Taking Sides: Political Alignment and Municipal Bond Yield

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Abstract

In this paper, we study how the political alignment between state governor party affiliation and counties affects yield spreads of municipal bonds issued by counties. Matching municipal bonds and gubernatorial election records at the county level, we present evidence that following close state-level elections, investors demand a higher yield spread if a county becomes politically misaligned with the state governor, and a lower yield spread if it becomes politically aligned with the state governor. The magnitude of the effect varies across bonds and county characteristics, longer term to maturity bonds, bonds backed by utility revenue and bonds issued by counties less dependent on state transfers are less sensitive to political alignment shock. Finally, we show that the changes in yield spread are correlated with changes in credit risk and are closely associated with changes in inter-governmental transfer.

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To the victor belong the spoils. In a war or other contest, the winner gets the booty.

William Learned Marcy
US Secretary of State (1853-1857)

1 Introduction

Understanding how politics shape the allocation of public resources has always been a central question in political economy research. Much work has focused on the effect of vertical political alignment or misalignment between upper-level government and lower-level government/geographical areas on government spending (Levitt and Snyder Jr, 1995; Albouy, 2013; Berry et al., 2010).In a similar vein, recent research showed political and ideology alignment could facilitate international capital flow (Kempf et al. (2021)), account for partisan fertility gap (Dahl et al. (2021)) and explain loan spreads differentials (Dagostino et al. (2020)).

In this paper, we take a further step asking whether and how political alignment affects asset prices and the municipal bond market provides an ideal setting for our research. The municipal bond market is a market of great economic significance, with a market size of 4.1 trillion dollars in the US and the 400 billion annual issuance represents 25% of the 1.7 trillion local government spending. More importantly, the municipal bond is a type of financial instrument that naturally bridges politics and public finance. Elected officials are responsible for proposing, determining, and implementing a wide variety of economic and public finance policies, including directing inter-governmental transfer or public spending projects, designating tax-advantaged status, etc. Such decisions directly affect the fiscal condition and creditworthiness of municipal bond issuers. Previous research in distributive politics has shown the importance of partisanship in shaping such decisions. However, how investors price political alignment is ex-ante ambiguous but understudied. Direct and favorable inter-governmental transfers along partisan lines could strengthen municipal bond issuers' fiscal fundamentals and lead investors to perceive less credit risk. On the other hand, this strengthening effect could be complicated by the possibility of moral hazard as local government may expand their balance sheet and spend less responsibly, leading to deteriorating creditworthiness. Motivated by the arguments above, we empirically investigate whether municipal bond investors recognize the variations of county financial strength and bailout probabilities induced by the political alignment status, and demand different yield spreads based on different political alignment statuses of the municipal bond issuers.

We analyze municipal bond yield spread between 2005-2020 by exploring U.S. gubernatorial elections in 49 states.[1] These elections provide an ideal setting to study the effect

[1] We excluded the state of Alaska since partisanship measures could not be constructed on the county level. Alaska's gubernatorial voting records are reported on the electoral district level and each electoral

of political alignment for two reasons. First, state governors have significant power over virtually all major economic and public finance policies, such as state and (pass-through of) federal grants, and public spending projects, opening the possibility of affecting yields of municipal bonds issued by local governmental bodies. In particular, state governors play important roles in multiple stages of the development of state budget bills as well as intergovernmental transfer plans. Second, most of the U.S. states hold elections every four years, and the cycle is pre-determined,[2] exogenous to local economic conditions, and thus partially alleviates endogeneity concerns.[3]

We begin our empirical analysis by collecting data from various sources outlined in Section 2. The main dataset used to perform the analysis is the secondary market trading records of municipal bonds from 2005 to 2020, coming from the Municipal Securities Rulemaking Board (MSRB). We complement this dataset with additional bond-level characteristics sourced from Mergent Municipal Bond Securities Database (MMBSD). County-level political alignment measures, as well as state-level governor election results, are constructed based on data from the CQ Voting & Elections Collection and Dave Leip's Atlas. Finally, we rely on the Census of Governments as well as the Annual Survey of State and Local Government Finances to obtain the local government's balance sheet information.

Data-wise, while both MSRB and MMBSD provide names of municipal bond issuers along with many other variables, they do not directly report the location of issuers that can be directly matched with county-level gubernatorial election records. We develop a multiple-step procedure to extract this information based on regular expression and further cross-validated our assignment algorithm. In particular, we aggregate municipal bond information at the county and state levels respectively and show that the correlation between the total amount of municipal bonds outstanding and the total amount of debt outstanding (i.e. bond and other loans) are highly correlated both geographically and over

district, in general, consists of multiple counties

[2]Over our sample period 2005-2020, there exist four off-cycle gubernatorial elections - 2010 UT, 2011 WV, 2012 WI and 2016 OR. None of these elections changed the governor's party affiliations.

[3]By contrast, since U.S. federal elections in all states are held concurrently, the variations of political alignment between the federal government and lower-level government or geographical districts would be perfectly correlated. As a result, the effects of federal-local political alignment are hard to be distinguished from pure time variations. In addition, elections at the federal level, including both presidential and congressional ones, feature highly persistent partisanship, especially over the most recent 20 years when only a few swing states ever changed their votes. This leads to two challenges: first, persistent voting patterns may induce candidates' strategic reactions by paying systematically and disproportionately more attention to those swing states relative to their core voters; second, it is hard to tell how well we can generalize the results even if we find any, as most of the variations come from a handful (swing) states. In comparison, voters are more likely to break party ranks in gubernatorial elections (Sievert and McKee, 2019), giving us much more variations to explore. For example, California has been voting for Democratic presidential candidates since 1992, but two of its governors during the same period, Pete Wilson (1991-1999) and Arnold Schwarzenegger(2003-2011) are Republican. Similarly, Kentucky has been voting for the Republican Party in presidential elections since 2000, but three of its governors during the same period, Paul E Patton (1995-2003), Steve Beshear (2007-2015), and Andy Beshear (2019-), are Democratic.

time. The percentage of municipal bonds issued by state-level and county-level entities is also consistent with estimates offered by third-party market research agencies. By matching counties and municipal bonds, we are able to identify county-issued municipal bonds that allow us to study the impact of political (mis-)alignment on yield spreads of municipal bonds in the secondary market.

To study the effect of vertical political alignment, we define a county to be politically misaligned with the state governor if the county's vote margin leans toward a party different from the incumbent governor's political party. We first present panel evidence that agencies in politically misaligned counties face higher financing costs in the primary market, and the larger the degree of political misalignment the county, the higher the yield spreads its municipal bonds traded are in the secondary market.

This panel evidence offers only first-pass evidence. To alleviate endogeneity concerns, we turn to a regression discontinuity design and further classify all county-month observations into four categories capturing all types of transitions into and out of political (mis)alignment: from aligned to aligned, from aligned to misaligned, from misaligned to aligned and from misaligned to misaligned. We then leverage (ex-post) close governor races to approximate the ideal experiment where the state governor's party is randomly assigned to constituent counties. The results show that among all counties that start as politically aligned with the state governor, those that subsequently become politically misaligned after a close governor election experience higher yield spreads relative to those that remain aligned. On the other hand, among counties that start as politically misaligned, those that subsequently become politically aligned experience a decrease in the yield spreads of their municipal bonds traded in the secondary market. The magnitudes are largely symmetric starting from these two different status quo (i.e. starting from politically aligned or politically misaligned) and correspond to around 20 basis points, roughly one-sixth of the sample standard deviation.

Our point estimates are comparable to responses of municipal bond yields studied by other researchers using different events.[4] Baber and Gore (2008) show that municipal bonds issued by states that mandated GAAP disclosure experience yields lower by 14-25 basis points on average. Similarly, exploiting an exogenous Moody's rating recalibration, Adelino et al. (2017) found municipal bonds issued by upgraded local governments saw a reduction of 14 basis points in offering yields. Moreover, Painter (2020) found that long-term bonds exposed to more climate risk had 16-20 basis points higher yields. Our findings in the secondary markets show comparable yield responses from municipal bonds when the local government becomes politically misaligned from the party of the governor following a close election.[5]

[4]One caveat is that most of the previous research focused on the primary market. We provide preliminary evidence on offering yield as well, but the magnitudes are much smaller relative to the ones we find in the secondary market.

[5]Compared to other events, our estimated magnitudes are around twice as large as the yield responses

To establish the robustness of our main findings and rule out alternative explanations, we perform extensive checks, including using different bandwidths as well as cutoffs for close elections, different sample filtering standards, testing the existence of jumps in election results, etc. Our results are robust to alternative specifications and are not driven by common vulnerabilities of the regression discontinuity design.

Our analysis includes tens of thousands of municipal bonds, and their differences along multiple dimensions are naturally associated with heterogeneous treatment effects. Bonds with very long remaining maturity are less subject to the near-term political alignment shocks as any benefits/damages caused by political alignment status are likely to be reverted in the next election. Compared to general obligations bonds, which carry the full faith and credit of the issuing authority, the guarantee of repayment for revenue bonds comes only from the specific revenue-generating project. In particular, utility bonds are tied to essential and conservative services and are also less sensitive to political alignment changes. Lastly, counties vary in terms of their dependence on state transfer as the primary source of revenue and unsurprisingly, municipal bonds issued by those more fiscally independent counties are less vulnerable to political alignment changes.

