax collections across time periods is more than twice the autocorrelation of average tax rates. In other words, average tax rates were too variable over time to affect rank order significantly. This variability of tax rates suggests that the reforms of the 1970s (or lack thereof for states that did not reform) had little effect on states' rankings when ranked by the relative size of tax collections. In contrast to the nation as a whole, average tax rates in the Southeast were much more persistent or more strongly positively correlated. Average tax rates in the Southeast grew more slowly than in the rest of the nation, causing relative average tax rates in the Southeast to fall.[10]

Chart 2 plots relative average tax rates along with relative state growth rates over the 1961-92 period. The two appear to be negatively related. In fact, the overall correlation is –0.42, and for the Southeast it is almost the same. At the same time, the correlation

Chart 2
Relative Average Tax Rates and State Growth Rates, 1961–92
(*Relative to National Average*)



● indicates nonsoutheastern states.

Table 2
Average and Marginal State and Local Tax Rates by State[a]

Region[c]	States	State Average Tax Rates (Percent)						Estimated State Marginal Tax Rates (Percent)[b]					
		1961-92	Rank	1961-76	Rank	1977-92	Rank	1961-92	Rank	1961-76	Rank	1977-92	Rank
Far West	AK	15.44	50	7.25	1	23.62	50	23.45*	50	13.40*	45	**14.72***	49
	CA	10.65	41	10.70	47	10.60	31	**10.32**	21	13.35	44	**10.68**	18
	HI	11.24	44	10.35	43	12.12	47	12.93	47	12.70	42	13.68	47
	NV	9.45	20	9.55	28	9.34	10	9.18	7	11.30	29	**9.35**	6
	OR	10.00	31	9.30	26	10.71	35	11.32	38	10.64	22	11.97	39
	WA	9.86	28	9.57	29	10.16	25	**10.76**	30	**10.79**	24	11.68	33
Great Lakes	IL	9.27	17	8.58	16	9.97	24	10.35	22	12.26	35	10.58	16
	IN	8.90	10	8.71	20	9.09	7	9.68	11	**10.21**	18	11.08	24
	MI	10.43	37	9.67	31	11.20	41	11.53	42	12.36	39	**11.50**	31
	OH	8.58	8	7.78	2	9.39	11	10.54	26	9.72	10	11.90	38
	WI	11.53	47	11.08	48	11.98	45	**12.24**	45	13.97	47	12.80	46
Mideast	DE	9.53	22	8.61	17	10.45	29	10.88	34	12.29	37	**10.84**	23
	MD	9.63	24	8.94	23	10.32	27	10.26	19	12.29	36	10.13	11
	NJ	9.32	18	8.39	12	10.24	26	10.87	33	12.16	34	11.22	30
	NY	13.09	49	11.75	50	14.43	48	15.01	48	18.54	50	**14.98**	50
	PA	9.40	19	8.85	22	9.95	23	**10.10**	16	12.29	38	**10.04**	9
New England	CT	9.08	13	8.42	13	9.74	16	10.47	25	12.40	40	11.17	29
	MA	10.66	42	10.09	38	11.23	42	10.45	23	15.31	49	9.62	7
	ME	10.50	38	9.94	37	11.05	39	11.70	44	13.27	43	12.52	43
	NH	7.94	1	7.94	4	7.93	1	**8.28**	1	**9.77**	11	**8.96***	3
	RI	9.96	30	9.25	25	10.66	33	**10.82**	32	12.52	41	**10.70**	19
	VT	11.30	45	11.17	49	11.43	43	**11.52**	41	14.77	48	**12.14**	41
Plains	IA	10.34	34	9.92	36	10.76	36	11.33	39	**10.92**	25	12.76	45
	KS	9.81	27	9.70	32	9.92	22	**10.20**	17	9.60	9	11.13	25
	MN	11.33	46	10.67	46	11.99	46	**12.27**	46	**13.47**	46	12.57	44
	MO	8.28	2	8.14	7	8.42	2	8.60	3	10.15	17	9.29	5
	ND	10.28	33	9.85	34	10.70	34	**10.79**	31	**8.69**	2	**11.14***	27
	NE	9.57	23	8.80	21	10.33	28	10.65	28	11.07	26	**10.72**	20
	SD	10.14	32	10.50	45	9.79	19	8.94	5	**9.92**	13	8.73	2

continued

Table 2 (*continued*)

