This article reports on research into the possible interest cost penalties when state governments impose increasingly high debt levels on their citizens. The potential effect of debt levels on borrowing costs is a material one, given the large amounts of state debt outstanding. At the same time that government borrowing is heavy, the demand for government obligations also appears to be strong. The authors examine state debt levels and borrowing costs over a six-year period (2001–2006) and find little evidence of such an effect, despite rapidly growing debt burdens. Those concerned about state debt levels, the authors say, must look to sources other than investors for pressure to reduce debt issuance.

In the face of diminished economic circumstances, persistent and unremitting state deficits, and mounting long-term obligations for pension and health care, one might expect state officials to cut back on their issuance of long-term debt or be pilloried in political debate and press reporting. But states have not cut back. Debt is not a hot topic of state-level political debate, and if there is growing press interest in the topic of state obligations, it seems to us to be growing from a very small base. These circumstances make us anticipate little pressure on government officials that might cause them to moderate their ongoing debt issuance.

Markets are less forgiving, however, and we might reasonably expect investors to exact a penalty from states as they stretch to borrow on top of increasingly large levels of debt. If states are reckless in their borrowing levels, we might expect them to face higher interest costs as a result. If these cost penalties exist, those concerned about the ever-expanding amount and burden of state debt could cite these costs in an effort to impose moderation on their governments.

States are reliable payers, and their debt is highly attractive to investors. State service recipients might ultimately be affected by ever-increasing debt service levels as the satisfaction of these obligations squeezes out budget allocations for current services. But legal protections and decades of history suggest that investors in state debt are extremely unlikely to see a disruption in the flow of interest and principal payments. From this perspective, the markets might be agnostic as to debt levels and thus an ineffective source from which to anticipate downward pressure on debt.

This article reports on our examination of the market for signs that investors have imposed penalties on governments that increased their debt loads. We look specifically at the market for state government general obligation bonds and measure the effect of the debt burdens faced by state residents on the cost of borrowing for the period from 2001 to 2006. We find little evidence that state debt levels influenced borrowing costs over the study period.

This article proceeds as follows: We present a brief background on debt and debt burdens and then review the literature on the determinants of municipal bond interest rates. We describe our data and methods before presenting the findings of our analysis. Finally, we conclude with a discussion of the implications of our findings.

**Background**

The outstanding debt of the U.S. Treasury totals approximately $12,044 billion, or about $40,000 for each resident of the United States (U.S. Census Bureau 2010a; U.S. Department of the Treasury 2010). The debt of state and local governments adds an additional $2,551 billion to that total (U.S. Census Bureau 2010a). The rapid growth in this debt has come from the compound effect of persistent annual federal deficits, most recently projected to be about $1.3 trillion in fiscal year 2011 (CBO 2011). There is no consensus about the long-term economic implications of deficit spending, in part because of uncertainty. If economic conditions remain constant, then ongoing deficits imply that citizens receive services today in exchange for some combination of higher taxes and decreased spending at a later date. If economic growth outpaces debt expansion and government spending, then the...
proportional share of government claims on economic output (tax burdens) might not increase. If spending continues to exceed revenue and economic growth, then debt claims an ever-larger share of economic output. State government debts and deferred obligations have reached such levels that a debate has ensued about the potential to repudiate these debts through bankruptcy (Walsh 2011). The concern is that the debts are so large that governments may not be able to manage them and still deliver essential services. Echoing the conclusions of some observers, Walsh (2011) noted that “[a] deeply troubled state could eventually be priced out of the capital markets.”

In fact, it was not uncommon for states to default on their debts prior to the 1930s. In the 1820s and 1830s, states issuing debt for internal improvements, such as railways and canals, began state borrowing as we know it today (Aronson and Hilley 1986). The severe depression of 1837 lasted for several years and resulted in nine states defaulting on their debts in 1841 and 1842, including Florida, Mississippi, Arkansas, Indiana, Illinois, Maryland, Michigan, Pennsylvania, and Louisiana (Ratchford 1941). There was another round of state defaults in the 1870s and 1880s. Nine Southern states repudiated, reduced, and/or adjusted debt payments that had been taken on by carpetbagger governments after the Civil War (Aronson and Hilley 1986). These states were Alabama, Arkansas, Florida, Georgia, Louisiana, North Carolina, South Carolina, and Tennessee (Virginia has a complicated story that lasted until it was finally resolved in 1919) (Ratchford 1941).

