

**TAX BURDEN AND THE MISMEASUREMENT  
OF STATE TAX POLICY**

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Revised December 21, 2005

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## **ABSTRACT**

Tax Burden, defined as the ratio of total tax revenues over personal income, is frequently used to measure state tax policy. We analyze the empirical relationship between changes in Tax Burden and changes in tax policies from 1987 to 2000 using states' forecasts of revenue impacts of new tax legislation. Our two major findings have important implications. First, we demonstrate that income-induced, non-tax policy changes are a significant determinant of changes in Tax Burden. These income effects are likely to cause misinterpretation when Tax Burden is used as a variable in economic growth regressions. Second, we estimate that approximately half of the total variation in Tax Burden is due to changes in non-tax policy factors. This finding quantifies the extent of the "mismeasurement" problem which has been discussed, but not analyzed, in previous literature. In concluding, we promote the use of alternative approaches for estimating the economic effects of taxes.

JEL Categories: E62, H20, H71, R11

Keywords: Tax Policy, Fiscal Policy, Tax Burden, State Economic Development, Tax Rates

## 1. INTRODUCTION

Conclusive evidence concerning the empirical relationship between state tax policy and economic growth continues to be elusive in the academic literature. Typically the relationship is analyzed by regressing an outcome measure of interest (such as per capita personal income) on a tax policy variable. The resulting coefficient estimate is commonly used to advise policy makers regarding the impact of tax policy proposals. The validity of this interpretation depends crucially on the accuracy with which the tax policy variable is measured.

Unfortunately, the complexity of state and local tax schemes makes it difficult to find good measures of tax policy (e.g., Gold 1996). These are difficult to construct from statutory tax parameters due to substantial variation in “state tax base definitions, rate structures and enforcement practices (Helms 1985, p. 577).” As a result, most of the state and local economic development literature measures tax rates with the variable “Tax Burden,” defined as the ratio of state and local tax revenues to personal income (cf. Wasylenko 1997, p. 42).<sup>1</sup>

The literature widely acknowledges that Tax Burden may be an imprecise measure of tax policy (Waslenko 1997; Gold 1996; Canto and Webb 1987; Helms, 1985). The problem is so widely recognized, that research often omits discussions of the potential imprecision associated with using Tax Burden as a proxy for tax policy (e.g., Tomljanovich, 2004; Yamarik, 2000). Empirical studies of growth continue to employ Tax Burden as a proxy for state tax policy because of its ease of availability and the lack of better alternatives.<sup>2</sup> This is regrettable, because it can lead to the misinterpretation of empirical results, and bad policy advice.

For example, if movements in Tax Burden are driven by non-tax policy factors, and these factors are correlated with the outcome measure, then the resulting coefficient estimates cannot be taken as descriptive of what would happen if policy makers altered tax policy. Theory

suggests that this scenario is quite plausible: If state tax systems are non-proportional, then changes in state income will induce changes in Tax Burden. If the dependent variable is also income-related, then an empirical relationship will be generated between Tax Burden and the dependent variable that has nothing to do with tax policy.

The purpose of this study is to investigate how well Tax Burden measures state tax policy. We make several contributions. First, we empirically quantify the relationship between changes in Tax Burden and changes in state tax policy. Following Poterba (1994), Poterba and Rueben (2001), Merriman (2001), and Maag and Merriman (2003), we use state-generated forecasts of revenue impacts associated with new tax legislation as direct measures of state tax policy. These serve as a proxy for changes in tax revenues due to changes in tax policy, holding constant the influence of other variables (like income).

We further contribute to the literature by evaluating sources of divergence between Tax Burden and state tax policy. To do so, we decompose changes in Tax Burden into three mutually exclusive components: (1) changes in state tax policy; (2) income-induced changes which are independent of tax policy; and (3) changes caused by other factors which are independent of state tax policy. We demonstrate the statistical significance of income-induced changes in explaining changes in the Tax Burden variable.

Finally, we use our theory-driven empirical results to estimate the percent of variation in the Tax Burden variable that is due to non-tax policy factors. Our preferred estimates indicate that approximately half of the variance in the change of Tax Burden is due to factors other than state tax policy.

Our results are important for researchers and policy-makers interested in the effect of tax policy on economic growth. By empirically identifying the substantial imprecision associated

with using Tax Burden as a proxy for state tax policy, we highlight the need for better measures. We conclude the paper with suggestions for future research.

The paper proceeds as follows. Section 2 identifies two data series that, we argue, provide objective and reliable measures of state tax policy. Using these data series as our benchmarks, Section 3 presents qualitative evidence that Tax Burden mismeasures state tax policy. Section 4 derives a theoretical model relating the *Tax Burden* variable to state tax policy and other factors. Section 5 presents the results of estimating this model, along with estimates of the degree to which changes in the *Tax Burden* variable are driven by non-tax policy factors. Section 6 concludes.

## **2. DIRECT MEASURES OF STATE TAX POLICY**

In order to determine whether Tax Burden is a reliable measure of state tax policy, we need to track and quantify changes in state tax policy. Total tax revenues will not work, since these go up and down with the business cycle, even when tax policy doesn't change. The tax policy measure needs to be independent of fluctuations in state income. Our approach employs the actual revenue forecasts used by states to assess the consequences of new tax legislation.

State laws generally require states to estimate the budgetary impacts of tax and spending legislation. This information is collected by two national organizations -- the National Association of State Budget Officers (NASBO) and the National Conference of State Legislatures (NCSL). NASBO is an independent professional organization for the chief financial advisors to governors, including heads of state budget offices, state finance departments and their staffs. NCSL is a bipartisan organization that serves state legislatures and represents their interest to federal policy makers. Both organizations began conducting annual surveys of their membership regarding state tax policy in 1987.

NASBO, in conjunction with the National Governors' Association, collects its information from state budget officers.<sup>3</sup> Among other things, respondents provide estimates of changes in the next fiscal year's tax revenues resulting from changes in tax legislation. NCSL surveys state legislative staff.<sup>4</sup> Historically, the NCSL has used two methods to report tax change impacts. The baseline method (NCSL-B), available as an annual time series from 1987 to 1997, tracks tax legislation changes adopted in a given year in terms of the impact on the following fiscal year. It was discontinued in favor of the taxpayer liability method (NCSL-TL), which was initiated in 1995. The NCSL-TL series provides estimates of changes in the taxes actually paid by taxpayers.<sup>5</sup>

In addition to definitional variations on the nature and timing of tax changes, the NASBO and NCSL surveys also differ with respect to when information is collected. Thus, revisions in revenue forecasts may be picked up by one survey and not by another. FIGURE 1 compares the NASBO and NCSL-collected, state revenue forecasts associated with tax policy changes. Fiscal year represents the year that the tax changes are legislated to take effect. Despite some differences, the overall impression is that the different series present similar pictures of predicted revenue changes resulting from changes in states' tax policies.<sup>6</sup> The sample correlation between the two series is 0.777, and is highly significant. When these series are converted to measures of tax policy as discussed in the next section, their correlation rises to 0.822. In contrast, pairwise correlations between each of these measures and the Tax Burden variable are substantially lower at 0.384 (NASBO) and 0.398 (NCSL).<sup>7</sup>

We take as our point of departure that the state revenue forecasts collected by NASBO and NCSL represent unbiased estimates of the revenue impacts of changes in state tax policy. Corroborating support for employing this assumption comes from three sources: (i) previous

research on strategic bias in state revenue forecasts, (ii) personal conversations with professional staff at NASBO, NCSL, and state budgetary offices, and (iii) the use of these series in recent studies.

While no studies directly evaluate the accuracy of state revenue forecasts associated with tax legislation, some studies have investigated state forecasts of *total* tax revenues—a related subject.<sup>8</sup> No conclusive evidence of bias has been found.<sup>9</sup> However, even if states strategically bias total revenue forecasts, it does not follow that this bias would extend to revenue forecasts of specific tax legislation. These latter forecasts are likely to be more closely scrutinized than overall budget forecasts since they are inputs in the legislative process and impact specific economic groups. As such, they need to be credible to many different constituencies.<sup>10</sup> Personal conversations with current and former professionals from NASBO, NCSL, and several state budgetary offices provided anecdotal confirmation that the survey responses supplied by the states are untainted by strategic bias.

Finally, we note that several recent studies have employed the NASBO and NCSL-collected revenue forecasts as direct measures of state tax policy. Poterba (1994) and Poterba and Rueben (2001) use NASBO data to represent state fiscal policy in their studies of how states respond to unexpected revenue shocks. Merriman (2001) uses both series in his analysis predicting changes in tax legislation. Maag and Merriman (2003) use NASBO-related estimates to investigate tax policy responses to the 1990 and 2001 recessions.