Region[c]	States	State Average Tax Rates (Percent) 1961-92	Rank	1961-76	Rank	1977-92	Rank	Estimated State Marginal Tax Rates (Percent)[b] 1961-92	Rank	1961-76	Rank	1977-92	Rank
Rocky Mountains	CO	9.72	25	9.63	30	9.81	20	**9.85**	12	**10.14**	16	10.33	14
	ID	9.47	21	9.44	27	9.50	13	**9.97**	14	9.11	6	11.15	28
	MT	10.88	43	10.28	42	11.47	44	**11.36**	40	**11.79**	32	10.81	21
	UT	10.36	35	9.85	33	10.87	37	11.28	37	**10.37**	19	**11.71**	35
	WY	12.73	48	10.11	40	15.35	49	**16.24***	49	**11.39**	31	**14.31***	48
Southeast	AL	8.39	3	7.98	5	8.79	5	8.92	4	9.05	5	**8.98**	4
	AR	8.57	7	8.31	9	8.84	6	9.32	8	**8.71**	3	10.23	13
	FL	8.45	5	8.45	14	8.45	3	**9.15**	6	**8.83**	4	10.14	12
	GA	8.92	11	8.36	11	9.48	12	9.99	15	10.13	15	10.48	15
	KY	9.10	14	8.47	15	9.72	15	10.47	24	10.69	23	11.70	34
	LA	10.38	36	10.24	41	10.52	30	**10.65**	29	**11.34**	30	**11.53**	32
	MS	9.81	26	9.87	35	9.74	17	9.58	9	**10.59**	21	**9.90**	8
	NC	9.15	15	8.64	19	9.65	14	10.21	18	10.09	14	10.82	22
	SC	9.06	12	8.35	10	9.77	18	10.28	20	9.84	12	**10.66**	17
	TN	8.40	4	8.17	8	8.64	4	**8.58**	2	9.38	8	**8.64**	1
	VA	8.54	6	7.89	3	9.19	9	9.64	10	10.50	20	10.09	10
	WV	9.94	29	9.22	24	10.65	32	11.13	35	11.20	28	**11.75**	36
Southwest	AZ	10.64	39	10.37	44	10.90	38	11.27	36	11.80	33	12.05	40
	NM	10.65	40	10.10	39	11.19	40	11.65	43	**11.16**	27	12.20	42
	OK	9.23	16	8.61	18	9.85	21	10.60	27	8.42	1	11.84	37
	TX	8.62	9	8.14	6	9.09	8	9.89	13	9.13	7	11.13	26
United States		9.92		9.40		10.44		10.75		11.98		11.21	

[a] States with highest tax rates are ranked lowest.
[b] Bold numbers represent that the constant term in the regression was insignificant; asterisks represent that adjusted R^2 was less than 0.95.
[c] States are grouped into eight standard regions defined by the Bureau of Economic Analysis, U.S. Department of Commerce.

between average tax rates and relative per capita personal incomes in 1960 is 0.33. This positive correlation presents a potential problem because it is difficult to distinguish the influence of convergence and taxes on growth. For example, suppose the positive correlation occurred only because of convergence and that taxes are passive without any independent growth effects.[11] Because convergence implies a negative correlation between initial incomes and subsequent growth, taxes and growth may—indirectly through convergence—be negatively correlated for completely spurious reasons. Alternatively, suppose there is no convergence but that taxes do have negative growth effects: the positive correlation between taxes and growth would imply convergence (again, spuriously) indirectly through the tax effects. Any regression of growth rates on average tax rates would need to control for the correlation of tax rates and initial incomes to isolate convergence and tax effects on growth.

The observation on the relation between average tax rates and growth rates also tends to hold true for the subintervals. For all states, the average tax rate has negative correlations with growth over the period from 1961 to 1976 and from 1977 to 1992 of –0.36 and –0.62, respectively, and the numbers for the Southeast are very similar. These data indicate that states with high growth rates also have relatively low tax revenues. Stronger negative correlations over time suggest a smaller role for taxes as a revenue source for such states and localities. Or, if there were a good reason to think that average tax rates were a sound measure of marginal tax rates, one could infer a larger negative growth effect of taxes. This possibility will be explored below.

Marginal Tax Rates. The above section surveyed average tax rates across states mainly because they have been popular for inferences about tax effects on growth. This section turns to marginal tax rates, which are the better theoretical measure of what influences behavior and ultimately growth because changes of the tax rate on the last taxable dollar create individual incentives to change behavior and lower tax burdens. In contrast, the average tax rate does not create behavioral changes but reflects the changes of the marginal tax rate and changes of the tax base induced by behavior changes. Before estimating marginal tax rates and characterizing them across states and time, this section will first show how marginal tax rates and average tax rates are related.

To see the relationship between marginal tax rates and average tax rates, consider a linear flat tax. Not only has the concept received a lot of public attention, but the flat tax is also a useful device for estimating marginal tax rates, as seen below. With a linear flat tax, tax revenues are the sum of revenues independent of behavioral changes and revenues that depend on behavioral influences through changes of income (or another measure of the tax base). Such a tax takes the following form:

$$Revenue_s = l + MTR \bullet Income_s. \qquad (1)$$

Here *MTR* • *Income* is revenues that respond to income changes, and the coefficient on income, *MTR*, gives the effect on tax revenues of a small change in income in period *s*. In other words, *MTR* is the marginal tax rate of the flat tax. The constant *l* designates tax revenues that are not affected by behavioral changes; nor does this "lump-sum tax" influence individual incentives. For this reason lump-sum taxes are also nondistortionary. While lump-sum taxes are not collected in practice, they are implicit in tax schedules that are either progressive or regressive. If the lump-sum tax is positive, the tax function is said to be regressive. If the lump-sum tax is negative—a lump-sum transfer—the tax schedule is progressive. Only if the lump-sum tax is zero is the tax schedule proportional. Finally, to see how average tax rates, denoted *ATR*, and marginal tax rates are related, divide both sides of equation (1) by income:

$$ATR_s = \frac{l}{Income_s} + MTR. \qquad (2)$$

Thus, for a regressive (progressive) flat tax, the average tax rate is greater (smaller) than the marginal tax rate and the average tax rate falls (rises) when income rises. A tax is proportional when the average tax rate equals the marginal tax rate or the average tax rate is the same for all income levels.[12]

