Notes

Chapter 1

1. The values in Figure 1.2 use the annual growth rate in real per capita incomes, continuously compounded. The formula is \[ \ln \left( \frac{X_t}{X_0} \right) / n \], where \( \ln \) is the natural logarithm, \( X_t \) is the value at the end of the period, \( X_0 \) is the value at the beginning of the period, and \( n \) is the number of years.

2. The results in Table 1.1 based on equation (1.1) use Newey-White standard errors with an AR(1) lag structure to correct for first-order serial correlation. Indicator (dummy) variables for the specific time periods interacted with the Trend, variable test for significant changes in the growth rates between time periods.

3. These 13 states are Alabama, Arkansas, Florida, Idaho, Kansas, Kentucky, Mississippi, New Mexico, Oklahoma, South Carolina, Tennessee, Virginia, and West Virginia.

4. These additional nine states are California, Georgia, Louisiana, Maryland, Minnesota, Missouri, North Carolina, Pennsylvania, and Wisconsin.

5. Canjels and Watson 1997 find that the least squares growth rate is more robust to differences in the serial correlation properties of the data than the geometric or continuously compounded rate of growth. See also Easterly and Rebelo 1993 for additional discussion in the context of comparing growth rates across nations. The least squares method computes the growth rate by regressing the natural logarithm of income in each state on a linear time trend, as shown in equations (1.2a) and (1.2b):

\[
\ln \left( \text{Real Income per Capita}_t \right) = \text{Constant} + \beta_{\text{spc}} (\text{Time Trend}_{1969-99}) + u_t, 
\]

(1.2a)

\[
\ln \left( \text{Real Income per Worker}_t \right) = \text{Constant} + \beta_{\text{spw}} (\text{Time Trend}_{1969-99}) + u_t, 
\]

(1.2b)

where \( \ln \) refers to the natural logarithm, the subscript \( t \) refers to the value in each year, and \( u_t \) is the random error term. In this specification the estimated coefficients for \( \beta_{\text{spc}} \) and \( \beta_{\text{spw}} \) yield the annual growth rates. Equations (1.2a) and (1.2b) are estimated using Newey-White standard errors with an AR(1) lag structure to correct for first-order serial correlation. The robustness issue becomes particularly relevant for the procedures employed in chapter 2 to test for income convergence.
6. If two variables are perfectly correlated the simple correlation coefficient is 1. Two totally uncorrelated variables have a simple correlation coefficient of 0. The correlation in the state rankings based on the two methods of measuring growth is also 0.86.

7. To some extent the income per worker measure avoids an inherent weakness in the income per capita measure. For example, suppose individuals migrate out of a poorly performing state. This population exodus drives up income per capita in that state, even though its income did not improve. The income per worker metric comes a bit closer than the income per person metric to economists’ standard concept of “productivity,” which seeks to measure output per hour of labor.

Chapter 2

1. This sketch of the forces underlying state income convergence stresses the mobility of productive factors facilitated by open state borders. However, the fundamental implication in the neoclassical model that income levels will converge to a steady state does not require open borders and factor mobility. In a closed economy, income levels converge to a steady state because of diminishing returns to incremental capital investments. Factor mobility greatly reinforces the convergence phenomenon.

2. Much attention has been paid in the literature on economic growth to the phenomenon of “conditional convergence,” the tendency of economies with lower-level incomes to grow faster, conditional on their rate of factor accumulation. Perhaps the most cited study supporting condition convergence using international data is Mankiw, Romer, and Weil 1992. However, Pritchett (1997) documents that, regardless of conditional convergence, perhaps the basic fact of modern economic history is massive absolute divergence in the distribution of incomes across countries. Pritchett estimates that between 1870 and 1985 the ratio of incomes in the richest and poorest countries increased sixfold, the standard deviation of (natural log) per capita incomes increased by between 60 and 100 percent, and the average income gap between the richest and poorest countries grew almost ninefold (from $1,500 to over $12,000).