### **3. QUALITATIVE EVIDENCE THAT TAX BURDEN MISMEASURES STATE TAX POLICY**

In the analysis that follows, we define the variable *Tax Burden* as the ratio of state (but not local) tax revenues ( $R$ ) over Personal Income ( $Y$ ),

$$Tax\ Burden_{st} = R_{st}/Y_{s,t-1}. \quad (1)$$

We exclude local tax revenues in order to be consistent with the NASBO and NCSL-collected estimates. We take the relationship between this restricted version of Tax Burden and state tax policy as an indication of the relationship between that of the more broadly defined Tax Burden variable and state and local tax policy. Note that tax revenues are reported by fiscal year, while state Personal Income is measured over the calendar year. Following convention, Personal Income is from the calendar year that spans the beginning of the fiscal year.<sup>11</sup>

FIGURE 2 compares the *Tax Burden* time series with the NASBO and NCSL-B time series for the state of Iowa for fiscal years 1988-2001.<sup>12</sup> For the most part, Iowa's *Tax Burden* series behaves in the manner expected of a reliable measure of state tax policy: it rises during years in which tax legislation was projected to increase state revenues, declines during years in which tax legislation was projected to decrease state revenues, and stays the same when no change in revenues was expected.

A careful examination of the *Tax Burden* series for all the states, however, reveals that Iowa's experience is the exception, not the rule. FIGURES 3 and 4 illustrate two typical scenarios in which *Tax Burden* mismeasures state tax policy. In FIGURE 3, large projected increases in Louisiana's taxes in 1989 had little effect on the state's *Tax Burden*. Furthermore, during the early 1990's, legislated tax increases corresponded with a general decline in the *Tax Burden* series. In contrast, the example in FIGURE 4 shows large movements in Michigan's *Tax Burden* from 1988 through 1994 despite the fact that tax policy was forecasted to have a negligible impact on tax receipts. Cases like Louisiana where significant changes in state tax policy correspond with little, or even perverse, movement in *Tax Burden*; and Michigan, where large movements in *Tax Burden* are not generated by changes in tax legislation, are common. In

fact, the motivation for this study came from an (unsuccessful) attempt in previous research to identify significant tax legislation from movements in states' *Tax Burden* time series.<sup>13</sup>

FIGURE 5 aggregates data from all the states to present an overall picture of how well changes in *Tax Burden* correspond to changes in state tax policy.<sup>14</sup> According to both the NASBO and NCSL-B measures, states legislated increases in tax revenues on net every year between 1988 and 1994. Yet, the value of *Tax Burden* in 1994 was about the same as it was in 1988. States legislated lower taxes on net every year from 1996 to 2001. However, except for fiscal year 2001, there is little evidence of these tax cuts in the corresponding *Tax Burden* series. Clearly, *Tax Burden* does not track changes in state tax policies.

#### 4. THEORETICAL ANALYSIS OF THE RELATIONSHIP BETWEEN TAX BURDEN AND STATE TAX POLICY

##### 4.1. THE DECOMPOSITION OF *TAX BURDEN*

This section models the relationship between *Tax Burden* and state tax policy in order to clarify how these are empirically linked. Following the literature, the relationship between a state's tax revenues ( $R$ ) and its income ( $Y$ ) is approximated with a linear revenue function<sup>15</sup>:

$$R_{st} = \beta_{0,st} + \beta_{1,st} Y_{s,t-1} + \varepsilon_{st}^R, \quad (2)$$

where  $\varepsilon_{st}^R$  is a mean-zero error term assumed to be uncorrelated with state income. Thus, tax policy for state  $s$  at time  $t$  can be characterized by the pair  $(\beta_{0,st}, \beta_{1,st})$ , where  $\beta_{1,st}$  is the state's effective marginal tax rate on income at time  $t$ .

A "true" measure of the revenue change caused by a change in state tax policy parameters  $(\beta_{0,st}, \beta_{1,st})$  in fiscal year  $t$ , which shows up in fiscal year  $t+1$  revenues, should hold income constant. This can be specified as follows,

$$\Delta Taxes_{st}^{True} = \Delta Taxes_{st} |_{Y} = \Delta \beta_{0,st} + \Delta \beta_{1,st} \cdot Y_{s,t-1}, \quad (3)$$

where  $\Delta\beta_{0,st}$  is the component of tax changes that does not change with a state's income, and  $(\Delta\beta_{1,st} \cdot Y_{s,t-1})$  is the component of tax changes that are affected by a state's income.

Let us consider measuring the change in state tax policy by the change in *Tax Burden*,

$$\Delta TaxBurden_{st} = TaxBurden_{s,t+1} - TaxBurden_{st} = \frac{R_{s,t+1}}{Y_{st}} - \frac{R_{st}}{Y_{s,t-1}}. \quad (4)$$

Substituting Equation (2) into Equation (4), the relationship can be expressed as,

$$\Delta TaxBurden_{st} = \Delta\beta_{1,st} + \left( \frac{\beta_{0,st+1}}{Y_{st}} - \frac{\beta_{0,st}}{Y_{s,t-1}} \right) + \left( \frac{\varepsilon_{s,t+1}^R}{Y_{st}} - \frac{\varepsilon_{st}^R}{Y_{s,t-1}} \right). \quad (5)$$

Equation (5) makes clear that changes in state income ( $Y_{s,t}, Y_{s,t-1}$ ) cause changes in *Tax Burden* even when there is no corresponding change in state tax policy parameters ( $\beta_{0,st} = \beta_{0,st+1}, \Delta\beta_{1,st} = 0$ ).<sup>16</sup> As we shall subsequently demonstrate, this is not the only problem associated with using *Tax Burden* to measure the impact of changes in tax policy.

Substituting Equation (3) into (5) yields the following:

$$\Delta TaxBurden_{st} = \frac{\Delta Taxes_{st}^{True}}{Y_{s,t-1}} + \beta_{0,st+1} \left( \frac{Y_{s,t-1} - Y_{st}}{Y_{s,t-1} Y_{st}} \right) + \eta_{st}, \quad (6)$$

where  $\eta_{st} = \left( \frac{\varepsilon_{s,t+1}^R}{Y_{st}} - \frac{\varepsilon_{st}^R}{Y_{s,t-1}} \right)$ ,  $E(\eta_{st}) = 0$ , and  $\eta_{st}$  is heteroscedastic and autocorrelated. Note that

the coefficient on  $\frac{\Delta Taxes_{st}^{True}}{Y_{s,t-1}}$ , the variable measuring the true change in state tax policy, is one.

Equation (6) decomposes the change in *Tax Burden* into three components. The first term is the change in *Tax Burden* due to the change in state tax policy. The second term represents the change in *Tax Burden* due to changes in income. The third term is composed of miscellaneous factors that are unrelated to state tax policy. The latter two terms cause *Tax*

Burden to mismeasure state tax policy. Estimation of Equation (6) would provide an indication of the extent of this measurement error. Unfortunately the policy variable  $\Delta Taxes_{st}^{True}$  is unobserved.

In the remainder of this section, we devise a strategy for overcoming this problem, allowing us to estimate the components of the *Tax Burden* variable as a function of observable variables. Our key insight consists of identifying the relationship between  $\Delta Taxes_{st}^{True}$  and the state revenue forecasts collected by NASBO and NCSL. A complication that we need to address is that these latter revenue forecasts incorporate changes in income, whereas  $\Delta Taxes_{st}^{True}$  consists of income-constant revenue changes.

#### 4.2. A CONSISTENT ESTIMATOR OF TAX POLICY BASED ON STATE REVENUE FORECASTS

Let the variable  $\Delta Taxes_{st}^{Forecast}$  represent the NASBO/NCSL-collected forecasts of the revenue change at time  $t+1$  attributed to a tax policy change at time  $t$ . In the context of the model above,

$$\Delta Taxes_{st}^{Forecast} = \Delta\beta_{0,st} + (\Delta\beta_{1,st} \cdot Y_{st}^F), \quad (7)$$

where  $\Delta\beta_{0,st}$  is the component of tax changes that does not change with a state's income<sup>17</sup>,  $Y_{st}^F$  is the forecasted value of state income for the next year, and  $(\Delta\beta_{1,st} \cdot Y_{st}^F)$  is the component of tax changes that are affected by a state's income.<sup>18</sup>

We need to make two assumptions in order to express  $\Delta Taxes_{st}^{True}$  as a function of observables. First, we assume that  $\Delta\beta_{0,st} = 0$ . In this case, it follows from Equations (3) and (7) that

$$\frac{\Delta Taxes_{st}^{True}}{Y_{s,t-1}} = \frac{\Delta Taxes_{st}^{Forecast}}{Y_{st}^F}. \quad (8)$$

Note that previous studies estimating marginal tax rates assume both (i)  $\Delta\beta_{0,st} = 0$  and (ii)  $\Delta\beta_{1,st} = 0$ ; i.e., they assume a linear revenue function that does not vary over time (e.g., Koester and Kormendi, 1989; Becsi, 1996). In comparison, our approach is less restrictive. However, there is an additional reason to support the assumption that  $\Delta\beta_{0,st} = 0$ : As a practical matter, the effect of this assumption is small. The Appendix demonstrates that under reasonable assumptions, the error associated with measuring  $\Delta Taxes_{st}^{True}$  using states' forecasts of tax policy changes when  $\Delta\beta_{0,st} \neq 0$  will generally be less than 5%.

