# Municipal Social Bonds: An Analysis of Pricing and Political Leanings

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**Abstract**

Municipal social bonds are debt securities issued by local governments or their agencies to fund projects with positive social impacts. Using fixed-effect regressions and exact matching methods, we find that US municipal social bonds exhibit no significant price differences compared with non-social bonds issued between 2018 and 2023. Democratic Party-leaning states issue more social bonds than Republican Party-leaning states, but no pricing premium or discount is observed in either. The transaction-level data from the secondary market confirms no significant differences between social and non-social bond yields. Our findings reveal that investors are unwilling to sacrifice financial returns to support socially beneficial projects. Social and non-social municipal bonds from the same issuer are seen as nearly identical, rendering the social bond premium essentially zero.

***Keywords****:* social bonds, municipal bonds, pricing premium, political preference, sustainable finance

***JEL Classification****:* H74, H75, G12, G14, Q01, Q56

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## 1. Introduction

In recent decades, the rapid escalation of climate and social challenges has elevated the importance of environmental, social, and governance (ESG) considerations in both academic research and professional practice. A key question in ESG finance is how ESG factors influence asset pricing (Servaes and Tamayo, 2013). Recent studies have primarily focused on examining the existence of a premium in green security prices (Baker et al., 2018; Larcker and Watts, 2020), which corresponds to the value implications of environmental factors, the "E" in ESG. However, relatively little attention has been given to understanding whether and how social factors, the "S" in ESG, impact asset pricing.

This paper investigates whether investors pay more for bonds issued to fund projects with positive social impacts. According to the International Capital Market Association (ICMA), social bonds are bond instruments with the proceeds, or an equivalent sum, being used solely for the financing or re-financing, in part or in full, new and/or existing qualifying social initiatives. The objectives of social bonds include affordable basic infrastructure, access to essential services, affordable housing, employment generation, food security and sustainable food systems, as well as socioeconomic advancement and empowerment. Social and green bonds are both financial innovations for sustainability uses, but social bonds start later and have seen rapid growth in the past few years.

In our analysis, we focus on US municipal social bonds from Bloomberg because of the adequate number of observations and consistent information availability. As Karpf and Mandel (2018) argued, the fundamental properties variables may affect the estimation of

pricing differences. The key to research design is selecting appropriate matching bonds and controlling other related variables. To reduce the issuer-related omitted variables, as Larcker and Watts (2020) emphasized, we only include issuers that issued social and non-social bonds from 2018 to 2023. In other words, issuers in our sample must issue at least one social bond and at least one non-social bond. The identification resulted in 6,623 social bonds and 11,711 non-social bonds issued by 92 different issuers as our research sample.

To estimate the premium or discount of social bonds, we use two empirical methods. First, following Baker et al. (2018), we use fixed-effect regressions to control potential characteristics between social and non-social bonds. We include maturity, rating, issuance month, issuer, and industry fixed effects and amount, coupon, callability, taxable, and underwriter discount as control variables. In addition, we use clustered standard errors by issuers to account for heteroskedasticity and potential serial correlation within clusters. The result shows that social bond yield is not significantly higher or lower than non-social bond yields. The coefficient of social bond on the strictest regression is insignificant, suggesting no premium or discount on social bond pricing. We conduct sub-sample analyses using sample periods of 2020-2023 and 2021-2023 as robustness checks and find the result remains unchanged.

Then, we use matching methods to estimate social bond pricing differences. Larcker and Watts (2020) comment that Baker et al. (2018)'s regression method is ineffective due to issuer-related omitted variables and they further use exact matchings to find different results. Following this strategy, we use three matching methods to control for the issuer, issuance

date, callability, rating, maturity, and coupon. For each social bond, we find the nearest non-social bond as its control group. After matching, we find no significant difference between the social bond group and the matched control group. The matching results also suggest no difference between social and non-social bond pricing.

After identifying social bond pricing, we want to study the heterogeneity of social bond issuance and pricing. We focus on political preference, an important external environment when government issuers decide the use of municipal bonds. Prior literature shows that the United States is becoming increasingly polarized politically, and political preference can influence the opinions viewing social problems, such as inequity, education, ESG, and immigration (Alesina et al., 2020; Wang & Overby, 2022). In short, Democrats pay more attention to social problems compared with Republicans. For example, according to Kuziemko et al. (2015), 61.3 percent of Republicans against 77.6 percent of Democrats believe that income inequality in the US has increased in recent decades. As for ESG, Democrats are positively related to ESG participation and performance. Di Giuli and Kostovetsky (2014) find that companies have better CSR performance when their founders, CEOs, and directors are Democrats rather than Republicans and when the firm is headquartered in Democratic- rather than Republican-leaning states. Hong and Kostovetsky (2012) conclude that mutual fund and hedge fund managers who make campaign donations to the Democratic party underweight "socially irresponsible" firms while overweighting "socially responsible" firms.

We use a Democrat dummy variable and the vote difference between the Democratic candidate and the Republican candidate in the nearest election to measure political preference. First, Democrat-leaning states issue more social bonds than Republican-leaning states. Both the number and dollar amount of social bonds are significantly higher for Democrat-leaning states after we control for the states' GDP, personal income, population, and employment. Then, we test whether social bond pricing performs differently under different political preferences. Using the fixed-effect regressions, we find there is no significant difference between social and non-social bonds in both Democrat-leaning states and Republican-leaning states. We also use matching methods and find similar results.

Finally, we test social bond pricing and the influence of political preference in the secondary market. MacAskill et al. (2021) review the literature investigating the green bond premium and show that 56% of studies prove significant greenium in the primary market, while the rate rises to 70% in the secondary market. Using transaction-level data from the Municipal Securities Rulemaking Board (MSRB), we also find no significant social bonds premium or discount in the secondary market, suggesting that investors in the secondary market are neither bearish nor bullish on social bonds. However, different from the results in the primary market, in the secondary market, social bonds earn lower yields than non-social bonds in Republican-leaning states. Specifically, there is a 6.7 basis point social bonds pricing premium in the secondary market (significant at the 10% level) in Republican-leaning states, but there is no premium or discount in the Democrat-leaning states.

Our study contributes to ongoing literature that discusses how ESG factors can impact asset pricing in the fixed-income market. Prior research mainly focuses on testing green bonds, and the conclusions are controversial (see MacAskill et al. (2021) for a review of recent studies). Our paper provides supplements from social factors, showing no significant difference between social and non-social bond pricing. Our paper is similar to Derwall and Koedijk (2009), which shows that the average socially responsible fixed-income funds performed similarly to conventional funds. To the best of our knowledge, we may be the first to estimate the pricing premium on social bonds, and our result supports Larcker and Watts's (2020) opinion.