In the last section of the paper, we investigate the potential mechanism of our results. As documented in earlier literature, most of the variations in municipal bond yield spread can be attributed to either credit risk or liquidity risk variations. [6] To test liquidity risk as the primary mechanism, we check whether becoming politically aligned and misaligned changes the share of inter-dealer trade or the standard deviation of yield spread in the opposite directions, and it turns out not to be the case. We also restrict the sample to more liquid bonds and the regression coefficients remain the same. For the test on credit risk, we first replicate Ansolabehere and Snyder Jr (2006)'s exercise on political alignment and intergovernmental transfers in the close election setting. Our specification shows that changes in political alignment are associated with $\sim 5\%$ changes in state (to county) level intergovernmental transfer and state transfer alone, on the other hand, consists of over 30% of the local budget. When we add credit ratings or state transfers to the main regression, the coefficients of political alignment status become less or insignificant, suggesting that the effects on municipal bond yield spreads are mostly associated with changes in the credit risk of the municipal bonds and that changes in intergovernmental transfer following the shifts in political alignment status play a role explaining our results.

The rest of the paper proceeds as follows. Section 1.1 discusses related literature and highlights our contribution. Section 2 describes the data we used as well as our data curation and wrangling procedures, and presents basic statistics. Section 3 presents the

from loss of public monitoring (Gao et al., 2020) and 2.5 times larger than the corruption penalty estimated by Butler et al. (2009).

[6] Another important factor is the tax factor. We exclude all taxable securities (for federal tax) from our main sample and adjusted the yields according to the tax rate of the highest income bracket for each state.

baseline results of political alignment on municipal bond yield spread and addresses potential identification concerns by showing results following close elections. Section 4 checks the robustness of our main results and offers discussions. Section 5 exploits credit risk and intergovernmental transfer as a potential mechanism for such effects. Section 6 concludes.

1.1 Literature

Our work contributes to the literature on the implication of political alignment on the asset (municipal bond) market. More specifically, it is related to three different literature.

First, our analysis is related to, and in large part, motivated by prior studies on partisanship and favoritism allocation of public resources. The theoretical foundation originates from testing the loyal voter models (Cox and McCubbins, 1986; Kramer, 1966) and pivotal voter models (Lindbeck and Weibull, 1987; Dixit and Londregan, 1995, 1996).[7] One branch of the empirical work focuses on "presidential particularism" or "congressional particularism", where administrations are found to steer federal grants/stimulus/programs/projects to areas of the core state (Albouy, 2013; Balla et al., 2002; Berry et al., 2010; Dynes and Huber, 2015; Gimpel et al., 2012; Hoover and Pecorino, 2005; Hudak, 2014; Kriner and Reeves, 2015; Larcinese et al., 2006; Levitt and Snyder Jr, 1995).[8] Additional evidence outside the U.S. includes Arulampalam et al. (2009); Brollo and Nannicini (2012); Golden and Picci (2008), showing that municipalities/provincial governments politically aligned with the central government receive more transfers in Brazil, Italy and India. The study of gubernatorial particularism is rather limited compared to the literature on the federal government, even though state governors in the U.S. system have discretion over important resources (Nicholson-Crotty, 2015). The earlier study by Ansolabehere and Snyder Jr (2006) finds that governing parties skew the distribution of funds in favor of areas with the strongest electoral support, while the recent study by Glick and Palmer (2021) does not find much evidence that governors systematically prioritized their partisan areas when allocating tax-advantaged status. Our paper provides new evidence using

[7] Also known as core voter model and swing voter model. "Both models envision two parties competing to win an election by promising to distribute targetable goods to various groups, should they be elected" (Cox, 2009). The core voter model claims that vote-maximizing parties will allocate distributive benefits primarily to their core voters as a reward for their strong support. The swing voter model argues that vote-maximizing parties will allocate distributive benefits to swing voters to attract more votes and increase chances of winning elections

[8] Loyal voter model might be a closer depiction of the reality of strategic behavior of politicians based on anecdotal evidence and empirical evidence also generally supports loyal voter model. Precisely testing the swing voter model is challenging, however, as the status of being a swing state or county is not affected by variations in the upper-level government (i.e. a swing state remains a swing state if a Republican president replaces a Democratic president, but a pro-Republcian state becomes politically aligned with (loyal voter of) the president following such an event), causal inference techniques commonly seen in the literature such as difference-in-difference, regression discontinuity designs will not be effective in such settings. The only way to test the swing voter model is to rely purely on geographical variation, subjecting to substantial endogeneity concerns.

municipal bond yield spread, which captures both explicit benefits a county could receive from its politically aligned governor via grants/programs and implicit backups/guarantees not observable in earlier research. Moreover, our results show that the market access to funding is also positively/negatively impacted by political alignment/misalignment, apart from its effect on direct access to funding from the intergovernmental transfer, and this complementarity further amplifies the real cost partisan agenda.

Second, our work relates to research on the determinants of municipal bond yield spread or local government borrowing cost (beyond the risk0-free rate). The three most important and fundamental factors are liquidity risk, credit risk and tax (Ang et al., 2014; Capeci, 1991; Cestau et al., 2019; Slemrod and Greimel, 1999; Wang et al., 2008). Depending on the research setting and the decomposition method, previous researchers find that credit risk can account for between 20 percent (Ang et al., 2014)-80 percent Schwert (2017) of the overall variations in municipal yield spread. Most factors affecting yield spread can be attributed to one or more of these three fundamental factors, including underwriter spread (Sorensen, 1980), climate risks (Painter, 2020), political uncertainty(Gao et al., 2019b), quality of disclosure and accounting principles (GAAP) (Baber and Gore, 2008; Fairchild and Koch, 1998; Wallace, 1981), state fiscal and, in particular, deficit policies (Poterba and Rueben, 1997, 2001; Wagner, 2004), local distress-related laws and statutes Gao et al. (2019a) etc. Our contribution is that we study the importance of political alignment with upper-level government officials, whose roles in the financial market, asset prices and local government borrowing cost, were largely ignored in the previous literature. We also show that the effect of political alignment can mostly be explained by changes in credit risk.

Finally, on a broader level, our paper is related to the large body of literature on the political economy of finance and, in particular, the study of asset market movements, (Akey and Lewellen, 2017; Belo et al., 2013; Brogaard and Detzel, 2015; Chan and Marsh, 2021; Kelly et al., 2016; Kim et al., 2012; Pástor and Veronesi, 2020, 2013; Acemoglu et al., 2018) and adds to the literature by analyzing the implication of partisanship on the 4 trillion dollars municipal bond market.

2 Data

2.1 Data Source

The empirical analysis in this paper employs the following three datasets.

Election records are contained in Congressional Quarterly (CQ) Press Voting & Elections Collection. CQ collects electoral votes for both presidential (1920-2020) and gubernatorial elections (1968-2020) from a number of authoritative press sources,[9] with vote

[9]Including America Votes biennial series, America at the Polls series, Politics in America biennial series,

counts at the county level.[10] We further complement CQ data with governor elections data from Dave Leip's Atlas for missing records and obvious data errors.[11] Most of the U.S. states hold gubernatorial elections every four years in even years in November, and altogether, we are able to collect 377 elections during the period 1991-2020. Section 7.1 provides additional institutional details.

Information on municipal bonds comes from several sources. Secondary market transaction records, including yield and transaction size, between 2005-2020 come from Municipal Securities Rulemaking Board (MSRB), which covers all historical transactions between all counter-party combinations such as dealer to customer, customer to dealer and inter-dealer. Following the literature, we collapse the data at the bond-month-counter party type level[12] by calculating the trade-size weighted average yield if there are multiple transactions in the same bond-month cell, where counter-party type can be any transactions or one of the counter-party combinations mentioned earlier.

Bond/issue-level characteristics of municipal bonds come from Mergent Municipal Bond Securities Database (MMBSD), including issue date, maturity date, size of issuance, coupon rate, credit rating, existence of embedded options, insurance status etc. We use this information to filter the sample and perform additional robustness checks.

Distribution of state- and county-level government revenue/expenditures comes from the Census of Governments, which is collected every five years since 1957[13] complemented by the Annual Survey of State and Local Government Finances. This dataset is the only source of nationwide, comprehensive local government financial information and can be obtained from the Census Bureau. The Census/Survey includes usual balance sheet variables such as total debt outstanding and total revenue, including inter-government transfers from different levels of government.

2.2 Political Leanings

There are a variety of ways to measure party control of the state government as well as the political alignment between counties and states. For state control, we focus on the state governor as it is the single most important governmental agency in state-level public finance decisions. The state governor participates in shaping the final budget in at least four ways. First, the start of a new budget cycle is marked by the guidance provided by the state budget office, which is within the department of treasury and reports to the

etc. See here for a description of data collection methodologies.

[10]Except for the state of Alaska, for which we have to drop all the observations as the election results are reported on the electoral district level and each electoral district sits across multiple counties

[11]For example, votes for both Republican and Democratic candidates in Louisiana's gubernatorial election on 2015/10/24 were reported as 0 in CQ data.

[12]We use CUSIP as the unique identifier of municipal bonds.

[13]The government organization data and information are for October of the year preceding the Census (1956, 1961, etc.)

state governor. Second, upon receiving recommendations from the budget office, the state governor reviews and adjusts the proposal before passing it to the legislature. Third, state governors coordinate, participate in and influence the legislature debate committee hearings on the budget bill throughout the process. Fourth, the budget bill needs approval from the state governor after the legislature sends it back and the governor can veto the entire bill or particular items. Section 7.2 provides more detailed information on the budget process.

For county political leanings, we use the average voting margin in each gubernatorial election between 2000 and 2020, which means that our county-level political leaning measure is time-invariant. As alternative measure we could have directly used county voting records (i.e. time-varying without taking average over time) or include elections prior to 2000 in the average. Our measure is better than both these alternative measures for three reasons.

