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INDIRECT AND DIRECT SUBSIDIES FOR THE COST OF GOVERNMENT CAPITAL: COMPARING TAX-EXEMPT BONDS AND BUILD AMERICA BONDS

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Using data from the California primary market, we find that on average Build America Bonds (BABs) have after-subsidy interest rates approximately 72 basis points lower than tax-exempt bonds, and the savings increase with bond maturity. The implied tax rate for the marginal municipal bond investor is 25 percent, which is also the neutral subsidy rate at which municipal bond issuers are indifferent between issuing tax-exempt bonds and BABs. Analysis of paired tax-exempt bonds and BABs issued by the same issuers on the same dates suggests a comparable implied tax rate and net after-subsidy savings of about 65 basis points.

Keywords: municipal bonds, Build America Bonds, federal subsidy, implied tax rate

JEL Codes: G28, H20, H74

I. INTRODUCTION

The exemption on tax-exempt bonds is a significant subsidy provided by the federal government that the Office of Management and Budget (2009) estimated to be worth $27 billion in 2009. The tax exemption on municipal bonds has been in place since the federal income tax was first levied in 1913 and has changed little except for the elimination of the subsidy for private purpose bonds under the Tax Reform Act 1986 and recent experimentation with a direct subsidy program called Build America Bonds (BABs).

BABs were created by the American Recovery and Reinvestment Act of 2009 (ARRA) as a new form of municipal bonds designed to stimulate state and local government capital investment. BABs utilize direct subsidies to local governments, a departure from the traditional indirect interest subsidy provided to tax-exempt municipal bonds. Unlike traditional tax-exempt bonds, the interest income from BABs is taxable to bond holders, but BAB issuers receive a direct subsidy from the federal government. Tax-exempt bonds are advantageous to investors in high tax brackets, while BABs are more attractive to investors who do not pay federal income taxes (e.g., foreign investors and pension funds) or pay federal income tax at low rates.

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This paper compares empirically the indirect interest subsidy offered through a reduction in the True Interest Cost (TIC) on traditional municipal bonds to the direct subsidy provided under BABs. Using a sample of bonds issued in the California primary market, we find that on average BABs have after-tax interest rates about 72 basis points[1] (bps) lower than tax-exempt bonds. The neutral subsidy rate is 25 percent, which is the rate where municipal bond issuers in California are indifferent between issuing tax-exempt bonds and BABs. An analysis of a subsample of paired BABs and tax-exempt bonds issued by the same issuers on the same dates circumvents some potential endogeneity bias and suggests an implied tax rate approximately the same as that in the full sample. The analysis using the subsample reveals cost savings of about 65 bps. The associated neutral subsidy rate (or implied tax rate) is much lower than the original federal subsidy rate of 35 percent, which was intentionally generous to encourage participation in the BABs program (U.S. Department of the Treasury, 2011). Our findings imply room to lower the federal subsidy rate of any future direct subsidy municipal bond programs.

The paper proceeds as follows. Section II provides background information on BABs and a theoretical discussion of the BAB program's costs and benefits to different stakeholders. Section III reviews the related literature on BABs. Section IV describes the data and the empirical model, and is followed by the presentation of the results in Section V. The final section discusses policy implications and offers concluding remarks.

II. BACKGROUND

A two-year experiment, the BAB program started in April 2009 and expired at the end of 2010. However, proposals have been considered to make the program permanent. The interest on BABs is subject to federal income tax, but the federal government subsidizes local governments by reimbursing part of their interest costs. The local government issuer of a BAB files a form with the Treasury for each semiannual interest payment. The original subsidy rate was especially generous at 35 percent but will likely be lowered if the BAB program is reinstated.

The BAB program aims to promote market demand for municipal securities by directly subsidizing bonds issuers and attracting investors in lower tax rate brackets. For the marginal investor who is indifferent between investing in a BAB and a similar tax-exempt bond, the after-tax return rate of the BAB should equal the interest rate of a comparable tax-exempt bond, such that[2]

$$(1) \quad r_{bab}(1-\tau) = R_e,$$

where r_{bab} is the before-tax interest rate of the BAB, τ represents the federal income tax rate for the marginal BAB investor, and R_e refers to the interest rate of tax-exempt bonds.

[1] A basis point is 1/100 of a percent; thus, 72 basis points is equal to 0.72 percentage points.

[2] This standard equation is based on Fama (1977) and Miller (1977) and is well supported by empirical findings on short-term yields. However, it is documented that the formula does not hold for the yield comparison between long-term tax-exempt bonds and taxable bonds such as Treasury and corporate bonds (Green 1993; Chalmers 1998; Chalmers 2006). Yet this "muni puzzle," discussed further below, has not been observed when using taxable municipal bonds as the benchmark.

Equation (1) demonstrates the relationship between the tax-exempt yield and the taxable yield on an otherwise equivalent bond. Whether an individual investor would invest in BABs or traditional tax-exempt bonds depends on the individual tax rate relative to the implicit tax rate. Investors with a federal income tax rate higher than τ will prefer traditional tax-exempt bonds, since the after-tax return is higher than on BABs. Governments, pension funds, investors in tax-advantaged accounts such as Individual Retirement Accounts, foreigners, and others in relatively low tax brackets (less than τ) will prefer BABs. Thus, BABs create demand for municipal bonds from investors in low or zero tax brackets. The larger investor pool may drive down the yield rate and reduce the borrowing costs of the bond issue.

The BAB program incurs an out-of-pocket cost for the federal government. As demonstrated below, the direct federal subsidy to BAB issuers is higher than the tax revenue derived from the BAB interest. At the 35 percent subsidy rate, the cost to the federal government for a BAB issue, C_f, equals $(0.35)r_{bab}B$, where B is the aggregate principal amount of BABs. The federal income tax derived from the BAB interest, T_f, depends on the distribution of investors in different tax brackets

$$(2) \quad T_f = \sum_{t_j \leq \tau} b_j r_{bab} t_j,$$

where t_j is the marginal federal income tax rate of investor j, b_j represents the amount of BAB held by investor j, and τ again denotes the implicit federal tax rate of the marginal BAB investor. As noted above, only investors with $t \leq \tau$ would rationally invest in BABs.

Since some BAB investors are in tax brackets less than τ and τ is smaller than the maximum tax rate of 35 percent during the BAB experimental period,

$$(3) \quad T_f < \tau\, r_{bab} B < (0.35) r_{bab} B = C_f.$$

Thus, T_f will be smaller than C_f, and federal tax receipts will not recoup the entire cost of the BAB subsidy.