Our study also contributes to the impact of political preference. Prior literature shows social perception differences under different political preferences (see Alesina et al. (2020) for a review of how political preference can impact education, inequity, and immigrants). There are still some papers focusing on firms and fund managers (Di Giuli & Kostovetsky, 2014; Hong & Kostovetsky, 2012). In this paper, we focus on social bonds, a new financial tool aiming at social problems, and find that Democrat-leaning states issue significantly more social bonds, both in terms of the number and dollar amount, than Republican-leaning states. However, we find no significant heterogeneity of political preferences regarding social bond pricing. We also show evidence from the secondary market.

The paper proceeds as follows. Section 2 introduces the overview of social bonds. Section 3 describes the data and sample. Section 4 shows the main results on whether social bonds price differently than non-social bonds, using different methods. Section 5 explores

whether and how social bond pricing performs differently under different political preferences and shows the results in the secondary market. Section 6 concludes.

## 2. An Overview of Social Bonds

ICMA published four kinds of specially used bond principles or guidelines in sustainable finance: green bonds, social bonds, sustainability bonds, and sustainability-linked bonds[1]. Green bonds are widely known in academic research. They have a longer history, a greater number of bonds, and a higher issuance volume. The first green bond was issued by the European Investment Bank in 2007 (Baker et al., 2018). The other three bonds have grown rapidly in recent years, especially social ones. According to Environmental Finance Sustainable Bond Insight (2022)[2], the issuance market share of green bonds is 51.9% ($532,245M) in the sustainable bond market, while the rates of social bonds, sustainability bonds, and sustainability-linked bonds are 20.0% ($205,185M), 18.5% ($189,875M), and 8.9% ($91,708M) in 2021. Social bonds are increasingly becoming more eminent in sustainable finance.

The ICMA social bond principles guide governments and corporations to issue social bonds. The principles contain four core components: use of proceeds, process for project evaluation and selection, management of proceeds, and reporting. ICMA illustrates four

[1] See: https://www.icmagroup.org/sustainable-finance/the-principles-guidelines-and-handbooks.

[2] See: https://efdata.org/.

kinds of social bonds: standard social use of proceeds bond, social revenue bond, social project bond, and social securitized and covered bond.

In the global market, many countries and corporations issue social bonds. Figure 1 shows the number of social bonds from different types of issuers from the Bloomberg Database. Social bonds are growing rapidly after 2018, especially for US municipal bonds. Government issuers issue more social bonds than corporate issuers, which may be because solving social problems is less likely to benefit firms.

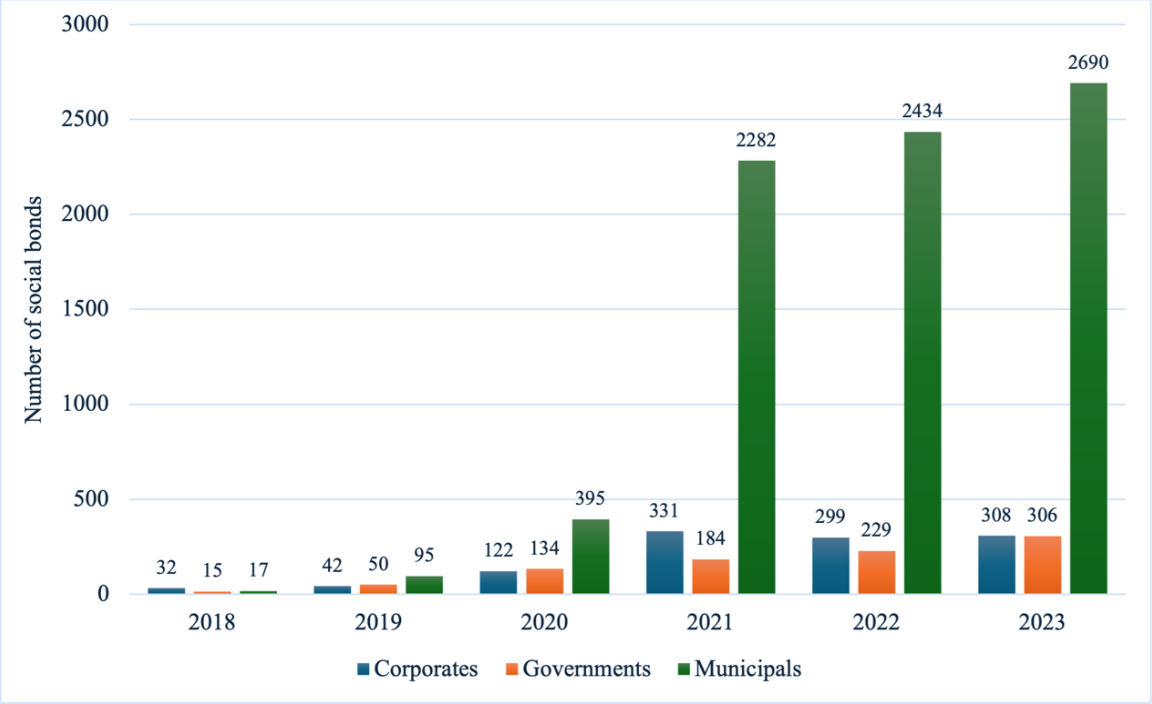


**Figure 1. The number of social bonds**

This figure shows the number of different social bonds between 2018 and 2023. Corporate social bonds are issued by corporate all over the world. Government social bonds are issued by governments from countries all over the world except US. Municipal social bonds are issued by US local governments. The data is from Bloomberg.

In literature, social bond differs from social impact bond (SIB). SIB is a broader concept that is similar to ESG. According to Broccardo et al. (2020), SIB investments should be

made into companies, organizations, vehicles, and funds with the intent to contribute to social, economic, and environmental impacts alongside financial returns. They review SIB academic papers and find that only two finance papers studied SIB, while most SIB papers focus on sociology and political science, public administration, and law problems. In contrast, social bonds may be a category of SIB or ESG that only pays attention to social problems. As far as we know, no paper discusses the pricing difference on social impact or social bonds.