State defaults in the 1800s were largely the result of severe economic downturns and political issues. Arkansas was the only state to default on its debts during the Great Depression (in 1932 and 1933). The Arkansas story is the closest to the current state problems because it was attributable, in part, to having too much debt. Arkansas borrowed very heavily for highways, including the assumption of local road district debt, as well as for Confederate pensions (Aronson and Hilley 1986; Ratchford 1941). Ratchford referred to the borrowing for Confederate pensions as happening during an “orgy of borrowing” (1941, 386). Arkansas has the dubious distinction of having defaulted on its debt three times. However, states have been reliable payers of their debt since the 1930s.

Excessive spending or insufficient revenue raising has the potential to cause a crisis of debt as a government extends itself ever more to provide public services. Subnational debt is low relative to the debt of the United States, however, and there is little recent historical evidence of state or local debt leading to dire economic consequences. So why should Americans care about it today?

The answer lies in the magnitude of contemporary debt, in the burdens that debt places on citizens, and in the profound financial, management, and equity implications of these choices. Public borrowing is a deliberate but often invisible process with the potential to impose on society a legacy of more constrained choices. It redistributes resources from person to person, from one place to another, and from the future to the present. Increasing debt has fundamental significance beyond the ability to curb economic growth.

The amount of debt that a state government has outstanding places a burden on citizens because of the costs of the obligations themselves, the cost of borrowing funds, and the degree to which future budget decisions are constrained because of spending to service that debt.

There is no single way to answer the question “how much debt is too much debt?” Public decision makers and debt managers attempt to satisfy many criteria at once when setting debt policies. Ensuring economic and social prosperity is a fundamental function of government, and state and local debt has an important role to play in providing public services. Debt issuance to finance important capital projects that meet a cost–benefit test, for instance, would have a net positive impact on society. The optimal debt burden would be a sum that produced just the right amount of capital infrastructure while minimizing the financial implications for citizens. However, it is difficult to determine the right amount of infrastructure and impossible to finance it without some financial impact.

States borrow money from the credit markets to finance capital projects and to manage cash flow needs. States have various debt issuance mechanisms at their disposal, such as general obligation bonds, certificates of participation, and revenue bonds, among others. We look at whether outstanding debt levels influence state borrowing costs for general obligation bonds. These bonds have the simplest structure and carry a full faith and credit repayment pledge.

**Previous Studies**

Municipal bond interest cost is a function of market conditions and of the specific characteristics of the issue and issuer. There is a long legacy of research testing various hypotheses about the determinants of municipal bond interest rates. Consequently, the body of knowledge about the factors that influence municipal bond costs is well developed, and, as a result, models tend to explain upwards of 75 percent of the variation in interest costs (see, e.g., Benson and Marks 2005; Brucato and Peng 2003; Joehnk and Kidwell 1979; Johnson and Kriz 2005; Robbins 2002; Roden and Bassler 1996; Simonsen, Robbins, and Helgerson 2001).

One recognized measure of a state or local government’s fiscal health and debt management is the bond rating. Ratings analysts base their ratings on information about the issuer’s debt, finances, economic factors, and management (Johnson and Kriz 2005). Those states with the rating AAA are considered to have the least risk of default. Those with lower investment grade ratings are not considered to be poor risks with regard to repayment (municipal bonds default less often than any other security except U.S. Treasury securities) but have, in the opinion of ratings analysts, weaker economic, debt, financial, and managerial conditions relative to their peers.
For our study period, 2001 to 2006, no state government in the United States had a credit rating below A, the upper-medium grade of the municipal bond ratings scale. States rated in the modal category, Aa2, are considered very high-quality credits. Securities from states rated A are suitable for most institutional investors. Standard & Poor’s does not rate any state below A, while Fitch Ratings and Moody’s Investors Service now have California at BBB and Baa1, respectively (these are still investment grade ratings).