Whether or not state and local governments will benefit from issuing BABs depends on the relative magnitudes of the subsidy rate and τ, the income tax rate of the marginal investor. Assuming a 35 percent subsidy rate, the after subsidy interest rate for a BAB is $(1 - 0.35)r_{bab}$. As shown in (1), the interest rate of a tax-exempt bond is $(1 - \tau)r_{bab}$. Thus, the benefit of issuing BABs rather than tax-exempt bonds is $(0.35 - \tau)r_{bab}B$ for bonds with the total principal amount of B. All else equal, the BAB would have lower interest costs as long as the direct subsidy rate for BABs is greater than the implicit marginal tax rate on traditional tax-exempt bonds. This relationship is expressed more generally by defining g as the BABs federal subsidy rate. Then the benefit of issuing BABs over tax-exempt bonds is$(g - r)r_{bab}$.

A third perspective to consider in the evaluation of the BAB program is the impact on investors. BABs will redistribute benefits from taxpayers in high tax brackets to those in low tax brackets. The redistribution is illustrated by considering the impact of a government choosing to issue BABs over traditional tax-exempt bonds. Define low (high) tax brackets as the set of income tax brackets with tax rates lower (higher) than

τ. Investors in the high tax brackets receive a benefit if traditional municipal bonds are issued. This benefit occurs because investors are getting the return on tax-exempt bonds when the taxed bond would result in a lower after tax return. On the other hand, investors in the lower tax brackets benefit if a BAB is issued because lower tax rates produce an after tax return that is higher than that of the traditional tax-exempt bond. This redistribution of wealth can be expressed more formally. The benefit of issuing BABs to low tax investors is given by $S_L = (1-\tau)r_{bab}B - \Sigma_{t_j \le \tau} b_j r_{bab} t_j$. Similarly, the benefit of issuing traditional tax-exempt bonds to high tax investors is given by $S_H = \Sigma_{\tau < t_j \le 35\%} b_j r_{bab} t_j - (1-\tau) r_{bab} B$.

Thus, issuing BABs instead of tax-exempt bonds transfers the benefits from investors in high tax brackets to investors in low tax brackets, with the amount equal to $S_H - S_L$. If the two terms are equal, the redistribution is zero-sum. Whether investors receive a net benefit depends on the distribution of the investors at different tax brackets and the marginal tax rate τ.

The above analysis, for simplicity of illustration, assumes that the municipal bond market is a closed system and thus ignores competition between the municipal bond markets and other financial markets, such as the corporate bond and Treasury markets. In reality, when competition with other financial markets does occur, the BAB program may attract investors in low tax brackets from other financial markets if risk-return opportunities are better in BAB markets. Therefore, the BAB program may encourage investment from the private sector or federal securities markets to the municipal bond markets. The impact could be substantial if the BAB program were to replace traditional tax-exempt bonds entirely.

This section has illustrated how the implicit tax rate determines the true cost to the federal government and the benefits to both issuers and investors. Empirical examination of the implicit tax rate will help to determine the true cost of BABs and identify these wealth redistribution effects.

An extensive literature has estimated the implied tax rate for tax-exempt bonds using Treasury or corporate securities as the benchmark, and found that the implied tax rate is substantially lower than theoretically predicted, especially for bonds with longer maturities. This empirical finding is called the "muni puzzle."

Researchers have proposed theories to explain this puzzle. One possible explanation is the substantial differences between the municipal, corporate, and Treasury markets, which differ in systematic default risk, liquidity level, and the pool of investors, etc. These differences make it questionable to attribute the variations in yield rates solely to differences in tax treatment. Hence, it may be less appropriate to use corporate bonds or Treasuries as the benchmark to calculate the implied tax rate for tax-exempt bonds. In contrast, BABs provide a compelling benchmark asset for calculating implied tax rate for tax-exempt bonds. Since BABs and tax-exempt bonds are issued by similar entities for similar purposes and traded in the same market, they are comparable in terms of non-tax factors (Poterba and Verdugo, 2011).

To the best of our knowledge, the only research that has explicitly calculated the implied tax rate for tax-exempt bonds using regular taxable bonds in the municipal market as the benchmark is Atwood (2003), who found an implied tax rate of 33.9 – 35.3 percent. Note that even taxable municipal bonds are not a perfect benchmark because tax-exempt bonds meet the criteria of providing a public benefit and are thus eligible for financial backing with tax revenues. BABs must also meet public benefit criteria and may be supported by tax revenues, making tax treatment the primary distinction between BABs and tax-exempt municipal bonds.

III. STUDIES OF THE BAB PROGRAM

The BAB program altered the incentives in the municipal bond market and has attracted much attention; nevertheless, only a few academic studies have studied BABs. This section will highlight the six papers that are directly related to the current study.

Fisher and Wassmer (2014) investigate the borrowing behavior of state and local governments during the Great Recession. They find that subnational government borrowing increased during this period and the increase is partially attributed to the availability of BABs at that time. They also discover that some states (California, Hawaii, Ohio, Nevada, and Utah) utilized the BAB program proportionately more than others.

Cestau, Green, and Schürhoff (2013) examine secondary market data and report that BABs are no more liquid than traditional tax-exempt bonds. They find evidence of underpricing of BABs among interdealer trades and that the underpricing is a strategic response to the tax subsidy.

Robbins and Simonsen (2010) provide an overview of BABs as an innovative financing mechanism and review the performance of the BAB market in its first nine months. They estimate that the lifetime federal subsidy to BABs issued in 2009 and 2010 will reach $63.8 billion. Furthermore, they reveal that foreign investors have increased their holdings of taxable municipal securities, including BABs.

The U.S. Department of the Treasury (2010) compares BABs to tax-exempt bonds issued by the same entity on the same day. They find that BABs can generate interest savings and that the savings are positively related to years to maturity. The yield curve they construct reveals that BABs lower the yield at issue by 31 bps for a 10-year bond, and by 112 bps for a 30-year bond. They also find that the underwriting costs for issuing BABs decreased over time to a level comparable to that of traditional tax-exempt bonds.

Ang, Bhansali, and Xing (2010) use a nonlinear model to compare BAB yields to hypothetical yields calculated using discount rates that capture the default risk of the bonds. Their national sample of BAB issues indicates a savings of 54 bps from issuing BABs instead of tax-exempt bonds. They also compare the costs of BABs to those of Treasuries and corporate bonds. For tax free investors who are mainly institutions, a BAB issue has a yield of 116 bps higher than that of comparable Treasuries and 88 bps

higher than that of comparable highly rated corporate bonds. However, for individual investors facing the highest individual income tax rate, the after-tax yield rate of BABs is lower than tax-exempt bonds by 54 bps.

Luby (2012) analyzes the efficiency of BABs compared to traditional tax-exempt securities using two representative BAB transactions issued by the State of Ohio in 2010, using a matched pair analysis and a willingness to pay methodology. This methodology was feasible in this case since the state evaluated the anticipated annual bond yields of both BABs and traditional tax-exempt bonds at the time of the sale. He determines that a federal direct subsidy rate of 24 percent is equal to the indirect subsidy of a traditional tax-exempt bond issue.