Koester and Kormendi (1989) propose a simple way of finding an average marginal tax rate that holds as a linear approximation.[13] Basically, the estimation procedure is to estimate equation (1) by regressing total tax revenues on a constant, *l*, and income. Using the sum of state and local tax revenues and state personal income in the regression provides an estimate of the average marginal tax rate over all taxed units. The estimated marginal tax rate is not any one individual's marginal tax rate, but with certain restrictions it could be interpreted as a representative individual's tax rate. In addition, one must assume that the tax base is income or that any other tax base (such as property or sales) is proportional with income in order for this equation to be a measure of what affects behavior.

Also, as Koester and Kormendi point out, the method is robust as long as there are no structural changes to the tax schedule during the sample period. This premise may not be tenable, though. During the 1960s many states adopted new sales tax and income tax systems. During the 1970s many big changes occurred such as the tax limitation movement, and during the 1980s there were major federal and state tax reforms.[14] Thus, it makes sense to investigate the stability of the marginal tax rate estimates over time by splitting the sample in two and considering if and how marginal tax rates differ.

Table 2 shows the results of the Koester and Kormendi-type ordinary least squares (OLS) regressions that estimate the above equation for all states individually. These regressions use Halbert White's (1980) formula for correcting for the possibility that the variances of the error terms change over the sample. All the estimated marginal tax rate coefficients are significant at the 5 percent level. Most regressions are estimated with high accuracy, with only seven of the 153 regressions having adjusted R^2s lower than 0.95. Regressions for Alaska and Wyoming tend to have low measures of fit. For the estimated marginal tax rates in Table 2 that are in bold type, the regression constant was insignificant. An insignificant constant implies that the tax system was not significantly different from proportionality or that the difference between the average tax rate and the estimated marginal tax rate in the table was insignificant.[15]

The aggregate average tax rate in Table 2 was less than the aggregate marginal tax rate for all periods reviewed. However, the two displayed dissimilar behavior over time: while the aggregate average tax rate tended to increase, marginal tax rates fell. In other words, differences between the two tax rates suggest that the progressivity of the state and local tax system for the United States as a whole fell over time. Looking at disaggregate behavior of the states, one finds that the marginal tax rates of individual states were more persistent than the average tax rates across subsamples. The autocorrelation of marginal tax rates was 0.46 comparing 1961-76 with 1977-92 while for average tax rates it was 0.3. Still, marginal tax rates in the sample are not highly persistent but vary over time, so they may explain some of the low persistence of state growth rates across time.

Average tax rates of the southeastern states declined relative to the nation's because they did not increase as fast as the rest of the nation's. Marginal tax rates in the region started out much lower relative to those in the rest of the nation than indicated by their average tax rates. Southeastern marginal tax rates (unweighted averages) were 18.1 percent lower than the nation's during the 1961-76 period. But from 1977 to 1992, when marginal tax rates in the nation fell, southeastern marginal tax rates rose and converged to the national average.

If one were to plot state marginal tax rates and growth rates for the nation, one would find a negative relation that is reflected in a negative correlation of –0.39. Just as for average tax rates, the negative relationship of the marginal tax rate and growth rates has grown stronger over time, with correlations going from –0.36 during 1961-76 to –0.47 during 1977-92. For the Southeast, the numbers are again similar. This finding suggests that taxes may have had a stronger influence over the latter half of the sample. As before, these simple correlations do not control for other variables such as the initial per capita personal income and convergence effects. Because marginal tax rates across all states are positively related to initial per capita personal incomes, it is difficult to disentangle the influence of convergence and taxes on growth. Thus, the separate effects will need to be isolated before anything definitive can be said about the growth effects of taxes. Nonetheless, the low persistence of marginal tax rates suggests that tax rates could well explain the variability of growth rates over time. Also, the negative correlation between marginal tax rates and growth rates supports that taxes have a negative growth effect. The discussion below will explore whether this result holds when common influences such as the effect of convergence are controlled for.

*E*mpirical Evidence

Before proceeding to the regressions used in this study, this section reviews related empirical studies of taxation and growth. This review shows how previous studies have dealt with the problems pointed out above and identifies some other relevant issues. While the previous section argues that to isolate tax effects from convergence effects on growth one has to control for initial income and use the correct measure of taxes, namely marginal tax rates, this section shows that identifying tax effects also requires limiting the influence of other government variables. More specifically, the issue is how the government's budget, which equates revenues to expenditures and transfers, is balanced after marginal tax rates change. The way the government's budget is balanced may have independent

effects on the economy and growth. Unless these influences are properly controlled for, estimates of tax effects may include the effects of other fiscal policies. The presence of these effects may explain why few studies have found significant and negative growth effects of marginal tax rates. While some studies have grappled with these problems, they have fallen short in some areas, as the discussion will make clear.

