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Democrats, republicans, and taxes: Evidence that political parties matter

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Abstract

I estimate the influence of political parties on state Tax Burdens over a 40-year period (1960–2000). Holding constant a large number of state and voter characteristic variables, I find that: (i) Tax Burdens are higher when Democrats control the state legislature compared to when Republicans are in control. (ii) The political party of the governor has little effect after controlling for partisan influences in the state legislature. I explain how both findings are consistent with median voter theory. My results suggest that after 5 years of Democratic control of the legislature, state government would be approximately 3–5% larger than if Republicans controlled the legislature during that same period, with the better specifications producing estimates in the higher end of this range.

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1. Introduction

Conventional wisdom (or at least Republican campaign propaganda!) holds that Democrats are more likely to raise taxes than Republicans. Surprisingly, this claim has not often been put to the test. This study exploits the rich variety of experiences at the state level to determine if political party variables affect taxes.

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The few studies that have previously examined this issue reach different conclusions. [Poterba \(1994\)](#) finds no difference in how the political parties respond to unexpected budget deficits. [Besley and Case \(1995a\)](#) report that, generally, the governor's political party is not significantly related to the level of total taxes. However, states with Democratic governors in their last terms have higher taxes. Their analysis does not include legislative branch variables. [Alt and Lowry \(2000\)](#) estimate that tax revenues are higher when Democrats control the state budgetary process. [Caplan \(2001\)](#) finds that taxes increase with the percent Democratic representation in either of the state's legislative chambers. However, there is no evidence that taxes are higher when Democrats are in control of the legislative chambers. His analysis does not include executive branch variables.

My study is motivated by a desire to better understand the influence of political parties on taxes. But there are wider applications. The question of whether political parties "matter" supports a long-standing debate in the political science and political economy literatures. A small sampling from this literature includes [Winters \(1976\)](#), [Garand \(1988\)](#), [Blais et al. \(1993\)](#), [Krehbiel \(1993\)](#), [Imbeau et al. \(2001\)](#), [Besley and Case \(2003\)](#), and [Pettersson-Lidbom \(2003\)](#). Central to this debate is the extent to which political parties deviate from the median voter in a two-party system.¹ This analysis contributes to that debate by providing evidence that political parties can exert a significant, independent effect on policy outcomes even when politicians faithfully represent their respective median voters.

A completely different application has to do with econometric analyses concerned with policy endogeneity. [Besley and Case \(2000\)](#) demonstrate that the fraction of women in state upper and lower houses can serve as an instrument for endogenous state policies when estimating the impact of those policies. The results of my study suggest that party control of the legislature may also be an effective instrument.

This paper proceeds as follows: Section 2 presents specification, data, and estimation issues. Section 3 reports the empirical results. Section 4 summarizes the main findings.

2. Specification, data and estimation issues

While the desire to generate a given level of total revenues may motivate tax policy, as a practical matter total revenues lie beyond policy-makers' direct control. Instead, policy-makers influence taxes through legislation that sets rate parameters and defines the tax base, among other things.

A commonly used measure of state tax policy is "Tax Burden," which is the ratio of total state and local tax revenues to state Personal Income.² Tax Burden provides a convenient summary measure of diverse and complex tax systems with non-uniform rate

¹ [Bender and Lott \(1996\)](#) provide a survey of the principal-agent literature in political markets.

² We follow [Gilligan and Matsusaka \(1995\)](#) in assuming that state fiscal policy is reflected in both state and local tax revenues, rather than just state tax revenues.

structures and multiple tax bases.^{3,4} It is closely monitored by many prominent organizations, including the Federation of Tax Administrators, the National Conference of State Legislatures, the National Tax Association, and the Tax Foundation. Further, it has been used in numerous empirical studies of taxes, including Dye (1980), Helms (1985), Benson and Johnson (1986), Canto and Webb (1987), Mofidi and Stone (1990), Yu et al. (1991), Mullen and Williams (1994), Carroll and Wasylenko (1994), Knight (2000), Yamarik (2000, 2004), and Caplan (2001).⁵

My sample consists of state-level Tax Burden data from 1960 to 2000. I follow the examples of Poterba (1994) and Alt and Lowry (2000) by focusing on changes in taxes. In particular, I look to the change in a state's Tax Burden, $\Delta\text{Tax Burden}_{st} = (\text{Tax Burden}_{st} - \text{Tax Burden}_{s,t-1})$, for evidence of political party influence on taxes.⁶

Further, I model my analysis after the economic growth literature by aggregating data into 5-year periods (cf. Grier and Tullock, 1989).⁷ Institutional and political barriers make it difficult for policy-makers to immediately implement their policy preferences. As a result, the real-time mapping from political party control to tax revenues may be different across states and time periods in ways that are difficult to formally specify. The advantage of aggregation is that it allows one to avoid having to explicitly model complex lag effects. This can reduce the likelihood of making specification errors, and increase the likelihood of identifying political party effects if they exist in the data. For these reasons, the focus variable in my study is the 5-Year Change in Tax Burden_{st},

$$\begin{aligned} & \text{Five - Year Change in Tax Burden}_{st} \\ & \equiv \sum_{i=1}^5 \Delta\text{Tax Burden}_{s,t+i-5} \equiv (\text{Tax Burden}_{st} - \text{Tax Burden}_{s,t-5}). \end{aligned} \quad (1)$$

2.1. Political party variables

Poterba (1994) and Gilligan and Matsusaka (1995) note that fiscal policies legislated in one year typically do not take effect until the next fiscal year. Hence policy preferences of the party in power will first be reflected in the next fiscal year's revenues and expenditures.

³ Benson and Johnson (1986, p. 392, FN7) note that calculating statutory tax rates that were comparable across states would be an enormous task and one "frothing" with errors.

⁴ Nelson (2000) provides an example of a conscientious attempt to use changes in statutory rates to measure state tax policy. However, he acknowledges that "tax legislation pertaining to the definition of a tax base . . . and tax credits are not considered" (p. 542f.) Further, he is only able to characterize tax rate changes within—but not across—revenue categories (e.g., individual income tax, corporate income tax, sales tax, etc.) "with no distinction given to the magnitude of the rate change" (p. 543).

⁵ Reed and Rogers (2004) compare changes in Tax Burdens with revenue estimates associated with recently adopted state tax legislation. They find that "changes in Tax Burden are positively and significantly related to changes in state tax policy" (p. 2).

⁶ I adopt the usual practice of defining a state's Tax Burden at time t as the ratio of that state's tax revenues in fiscal year t over its Personal Income in calendar year $t - 1$.

⁷ I demonstrate in the Appendix that the use of annual data produces larger estimates of partisan control effects. The corresponding hypothesis tests are unaffected.

This study incorporates their insight by modeling the observed change in Tax Burden at time t as a function of political party variables observed at time $t-1$, $\Delta\text{Tax Burden}_{st} = f(X_{s,t-1})$.

Like Poterba (1994, 1995), Alt and Lowry (1994, 2000), and Gilligan and Matsusaka (1995), I model partisan political influences via control of the legislative and executive branches. Democratic Legislature measures the percentage of years during the 5-year period that Democrats controlled both chambers of the state legislature. Republican Legislature does the same for Republicans. The respective mean values of these variables for my sample are 56.39% and 24.61%.⁸ In other words, during a typical 5-year period in my sample, Democrats controlled both chambers of the legislature a little more than half the time. Republicans controlled both chambers about a fourth of the time. Note that the two variables do not sum to 100%. The omitted category represents those years in which control of the state legislature was split between the two parties.

Democratic Governor measures the percentage of years during the 5-year period that the state had a Democratic governor. The mean value of this variable for my sample is 56.83%. Given the rarity of a third-party governor, the omitted category can be interpreted as those years for which the state had a Republican governor. In addition to including this as an independent political party variable, I also interact partisan control of the executive branch with that of the legislative branch. This enables me to explore alternative avenues by which political parties influence taxes.

All political variables represent averages over the respective 5-year period lagged by 1 year. In other words, to explain the sum of Tax Burden changes $\Delta\text{Tax Burden}_{s,t-4}$ through $\Delta\text{Tax Burden}_{st}$ (cf. Eq. (1)), I use political variables observed during the time period $t-5$ to $t-1$. I do this to be consistent with the fact that tax legislation enacted in one fiscal year typically does not go into effect until the next fiscal year.

2.2. State and voter characteristic variables

Omitted variable bias is a potential problem in any analysis that attempts to attribute policy outcomes to political representation variables. In light of this, my study employs a large number of state and voter characteristic variables. The variable ADA Average measures the average Americans for Democratic Action (ADA) score of the state's federal legislators.⁹ To construct this variable, I add the mean, annual ADA score for the state's US House representatives to the mean, annual ADA score for the state's two US senators, and divide by two. This provides an average ADA score for that state's federal legislators in any given year. As in the case of the political party variables, I use the average value for this variable over the respective 5-year period, lagged by 1 year. If voters' policy preferences influence state tax policy, one would expect that they would also influence the public policy of that state's federal legislators. By including a measure of the latter, I aim to hold this influence constant.