The second assumption we make is that the relationship between the realized and forecasted values of state income is given by

$$Y_{st} = (1 + \varepsilon_{st}^F) Y_{st}^F, \quad (9)$$

where  $\varepsilon_{st}^F$  represents the percentage difference between the income forecast developed by state budgeters and the realized value of state income, and  $E(\varepsilon_{st}^F) = 0$ .<sup>19</sup>

Substituting Equation (9) into Equation (8) produces the following relationship,

$$\frac{\Delta Taxes_{st}^{Forecast}}{Y_{st}} = \frac{\Delta Taxes_{st}^{True}}{Y_{s,t-1}} + \nu_{st}, \quad (10)$$

where  $\nu_{st} = -\frac{\Delta Taxes_{st}^{Forecast}}{Y_{st}} \cdot \varepsilon_{st}^F$ ,  $\nu_{st}$  is heteroscedastic, and  $plim_{T \rightarrow \infty} \left( \sum_{t=1}^T \frac{\nu_{st}}{T} \right) = 0$ . Thus, the ratio of

the observed variables  $\Delta Taxes_{st}^{Forecast}$  and  $Y_{st}$  is a consistent estimate of the change in state tax

policy in the sense that  $\sum_{t=1}^T \frac{\Delta Taxes_{st}^{Forecast}}{Y_{st}} / T$  is arbitrarily close to  $\sum_{t=1}^T \frac{\Delta Taxes_{st}^{True}}{Y_{s,t-1}} / T$  for

sufficiently large  $T$ .<sup>20</sup>

Having shown that the observed variable  $\frac{\Delta Taxes_{st}^{Forecast}}{Y_{st}}$  is a consistent estimator of the unobserved variable  $\frac{\Delta Taxes_{st}^{True}}{Y_{s,t-1}}$ , we can use the former as a proxy in Equation (6), yielding the following estimable regression equation,

$$\Delta Tax Burden_{st} = \alpha_0 + \alpha_1 \cdot \frac{\Delta Taxes_{st}^{Forecast}}{Y_{st}} + \alpha_{2,s} \left( \frac{Y_{s,t-1} - Y_{st}}{Y_{s,t-1} Y_{st}} \right) + \omega_{st}, \quad (11)$$

where  $\alpha_{2,s}$  is a state-specific coefficient estimating  $\beta_{0,s}$ .<sup>21</sup> The estimation is at best suggestive, since  $\frac{\Delta Taxes_{st}^{Forecast}}{Y_{st}}$  measures  $\frac{\Delta Taxes_{st}^{True}}{Y_{s,t-1}}$  with error (cf. Equation [10]).

## 5. ESTIMATING THE RELATIONSHIP BETWEEN THE *TAX BURDEN* VARIABLE AND STATE TAX POLICY

### 5.1. ESTIMATION OF EQUATION (11)

Columns (1) and (2) of TABLE 1 report the results of estimating Equation (11) using the NASBO- and NCSL-collected state revenue forecasts, respectively. The NASBO data consist of 658 annual observations of 47 states over the years 1987-2000.<sup>22</sup> The NCSL data consist of 517 observations of the same 47 states over the years 1987-1997. Coefficients are estimated using OLS with robust standard errors. We use the “White period robust coefficient variance estimator” (Quantitative Micro Software 2004, page 854) to accommodate both arbitrary serial correlation and time-varying variances in the error terms. This is appropriate given the error structure defined by Equation (6) above.

The first explanatory variable in the *NASBO-I* and *NCSL-I* specifications is  $\frac{\Delta TAXES_{st}^{Forecast}}{Y_{st}}$ , which was demonstrated to be a consistent estimator of state tax policy in

Section IV. Both the NASBO and NCSL specifications find that  $\frac{\Delta TAXES_{st}^{Forecast}}{Y_{st}}$  is positively and significantly associated with  $\Delta Tax Burden$ . The  $t$ -values are quite high: 10.00 and 8.77, respectively. This result is consistent with Equation (11) and provides evidence that  $\Delta Tax Burden$  captures, at least in part, the effects of actual state tax policy.

While it is true that both of the estimated coefficients are less than one (0.5872 and 0.5578, respectively), this is not unexpected if  $\frac{\Delta Taxes_{st}^{Forecast}}{Y_{st}}$  measures state tax policy with error, which it certainly does. Recall that the NASBO and NCSL revenue forecasts, which are designed to measure the same thing, are imperfectly correlated (the sample correlation of the two series is 0.777). This is testimony to the difficulty of accurately measuring the revenue impacts of tax legislation. Nevertheless, the empirical results using these two different measures are quite similar, and continue to be so in subsequent specifications reported below.

While Equation (11) predicts that  $\Delta Tax Burden$  will pick up changes in state tax policy, it also predicts that it will reflect the influences of other factors. Of particular interest are the 47 state-specific interaction terms (corresponding to the terms  $\alpha_{2,s} \left( \frac{Y_{s,t-1} - Y_{st}}{Y_{s,t-1} Y_{st}} \right)$  in Equation [11]). These terms reflect the influence that changes in state income – which are not associated with state tax policy -- exert on  $\Delta Tax Burden$ . The empirical question is: Are these non-policy related factors significant determinants of  $\Delta Tax Burden$ ?

Although we do not report the 47 individual coefficient estimates ( $\hat{\alpha}_{2,s}$ 's) due to space constraints, approximately three-fourths of these terms are individually significant at the 5% level. We test the hypothesis that these 47 coefficients are jointly equal to zero. This corresponds to a test that  $Tax Burden$  is unaffected by non-tax policy related movements in state

income. The results are reported at the bottom of Columns (1) and (2). The hypothesis is soundly rejected in both specifications, with  $p$ -values well below 0.1 percent (cf. “Hypothesis Test: State-Specific Interaction Terms”). These results provide empirical evidence that changes in state income induce significant movement in the *Tax Burden* variable, causing the *Tax Burden* variable to change even when there has been no change in state in tax policy.

The results of Columns (1) and (2) also provide suggestive evidence of the influence of other, non-tax policy related factors. Recall that the error term in Equation (11),  $\omega_{st}$ , represents all other factors that can cause *Tax Burden* to mismeasure tax policy. The more important these factors, the larger the error term, and the lower the  $R^2$  of the equation. In fact, both specifications are characterized by low  $R^2$  values: 0.209 and 0.273, respectively. Of course, this is only suggestive since other factors, such as using an imperfect measure for  $\frac{\Delta Taxes_{st}^{True}}{Y_{s,t-1}}$ , would also depress  $R^2$ .

Although the theory of Equation (11) specifies the change in income terms to be interacted with state-specific dummy variables to obtain the terms,  $\alpha_{2,s} \left( \frac{Y_{s,t-1} - Y_{st}}{Y_{s,t-1} Y_{st}} \right)$ ,  $s = 1, 2, \dots, 47$ ; this specification is admittedly unorthodox. It raises concerns that the significance of these terms may be spurious, reflecting the influence of (omitted) state fixed effects. To address this concern, each of the equations in Columns (1) and (2) were respecified. The  $\left( \frac{Y_{s,t-1} - Y_{st}}{Y_{s,t-1} Y_{st}} \right)$  term was included without interactions and, instead, state fixed effects were added separately. The results are reported in Columns (3) and (4) of TABLE 1 as specifications *NASBO-2* and *NCSL-2*.

As a means of comparing these (non-nested) specifications, we employ two model selection criteria. The Akaike Information Criterion (AIC) and the Schwarz Information Criterion (SIC). Lower criterion values represent “better” models. Both the AIC and SIC criteria select the specifications of (1) and (2) over those of (3) and (4), respectively. In other words, the “unorthodox” specifications that arise from the theory are preferred to the more usual, fixed effects specification. This provides corroborating evidence in favor of the theory.

We perform one additional robustness check: FIGURE 5 suggests that *Tax Burden* is characterized by cyclical behavior. Accordingly, we add time fixed effects to the specifications of Columns (1) – (4) and repeat our analysis. The results are reported in Columns (5) – (8) of TABLE 1.<sup>23</sup>

There is some difference of opinion between the AIC and the SIC whether the addition of time fixed effects improves the specifications. The AIC always concludes that time fixed effects improve the specification. In contrast, the SIC finds that only the NASBO specifications are improved by the addition of time fixed effects. As a practical matter, however, our main results are unaffected: (i) the estimated coefficient on the  $\frac{\Delta TAXES_{st}^{Forecast}}{Y_{st}}$  variable is approximately equal to 0.6 across all specifications; (ii) the hypothesis that the state-specific interaction terms have coefficients equal to zero is always soundly rejected; and (iii) the theory-driven specifications are always preferred to the adhoc, state-fixed effects specifications.