Despite several papers on green pricing premiums, we still research social bond pricing for two reasons. First, the existence of green premiums is controversial. Different samples, methods, or matching groups show a different relationship between green factors and bond pricing. For example, Baker et al. (2018) select US municipal and corporate green bonds from 2010 to 2016 and find a significant premium using fixed-effect regressions. Similarly, Zerbib (2019) and Nanayakkara and Colombage (2019) provide evidence of the premium of green bonds. On the other hand, Larcker and Watts (2020) focus on US municipal bonds and conclude that there is no premium after using several matching methods. Similarly, Hyun et al. (2020) and Flammer (2021) support no significant green premium or discount on bond pricing. Otherwise, several papers have mixed results. Karpf and Mandel (2018) find that green bonds were traded at lower prices historically, but the premium turned green in recent years. Hyun et al. (2020) argue that certificates by an external reviewer can affect the existence of green bonds.

The second motivation of this paper is the difference between environmental and social impact. Some research considers environmental investment a long-term project (Narver, 1971). Although it takes such an extended period, an environmental project may benefit firms and investors finally. However, social projects are usually more remote from them than environmental projects. For example, an investor may change his investment policy as the recovery from climate change is suitable for him, but he cannot benefit from an affordable housing project because bond investors are more likely to be rich and not to be the target of social projects. Thus, it is more debatable to discuss the premium for social bonds.

## 3. Data and Sample Selection

We focus on United States municipal bonds covered by Bloomberg's fixed income database from 2018 to 2023. There was no municipal social bond record in Bloomberg before 2018. We do not research corporate or government social bonds for three reasons. Firstly, the number of US municipal social bonds is far more than other social bonds. Based on Bloomberg data, 79.4% (7913/9965) of newly issued social bonds are US municipal bonds between 2018 and 2023. Understandably, firms have less motivation to contribute to social problems. Secondly, US municipal bonds have available and structured data at the issuer, issuance, and transaction level. In contrast, most corporate social bonds are issued by private firms, which are hard to get access to related information. Thirdly, the municipal bond market is the largest and most important US capital market for state and municipal finance and has become a valuable empirical laboratory in many finance topics (Cestau et

al., 2019). Many papers studying green bonds also focus on the US municipal bond market (e.g., Karpf & Mandel, 2018; Larcker & Watts, 2020).

We identify our sample of social bonds in Bloomberg labeled as "social bonds"[3]. Bloomberg is a widely used database in finance research, especially in papers on green bonds (e.g., Karpf & Mandel, 2018; Larcker & Watts, 2020; Flammer, 2021). Larcker and Watts (2020) suggest that fixed-effects methodology may lead to bias due to issuer-related omitted variables. To reduce the endogeneity of issuers, we exclude issuers that never issue social bonds or only issue social bonds. In other words, issuers in our sample must issue at least one social bond and at least one non-social bond in our sample period. Following Larcker and Watts (2020), we also restrict our sample to fixed-rate coupon bonds to simplify yield calculations. Most of our bond data is from Bloomberg Terminal. These variables are defined in Appendix A. We also exclude green and sustainability bonds from our sample as green characteristics may affect the result.

We only want to compare social bonds and ordinary bonds. After deleting observations with missing values, we retrieved 6,623 social bonds and 11,711 non-social bonds issued by 92 different issuers. To facilitate comparisons, we provide yield at issue over time and use of proceeds. Table 1 reports the municipal bond number, total issuance amount, and yield at issuance mean difference between non-social and social bonds in our sample by year.

[3] More precisely, bonds for which the field "social bond indicator" is "Yes". Bloomberg's "social bond indicator" field definition indicates if the proceeds of security will be applied toward projects that promote improved social welfare and positive social impact directly for underprivileged, low income, marginalized, excluded or disadvantaged populations.

Although only 15 municipal social bonds were issued in 2018, they have grown rapidly these years, especially after 2020. In 2021, the amount of newly issued municipal social bonds was over $10 billion and kept increasing to over $12 billion in 2023. Table 1 also shows a yield decrease over the 2018-2021 period, then a yield increase in 2022 and 2023. Although the mean yield at issue for social bonds was higher than for non-social bonds in 2018 and 2019, the pattern changed in the later years, showing lower yield for social bonds in 2020, 2022, and 2023. The mean difference of yield at issuance between non-social and social bonds shows that social bonds were traded at significant discount prices in the years 2018 and 2019 but then turned to significant price premiums in the later years, except in the year 2021, which shows an insignificant mean difference.

Table 2 provides the use of proceeds on the bonds in our sample and the yield at issue mean difference between social and non-social bonds for each classification. Industries are classified by Bloomberg's BICS level 2 codes. The table shows that around 86.2% (5708/6623) of municipal social bonds contribute to housing projects. Browsing their official statement, we find that they are more likely to raise housing funds for first-time homebuyers, low- or moderate-income persons or families, or some specific jobs (such as qualified veterans). Education is another important application of municipal social bonds. Raising funds is more likely to pay for establishing or renovating schools or related facility improvements. Meanwhile, in local and state industry classification, the more general use of proceeds, such as access to essential services, affordable basic infrastructure, socioeconomic, and employment generation, are listed under the project category.

Additionally, we can find similar industry distributions between social and non-social bonds in our sample.

## 4. The Premium for Social Bonds

Are investors willing to pay more for social bonds? In this section, we use three methods to show the premium on social bond pricing.

### *4.1. Sample Characteristic Comparisons*

We begin our analyses by simply comparing the average characteristics between social and non-social bonds. Our key dependent variable is the yield at issue. If investors are willing to pay more for social bonds, the transaction price will be higher, and the yield should be lower. In the first row of Table 3, we can see that the issuance yield of social bonds is significantly higher than non-social bonds' yield, which means the transaction price of social bonds is lower on average. The summary shows that investors would like an additional 16.7% (0.416/2.493) return for social bonds. This result provides huge economic significance.

However, this conclusion is unconvincing due to the potential differences between social and non-social bonds. As shown in Table 3, there are many significant distinctions between these two groups. Social bonds, on average, have higher ratings, shorter years to maturity, higher coupon rates, and smaller issuance amounts. For instance, the premium for social bonds may come from more safety (reflected in bonds' rating) instead of investors'

ESG preference. To gain the actual effect of social bonds, we need more reliable research designs to ensure there are few potential differences between social bonds and control bonds.