A number of cross-section studies have analyzed the relationship of taxation and international growth differences. As Peter N. Ireland's (1994) review of the literature concludes, while some of these studies find tax rate effects on long-term growth and appear to support endogenous growth theories, others find no significant effects. He suggests that part of the problem may be that few studies average growth rates over sufficiently long time intervals (to smooth out short-run fluctuations) to be able to distinguish among theories.

It appears that state and local taxes have temporary growth effects that are stronger over shorter intervals and a permanent growth effect that does not die out over time.

Also important is that few measures used as tax variables are robust determinants of growth after other explanatory measures are considered. For instance, Koester and Kormendi (1989) have argued that previous studies may have mistakenly found negative long-run growth effects of taxation, if both tax and growth rates are related to the level of initial income. To control for this possibility, Koester and Kormendi add the initial level of income to cross-country regressions of growth that use different tax measures. While they find that both the average tax rate and marginal tax rates have negative effects on growth in separate regressions, the coefficients on the average tax rate and marginal tax rates are not significant. More recently, for a broad cross-section of countries, Easterly and Sergio Rebelo (1993) concluded that the evidence that tax rates matter for growth is fragile. Only the marginal income tax rate estimated using Koester and Kormendi's method, and the ratio of income taxes to personal income, survive inclusion of other explanatory variables (such as initial income, and government expenditures and nontax revenues) in their cross-country regressions. Other tax variables used to measure the effective rate of taxation obliterate the effect of initial income so that it is difficult to isolate convergence effects from the effects of tax policy.

There have been a few studies looking for evidence on the growth effects of state and local tax policy. As Alaeddin Mofidi and Joe A. Stone (1990) noted, the empirical findings have been mixed with estimated effects ranging from positive to negative. Tax rates may be significant in simple regressions, as in the international literature, but multivariate regressions that add more explanatory variables can result in insignificant coefficients on tax rates. For instance, L. Jay Helms (1985) argued that higher taxes may stimulate economic activity if used to finance appropriate expenditures. Thus, a regression should consider all sources and uses of government funds to be able to interpret the coefficient on taxes. Helms estimated a pooled time-series, cross-section regression using annual data for the period from 1965 to 1975. After controlling for all sources and uses of funds except transfers to individuals, Helms found a negative and significant growth effect of taxes. Thus, controlling for nontax items to balance the budget becomes doubly important. It helps interpret the sign of the tax rate coefficient, which may be positive if taxes primarily finance the appropriate spending, or, in Helms's case, negative if taxes primarily finance welfare transfers. Also, judicious choice of explanatory nontax variables will affect the significance of the estimated tax coefficients.

By contrast, John K. Mullen and Martin Williams (1994) took another approach suggested in Koester and Kormendi. They excluded expenditure variables in their growth regressions in order "to disentangle average from marginal tax effects." Specifically, they tested whether increases in the marginal tax rate that are revenue-neutral—with simultaneous reductions in transfers to keep revenues unchanged and so keep the budget balanced—reduce real GSP growth rates over 1969-86. To find revenue-neutral marginal tax rate effects, Mullen and Williams include both the average tax rate and the marginal tax rate in their growth regression, and they find negative coefficients on both, with only the marginal tax rate significant. However, the regression has low explanatory power, with an R^2 equal to 0.192. Also, while the coefficient for initial income is negative, suggesting beta-convergence, it is also insignificant.

The theoretical literature typically analyzes the effects of balanced-budget marginal tax rate shocks. Usually, nondistortionary lump-sum transfers are used to balance the government's budget. This practice isolates the distortionary effects of taxes because one does not have to worry about the effects of other government policies. But sometimes expenditures are allowed to adjust. By including government expenditures in the growth and tax regressions, researchers try to control for expenditure effects and isolate pure distortionary effects. Helms (1985) controls for expenditures but excludes welfare transfer payments from the regression. The interpretation of the estimates is that taxes finance distortionary welfare transfers, not lump-sum transfers as would be required to uncover the distortionary effects of taxes. To correctly identify the distortionary tax effects requires an empirical specification that controls for all nontax revenue sources and all expenditures and welfare transfers. In this case, the lump-sum tax implicit in the tax schedule adjusts to keep revenues constant and the government's budget in balance.[16]

Mullen and Williams (1994) and Koester and Kormendi (1989) propose a short cut around including all expenditure and nontax revenue items in growth regressions. By controlling for average tax revenues when marginal tax rates change, they hoped to isolate revenue-neutral tax policy. Revenue-neutral marginal tax rate effects would isolate the distortionary effects of taxes because the budget would be balanced without expenditures, distortionary transfers, or nontax revenues changing. However, controlling for average tax rates means neutrality of average revenue but does not imply revenue neutrality. Thus, these studies do not isolate the distortionary tax effects on growth. However, the marginal tax rate changes that are regressivity-neutral might do so.