## **5.2. THE IMPORTANCE OF NON-TAX POLICY FACTORS AS DETERMINANTS OF THE *TAX BURDEN* VARIABLE**

The preceding analysis finds statistically significant relationships between the *Tax Burden* variable and both (i) tax policy and (ii) non-tax policy variables. However, from a mismeasurement perspective, we really would like to know how much of the movement in *Tax*

*Burden* is due to factors other than state tax policy. This section takes three approaches to answering this question.

The first approach estimates a simple regression model with  $\Delta Tax Burden$  as the dependent variable and  $\frac{\Delta TAXES_{st}^{Forecast}}{Y_{st}}$  as the single explanatory variable. The  $R^2$  from this equation provides an estimate of how much of the variance of  $\Delta Tax Burden$  is due to state tax policy. It follows that  $1 - R^2$  provides an estimate of how much of the variance is due to non-tax policy factors. The results from this analysis are reported in Row (1) of TABLE 2. Approximately 87.1% of the variance of  $\Delta Tax Burden$  cannot be “explained” by the NASBO-measured tax policy variable,  $\frac{\Delta TAXES_{st}^{Forecast}}{Y_{st}}$ , and can correspondingly be attributed to non-tax policy factors. The corresponding value is 84.1% when we use the NCSL-measure of state tax policy.

One problem with this simple approach is that the estimate of the effect of tax policy may be biased by the omission of other variables from the regression equation. Our second approach addresses this problem by employing the *NASBO-3* and *NCSL-3* specifications from TABLE 1, which include a large number of control variables. In order to isolate the effect of tax policy, we use the estimated coefficients from these specifications, fix the other variables in the equation at their sample means, and then obtain predicted values for  $\Delta Tax Burden$ . The variance in these predicted  $\Delta Tax Burden$  values allows us to compute the percent of the total variance in  $\Delta Tax Burden$  that can be attributed to changes in state tax policy. It follows that the remaining variance becomes an estimate of the amount of variation in  $\Delta Tax Burden$  that can be attributed to non-tax policy factors. The results from this analysis are reported in Row (2) of TABLE 2. Based on the NASBO estimates of state tax policy, this approach leads to an estimate that 84.1%

of the variance in  $\Delta Tax Burden$  is due to non-tax policy factors. The corresponding value using the NCSL estimates is 81.8%.

One can also find fault with this second approach. Measurement error in the NASBO and NCSL estimates is expected to cause the estimated coefficient of  $\frac{\Delta TAXES_{st}^{Forecast}}{Y_{st}}$  to be biased towards zero. This would dampen the predicted effect of tax policy on  $\Delta Tax Burden$ , and lead to an underestimation of the portion of  $\Delta Tax Burden$  attributable to state tax policy. We address this problem by imposing the restriction from Equation (6) that the coefficient on the tax policy variable should equal one. Restricted OLS estimation of the *NASBO-3* and *NCSL-3* models produces consistent estimates of the other coefficients in the equation, subject to the restriction being true. These coefficient estimates are then used to generate predicted values of  $\Delta Tax Burden$ , again fixing the other variables in the equation at their mean levels.

Forcing the coefficient on  $\frac{\Delta TAXES_{st}^{Forecast}}{Y_{st}}$  to equal one serves to greatly increase the amount of variation in  $\Delta Tax Burden$  “explained” by state tax policy. Correspondingly, this decreases the amount “explained” by non-tax policy factors. Row (3) of TABLE 2 gives estimates of the latter. Using this third approach, we find that non-tax policy factors “explain” 56.8% of the variance of  $\Delta Tax Burden$  using the NASBO data, and 44.9% of the variance of  $\Delta Tax Burden$  using the NCSL data.

If we take the calculations from this third approach as our preferred estimates, we are still left with the conclusion that a large portion of the movement in the *Tax Burden* variable, roughly half of its variance, is due to factors that are unrelated to state tax policy. This is consistent with the qualitative evidence presented in FIGURES 1 through 5 above.

## 6. CONCLUSION

This paper investigates whether the variable *Tax Burden*, widely used in empirical studies of taxes and economic growth, reliably measures state tax policy. We have some good news: Our findings indicate that changes in *Tax Burden* are positively and significantly related to changes in state tax policy. Unfortunately, we also find evidence of substantial measurement error.

We decompose *Tax Burden* changes into three components: (1) changes in state tax policy, (2) income-induced changes in revenue that do not measure state tax policy, and (3) other factors that do not measure state tax policy. The latter two categories constitute measurement error with respect to measuring state tax policy. Our empirical analysis establishes the quantitative and statistical importance of the second component. In other words, we demonstrate that changes in state income cause the *Tax Burden* variable to change even when there has been no change in policy. This is of particular concern because many studies that attempt to measure the impact of taxes use an income-based dependent variable. Income-generated movement in the *Tax Burden* variable will induce a correlation between *Tax Burden* and the dependent variable that is unrelated to state tax policy.

Lastly, our theoretical framework allows us to estimate the importance of non-tax policy factors as determinants of changes in *Tax Burden*. Our preferred estimates indicate that approximately half of the variance in changes in *Tax Burden* is due to non-tax policy factors. This constitutes a serious concern for those who rely on *Tax Burden* to provide an accurate measure of state tax policy.

Our findings should be of particular interest to researchers and policy-makers interested in measuring the effects of state tax policy. On a positive note, this study demonstrates how state revenue forecasts can be used to construct consistent measures of state tax policy. We believe

that researchers will find these forecast data increasingly attractive as the respective time series lengthen over time.

In the meantime, instrumental variables remain a potentially fruitful way to address measurement error bias in Tax Burden. Statutory tax parameters (e.g., property and sales tax rates, including information on the tax base; income tax rate parameters, including bracket and tax credit data) are obvious candidates for instruments. In addition, researchers may find it useful to pursue alternative methodologies for measuring and estimating tax effects. Representative agent models (e.g. Fisher and Peters 1998) and new, quasi-experimental methods (e.g., Reed and Rogers 2003; Reed and Rogers 2004) are promising avenues for future research.

## APPENDIX

A CALCULATION OF THE ERROR ASSOCIATED WITH MEASURING  $\frac{\Delta Taxes_{st}^{True}}{Y_{s,t-1}}$   
 WITH  $\frac{\Delta Taxes_{st}^{Forecast}}{Y_{st}^F}$  WHEN  $\Delta\beta_{0,st} \neq 0$

We define the error associated with measuring  $\frac{\Delta Taxes_{st}^{True}}{Y_{s,t-1}}$  with  $\frac{\Delta Taxes_{st}^{Forecast}}{Y_{st}^F}$  when  $\Delta\beta_{0,st} \neq 0$

by

$$Error = \frac{\left( \frac{\Delta Taxes_{st}^{Forecast}}{Y_{st}^F} \right) - \frac{\Delta Taxes_{st}^{True}}{Y_{s,t-1}}}{\frac{\Delta Taxes_{st}^{True}}{Y_{s,t-1}}}. \quad (12)$$

Substituting Equations (3) and (7) into (12) yields

$$Error = \frac{\left( \frac{\Delta\beta_{0,st} + \Delta\beta_{1,st} \cdot Y_{st}^F}{Y_{st}^F} \right) - \left( \frac{\Delta\beta_{0,st} + \Delta\beta_{1,st} \cdot Y_{s,t-1}}{Y_{s,t-1}} \right)}{\left( \frac{\Delta\beta_{0,st} + \Delta\beta_{1,st} \cdot Y_{s,t-1}}{Y_{s,t-1}} \right)}. \quad (13)$$

Algebraic manipulation allows us to rewrite (13) as follows,

$$Error = \frac{\Delta\beta_{0,st} \left( \frac{Y_{st}^F}{Y_{st}^F} \right) - \Delta\beta_{0,st}}{\left( \Delta\beta_{0,st} + \Delta\beta_{1,st} \cdot Y_{s,t-1} \right)}. \quad (14)$$

Note that when  $\Delta\beta_{0,st} = 0$ ,  $Error = 0$ .