First, counties are much smaller geographical units compared to states and most counties have small population sizes. As a result, the voting pattern of a particular county, especially one with a small population size, may be fickle. As we want our county political leaning measure to be highly visible to both the elected governors and the investors trading municipal bonds, we will ignore swing counties defined as those whose partisan voting margin is lower than a certain threshold. Fickleness in one particular governor race may result in an otherwise strongly partisan county being dropped from the analysis if one uses time-varying measures.[14]

Second, the time-varying county political leaning may suffer from potential endogeneity concerns. For example, gubernatorial election candidates may make promises on the local economy or public finances that help them win an election and at the same time, affect bond yield spread. In addition, abnormally high municipal bond yield spread may be correlated with measures that reflect county residents' sentiments that their county has been adversely targeted by state government (but in reality, not necessarily so). However, such sentiments could be strong predictors for future election voting patterns. On the other hand, bond yield is also likely to be auto-correlated. As a result, researchers will find the impact of political alignment on yield spread even if there is no casual relationship.

Third, as our current measure is subject to look ahead bias,[15] one might consider taking the average for elections before 2000. However, the look-ahead bias should be quite small as the correlation of voting margin on the county level is very high over time. Using dated election records will also unnecessarily expose us to more complexities in counties or

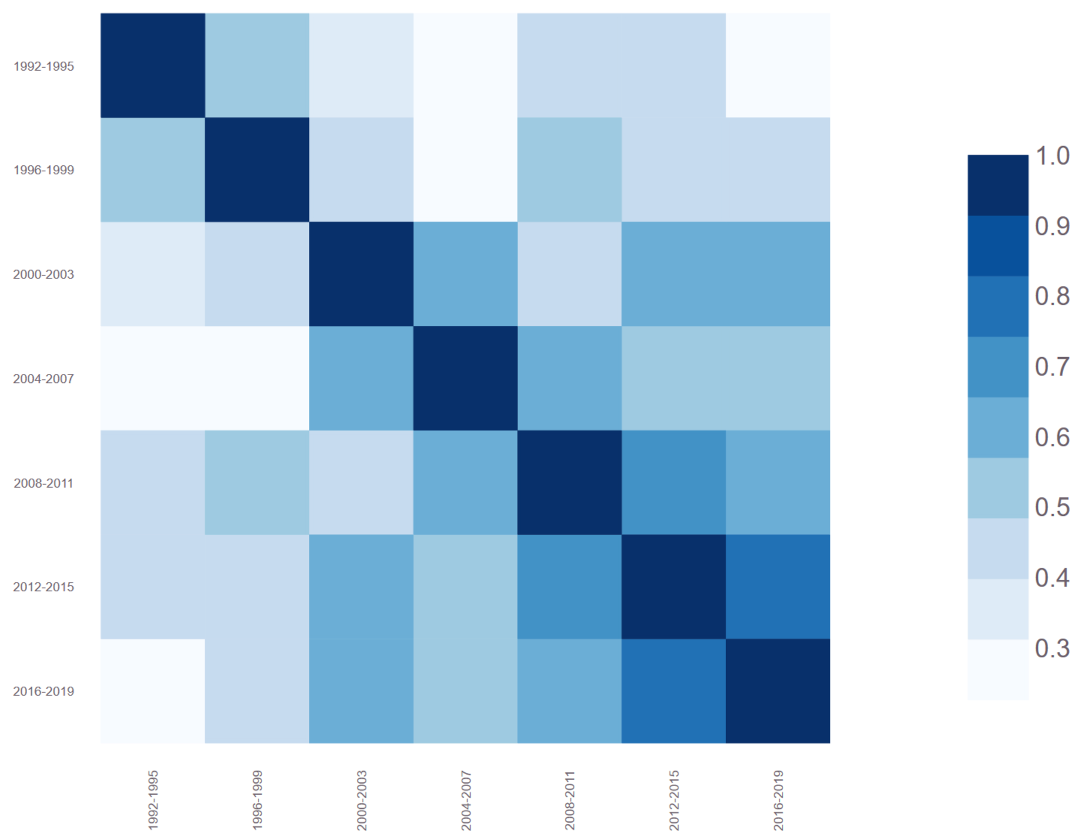
[14]However, as the voting behaviors of different groups (across the state, rural v.s. urban, race, social-economic status etc.) have been rather stable since 2000, the correlation between this "smoothed" measure and raw votes is over 0.8. Whether we use one over the other measure does not make a big difference in our empirical analysis

[15]For example, when the governor was making decisions in 2006 whether to shift resources to or away from a county, (s)he may have a slightly different view on which county is loyal, swing, or opponent from the view indicated by our measure as it also incorporates information in later years.

county-equivalent entities involving reshaping, addition, and deletion. Moreover, political scientists have long recognized a geographical shift and realignment of partisan lines in the U.S. between the 1980s and 1990s (Miller and Schofield, 2003). We replicate similar findings using gubernatorial election votes. As one can see from the correlation plot in Figure 1, the correlations of gubernatorial voting patterns since 1992 can be roughly split into two blocks: 1992-1999 and 2000-2019, as evidenced by the strong within-block correlations and low across-block correlations.

Figure 1: U.S. Counties Gubernatorial Voting Correlation

Note: This graph plots the correlations of election cycle-based political leanings on the county level since 1992. Political leaning is defined as $PL = \frac{\text{Rep Vote}-\text{Dem Vote}}{\text{Rep Vote}+\text{Dem Vote}}$. For states (NH, VT) with a two-year gubernatorial election cycle (i.e. two elections in each four-year cycle), the average PL is used. Off-cycle elections that did not change the governor's party affiliation and the governor race won by independent candidates are excluded (exception off-cycle election - 2003 CA; 2010 RI race was won by an independent candidate).



As mentioned above, the political leaning of a county is given by the relative difference of votes going to the Republican and Democratic Parties, shown in the following equation. The political leaning variable lies between -1 and +1, where a larger positive number indicates more pro-Republican.

$$PL = \frac{\text{Rep Vote} - \text{Dem Vote}}{\text{Rep Vote} + \text{Dem Vote}}$$

In Figure 2, we plotted both the histogram and geographical map of county-level average political leaning measures since 2000. As one can see in the graph, most counties are pro-Republican and located in rural areas in the U.S.[16]

The (time-varying) state-county political alignment measure is defined as the following:

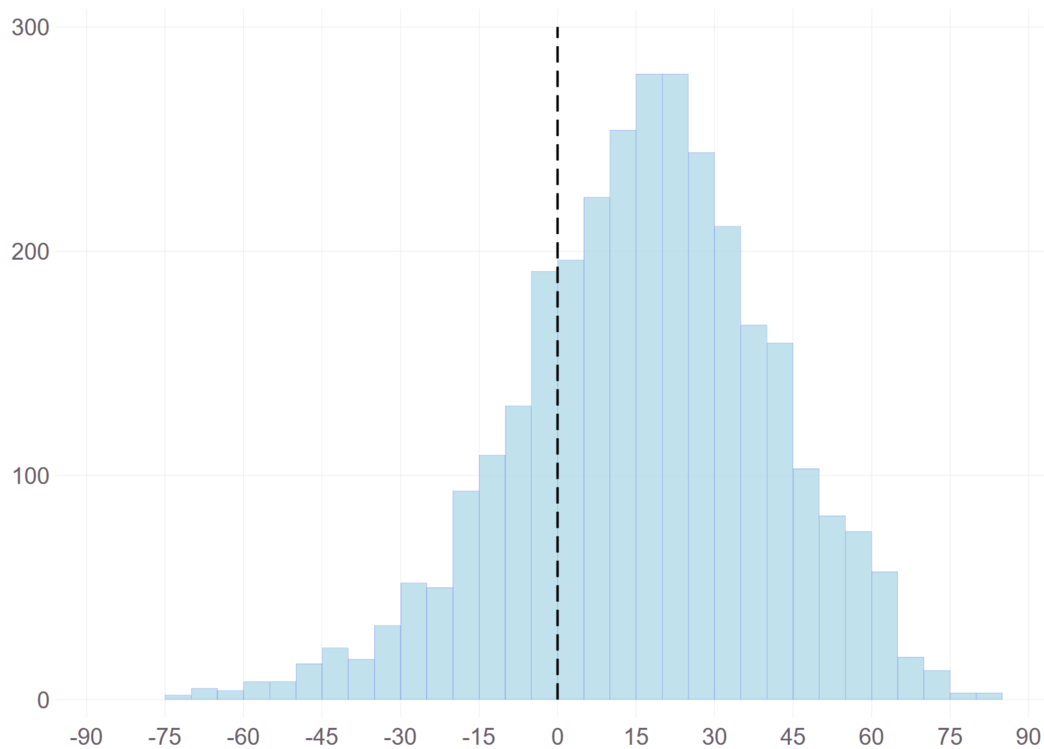
$$PA_{cs,t} = \mathbb{1}_{PL_{cs} * PL_{s,t} > 0}$$

where PL_{cs} is the (time-invariant) political leaning of a county c in state s, and $PL_{s,t}$ is the party affiliation of the state governor at time t. As PL_{cs} is a continuous variable, we can naturally define $PA_{cs,t}$ in a continuous way to reflect the degree/strength of political alignment/misalignment.