To see that holding average tax rates fixed does not mean that revenues are unchanged, consider equation (2) and totally differentiate it. The flat tax schedule can be changed only by changing the intercept, *l*, or the slope of the tax schedule, *MTR*. The combined total effects of such shocks on average revenue collections are

$$\frac{\Delta ATR}{ATR} = \left(\frac{MTR}{ATR}\right)\frac{\Delta MTR}{MTR} + \left(\frac{L}{ATR \bullet Income}\right)\left(\frac{\Delta L}{L} - \frac{\Delta Income}{Income}\right), \qquad (3)$$

where the implied changes in income are also included and Δ denotes change. Equation (3) says that the percentage change in average tax rates is equal to a weighted average of the percentage change of marginal tax rates and the percentage change of the average lump-sum tax, which is the ratio of nondistortionary taxes implicit in the tax schedule to personal income. Notice that the average lump-sum tax rises when income falls, which might happen when marginal tax rates increase. Differentiating the regressivity index, *ATR*/*MTR*, yields[17]

$$\Delta\left(\frac{ATR}{MTR}\right) = \frac{ATR}{MTR}\left(\frac{\Delta ATR}{ATR} - \frac{\Delta MTR}{MTR}\right). \qquad (4)$$

This equation states that regressivity falls or progressivity increases when the percentage change of average tax rates is smaller than the percentage change of marginal tax rates.

There are several natural tax experiments that one can analyze with the last two equations. For instance, Mullen and Williams (1994) and Koester and Kormendi (1989) consider an ATR-neutral change of marginal tax rates. Average revenue neutrality requires that $\Delta ATR = 0$, or no change of the average tax rate. To accomplish this condition and satisfy equation (3), there must be offsetting lump-sum tax reductions when the marginal tax rate increases. Such a policy also implies a rise in progressivity because now $\Delta(ATR/MTR) = -ATR/MTR \bullet \Delta MTR/MTR$ in equation (4). Since total tax revenues are the product of the income tax base and the average tax rate—or *Revenues* = *ATR* • *Income*—and the average tax rate cannot change, revenues will change only if income changes. Because an increase in the marginal tax rate tends to lower income, an ATR-neutral increase of marginal tax rates implies a negative effect on tax revenues. Thus, ATR-neutrality does not imply revenue-neutrality. A problem results because something must be done to offset the resulting budget deficit and keep the government's budget in balance. For instance, the deficit might be offset by reductions in expenditures. However, changes in expenditures have their own growth effects that must be kept separate from the growth effects of taxes. The upshot is that growth-and-marginal tax rate regressions that control for average tax rates but not for expenditures have not isolated the distortionary effects of taxes. The effects estimated in such regressions are in fact a mixture of tax and spending effects.

Alternatively, a progressivity-neutral tax policy may come closer to isolating the distortionary effects of taxation. Such a policy requires no change in progressivity, or $\Delta(ATR/MTR) = 0$ in equation (4), which implies $\Delta ATR/ATR = \Delta MTR/MTR$ in equation (4). Thus, average revenue collections increase. The increase of the average tax rate offsets the negative effect of a smaller tax base on revenues. In other words, it offsets $\Delta Y/Y < 0$ in

equation (3). Thus, a progressivity-neutral increase of marginal tax rates has a smaller negative revenue effect than an ATR-neutral tax increase. This result can be seen by looking at the percentage change of revenues, which equals the percentage change of income plus the percentage change of the average tax rate, or $\Delta Revenues/Revenues = \Delta Y/Y + \Delta ATR/ATR$. For any marginal tax rate increase $\Delta Y/Y < 0$, but $\Delta ATR/ATR > 0$ for a progressivity-neutral shock while for an ATR-neutral shock $\Delta ATR/ATR = 0$. Thus, revenues fall by a smaller amount for a progressivity-neutral tax increase than for an ATR-neutral tax increase, so the implied budget deficit is also smaller, requiring a smaller expenditure offset. A regressivity-neutral tax change therefore comes closer to isolating the distortionary effects of taxes in simple growth regressions where expenditures are not controlled for.[18]

Controlling for Progressivity. This section reports the results of simple cross-section regressions that control for progressivity in order to isolate the effect on growth of the marginal tax rate changes. To find the effects of relative tax rates on relative growth rates, dependent and explanatory variables in the regressions are expressed as log differences from their national averages. The explanatory variables include relative initial average personal income, *RPCPI*, relative marginal tax rates, *RMTR*, and relative regressivity, *RR*, where regressivity is defined as *ATR*/*MTR* (and relative progressivity is the inverse of *RR*.) As argued above, controlling for regressivity adds precision to the estimate of the distortionary effect of marginal tax rates and a meaningful interpretation. Thus, the discussion focuses primarily on the coefficient for *RMTR*, which is expected to be negative. To get a sense of how large the tax effects are, the coefficient for *RMTR* is compared with the coefficient on *RPCPI*, which measures the effect of initial conditions (or convergence).

The first cross-section regression estimates growth effects with OLS after White's correction. This regression uses a sample of all fifty states, *j*, where data are averaged for the 1961-92 period and initial income is from 1960. Equation (R1) presents the results of the regression where standard errors are in parentheses and significance values in brackets:

$$RG6192_j = -0.00003 - 0.0115\ RPCPI60_j \quad \text{(R1)}$$
$$(0.0003)\quad (0.0016)$$
$$[0.93]\quad [0.000]$$

$$-0.0054\ RMTR6192_j - 0.0067\ RR6192_j + e_j,$$
$$(0.0027)\quad (0.0056)$$
$$[0.043]\quad [0.24]$$

where $R^2 = 0.63$, adjusted $R^2 = 0.573$, the standard error of estimate (*SEE*) is 0.0022, and the number of observations, *N*, is equal to 50.