Therefore, the amount of debt can influence interest rates directly, or indirectly as a factor in the rating calculation. Denison, Yan, and Zhao (2007) examined the determinants of bond ratings for Texas school districts. Outstanding debt (as a percentage of property value) was not a significant predictor of bond ratings (although this was not their research question). One explanation for this insignificant finding is the substantial equalization of funding across Texas school districts.

Capeci (1991) examined the effect of ratings on local government interest rates. Of particular interest to our study, he found no effect of outstanding debt per capita on local government interest rates, either singly or indirectly through rating (outstanding debt per capita was not a significant predictor of ratings). He did find that ratings had a significant influence on interest rates. Specifically, higher (better) ratings produced lower interest rates. In later work, using data from local government bond issues only from New Jersey, Capeci (1994) found something different: that the amount of borrowing and debt outstanding became significant (and positive) determinants of the dependent variable once instruments were introduced for them using two-stage least squares.

Eaton and Gersovitz (1981) estimated the determinants of the privately held debt of poor sovereign nations. Debt to public institutions was a positive and statistically significant parameter estimate in one of their models. The authors interpreted this as evidence that “[p]rivate lenders may regard a high value of [debt to public institutions] as indicating that public lenders view the country to be generally stable” (1981, 303). Their interpretation suggests that prior outstanding debt might be perceived as a positive recommendation for a government’s future debt issues.

Bayoumi, Goldstein, and Woglom (1995) reported that the opinion of traders about what the magnitude of the risk premium should be is influenced by the ratio of debt to gross state product (in most of the specifications). Studies employing the Chubb data face an insurmountable measurement problem because they use opinion data rather than actual interest costs resulting from actual transactions. As noted by Johnson and Kriz, “The Chubb Relative Value Survey of state tax-exempt bond yields used in previous studies is based on reported traders’ opinion on the relative value of municipal securities. The Chubb data are at best indirectly related to the interest costs faced by municipal borrowers in the primary market” (2005, 85). Interest costs during that time may have been affected by debt levels. We believe it is more likely that the actual behavior of investors and the hypothetical notions of traders simply defer. Traders expecting the market to discipline issuers may impose a heuristic that disfavors issuers with more debt.

Poterba and Rueben (2001) also used Chubb data and found no significant relationship between debt limits and traders estimates of (or opinions about) bond yield differentials, but they found in their change models that increases in state debt outstanding had a significant effect on changes in traders opinions of perceived yield differentials. This presents a view of what traders expect to see in yields. Our study looks at the actual interest rate effects of debt levels.

Benson, Marks, and Raman (1984) analyzed two subsets totaling 245 city bond issues in 1976–79 to identify whether those issued in the 14 states with “stringent” accounting requirements (uniform and standardized reporting) had lower net interest costs. They found higher costs associated with larger amounts of debt and lower costs associated with more debt in cities with stringent accounting.

Marks and Raman (1985) included some state bond sales in their study of 186 state and local sales from 1976 to 1979 and found debt per capita to be a significant determinant of net interest cost (at the 0.10 level of significance), an effect that appeared to act through the ratings.

Liu and Thakor (1984) used bond sale data from 1977 and found no statistically significant effect of debt outstanding on reoffering yields, controlling for ratings, and found significant and negative effects of debt on ratings.

More recently, Johnson and Kriz (2005) examined the influence of state fiscal institutions on the cost of state debt. They found that revenue limits were directly associated with higher interest rates. They also found that debt limits, among other limits and rules, were indirectly associated with lower interest rates because of their influence on bond ratings. They found rating to be a significant predictor of interest rates. In addition, these authors found that per capita state full faith and credit debt was a significant predictor of state bond ratings. Full faith and credit debt did not have an effect independent of rating and was not included in their cost models.