### *4.2. Fixed-effect Regression Approach*

Table 3 shows why we need to undertake some approaches before comparing two kinds of bonds. In finance research, matching and regression are two common methods to control differences and identify the causal effect. In this section, following Baker et al. (2018), we use fixed-effect regressions to test the premium of social bonds. We apply the following cross-sectional regression specification:

$$Yield_i = \alpha_i + \beta_1 \times Social\ Bond_i + \theta \times Control\ Variables_i + Fixed\ Effects + \varepsilon \quad (1)$$

$Yield_i$ is the dependent variable. For bond i, we use its issuance yield to reflect the pricing preference in the bond market. $Social\ Bond_i$ is a dummy variable, which equals to one if bond i is a social bond and equals to zero if it is not. Our control variables include ln(amount), coupon, callability, taxable, and underwriter discount. These are common variables in bond research. As for fixed effects, following Baker et al. (2018), we control for maturity, rating, issuance year, issuer, and industry (use of proceed) fixed effects. These control variables and fixed effects account for most of the influence of the bond's yield. If $\beta_1$ is less than zero, we can prove a lower yield of social bonds, which means investors pay more for social bonds. Robust standard errors are used. In addition, clustered standard errors by issuers are employed in this research to account for within-group correlation.

Table 4 presents the results. In all specifications, we control for issuer and industry fixed effects. We also include maturity, rating, and issuance month fixed effects in the first three columns. The preliminary results suggest that social bonds have a 2 basis point lower yield than non-social bonds after controlling five control variables and using robust standard errors (column 2). This coefficient is significant at a 5% significance level. However, after using clustered standard errors by issuers, the coefficient is no longer significant, meaning that there is no significant yield difference between social and non-social bonds. In the last three columns, we use Maturity × Rating × Issue Year interaction fixed effects to replace these three fixed effects. After controlling the interaction fixed effect and control variables (columns (5) and (6)), the results have a higher adjusted R-squared (0.968). Employing clustered standard errors (column (6)), the coefficient of social bond is no longer significant. These results suggest that social bonds have no pricing premium or discount after we control some bond-level characteristics.

We also do some robustness checks. Firstly, as the number of social bonds is quite small in 2018 and 2019, we use the 2020-2023 subsample. Since most of the social bond issuance is from the 2021 to 2023 period, we also use the 2021-2023 subsample. All the specifications in Table 5 include maturity, rating, issue month, issuer, and industry fixed effects and use cluster standard errors by issuers. The result of robustness checks in Table 5 is consistent with the main finding showing that social bonds have no significant pricing premium or discount compared to non-social bonds.

*4.3. Nearest Neighbors Matching Approach*

The advantage of the pooled regression model is making use of comprehensive information as it contains a large number of observations. However, there are concerns with this methodological approach. Larcker and Watts (2020) argue that this approach requires fixed effects to be effective controls. They suggest that using a simple fixed-effect methodology to estimate premiums leads to biased inference due to issuer-related omitted variables. Thus, they use an exact matching method to prove there is no premium when green bonds are issued.

In this paper, our sample sets can overcome this "issuer-related omitted variables" problem because issuers in our sample issued both social and non-social bonds in the sample period. Comparing yields within these issuers can be more convincing. To more properly test the different pricing of social bonds, we also follow Larcker and Watts's (2020) nearest neighbor matching method. Firstly, we use a logit regression on social bonds and rating, callability, years to maturity, and coupon and calculate the prediction of social bonds' propensity. For the first matching, we match each social bond with a non-social bond with the same issuer, issue date, and callability. If there is more than one suitable non-social bond, we use the social bond with the nearest prediction value. Panel B of Table 6 shows the results. There are 759 social bonds and 759 non-social bonds after matching. The mean (median) difference shows a significant pricing premium of social bonds. However, we still find a significant difference in years to maturity and coupon in the first matching shown in Column 1 of Panel A. The results are still unclear under this matching.

Then, we apply the second matching method. For each social bond, we find a non-social bond with the same issuer, issue date, callability, and years to maturity. Panel C shows the significant mean and median yield difference between social and non-social bonds. The mean difference is 52.4 bps, which is also economically significant. However, as the second column of Panel A shows, the coupon difference between social and non-social bonds is still significant. Furthermore, the mean yield difference in Panel C is higher than the mean yield difference in Panel B due to significant coupon differentials, suggesting that coupon is the main driver of the mean yield difference between social and non-social bonds.

Since the second matching method still resulted in significant coupon differences between social and non-social bonds, in the third matching method, we match each social bond with the same issuer, issue date, callability, rating, year to maturity, and coupon. This matching is the strictest in this section and stricter than Larcker and Watts' (2020) setting. As shown in the third column of panel A, there are no significant differences in the matching variables between social and non-social bonds, showing that we effectively address concerns on issuer-related omitted variables. In Panel D, we find insignificant yield differences between social and non-social bonds, supporting our previous findings using a fixed-effect regression approach.

In summary, this section uses an exact matching method, as Larcker and Watts (2020). This methodology has strict procedures to reduce potential omitted variables between social and non-social bonds, although this procedure heavily reduces the number of observations. We find a similar result that social bonds have no significant price premium

or discount while issued. Therefore, we conclude that investors are unwilling to pay more for social bonds after controlling potential omitted variables.

## 5. Political Preference and Social Bond

Section 4 provides evidence that social bonds, compared with non-social bonds, have no premium pricing in the municipal bond market. Further, we want to investigate whether there is any heterogeneity in social bond issuance and pricing decisions. We focus on political preference, an important external environment when government issuers decide the use of municipal bonds. Prior research highlights that Democrat-leaning individuals and firms pay more attention to social problems, such as inequity and corporate social responsibility (Di Giuli and Kostovetsky, 2014; Hong and Kostovetsky, 2012; Kuziemko et al., 2015). In this section, we conduct several analyses of the relationship between political preference and social bond decisions.

### *5.1. Does Political Preference Affect Social Bond Issuance?*

At first, we test whether political preference can influence the issuance of social bonds. Di Giuli and Kostovetsky (2014) regard political affiliation as a natural measure of social responsibility preference. As individuals in Democratic-leaning states place more emphasis on social problems, the state government is likely to spend more on social use projects to cater to their voters. Moreover, as municipal bonds are typically priced locally

(Butler, 2008), social bonds may attract more local investors in these socially concerned environments. Thus, we assume that Democratic-leaning states issue more social bonds.

We use a panel regression between 2018-2023 to test this hypothesis. The dependent variable is the issuance of social bonds. We use two measurements: the number of social bonds and the natural logarithm of dollar amount plus one of the social bonds in that year. As most states in our sample did not issue social bonds, we use a Tobit regression to reduce the estimation error. The independent variable is political preference. We also use two measurements: (1) a dummy variable that equals 1 if the state is Democrat-leaning in that year and equals 0 otherwise, and (2) the vote difference between the Democratic candidate and a Republican candidate scaled by the total votes of the state in the nearest election. We also control for GDP, personal income, population, and employment to reduce potential bias. We also use year fixed effect. We cannot include state-fixed effects because there are few political preference changes in our six-year sample.