The regression shows a negative relation between relative growth and both relative initial income and relative marginal tax rates. Both coefficients are significant at the 5 percent level. The coefficient on *RPCPI* implies that for a state with an initial per capita personal income that is 60.3 percent below the national average, as Mississippi in 1960 is in Table 1, one would expect growth from 1961 to 1992 to be 0.693 percentage points above the national average. Because Mississippi's marginal tax rate was 11.6 percent below the nation in Table 2, one would expect this fact to increase the relative growth rate by 0.063 percentage points. Combined, the regression predicts growth for Mississippi to be 0.756 percentage points above the nation. (Mississippi's actual growth rate was in fact 0.763 percentage points higher.) The estimated effect on growth of relative marginal tax rates is slightly less than half that of initial per capita personal incomes. A state's marginal tax rate would have had to be roughly 21 percent below the national average marginal tax rate of 10.75 percent during 1961-92 to offset the negative effects on growth of an initial per capita personal income that was 10 percent above average.

Next, this section investigates whether there have been changes over time in the responsiveness of relative growth to relative marginal tax rates. These same OLS regressions (with White's correction) are used when the time period is split into two subsamples. For 1961-76

$$RG6176_j = 0.0006 - 0.0223\ RPCPI60_j \quad \text{(R2a)}$$
$$(0.0008)\quad (0.0024)$$
$$[0.49]\quad [0.000]$$

$$-0.0131\ RMTR6176_j - 0.0235\ RR6176_j + e_j,$$
$$(0.007)\quad (0.014)$$
$$[0.064]\quad [0.084]$$

where $R^2 = 0.615$, adjusted $R^2 = 0.539$, $SEE = 0.004$, and $N = 50$. For 1977-92

$$RG7792_j = -0.0007 - 0.0032\ RPCPI76_j \quad \text{(R2b)}$$
$$(0.0008)\quad (0.0052)$$
$$[0.38]\quad [0.53]$$

$$-0.0196\ RMTR7792_j - 0.0194\ RR7792_j + e_j,$$
$$(0.0068)\quad (0.0098)$$
$$[0.004]\quad [0.048]$$

where $R^2 = 0.398$, adjusted $R^2 = 0.354$, $SEE = 0.0046$, and $N = 50$. The results reveal that the marginal tax rate has negative growth effects that are weakly significant during 1961-76 and strongly significant over 1977-92. The growth effects of the marginal tax rate not only strengthened over time but increased relative to the effect of the initial position of the states. The coefficient on initial per capita personal income is only significant in the first equation, indicating that in 1977-92 catching up was less important for states' growth than previously. In fact, this finding indicates nonconvergence of growth rates. Also, equations (R2) indicate that the medium-run growth effects of marginal tax rates were larger than the long-run effects in equation (R1), a result consistent with the exogenous growth model, which predicts smaller growth effects the longer the time horizon is.

There are many potential problems with the above regressions that have not been addressed here.[19] Nonetheless, the regressions give a "first-pass" conclusion that regressivity-neutral marginal tax rate increases reduce growth. Since regressivity-neutral tax changes are "almost" revenue-neutral tax changes, one can infer that growth rates are reduced when tax rates rise. But one must bear in mind that offsetting changes in nondistortionary transfers are occurring in the background, something that is not likely to happen in practice. Also, tax effects appear to be relatively stronger the shorter the sample period is. But even as the sample period lengthens, and the tax effect diminishes, the tax effect still remains (economically and statistically) significant. Thus, tax effects have a temporary component that diminishes over time as well as a permanent component that does not disappear. While this is evidence for a hybrid endogenous growth model with the transitional dynamics of an exogenous growth model, it could also be that the sample period was still too short to elicit true long-term effects. Also, even though the results are consistent with economic theory, they are not necessarily exploitable. In other words, it is not clear that a given change in tax rates will produce changes in growth rates consistent with the regressions in this article. Care must be taken to ensure that the regressions are structural and robust to other specifications. Only then could one say that the regressions indicate causality and not just happy circumstance.[20] Future work will need to address these issues.

By contrast to the regressions above, proceeding as Mullen and Williams (1994) did and controlling for relative average tax rates rather than relative regressivity to determine the strength of ATR-neutral marginal tax rate changes results in insignificant and positive coefficients on the marginal tax rate and significant and negative coefficients for the average tax rate. As argued before, there is a simple economic answer that suggests that this sort of regression is misspecified. Controlling for average tax rates does not control for expenditures and so does not isolate the distortionary effects of taxes. When controlling for average tax rates, the coefficient on the marginal tax rate encompasses both the purely distortionary effect of taxes as well as the effects of other variables that must adjust to maintain the government budget identity. ATR-neutral tax changes therefore still require that other expenditures' terms be controlled for in regressions that purport to identify the distortionary effects of taxes. Thus, the method is a dubious shortcut and explains why estimating progressivity-neutral marginal tax rate effects is preferable.