Define  $k_{st}$  such that

$$\Delta\beta_{0,st} = k_{st} \cdot \left( \Delta\beta_{1,st} Y_{s,t-1} \right). \quad (15)$$

Thus, if  $k_{st} = 1$ , the component of total new taxes that is independent of state income,  $\Delta\beta_{0,st}$ , is equal to the component of total new taxes that is dependent on the value of state income,  $(\Delta\beta_{1,st}Y_{s,t-1})$ .<sup>24</sup> Substituting (15) into (14) and doing some manipulation yields,

$$Error = \frac{-k_{st} \left( I - \frac{Y_{s,t-1}}{Y_{st}^F} \right)}{I + k_{st}}. \quad (16)$$

We now define a new variable,  $g_{st}$ , such that

$$Y_{st}^F = (I + g_{st}) \cdot Y_{s,t-1}. \quad (17)$$

Thus,  $g_{st}$  is the forecasted annual growth rate of Personal Income. Substituting (17) into (16) and performing some algebraic manipulation yields

$$Error = \frac{-k_{st} \left( \frac{g_{st}}{I + g_{st}} \right)}{I + k_{st}}. \quad (18)$$

We are now in a position to estimate the size of the error. The annual growth rate of (nominal) state Personal Income from 1970-2000 is approximately 6 percent. Further, it is unlikely that the changes in total taxes that were independent of income would ever be as large as the portion that is dependent on income. Accordingly, if we substitute “upper bound” values of  $g_{st} = 0.10$  and  $k_{st} = 1$ , we get  $Error = -0.045 = -4.5\%$ . This constitutes the basis for our

claim in the text that “the error associated with measuring  $\frac{\Delta Taxes_{st}^{True}}{Y_{s,t-1}}$  by  $\frac{\Delta Taxes_{st}^{Forecast}}{Y_{st}^F}$  when

$\Delta\beta_{0,st} \neq 0$  will generally be less than 5 percent.”

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\* An earlier draft of this paper was presented at the University of Oklahoma and at the 2003 National Tax Association meetings. We thank the participants at both presentations for their helpful comments. We also are indebted to Kevin Grier, David Merriman, Dan Sutter, and Steve Yamarik for helpful comments and suggestions.

<sup>1</sup> Alternative names for this variable include average tax burden, average state tax rate, effective average state tax rate, and tax share.

<sup>2</sup> Helms (1985) argues that the use of tax burden to measure tax policy presents less severe problems compared with other feasible measures (p. 577).

<sup>3</sup> NASBO estimates are reported in a series entitled *The Fiscal Survey of the States* (1987-2002). The latest estimates are available online at [www.nasbo.org](http://www.nasbo.org).

<sup>4</sup> NCSL estimates are published in *State Budget Actions* (1987-1989), *State Budget and Tax Actions* (1990-1991) and *State Tax Actions* (1992-2002).

<sup>5</sup> For example, in the tax liability method, multi-year tax changes are credited to the fiscal year when the change is scheduled to take effect. Thus, if tax increases are phased in over a three-year period, the tax liability method shows three years of increases, whereas the baseline method only shows changes in the first year. Further, if the legislature decides to extend a tax increase that was previously scheduled to expire, or to postpone a tax decrease that was previously scheduled to take effect, the tax liability method shows no change in taxes, while the baseline measure would show an increase. See *State Tax Actions 1996* for a comparison of the treatment of tax changes under both methods.

<sup>6</sup> See Merriman (2000) for further discussions of the NASBO and NCSL estimates.

<sup>7</sup> The *Tax Burden* variable used for these correlations is defined below. It is based solely on state revenues to make it comparable to the state-level revenue forecasts collected by NASBO and NCSL.

<sup>8</sup> Various hypotheses address why policymakers might want to either over- or under-state expected revenues (Klay 1983; Rodgers and Joyce 1996). These include partisan politics and aversion to revenue shortfalls. In contrast, other researchers argue that the overriding concern of the revenue forecast process is to minimize the costs associated with inaccurate forecasts (Mocan and Azad 1996; Shkurti and Winefordner 1989; Bretschneider et al.

1989). Budget shortfalls cause cuts in program spending while surpluses can be seen as evidence of excessive tax rates or the underfunding of public goods (Feenberg et al. 1989).

<sup>9</sup> Building on Cassidy et al. (1989), Bretschneider and Gorr (1992) find that a complicated mix of partisan politics and fiscal stress factors drive forecast errors in sales tax revenues. In contrast, Mocan and Azad (1995) find no systematic bias in general fund revenues and little evidence of political and institutional influences as a whole. This is perhaps the most econometrically rigorous analysis of state revenue forecast errors. It uses a rich set of forecast variables, including the source of state and federal economic trend forecasts for 20 states from 1986-92, to estimate a cross section, times series model with random effects.

<sup>10</sup> Corroborating this interpretation are the similarities in the NASBO and NCSL estimates (cf. FIGURE I), despite originating from organizations facing different political pressures.

<sup>11</sup> For example *Tax Burden* for 1996 would have tax revenues corresponding to Fiscal Year 1996 (which typically runs from July 1, 1995 through June 30, 1996) divided by Personal Income for calendar year 1995.

<sup>12</sup> The NCSL-TL series is omitted because it is available for only a small number of years. However, as discussed above, it bears close resemblance to the NASBO series. The series only extend to 2001 because this is the most recent year for which *Tax Burden* could be calculated.

<sup>13</sup> Figures representing *Tax Burden* time series for each state may be accessed via the internet at: “<http://faculty-staff.ou.edu/R/Cynthia.Rogers-1/TAX/TAXBURDEN.htm>”.

<sup>14</sup> In FIGURE 5, *Tax Burden* for the U.S. is calculated as the ratio of the sum of state tax revenues for the U.S. over national Personal Income.

<sup>15</sup> See for example Koester and Kormendi (1989) and Mullen and Williams (1994).

<sup>16</sup> If state tax policy stays constant, then Equation (5) becomes 
$$\Delta TaxBurden_{st} = -\beta_{0,st} \left( \frac{\Delta Y_{st}}{Y_{s,t-1} Y_{st}} \right) + \left( \frac{\mathcal{E}_{s,t+1}^R}{Y_{st}} - \frac{\mathcal{E}_{st}^R}{Y_{s,t-1}} \right).$$

Accordingly, if a state’s tax structure is regressive ( $\beta_{0,st} > 0$ ), then an increase in income will cause a decrease in that state’s *Tax Burden*.

<sup>17</sup> Note that the NASBO/NCSL-collected forecasts consist solely of taxes, excluding fees.

<sup>18</sup>  $\Delta Taxes_{st}^{Forecast}$  is the same variable that Poterba (1994) calls “ $\Delta TAXNEXT_{st}$ .”

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<sup>19</sup> Note that the “next” year is  $Y_{st}$ , since the budget forecast is made at the beginning of fiscal year  $t$ , which begins in the calendar year corresponding to  $Y_{s,t-1}$ .

<sup>20</sup> Although  $\frac{\Delta Taxes_{st}^{Forecast}}{Y_{st}}$  and  $\Delta TaxBurden_{st}$  both suffer from measurement error, the nature of the errors are different. The measurement error in the former stems from errors in forecasting next year’s state income ( $\varepsilon_{st}^F$ ). In contrast, the measurement error in  $\Delta TaxBurden_{st}$  is due to changes in income as well as miscellaneous factors that are unrelated to state tax policy. These measurement errors have different consequences to the extent that these other sources of measurement error matter.

<sup>21</sup> The reader may note that the error term in Equation (11) includes the components  $\frac{\varepsilon_{s,t+1}^R}{Y_{st}}$  and  $\frac{\varepsilon_{st}^R}{Y_{s,t-1}}$ , where  $Y_{st}$  and  $Y_{s,t-1}$  also appear as explanatory variables in the second term. However, recall that  $E(\varepsilon_{st}^R) = 0$  and is assumed to be uncorrelated with the income variable.

<sup>22</sup> Alaska, Hawaii, and Wyoming were omitted; the latter because its *Tax Burden* values, like Alaska’s, have been greatly impacted by fluctuations in oil prices and production.

<sup>23</sup> We also estimated specifications that added both state and time fixed effects to the *NASBO-1* and *NCSL-1* models, but these were strictly dominated by the specifications with just time fixed effects.