Table 7 shows the results. We can see a positive and significant coefficient regardless of the measurement of dependent and independent variables. Our estimates indicate that Democrat states issue 32 more counts and 6.6% more amount of social bonds than Republic states after controlling for four state-level variables and year fixed effect. We also find that the significance of social bonds is more than all control variables, including GDP, personal income, population, and employment, which means political preference is an important factor influencing social bond issuance decisions. In addition, we also find that population and employment are significantly related to the size of social bond issuance but not the

number of issuances. Specifically, states with more population issue higher amounts of social bonds. Conversely, states with higher numbers of employment issue lower amounts of social bonds.

*5.2. The Impact on Social Bond Pricing*

More issuance cannot reflect more acceptance. To test the social bond pricing difference between Republican states and Democrat states, we include the interaction into the regression model as follows:

$$Yield_i = \alpha_i + \beta_1 \times Social\ Bond_i \times Democrat_i + \beta_2 \times Social\ Bond_i + \beta_3 \times Democrat_i + \theta \times Control\ Variables_i + Fixed\ Effects + \varepsilon \quad (2)$$

Where $Democrat_i$ is an indicator of whether bond i is issued by a Democrat-leaning state when issued. Other variables are the same as in model (1). The coefficient of the interaction, $\beta_1$, reflects the difference between the Democrat social bond premium and the Republican social bond premium. We also use model (1) in two sub-samples with different political preferences and estimate the difference.

In column 1 of Table 8, we see that the estimate of $\beta_1$ on the interaction of social bond indicator and democrat-leaning state indicator is insignificant. In columns 2 and 3, we can see that in Republican-leaning states and Democrat-leaning states, there is no pricing difference between social and non-social bonds. After controlling control variables and fixed effects and using cluster standard errors by issuers, we do not find significant pricing differences between social and non-social bonds in both Republican-leaning states and Democrat-leaning states. However, the observations of column 2 are less than those of

column 3, which supports the conclusion that Democrat-leaning states issue more social bonds, as section 5.1 discussed. Hence, we conclude that while Democrat-leaning states issue more social bonds, political preference does not affect the pricing of social bonds.

We also use Larcker and Watts (2020) matching methods to test this relationship, as shown in Table 9. We use three matching methods, the same as in Table 6. However, in the third matching method, only 2 observations were left in Republican-leaning states. Hence, we cannot make any inference from the third matching method. In Panel A and B, we can see that in Republican-leaning states, social bond yield is significantly higher than non-social bond yield. Meanwhile, there is no difference between social and non-social bond yields in Democrat-leaning states. These results suggest that for similar characteristics of social bonds, there is more aversion toward social bonds in Republican-leaning states. However, we cannot conclude that there is a significant social bond price discount in the Republican-leaning states because of the significantly different characteristics of social bonds and non-social bonds. In Panel A, there are significant differences between social and non-social bonds regarding years to maturity and coupon (as shown in Table 6, Panel A, Column 1). Meanwhile, in Panel B, there is a significant coupon difference between social and non-social bonds (as shown in Table 6, Panel A, Column 2). Overall, Table 8 and Table 9 use two different methods, and both find no evidence of significant price difference between social and non-social bonds in Republican-leaning states and Democrat-leaning states.

*5.3. Social Bonds in the Secondary Market*

The above sections show the pricing difference in the primary municipal bond market. The conclusion may change in the secondary market. MacAskill et al. (2021) review the literature investigating the green bond premium and show that 56% of studies prove significant greenium in the primary market, while the rate rises to 70% in the secondary market. Do social bonds have pricing differences in the secondary market? Do these results change under different political preferences? We will test these questions.

The bond transaction data is from Municipal Securities Rulemaking Board (MSRB) provided by Wharton Research Data Service (WRDS). MSRB is a self-regulatory organization charged by US Congress in the municipal securities market. It provides municipal securities transaction data through its Electronic Municipal Market Access (EMMA) website[4]. MSRB data has been used in academic research (Karpf and Mandel, 2018; Partridge and Medda, 2018). We also use models (1) and (2), but we change the dependent variable from yield at issuance to yield at transaction.

Table 10 presents the relationship between social bonds, political preference, and the yields in the secondary market. All the columns are at the transaction level, include all control variables and fixed effects, and use clustered standard errors by issuers. In column (1), the coefficient of social bond on yield is -0.026 but insignificant. This result is similar to the primary market, as Table 4 shows, which suggests no significant social bond price premium in the secondary market.

[4] For more details, see the website of EMMA: https://emma.msrb.org/AboutEmma/Overview.

Columns (2)-(4) of Table 10 test whether political preference can influence the discount of social bonds. The results show that no significant social bond yield differences between Democrat-leaning states and Republican-leaning states. Specifically, the results in Republican-leaning states (column (3)) show a 6.7 basis point premium when pricing social bonds (minor significant at 10% significance level), while there is no significant social bond price premium in the Democrat-leaning states, as column (4) shows. These results are similar to evidence in the primary market, meaning political preference does not significantly impact social bond pricing in the primary and secondary markets.

## 6. Conclusion

Using Baker et al. (2018) fixed-effect regression and Larcker and Watts (2020) exact matching methods, this paper tests whether investors are willing to pay more for social bonds. We use US municipal bonds issued from 2018 to 2023 as our sample and find several conclusions. Firstly, we find no significant pricing premium or discount of social bonds compared to non-social bonds after considering other characteristics. This result suggests that investors do not have social-use preferences while buying bonds. Secondly, we find that Democratic-leaning states issue more social bonds than Republican-leaning states. Thirdly, we find that political preference does not significantly impact social bond pricing. Finally, we also find no significant social bond price premium or discount in the secondary market.

While controversial, most green bond research does not find a discount in green pricing. Some of them believe in a pricing premium, and others conclude that there is no pricing

difference between green bonds and ordinary bonds. As social bonds are growing and becoming increasingly important, What motivates investors to buy or not to buy social bonds? How does the investor base affect social bond pricing? Are there any distinct incentives between institutional and individual investors? Why do investors in Republican-leaning states show less aversion to social bonds in the secondary market than in the primary market? We shall delve into these questions in the future.