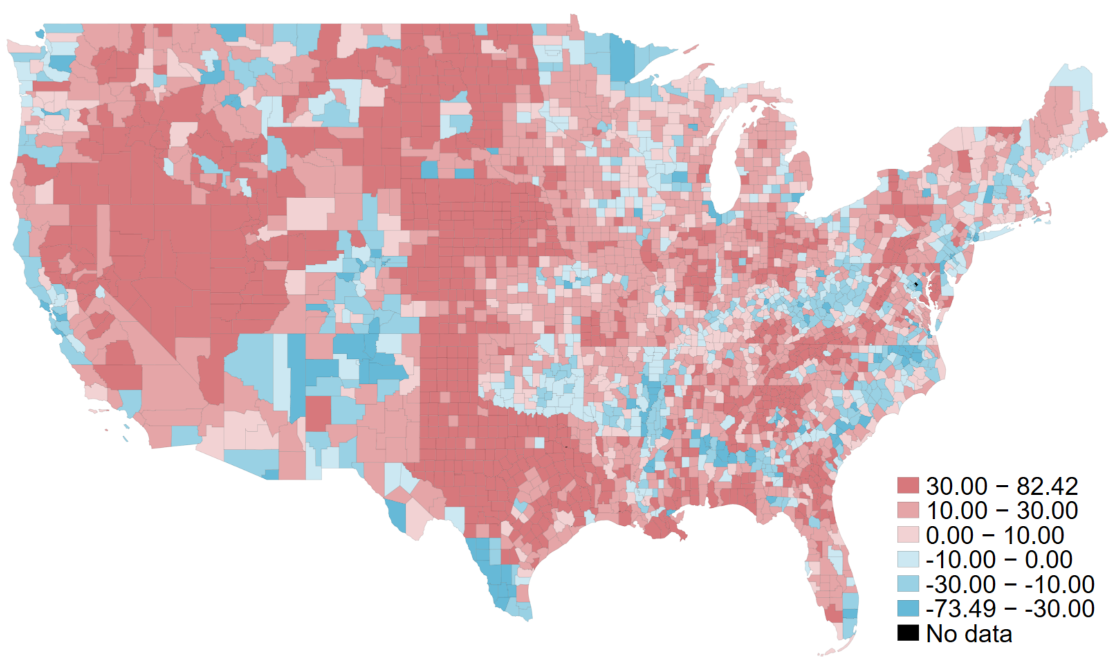
[16]The map aligns well with its counterpart constructed using presidential voting records. This result is in line with the evidence of a decline in "split" states in recent years(Jacobson, 2013). "Split" states vote for different party candidates in different Federal elections (e.g. Republican senator with Democratic presidential candidate).

Figure 2: County Political Leaning

Note: This graph plots the distribution of average political leanings on the county level since 2000. Political leaning is defined as $PL = \frac{\text{Rep Vote}-\text{Dem Vote}}{\text{Rep Vote}+\text{Dem Vote}}$ for each gubernatorial election. Off-cycle elections that did not change the governor's party affiliation and governor races won by independent candidates are excluded.



(a) Histogram of Average County Political Leaning



(b) Map of Average County Political Leaning

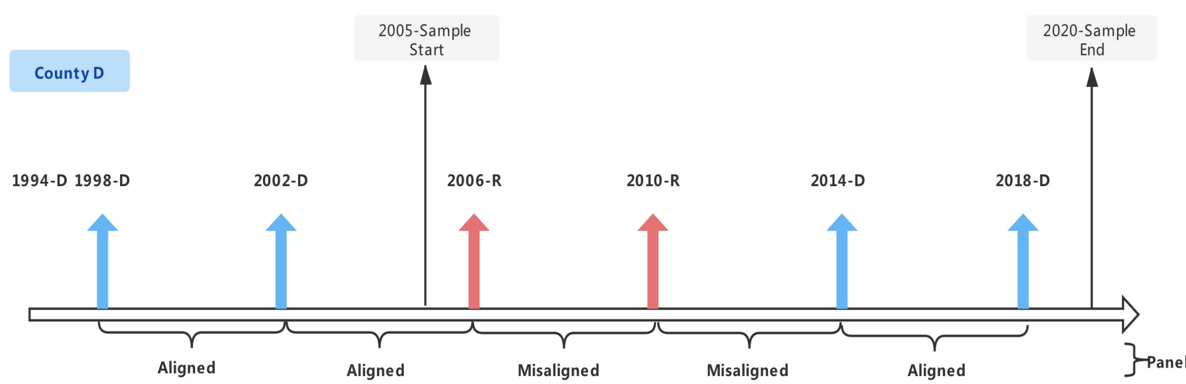
2.3 Political Alignment

2.3.1 Simple Political Alignment Measure

We construct the political alignment measure on the basis of county political leaning. In its simplest format, the political alignment status for a county at a specific time can be determined by comparing the political leaning of this county and the party affiliation of the incumbent state governor. The following Figure 3 illustrates the classification of political alignment status.

Figure 3: Political Alignment Groups for Panel Regression

Note: This graph shows an example of political alignment group classification used in panel regressions. Our sample starts from 2005 and ends at 2020. County D is classified as a pro-democratic county by averaging its gubernatorial votes across 2000-2020. County D will be classified as politically aligned with the state governor if a Democratic candidate won the most recent gubernatorial election and as politically misaligned with the state governor if a Republican candidate won the most recent gubernatorial election.



Focusing on a hypothetical Democratic-leaning county D, suppose that the state holds gubernatorial elections every four years and a Democratic candidate won the election in 1998/2002/2014/2018, then this county is labeled as politically aligned with the state governor in those four-year periods immediately following the elections.[17] On the contrary, this county D is labeled as politically misaligned with the state governor in 2007-2010, 2011-2014 as the Republican candidate won the 2006 and 2010 gubernatorial elections.

[17] Even though the newly elected governors do not take office until the following January, investors immediately observe the election outcome in November and the effects of political alignment may take place given any changes.

2.3.2 Political Alignment Measure by Status Quo

A major concern directing comparing outcomes for politically aligned counties and politically misaligned counties is that these counties may differ in characteristics besides political alignment status and these additional dimensions can be corrected with the outcome variable as well. We take several steps to address the potential endogeneity problems.

First, as different counties/states start from different political misalignment statuses before an election, we split our sample (bond-month) into two sub-samples according to different status quo. This split could generate meaningful comparisons as different status quo could have different impacts on yield spreads. For illustration, we use the same hypothetical Democratic-leaning county D and the same election results every four years starting from 1998 as Section 2.3.1 in Figure 4. For 2002 and 2006 elections, county D is politically aligned with the state governor before the elections as the winners in 1998 and 2002 elections are both Democratic candidates. After the election, however, the political alignment status diverges as the winner is still from the Democratic party in 2002 but from Republican party in 2006. The observations in 2002/11-2006/10 and 2006/11-2010/10 are grouped together as they share the same status quo (politically aligned with the governor before an election). Within the group, the events are labeled as "Stay Aligned" and "Become Misaligned" to reflect different post-election political alignment statuses. Similarly, observations in 2010/11-2014/10 and 2014/11-2018/10 are grouped together as they share the same status quo as politically misaligned with the governor before the election. Within their group, they are labeled as "Stay Misaligned" and "Become Aligned" accordingly.

Splitting and grouping, however, cannot solve all problems. For example, when we compare the two groups in the first sub-sample (status quo: politically aligned), one natural concern is whether these county-month observations are really comparable, conditional on the status quo and other co-variates. The majority rule feature of gubernatorial elections naturally fits into a (sharp) regression discontinuity design, where the election outcome can be expressed as an indicator function denoting whether the running variable (vote margin) is above or below a certain cutoff.[18] Papers in both economics and political

[18]Our main specification uses ex-post voting margin to measure the closeness/surprise of an election and we focus on these elections exclusively to make sure our treated groups and control groups only differ in the election results but not any other characteristics. Indeed, Beland and Oloomi (2017) shows pre-election income, population, state house majority, and governor gender do not differ across (ex-post) close gubernatorial elections. However, it is up to debate whether ex-post close elections are good natural experiments to approximate the random assignment of state governor's party affiliation. For example, it is possible that one election is predicted to be a landslide ex-ante but turns out ex-post to be very close. If investors' expectations are anchored by ex-ante prediction and the ex-post election result align with the ex-ante prediction, then classifying such events as close elections may be problematic since the underlying trend could be quite different from "true" close elections. On the other hand, there could be other elections that are predicted to be very close ex-ante but turn out to be one-sided. In principle, we wish to include such events if investors trade on their ex ante predictions even after election results are known. In general, using

science literature have been exploiting the quasi-natural experiment made possible by close elections to study a wide range of questions, including the analysis of incumbent advantage in congressional elections (Lee, 2008), the economic impact of being represented by a politician in the ruling party (Asher and Novosad, 2017), and impact on the allocation of state expenditures by governor party affiliation (Beland and Oloomi, 2017) etc. By focusing only on marginal elections, we can ensure that the current political alignment statuses of counties are approximately randomly assigned and thus ideally uncorrelated with other unobserved covariates.

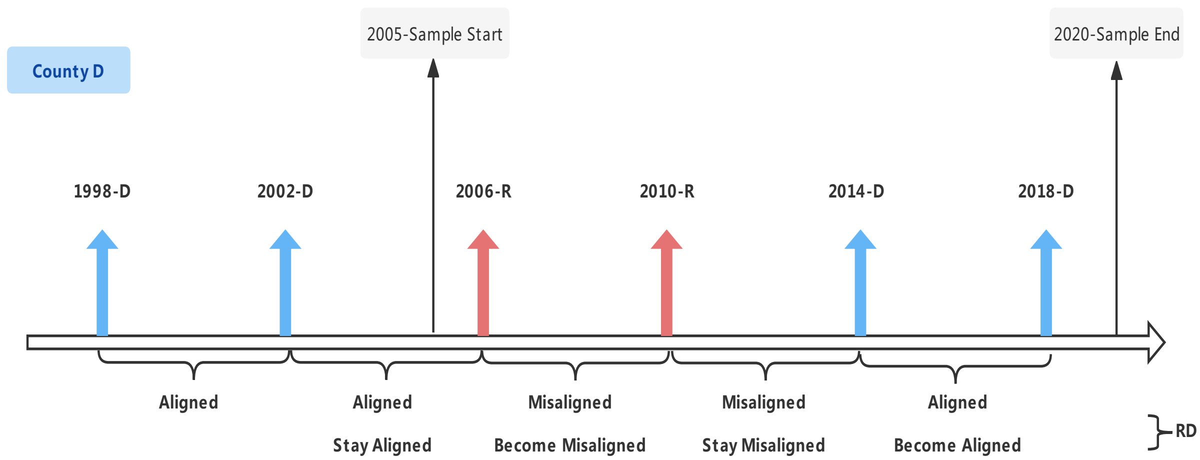
The last concern is whether the election result is truly exogenous in our setting since we are looking at outcome variables at the county level and the state election result itself is a function of all constituent counties' aggregated votes. Specifically, the number of counties in each state ranges from 3 to 254 (with a mean 62.78 and median 64), and in many cases, one or two counties in a state account for a substantial fraction of the state population.[19] Considering that the most populous counties also tend to issue more municipal bonds, creates additional endogeneity problems: changes of votes in the populous counties in a state between two elections is an important determinant of the governor election results, and these changes in votes and variations in municipal bond yield spreads may have common origins such as economic growth, risk appetites, etc. (Pástor and Veronesi, 2020). However, this is worrisome as we measure counties' political leaning by taking the average of all vote margins since 2000. Due to its time-invariant property, this measure is unlikely to be correlated with time-series changes of the associated state's gubernatorial election results.

ex-ante close elections should be preferable to ex-post close elections as investors trade in response to the resolution of uncertainty after elections happen and the yield spread responses are what we wish to capture. However, in reality, there are two major obstacles to gubernatorial election polls. First is data availability. Unlike presidential elections, there are very few sources publishing gubernatorial election polls even during recent time periods, not to mention a single source that covers our entire sample period and maintains consistent polling methodologies over time. Second and perhaps more important is the segregation of the pool market and the financial market. Participants in these markets are not necessarily the same and predictions made by polls might be a very biased measure of actual predictions used by municipal bond traders.