<sup>24</sup> Strictly speaking this should read, “the component of total new taxes that is dependent on the value of state income *assuming state income stays constant.*”

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**TABLE 1**  
**Estimating the Determinants of Changes in the *Tax Burden* Variable**

	<u>Specification<sup>a</sup></u>			
	<i>NASBO-1</i> (1)	<i>NCSL-1</i> (2)	<i>NASBO-2</i> (3)	<i>NCSL-2</i> (4)
<b>Constant</b>	0.0014 (5.82)	0.0015 (5.23)	-0.0001 (1.79)	-0.0001 (0.97)
$\frac{\Delta TAXES_{st}^{Forecast}}{Y_{st}}$	0.5872 (10.00)	0.5578 (8.77)	0.5693 (9.28)	0.5760 (9.03)
$\left( \frac{Y_{st-1} - Y_{st}}{Y_{st-1} Y_{st}} \right)$	-----	-----	541.37 (7.54)	478.01 (5.71)
<b>State-Specific Effects</b>	Interaction Terms <sup>b</sup>	Interaction Terms <sup>b</sup>	Fixed Effects	Fixed Effects
<b><i>R</i><sup>2</sup></b>	0.209	0.273	0.187	0.244
<b>AIC</b>	-8.6396	-8.7789	-8.6122	-8.7399
<b>SIC</b>	-8.3053	-8.3763	-8.2778	-8.3373
<b>Observations</b>	658	517	658	517
<b><u>Hypothesis Test:</u></b> <b>State-Specific Interaction</b> <b>Terms<sup>c</sup></b>	<i>F</i> = 2.211 ( <i>p</i> -value = 0.000)	<i>F</i> = 2.356 ( <i>p</i> -value = 0.000)	----	----

**TABLE 1 (Continued )**  
**Estimating the Determinants of Changes in the *Tax Burden* Variable**

	<u>Specification</u>			
	<i>NASBO-3</i> (5)	<i>NCSL-3</i> (6)	<i>NASBO-4</i> (7)	<i>NCSL-4</i> (8)
<b>Constant</b>	0.0020 (2.32)	0.0029 (3.61)	-0.0000 (0.03)	0.0003 (0.60)
$\frac{\Delta TAXES_{st}^{Forecast}}{Y_{st}}$	0.6061 (9.15)	0.5747 (7.68)	0.6271 (9.62)	0.6158 (7.95)
$\left( \frac{Y_{s,t-1} - Y_{st}}{Y_{s,t-1} Y_{st}} \right)$	----	----	343.47 (3.90)	327.96 (3.47)
<b>State-Specific Effects</b>	Interaction Terms <sup>b</sup>	Interaction Terms <sup>b</sup>	Fixed Effects	Fixed Effects
<b>Time Effects</b>	Fixed Effects	Fixed Effect	Fixed Effects	Fixed Effects
<b>R<sup>2</sup></b>	0.324	0.350	0.314	0.323
<b>AIC</b>	-8.7577	-8.8521	-8.7425	-8.8117
<b>SIC</b>	-8.3347	-8.3673	-8.3195	-8.3269
<b>Observations</b>	658	517	658	517
<b><u>Hypothesis Test:</u></b> <b>State-Specific</b> <b>Interaction Terms<sup>c</sup></b>	<i>F</i> = 1.592 ( <i>p</i> -value = 0.009)	<i>F</i> = 2.310 ( <i>p</i> -value = 0.000)	----	----

NOTES:  $t$ -statistics are reported in parentheses below the estimated coefficients and are based on White period standard errors.

Hypothesis tests use White's heteroscedastic-consistent covariance matrix.

<sup>a</sup> The dependent variable is  $\Delta Tax Burden_{st}$ . The *NASBO-1* and *NCSL-1* specifications are based on Equation (11) in the text, with  $\Delta TAXES_{st}^{Forecast}$  alternatively being measured by the NASBO- and NCSL-collected state revenue forecasts, respectively. The other specifications represent alternative variants or extensions of these original models.

<sup>b</sup> The “state-specific interaction terms” consist of the 47 terms,  $\left( \frac{Y_{s,t-1} - Y_{st}}{Y_{s,t-1} Y_{st}} \right) \times \sum_{i=1}^{47} \alpha_{2,i} D_{st}^i$ , where  $D_{st}^i$  is a dummy variable taking the value 1 for state  $i$  and 0 otherwise.

<sup>c</sup> The associated null hypothesis is  $H_0 : \alpha_{2,1} = \alpha_{2,2} = \dots = \alpha_{2,47} = 0$ .

**TABLE 2**  
**Estimating the Importance of Non-Tax Policy Factors as Determinants of *Tax Burden***

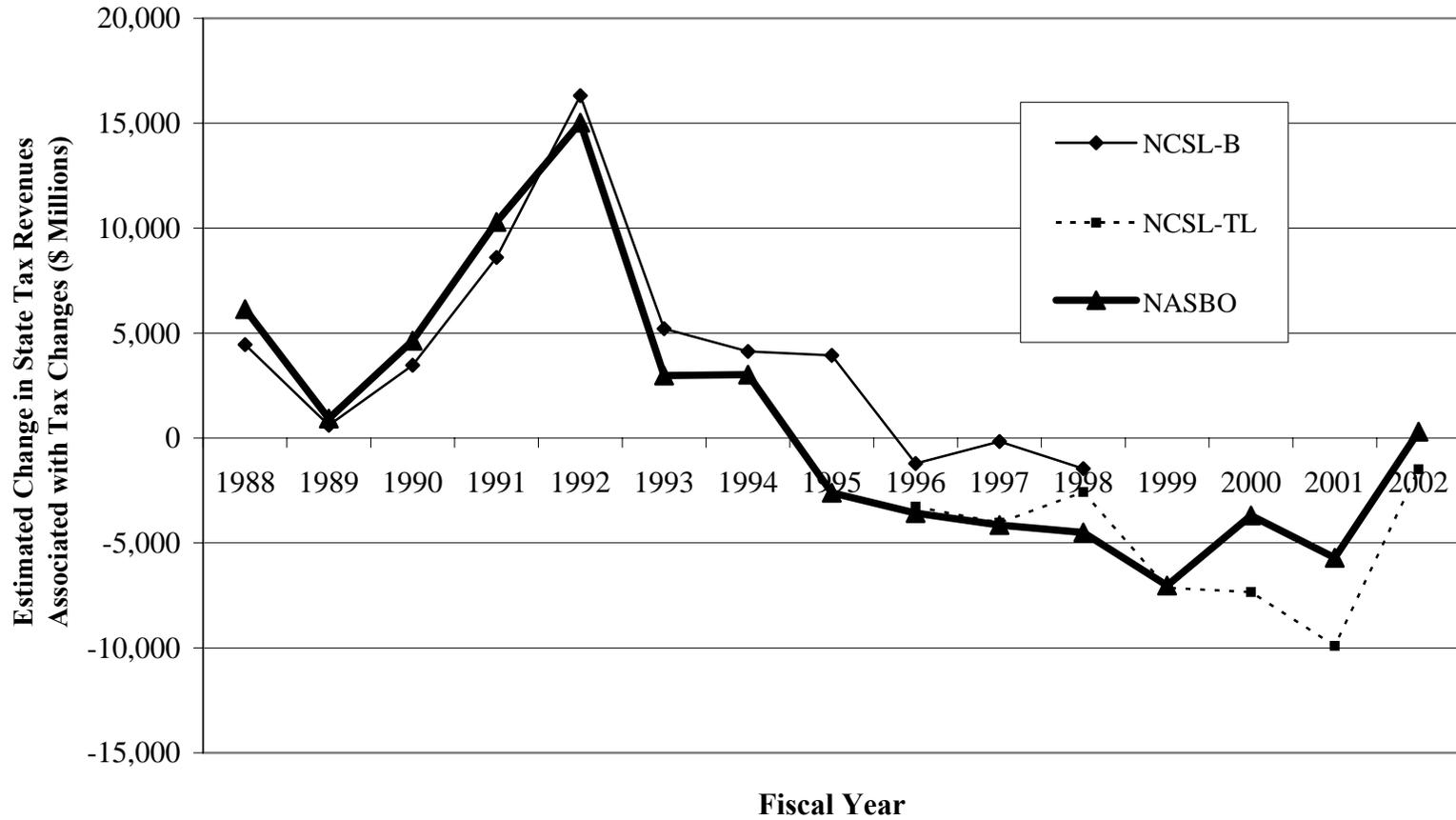
<i>Approach</i>	<i>Description</i>	<i>NASBO</i>	<i>NCSL</i>
<b>1<sup>a</sup></b>	<b>Percent Variance of <math>\Delta Tax Burden</math> “Explained” by Non-Tax Policy Factors (No Control Variables)</b>	87.1%	84.1%
<b>2<sup>b</sup></b>	<b>Percent Variance of <math>\Delta Tax Burden</math> “Explained” by Non-Tax Policy Factors (With Control Variables, <math>\beta \left( \frac{\Delta TAXES_{st}^{Forecast}}{Y_{st}} \right) = \hat{\beta} \left( \frac{\Delta TAXES_{st}^{Forecast}}{Y_{st}} \right)</math>)</b>	84.1%	81.8%
<b>3<sup>c</sup></b>	<b>Percent Variance of <math>\Delta Tax Burden</math> “Explained” by Non-Tax Policy Factors (With Control Variables, <math>\beta \left( \frac{\Delta TAXES_{st}^{Forecast}}{Y_{st}} \right) = 1</math>)</b>	56.8%	44.9%

<sup>a</sup> This approach consists of a simple regression in which  $\Delta Tax Burden$  is regressed on  $\Delta TAXES_{st}^{Forecast} / Y_{st}$ . The “Percent Variance ‘Explained’ by Non-Tax Policy Factors” is  $1 - R^2$  from this regression.