The literature reveals broad questions about the effect of debt on borrowing costs. Some evidence appears in conflict, much of the work comes from decades ago, and none looks at the effect of debt

<table>
<thead>
<tr>
<th>Year</th>
<th>New Money Municipal Issuance*</th>
<th>Percent Change</th>
<th>Total Municipal Debt Outstanding*</th>
<th>Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>165.1</td>
<td></td>
<td>1,480.7</td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>197.2</td>
<td>19.44</td>
<td>1,603.4</td>
<td>8.29</td>
</tr>
<tr>
<td>2002</td>
<td>236.9</td>
<td>20.13</td>
<td>1,762.9</td>
<td>9.95</td>
</tr>
<tr>
<td>2003</td>
<td>262.2</td>
<td>10.68</td>
<td>1,900.4</td>
<td>7.80</td>
</tr>
<tr>
<td>2004</td>
<td>229.1</td>
<td>–12.62</td>
<td>2,030.9</td>
<td>6.87</td>
</tr>
<tr>
<td>2005</td>
<td>222.3</td>
<td>–2.97</td>
<td>2,225.9</td>
<td>9.60</td>
</tr>
<tr>
<td>2006</td>
<td>256.0</td>
<td>15.16</td>
<td>2,403.3</td>
<td>7.97</td>
</tr>
<tr>
<td>2007</td>
<td>273.7</td>
<td>6.91</td>
<td>2,618.9</td>
<td>8.97</td>
</tr>
<tr>
<td>2008</td>
<td>208.2</td>
<td>–23.93</td>
<td>2,683.5</td>
<td>2.47</td>
</tr>
<tr>
<td>2009</td>
<td>261.4</td>
<td>25.55</td>
<td>2,811.6</td>
<td>4.77</td>
</tr>
</tbody>
</table>

Percent Change from 2000 to 2009: 89.88

* in Billions.
Municipal Bond Issuance - New Capital and Refunding $ Billions.
and
Holders of U.S. Municipal Securities $ Billions.
levels on the true interest cost of issues. The contribution of this article is to evaluate the full effects of outstanding debt levels on the true interest costs that state governments experience from borrowing in the contemporary market.

**National Trends**
The amount of state and local debt has increased substantially over the last decade. Table 1 reports the municipal new issuance and debt outstanding from 2000 to 2009. State and local governments are issuing new debt faster than they are paying off their old debt. In nominal dollars, the amount of state and local debt has increased about 7.4 percent per year and nearly doubled since 2000.

The press has reported that California is in a debt crisis (McCarthy 2010). Table 2 shows the growth of California debt from 2001 to 2009. In fact, California debt has increased by about 50 percent during this period, but it has grown more slowly than overall state and local debt—a 6.3 percent average annual increase for California compared to 7.3 percent for state and local governments nationally for this period.

Has the market had a negative reaction to the growth of state and local debt? The Bond Buyer, the trade publication that focuses on the municipal bond market, compiles averages of national municipal bond rates. Table 3 shows the trend for municipal market rates as a percentage of Treasury rates from 2000 to 2009. Municipal market rates, as measured by the average yearly bond buyer GO index, tracks closely to Treasury yields throughout most of this period. The exception is the last two years, when Treasury securities were extremely low and municipal bond rates did not fall in response—however, all financial markets were affected in these years by the so-called Great Recession. During these last two years, state and local debt grew the slowest. That there was growth in debt at all is remarkable given the tumultuousness in the market and the demise of municipal bond insurance. In fact, total new money municipal bond issuance fell in 2008 but returned to prior levels in 2009 (SIFMA 2010). In sum, there is little prima facie evidence that governments have paid more for their debt in reaction to increasing debt loads.

In addition, there is little evidence that the market has extracted any interest rate penalties specifically for states issues. State general obligation bonds very are highly rated by the bond rating agencies, with almost all in the AA or AAA ratings categories (U.S. Census Bureau 2010b). Deteriorating finances, not debt load, is the reason cited for Standard & Poor’s placing Illinois general obligation debt on negative credit watch (but still placed an A+ rating on their bonds) (Hinz 2010). A bond rating in the A category is considered in the upper-medium grade category. The same reason—deteriorating finances—was cited for the recent downgrades of California general obligation debt, which now stands at Baa1 from Moody’s Investors Service, BBB from Fitch Ratings, and A− from Standard & Poor’s (California State Treasurer 2010).