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**Table 1. Sample construction and Yield at issue difference by year**

This table reports the number, issuance amount, mean of yield at issuance, and yield at issuance mean difference of US municipal social and non-social bonds on an annual basis in our sample. Bonds in our sample are from specific issuers which issued at least one social bond and one non-social bond between 2018-2023. Column "Difference" presents a standard two-sided t-test of yield at issuance mean difference between non-social and social bonds. T-statistics are shown in parentheses. *, **, and *** denotes significance at 10%, 5%, and 1% level, respectively.

| Issue Year | Non-social bonds | | | Social bonds | | | Difference |
|---|---|---|---|---|---|---|---|
| | N | Amount (T$) | Mean of Yield | N | Amount (T$) | Mean of Yield | |
| 2018 | 1,823 | 12.369 | 2.933 | 15 | 0.276 | 3.353 | -0.419*** (-2.24) |
| 2019 | 2,482 | 16.478 | 2.214 | 52 | 0.665 | 2.617 | -0.402*** (-4.23) |
| 2020 | 2,926 | 21.957 | 1.655 | 345 | 5.144 | 1.471 | 0.184*** (-3.96) |
| 2021 | 1,683 | 16.684 | 1.324 | 1,979 | 10.764 | 1.336 | -0.012 (-0.468) |
| 2022 | 1,071 | 11.335 | 3.462 | 2,092 | 12.039 | 3.230 | 0.231*** (5.357) |
| 2023 | 1,726 | 13.535 | 4.384 | 2,140 | 12.334 | 4.284 | 0.100*** (3.427) |
| Total | 11,711 | 92.358 | 2.493 | 6,623 | 41.222 | 2.909 | -0.416*** (-19.37) |

**Table 2. Sample construction and Yield at issue difference by industry**

This table presents the number, mean of yield at issuance, and yield at issuance mean difference of US municipal social and non-social bonds by industry in our sample. Bonds in our sample are from specific issuers which issued at least one social bond and one non-social bond between 2018-2023. Industries are classified by Bloomberg's BICS (Bloomberg Industry Classification System) Level II codes. Column "Difference" presents a standard two-sided t-test between non-social and social bonds. T-statistics are shown in parentheses. *, **, and *** denotes significance at 10%, 5%, and 1% level, respectively.

| Industry | Non-Social bonds | | Social bonds | | Difference |
|---|---|---|---|---|---|
| | N | Mean of Yield | N | Mean of Yield | |
| Housing | 7,516 | 2.521 | 5,708 | 2.966 | -0.445*** (-17.68) |
| Local | 1,507 | 2.12 | 350 | 2.81 | -0.690*** (-9.53) |
| Education | 1,220 | 2.79 | 203 | 1.993 | 0.797*** (7.88) |
| State | 580 | 2.367 | 52 | 1.782 | 0.585*** (3.72) |
| Health Care | 386 | 2.342 | 56 | 1.679 | 0.663*** (3.76) |
| Lease | 239 | 3.255 | 164 | 3.459 | -0.340** (-2.62) |
| Others | 263 | 2.922 | 90 | 3.271 | -0.348* (-2.40) |
| Total | 11,711 | 2.493 | 6,623 | 2.909 | -0.416*** (-19.37) |

## Table 3. Difference between social and non-social bonds

This table summarizes the number and means of US municipal social and non-social bond variables. Bonds in our sample are from specific issuers which issued at least one social bond and one non-social bond between 2018-2023. Column "Difference" presents a standard two-sided t-test between non-social and social bonds. T-statistics are shown in parentheses. All variables are defined in the Appendix. *, **, and *** denotes significance at 10%, 5%, and 1% level, respectively.

| Variables | Non-Social bonds | | Social bonds | | Difference |
|---|---|---|---|---|---|
| | N | Mean | N | Mean | |
| Yield at Issue | 11,711 | 2.493 | 6,623 | 2.909 | -0.416*** (-19.37) |
| Rating | 11,711 | 2.678 | 6,623 | 2.090 | 0.588*** (18.03) |
| Callability | 11,711 | 0.393 | 6,623 | 0.368 | 0.024** (3.26) |
| Years to maturity | 11,711 | 9.720 | 6,623 | 9.272 | 0.449*** (4.03) |
| Years to call | 4,627 | 9.109 | 2,427 | 9.176 | -0.0666* (-2.15) |
| Coupon | 11,711 | 3.255 | 6,623 | 3.459 | -0.205*** (-8.75) |
| Ln (Amount) | 11,711 | 14.504 | 6,623 | 14.376 | 0.128*** (5.54) |

**Table 4. Fixed effect regression results of social bond premium**

This table shows regressions of issuance yield on social bond indicators, other bond control variables, and fixed effects. The dependent variable is the yield at issue. Social bond is the key independent variable that equals to one if the bond is a social bond. Control variables and fixed effects are defined in Appendix A. T-statistics are shown in parenthesis. *, **, and *** denotes significance at 10%, 5%, and 1% level, respectively.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Social bond | -0.142*** | -0.020** | -0.020 | -0.208*** | -0.015* | -0.015 |
| | (-10.749) | (-2.313) | (-0.766) | (-13.058) | (-1.754) | (-0.461) |
| Ln(Amount) | | -0.035*** | -0.035*** | | -0.012*** | -0.012 |
| | | (-10.002) | (-3.553) | | (-3.514) | (-0.938) |
| Coupon | | 0.097*** | 0.097*** | | 0.089*** | 0.089*** |
| | | (27.034) | (6.227) | | (23.853) | (6.309) |
| Callability | | 0.068*** | 0.068*** | | 0.053*** | 0.053* |
| | | (3.947) | (2.763) | | (3.090) | (1.930) |
| Taxable | | 0.981*** | 0.981*** | | 0.946*** | 0.946*** |
| | | (113.509) | (23.074) | | (106.808) | (19.750) |
| Underwriter Discount | | 0.079*** | 0.079* | | 0.071*** | 0.071 |
| | | (5.001) | (1.916) | | (4.450) | (1.292) |
| Maturity FEs | Yes | Yes | Yes | No | No | No |
| Rating FEs | Yes | Yes | Yes | No | No | No |
| Issue Month FEs | Yes | Yes | Yes | No | No | No |
| Maturity×Rating×Issue Month FEs | No | No | No | Yes | Yes | Yes |
| Issuer FEs | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry FEs | Yes | Yes | Yes | Yes | Yes | Yes |
| Standard Errors | Robust | Robust | Clustered | Robust | Robust | Clustered |
| Observations | 18,318 | 17,154 | 17,154 | 15,822 | 14,645 | 14,645 |
| N_full | 18320 | 17156 | 17156 | 18320 | 17156 | 17156 |
| R-squared | 0.875 | 0.946 | 0.946 | 0.922 | 0.975 | 0.975 |
| Adj. R-squared | 0.874 | 0.945 | 0.945 | 0.903 | 0.968 | 0.968 |