Conclusion

Thirty-five years ago the Southeast by and large lagged behind the nation, but in the meantime strong growth rates have propelled the region forward. Was this progress due to convergence, or have state and local taxes affected relative state growth? To understand the role of taxes for growth, this article reviews states' growth experiences and the history of state and local taxes in the United States from 1960 to 1992. That states' growth rates of per capita personal income are negatively correlated with their initial levels reflects convergence of incomes. At the same time, the rankings of states' per capita personal incomes have been fairly persistent because states' growth rates tend to fluctuate over time.

These fluctuations may have been caused by changing taxes. State and local tax rates fluctuated approximately as much as growth rates, making them good candidates for explaining variable state growth rates. This relationship holds true for both states' average and marginal tax rates. However, the two should not be confused. Average tax rates only measure the size of government collections, and marginal tax rates create distortions to individual behavior and the economy as a whole. Distortions occur when households and firms change their work, consumption, or investment behavior to minimize tax payments. When households substitute away from investment in physical or human capital or technological progress, growth ultimately suffers. However, marginal tax rates are difficult to

come by and must be estimated. Marginal tax rates, estimated using a method of Koester and Kormendi (1989), generally were higher than average tax rates, but the gap narrowed as marginal rates fell and average tax rates rose when comparing 1961 with 1976 and 1977 with 1992. Thus, state and local taxes became less progressive for the United States overall and more states had tax systems that were indistinguishable from proportionality.

While the simple correlations above suggest that a relationship between taxes and growth exists, regressions can put the hypothesis to the test. The main problem is isolating the tax effects on growth. First, one needs to control for variables that affect both growth rates and tax rates, such as initial incomes that govern the rate of convergence but for independent reasons may also influence taxes. One also needs to keep separate changes in the marginal tax rate from changes in other government policies while not violating the government's budget constraint, which equates revenues to government purchases and transfers. There are two ways to accomplish this goal, namely, either hold all spending and transfers constant or keep revenues fixed. In both cases, when marginal tax rates are raised nondistortionary transfers implicit in the tax schedule adjust to keep revenues the same.

Previous empirical work has attempted to isolate the effects of marginal tax rates either by controlling for all expenditure items except welfare transfers or by controlling for average tax revenues. Neither method correctly identifies the distortionary effects of taxation, however. Real-world transfers are not distortionary because welfare alters incentives and creates distortions that must be kept separate from those of taxes. Controlling for average tax revenues when marginal tax rates increase implies a fall in revenues and a budget deficit. To get around this problem, this study proposes controlling for progressivity when marginal tax rates change. Progressivity-neutral tax increases cause smaller revenue reductions than if average tax rates do not change. In other words, progressivity-neutral tax changes are more likely to be revenue-neutral. In turn, the offsetting policy changes that balance the budget in the background are smaller so that the estimates more accurately reflect the effect of taxes.

This article focuses on a specific question: Do state and local taxes affect relative state growth? The study finds that relative marginal tax rates have a statistically significant negative relationship with relative state growth averaged for the period from 1961 to 1992. These results are economically significant because controlling for progressivity with greater accuracy than other specifications uncovers the effect of taxes. Also, the growth effect of taxation appears sizable, especially when compared with the effect on growth of initial state conditions, or the convergence effect. Aggregate marginal tax rates that are 20 percent below the national average have the same positive effect on state growth rates as initial incomes that are 10 percent below average. Reestimating the regressions when the sample period is split in half shows that the tax effects grow even stronger when compared with the convergence effect, which is insignificant in the latter half of the sample. Thus, it appears that state and local taxes have temporary growth effects that are stronger over shorter intervals and a permanent growth effect that does not die out over time, at least for the sample considered. This finding also supports the inference that part of growth is endogenous and susceptible to policy influence.

Finally, while one can conclude that state and local tax rates (relative to those of other states) affect relative state growth in both the short term and long term, there is a caveat that should precede any policy recommendation. Specifically, to isolate the growth effect of tax rates the regressions estimate the effect of a particular policy. Since a revenue-neutral change in aggregate state and local marginal tax rates is not likely to occur in practice, one should not extrapolate to more likely scenarios such as revenue-altering changes in tax rates or other fiscal policies that may accompany tax reform. Given this caveat, the results have the following policy implication. If growth is a policy objective, one should, at the very least, assess whether tax policies are out of line with other states. If long-term growth rates seem too low relative to other states, lowering aggregate state and local marginal tax rates is likely to have a positive effect on long-term growth rates. This likelihood is greater if the reduction in marginal tax rates is sustained rather than temporary. However, such a policy also reduces the progressivity of the tax system. No matter what emphasis is placed on growth, states should be aware of the potential trade-offs as they make choices to encourage economic growth.