3. The coefficient of variation is derived by dividing the standard deviation by the mean. Examining the dispersion in the logarithm of the level of per capita income, not the dispersion in the level itself, is the correct way to test for convergence in the growth rates. If the rate of growth were constant across states that start from different levels, the dispersion in the logarithm of the levels will stay constant but dispersion in the levels will increase.

4. Caselli and Coleman (2001) studied the U.S. structural transformation (the decline of agriculture as the dominating sector) and regional convergence (of southern to northern average wages). Their empirical findings provide a powerful explanation for the convergence pattern in the early part of the twentieth century, as illustrated in figure 2.1. Most of the regional convergence is attributable to the structural transformation: the nationwide con-
vergence of agricultural wages to nonagricultural wages and the faster rate of transition of the southern labor force from agricultural to nonagricultural jobs. Similarly, the Caselli and Coleman analysis describes the Midwest’s catchup to the Northeast.

5. Barro and Sala-i-Martin (1992, 1995) in particular examine the convergence pattern in income per capita for the American states for a period that ended in the mid-1980s. As figure 2.1 illustrates, the pattern of state income convergence began to flatten about that same time.

6. The results reported in table 2.1 use the Huber-White estimator of the variance. When the traditional calculation of the variance is used in the regression model, the significance levels on all the estimated parameters are the same as those reported in table 2.1.

7. See Buchanan and Yoon 1994 for an extensive collection of readings on alternative growth models.

Chapter 3

1. See, for example, the treatment in Brealey and Myers 2000.


3. See Stata Corp. (1999, 360–69) for details of the FGLS technique. One point merits further emphasis. Income data are generally heteroskedastic, with larger variances for higher incomes than for lower incomes. As a simple illustration, from year to year Bill Gates’s income may fluctuate by millions while my income may fluctuate by only thousands. This is the standard reason why income and volatility go together. The typical solution to this source of heteroskedasticity is to transform the income data into log form, as is done in the text. Beyond that, the FGLS estimation procedure estimates and then adjusts for systematic patterns in the residuals across states.

4. For a survey of the empirical literature that examines state economic performance see Crain and Lee 1999.

5. This measurement procedure also follows the technique developed by Christina Romer (1986) in a study that compared U.S. economic fluctuations in the prewar and postwar periods. Levinson (1998) provides another application of the technique, analyzing the impact of state balanced budget requirements on state economic fluctuations. As noted, the cross-country study by Ramey and Ramey (1995) uses both methods: the standard deviation in the regression model residuals and the standard deviation in innovations from the forecasted values. They conclude that the second method provides the best results in the cross-country analysis.
6. Delaware’s value shown in table 3.2 is also 0.018, rounded to three digits, but slightly higher than the U.S. value.

7. The main difference between the 50-state sample and the 48-state sample lies in the magnitude of the coefficients on the Volatility indices. The estimated coefficients on all four Volatility measures are significant at the 0.05 level or higher using the 48-state sample, and three of the four coefficients are significant at the 0.01 level in the 50-state model. The magnitudes of the coefficients are consistently smaller in the 50-state sample than in the 48-state sample, which indicates that the outliers dampen the underlying relationship.

8. The positive correlation between volatility and state income levels stands in contrast to the negative relationship between volatility and income growth rates that Ramey and Ramey (1995) find using a cross-sectional sample of 97 countries.

9. To clarify, recall that estimation models used the logarithmic transformation of the income data. The results indicate that the relationship between volatility and the logarithmic transformation of income is linear. However, this means that the relationship between volatility and nonlogged income levels will be nonlinear, as the figures show.

Chapter 4


2. Throughout the remaining analysis total state taxes are defined as the sum of sales taxes (general and selective), individual income taxes, and corporation net income taxes. This definition facilitates the comparisons across states because states differ in definitions of the remaining “tax” revenue sources. For example, what some states define as a “current user charge,” other states define as a “tax.”