**Research Design**
**Research Question and Hypothesis**
Our research question is, does the amount of tax-supported debt influence borrowing costs for state general obligation bonds? We test the following hypothesis:

Hypothesis 1a: States with more accumulated debt outstanding will have higher general obligation bond interest rates, all else being equal.

Our alternate hypothesis is based on the notion that higher levels of outstanding debt will lead to investors demanding higher returns.

**Data**
Data for the analysis of borrowing costs come from the Thompson Financial Services SDC Platinum database of primary market bond sales, Bloomberg, and, in some cases, the official statements of the sales themselves. The target population is primary market general obligation bond sales from the U.S. states sold from 2001 to 2006.

Missing information on the true interest cost (TIC) is common in these data, as are other fields such as amount and years to final maturity. When possible, we have calculated TIC from other sources (such as the Bloomberg data or the official statements themselves). In some cases, we could not find complete data and dropped those
cases from our analysis. From the total of 844 bond sales during this period, we removed 90 for missing data other than TICs. We removed another nine issues for which the amount was not listed or discrepancies about the amount of the sale could not be resolved. The remaining sample of 745 issues contained 145 sales for which TIC was not available and the source material to calculate them ourselves could not be obtained. Removing these from the sample left 600 issues for our analysis. We also removed refunding (re-financing) bonds, a choice that we will explain in the section on endogenous variables.

In this study, we focus on the tax-supported debt of state governments. These debts, particularly general obligations, represent the government burdens with the greatest fiscal impact because they require a government to promise to increase taxes to whatever level is needed to repay them. Outstanding debt includes all balances to be repaid from general tax revenues. This includes not only general obligations but also long-term leases, which require a state government to appropriate funds from the state operating budget in order to pay them. The debt outstanding figures were obtained from Moody’s Investors Service. Data from the U.S. Census Bureau on income, population, age (percentage over 65 years old), and homeownership are also included in our models.

Estimation Methods
We estimate the influence of outstanding debt on interest rates (TIC) using two-stage least squares (2SLS) regression analysis. Many other factors that influence borrowing costs are included in the models as control variables. As mentioned earlier, there is a rich literature on the determinants of municipal bond interest costs. Specifically, our model is as follows:

\[ \text{TIC} = f(\text{outstanding debt per capita, } w, \epsilon) \]

where TIC is the interest rate, true interest cost; outstanding debt per capita is the reported accumulated tax supported debt outstanding (per person) according to Moody’s Investors Service; and \( w \) is a vector of the following independent control variables:

- **Call provision =** Dummy variable, 1 if callable, 0 otherwise
- **Years to call =** Number of years until the first call
- **Competitive sale =** 1 if the bond was sold by competitive sale, 0 if the bond was sold sole source by negotiation
- **Years to maturity =** Bond length or number of years to final bond maturity
- **Amount and Amount2 =** Natural logarithm of the size of the bond in millions of dollars and its square
- **General purpose =** 1 if the bond was sold to fund general government purposes, 0 if the bond was sold for some other purpose
- **Industrial development =** 1 if the bond was sold to fund industrial development purposes, 0 if the bond was sold for some other purpose
- **Alternate minimum tax =** 1 if the bond is subject to the alternate minimum tax, 0 if not
- **Taxable =** 1 if the bond is subject to federal income taxation, 0 if not
- **Bond Buyer GO Index =** The level of market interest rates as measured by the Bond Buyer General Obligation Index (percent)
- **Marginal tax rate =** Highest marginal tax rate by state and year
- **Income per capita =** Resident per capita income
- **Years =** Set of dummy variables for years
- **State =** Series of state dummy variables are used to fix the effects of state-by-state differences (explained more fully later)
- **Year trend =** Counter that increases by 1 for each year to account for linear time trends
- **State * year trend =** Interaction of the state dummy variables and the year trend to account for state specific linear trends

Finally, \( \epsilon \) equals the error unexplained by the model.