The current study differs from previous studies in two respects. First, both the U.S. Department of the Treasury (2010) and Ang, Bhansali, and Xing (2010) treat each issue in serial bonds as an individual observation and use data from secondary market trades. The current study examines the True Interest Cost (TIC) of the whole bond series. TIC is the discount rate at which the present value of all interest and principal payments equals the total bond proceeds of a serial bond issue. It takes into the consideration of the time value of money.[3] The 35 percent subsidy payments for BAB issues are not included in the TIC computations and are therefore considered ex post in Table 4. TIC more precisely reflects the issuer's actual borrowing costs because it considers the present value cost of the cash flows associated with all the serial bonds in the entire issue. TIC analysis provides an important comparison to the findings of the studies employing primary market data. Second, in addition to assessing the borrowing cost difference between BABs and traditional tax-exempt bonds, the current study also estimates the implied tax rates for marginal investors in BABs.

IV. EMPIRICAL MODEL

A. Data

This paper focuses on the California (CA) bond market, which is the largest tax-exempt bond and BAB market; according to Robbins and Simonsen (2010), almost one fourth of BABs were issued by CA government entities. Primary market information on long term bonds issued in California between April 1, 2009 and March 31, 2010 was obtained from the California State Treasurer's Office. During this one-year period after the BAB program was introduced, 1,392 bonded securities were issued by government entities in California. Our focus is on the comparison between traditional municipal bonds and BABs with fixed interest rates, so we omit from the sample 119 certificates of participation/leases and 382 notes and commercial papers. We further drop 149 variable-rate bonds, nine Tax Credit Bonds (TCBs), and three Recovery Zone Economic Development Bonds (RZEDBs). The TCBs and RZEDBs face different tax

[3] A calculation called "All-in TIC" incorporates issuance costs, but issuance costs are generally not reported. Our data are traditional TIC computations and do not include issuance costs in the calculation.

and subsidy treatment than BABs, general taxable bonds, or tax-exempt bonds, and including these bonds would complicate the analysis.

The remaining sample of CA bonds used in the study is 730 bonds. In order to assure the accuracy of TIC information from the original dataset, we also calculate the TIC of individual bond issues based on information recorded in the issue's official statement when available from the Municipal Securities Rulemaking Board.[4] Unfortunately, missing information in the original dataset and official statements required that 229 bond issues be dropped, leaving 501 bond issues in our final sample.[5] One minor advantage of using CA bonds is that the bonds are more homogeneous in that they are exposed to the same state political, economic, and market factors occurring during the financial crisis.

The 501 bonds in the sample included 74 BABs, 53 of which were issued by an issuer that also issued at least one tax-exempt bond the same day. This subsample of paired BABs and tax-exempt bonds provides a way to control for unobservable characteristics of issuers and circumvent potential selection bias.

B. Methodology

The bond interest rate, measured with the TIC, is modeled as a function of the market interest rate, federal tax treatment, bond attributes, and bond type dummy variables

(4) *TIC = f(market interest rate, federal tax treatment, bond attributes, bond type dummy variables).*

Table 1 provides a discussion of the definitions and the expected signs of variables included in this study. *Bond Buyer Index 20* is used to measure the market interest rate. *Federal tax treatment* is a vector of dummy variables indicating the tax and subsidy treatment status. Bonds in our sample are divided into three groups according to their tax treatment status: tax-exempt, BABs, and general taxable.[6] *Tax-exempt bonds* refer to bonds that have their interest income exempt from the federal income tax and enjoy no tax credit benefit. *BABs* refer to bonds that are subject to federal tax and are subsidized under the BAB program. *General taxable bonds* refer to bonds that are taxable and receive no federal subsidy.

Interest costs are also affected by bond characteristics. A simple comparison of interest costs might reflect only the differences in characteristics. By comparison, regression analysis generates ceteris paribus estimates. Following previous studies on municipal bond interest cost, we include the following variables to capture bond attributes: principal amount (in logarithmic value), years to maturity (in logarithmic value), refunding, call-

[4] See http://www.msrb.org.

[5] We conducted a logistic regression using the missing dummy variable as the dependent variable and all explanatory variables in the original regression as the independent variables. The results suggest that most variables, including the tax treatment variables, have no impact on whether an observation is missing or not.

[6] Our sample excludes TCB, RZEDB, and contains no Alternative Minimum Tax (AMT) bonds. Neither the BABs nor the traditional tax-exempt bonds in our sample are subject to California state income tax.

Table 1
Variable Descriptions and Expected Signs

Variable Name	Description	Expected Sign
1. Dependent variable:		
TIC	The true interest cost before adjusting for the subsidy. It is the internal rate of return of all series of a bond issue and is widely used as a measure of the interest cost to the issuer.	
2. Tax and subsidy status		
BAB	A dummy variable that is coded 1 if a bond is a Build America Bond and 0 otherwise. It is expected to be positive, because BABs are taxable and thus have higher yield rate than the reference group tax-exempt bonds.	+
General taxable	A dummy variable indicating whether the interest income from a bond is subject to federal income tax (excluding Build America Bonds, Tax Credit Bonds and Recovery Zone Economy Development Bonds); it is coded as 1 if the interest of a bond issue is subject to federal income tax and 0 otherwise. Taxable bonds have higher TICs than tax-exempt bonds. Thus this coefficient has a positive sign.	+
3. BBI20		
	The Bond Buyer 20 Index, as reported by the *Bond Buyer* based on the weekly average of market yields of 20 general obligation bonds that mature in 20 years. It is utilized as the measure for the municipal bond market interest rate. The TICs of individual issues change in the same direction as the municipal bond market interest rate. Thus, the coefficient of BBI20 has a positive sign.	+

Table 1 (Continued)
Variable Descriptions and Expected Signs

Variable Name	Description	Expected Sign
4. Bond Issue and Issuer Characteristics		
Competitive	A dummy variable for the method of sale via competitive bid; it is coded as 1 if the issue was sold through competitive bidding and 0 if it was issued via a negotiated sale. The competition among underwriters under the competitive approach is likely to drive down the interest cost. Most empirical studies have found that competitive sales can lower the borrowing cost (Simonson and Robbins, 1996; Simonsen, Robbins and Helgerson, 2001).	–
Top 10 underwriter	A dummy variable coded as 1 if the bond was underwritten by one of the top 10 largest underwriters in the United States (in terms of amount written as reported by *Bond Buyer*) in 2010. It is argued that a prestigious underwriter can lower the interest costs. Thus, its coefficient is expected to be negative, as found in Peng and Brucato (2004) and Daniels and Vijayakumar (2007).	–
Callable	A dummy variable indicating that a bond is callable; it is coded as 1 if the bond is callable and 0 otherwise. A callable option increases risk for investors, who in turn require a higher interest rate. Thus, the sign of the coefficient is expected to be positive.	+
Refunding	A dummy variable. Bonds that are issued for the purpose of refunding previous debt outstanding are coded as 1. Previous studies have found that refunding bonds have a lower interest rate (e.g., Robbins, 2002).	–
Insured	A dummy variable that indicates whether the bond is insured; it is coded as 1 if the bond is insured and 0 otherwise. Bond insurance provides credit enhancement to the insured bond and lowers its credit risk and consequently the interest cost. Therefore, it is expected to have a negative sign.	–