⁸ Descriptive statistics of the variables used in the study are reported in Table 1.

⁹ I use the "Inflation-Adjusted ADA Scores" calculated by Tim Groseclose and accessible for download at the website: "<http://www.faculty-gsb.stanford.edu/groseclose/homepage.htm>".

A commonly employed variable for proxying voters' preferences towards public goods is income. As a measure of income, I use the log of real Per Capita Personal Income (PCPI), measured in 1983–1984 constant dollars. Wagner's Law predicts that a state's Tax Burden will rise as its income rises. On the other hand, states tend to raise taxes during economic downturns and cut taxes during times of economic prosperity, suggesting an inverse relationship between state income and Tax Burden. The net effect is theoretically ambiguous.

I also include a relatively large number of state demographic variables. Percent Elderly measures the share of a state's population aged 65 and over.¹⁰ Percent Black and Percent Female measure the corresponding share of the black and female populations. Percent College-Educated is defined as the fraction of the population aged 25 years old and above who have completed college or a higher degree program. Percent Union is the percent of nonagricultural wage and salary employees who are union members.¹¹ Population Density is the ratio of population to land area. Farm Share and Manufacturing Share measure the percent of the state's Personal Income attributed to the farm and manufacturing sectors.

I do not have strong priors about the effects of these "taste" variables. Conventional wisdom suggests that populations that are older, more educated, and more agriculturally based will prefer lower taxes. Populations that are more urban, unionized, and contain greater proportions of women and blacks are usually assumed to prefer higher taxes (and spending). I have no prior expectations about the sign of Manufacturing Share. Most of these variables have not been included in previous studies of state taxes.

Like ADA Average, all these state and voter characteristic variables are measured by their average value over the respective 5-year period, lagged by 1 year. An econometric concern in this analysis is that income, and perhaps the other state characteristic variables, are characterized by endogeneity. This possibility will be investigated below.

2.3. Initial Tax Burden

According to Besley and Case (1995b), political agents are constrained in their tax-setting behavior by "yardstick competition." Specifically, politicians in states with relatively high Tax Burdens will face greater electoral costs when raising taxes compared to politicians from states with relatively low Tax Burdens. To control for this phenomenon, I include the value of the state's Tax Burden at the beginning of the respective 5-year period ($\text{Initial Tax Burden}_{st} = \text{Tax Burden}_{s,t-5}$).

2.4. State and time fixed effects

If one constructs a national "Tax Burden" variable defined by the total of all state and local tax revenues divided by national Personal Income, three

¹⁰ The importance of demographic variables, and particularly, the share of the population that is elderly, is demonstrated by Poterba (1997).

¹¹ Union data was downloaded from the website: www.uniondata.com. A description of how the database was constructed in Hirsch et al. (2001).

“cycles” become evident in the time series: (i) a sharply rising Tax Burden from 1960–1973, (ii) a sharply falling Tax Burden from 1973–1983, and (iii) a gradually increasing Tax Burden from 1983–2000.¹² For that reason, I include time fixed effects to control for the influence of time-varying variables not included in the model. State fixed effects are added to pick up the influence of omitted (time-invariant) state characteristics.

2.5. Sample

My sample consists of 40 years of observations (1960–2000) from 45 states. I follow convention by deleting Alaska and Hawaii. I also exclude Nebraska, Minnesota, and Wyoming. Nebraska is excluded because state representatives do not formally affiliate with political parties. Minnesota is excluded because it had a unicameral state legislature through 1970. Finally, Wyoming is omitted because of peculiarities in the composition of its Tax Burden variable.¹³

2.6. Specification of the regression equation

The previous analysis suggests an empirical strategy consisting of the following elements: (i) aggregating state-level observations into 5-year periods; (ii) using the change in state Tax Burden as the dependent variable; and (iii) including measures of political variables, state and voter characteristic variables, “yardstick competition,” and state and time fixed effects as explanatory variables. This leads to the following specification of the regression equation:

$$\begin{aligned} \text{Five - Year Change in Tax Burden}_{st} &= (\text{Tax Burden}_{st} - \text{Tax Burden}_{s,t-5}) \\ &= \alpha + \sum_i \beta_i \text{Political Party Variable}_{i,st} + \sum_j \gamma_j \text{State Characteristics Variable}_{j,st} \\ &\quad + \delta \text{Initial Tax Burden}_{st} + \text{State Fixed Effects} + \text{Time Fixed Effects} + \varepsilon_{st}, \end{aligned} \tag{2}$$

where $t = 1965, 1970, \dots, 2000$.

¹² The Appendix contains a figure showing the cyclical behavior of this national “Tax Burden” variable over time.

¹³ Wyoming’s Tax Burden time series displays a dramatic increase in the late 1970s through mid-1980s. My research determined that this was not the result of changes in the state’s tax code. Rather, it was primarily the product of a heavy reliance on severance taxes combined with an extended oil boom during this period. Accordingly, I eliminate this state to prevent this extraordinary increase in Tax Burden from skewing the results. I also investigated Tax Burden time series from other states for which severance taxes comprised an important component of overall state tax revenue (e.g. Oklahoma, Texas, Louisiana). I did not find these other cases problematic. Time series graphs of Tax Burdens from individual states can be viewed at “<http://www.faculty-staff.ou.edu/R/Cynthia.Rogers-1/TAX/TAXBURDEN.htm>”.

Table 1
Statistical description of the data

Variables	Mean	Standard deviation	Minimum	Maximum
Tax Burden	10.73	1.25	7.92	15.83
Initial Tax Burden	10.53	1.34	7.15	15.83
Democratic Legislature	56.39	45.61	0	100
Republican Legislature	24.61	38.44	0	100
Democratic Governor	56.83	41.26	0	100
Democratic Governor and Democratic Legislature	35.89	41.30	0	100
Republican Governor and Republican Legislature	14.22	29.78	0	100
ADA Average	41.46	18.64	1.23	96.24
Log of Real PCPI	2.424	0.274	1.525	3.099
Percent Elderly	10.81	2.10	5.54	17.06
Percent Black	10.03	9.42	0.18	40.18
Percent Female	50.63	1.76	43.52	55.48
Percent College-Educated	15.23	6.06	5.04	33.21
Percent Union	19.69	9.07	3.80	48.1
Population Density	161.38	212.94	3.22	1034.24
Farm Share	2.60	3.57	-0.03	25.01
Manufacturing Share	16.57	7.24	2.97	35.86

Variables are described in Section 2.

In order to facilitate interpretation of my results, I recast this equation in terms of levels as follows:

$$\begin{aligned}
 \text{Tax Burden}_{st} = & \alpha + \sum_i \beta_i \text{Political Party Variable}_{i,st} \\
 & + \sum_j \gamma_j \text{State Characteristics Variable}_{j,st} \\
 & + \tilde{\delta} \text{Initial Tax Burden}_{st} + \text{State Fixed Effects} \\
 & + \text{Time Fixed Effects} + \varepsilon_{st},
 \end{aligned} \tag{3}$$

where $t=1965, 1970, \dots, 2000$ and $\tilde{\delta}=(1+\delta)$.

The subsequent empirical analysis relies on Eq. (3) for the general specification of the regression equations. I assume that the error term is independently distributed but possibly heteroscedastic. I initially estimate the model using OLS and employ White's heteroscedastic consistent covariance matrix for the purposes of hypothesis testing. I then test for endogeneity and reestimate my main equations using 2SLS. Descriptive statistics for all the variables are presented in Table 1.