<sup>b</sup> This approach uses the estimated coefficients from the *NASBO-3* and *NCSL-3* specifications of TABLE 1 to construct predicted values for  $\Delta Tax Burden$ . The “Percent Variance ‘Explained’ by Non-Tax Policy Factors” equals 1 minus the ratio of the variance in these predicted values over the total sample variance of  $\Delta Tax Burden$ .

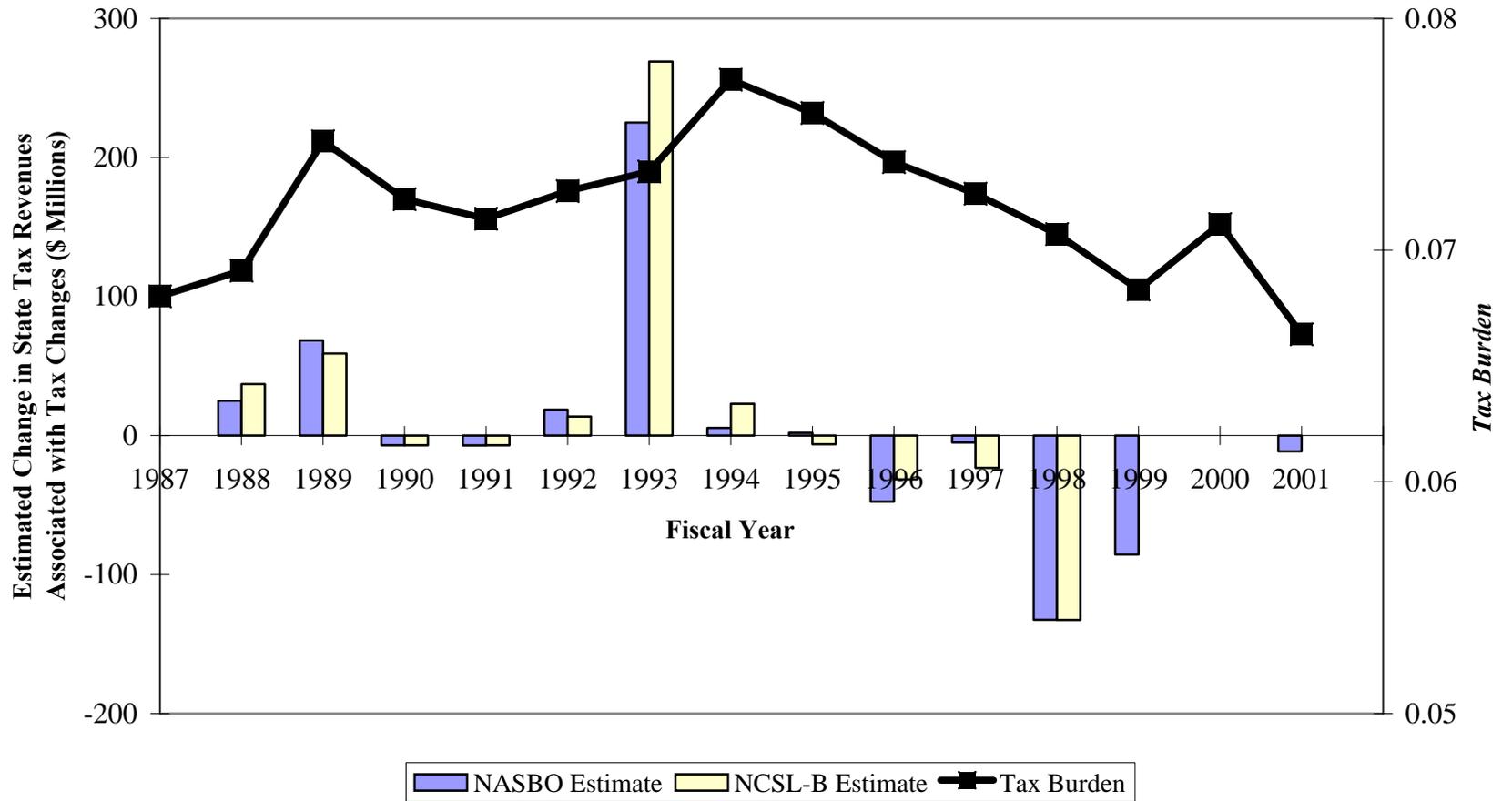
<sup>c</sup> This approach is similar to the previous approach, except that *NASBO-3* and *NCSL-3* specifications are reestimated with the restriction that the coefficient on  $\Delta TAXES_{st}^{Forecast} / Y_{st}$  equals 1. These (restricted) coefficient estimates are then used to construct predicted values for *ΔTax Burden*.

**FIGURE 1**  
**A Comparison of Three Measures of State Tax Policy Changes: NASBO, NCSL-B, and NCSL-TL**



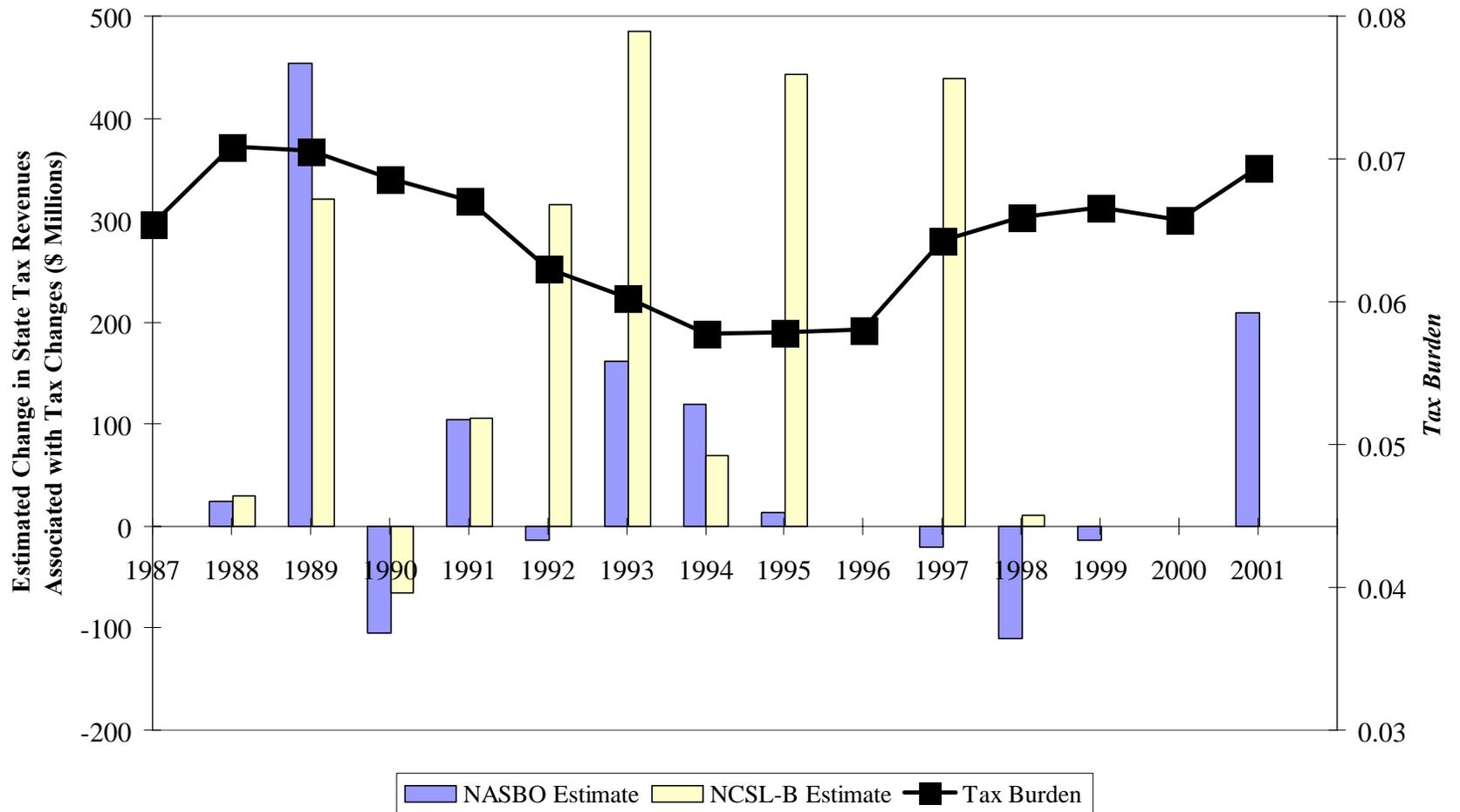
*NOTES:* The figure plots the annual sum of state tax changes as estimated by the NASBO, NCSL-B and NCSL-TL measures. NCSL-B and NCSL-TL refer to NCSL’s “Baseline” and “Tax Liability” measures. The three measures are described in the text. Fiscal year refers to fiscal year when tax changes are estimated to take effect.