[19]Eg: According to the 2019 official estimate, Cook county (IL) has a population of 5.15 million, compared with State of Illinois' population 12.67 million. Clark County (NV) has a population of 2.3 million, compared with the State of Nevada's population of 3.1 million.

Figure 4: Political Alignment Groups for RD Regressions

Note: This graph shows an example of political alignment group classifications used in close election regression. Our sample starts from 2005 and ends in 2020. County D is classified as a pro-democratic county by averaging its gubernatorial votes across 2005-2020. County D will be classified as politically aligned with the state governor if a Democratic candidate won the most recent gubernatorial election and classified as politically misaligned with the state governor if a Republican candidate won the most recent gubernatorial election. At any point in time, the status quo is defined as the political alignment status before the nearest upcoming election (e.g.: in 2007, the status quo refers to political alignment status before the 2006 election). Labels for political alignment groups are shown at the bottom, reflecting various post-election alignment changes.



2.4 Bond Geocoding and Sample Selection

To examine its effects on bond yield spreads, we need to match bond data to the same geographical level. One difficulty with MSRB and MMBSD data is that county information is not readily available. To overcome this difficulty, we develop a geocoding algorithm based on regular expression and rely on a comprehensive list of U.S. counties/cities/townships (with over 100,000 geographical records) and associated crosswalks from SimpleMaps developed by Pareto Software LLC. The detailed string matching procedure and associated data validation steps can be found in Section 7.4.[20]

After obtaining geo-coded bond-level data, we follow the literature and further apply several filters to obtain the final sample for empirical analysis. We first exclude all state bonds as they are issued by the state government or its affiliated agencies and thus not subject to the political alignment channel we examine here. We then remove all irregular debt instruments including (bond anticipation, construction loan, collateralized, etc) notes, certificates (of obligation, participation), commercial paper, derivatives etc, and only keep securities of the most common bond type. Next, we remove bonds with variable interest rates and only kept bonds with either fixed or zero coupon rate, as such information is

[20] In the next version, we further incorporate GIS information sourced from Atlas Muni. The pros and cons of different matching methods are discussed in the Section 7.4.

necessary for calculating yield spreads. Taxable and AMT bonds are further removed to keep the contract of securities in our analysis sample comparable and avoid measurement errors in bond yield. Green bonds, tribal bonds, university and college bonds[21] are also removed for similar consideration since certain holders may enjoy incremental tax advantages. In addition, we exclude all trades that took place before bond issuance or after bond maturity as these observations are likely results of data entry errors. Table 1 presents the number of unique bonds/CUSIPs and bond-month trading records after each filter. The full (collapsed) MSRB sample includes 2.8 million bonds with over 22 million bond-month records, and the main sample used in our empirical analysis (after applying all filters except those with asterisk items) includes 1.8 million bonds with around 13 million bond-month observations. On average, each municipal bond is associated with roughly 7.2 months of tradings.

Table 1. Sample Construction

Note: This table describes the steps involved in cleaning the MSRB data. Transaction records are first collapsed and reshaped into security-month units. Column *Bonds* reflects the number of unique bonds remaining after each cleaning step, while column *Bond-Month* reflects the number of bond-month records (as the unit of observations) in the sample. Asterisk items are only adopted in robustness check section but not in the main analysis. See Section 7.4 for a detailed description of the geocoding algorithm needed to perform certain cleaning steps.

Cleaning Step	Bonds	Bond-Month
Full MSRB sample	2800430	22294603
Remove state bond	2217314	15386166
Remove certificates, notes and other irregular debt instruments	1995686	14101057
Remove floating bond, bond with missing coupon	1978840	13690935
Remove taxable and AMT bond	1868138	13032106
Remove green bond, tribal bond, university and college bond	1838206	12746776
Remove trades before issuance, after maturity	1837107	12741320
*Remove trades three months after issuance	1271376	11534300
*Remove trades three months before maturity	1163769	10633438
*Remove bonds with tranche structure	1159230	10567607
*Remove bonds with sinking fund provision	1046705	8726451
*Remove insured bonds	600343	5019096
*Remove bonds with embedded option	321051	2462576

In robustness analysis, we apply several additional filters previously adopted in the literature. Firstly, it is known that newly issued municipal bonds exhibit high price dispersion since a major chunk of trades occurs during this period. Most investors subsequently hold the securities to maturity. High price dispersion could lead to yield spread movement independent of political alignment status. Similarly, small price deviation could lead to

[21] All categories except tribal bonds, university and college bonds are directly flagged in MMBSD. We identify tribal, university and college bonds by searching for specific strings (eg: ”COLLEGE”, ”UNIVERSITY”, ”TRIBE”) within the issuer name. This process may cause incidental exclusion of certain bonds such as all bonds issued by agencies in College Station city, Brazos county, Texas.

large changes in yields when bonds are close to maturity. To avoid such confounding effects, we remove trades three months after issuance and three months before maturity. We further remove all non-straight bonds including bonds with tranche structure, sinking fund provision, bond insurance, and embedded option since they can obviously affect the risk profile of bonds and thus their yield spreads. However, one should be cautious about certain filters as these characteristics are endogenously determined and some (insurance, embedded options) have major impacts on sample size.

2.5 Summary Statistics

In this section, we report the summary statistics for our main empirical sample (i.e. applying the first six filters) of both time-varying and time-invariant county-level and bond-level variables.

Table 2 reports summary statistics for county-level variables. Time-invariant characteristics include population and GDP in 2010, as well as average political leaning since 2000. The main sample includes 2843 unique counties. Consistent with the graphical evidence shown in Figure 2, the average and median county are pro-Republican. Time-varying characteristics are presented in the table as well. Municipal bonds issuers in an average county-month have 94 unique bonds outstanding. The degree of heterogeneity is noticeable as the standard deviation is more than 3 times of the sample average. This is largely driven by populous and large counties such as Los Angeles (CA), Kings (NY), Queens (NY), New York (NY) etc that issue more municipal bonds than the average county. Similar observations can be made for the dollar amount of bonds outstanding for an average county-month. Certain balance sheet variables are also presented. The average county runs a balanced budget and receives the majority of total transfers from the state government. Regarding political alignment measures, one could first observe the similarity of distributions of our preferred "smoothed" version of county political leaning and the political leaning measure from last election. Variables "Stay Aligned" and "Become Misaligned" include observations that are politically aligned *before* the nearest upcoming gubernatorial election. Among all these observations, 73% stay aligned *after* the most recent gubernatorial election while 27% become misaligned. On the other hand, considering politically misaligned counties *before* the nearest upcoming gubernatorial election (i.e. variables "Become Aligned" and"Stay Misaligned"), 59% of the counties remain misaligned and 41% become aligned *after* the most recent gubernatorial election. In any year, on average, $\frac{14287*0.73+9770*0.41}{14287+9770} * 100 = 60\%$ of the counties are politically aligned with the state governor. The ratio is larger than 50% which is as expected as the party affiliation of state governor itself is determined by the majority rule.

Table 3 reports the information for bond-level variables. Panel (a) includes time-invariant characteristics. The average offering yield is 3.06% and the average offering amount is 1.93 million. The average maturity at issuance is 10 (10=123/12) years and duration is 7.96 years as most of the bonds are not zero-coupon bonds. Putable bonds are fairly unusual, representing fewer than 1% of the sample while callable bonds comprises roughly 48% of the sample. The average yield on bond-month level in the secondary market is 2.71%, smaller than the average offering yield mainly because trading is more concentrated during recent time periods when risk free rate is low. Average tax adjusted spread for all transactions is 1.79% and the average tax adjusted spread for purchases of municipal bonds from a customer by a dealer is higher than the average tax adjusted spread for other types of transactions, reflecting a premium earned (higher yield is associated with lower price) by dealers for mediating the market. The average par value traded is large and it is mostly driven by some very large outliers.

Table 2. County Summary Statistics

Note: This table reports summary statistics for the counties included in the main sample. It includes both time-invariant characteristics and time-varying ones. *Pop (2010)* and *GDP (2010)* are the population (in thousand) and GDP (in million USD) of the county in year 2010. *Vote (average)* is the average political leaning defined in Section 2.2 for all gubernatorial elections since 2000. *Num bonds*, *Value bonds* are the number of bonds and value of bonds outstanding for a county in a given year. *Total Debt*, *Total Rev*, *Total Exp*, *Transfer (Federal)*, *Transfer (Local)*, *Transfer (State)* are the total debt outstanding (bonds included), total revenue, total expenditure, federal transfer (inflow), local transfer (gross inflow), state transfer (inflow) respectively. *Vote (Last Election)* is the county level political leaning in the most recent election. Both *Stay Aligned* and *Become Misaligned* start from the status quo of being politically aligned with the governor before the most recent election, while both *Become Aligned* and *Stay Misaligned* start from the status of being politically misaligned with the governor before the most recent election.