3. Results

3.1. The estimated effect of partisan control of the legislative branch

Table 2 presents results from four different OLS regressions having the general specification of Eq. (3) above. These equations share a core set of variables, to which

Table 2
 OLS estimation of the determinants of state Tax Burdens: 1960–2000

Variables ^a	Eq. (A) ^b	Eq. (B) ^b	Eq. (C) ^b	Eq. (D) ^{b,c}
Democratic Legislature	-0.01010 (-4.19)	-0.00145 (-1.04)	0.00334 (2.58)	0.00358 (2.66)
Republican Legislature	-0.00701 (-2.37)	-0.00042 (-0.26)	0.00019 (0.13)	-0.00092 (-0.63)
ADA Average	-	0.00443 (1.53)	-0.00212 (-0.71)	-0.00150 (-0.49)
Log of Real PCPI	-	-0.45305 (-1.24)	-1.71889 (-2.12)	-0.82203 (-0.88)
Percent Elderly	-	-0.04792 (-2.40)	-0.08151 (-1.60)	-0.07210 (-1.31)
Percent Black	-	-0.00651 (-1.19)	-0.07660 (-2.42)	-0.05898 (-1.71)
Percent Female	-	0.07789 (2.99)	0.02633 (1.42)	0.04410 (1.82)
Percent College-Educated	-	-0.00570 (-0.33)	-0.04890 (-2.22)	-0.04451 (-1.87)
Percent Union	-	0.00568 (0.95)	0.01742 (1.10)	-0.00065 ^c (-0.04)
Population Density	-	0.00029 (1.25)	0.00749 (4.15)	0.00175 ^c (0.56)
Farm Share	-	-0.02670 (-1.30)	-0.07180 (-2.65)	-0.02816 ^c (-1.03)
Manufacturing Share	-	-0.01406 (-1.73)	-0.09149 (-4.25)	-0.03345 (-1.55)
Initial Tax Burden	-	0.77004 (19.14)	0.43676 (8.28)	0.43102 ^c (5.42)
Other included variables:	(1) Intercept	(1) Intercept	(1) plus, (2) State and Time	(1), (2), plus (3) Interaction Effects ^c
			Fixed Effects	
Observations ^d	360	360	360	360
R ² (Adjusted R ²)	0.066 (0.061)	0.702 (0.691)	0.856 (0.825)	0.890 (0.852)
AIC	3.227	2.146	1.702	1.591
Hypothesis Tests: ^e				
Political Party Variables ^f	$\chi^2=2.960$ (0.085)	$\chi^2=0.607$ (0.436)	$\chi^2=4.783$ (0.029)	$\chi^2=9.468$ (0.002)
State and Voter	-	$\chi^2=44.267$ (0.000)	$\chi^2=41.347$ (0.000)	$\chi^2=173.569$ (0.000)
Characteristic Variables ^g				
Interaction Effects ^h	-	-	-	$\chi^2=112.385$ (0.000)

^a Variables are described in Section 2. Descriptive statistics for all variables are reported in Table 1.

^b *t*-statistics are reported in parentheses below the coefficient estimates. All hypothesis tests employ White's heteroscedastic consistent covariance matrix in calculating sample statistics.

^c In Eq. (D), the variables *Percent Union*, *Population Density*, *Farm Share*, and *Initial Tax Burden* are each interacted with the 7 time period dummy variables, resulting in a total of 28 interaction effects. Accordingly, the coefficient estimates and *t*-statistics reported in the table represent the effect of the respective variables in the omitted time period (1960–1965). Hypothesis tests of the joint significance of the respective variables over all the time periods produced the following results: (i) Percent Union ($F=1.670$, p -value=0.106), (ii) Population Density ($F=4.719$, p -value=0.000), (iii) Farm Share ($F=7.303$, p -value=0.000), and (iv) Initial Tax Burden ($F=10.179$, p -value=0.000).

^d There are 8 observations for each of 45 states (Alaska, Hawaii, Nebraska, Wyoming, and Minnesota are excluded, as described in Section 2).

^e p -values are reported in parentheses below the χ^2 sample statistic values. Hypothesis tests for (i) state and (ii) time fixed effects reject the null hypothesis of zero coefficients at the 0.001 significance level.

^f The corresponding null hypothesis is $\beta_{\text{Democratic Legislature}} = \beta_{\text{Republican Legislature}}$.

^g The "state and voter characteristic variables" are ADA Average, Log of Real PCPI, Percent Elderly, Percent Black, Percent Female, Percent College-Educated, Percent Union, Population Density, Farm Share, and Manufacturing Share. In Eqs. (A)–(C), the corresponding null hypothesis is that these variables are jointly equal to zero. In Eq. (D), the null hypothesis also tests whether the respective time interaction effects are jointly equal to zero.

^h The corresponding null hypothesis is that the 28 interaction effects (cf. Note (c)) are jointly equal to zero.

additional variables are included in each subsequent equation. Given the concern with omitted variable bias, I am interested in studying how the addition of control variables affects the partisan control coefficients.

Eq. (A) consists of a constant and the two partisan control variables, Democratic Legislature and Republican Legislature. Obviously, this equation is woefully under-specified (the associated R^2 value is 0.066). Its usefulness lies in being a benchmark for subsequent equations, and in illustrating the importance of omitted variable bias. The coefficients for the partisan control variables are large and statistically significant. Each of these coefficients estimates the effect of the respective political party controlling both chambers of the legislature against the alternative of split control.

For example, the Democratic Legislature coefficient of -0.01010 estimates that Democratic control of both chambers of the legislature for a period of five consecutive years would result in a Tax Burden that was 1.01 percentage points lower at the end of that period, compared to the case where legislative control was split. As shall be shortly demonstrated, this puzzling result arises from failure to control for the influence of other variables.

Eq. (B) improves upon the specification by adding state and voter characteristic variables, along with Initial Tax Burden. This specification “explains” approximately 70% of the variation in state Tax Burdens. The state and voter characteristic variables generally have the expected signs and are jointly highly significant.¹⁴ Further, states with high initial Tax Burdens are estimated to have had higher Tax Burdens 5 years later. The estimated Initial Tax Burden coefficient of 0.77 is highly significant and less than one. This latter finding suggests convergence in Tax Burdens, consistent with the “yardstick competition” hypothesis of Besley and Case (1995b).

Adding these control variables reduces the size of the political party variables by roughly an order of magnitude. The Democratic Legislature and Republican Legislature coefficients are now each statistically insignificant. Further, I cannot reject the hypothesis that there is no difference between Democrats and Republicans when it comes to how control of the legislature affects a state’s Tax Burden: the hypothesis $\beta_{\text{Democratic Legislature}} = \beta_{\text{Republican Legislature}}$ fails to be rejected way above the 5% significance level (the p -level is 0.436). A comparison of Eqs. (A) and (B) highlights the importance of including appropriate controls when estimating the influence of political party variables.

Eq. (C) improves upon the specification by adding state and time fixed effects.¹⁵ While not reported in the table, the state and time fixed effects are each jointly significant at the 0.001 significance level. Indeed, this will continue to be the case for all subsequent specifications including these effects. The primary consequence of adding these additional controls is to increase the Democratic Legislature coefficient from -0.00145 to 0.00358. The Democratic Legislature coefficient is now statistically significant at the 5% level (the t -statistic is 2.58). The Republican Legislature remains insignificant. A test of the hypothesis $\beta_{\text{Democratic Legislature}} = \beta_{\text{Republican Legislature}}$ is now rejected.

¹⁴ A test of the hypothesis that the coefficients for each of the 10 state and voter characteristic variables is equal to zero is rejected with a corresponding p -value of 0.000 (cf. “Hypothesis Test” for “State and Voter Characteristic Variables” at the bottom of Table 2).

¹⁵ A test of fixed effects versus random effects soundly rejects the hypothesis of random effects (the associated p -value is 0.000).

Because they are based solely on “within group” differences, the partisan control coefficients in Eq. (C) can now be directly interpreted as the effect of a change in control of a given state’s legislature. Taken together, these results indicate that taxes are likely to increase when Democrats control both chambers of the state legislature. In contrast, there is little difference between Republican and split control of the legislature.

I next experiment with a number of alternative specifications in order to minimize omitted variable bias. I find that the addition of quadratic terms does not significantly improve the fit of the equation; whereas, the addition of time-varying coefficients does.¹⁶ There are thirteen explanatory variables in the specification of Eq. (C), not counting state and time fixed effects. Allowing all possible subsets of these thirteen variables to have time-varying coefficients produces a total of 8191 possible combinations.¹⁷ I estimate all 8191 of these specifications and report the “best” specification as determined by lowest AIC value in Eq. (D) of Table 2.

The specification with the lowest AIC value includes interactive time effects for the following four variables: Percent Union, Population Density, Farm Share, and Initial Tax Burden. Since each of these four variables is multiplied by seven separate time-period dummy variables, a total of twenty-eight time interaction terms are included in Eq. (D).

Eq. (D) represents an improvement over Eq. (C) in terms of explanatory power. The R^2 increases from 0.856 to 0.890 and the AIC decreases from 1.702 to 1.591. Further, the set of twenty-eight interaction effects is jointly significant at well below the 1% level.

The inclusion of these additional control variables serves to marginally increase the Democratic Legislature coefficient and marginally decrease the Republican Legislature coefficient. The Republican Legislature coefficient is now negative, but remains insignificant. The hypothesis of no difference between the two parties, $\beta_{\text{Democratic Legislature}} = \beta_{\text{Republican Legislature}}$, continues to be rejected, this time with an associated p -value of 0.002.