**FIGURE 2**  
*Tax Burden Versus Changes in State Tax Policy: Iowa*



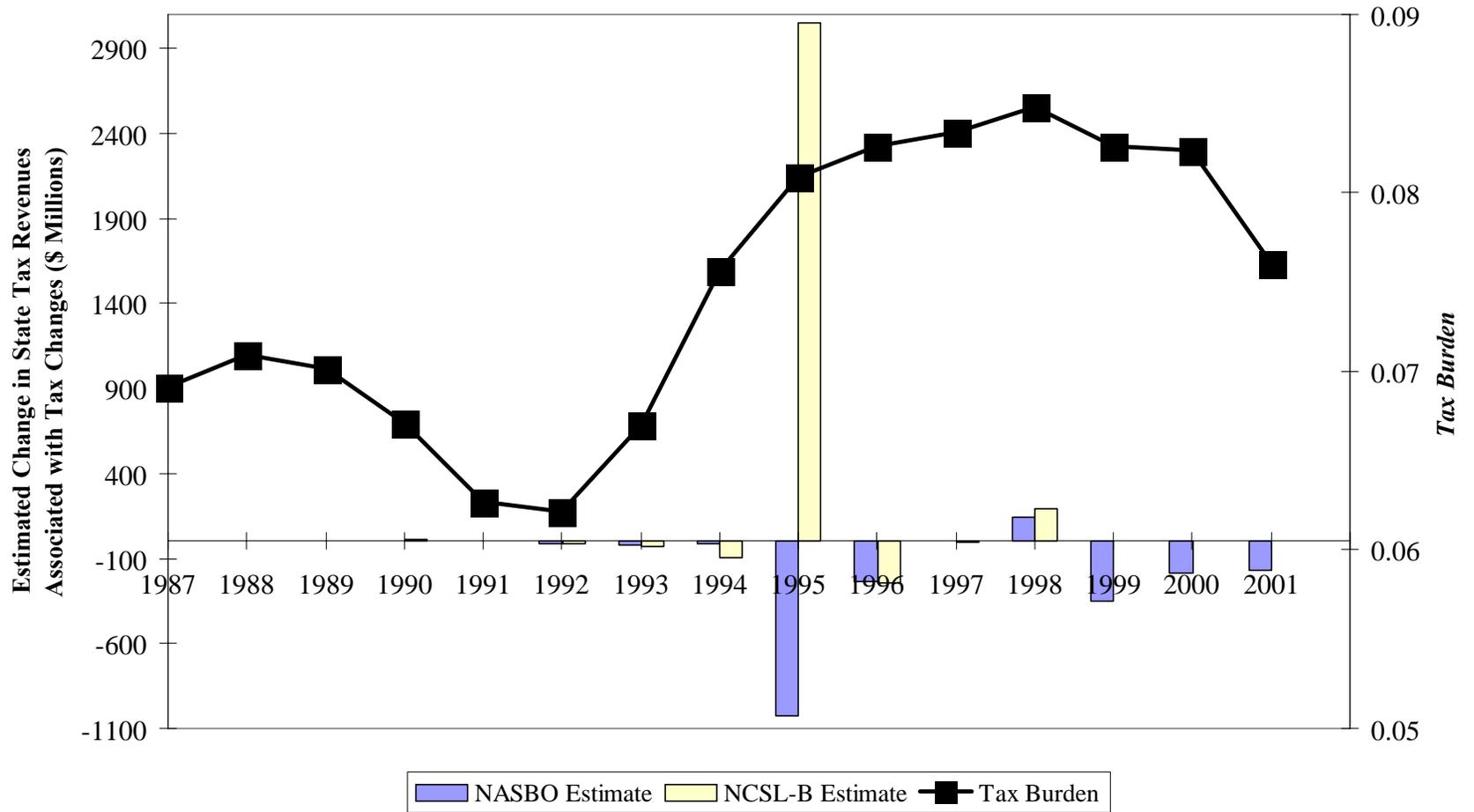
*NOTES:* The NASBO estimates run through 2002, while the NCSL-B estimates only extend through 1998. *Tax Burden* measures the ratio of total state tax revenues over total state Personal Income.

**FIGURE 3**  
***Tax Burden Versus Changes in State Tax Policy: Louisiana***



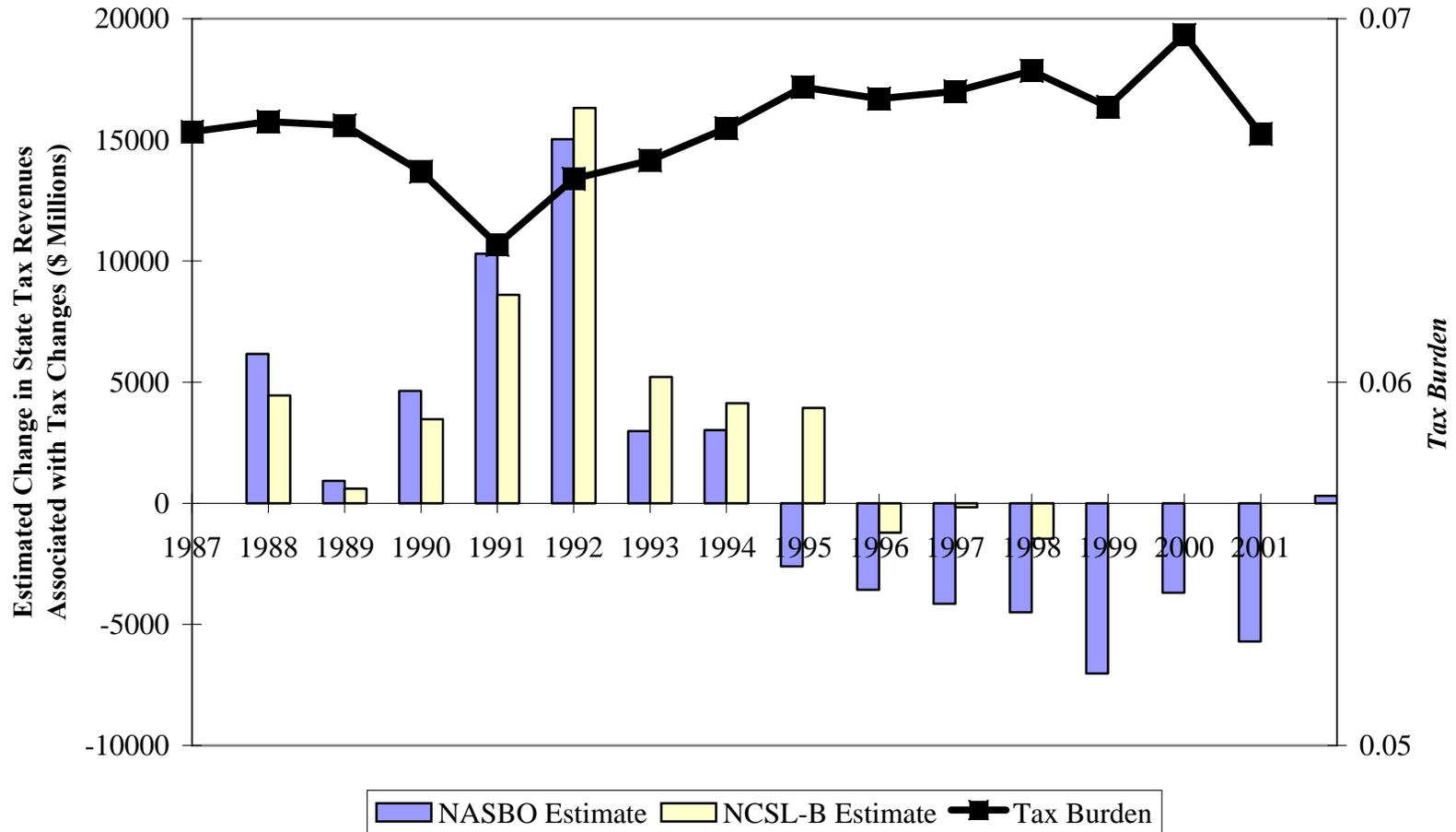
*NOTES:* The NASBO estimates run through 2002, while the NCSL-B estimates only extend through 1998. *Tax Burden* measures the ratio of total state tax revenues over total state Personal Income.

**FIGURE 4**  
***Tax Burden Versus Changes in State Tax Policy: Michigan***



*NOTES:* The NASBO estimates run through 2002, while the NCSL-B estimates only extend through 1998. *Tax Burden* measures the ratio of total state tax revenues over total state Personal Income.

**FIGURE 5**  
*Tax Burden Versus Changes in State Tax Policy: United States*



*NOTES:* The NASBO estimates run through 2002, while the NCSL-B estimates only extend through 1998. *Tax Burden* measures the ratio of total state tax revenues over total state Personal Income