	Mean	Std	Min	P25	Median	P75	Max	N
Pop (2010)	104.62	324.06	.29	12.65	28.45	74.75	9818.6	2843
GDP (2010)	5.29	21.63	.01	.4	.97	2.74	574.26	2802
Vote (average)	.15	.23	-.7	.01	.17	.31	.82	2831
Num Bonds	93.09	317.63	1	8	24.5	73	14062	24106
Value Bonds	240.03	2949.07	0	3.11	16.66	81	175283.36	24106
Total Debt	438.15	2984.33	0	16.9	51.56	181.55	162934.59	13562
Total Rev	453.3	2809.53	0	37.5	91.71	253.89	134443.94	7564
Total Exp	449.35	2810.45	.01	36.66	89.84	250.23	129637.26	7563
Transfer (Federal)	14.94	111.72	0	.23	1.31	5.91	6331.29	12812
Transfer (Local)	14.03	67.31	0	.46	1.89	6.87	2454.83	13250
Transfer (State)	132.61	568.86	0	15.14	36.44	94.35	29034.11	13691
Vote (Last Election)	.16	.3	-.89	-.04	.17	.37	.98	24057
Stay Aligned	.73	.44	0	0	1	1	1	14287
Become Misaligned	.27	.44	0	0	0	1	1	14287
Become Aligned	.41	.49	0	0	0	1	1	9770
Stay Misaligned	.59	.49	0	0	1	1	1	9770

Table 3. Bond Summary Statistics

Note: This table reports summary statistics for the bond sample used in the analysis. Panel (a) presents the primary market (bond level) characteristics and Panel (b) presents the secondary market (bond-month level) characteristics. In Panel (a), *Amount* is the size of issuance in million USD; *Duration (year)*, *Mod-duration (year)*, *Convexity* and *Maturity* are bond duration, modified duration, convexity and the number of months toward maturity, all measured at issuance; *Funded* takes value 1 if there exists companion sinking fund, including invested/mandatory/optional/anticipated fund type; *General Obligation* bonds (backed by the general revenue of the issuing municipality) are in contrast with revenue bonds (supported by project-specific revenue source). In Panel (b), *Weighted Yield* is the yield of municipal bond weighted by *Par* (in thousand USD) value in the transaction, prior to tax adjustment; *Spread* is the yield spread of bond, adjusted for tax treatment; *Spread_D*, *Spread_P*, *Spread_S* are yield spreads only for inter-dealer trade (D), purchase from a customer by a dealer (P) or sale to a customer by a dealer (S); *Std Yield* is the standard deviation of yield in each transaction if there are multiple transactions for a given security in a specific month; *Age* and *Maturity* are the number of months between this trading month to bonds' issuing month and to maturity; *Since Last Election* and *To Next Election* are the number of months since the last election and to the next election respectively.

(a) Primary Market (Bond) Characteristics

	Mean	Std	Min	P25	Median	P75	Max	N
Coupon	3.7	1.28	0	3	4	4.75	16	1837107
Offer Price	102.7	10.6	.73	99.96	101.21	105.64	496.01	1801685
Offer Yield	3.06	1.43	0	1.95	3.11	4.08	100	1801478
Amount	1.93	14.12	0	.22	.5	1.34	8815	1821096
Duration	7.96	4.20	0.5	4.69	7.86	10.89	55	1837107
Mod-duration	7.82	4.09	0.11	4.65	7.74	10.68	52.95	1837107
Convexity	95.26	94.6	0.02	24.75	69.77	140.09	2829.14	1837107
Maturity	123.41	78.13	0	62	112	172	1255	1837107
Putable	0	.03	0	0	0	0	1	1837107
Callable	.48	.5	0	0	0	1	1	1837107
Funded	.09	.29	0	0	0	0	1	1837107
Insured	.36	.48	0	0	0	1	1	1837107
General Obligation	.4	.49	0	0	0	1	1	1837107

(b) Seconcary Market (Bond-Month) Characteristics

Variable	Mean	Std	Min	P25	Median	P75	Max	N
Weighted Yield	2.71	1.39	.27	1.56	2.6	3.75	6.61	12638282
Spread	1.79	1.53	-1.92	.82	1.54	2.46	7.47	12559127
Spread (Inter Dealer)	1.49	1.34	-1.71	.63	1.25	2.19	6.47	4610097
Spread (Dealer Buy)	2.19	1.74	-1.51	1.03	1.87	2.97	8.6	9245699
Spread (Dealer Sell)	1.47	1.48	-2.57	.6	1.28	2.17	6.71	11236630
Par	901.78	6943.45	0	50	135	430	8763955	12741320
Std Yield	.32	1.16	0	.06	.14	.29	86.36	10599393
Age	52.86	49.13	-2	14	44	81	1021	12741320
Maturity	110.58	82.03	0	45	93	160	761	12741320
Since Last Election	25.29	13.91	2	13	25	37	50	12741320
To Next Election	22.84	13.88	1	11	21	35	49	10808103

3 Political Misalignment and Yield Spread

3.1 Panel Evidence

We start off by looking at whether political alignment between a county and the then governor helps explain the variations in municipal bond yield spread. Recall that we define political alignment by comparing the counties' time-invariant political leaning measure and the party affiliation of the incumbent governor, as illustrated in Section 2.3.2.

Table 4 reports regression results using primary market information. The left hand side variable is the municipal bond offering yield and the right hand side variable is an indicator variable whether the issuer of the municipal bond is in a county that is currently politically misaligned with the state governor. As we can see, the coefficient is positive and significant across all specifications, suggesting that it is more costly for agencies in counties that are politically misaligned with the state governors to raise funding in the municipal bond market.

Table 4. Primary Market Evidence

Note: This table reports the effect of political alignment on municipal bond offering yield. *Misaligned County* takes value of 1 if the issuer of the municipal bond is in a county that is currently politically misaligned with the state governor and takes value of 0 otherwise. Column (1) performs the uni-variate analysis with *Misaligned County* as the only RHS regressor. Columns (2)-(4) adds *Log(Issuance Amount)*, *Convexity*, *Modified Duration*, *Coupon* as additional control variables. Columns (3)-(5) adds time fixed effect, issuer fixed effect and both respectively. Standard errors are two way clustered at the issuer and time level.

	(1) Offering Yield	(2) Offering Yield	(3) Offering Yield	(4) Offering Yield	(5) Offering Yield
Misaligned County	0.3163***	0.2023***	0.0214**	0.1508***	0.0219***
	(0.0569)	(0.0320)	(0.0094)	(0.0294)	(0.0083)
Log(Issuance Size)		-0.1551***	-0.0694***	-0.2221***	-0.0483***
		(0.0110)	(0.0042)	(0.0079)	(0.0028)
Convexity		-0.0017***	-0.0030***	-0.0020***	-0.0035***
		(0.0002)	(0.0001)	(0.0002)	(0.0001)
Modified Duration		0.2164***	0.2333***	0.2306***	0.2452***
		(0.0040)	(0.0026)	(0.0037)	(0.0023)
Coupon		0.4479***	0.1904***	0.3864***	0.1589***
		(0.0090)	(0.0044)	(0.0084)	(0.0040)
Observations	420858	417092	417091	416570	416570
R^2	0.011	0.514	0.858	0.660	0.909
Adjusted R^2	0.011	0.514	0.858	0.652	0.907
Time FE	N	N	Y	N	Y
Issuer FE	N	N	N	Y	Y

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Results from primary market is only suggestive as neither of the two most important factor, liquidity and credit risk, can be easily measured or captured in the regression. Differences in offering yield may just be a result of different seniority, different sources of fund, or even different skills of underwriters. To address such concerns effectively, we will focus on the secondary market in the remaining part of the paper. The extra time dimension within each single municipal bond allows us to parse out much of the heterogeneity across municipal bonds and instead to only focus on the yield spread changes over time.

As political leaning is continuously defined, we unify measures of political alignment/misalignment together using the variable political misalignment. It takes positive values when misaligned and negative ones otherwise, and its magnitudes represent the degree of misalignment/alignment. We run the following regression for different cut(off) values to understand the relationship between municipal yield spread and degree of misalignment.

$$YS_{icst} = \beta_0 + \beta_1 \mathbb{1}_{Misalign_{cst}>cut} + \gamma_i + \eta_{st} + \epsilon_{isct}$$

where YS_{icst} is the yield spread for municipal bond i issued by county c in state s at time t, $\mathbb{1}_{Misalign_{cst}>cut}$ equals 1 for counties whose degree of misalignment at time t is greater than cut and 0 for counties with negative degree of misalignment,[22] γ_i and η_{st} stand for bond fixed effects and state-month-year fixed effects respectively, and standard errors are clustered at the county level since we expect municipal bonds issued by agencies in the same county co-move strongly with respect to changes in the county's political alignment.

The literature has documented dozens of factors that can explain municipal bond yield spread (Ang et al., 2014; Baber and Gore, 2008; Capeci, 1991; Cestau et al., 2019; Fairchild and Koch, 1998; Gao et al., 2019b,a; Poterba and Rueben, 1997, 2001; Schwert, 2017; Slemrod and Greimel, 1999; Wagner, 2004; Wallace, 1981; Wang et al., 2008) and here we take an easier approach exploiting the panel structure of our dataset, rather than constructing those measures one by one. Since most of the measures are constant or close to constant along one or more particular dimensions, bond fixed effects and state-month-year fixed effects are able to absorb bond-level time-invariant characteristics and state-specific (non-linear) time-trend.