What about the concern that political party variables are merely proxying for voters’ preferences; i.e., the omitted variable bias problem? There are three reasons why omitted variable bias is less likely to affect my estimates compared to previous studies. First, I include a larger variety of state and voter characteristic variables than any other study of partisan influences on taxes. Second, as more controls for state and voter characteristic

¹⁶ There are a number of reasons why one might expect this result. The political effectiveness of labor unions could change over time, inducing time-varying behavior in the Percent Union coefficient. Further, if greater polarity in the urban and rural electorate has occurred over time, as suggested by some, then variables such as Population Density and Farm Share could have time-varying effects. Finally, taxes may resonate as a campaign issue to a greater or lesser degree at different points in time according to the mood of the electorate, resulting in differing rates of “tax convergence.” This would cause the coefficient on Initial Tax Burden to change over time. In any case, given the 40-year length of my sample, it seems reasonable to generalize Eq. (C) to allow the coefficients to be time varying.

¹⁷ This calculation assumes that interaction effects are not introduced piecemeal, for only some time periods, but for all time periods.

variables are added to the model (i.e., as one moves from Eq. (B) to Eq. (D) in Table 2) the party differences become more, not less, pronounced. Finally, my best specification (Eq. (D)) “explains” approximately 90% of the variation in the level of state Tax Burdens. This reduces the scope for omitted variables to bias the sign of the political party variables. This provides some confidence that the inclusion of additional state and voter characteristic variables will not substantially alter my finding of significant party differences.

3.2. Addressing endogeneity in the data

One concern that I have not yet addressed is endogeneity, particularly with respect to the relationship between income and taxes. There is a large literature that assumes that the direction of causation runs from taxes to income.¹⁸

Indeed, a case can be made that taxes may also affect other state and voter characteristic variables: Elderly citizens may choose to migrate out of states with high Tax Burdens. On the other hand, high-tax states may be particularly appealing to certain socio-economic groups because these states may be relatively generous in funding public programs. The associated programs may be disproportionately appealing (or unappealing) to certain groups, who may migrate in or out in response (i.e., the Tiebout hypothesis). Taxes may also disproportionately affect different industries within a state. Accordingly, the following variables are suspected to be endogenous: Log of Real PCPI, Percent Elderly, Percent Black, Percent Female, Percent College-Educated, Percent Union, Population Density, Farm Share, and Manufacturing Share.¹⁹

To address this concern, I choose as instruments the initial value of these variables at the beginning of the respective 5-year period. In other words, to instrument the average value of state and voter characteristic variables calculated over the time period $t-5$ to $t-1$, I use the value of these variables at time $t-5$. These instruments are (i) highly correlated with the respective 5-year average values, and (ii) expected to be independent of subsequent tax changes.

Application of the Hausman test to Eq. (C) produces strong evidence of endogeneity: A Hausman test of the endogeneity of Log of Real PCPI strongly rejects the null hypothesis of exogeneity. A Hausman test of the joint endogeneity of the variables Log of Real PCPI, Percent Elderly, Percent Black, Percent Female, Percent College-Educated, Percent Union, Population Density, Farm Share, and Manufacturing Share is also strongly rejected.²⁰ These tests provide evidence that instrumental variable regression is warranted.

Eq. (E) in Table 3 reports the results of reestimating Eq. (C) from Table 2 using Two-Stage Least Squares (2SLS). If higher taxes decrease state incomes, the associated

¹⁸ Wasylenko (1997) provides a survey of this literature.

¹⁹ I assume that the political control variables (Democratic Legislature, Republican Legislature, and the governorship variables) are exogenous with respect to changes in tax rates. While increases in tax rates are widely presumed to decrease the probability of reelection for incumbent politicians, there is no reason to believe that this electoral cost is different across the political parties.

²⁰ The associated p -values are 0.0001 and 0.0004, respectively.

Table 3
2SLS estimation of the determinants of state tax burdens: 1960–2000

Variables ^a	Eq. (E) ^{b,c}	Eq. (F) ^{b,d}
Democratic Legislature	0.00320 (2.41)	0.00382 (2.84)
Republican Legislature	-0.00062 (-0.40)	-0.00142 (-0.94)
ADA Average	-0.00121 (-0.39)	-0.00187 (-0.60)
Log of Real PCPI	0.78064 (0.78)	-0.33345 (-0.29)
Percent Elderly	-0.08873 (-1.57)	-0.07202 (-1.21)
Percent Black	-0.06888 (-1.82)	-0.08057 (-2.01)
Percent Female	0.02335 (0.82)	0.05996 (1.54)
Percent College-Educated	-0.05462 (-2.09)	-0.03839 (-1.39)
Percent Union	-0.02187 (-1.02)	0.01539 ^e (-0.63)
Population Density	0.00839 (4.49)	0.00265 ^e (0.80)
Farm Share	-0.04649 (-1.86)	-0.04843 ^e (-1.54)
Manufacturing Share	-0.05919 (-2.40)	-0.02081 (-0.83)
Initial Tax Burden	0.46870 (8.52)	0.44685 ^e (5.52)
Other included variables:	Same as Eq. (C) in Table 2	Same as Eq. (D) in Table 2
Observations	Same as Eq. (C) in Table 2	Same as Eq. (D) in Table 2
Hypothesis Tests: ^f		
Political Party Variables ^g	$\chi^2=6.240$ (0.012)	$\chi^2=11.264$ (0.001)
State Characteristic Variables ^h	$\chi^2=36.680$ (0.000)	$\chi^2=152.142$ (0.000)
Interaction Effects ⁱ	–	$\chi^2=100.156$ (0.000)

^{a,b,f,g,h,i}See notes a, b, e, f, g, and h in Table 2, respectively.

^cThe specification of this equation is the same as that of Eq. (C) in Table 2. The following variables are identified as endogenous: Log of Real PCPI, Percent Elderly, Percent Black, Percent Female, Percent College-Educated, Percent Union, Population Density, Farm Share, and Manufacturing Share. The corresponding instruments consist of the same variables, but measured at the start of the 5-year period, as opposed to the 5-year period's average value. Eq. (E) is just identified. A Hausman test of the endogeneity of Log of Real PCPI rejects the null hypothesis of exogeneity with an associated p -value of 0.000. A Hausman test of the joint endogeneity of the variables Log of Real PCPI, Percent Elderly, Percent Black, Percent Female, Percent College-Educated, Percent Union, Population Density, Farm Share, and Manufacturing Share rejects the null hypothesis of exogeneity with an associated p -value of 0.000.

^dThe specification of this equation is the same as that of Eq. (D) in Table 2. The following variables are identified as endogenous: Log of Real PCPI, Percent Elderly, Percent Black, Percent Female, Percent College-Educated, Percent Union, Population Density, Farm Share, Manufacturing Share plus all corresponding interaction effects. Instruments for the state characteristic variables consist of the same variables, but measured at the start of the five-year period. Instruments for interaction effects consist of the time-period dummy times the instrument for the respective state characteristic variable. Eq. (F) is just identified.

^eIn Eq. (F), the variables Percent Union, Population Density, Farm Share and Initial Tax Burden are each interacted with the 7 time period dummy variables, resulting in a total of 28 interaction effects. Accordingly, the coefficient estimates and t -statistics reported in the table represent the effect of the respective variables in the omitted time period (1960–1965). Hypothesis tests of the joint significance of the respective variables over all the time periods produced the following results: (i) Percent Union ($F=1.906$, p -value=0.059), (ii) Population Density ($F=5.157$, p -value=0.000), (iii) Farm Share ($F=6.234$, p -value=0.000), and (iv) Initial Tax Burden ($F=10.686$, p -value=0.000).

endogeneity would be expected to negatively bias the coefficient on Log of Real PCPI in Eq. (C). The fact that the coefficient for Log of Real PCPI becomes positive in Eq. (E), though it remains insignificant, is consistent with the removal of this bias.

A comparison of the other coefficients shows little substantive difference with respect to estimates of the influence of partisan control. The hypothesis test, H_0 :

$\beta_{\text{Democratic Legislature}} = \beta_{\text{Republican Legislature}}$, continues to be rejected, with a p -value of 0.012. Eq. (F) repeats the exercise, reestimating Eq. (D) in Table 2 using 2SLS. Again, the hypothesis is rejected with a p -value of 0.001.

Taken together, these results provide strong evidence that when it comes to taxes, it makes a difference which party controls the state legislature. The next section explores the influence of the governorship on taxes.

3.3. The estimated effect of partisan control of the executive branch

The top half of Table 4 reports the results of adding the variable Democratic Governor to Eqs. (C) and (D) (from Table 2), and to Eqs. (E) and (F) (from Table 3). I report the estimated coefficients for the Democratic Legislature and Republican Legislature variables along with the gubernatorial variable, but do not report other coefficients for brevity's sake. The results provide no evidence that partisan control of the executive branch matters for state tax policy. The coefficient for Democratic Governor does not achieve significance in any of the equations.