Table 1 (Continued)
Variable Descriptions and Expected Signs

Variable Name	Description	Expected Sign
Ln(principal)	The natural logarithm of the par amount (in $million) of a bond issue. A larger principal amount is expected to lower the TIC of a bond issue, but the relationship is non-linear. Economies of scale will lower the interest cost.	—
Bond rating	A set of dummy variables indicating the underlying credit rating of the bond. They include a BBB dummy, an A dummy, a AA dummy, a AAA dummy, and a dummy for an unrated bond. The reference group is the unrated bond. When a bond has split ratings, the higher bond credit is used. Bonds with a higher credit rating have a lower yield rate.	
Maturity		
ln(years to maturity)	In Model 1, maturity is measured with the natural logarithm of the weighted average life (in years) of all series. Previous studies have found that municipal bonds always have a positive term structure. Thus, a positive sign is expected.	+
Years to maturity dummy variables	In Model 2, the effect of maturity is measured with a set of dummy variables and their interaction terms with BAB program. The dummy variables include: *Dummy_year_5* (years_to_maturity≤7.5), *Dummy_year_10* (7.5<years_to_maturity≤12.5), *Dummy_year_15* (12.5<years_to_maturity≤17.5), *Dummy_year_20* (17.5<years_to_maturity≤22.5), *Dummy_year_25* (22.5<years_to_maturity≤27.5), *Dummy_year_30* (27.5<years_to_maturity≤32.5), *Dummy_year_35* (32.5<years_to_maturity). *Dummy_year_35* serves as the reference group.	
5. Bond Type	A bond type fixed effect is used in the model. The following types by payment sources are included: conduit revenue bond, general obligation bond, limited tax obligation bond, pension obligation bonds, public enterprise revenue bond, public lease revenue bond, revenue bond (Pool), sales tax revenue bond, special assessment bond, tax allocation bond, and other type of bonds.	

able, insured, competitive sale, credit rating, and top ten underwriter. *Principal amount* is expected to have a negative coefficient, as economies of scale can lower borrowing costs. A longer *Years to maturity* increases the interest cost because the yield rate of municipal bonds generally has a term structure with an upward slope. *Competitive sale* is expected to decrease the interest cost of municipal bonds, because competition among underwriters can drive down costs. Peng and Brucato (2004) and Daniels and Vijayakumar (2007) found that prestigious underwriters can lower the interest cost of the bond issue. Thus, the coefficient of *Top ten underwriter* is expected to be negative. *Callable* indicates that the issuer has an option to redeem the bond prior to the maturity date. As result, investors would require a higher interest rate to compensate for uncertainty regarding the timing of reinvestment. Bond insurance can decrease the credit risk of municipal bonds, as the insurer promises to take over the debt payments in the case of issuer default. Therefore, the coefficient of *Insured* is expected to be negative. A *Refunding* bond has been found to have a lower interest cost than non-refunding bonds (Robbins, 2002).

A set of dummy variables is included to control for types of bonds. We employ the original bond categories used by California State Treasurer's Office: conduit revenue bond, general obligation bond, limited tax obligation bond, pension obligation bonds, public enterprise revenue bond, public lease revenue bond, pooled revenue bond, sales tax revenue bond, special assessment bond, tax allocation bond, and other bonds.

An important purpose of the current study is to calculate the implied tax rate of the marginal investor in BABs. From (1), the implied federal income tax rate for the marginal investor is

$$(5) \quad \tau = 1 - R_e / r_{bab}.$$

We use the regression model statistics estimated in (4) to predict the respective TIC for taxable bonds, BABs, and tax-exempt municipal bonds with average characteristics. The predicted TICs are then used to calculate the implied tax rates using (5).[7]

An issue that we need to address is whether bonds with different tax treatments can be pooled in the same regression, as it is unclear how investors evaluate the premium across different types of bonds. For example, if investors in BABs and investors in tax-exempt bonds price credit ratings differently, then credit ratings will have a different impact on BABs than on tax-exempt bonds and bonds with different tax treatment status should not be pooled together. To test the validity of pooling, we conduct a Chow test to examine whether the coefficients estimated over the BAB sample are equal to those estimated over the rest of the full sample. The Chow test results ($F(11, 466)=1.37$, $P=0.17$) suggests that there is no statistically significant difference between the coef-

[7] The implied tax rate is generally viewed as the rate at which the investor is indifferent between investing in a taxable or tax-exempt bond. In this context, the marginal tax rate may be more narrowly interpreted as the switching point for investors who want to hold state and local debt but would prefer to hold it with the highest after tax rate of return.

ficients of the BAB sample and the rest of the sample, justifying the pooling of bonds with different tax treatments into the same regression.[8]

V. ESTIMATION

A. Full Sample

1. Summary Statistics

Table 2 reports descriptive statistics on the variables included in our analysis, by tax and subsidy treatment. Tax-exempt bonds account for approximately 80 percent of the sample (404 issues), BABs account for about 15 percent (74 issues), and general taxable bonds account for about 5 percent (23 issues). Furthermore, all BABs are direct payment BABs, and the sample contains no tax credit bonds. The distribution of bonds by tax and subsidy treatment is similar to the nationwide distribution found by Robbins and Simonsen (2010).[9]

On average the TIC of tax-exempt bonds is 518.3 bps, about 72 percent of that of BABs (714.9 bps), and 70.5 percent of that of taxable bonds (735.1 bps). If the BABs in the sample are comparable (in terms of characteristics such as years to maturity, principal amount, credit quality, etc.) to tax-exempt bonds, the implied tax rate would be 28 percent (l–518.3/714.9) for the marginal investor in BABs. Likewise, the implied tax rate would be 29 percent for the marginal investor in general taxable bonds. After the subsidy, BABs can save issuers 54 bps (518.3–714.9 × 0.65), a savings similar to that found by Ang, Bhansali and Xing (2010). However, as discussed below, the three categories of bond issues differ in many characteristics. Thus, the implied tax rates that are estimated without controlling for the characteristics of bond issues may be biased. Among the three categories by tax treatment and subsidy, BABs have the longest maturity and largest principal amount. On average BABs mature 27.7 years after their issue date, while tax-exempt bonds average 22.9 years to maturity and general taxable bonds have an average maturity of 15.9 years. BABs have an average principal amount of $146 million which is larger than the $51.3 million average for tax-exempt bonds and the $18.4 million average for general taxable bonds.