3. Subsequent chapters will address the important consequences of this structural change in state tax instruments and offer insights into the forces underlying this change.

4. To reiterate, the coefficient of variation is the standard deviation of a variable divided by its mean value. An advantage of using this measure of dispersion (as opposed to, say, the standard deviation) is that it normalizes the values for differences in the means. This makes the coefficient of variation measures of dispersion comparable between different data series (in this case between the different types of taxes), as well as over time.

5. Equation (4.2) shows the computation of the average tax rate values, and the values for each state are reported in table 4.2 for the 1969–98 period.

6. The presentation adopts the convenient notation and clear exposition of the Koester-Kormendi procedure provided by Besci (1996). The Besci
study builds upon and extends the application of the Koester-Kormendi procedure to states by Mullen and Williams (1994).

7. The analysis assumes that a state’s total personal income reflects the relevant tax base. For the individual income tax this assumption is straightforward. For sales taxes, it requires consumer spending or retail sales (the direct tax base for the sales tax) to be proportional to income, which appears reasonable. As noted in the text, all prior studies estimate the MTR using total state and local taxes (including property taxes). These widely inclusive measures of tax revenues have the disadvantage of being less directly tied to personal income as the appropriate tax base. The Mullen and Williams 1994 study uses Gross State Product to proxy the aggregate tax base, but this may also be inappropriate given the inclusion of property taxes that are linked to wealth measures. State Income and Gross State Product are correlated with state wealth, and the strength of this correlation determines the precision of the parameter estimates in those studies.

8. Taxes that do not affect behavior are 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, the tax schedule is progressive. Only if the lump sum tax is zero is the tax schedule proportional.

9. The seven states without individual income taxes are excluded from the income tax regressions: Alaska, Florida, Nevada, South Dakota, Texas, Washington, and Wyoming. In addition, I exclude from the income tax regressions the three states without an individual income tax on earned income (i.e., salaries and wages): Connecticut, New Hampshire, and Tennessee. To clarify, these three states levy individual income taxes on unearned income such as interest and dividends. I drop from the sales tax regressions the four states that do not have a general sales tax: Delaware, Montana, New Hampshire, and Oregon. These states levy some selective sales taxes, but the small revenues associated with these taxes are not of a comparable magnitude to the revenues in states with a general sales taxes.

10. In each case the modified sample period ends in 1998. The beginning years of the sample period for each of these six states are as follows: Illinois (1971), Maine (1970), Ohio (1973), Pennsylvania (1971), Rhode Island (1972), and West Virginia (1972). I also conducted the analysis using the full 1969–98 period for these states. In those regressions, the specific parameter estimates for the MTR differed from those in the modified sample periods, but none of the major conclusions was affected.


12. Besci (1996) illustrates how average tax rates and marginal tax rates are related by dividing both sides of equation (4.1) by income:

\[
\text{ATR}_t = \left( \lambda \div \text{Income}_t \right) + \text{MTR}. \tag{4.2a}
\]

Equation (4.2a) shows that for a regressive (progressive) flat tax the average tax rate is greater (smaller) than the marginal tax rate and that the average tax rate falls (rises) when income rises. A tax is proportional when the average tax rate is the same for all levels of income. Stated differently, a flat tax schedule is progressive if ATR/MTR < 1 and regressive if ATR/MTR > 1.

Chapter 5

1. Some studies find no effect at all, and perhaps surprisingly others suggest a positive correlation between taxes and state economic performance. For examples, see Genetski and Chin 1978; Romans and Subrahmanyan 1979; Dye 1980; Plaut and Pluta 1983; Helms 1985; Wasylenko and McGuire 1985; Benson and Johnson 1986; Canto and Webb 1987; Koester and Kormendi 1989; Wei, Wallace, and Nardinelli 1991; Mullen and Williams 1994; and Besci 1996. Phillips and Goss 1995 and Crain and Lee 1999 provide surveys of the state tax studies.