Table 4
Regression results from adding governor effects to Eqs. (C)–(F)

Variables ^{a,b}	Eq. (C) plus governor effects ^c	Eq. (D) plus governor effects ^c	Eq. (E) plus governor effects ^c	Eq. (F) plus governor effects ^c
Democratic Legislature	0.00322 (2.45)	0.00366 (2.70)	0.00300 (2.22)	0.00389 (2.86)
Republican Legislature	0.00006 (0.42)	−0.00083 (−0.57)	−0.00083 (−0.53)	−0.00136 (−0.89)
Democratic Governor	−0.00049 (−0.58)	0.00035 (0.40)	−0.00080 (−0.90)	0.00027 (0.30)
Democratic Legislature	0.00358 (2.55)	0.00371 (2.68)	0.00329 (2.26)	0.00401 (2.91)
Republican Legislature	−0.00089 (−0.50)	−0.00105 (−0.63)	−0.00228 (−1.13)	−0.00142 (−0.81)
Democratic Governor and Democratic Legislature	−0.00101 (−0.83)	−0.00039 (−0.35)	−0.00098 (−0.79)	−0.00047 (−0.43)
Republican Governor and Republican Legislature	0.00159 (0.87)	0.00021 (0.12)	0.00254 (1.23)	0.00001 (0.01)
Hypothesis test: Governor interaction effects ^d	$\chi^2=1.505$ (0.471)	$\chi^2=0.137$ (0.934)	$\chi^2=2.186$ (0.335)	$\chi^2=0.186$ (0.911)

^{a,b}See corresponding notes in Table 2.

^cIn the top part of Table 4, each equation includes the same variables as the equation indicated in the respective column heading, plus the variable Democratic Governor. In the bottom part of Table 4, each equation includes the same variables as the equation indicated in the respective column heading, plus two additional variables: Democratic Governor and Democratic Legislature, and Republican Governor and Republican Legislature. Like the other political variables, these variables represent the percent of years over the respective 5-year period for which (i) a Democratic governor was in power, (ii) Democrats controlled both the governorship and the legislature, and (iii) Republicans controlled both the governorship and the legislature.

^dThe corresponding null hypothesis is that the coefficients for both Democratic Governor and Democratic Legislature and Republican Governor and Republican Legislature are equal to zero. p -values are reported in parentheses below the χ^2 sample statistic values.

The bottom half of Table 4 reports an alternative specification in which I distinguish five partisan control configurations:

1. Democrats control the legislature and the governorship.
2. Democrats control the legislature.
3. Split control of the legislature.
4. Republicans control the legislature.
5. Republicans control the legislature and the governorship.

If partisan control of the executive branch matters, I expect to see a greater effect when the same party controls both branches of state government than when it only controls the legislative branch. However, the interactive effects (Democratic Governor and Democratic Legislature and Republican Governor and Republican Legislature) are usually wrong-signed and never significant, neither individually nor jointly: Across the four specifications, the p -values for the null hypothesis that both gubernatorial coefficients are equal to zero are 0.471, 0.934, 0.335, and 0.911, respectively.

3.4. Reconciling the estimates of party control of the governorship and party control of the legislature with median voter theory

Why would party control of the governorship not affect state tax policy, while party control of the legislature does? A straightforward explanation is provided by median voter theory. A governor's constituents consist of all the voters in that state. Thus, Democratic and Republican governors face the same median voter. This limits the ability of governors to implement their personal tax agendas.²¹ It forces Democratic and Republican governors to behave similarly.

In contrast, members of the state legislature represent different districts. The median voter in Democratic districts is likely to have very different preferences than the median voter in Republican districts. As a result, Democratic leaders in the state legislature face different median voters than Republican leaders in the state legislature. When control switches from one party to the other, there is not the same electoral pressure to compel Democratic and Republican legislative leaders to behave similarly. Rather than being unexpected, my results are precisely what one would expect from a straightforward application of median voter theory.

The different implications for median voter theory with respect to political party influence on the legislative and executive branches has been conjectured—but not empirically demonstrated—in previous studies. Douglas Holtz-Eakin (1988, p. 272) writes:

Each representative in the state legislature will reflect the preferences of the median voter of his or her district. The state legislative process will consist of the 'votes' (by proxy) of each local median voter. If the legislature votes as a single on spending proposals the bill which passes will be favored by the median point in the

²¹ Besley and Case (1995a) present evidence that governors who deviate from the preferences of the median voter will be punished in the next election.

distribution of median voters across the jurisdictions. The governor, in contrast, will reflect the tastes of the median voter in the statewide distribution of all voters.

This insight also underlies Crain's study on the importance of diversity in legislative districts (Crain, 1999). If this interpretation of my empirical results is correct, it suggests that party control of the state legislature may be a useful instrumental variable in studies of state public policy. I discuss this further below.

3.5. The quantitative importance of partisan control of the legislature

Consider the following two scenarios. In the first scenario, Republicans control the state legislature for all 5 years of a given 5-year period. In the second scenario, Democrats control the state legislature during the same time period. The difference between the coefficients for Democratic Legislature and Republican Legislature provides an estimate of the impact of this switch in party control on a state's Tax Burden.

The respective estimated differences in Eq. (C) through (F) are 0.00315, 0.00450, 0.00382, and 0.00524. In words, these estimates indicate that the switch from Republican to Democratic control would cause state Tax Burdens to increase 0.315 to 0.524 percentage points.²² As a point of reference, I note that the average 5-Year Change in Tax Burden for my sample is 0.19 percentage points, and the standard deviation is 0.79 percentage points. Thus, the estimated partisan control effects are approximately twice the size of the average 5-year change in Tax Burden and half the standard deviation. Further, the estimated effects are larger for Eqs. (D) and (F), the two "best" specifications based on goodness-of-fit measures, with the latter being preferred to the extent that the corresponding 2SLS estimates improve upon OLS.

The quantitative importance of these estimates can perhaps be better gauged if the effects are recast in terms of the overall size of government. Let G represent the size of government as measured by state and local expenditures as a share of state Personal Income. Let T represent the Tax Burden. As a first approximation, I assume that each state's total expenditures as a share of Personal Income is a constant multiple of its Tax Burden, so that $G_{st} = k_s \cdot T_{st}$. If I evaluate G at the mean value of Initial Tax Burden (10.534, cf. Table 1), the corresponding estimates indicate that after 5 years of Democratic control of the legislature, government would be roughly 3 to 5% "larger" at the state and local level than if the state legislature were controlled by Republicans during that same period.²³ The "better" specifications of Eqs. (D) and (F) produce estimates of 4.2% and 4.9%, respectively.

However, the effect from this 5-year change in control would dissipate over time. The coefficients for Initial Tax Burden in Eqs. (C) through (F) range between 0.43 and 0.47. This implied "tax convergence" suggests that more than half of the Democratic-produced increase in Tax Burden would dissipate 5 years later; about 80% of the original effect would be gone 10 years later. Of course, if Democrats continued in control of the

²² The respective differences are multiplied by 100 because a complete switch for five years implies that the values of the Republican Legislature and Democratic Legislature variables change by 100.

²³ The effects are calculated by $\ln(k_s \cdot (10.534 + \text{Estimated Change in Tax Burden}) / k_s \cdot 10.534) \cdot 100$.

legislature for subsequent 5-year periods, the associated increases in the size of state and local government would accumulate over time.

3.6. Why have many previous studies failed to find significant political party effects?

My results indicate that partisan control of state legislatures has an important influence on taxes and, correspondingly, on the size of state and local government. In fact, given its substantial size, one wonders why many previous studies have not found evidence of this effect. Table 5 identifies two reasons: failure to control for (i) the lag between legislation and observed tax revenues, and (ii) time-varying behavior in the Tax Burden time series.

As discussed in the text (cf. Section 2, “State and Voter Characteristic Variables”), tax legislation passed in one year does not get reflected in revenues until, at least, the next fiscal year. Failure to control for this lag can result in statistically insignificant political party effects. Column (1) of Table 5 reports the results of estimating a specification similar to Eq. (C) in Table 2, except that the lagged values of the state and voter characteristic variables are replaced by current values. Using this latter specification, a test of differences in the party control coefficients fails to be rejected. The corresponding p -value is 0.905. In other words, had I not controlled for the lagged effects of state and voter characteristic variables, I would have failed to estimate a significant partisan control effect. Note that the higher AIC value of Column (1) relative to that of Eq. (C) in Table 2 indicates that the use of current values is inferior to that of lagged values. This highlights the importance of appropriately controlling for the lag between legislation and revenues.