## Table 5. Robustness checks

This table shows robustness checks of issuance yield on social bond indicators and other bond control variables and fixed effects. The dependent variable is the yield at issue. Social bond is the key independent variable that equals one if the bond is a social bond. Columns 1 and 2 are for sub-sample containing bonds issued between 2020-2023. Columns 3 and 4 are for the sub-sample period of 2021-2023. Control variables and fixed effects are defined in Appendix A. T-statistics are shown in parenthesis. *, **, and *** denotes significance at 10%, 5%, and 1% level, respectively.

| | 2020-2023 | | 2021-2023 | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Social bond | -0.023 | -0.016 | -0.006 | 0.006 |
| | (-0.786) | (-0.440) | (-0.179) | (0.151) |
| Ln(Amount) | -0.045*** | -0.022 | -0.032** | -0.012 |
| | (-3.840) | (-1.403) | (-2.471) | (-0.707) |
| Coupon | 0.106*** | 0.097*** | 0.105*** | 0.103*** |
| | (6.092) | (6.368) | (5.634) | (6.155) |
| Callability | 0.071** | 0.062* | 0.062** | 0.063 |
| | (2.477) | (1.811) | (2.026) | (1.622) |
| Taxable | 1.012*** | 0.964*** | 1.098*** | 1.051*** |
| | (21.953) | (18.500) | (22.731) | (20.054) |
| Underwriter Discount | 0.084 | 0.091 | 0.051 | 0.149** |
| | (1.655) | (1.194) | (1.363) | (2.013) |
| Maturity Fes | Yes | No | Yes | No |
| Rating Fes | Yes | No | Yes | No |
| Issue Month Fes | Yes | No | Yes | No |
| Maturity×Rating×Issue Month FEs | No | Yes | No | Yes |
| Issuer Fes | Yes | Yes | Yes | Yes |
| Industry Fes | Yes | Yes | Yes | Yes |
| Clustered Standard Errors | Yes | Yes | Yes | Yes |
| Observations | 13,027 | 11,218 | 10,179 | 8,824 |
| N_full | 13031 | 13031 | 10183 | 10183 |
| R-squared | 0.950 | 0.976 | 0.953 | 0.978 |
| Adj. R-squared | 0.949 | 0.971 | 0.952 | 0.973 |

## Table 6. Matching methods

This table shows nearest neighbors matching tests between social and non-social bond yields. Panel A presents the difference between social and non-social bond characteristics under the three matching methods. Panel B finds the non-social group by selecting the nearest neighbor after matching on the same issuer, issuance date, and callability. Panel C finds the same issuer, issuance date, callability, and years to maturity. Panel D finds the same issuer, issuance date, callability, years to maturity, and coupon. The difference in mean (median) issuance yields between social and non-social bonds is calculated using a standard two-sided t-test (Wilcoxon test) for each matching test. T-statistics (Z-statistics) are shown in parentheses. All variables are defined in the Appendix. *, **, and *** denotes significance at 10%, 5%, and 1% level, respectively.

| Panel A: Difference in issuance variables (nonsocial – social) | | | |
|---|---|---|---|
| | Matching 1 | Matching 2 | Matching 3 |
| Rating | 0.037 | 0.06 | 0 |
| Callability | 0 | 0 | 0 |
| Years to maturity | 2.410*** | 0 | 0 |
| Coupon | 0.266** | 0.394*** | 0 |
| Panel B: Matching 1 | | | |
| | N | Mean | Median |
| Non-social bonds | 759 | 3.243 | 3.17 |
| Social bonds | 759 | 2.887 | 3.14 |
| Difference | | 0.355*** | 0.03*** |
| | | (4.04) | (4.20) |
| Panel C: Matching 2 | | | |
| | N | Mean | Median |
| Non-social bonds | 381 | 3.194 | 3.239 |
| Social bonds | 381 | 2.67 | 2.94 |
| Difference | | 0.524*** | 0.299*** |
| | | (4.39) | (4.34) |
| Panel D: matching 3 | | | |
| | N | Mean | Median |
| Non-social bonds | 54 | 1.953 | 1.769 |
| Social bonds | 54 | 1.944 | 1.769 |
| Difference | | 0.009 | 0 |
| | | (0.036) | (0.077) |

## Table 7. Political preference and social bond issuance (Tobit Regression)

This table reports the relationship between state potential preference and social bond issuance. The dependent variable is the number and amount of social bond issuance. All columns show Tobit regression results. Independent variables, control variables and fixed effects are defined in Appendix A. T-statistics are shown in parenthesis. *, **, and *** denotes significance at 10%, 5%, and 1% level, respectively.

| Dependent variable | Social bond count | | Social bond amount | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Democrat | 31.808*** | | 6.558*** | |
| | (2.895) | | (2.873) | |
| Difvote | | 63.226*** | | 16.114*** |
| | | (2.641) | | (3.273) |
| GDP | -0.032 | -0.036 | 0.01 | 0.008 |
| | (-0.391) | (-0.441) | (0.558) | (0.491) |
| Personal income | 0.123 | 0.153 | -0.006 | -0.002 |
| | (1.011) | (1.264) | (-0.247) | (-0.082) |
| Population | 0.01 | 0.015 | 0.007** | 0.008*** |
| | (0.825) | (1.178) | (2.526) | (2.965) |
| Employment | -0.02 | -0.031 | -0.010** | -0.013*** |
| | (-0.961) | (-1.446) | (-2.256) | (-2.799) |
| Year FE | Yes | Yes | Yes | Yes |
| N | 306 | 306 | 306 | 306 |
| Pseudo R2 | 0.116 | 0.115 | 0.148 | 0.15 |

## Table 8. Political preference and social bond premium

This table shows regressions of issuance yield on social bond indicator, political preference indicator, and other bond control variables and fixed effects. The dependent variable is the yield at issue. Social bond is the key independent variable, which equals one if the bond is a social bond. Democrat is the measurement of political preference, which equals one if the bond is issued in a Democrat-leaning state. Control variables and fixed effects are defined in Appendix A. T-statistics are shown in parenthesis. *, **, and *** denotes significance at 10%, 5%, and 1% level, respectively.