Since large state and local governments that are experienced and knowledgeable about the municipal market are more likely to participate in BAB issuance, BABs have relatively higher credit ratings than tax-exempt bonds and general taxable bonds (Robbins and Simonsen, 2010). Around 89 percent of the bond issues have at least one underlying credit rating, while the remaining 11 percent are unrated. About 39 percent and 40

[8] In fact, the implied tax rate deduced from the estimations based on individual samples is almost the same as that based on the pooled sample.

[9] They found that roughly 15 percent of new issues were BABs, and another 5 percent were subject to regular federal income tax.

Table 2

Summary Statistics of the Full Sample

	Tax Exempt	BAB	T-statistics ($\mu_{exempt} = \mu_{bab}$)	General Taxable	T-statistics ($\mu_{exempt} = \mu_{taxable}$)	Full Sample
	(N=404)	(N=74)		(N=23)		(N=501)
TIC	5.183 (1.541)	7.149 (0.981)	[–10.581***]	7.351 (2.127)	[–6.412***]	5.573 (1.700)
Principal	5.13e+07 (1.34e+08)	1.46e+08 (2.85e+08)	[–4.500***]	1.84e+07 (2.34e+07)	[1.181]	6.38e+07 (1.66e+08)
Years to maturity	22.926 (9.076)	27.717 (4.609)	[–4.435***]	15.911 (10.075)	[3.584]	23.311 (8.915)
BBI20	4.495 (0.251)	4.431 (0.239)	[2.023**]	4.510 (0.264)	[–0.279]	4.486 (0.251)
Top 10 underwriter (%)	27	46	[–3.357***]	17	[0.989]	29
BBB (%)	3	4	[–0.251]	4	[–0.223]	4
A (%)	41	27	[2.250**]	52	[–1.072]	39
AA (%)	37	61	[–3.907***]	22	[1.471]	40
AAA (%)	6	7	[–0.269]	4	[0.316]	6
Competitive (%)	13	7	[1.443]	0	[1.819*]	11
Insured (%)	27	12	[2.695***]	9	[1.928*]	24
Refunding (%)	30	0	[5.613***]	17	[1.287]	25
Callable (%)	76	69	[1.289]	48	[3.038***]	74

Notes: Standard deviations are reported in parentheses. T-test statistics of the difference between tax-exempt bonds and BABs and the difference between tax-exempt bonds and traditional taxable bonds are reported in squared brackets. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

percent of the bond issues in our sample are rated A and AA, respectively.[10] BABs have significantly better credit quality than other categories, with 77 percent rated AA or AAA. General taxable bonds have the lowest credit ratings among the three categories.

Around 74 percent of the bond issues are callable, and 89 percent are sold through negotiated approach. Twenty-seven percent are insured, and 25 percent are issued to refund previous debt outstanding. Compared to tax-exempt bonds, BABs are less likely to be insured or callable. Only 12 percent of BABs went to the market with insurance, as compared to 27 percent of tax-exempt bonds. Sixty-nine percent of BABs were issued with a call option, lower than the 76 percent for tax-exempt bonds but higher than the 48 percent for general taxable bonds. No BAB is issued for refunding purposes,[11] as compared to 30 percent of tax-exempt bonds and 17 percent of general taxable bonds.

2. Results

Since White's test rejects the homoscedasticity of standard errors (Chi-squared (186) = 387.31), robust standard errors are estimated and reported. The regression results of Model 1 are presented in Table 3. All coefficients on the variables have the expected signs, except for the callable bond variable.

Our focal variables, BABs and general taxable bonds, have the expected positive signs. All else held constant, BABs and general taxable bonds on average have an interest rate approximately 172 and 253 bps higher than tax-exempt bonds, respectively. However, the cost of BABs does not take into consideration the federal subsidy to issuers.

Table 4 presents the implied tax rates associated with BABs and tax-exempt bonds. We first calculate the implied tax rate for BABs using the raw TIC values. As reported on Panel A of Table 4, the implied tax rate is 28 percent for the marginal investor of BABs ($\tau = 1 - R_e / r_{bab} = 1 - (5.183) / (7.149) = 0.28$), and 29 percent for general taxable bonds ($\tau = 1 - R_e / r_{taxable} = 1 - (5.183) / (7.351) = 0.29$).

However, these results do not consider the premia associated with factors other than tax and subsidy treatment and are thus biased. Another set of more sophisticated estimates based on the regression results is reported in Panel B of Table 4.

Based on (4), we estimate the respective TIC for BABs, general taxable bonds, and tax- exempt bonds with average characteristics by setting all variables (except BABs and general taxable dummy variables) at their mean values. The estimated TICs are 7.017 percent, 7.810 percent, and 5.288 percent respectively for BABs, general taxable bonds, and tax-exempt bonds. Thus, the implied tax rate for the marginal investor of BABs is approximately 25 percent ($\tau = 1 - R_e / r_{bab} = 1 - (5.288) / (7.017) = 0.25$). The implied tax rate for the marginal investor of general taxable bonds is about 32 percent ($1 - 5.288 / 7.810 = 0.32$), which is roughly 3 percent

[10] All credit ratings referred in this article include their sub-categories at the notch level. For example, the A dummy category includes bonds rated as A–, A, and A+.

[11] According to the ARRA, the proceeds of BABs cannot be used to refinance outstanding bonds.

Table 3
Regression Results Using the Full Sample

Dependent Variables	TIC Model 1	TIC Model 2
BAB[1]	1.729***	1.145***
	(0.101)	(0.362)
General taxable[1]	2.521***	2.442***
	(0.294)	(0.213)
BBI20	0.732***	0.781***
	(0.150)	(0.172)
ln(principal)	–0.075*	–0.076**
	(0.042)	(0.038)
Top 10 underwriter	–0.163*	–0.177
	(0.094)	(0.111)
A[2]	–0.243	–0.149
	(0.321)	(0.199)
AA[2]	–0.651**	–0.539***
	(0.310)	(0.196)
AAA[2]	–1.354***	–1.342***
	(0.339)	(0.251)
BBB[2]	1.251***	1.348***
	(0.376)	(0.272)
Competitive	–0.580***	–0.617***
	(0.082)	(0.141)
Insured	–0.093	–0.143
	(0.108)	(0.130)
Refunding	–0.344***	–0.291**
	(0.118)	(0.113)
Callable	–0.101	–0.099
	(0.104)	(0.118)
ln(years to maturity)	1.661***	
	(0.144)	
Dummy_year_5[3]		–3.226***
		(0.243)
Dummy_year_10[3]		–2.463***
		(0.221)

Table 3 (continued)
Regression Results Using the Full Sample

Dependent Variables	TIC Model 1	TIC Model 2
Dummy_year_15[3]		–1.721***
		(0.226)
Dummy_year_20[3]		–1.133***
		(0.230)
Dummy_year_25[3]		–0.620***
		(0.189)
Dummy_year_30[3]		–0.599***
		(0.186)
Dummy_year_20×BAB[4]		0.908*
		(0.547)
Dummy_year_25×BAB[4]		0.543
		(0.402)
Dummy_year_30×BAB[4]		0.577
		(0.406)
Constant	–0.898	5.047***
	(0.967)	(1.019)
Observations	501	501
Adjusted R^2	0.7144	0.7108
Bond type fixed effect	Yes	Yes

Notes: The reference group is ≥ 32.5 years × BAB. Robust standard errors are reported in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.
[1] The reference group is tax-exempt bonds.
[2] The reference group is unrated bonds.
[3] The reference group is ≥ 32.5 years.
[4] There is no BAB bond with years to maturity of less than 17.5 years.

lower than the 35 percent tax rate for taxpayers at the highest tax bracket; it is comparable to the implied tax rate found in Atwood (2003).