Notes

1. For surveys of exogenous and endogenous growth models see, for example, the *Journal of Economic Perspectives* (Winter 1994), especially articles by Romer (1994), Grossman and Helpman (1994), and Pack (1994) and references therein.
2. The perspective does not distinguish among the composition of state and local taxes across states, although it may be very important for state growth. For instance, a plausible explanation for the higher growth rates of southeastern states may be their lower reliance on property taxes for revenues and greater reliance on nontax revenue sources. The article also ignores the regional pattern of federal and state and local government expenditures and transfers that is thought to have particularly stimulated the Southeast and may soon be reversed with federal government retrenchment.
3. The American Chamber of Commerce Researchers Association cost-of-living index of U.S. metropolitan areas is inappropriate for this study because it extends back only to the mid-1980s. Similarly, statewide GSP price deflators can be obtained only up to 1989 as of this writing.
4. See note 1 for references. For a comprehensive overview of the convergence literature see Barro and Sala-i-Martin (1991, 1992, 1995); Sala-i-Martin (1994) presents an overview of cross-sectional regressions.
5. Initial income can be interpreted as a proxy for the initial capital stock under broad or narrow definitions. Initial conditions such as whether initial capital is below or above its long-run level determines the transition path to steady-state.
6. For other criticisms of Barro regressions see, for instance, Quah (1993a, 1993b, 1995), Bernard and Durlauf (1994), Pack (1994), Kocherlakota and Yi (1995), and Carlino and Mills (1995).
7. See Ireland (1994) for a simple overview that contrasts the effects of taxation in simple exogenous and endogenous growth models. For more on tax effects in endogenous growth models see, for instance, Stokey and Rebelo (1995) and citations therein.
8. Average tax rates are perfect proxies for marginal tax rates only when the tax system is proportional or when the two are equal. Benson and Johnson (1986) have argued that nationwide the state and local tax system is close to proportionality: property taxes are roughly proportional, and sales taxes are regressive and income taxes, progressive.
9. Unless otherwise stated, all correlations involving tax rates use relative tax rates where relative is defined as logarithmic differences with the aggregate tax rate.
10. For more on this topic, see Bahl and Sjoquist (1990) as well as Gold (1991).
11. Koester and Kormendi (1989) studied the effect of this positive correlation but offered little explanation for it. Easterly and Rebelo (1993) explored the determinants of the correlation, suggesting that it could arise because of fiscal endogeneity such as scale effects in the costs of administering fiscal programs or voting.
12. Two simple ways of measuring the degree of progressivity of a flat rate tax schedule in equations (1) and (2) are by the ratio of the average tax rate to the marginal tax rate or by their difference. Thus, a flat tax schedule is progressive (regressive) if $ATR/MTR < (>) 1$ or if $ATR - MTR < (>) 0$. How progressive a tax system is tells how distortive the tax is. More progressivity implies greater efficiency loss for society: marginal tax rates must be higher for a given level of expenditures because as transfers increase, more revenues must be raised.
13. Among more recent studies that use this method are Easterly and Rebelo (1993), Mullen and Williams (1994), and Garrison and Lee (1995). More generally, one could include exclusions, deductions, and exemptions, or one could have multiple tax brackets or a nonlinear tax function. The virtue of the approach is its simplicity, but there may be a significant bias in assuming linearity instead of a nonlinear specification.
14. Briefly, the relevant historical background can be summarized as follows. From 1961 to 1971, ten states adopted a general sales tax, ten states adopted a broad-based personal income tax, and nine adopted a corporate income tax (U.S. Advisory Commission on Intergovernmental Relations 1994). In the late 1970s and 1980s the tax limitation movement caused a number of legislative controls on taxes to be enacted. During the 1980s two major federal income tax reforms lowered tax rates, broadened tax bases, and increased the emphasis on economic development as opposed to equity. While state reforms echoed federal reform themes, the cutback in the flow of federal grants caused rising state and local taxes and user fees in the 1980s.
15. With a significant constant, comparing estimated marginal tax rates and average tax rates gives an indication of how progressive a tax system is. For the nation as a whole, state and local taxes are progressive; the aggregate average tax rate is less than the marginal tax rate for the United States. Using any measures from note 12, overall progressivity fell over time. However, the aggregate estimate may overstate the case for progressivity. While most states appear to have a progressive tax system, for a large number of states one can reject progressivity or regressivity in favor of proportionality. Also, more states have become insignificantly different from proportionality from one subsample to the next. Comparing average tax rates and marginal tax rates for the Southeast, one sees that most states are progressive. However, the Southeast tended to be less progressive than the nation, except for the 1977-92 period.
16. But the regression would also suffer from multicollinearity because it would essentially be estimating a budget identity that equates all sources and uses of government funds.
17. See note 12 for a discussion of this index. One common measure of progressivity is the ratio MTR/ATR, where the ratio is greater than one if taxes are progressive. A regressivity index can be thought of as the inverse of the progressivity measure, or ATR/MTR. Using these indexes,

regressivity and progressivity are referred to interchangeably.

18. The closer the state and local tax system is to proportionality, the more precise is the approximation of the distortionary effect on growth for a regressivity-neutral tax policy. Of course, as states move toward proportionality, average tax rates become a better proxy for marginal tax rates.
19. Potential trouble spots are that the explanatory variables may be endogenous, that there exist high correlations among explanatory variables, or that some important variables were omitted. These possibilities temper any policy inferences one might want to make from the regression results.
20. Also, the level of aggregation in this study does not allow specific conclusions about how the composition of a state's state and local taxes affects growth. Nor does the study allow inferences about how other nontax revenues enter the mix. For the Southeast, it may be that the low tax rates (and a tilt of the revenue mix toward nontax sources) spurred growth, but the Southeast's mix of relatively low property and income taxes may also have been important.

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