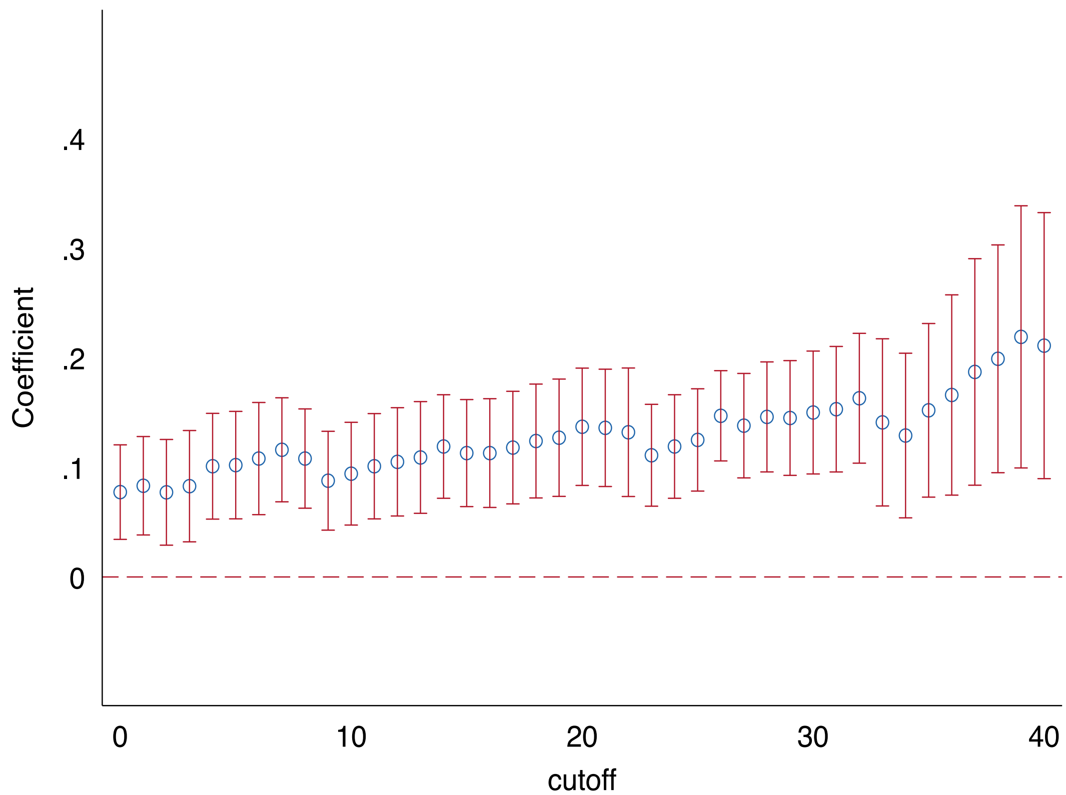
Figure 5 plots the coefficients along with the 95% confidence interval obtained from the regressions against corresponding cut(off). As one can see, all coefficients are significant and positive, suggesting that misalignment between county's political leanings and state governor's party is indeed associated with higher municipal bond yield spread. Perhaps

[22] Observations with degree of misalignment between [0,cut] are dropped so that the comparison group stays the same across regressions. We also tried two alternative specifications. One dropped all observations with degree of misalignment between [-cut,cut] so that we ignore all swing counties, and the other directly added a group of dummy variables corresponding to different misalignment level. Results are almost exactly the same, except that coefficients in the last specification are not precisely estimated. In addition, the specification labeling all observations with degree of misalignment smaller than cut as 0 is problematic as the comparison group will become increasingly political misaligned with the state governor as cut increases.

more interesting and reassuring is the almost monotonic relationship between coefficient/significance and cutoff: as counties become more firmly supportive of the opposition party, governors could be less concerned about the potential loss of votes when designing public finance policies, investors may price in such misalignment effects, and the yield spread of municipal bonds issued by agencies in those counties indeed experienced larger yield spread increases.[23]

Figure 5: Degree of Misalignment v.s. Yield Spread

Note: This figure plots the regression coefficients (β_1) obtained from a series of panel regressions. For each cutoff value, we run the panel regression in the form of $YS_{icst} = \beta_0 + \beta_1 \mathbb{1}_{Misalign_{cst} > cut} + \gamma_i + \eta_{st} + \epsilon_{isct}$ after dropping all the observations with $Misalign_{cst} \in (0, cutoff)$, i.e. we hold the control group (counties with average political leanings the same as the current state governors' party affiliation) the same across regressions and increase the degree of political misalignment of the "treatment" group.



One obvious caveat of the panel evidence is that it is subject to endogeneity concerns and thus can only be interpreted as correlation instead of causation. For example, Republican party is relatively stronger at the state level election in general, meaning that Democratic counties are more likely to be politically misaligned with the state governor than Republican counties. At the same time, Democratic counties are relatively looser in

[23]The monotonicity no longer holds as we push to the "boundary" as the number of counties that could be classified as having an "extreme" level of political misalignment drops significantly.

budget management and more likely to run a deficit, leading to higher municipal bond yield spread. In addition, any time-varying bond-level characteristics may be omitted variables in our specification. Many municipal bonds had exotic embedded call options, and issuers may choose to exercise any amounts. Even though we have tried to directly adjust the yield spread, such adjustment may still be inadequate to fully capture investors' reactions in the secondary market. If these factors are also correlated with election results, then our results will suffer from potential biases.

3.2 Evidence From Close Elections

To alleviate the endogeneity concern discussed in the previous section, we group observations based on the political alignment status prior to the most recent gubernatorial election, and focus exclusively on close elections. As illustrated in Section 2.3.2, this guarantees that the within group characteristics are similar and the current political alignment status of these observations is approximately random.

With these two features, our empirical design can be viewed as a combination of Diff-in-Diff and RDD.[24] Specifically, we run the following regressions:

$$YS_{icst} = \beta_0 + \beta_1 v_{st} + \beta_2 v_{st} D_{cst} + \beta_3 D_{cst} + \beta_4 x_{st} + \eta_t + \gamma_i$$

where the left hand side variable is the yield spread of a municipal bond i issued by county c in state s at time t. The alignment indicator D_{cst} is an indicator variable that varies at the county level and equals 1 when there is a change in the status quo.[25] The running variable v_{st} is the vote margin on the state level and the interaction between the running variable and alignment indicator allows slopes to differ on either side of the cutoff, x_{st} includes other potential control variables, and η_t and γ_i are time fixed effects and bond fixed effects, respectively.

To further mitigate data snooping concerns, we choose a prefixed bandwidth of 0.05 for gubernatorial elections (i.e., the winning party wins less than 52.5% of the total votes), remove swing counties with average political leaning between -0.2 and +0.2, and fix these values in all of the analysis hereafter.[26]

[24]Compared with Diff-in-Diff, we restrict our attention to close elections to analyze the effect following a surprising election outcome. Compared with the RDD, we do not stop at the jump of state-level election outcome as vote margin changes, but further interact this jump with pre-determined county-level political leaning measures to study the effect of changes in political alignment status.

[25]For example, when the status quo is politically aligned, this indicator takes value 1 when counties become politically misaligned after an election and 0 if the status quo remained intact.

[26]The results are highly robust to the choice of bandwidth and cutoff of swing counties. Less than 10% of the regressions had β_2 with statistical significance less than 5% when we ran regressions on a grid of bandwidth and swing counties cutoff values. In addition, the results are also highly robust to the use of alternative measures of misalignment. In fact, the measure constructed by votes in the 2000 election cycle gives slightly larger and more significant regression using the cutoffs reported in Table 5

The following Table 5 reports our main regression results with two-way clustered standard errors on both county and month level. We only reported estimates of β_2 as it is our main variable of interest. Odd numbered columns have politically aligned as the status quo with the "shock" being "Become Misaligned." Even numbered columns, on the other hand, have politically misaligned as the status quo with the "shock" being "Become Aligned." Columns (1) and (2) are the baseline regression results. As we can see, starting from being politically aligned, the county receiving the alignment shock following a close gubernatorial election subsequently saw its associated municipal bond yield spreads rising by 20 basis points on average compared to its counterpart whose status quo remained intact. On the other hand, counties that started out as being politically misaligned but subsequently became aligned following a close gubernatorial election saw their associated municipal bond spreads drop by 29 basis points on average, relative to their counterparts whose status quo remained intact. In columns (3)-(4), we instead interact the "shock" with the degree of average political leaning of the counties, and the results remain statistically significant. The coefficient estimates showed that one additional degree of misalignment leads to 0.6 basis points higher yield spread for municipal bonds associated with counties that became politically misaligned following a close gubernatorial election, relative to their counterparts that stayed politically aligned. On the other hand, one additional degree of alignment reduces yield spread by 1 basis point for municipal bonds issued by entities residing in counties that became politically aligned following a close governor election, relative to their counterparts that stayed politically misaligned.

Table 5. RD Regression Results

Note: This table analyze the impact of becoming politically (mis)-aligned with state governors on yield spreads of municipal bonds issued by these counties. The specification of the regressions resembles a RDD with bandwidth 0.05 (i.e. $\frac{\text{(votes by winning party-votes by losing party)}}{\text{(votes by winning party+votes by losing party)}} < 0.05$). Swing counties where absolute value of political leaning smaller than 0.2 are not included in the regressions. Columns (1)-(2) report the baseline results, columns (3)-(4) include the absolute value of voting margin, columns (5)-(6) interact the discontinuity variable "Become (Mis)Aligned" with the degree of political leaning. Odd columns use the subsample where the status quo was politically aligned (with the state governor) before the most recent gubernatorial election while even columns use the subsample where the status quo was politically misaligned (with the state governor). Time fixed effects and bond fixed effects are included in the regressions and standard errors are two way clustered at the time and county level.