2. Changes in the tax rate on the last taxable dollar, the “marginal tax rate,” create incentives to change behavior. The average tax rate does not create behavioral changes but rather tends to reflect the changes of the marginal tax rate and changes of the tax base induced by behavior changes.

3. The pre-Besci empirical studies generally attempt to deal with this issue in two ways. Helms (1985) pioneered the approach that adds to the regression model all sources and uses of government funds. Helms uses the average tax rate based on all state and local taxes. He finds a net negative effect on growth if taxes finance welfare transfers and a net positive effect if taxes primarily finance appropriate spending. A second approach proposes a way around including all expenditure and nontax revenue items as independent control variables (Koester and Kormendi 1989 and Mullen and Williams 1994). These studies propose that controlling for average tax rates as well as marginal tax rates isolates the effects of “revenue-neutral” fiscal policies. This approach includes both the average tax rate and the marginal tax rate in the regression equation. However, Besci (1996) demonstrates that neutrality of average revenue does not imply revenue neutrality. As an alternative, he shows that a progressivity-neutral (or, equivalently, a regressivity-neutral) tax policy comes close to isolating the distortionary effects of taxation when expenditures are not included in the regression model.
4. Besci follows at least two other studies in this regard, namely, Genetskii and Chin 1978 and Mullen and Williams 1994.

5. For comparison, I also estimated the same regressions (not reported) without the Besci method of using the log differences from average state values. The signs and significances of the coefficients were quite similar to those reported in tables 5.1 and 5.2 using the log differences from the average state values.

6. Recall that Kansas happens to have the median marginal sales tax rate, which simplifies the exposition. In general, the calibration of the tax rate change needs to be assessed relative to the median tax rate across states; that is, the tax rate rises 10 percent relative to the median state. The predicted income decline of $1,375 is computed by multiplying the change in the tax rate (10 percent) times the estimated coefficient on the marginal tax rate (0.31) times the state median income ($44,340 in 1999).

7. If consumer demand is perfectly inelastic or if producer supply is perfectly inelastic, prices will rise in response to a sales tax but output would not change. If consumer demand is perfectly elastic or if producer supply is perfectly elastic, prices will not change in response to a sales tax but output would decline.

8. These commodities include: bananas, bread, Big Mac, Crisco, eggs, Kleenex, milk, Monopoly (board game), shampoo, soda, spin balance, and underwear (boys briefs).

Chapter 6

1. “. . . [I]n taxation, a matter of so great importance, that a very considerable degree of inequality, it appears, I believe, from the experience of all nations, is not so great an evil as a very small degree of uncertainty” (Smith 1937, 778). Gold (1983) and Sobel and Holcombe (1996) provide some historical background on the role of reliability in the analysis of taxation.

2. The asymmetric political consequences of a revenue shortfall versus a revenue windfall create a perverse incentive to be “conservative” when making state revenue projections. That is, the political fallout from cutting programs or raising taxes to cope with end-of-year deficits is large relative to the political consequences from not having implemented a tax reduction. One rarely sees end-of-year state budget surpluses being refunded to taxpayers.

3. Chapters 8 and 9 examine in further detail the effects of various constitutional rules and statutory institutional arrangements on state fiscal policies.

4. As discussed in chapter 3 (see note 5), this technique follows the procedure developed in Christina Romer (1986) and Levinson (1998).

5. The general trend over the 1968–98 period, as indicated by the median state values, has been an increase in the income tax revenues as a share of state income and a slight decline in sales tax revenues as a share of state income. As shown in chapter 4, the result of these trends has been a
displacement of sales tax revenues by income tax revenues in the composition of total state taxes. By examining the deviations from the trend, the volatility measures are normalized around a zero mean value.