To determine whether BABs save issuers interest costs, we further compare the actual interest rate of issues (the after-subsidy interest rate) of BABs to that of tax-exempt bonds. The results are also presented in Table 4. Based on the raw value of TIC, BABs have an after-subsidy interest cost of 54 bps lower than that of tax-exempt bonds. After controlling for the differences of other factors by setting all

Table 4

Estimates of Implied Tax Rates and Savings

	TIC (Percent)	Implied Tax Rate (Percent)	After-subsidy TIC	BAB Saving After Subsidy
Panel A (Using Raw TIC)				
Tax exempt	5.183		5.183	
General taxable	7.351	29	7.351	
BAB	7.149	28	4.647	0.536
Panel B (Estimation Based on Model 1)				
Tax exempt	5.288		5.288	
General taxable	7.810	32	7.810	
BAB	7.017	25	4.561	0.727
Panel C (Estimation Based on Model 2)				
Tax exempt	5.12		5.12	
General taxable	7.563	32	7.563	
BAB	6.67	23	4.336	0.784
Panel D (Estimation Based on Paired Sample with Model 3)				
Tax exempt	4.922		4.922	
BAB	6.576	25	4.274	0.647

other variables at their mean value, the estimated savings is even larger, as issuers can save 72.7 bps (528.8 – 701.7 × 0.65) by issuing BABs instead of tax-exempt bonds.

Holding everything else constant, the competitive sale method generates a significant savings of 58 bps. Bonds that are issued to refund prior bond issues are sold at an interest rate of 34.4 bps lower than those that are not sold for refunding purposes. The insurance variable has the expected sign but is statistically insignificant, suggesting that private insurance was unable to lower the interest rate of insured bonds. However, this is not unexpected, as it has been documented that after the subprime crisis, bond insurance was not be able to reduce the issuer's interest cost (Denison 2009; Liu, 2011). The *Callable* variable has an unexpected negative sign but is statistically insignificant.

Most credit rating variables, except "A," are statistically significant. The coefficients of this set of variables indicate that a higher credit rating leads to a lower interest rate.

For example, the AAA dummy variable has a significant coefficient of –1.354, suggesting that on average the interest rate of AAA-rated bonds is 135.4 bps lower than that of the reference group, unrated bonds. On the other hand, bonds rated BBB have to pay an interest rate 125.1 bps higher than unrated bonds. It appears that the average interest rate for unrated bonds lies between A-rated and BBB-rated bonds.

3. Term Structure Analysis

This section presents a term structure analysis to examine whether and how implied tax rates change with the maturity of BABs. As discussed in Section V.A.1, most BABs are at the long end of the term structure, with a minimum years to maturity of about 18 years. Municipal bonds are subject to tax policy risk — the possibility of future change of tax policy or tax rate. This policy risk arises from two sources and may be different for tax-exempt bonds and BABs. First, the government could change the rules, such as repealing the subsidy for BABs, reducing the BAB subsidy rate, or revoking the tax exemption treatment of tax-exempt bonds. For these types of changes, an important issue is whether existing contracts would be grandfathered. Without grandfathering, the issue for the pricing of the bond is how it would change future demand. For example, the recent sequestration has reduced the promised subsidy rate by 8.7 percent in fiscal year 2013 and by 7.2 percent in fiscal year 2014. This change has led to a drop in the BAB price in the secondary market, primarily due to the risk that the BAB may be redeemed prematurely. Yet the effect would not be as substantial as that caused by a change in tax exemption, because the former has little impact on the cash flow of the BAB unless the issuer redeems the bond.

Second, investors face the risk of changes of their tax rate on interest income. For tax-exempt bonds, prices adjust because the value of the exemption relative to market benchmarks changes. The prices of BABs would react to tax changes that affect other taxable bonds. Given the premium required for higher expected tax policy risk for tax-exempt bonds in the long term, it should be anticipated that as years to maturity increases, the cost savings for BABs would increase and the implied tax rate would decrease.

To examine the term structure of interest rates for BABs and tax-exempt bonds, Model 2 is utilized. Model 2 assumes that the yield rate spread between BABs and tax-exempt bonds may depend on maturity. As such, the model interacts years to maturity with the dummy variable for BABs. It also captures bond maturity using a set of dummy variables instead of the logarithmic value of years to maturity as in Model 1. Table 1 lists how the set of dummy variables representing the years to maturity is defined. Since the shortest years to maturity for BABs in the sample is about 17.5 years, there are no interaction terms between the BABs dummy variable and years to maturity variable when the latter is smaller than 17.5 years.

The regression results of Model 2 are presented in Table 3, and the estimates of implied tax rates and cost savings are shown in Table 5. The set of dummy variables representing the years to maturity are all significant and their values rise as maturity lengthens, suggesting a normal yield curve. The interaction terms between the BABs variable and

Table 5

Estimated TIC and Implied Tax Rate for Bonds with Different Maturities in Percent

Maturity	Tax-exempt	BAB	Implied Tax Rate	Saving After Subsidy
<7.5 years	2.969			
7.5–12.5 years	3.732			
12.5–17.5 years	4.474			
17.5–22.5 years	5.062	7.116	29	0.437
22.5–27.5 years	5.575	7.263	23	0.853
27.5–32.5 years	5.596	7.319	24	0.839
≥32.5 years	6.195	7.340	16	1.424

Notes: There is no BAB bond with years to maturity of less than 17.5 years. Estimates are based on Model 2.

the maturity categories are positive but insignificant at the 95 percent confidence level. Notice that the relative small numbers of observations in each maturity category may contribute to the insignificance of the interaction terms.