The last two columns of Table 5 demonstrate what happens when time-varying behavior in the TAX BURDEN time series is not appropriately controlled. As discussed in the text (cf. Section 2, “State and Time Fixed Effects”), state Tax Burdens exhibited strong cyclical behavior over the sample period. Therefore, it is important to control for the effect

Table 5
The importance of controlling for (i) lagged effects and (ii) time-varying behavior in Tax Burden

Variables ^a	Eq. (C) with current rather than lagged values ^{b,c} (1)	Eq. (C) with no time fixed effects ^{b,d} (2)	Eq. (C) with a linear time trend rather than time fixed effects ^{b,e} (3)
Democratic Legislature	0.00043 (0.41)	-0.00010 (-0.06)	0.00035 (0.24)
Republican Legislature	0.00059 (0.51)	0.00027 (0.15)	0.00042 (0.24)
$H_0: \beta_{\text{Democratic Legislature}} = \beta_{\text{Republican Legislature}}$	$\chi^2 = 0.014$ (0.905) ^f	$\chi^2 = 0.051$ (0.822) ^f	$\chi^2 = 0.002$ (0.965) ^f
AIC	1.741	2.012	1.990

^aThe full set of results is not reported here for the sake of brevity.

^{b,f}See notes a and e in Table 2, respectively.

^cThe specification of Column (1) differs from Eq. (C) in Table 2 in that it uses current values of the state and voter characteristic variables rather than the “average value over the respective five-year period, lagged by one year” (cf. Section 2 of the text, “State and Voter Characteristic Variables”).

^dThe specification of Column (2) differs from Eq. (C) in Table 2 in that it omits time fixed effects.

^eThe specification of Column (3) differs from Eq. (C) in Table 2 in that it substitutes a linear time trend for the time fixed effects.

of omitted, time-varying variables. This is especially true when the specification includes state fixed effects, and changes in partisan control of the legislature occur unevenly over time and across states.

Column (2) of Table 5 reports the results of estimating an equation with a specification similar to Eq. (C) of Table 2, except no time fixed effects are included. In sharp contrast to the specification with time fixed effects, the null hypothesis, $H_0: \beta_{\text{Democratic Legislature}} = \beta_{\text{Republican Legislature}}$, fails to be rejected (p -value=0.822). Column (3) reports what happens when a linear time trend variable is used instead of the time fixed effects. Again, the null hypothesis fails to be rejected (p -value=0.965). A comparison of the AIC values in Column (2) and (3) with their counterpart in Eq. (C) in Table 2 clearly demonstrates the inferiority of these specifications compared to one including time fixed effects.

In conclusion, the results of Table 5 demonstrate the importance of controlling for (i) the lag between legislation and observed tax revenues, and (ii) time-varying behavior in the Tax Burden time series. When these two factors are not appropriately controlled in empirical studies, the influence of political party variables can be missed. These results, as well as an examination of the influence of other factors, are presented in greater detail in the Appendix.

3.7. On the use of partisan control variables as instruments in state policy studies

Besley and Case (2000) argue that studies of state policies are likely to suffer from endogeneity. This creates a demand for effective instrumental variables. In order to be a good instrument, a variable should be highly correlated with the endogenous explanatory variable, but uncorrelated with the error term. As discussed in the Appendix, my results indicate that party control of the state legislature has the requisite characteristics to serve as an effective instrumental variable when estimating the impact of public policies.

4. Summary

This study finds evidence that political parties significantly impact state tax policy. My two main results are: (i) Tax Burdens are higher when Democrats control the state legislature compared to when Republicans are in control. (ii) The political party of the governor has little effect after controlling for partisan influences in the legislature.

I reconcile these seemingly inconsistent findings of partisan influence using median voter theory. Governors face a statewide electorate. In order to be elected, both Republican and Democratic governors need to satisfy the same median voter. This constrains their ability to deviate from the median voter's policy ideal. In contrast, legislative leaders need to satisfy the median voter in their respective districts. Since Democratic and Republican legislators serve different districts and, hence, different median voters, public policies will differ depending on which party controls the state legislature.

The quantitative importance of party control of the legislature is substantial both from the perspective of size of Tax Burden and size of state and local government. I estimate

that a state's Tax Burden would be 0.315–0.524 percentage points higher at the end of a 5-year period if Democrats rather than Republicans controlled the legislature. Stated differently, these estimates indicate that state and local government would be approximately 3% to 5% larger if Democrats rather than Republicans were in control of the legislature for a period of 5 years. The better specifications produce estimates at the higher end of these ranges.

These results have implications for econometric analyses that measure the impact of public policies on various economic outcomes. As emphasized by [Besley and Case \(2000\)](#), a serious econometric concern is the endogeneity of public policies. Failure to address this problem will result in inconsistent estimates of policy impacts. My findings suggest that political influence variables—particularly variables that measure partisan control of state legislatures—can make effective instruments in analyses of the impact of state policies.

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Appendix A. On the use of partisan control variables as instruments in analyses of the impact of state policies

[Besley and Case \(2000\)](#) argue that endogeneity is a potentially serious problem in any empirical analysis of the consequences of public policy. To illustrate their point, they study the effect of workers' compensation benefits on average hourly earnings in the construction industry. They note that there may be uncontrolled factors that simultaneously influence average hourly earnings and the level of workers' compensation benefits. As instruments, they propose the fraction of women legislators in state lower and upper houses. Their argument is that, *ceteris paribus*, women legislators are more likely to support worker's compensation benefits than male legislators. They report success with this instrument and conclude: "One general idea that has heretofore received relatively little attention is using political variables as instruments. We show that this idea has some merit ([Besley and Case, 2000](#), p. F689)." This appendix shows that it is an easy stretch to apply the same line of reasoning to the use of party control variables as instruments.

To be effective, an instrument needs to be (i) orthogonal to the error term in the policy outcome equation (e.g. hourly earnings equation), but (ii) highly correlated with the endogenous policy variable (e.g., workmen's compensation benefits). Party control of the legislature has good potential to satisfy both conditions.

With respect to the first condition, it should be noted that legislative control can hinge on electoral outcomes in just a few districts. It is not hard to imagine that the salient electoral issues in these districts could be independent (or only weakly dependent) of the policy outcome variable. For example, campaign issues such as the appearance of

impropriety in accepting gifts from supporters, draft-dodging during the Vietnam War, or the discovery of infidelity in a “family values” candidate, could result in electoral outcomes that tip party control of the legislature. These events would obviously be orthogonal to a policy outcome such as “average hourly earnings in the construction industry.”

With respect to the second condition, Bound et al. (1995) emphasize that an instrument that is only weakly correlated with an endogenous explanatory variable will result in IV estimates that are biased in finite samples. They find that the bias is related to $1/F$. They conclude that “examining the F statistic on the excluded instruments in the first-stage regression of IV is useful in gauging the finite-sample bias of IV relative to OLS. . . . F statistics close to 1 should be cause for concern” (pp. 445–446).

My results can be seen as providing evidence of the suitability of party control of the legislature on this score: Consider an empirical analysis of the impact of state tax policy on an outcome variable like state income or employment. Suppose that changes in state tax policy were endogenous (e.g., states raise/lower taxes during bad/good economic times). In this context, Eqs. (C) through (F) can be thought of as first-stage regressions in a two-stage IV procedure. The sample F -statistics corresponding to the joint hypothesis $\beta_{\text{Democratic Legislature}} = \beta_{\text{Republican Legislature}}$ range from 4.0 to 6.6. In other words, by the criterion identified by Bound et al. (1995), these two political variables could serve as useful instruments to reduce endogeneity bias.

If this is true for state tax policy, it may also be true for other state policies. Moreover, if party control of the legislature were more highly correlated with the policy variable than fraction of women legislators, it could make an even better instrument than the one proposed by Besley and Case (2000). This is a potentially fruitful topic for future research.

Appendix B. Estimation of political party effects using alternative specifications

This appendix reports the results of an investigation into the factors that influence the empirical finding of political party effects. The following four factors are examined for their impact on estimates of political party effects:

1. The use of 5-year interval data versus annual data.
2. The use of lagged versus current values of the state and voter characteristic variables.
3. The inclusion of Initial Tax Burden as an explanatory variable.
4. The inclusion of different controls for the influence of time trend effects.

Table 1-A reports the results of my investigation.

The top part of the table reports regression results using 5-year interval data (360 observations). The bottom part of the table is based on annual data from 1961–2000 (1800 observations). Only the coefficients for the partisan control variables Democratic Legislature and Republican Legislature are reported in the table, along with a test of the hypothesis that $\beta_{\text{Democratic Legislature}} = \beta_{\text{Republican Legislature}}$ and the Akaike Information Criterion (AIC) value to compare goodness-of-fit across specifications.