We estimate three different 2SLS and ordinary least squares (OLS) models with three different specifications of debt outstanding, for a total of nine models each. The first model does not include state fixed effects or a state and year trend interaction. This is a basic model that uses only the other independent variables to control for other factors that might influence TIC. It is possible that variables other than those included in this basic model might influence interest costs. In particular, every state is unique, and variations across states could result in omitted variable bias. If omitted variables are correlated with both outstanding debt and interest costs, the coefficient for debt outstanding could be biased. To rule out such omitted variable bias, we also estimate models that fix the effects of state specific differences and linear time trends within states.

Specifically, the second model includes the state dummy variables to control for differences between states. In this case, the outstanding debt coefficient can be interpreted as the effect of year-to-year changes in debt levels. The third model includes the state and year trend interaction. This interaction controls for possible state specific time trends. Specifically, we interact a year counter (2001 = 1, 2002 = 2, and so on) with the state dummies. This specification adds controls for changes that might occur within states over the time frame for which we estimate the model. Therefore, in this case, the outstanding debt coefficient can be interpreted as year-to-year changes that vary from the linear trend. Thus, this model controls for unobserved variation that is both specific to each state and to any time trend within each state.

We specify outstanding debt three different ways for each of the foregoing models. First, we specify outstanding debt normalized by population. In addition to this untransformed debt outstanding per capita measure, we also specify it as a natural log and as itself and its square. These two specifications are nonlinear and reflect the likelihood that if more debt influences interest rates, it might be that it increasingly does so at higher debt levels.

We do not include bond ratings or a variable indicating that the bonds were insured in our interest cost models. The amount of debt outstanding is a factor that the ratings agencies use to determine bond ratings. We are interested in the total effect, if any, of debt on interest rates. Ratings would mediate some of the effect of debt on interest rates to the extent that debt is correlated with both ratings and interest rates. That is, if we included ratings in the models, some portion of the effect of debt would be separated and reported as the influence of ratings. Leaving ratings out of the models allows us to measure the total effect of debt outstanding on borrowing
costs without biasing the coefficient for outstanding debt. Insurance is likely to be highly correlated with lower credit quality, as insurance is of limited value for more highly rated bonds. Therefore, we also do not include a variable for insurance. However, it is possible that ratings or insurance would artificially lower the bond interest rate in ways that are not correlated with debt levels. Because they are not correlated, it will not bias the coefficients for our debt variables. We also ran specifications removing insured bonds, with no appreciable change in the results.

Endogenous Variables
A potential source of bias is the possible endogenous relationship between outstanding debt and interest rates. While interest rates might rise because of debt levels, states might also cut back on debt issuance because of increases in interest rates. Municipal bond interest rates generally have fallen and debt issuance has increased, which lends some credence to this reverse causality story.

However, we have some doubts about reverse causality in practice. The amount of debt outstanding represents the accumulated effects of decisions made over 20–30 years about borrowing and retiring debt prior to the observed debt sale. However, it is possible that bias could enter if prior debt levels are correlated with current debt levels. As mentioned earlier, the debt outstanding per capita coefficient in the model that includes the state fixed effects and the state dummy year trend interaction can be interpreted as the year-to-year change from the linear trend. It seems unlikely that state debt managers would know or be able to predict how interest rate changes would affect deviations from their linear trend. Also, we omit the 63 refunding issues from the analysis because decisions to refinance debt are the most likely to be interest rate sensitive.