Table 5 shows that the cost savings, the yield spread between tax-exempt bonds and BABs after subsidy, increases with maturity. For the category of maturity between 17.5 years and 22.5 years, the cost savings is 44 bps, while for the category of maturity longer than 32.5 years, the cost savings increases to 142 bps. Also as expected, the implied tax rate decreases with maturity from 9 percent for maturities between 17.5 and 22.5 years to 16 percent for maturities beyond 32.5 years. This declining trend is consistent with the results of Ang, Bhansali and Xing (2010) and the U.S. Department of the Treasury (2010). This downward slope of the implied tax rate is also consistent with previous empirical findings on implied tax rates using Treasury and corporate securities as the benchmark.

B. Sub-sample of Paired BABs and Tax-exempt Bonds

In this section, we examine whether the results of the proceeding models are subject to endogeneity bias. Although we have controlled for many bond characteristics, it is still possible that issuing BABs or tax-exempt bonds, as an issuer choice, is correlated with some unobserved factors (e.g., issuer-specific characteristics) relegated to the error term, leading to biased estimates. To tackle the potential endogeneity problem, we conduct an analysis based on a sample of paired bonds. By utilizing a fixed-effects model based on a sample of paired bonds sold on the same date, two sources of endogeneity bias are removed. The first is the bias derived from issuer-specific unobserved factors,

for instance, financial management knowledge and skills of issuers. The second is the bias related to unobserved factors specific to issue dates.

In this subsample, BABs and tax-exempt bonds are considered a matched pair if they were issued by the same issuer on the same date. Some issuers might issue more than one tax-exempt bond or BAB on the same date. Thus, the number of tax-exempt bonds is not exactly the same as the number of BABs in the paired sample. This subsample contains 64 tax-exempt bonds and 53 BABs issued by 48 unique issuers. As shown in Table 6, BABs in this sub-sample have significantly larger principal amounts and years to maturity than tax-exempt bonds, as suggested by the paired t-test. Before controlling for other variables, the implied tax rate based on the raw TIC is 34.5 percent, and the interest saving is 39 bps.

In this fixed-effect model, variables that are fixed with the same issuers or the same issue date, such as BBI20, bond rating dummy variables, etc., are suppressed and thus dropped from the regression model. The final model includes variables for principal amount and years to maturity, as well as indicator variables for competitive markets,

Table 6

Summary Statistics of the Sub-Sample of Paired Issues

	Tax-exempt	BAB	T-statistics ($\mu_{exempt} = \mu_{bab}$)	Total
	(N=64)	(N=53)		(N=117)
TIC	4.717 (1.543)	7.197 (0.963)	[10.171***]	5.840 (1.802)
Principal	4.45E+07 (8.03E+07)	8.91E+07 (1.96E+08)	[1.662*]	6.74E+07 (1.46E+08)
Years to maturity	17.230 (26.900)	26.900 (4.143)	[8.211***]	21.610 (7.953)
Competitive	0.047 (0.213)	0.075 (0.2667)	[1.662*]	0.060 (0.238)
Insured (%)	16	15%	[–0.079]	15
Refunding (%)	20	0%	[–3.644***]	11
Callable (%)	66	72%	[0.699]	68

Notes: Standard deviations are reported in parentheses. T-test values of the differences between tax-exempt bonds and BABs are reported in squared brackets. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

insurance, and whether the bond is a refunding issue or is callable. All these variables have the same definition as in Models 1 and 2.

As shown in Table 7, most variables in Model 3 have the expected sign. The insured dummy variable is insignificant. Panel D of Table 4 shows the implied tax rate and cost savings of BABs based on the estimation of Model 3. The estimated implied tax rate is 25 percent, approximately the same as the estimate based on Model 1. The after-subsidy cost savings is about 65 bps, 8 bps smaller than that estimated with Model 1.

Table 7

Fixed Effect Regression Results of the Paired Sample
(Number of Observations: 117)

Variables	TIC Model 3
BAB[1]	1.654*** (0.197)
ln(years to maturity)	1.907*** (0.315)
ln(principal)	–0.295** (0.137)
Insured	0.339 (1.045)
Refunding	–0.155 (0.291)
Callable	0.071 (0.186)
Constant	4.334** (1.860)
Number of issuers	48
R^2: Within	0.8560
Between	0.6076
Overall	0.7703

Notes: The reference group is tax-exempt bonds. Robust standard errors are in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

VI. POLICY IMPLICATIONS AND CONCLUSION

The BAB program has expired, but discussions about reinstating the program are fueling a debate over its merits and drawbacks. Our study has some important policy implications for the debate. First, it provides an estimate for the neutral federal subsidy rate. Our analysis of California bonds indicates that the BAB program currently provides a larger subsidy to local governments than the implicit subsidy obtained through tax-exempt bonds. The implied tax rate we estimate of 25 percent is also the neutral subsidy rate at which bond issuers will be indifferent between issuing tax-exempt bonds and BABs in the current market situation. Our results provide an empirical foundation for the magnitude of the neutral federal subsidy rate and estimate one of the important parameters for evaluating the true federal cost of the program. Second, our study demonstrates the BAB program provided a large financial subsidy to state and local bond issuers. It suggests that at the 35 percent federal subsidy rate, California issuers were able to save an average of 72 bps by issuing BAB instead of tax-exempt bonds. The saving is larger for California bonds than the 54 bps estimated by Ang, Bhansali and Xing (2010). One possible reason for the difference in the cost savings estimates is that Ang, Bhansali and Xing do not control for bond characteristics, such as bond type, sale types, callable option, etc., that we find to affect borrowing costs. The sampling period and the sampling frame may also lead to different estimates.

It should be noted that the implied tax rate and cost savings may change over time as market conditions affect the spread between exempt and taxable municipal bonds. If the program were permanent, the implied tax rate may change in a more mature market from what we observed in the two-year experiment. On the one hand, since in the experimental period the number of BABs issued was modest, there might be a relatively large pool of investors interested in BABs. If this is true, the relative interest rate of BABs will be higher in the future. On the other hand, it is also possible that as investors become more knowledgeable about BABs, market demand will be higher for BABs in the future, leading to a lower cost.

Some analyses in this study are based on the assumption that the federal subsidy policy (e.g., the 35 percent subsidy rate) will not change. However, recent developments in federal tax policy suggest that the subsidy may change. Under the so-called sequestration, the congressionally-mandated across-the-board reduction in federal spending, the subsidy to BAB issuers was reduced by 8.7 percent for part of fiscal 2013 and will be reduced by 7.2 percent in fiscal 2014 (Jagoda, 2014). Given the reduced BAB subsidies, the cost saving in the current study is overestimated. However, the estimated implied tax rate is independent of the subsidy rate. As long as the subsidy rate is higher than the estimated implied tax rate of 25 percent, BAB issuers will still enjoy a cost savings. When designing tax policy for municipal bonds in the future, policy makers need to decide what level of subsidy (if any) is appropriate. The BAB program, with a direct payment to the issuer, permits policy makers to set the subsidy rate at a generous rate (35 percent), a neutral rate (25 percent), or a lower rate. Such direct payments are transparent because they are tracked as a budget line item, and their political cost

is high because BABs will not generate sufficient tax revenue to offset the cost of the direct subsidy. Moreover, the direct subsidy payments of the BABs may be subject to cuts, as occurred in the wake of budget sequestration in 2013. Traditional tax-exempt bonds also are costly in terms of tax revenues that are never collected, and raise equity issues since investors in the top tax brackets benefit the most from buying them. More research needs to be done on BABs to examine their financial implications for the federal government, issuers, and different type of investors.