Table 1-A
Investigating the effects of alternative specifications

5-year interval data ^a	Eq. (A1)	Eq. (A2)	Eq. (A3)	Eq. (A4)
Democratic Legislature	0.00326 (2.55)	0.00043 (0.41)	0.00236 (1.78)	0.00035 (0.24)
Republican Legislature	0.00036 (0.24)	0.00059 (0.51)	-0.00029 (-0.17)	0.00042 (0.24)
$H_0: \beta_{\text{Democratic Legislature}} = \beta_{\text{Republican Legislature}}$	$\chi^2=3.961$ (p -value=0.047)	$\chi^2=0.014$ (p -value=0.905)	$\chi^2=2.730$ (p -value=0.098)	$\chi^2=0.002$ (p -value=0.965)
Observations	360	360	360	360
AIC	1.698	1.741	1.924	1.990
Annual data ^b	Eq. (A5)	Eq. (A6)	Eq. (A7)	Eq. (A8)
Democratic Legislature	0.00102 (3.24)	0.00056 (1.67)	0.00108 (2.32)	0.00036 (1.00)
Republican Legislature	0.00023 (0.60)	-0.00009 (-0.25)	-0.00077 (-1.48)	0.00038 (0.89)
$H_0: \beta_{\text{Democratic Legislature}} = \beta_{\text{Republican Legislature}}$	$\chi^2=3.953$ (p -value=0.047)	$\chi^2=2.506$ (p -value=0.113)	$\chi^2=10.203$ (p -value=0.001)	$\chi^2=0.002$ (p -value=0.967)
Observations	1800	1800	1800	1800
AIC	0.936	0.992	1.752	1.200

The full set of results is not reported here for the sake of brevity. The specifications of the respective equations are described in the notes below. t -statistics are reported in parentheses below the coefficient estimates. All hypothesis tests employ White's heteroscedastic consistent covariance matrix in calculating sample statistics.

^a The top part of the table uses 5-year interval data. The specification of Eq. (A1) is identical to that of Eq. (C) in the text, except that the variable ADA Average has been omitted to make the specification more compatible with those that follow. The specification of Eq. (A2) is identical to that of Eq. (A1), except it uses current values of the state and voter characteristic variables, rather than the "average value over the respective five-year period, lagged by one year" (cf. Section 2 of the text, "State and Voter Characteristic Variables"). The specification of Eq. (A3) is also identical to that of Eq. (A1), except it omits Initial Tax Burden as an explanatory variable. Finally, the specification of Eq. (A4) is identical to that of Eq. (A1) except that it replaces the time fixed effects with a linear time trend variable.

^b The bottom part of the table uses annual, state-level data for the period 1961–2000. The specification of Eq. (A5) is intended to be the "annual-equivalent" of Eq. (C) in the text, though it also omits ADA Average, as discussed above. State and voter characteristic variables are lagged by 1 year. For Initial Tax Burden, I use the 1-year lagged value of Tax Burden. Annual time fixed effects are used to capture the influence of omitted, time-varying variables. The specification of Eq. (A6) is identical to that of Eq. (A5), except it uses current values of the state and voter characteristic variables, rather than one-year lagged values. The specification of Eq. (A7) is also identical to that of Eq. (A5), except it omits Initial Tax Burden as an explanatory variable. Finally, the specification of Eq. (A8) is identical to that of Eq. (A5) except that it replaces the annual time fixed effects with a linear time trend variable.

The first column in the table reports the results of equations that are specified to closely resemble Eq. (C) in Table 2 of the text (cf. description of specifications in the notes below Table 1-A). Eq. (A1) uses 5-year interval data, whereas Eq. (A5) uses annual data. Note that both equations reject the hypothesis of no difference in the political parties at the 5% significance level. While the coefficient values are smaller in Eq. (A5), this is misleading because this equation estimates the 1-year impact of party control of the legislature. The estimates in Eq. (A1) measure 5-year impacts. To make the estimates comparable, one should multiply the estimates in Eq. (A5) by 5. It is easy to verify that the estimates based on annual data imply a larger partisan control effect. I conclude that my finding of a partisan control effect is not dependent on my use of 5-year interval data. If anything, annual data would produce a larger estimated effect.

The second column in Table 1-A investigates the impact of using current versus lagged values of the state and voter characteristic variables. As discussed in the text (cf. Section 2, “State and Voter Characteristic Variables”), tax legislation passed in 1 year does not get reflected in revenues until, at least, the next fiscal year. It turns out that ignoring this lag between legislation and actual revenues can cause one to fail to estimate a partisan control effect.

The specification of the equations in the second column (Eqs. (A2) and (A6)) is identical to that of the equations in the first column (Eqs. (A1) and (A5), respectively), except that lagged values of the state and voter characteristic variables are replaced with current values. When I use 5-year interval data, this replacement results in a failure to reject the hypothesis of no party effect: The p -value associated with the test of the hypothesis $\beta_{\text{Democratic Legislature}} = \beta_{\text{Republican Legislature}}$ is 0.905 in Eq. (A2) versus 0.047 in Eq. (A1). The impact is less drastic using annual data, but the result is the same. Substituting current values for lagged values causes one to fail to reject the hypothesis $\beta_{\text{Democratic Legislature}} = \beta_{\text{Republican Legislature}}$ at the 5% level (cf. Eq. (A6), the associated p -value is 0.113). This highlights the importance of appropriately controlling for the lag between legislation and revenues.

The third column reports the effects associated with omitting the Initial Tax Burden variable from the specifications of Eqs. (A1) and (A5). A comparison of Eq. (A3) with Eq. (A1), and Eq. (A7) with Eq. (A5) demonstrates that the associated effects are generally small, and can cut both ways with respect to estimating the influence of political parties. When using 5-year interval data, the p -value associated with the hypothesis test of no party effect rises to 0.098 from 0.047. In contrast, the p -value based on annual data falls to 0.001 from 0.047. The AIC values associated with Eqs. (A3) and (A7) are substantially larger than their counterpart values in Eqs. (A1) and (A5), respectively. I conclude from this that the effects of omitting Initial Tax Burden are generally unclear, but the AIC values clearly indicate that Initial Tax Burden belongs in the specification.

The last column of Table 1-A investigates the impact of using different controls to hold constant the influence of time effects. As discussed in the text (cf. Section 2, “State and Time Fixed Effects”), state Tax Burdens exhibited strong cyclical behavior over the sample period (cf. Fig. 1). Therefore, it is important to control for the effect of omitted, time-varying variables. This is especially true when the specification includes state fixed effects, and changes in political party control of the legislature occur unevenly over time and across states.

Eqs. (A4) and (A8) are identical to their counterparts, Eqs. (A1) and (A5) respectively, except that the time fixed effects are replaced with a linear time trend. This has a substantial impact on tests of no party effects: Using 5-year interval data, the effect of using a linear time trend is to cause the p -value associated with the test of the hypothesis, $\beta_{\text{Democratic Legislature}} = \beta_{\text{Republican Legislature}}$, to increase to 0.965 from 0.047. The corresponding p -value based on annual data increases to 0.967 from 0.047. A comparison of the AIC values across equations indicates that a linear time trend variable does a poor job of capturing time-varying behavior in the dependent variable.

In summary, my investigation produces the following conclusions:

1. Failure to take into account the lag between legislation and revenues can cause one to fail to find evidence of political party influences on taxes.

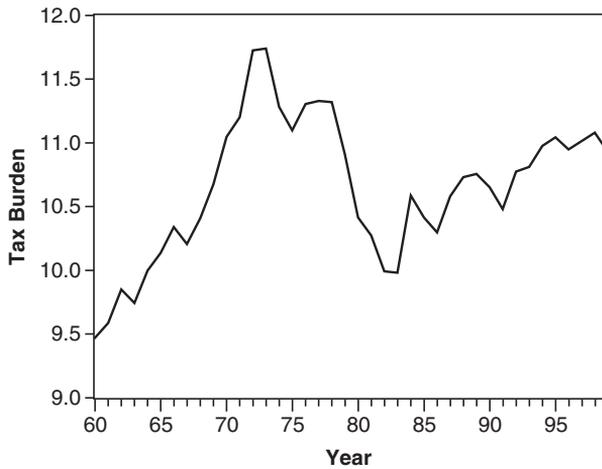


Fig. 1. Average state Tax Burden for US: 1960–1999.

2. Failure to properly model time-varying behavior in the dependent variable can also cause one to fail to find evidence of political party influences on taxes.
3. The effect of omitting Initial Tax Burden is unclear, but the evidence indicates that this variable belongs in a regression equation that seeks to explain state Tax Burdens.