However, to guard against possible endogeneity, we estimate the models using 2SLS with instruments for outstanding debt per capita and its nonlinear transformations. Our choice of instruments is based on Capeci (1991), who, in turn, based his instruments on the work of Gordon and Slemrod (1986). Those authors found that communities in which people with low marginal tax rates live will prefer debt financing compared to communities in which individuals with high tax rates reside. Capeci used the homeownership rate as a proxy for the number of households that itemize their deductions, a good indicator of residents’ after-tax cost of borrowing. He also used age distribution variables, as the elderly might prefer debt financing if future tax liabilities are not perfectly capitalized into current housing values. We use both homeownership and the percentage over 65 years of age to instrument outstanding debt. Homeownership might also measure the ability to pay (which has an influence on interest rates), so we include income per capita as a control variable (not as an instrument) in the first- and second-stage estimates.

Findings
Table 4 reports the descriptive statistics. There is a wide range of outstanding debt per capita across the states, ranging from $209 to $3,713 per person. State general obligation bonds have lower interest rates than the market generally, which likely reflects their higher ratings on average. The number of observations is relatively evenly split over the years of the sample.

### Table 4 Descriptive Statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>True interest cost (TIC)</td>
<td>4.1191</td>
<td>0.7508</td>
<td>1.3365</td>
<td>7.1183</td>
</tr>
<tr>
<td>Per capita debt outstanding</td>
<td>1.048</td>
<td>717</td>
<td>209</td>
<td>3,713</td>
</tr>
<tr>
<td>Years to call</td>
<td>9.6711</td>
<td>2.9092</td>
<td>1.2220</td>
<td>32.0220</td>
</tr>
<tr>
<td>Callable</td>
<td>0.7561</td>
<td>0.4299</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Competitive sale</td>
<td>0.7356</td>
<td>0.4414</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Years to maturity</td>
<td>17.6694</td>
<td>7.1962</td>
<td>1.2220</td>
<td>41.1100</td>
</tr>
<tr>
<td>Sale amount (in thousands)</td>
<td>175,331</td>
<td>257,299</td>
<td>10</td>
<td>2,083,960</td>
</tr>
<tr>
<td>General purpose</td>
<td>0.6704</td>
<td>0.4705</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Industrial development</td>
<td>0.0019</td>
<td>0.0432</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Alternate minimum tax</td>
<td>0.0335</td>
<td>0.1802</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Taxable</td>
<td>0.1229</td>
<td>0.3286</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Volatility</td>
<td>0.1645</td>
<td>0.4662</td>
<td>0.0000</td>
<td>2.4893</td>
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<tr>
<td>Bond Buyer GO Index</td>
<td>4.7595</td>
<td>0.3414</td>
<td>4.0400</td>
<td>5.8300</td>
</tr>
<tr>
<td>Maximum tax rate</td>
<td>0.0593</td>
<td>0.0319</td>
<td>0.0000</td>
<td>0.1200</td>
</tr>
<tr>
<td>Income per capita</td>
<td>31,676</td>
<td>5,005</td>
<td>22,008</td>
<td>49,852</td>
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<tr>
<td>year2001</td>
<td>0.1639</td>
<td>0.3705</td>
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<tr>
<td>year2002</td>
<td>0.2067</td>
<td>0.4053</td>
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<tr>
<td>year2005</td>
<td>0.1583</td>
<td>0.3654</td>
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</table>

2SLS Estimation
Table 5 reports the results for the 2SLS estimation for the untransformed debt per capita variable. These 2SLS estimations account for the possibility of endogenous variables, using instruments based on the work of Capeci (1991). The model presented in the far right column is our preferred estimation because it (1) corrects for potentially endogenous variables, (2) controls for state specific unobserved variation, and (3) controls for state-specific linear time trends. None of the models results in significant coefficients for per capita debt outstanding. The models have an overall explanatory power of about 77 percent, which is in keeping with the majority of the research about the determinants of TIC. As the descriptive statistics suggest, the models indicate that state TICs run 84 percent to 92 percent of the overall market rate, as measured by the Bond Buyer Index.

Table 6 reports the results for the transformed per capita debt outstanding variables (the coefficients for the untransformed variable are shown for comparison purposes). In the interest of space, the results for the control variables are not shown. In no specification are the debt measures significantly related to interest costs.