6. I note two additional details about the estimation of equation (6.1). First, the estimation procedure uses a first-order autoregressive model to correct for serial correlation in the error terms. Second, as noted in chapter 4, six states experienced major changes in tax structure in the early 1970s. For these six states equation (6.1) is estimated using a slightly modified sample period, all of which end in 1998. For beginning sample dates for these six states see chapter 4.

7. Technically, let $\phi$ stand for the percent of combined taxes raised by a tax instrument. Let $\sigma$ stand for the standard deviation in the tax instrument under a state’s existing mix of sales and income taxes. The projected standard deviation assuming that the single tax instrument generated all revenues is $((1 / \phi) \times \sigma)$. For example, suppose combined revenues equal $4 billion, $\phi$ for the sales tax is 25 percent, and $\sigma$ for the sales tax is 0.01. The projected standard deviation is 0.04, that is, $((1 / 0.25) \times 0.01)$. If $\phi$ for the income tax is 75 percent, and $\sigma$ for the income tax is also 0.01, the projected standard deviation is 0.013, that is, $((1 / 0.75) \times 0.01)$.

8. For the within-state comparison I omit states that do not levy general sales taxes or individual income taxes on earned income. See chapter 4 for a complete discussion of the specific tax structures in each state.

9. This repeats the procedure employed in table 6.1 to make the appropriate revenue-equivalent comparisons.

Chapter 7

1. The analysis of state spending throughout the chapter omits three states that experienced atypical spending patterns during these three decades: Alaska, Hawaii, and Wyoming. This follows the conventional practice in the literature because the fiscal experiences of these states represent clear statistical outliers. Data values with large deviations from the average sample values usually exert undue influence in statistical analysis and thereby result in biased parameter estimates. The source of the large deviations in Alaska and Wyoming stems from their unusually heavy reliance on energy severance taxes. In Hawaii the state government funds all public education expenditures. Other states delegate to local governments the main responsibility for funding education for grades K–12.

2. This indicator of government growth differs slightly from that shown in figure 7.1 simply because the states with the median income and median spending are not the same as the state with the median ratio of spending as a share of income. However, both measures depict a quite similar pattern in the growth of state spending.

3. To some extent these divergent spending patterns reflect an increase in intergovernmental transfers from the federal government to the state governments.
4. For the reasons described previously, Alaska, Hawaii, and Wyoming are omitted from the analysis, which means that 47 is the maximum possible rank. Here, the four-year averages are used to dampen the importance of a random downturn or upturn in spending that may have occurred in a single year. Comparisons based on rankings for spending in 1969 and 1998 produce similar results.

Chapter 8

1. See Poterba 1996 and 1997 for surveys of the American state literature. In addition to the state studies, some researchers have analyzed how differences in the rules for developing, enacting, and enforcing budgets affect fiscal performance across nations. See the survey in Alesina and Perotti 1996 and the collected volume edited by Poterba and Von Hagen (1999).

2. Krause 2001 provides a survey of the scant literature on this issue. He further models a closely related issue: How do administrative agencies construct budget requests under conditions of uncertainty? The purpose of the Krause model is to determine the extent to which an administrative agency is willing to extract additional budgetary resources (organizational slack) in response to the uncertainty that they are experiencing. Krause contends that administrative agencies treat budgetary resources as a hedge against the uncertainty that they experience from an organizational perspective. Administrative agencies view budget requests as an instrument to help buffer the organization against uncertainty, thus serving as a viable means to acquire organizational slack. Krause concludes that budgetary risk-averse agencies place a premium on organizational maintenance in their attempts to obtain additional funding, and therefore respond with larger budget requests under uncertainty compared to budgetary risk-seeking or risk-neutral agencies.

3. If the agency selects the $\alpha$-process and $Q_H$ materializes, costs exceed the minimum by $200$ million ($= $900 $-$ $700$). If it selects the $\beta$-process and $Q_L$ materializes, costs exceed the minimum again by $200$ million ($= $500 $-$ $300$).