| | Full Sample | Republican | Democrat |
|---|---|---|---|
| | (1) | (2) | (3) |
| Social bond * Democrat | 0.012 | | |
| | (0.236) | | |
| Social bond | -0.018 | 0.017 | -0.050 |
| | (-0.348) | (0.257) | (-1.058) |
| Democrat | -0.089 | | |
| | (-1.552) | | |
| Controls | Yes | Yes | Yes |
| Maturity×Rating×Issue Month FEs | Yes | Yes | Yes |
| Issuer FEs | Yes | Yes | Yes |
| Industry FEs | Yes | Yes | Yes |
| Standard Errors | Clustered | Clustered | Clustered |
| Observations | 14,647 | 5,925 | 8,228 |
| N_full | 17156 | 6543 | 10613 |
| R-squared | 0.975 | 0.980 | 0.979 |
| Adj. R-squared | 0.968 | 0.973 | 0.971 |

**Table 9. Political preference and social bond pricing (Larcker & Watts (2020) method)**

This table shows nearest neighbors matching tests between social bond and non-social bond yields by different political preferences. Panel A finds the non-social group by selecting the nearest neighbor after matching on the same issuer and issuance month. Panel B finds the same issuer, issuance date, and callability. Panel C finds the same issuer, issuance date, callability, years to maturity, and coupon. For each matching test, the difference in mean (median) issuance yields between social and non-social bonds are calculated using a standard two-sided t-test (Wilcoxon test). T-statistics (Z-statistics) are shown in parentheses. All variables are defined in the Appendix. *, **, and *** denotes significance at 10%, 5%, and 1% level, respectively.

| Panel A: Matching 1 | | | | | | |
|---|---|---|---|---|---|---|
| | Republican | | | Democrat | | |
| | N | Mean | Median | N | Mean | Median |
| Non-social bonds | 285 | 3.734 | 4.308 | 474 | 2.947 | 2.958 |
| Social bonds | 285 | 3.029 | 3.4 | 474 | 2.802 | 2.705 |
| Difference | | 0.705*** | 0.908*** | | 0.145 | 0.253 |
| | | (5.32) | (6.64) | | (1.27) | (1.20) |
| Panel B: Matching 2 | | | | | | |
| | Republican | | | Democrat | | |
| | N | Mean | Median | N | Mean | Median |
| Non-social bonds | 137 | 4.612 | 5.128 | 244 | 2.397 | 2.19 |
| Social bonds | 137 | 3.304 | 3.45 | 244 | 2.314 | 2.142 |
| Difference | | 1.309*** | 1.678*** | | 0.083 | 0.048 |
| | | (9.50) | (9.969) | | (0.59) | (0.476) |
| Panel C: matching 3 | | | | | | |
| | Republican | | | Democrat | | |
| | N | Mean | Median | N | Mean | Median |
| Non-social bonds | 2 | 0.25 | 0.25 | 52 | 2.018 | 1.85 |
| Social bonds | 2 | 0.2 | 0.2 | 52 | 2.011 | 1.85 |
| Difference | | 0.05 | 0.05 | | 0.007 | 0 |
| | | . | (1.732) | | (0.029) | (0.716) |

**Table 10. Social bonds in the secondary market**

This table shows regressions of issuance yields on the social bond indicator, political preference indicator, and other bond control variables and fixed effects in the secondary market. The data are at the transaction level. The dependent variable is the yield at the transaction. Social bond is the key independent variable that equals one if the bond is a social bond. *Democrat* is the measurement of political preference, which equals one if the bond is issued in a Democrat-leaning state. Control variables are defined in Appendix A. T-statistics are shown in parentheses. *, **, and *** denotes significance at 10%, 5%, and 1% level, respectively.

| | Full Sample | Full Sample | Republican | Democrat |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Social bond * Democrat | | 0.027 | | |
| | | (0.988) | | |
| Social bond | -0.026 | -0.041 | -0.067* | -0.030 |
| | (-1.069) | (-1.392) | (-1.727) | (-0.809) |
| Democrat | | -0.035 | | |
| | | (-1.010) | | |
| Controls | Yes | Yes | Yes | Yes |
| Maturity×Rating×Issue Month FEs | Yes | Yes | Yes | Yes |
| Trade Month FE | Yes | Yes | Yes | Yes |
| Issuer FEs | Yes | Yes | Yes | Yes |
| Industry FEs | Yes | Yes | Yes | Yes |
| Standard Errors | Clustered | Clustered | Clustered | Clustered |
| Observations | 923,662 | 923,662 | 257,494 | 666,160 |
| N_full | 923885 | 923885 | 257522 | 666363 |
| R-squared | 0.918 | 0.918 | 0.929 | 0.919 |
| Adj. R-squared | 0.918 | 0.918 | 0.929 | 0.918 |

## Appendix A. Variable Definitions

| Variable | Description | Data Source |
|---|---|---|
| *Bond Level* | | |
| Yield at issue | Yield to maturity on the issue date, measured at percentage point. | Bloomberg |
| Yield at transaction | Yield to maturity on the transaction date, measured at percentage point. | MSRB |
| Social bond | An indicator variable that equals to one if the bond was issued as a social bond and zero otherwise. | Bloomberg |
| Rating | Issue level rating assigned by S&P, Moody, or Fitch. Converted to a numerical scale from 1 (highest rate, AAA/ Aaa/ AAA) to 16 (B-/ B3/ B-). | Bloomberg |
| Callability | An indicator variable that equals to one if the bond is callable and zero otherwise. | Bloomberg |
| Years to maturity | Years to the maturity date at issuance. | Bloomberg |
| Years to call | Years to the first call date at issuance. | Bloomberg |
| Coupon | The coupon rate of the bond, measured at percentage point. | Bloomberg |
| Amount | The dollar amount outstanding of the bond at issuance, measured at $. | Bloomberg |
| Taxable | An indicator variable that equals to one if the bond is subject to Federal Income taxes and zero otherwise. | Bloomberg |
| Underwriter discount | Security issuance underwriter discount costs (including spreads, takedown and underwriting fees disclosed by the underwriter in official documents accompanying the sale) expressed as a percentage of the total issued amount. | Bloomberg |
| *State Level* | | |
| Democrat | An indicator variable that equals to one if the state is a democratic party leaning state and zero otherwise. | MIT Election Data and Science Lab |
| Difvote | The vote difference between democratic presidential candidate and republican candidate scaled by total votes of the state. | MIT Election Data and Science Lab |
| GDP | The real GDP of the state. | Bureau of Economic Analysis |
| Personal income | The personal income of the state. | Bureau of Economic Analysis |
| Population | The population of the state. | Bureau of Economic Analysis |
| Employment | The number of jobs of the state. | Bureau of Economic Analysis |