Table 2-A

2SLS estimation of the determinants of state tax burdens: 1960–2000 (assuming log of real PCPI is the only endogenous variable)

Variables ^a	Eq. (E) ^{b,c}	Eq. (F) ^{b,d}
Democratic Legislature	0.00331 (2.53)	0.00353 (2.62)
Republican Legislature	0.00010 (0.07)	-0.00087 (-0.59)
ADA Average	-0.00221 (-0.74)	-0.00120 (-0.39)
Log of Real PCPI	-0.61518 (-0.75)	0.01350 (0.01)
Percent Elderly	-0.08692 (-1.70)	-0.07594 (-1.37)
Percent Black	-0.06403 (-2.00)	-0.05457 (-1.56)
Percent Female	0.02492 (1.33)	0.04386 (1.81)
Percent College-Educated	-0.05486 (-2.46)	-0.04974 (-2.08)
Percent Union	0.00667 (0.42)	-0.00424 ^e (-0.24)
Population Density	0.00735 (4.07)	0.00206 ^e (0.66)
Farm Share	-0.07446 (-2.64)	-0.02565 ^e (-0.91)
Manufacturing Share	-0.08566 (-3.97)	-0.02706 (-1.23)
Initial Tax Burden	0.45517 (8.56)	0.42949 ^e (5.44)
Other included variables:	Same as Eq. (E) in Table 3	Same as Eq. (F) in Table 3
Observations	Same as Eq. (E) in Table 3	Same as Eq. (F) in Table 3
Hypothesis Tests:		
Political Party Variables ^f	$\chi^2=4.873$ (p -value=0.027)	$\chi^2=8.703$ (p -value=0.003)
State Characteristic Variables ^g	$\chi^2=39.713$ (p -value=0.000)	$\chi^2=165.889$ (p -value=0.000)
State Fixed Effects ^h	$\chi^2=144.562$ (p -value=0.000)	$\chi^2=136.516$ (p -value=0.000)
Time Effects ⁱ	$\chi^2=124.106$ (p -value=0.000)	$\chi^2=256.835$ (p -value=0.000)
Interaction Effects ^j	-	$\chi^2=108.894$ (p -value=0.000)

Appendix C. Results of re-estimating Eqs. (E) and (F) when Log of real PCPI is the only endogenous variable

The text reports that H_0 : Log of Real PCPI, Percent Elderly, Percent Black, Percent Female, Percent College-Educated, Percent Union, Population Density, Farm Share, and Manufacturing Share are all exogenous is soundly rejected (the associated p -value is 0.0004). It is possible that this result is driven by the endogeneity of Log of Real PCPI, with the other variables being exogenous (a test of H_0 : Log of Real PCPI is exogenous is rejected at a level below 0.0001). Accordingly, this Appendix re-estimates the Two-Stage Least Squares (2SLS) results reported in the text, this time assuming that Log of Real PCPI is the only endogenous variable.

Table 2-A repeats the analysis of Table 3 in the text. The only difference is that the variables Percent Elderly, Percent Black, Percent Female, Percent College-Educated, Percent Union, Population Density, Farm Share, and Manufacturing Share are assumed to be exogenous in Table 2-A. The main results of the analysis are unchanged. In particular, the null hypothesis $\beta_{\text{Democratic Legislature}} = \beta_{\text{Republican Legislature}}$ is convincingly rejected in Table 2-A, just as it is in Table 3.

Notes to Table 2-A:

^a Variables are described in Section 2 of the text. Descriptive statistics for all variables are reported in Table 1.

^b t -statistics are reported in parentheses below the coefficient estimates. All hypothesis tests employ White's heteroscedastic consistent covariance matrix in calculating sample statistics.

^c The specification of this equation is the same as that of Eq. (C) in Table 2. The following variables are identified as endogenous: Log of Real PCPI, Percent Elderly, Percent Black, Percent Female, Percent College-Educated, Percent Union, Population Density, Farm Share, and Manufacturing Share. The corresponding instruments consist of the same variables, but measured at the start of the five-year period, as opposed to the 5-year period's average value. Eq. (E) is just identified. A Hausman test of the endogeneity of Log of Real PCPI rejects the null hypothesis of exogeneity with an associated p -value of 0.000. A Hausman test of the joint endogeneity of the variables Log of Real PCPI, Percent Elderly, Percent Black, Percent Female, Percent College-Educated, Percent Union, Population Density, Farm Share, and Manufacturing Share rejects the null hypothesis of exogeneity with an associated p -value of 0.000.

^d The specification of this equation is the same as that of Eq. (D) in Table 2. The following variables are identified as endogenous: Log of Real PCPI, Percent Elderly, Percent Black, Percent Female, Percent College-Educated, Percent Union, Population Density, Farm Share, Manufacturing Share plus all corresponding interaction effects. Instruments for the state characteristic variables consist of the same variables, but measured at the start of the five-year period. Instruments for interaction effects consist of the time-period dummy times the instrument for the respective state characteristic variable. Eq. (F) is just identified.

^e In Eq. (F), the variables Percent Union, Population Density, Farm Share and Initial Tax Burden are each interacted with the 7 time period dummy variables, resulting in a total of 28 interaction effects. Accordingly, the coefficient estimates and t -statistics reported in the table represent the effect of the respective variables in the omitted time period (1960–1965).

^f The corresponding null hypothesis is $\beta_{\text{Democratic Legislature}} = \beta_{\text{Republican Legislature}}$.

^g The "state characteristic variables" are ADA Average, Log of Real PCPI, Percent Elderly, Percent Black, Percent Female, Percent College-Educated, Percent Union, Population Density, Farm Share, and Manufacturing Share. In Eq. (E), the corresponding null hypothesis is that these variables are jointly equal to zero. In Eq. (F), the null hypothesis also tests whether the associated time interaction effects are jointly equal to zero.

^h The corresponding null hypothesis is that the 44 state fixed effects are jointly equal to zero.

ⁱ In Eq. (E), the corresponding null hypothesis is that the 7 time-period fixed effects are jointly equal to zero. In Eq. (F), the null hypothesis also tests whether the time interaction effects are jointly equal to zero.

^j The corresponding null hypothesis is that the 28 interaction effects (cf. Note (e)) are jointly equal to zero.

Table 3-A

Regression results from adding governor effects to Eqs. (E) and (F) of Table 2-A (assuming log of real PCPI is the only endogenous variable)

Variables ^a	Eq. (E) plus governor effects ^b	Eq. (F) plus governor effects ^b
Democratic Legislature	0.00318 (2.41)	0.00358 (2.63)
Republican Legislature	-0.00004 (-0.03)	-0.00081 (-0.56)
Democratic Governor	-0.00053 (-0.63)	0.00024 (0.27)
Democratic Legislature	0.00348 (2.46)	0.00367 (2.67)
Republican Legislature	-0.00115 (-0.64)	-0.00113 (-0.67)
Democratic Governor and Democratic Legislature	-0.00092 (-0.77)	-0.00045 (-0.41)
Republican Governor and Republican Legislature	0.00184 (0.99)	0.00041 (0.23)
Hypothesis Test: Governor Interaction Effects ^c	$\chi^2=1.633$ (<i>p</i> -value=0.442)	$\chi^2=0.215$ (<i>p</i> -value=0.898)

^a Variables are described in Section 2 of the text. Descriptive statistics for all variables are reported in Table 1.

^b In the top part of Table 4, each equation includes the same variables as the equation indicated in the respective column heading, plus the variable Democratic Governor. In the bottom part of Table 4, each equation includes the same variables as the equation indicated in the respective column heading, plus two additional variables: Democratic Governor and Democratic Legislature, and Republican Governor and Republican Legislature. Like the other political variables, these variables represent the percent of years over the respective five-year period for which (i) a Democratic governor was in power, (ii) Democrats controlled both the governorship and the legislature, and (iii) Republicans controlled both the governorship and the legislature. *t*-statistics are reported in parentheses below the coefficient estimates. All hypothesis tests employ White's heteroscedastic consistent covariance matrix in calculating sample statistics.

^c The corresponding null hypothesis is that the coefficients for both Democratic Governor and Democratic Legislature and Republican Governor and Republican Legislature are equal to zero.

Table 3-A re-estimates the last two columns of Table 4 in the text. These last two columns add variables for party control of the governorship to Eqs. (E) and (F) of Table 3. The re-estimated equations add the same executive branch variables to the 2SLS specifications of Table 2-A. Again, the main results are unchanged: all specifications find that the gubernatorial coefficients are insignificantly different from zero.

In conclusion, all the key results of this study with respect to the effect of partisan control variables are unchanged when it is assumed that the only endogenous variable is Log of Real PCPI.

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