### Table 5 2SLS Estimation Results

<table>
<thead>
<tr>
<th>Year</th>
<th>TIC</th>
<th>t-Statistic</th>
<th>p-Value</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>4.1191</td>
<td>0.7508</td>
<td>1.3365</td>
<td>7.1183</td>
</tr>
<tr>
<td>2002</td>
<td>1.048</td>
<td>717</td>
<td>209</td>
<td>3,713</td>
</tr>
<tr>
<td>2003</td>
<td>9.6711</td>
<td>2.9092</td>
<td>1.2220</td>
<td>32.0220</td>
</tr>
<tr>
<td>2004</td>
<td>0.7561</td>
<td>0.4299</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>2005</td>
<td>0.7356</td>
<td>0.4414</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

### Table 6 OLS Estimation Results

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<tr>
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<th>p-Value</th>
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</table>

Findings
Table 4 reports the descriptive statistics. There is a wide range of outstanding debt per capita across the states, ranging from $209 to $3,713 per person. State general obligation bonds have lower interest rates than the market generally, which likely reflects their higher ratings on average. The number of observations is relatively evenly split over the years of the sample.
Discussion

We have explored the potential relationship between state debt and interest rates and find little evidence that states pay an interest cost penalty as their outstanding debt mounts. Municipal bond interest rates have remained a relatively constant percentage of U.S. Treasury securities, with the exception of 2008 and 2009, when all of the financial markets had difficulties (this period is excluded from our sample). Municipal debt has increased unabated throughout the decade, and states have maintained nearly uniformly high bond ratings. Our empirical test, using state data from 2001 to 2006, does not indicate that the market extracted a penalty for increasing debt loads.

We should not be surprised, then, that state debt has grown unabated. Without market pressures that would lead politicians and debt managers to moderate their propensity to borrow, decision makers are free to isolate their debate to the political and social merits of the proposed project purposes.

Recent history suggests that states borrow for many purposes other than capital needs. For example, states have borrowed against future revenue streams, such as lotteries or tobacco settlements, to balance their budgets. Further, states borrow to finance unfunded pension benefits—which often turns out to be more costly than simply putting the money aside annually. According to the Center for State and Local Government Excellence, “Only those [pension] bonds issued a very long time ago and those issued during dramatic stock market downturns have produced a positive return; all others are in the red” (Munnell et al. 2010, 6).

States borrow in ways other than selling municipal debt. Underfunding pension liabilities and other postemployment benefits is another means of borrowing. Accounting rules about revealing other postemployment benefits liabilities are new. These debts to future retirees can far exceed a state’s municipal debt. For instance, according to Walsh (2010), California’s municipal debt totals 8 percent of its gross state product, but including its shortfall in retirement obligations, the debt grows to 37 percent of gross state product. Still, demand for historically safe and reliable government debt obligations has continued unabated.

There might be a threshold at which the markets do extract an interest rate penalty—states just might not have not reached it yet. Walsh (2010) makes the case that some states are
showing the same debt overload warning signs that led to Greece’s difficulties in the financial markets. In particular, she mentions states’ use of derivatives and budget and accounting gimmicks to mask budget deficits. In the meantime, as long as there is sufficient investor demand for state government obligations, there will not be punitive rates.

Acknowledgments
This research was supported in part by the Public Policy Institute of California. The authors would like to thank Bob Bifulco, Eric Brunner and Ellen Hanak for their comments at various stages of this project.

Notes
1. New York City in 1975 is the exception, a case in which ongoing borrowing to finance daily operations is widely believed to have precipitated the city’s fiscal decline and bond defaults (see, e.g., Shefter 1992).
2. We use White’s (1980) corrected standard errors for our significance tests—specifically, we employ robust cluster standard error correction, with each state representing a cluster.
3. These instruments pass various over-, weak-, and under-identification tests.
4. The quadratic specification means that the functional form changes sign, in this case from negative to positive. The highest observed debt outstanding per capita is $3,713 per person. The coefficients of the significant quadratic variables suggest that the effect on TIC does not turn positive and create an interest rate penalty until about $4,300 per person—significantly out of the sample.

References