As with any direct subsidy, it is critical that proper controls are in place to prevent fraud and misuse of the BAB program. Issuers should be required to provide appropriate documentation of approved subsidy payments. Transfers of cash necessitate regular audits and constant oversight. Administrative controls should be in place to insure that interest reimbursement checks are accurate and not duplicated. Fraudulent claims by healthcare providers to the Medicaid and Medicare programs illustrate the potential incentives to abuse cash transfers (Iglehart, 2009). A caveat to setting the subsidy rate too high is that it provides an opportunity for underwriters to extract higher fees that issuers are willing to pay with a portion of the subsidy. The higher the subsidy, the greater the potential for underwriters to charge a higher fee while providing interest savings to issuers. Adequate competition among underwriters and/or proper regulation must be maintained to reduce the temptation for underwriters to inflate issuance fees.

One limitation of our analysis is that bond issuance costs are not directly incorporated into our models. U.S. Department of the Treasury (2011) indicates that underwriting costs were unusually high relative to tax-exempt bond issues during the first months the BAB program, but costs dropped significantly after the first six months of the program and became only slightly higher than those of tax-exempt bonds. On average, the difference between the one-time underwriting fee for a BAB and a tax-exempt bond is about seven bps over the life of the bond (U.S. Department of the Treasury, 2011). Compared to the annual saving of 65–72 bps found in this study, the difference in underwriting cost is so small that it would not change our conclusions significantly.

The direct subsidization of municipal bonds through the BAB program ended for new bond issues on December 31, 2010. Questions raised by this experiment linger and will need to be considered in the debate on whether the BAB program should be reinstated.

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REFERENCES

Ang, Andrew, Vineer Bhansali, and Yuhang Xing, 2010. "Build America Bonds." *Journal of Fixed Income* 20 (1), 67–73.

Atwood, T. J., 2003. "Implicit Taxes: Evidence from Taxable, AMT, and Tax-Exempt State and Local Government Bond Yields." *Journal of the American Taxation Association* 25 (1), 1–20.

Cestau, Dario, Richard C. Green, and Norman Schürhoff, 2013. "Tax-subsidized Underpricing: The Market for Build America Bonds." *Journal of Monetary Economics* 60 (5), 593–608.

Chalmers, John M. R., 1998. "Default Risk Cannot Explain the Muni Puzzle: Evidence from Municipal Bonds that are Secured by U.S. Treasury Obligations." *Review of Financial Studies* 11 (2), 281–308.

Chalmers, John M. R., 2006. "Systematic Risk and the Muni Puzzle." *National Tax Journal* 59 (4), 833–848.

Daniels, Kenneth N., and Jayaraman Vijayakumar, 2007. "Does Underwriter Reputation Matter in the Municipal Bond Market?" *Journal of Economics and Business* 59 (6), 500–519.

Denison, Dwight V., 2009. "What Happens When Municipal Bond Insurance Companies Lose Credit?" *Municipal Finance Journal* 29 (4), 27–47.

Fama, Eugene F., 1977. "A Pricing Model for the Municipal Bond Market." Unpublished manuscript. University of Chicago, Chicago, IL.

Fisher, Ronald C., and Robert W. Wassmer, 2014. "The Issuance of State and Local Debt During the United States Great Recession." *National Tax Journal* 67 (1), 113–150.

Green, Richard C., 1993. "A Simple Model of the Taxable and Tax-exempt Yield Curves." *Review of Financial Studies* 6 (2), 233–264.

Iglehart, John K., 2009. "Finding Money for Health Care Reform — Rooting Out Waste, Fraud, and Abuse." *New England Journal of Medicine* 361 (3), 229–231.

Jagoda, Naomi, 2014. "Congress Passes Another Extension of BABs Sequestration." *Bond Buyer*, Feb.13, http://www.bondbuyer.com/issues/123_31/congress-passes-another-extension-of-babs-sequestration-1059870-1.html.

Liu, Gao, 2011. "The Subprime Crisis, Bond Insurers' Credit Risk, and the Interest Cost of Municipal Bonds." *Municipal Finance Journal* 32 (3), 37–58.

Luby, Martin J., 2012. "Federal Intervention in the Municipal Bond Market: The Effectiveness of the Build America Bond Program and Its Implications on Federal and Subnational Budgeting." *Public Budgeting & Finance* 32 (4), 46–70.

Miller, Merton, 1977. "Debt and Taxes." *Journal of Finance* 32 (2), 261–275.

Office of Management and the Budget, 2009. *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2009*. U.S. Government Printing Office, Washington, DC.

Peng, Jun, and Brucato, Peter F., 2004. "An Empirical Analysis of Market and Institutional Mechanisms for Alleviating Information Asymmetry in the Municipal Bond Market." *Journal of Economics and Finance* 28 (2), 227–239.

Poterba, James M., and Arturo R. Verdugo, 2011. "Portfolio Substitution and the Revenue Cost of the Federal Income Tax Exemption for State and Local Government Bonds." *National Tax Journal* 64 (2), 591–613.

Robbins, Mark D., 2002. "Testing the Effects of Sale Method Restrictions in Municipal Bond Issuance: The Case of New Jersey." *Public Budgeting & Finance* 22 (2), 40–56.

Robbins, Mark D., and William Simonsen, 2010. "Build America Bonds." *Municipal Finance Journal* 30 (4), 53–77.

Simonsen, William, and Mark D. Robbins, 1996. "Does It Make Any Difference Anymore? Competitive versus Negotiated Municipal Bond Issuance." *Public Administration Review* 56 (1), 57–64.

Simonsen, William, Mark D. Robbins, and Lee Helgerson, 2001, "The Influence of Jurisdiction Size and Sale Type on Municipal Bond Interest Rates: An Empirical Analysis." *Public Administration Review* 61 (6), 709–717.

U.S. Department of the Treasury, 2010. "Treasury Analysis of Build America Bonds and Issuer Net Borrowing Costs." U.S. Department of the Treasury, Washington, DC, http://www.treasury.gov/initiatives/recovery/Documents/BABs-Report-4-2-2010-FINAL.pdf.

U.S. Department of the Treasury, 2011. "Treasury Analysis of Build America Bonds Issuance and Savings." U.S. Department of the Treasury, Washington, DC, http://www.treasury.gov/initiatives/recovery/Documents/BABs Report.pdf.