5. It is interesting to note that the long-term trend in state governments has been away from biennial budgets. In 1940 only four states had annual budgets; in 1962 thirty-two states had annual budgets.

6. This hypothesis follows the theory developed in Landes and Posner 1975. See also Crain 2001 for a survey of the studies that explore the role of institutions as mechanisms that determine the durability of political transactions.

7. For examples of prior studies, see Crain and Crain 1999, Bohn and Inman 1996, Gilligan and Matsusaka 1995, Poterba 1994, and Alt and Lowry 1994. Other base-model specifications were examined that included the following in the vector of control variables: the growth rate in income per capita, the change in the unemployment rate, and the population growth.
rate. Adding these additional variables changed none of the results on the impact of volatility or the institutional variables.

8. The first-stage estimation of Expenditure Volatility uses two variables as instruments, Tax Volatility and Lame Duck. These variables are described in equation (8.4) in the text, and table 8.6 shows the results of the model that specifies Expenditure Volatility as the dependent variable.

9. The estimates based on the two-stage models appear more appropriate than those based on the single-stage models because the first-stage results indicate that Expenditure Volatility is correlated with the institutional variables. Note that in the Instrumental Variables model the coefficient on Expenditure Volatility, 5.87, is more than twice the size of this coefficient in the single-stage model, 2.51. In other words, the endogeneity problem results in a substantial downward bias in this parameter estimate.

10. Recall that total tax revenues include sales taxes, individual income taxes, and corporation net income taxes.

11. For example, if a state had no gubernatorial term limit, the Lame Duck variable equals 0. If a state has a one-term limit the variable equals 1. If a state’s governors faced a term limit in 14 of the 29 years, the Lame Duck variable equals 0.5. This variable follows from the study by Besley and Case (1995b).

Chapter 9

1. These four categories generally follow the divisions adopted by the U.S. Census Bureau. I combine spending for public welfare, health, and hospitals into a single category and do the same for police protection and corrections. The Census Bureau reports separately the spending levels for these programs.

2. The coefficient of variation is the standard deviation divided by the mean. The analysis here excludes Alaska, Hawaii, and Wyoming.

3. The two ideology variables are obtained from Berry, Ringquist, Fording, and Hanson 1998. The ideology measures described in this 1998 article were updated through 1996 for the government index and through 1997 for the citizen index at the time of this writing. The construction of these indices relies on roll call voting scores of state congressional delegations (ADA and COPE scores), the outcomes of congressional elections, the partisan division of state legislatures, the party of the governor, and various assumptions regarding voters and state political elites. A full description of the methodologies employed and the data set are available at <http://pubadm/fsu.edu/archives>. The website also provides references to the growing body of papers (mostly by political scientists) that have used these and other political ideology indices.

4. As in chapter 8, the models are estimated using panel data that begin in 1970. The models containing the Citizen Ideology index end in 1997, and the models that contain the Government Ideology index end in 1996. The dependent variables in all models denominate spending in terms of real (2000)
dollars per capita. Table 9.A1 in the appendix to this chapter provides summary statistics for all variables used in the analysis.

5. I investigated the potential endogeneity problem in this specification, namely, that political ideology might jointly determine fiscal institutions and spending and thereby bias the single-stage parameter estimates. Using a pooled probit regression model, I find a significant relationship between ideology and the adoption of balanced budget rules and supermajority requirements. However, the results reported in the text were not materially different from those obtained from a more complex two-stage specification that attempts to endogenize these two fiscal rules.

6. The Citizen and Government Ideology indices are significantly correlated, both within a state over time and across states. A FGLS regression of Government Ideology against Citizen Ideology yields a coefficient of 1.2, with a \( t \)-statistic of 22 and an overall \( R \)-squared of 0.47. For this reason, each index is examined separately rather than combined into a single regression model.