VARIABLES	(1) Spread	(2) Spread	(3) Spread	(4) Spread	(5) Spread	(6) Spread
Become Misaligned	0.197***		0.295***			
	(0.0745)		(0.0887)			
Become Aligned		-0.288**		-0.330**		
		(0.132)		(0.134)		
Become Misaligned (Cont)					0.00635***	
					(0.00183)	
Become Aligned (Cont)						-0.0114***
						(0.00317)
Interaction	0.102	0.0285	-0.221	-0.130	0.00265	0.00246
	(0.107)	(0.0886)	(0.165)	(0.101)	(0.00249)	(0.00195)
Margin	0.0529	0.0458	0.203**	0.122**	0.0615	0.0203
	(0.0551)	(0.0461)	(0.0817)	(0.0495)	(0.0408)	(0.0301)
Abs(Margin)			0.146**	0.0953**		
			(0.0587)	(0.0402)		
Constant	1.819***	1.744***	1.471***	1.528***	1.817***	1.774***
	(0.0247)	(0.0620)	(0.143)	(0.0950)	(0.0198)	(0.0492)
Observations	646,159	323,443	646,159	323,443	646,159	323,443
R-squared	0.711	0.709	0.712	0.709	0.712	0.709
Status Quo	Aligned	Misaligned	Aligned	Misaligned	Aligned	Misaligned
Num Counties	522	289	522	289	522	289

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

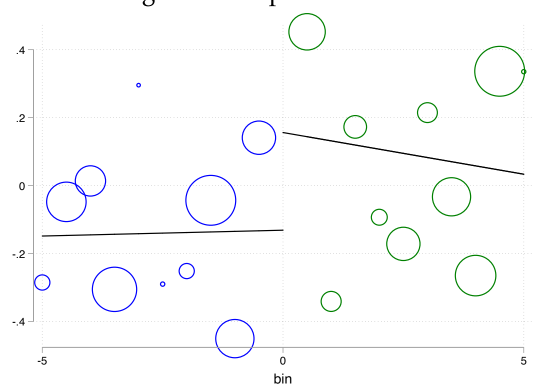
In Figure 6, we present the bin scatter plot of (residualized) municipal bond yield spreads against winning margin of the challenger party. Panel (a) includes the sub-sample where the status quo of the county before the nearest upcoming gubernatorial election is being politically aligned with the state governor,[27] while Panel (b) includes the sub-sample where the status quo of the county before the nearest upcoming gubernatorial election is being politically misaligned with the state governor. To isolate differences in bond characteristics, we residualize yield spreads using the bond and time fixed effects. We then gridify the running variable "winning margin" in $[-5\%, 5\%]$ into small intervals of length 0.5% and compute the par-weighted average yield spread residuals in each interval. Consistent with the regression results, Figure 6 shows a positive jump to the right of winning margin 0 in Panel (a), and a negative jump to the right of winning margin 0 in

[27] Thus a positive vote margin to the challenger party (i.e. a candidate from the challenger party wins the election) means the political alignment status will switch to misaligned after the election.

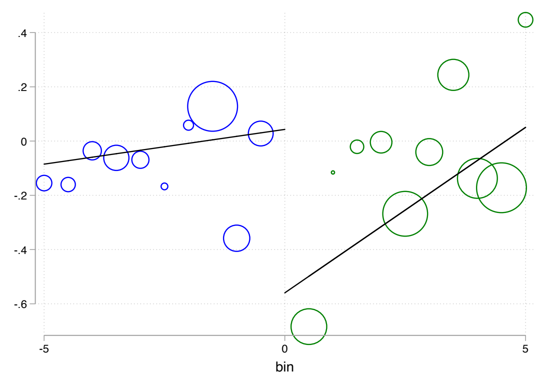
Panel (b).

Figure 6: Yield Spread versus Winning Margin of Challenger

Note: This graph shows the binscatter plot of (residualized) municipal bond yield spread against winning margin of the challenger party. Panel (a) include the sub-sample where the status quo of the county before the nearest upcoming gubernatorial election is being politically aligned with the state governor, while Panel (b) include the sub-sample where the status quo of the county before the nearest upcoming gubernatorial election is being politically misaligned with the state governor. Circles are weighted by the size of par value traded and fitting lines are plotted.



(a) Status Quo=Aligned

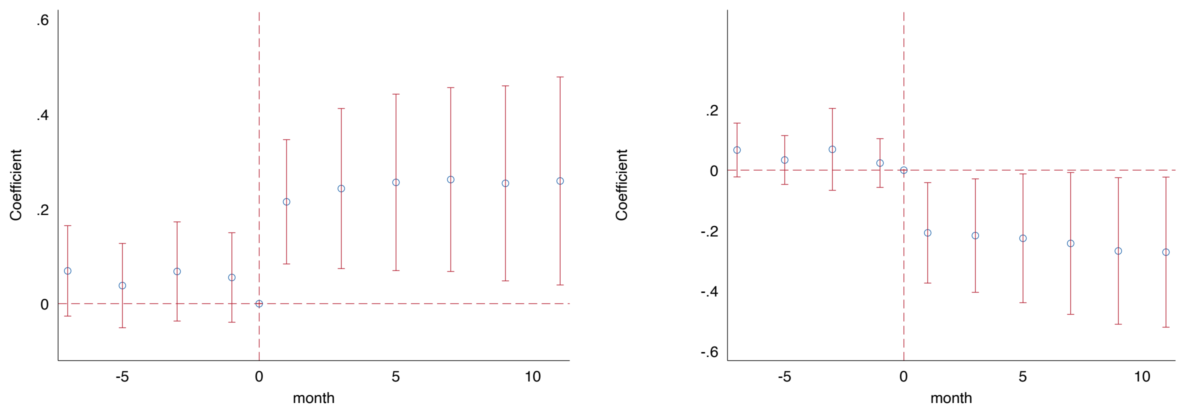


(b) Status Quo=Misaligned

One merit of the secondary market data lies around its panel structure (i.e. county/vote margin dimension and time dimension). In the analysis above, Table 5 pool both dimensions together while Figure 6 pools the time dimension together and analyzes the effect of vote margin on yield spread. Alternatively, we adopt the spirit of difference-in-difference/event study analysis and look at the dynamics in yield spread around the election. As usual, we separate the cases where the status quo is politically aligned/misaligned before the most recent election. In the following Figure 7, we plot the regression coefficients against the months after the election. As we can see, there is generally no pre-trend before the election, and the yield spread exhibits an immediate jump two months after the election, followed by a prolonged slow strengthening (further increase or decrease) period. The other interesting fact from Figure 7 is that in both of the cases, the yield spread for counties experiencing a change in political alignment status seems to be higher than the counties maintaining the status quo, which may be related to the higher degree of political uncertainties in these cases.

Figure 7: Yield Spread versus Months after the Election

Note: This graph shows the regression coefficients in the event study analysis $YS_{icst} = \beta_0 + \sum_{i=-8}^{12} \mathbb{1}_{\text{Alignment Change}} * \mathbb{1}_{i_{th}\text{ Month after Election}} + \gamma_i + \eta_{st} + \epsilon_{isct}$. Panel (a) include the sub-sample where the status quo of the county before the nearest upcoming gubernatorial election is being politically aligned with the state governor, while Panel (b) include the sub-sample where the status quo of the county before the nearest upcoming gubernatorial election is being politically misaligned with the state governor. We group every two months together for more precise estimation but the results are quantitatively similar when include individual months in the regression, except that the standard errors are very large for a certain months with very few number of observations.



(a) Status Quo=Aligned

(b) Status Quo=Misaligned

4 Additional Specifications and Discussions

4.1 Economic Significance

The size of the regression coefficients presented in Table 5 indicates that being politically aligned with the state governor is associated with roughly 20 basis points reduction in municipal bond yield spread, all else equal. For in-sample comparison, the standard deviations of yield spread in primary market (offering yield) and secondary market (trading yield) are 1.43 and 1.53, respectively. Therefore the effect of political alignment can explain up to 1/6 of the sample standard deviation. As an alternative measure, the average yield spread difference between AAA-rated and BBB-rated bonds is ∼90 basis points, thus the effect of our political measure represents about a quarter of the BBB-AAA spread.

In a very closely related paper, Gao et al. (2019b) shows that gubernatorial election uncertainty itself is associated with a 7.2 basis point increase in municipal bond yield spread. The effect when restricting to close elections is larger, however, equals around 13 basis points. The effect of political alignment is roughly 1.5x of the effect of political uncertainty.[28]

[28]However, there are two important differences in the definition of close election in Gao et al. (2019b) and our analysis. First, they rely on polls, which are ex-ante expectations in its virtue but subject to the several

Comparing with other estimates of municipal bond yields studied by other researchers using different events in the literature, one could notice that they are largely comparable.[29] Baber and Gore (2008) showed that municipal bonds issued by states that mandated GAAP disclosure saw yields lowered by 14-25 basis points on average. Similarly, exploiting an exogenous Moody's rating recalibration, Adelino et al. (2017) found municipal bonds issued by upgraded local governments saw a reduction of 14 basis points in offering yields. Moreover, Painter (2020) found that long-term bonds exposed to more climate risk had 16-20 basis points higher yields. Our findings in the secondary markets show comparable yield responses from municipal bonds issued by local government affiliates that changed political alignment status following a close governor election. Compared to other events, our estimated magnitudes are around twice as large as the yield responses from loss of public monitoring (Gao et al., 2020) and 2.5 times larger than the corruption penalty estimated by Butler et al. (2009).

4.2 Balance Test

Regression discontinuity design requires that any unobservables should be similar on average across states where incumbents barely win the elections and the ones where incumbents barely lose the elections. Grimmer et al. (2011), however, finds structurally advantaged candidates are more likely to win close elections.[30] Eggers et al. (2015) show that Grimmer et al. (2011)'s results are exceptions by systematically analyzing a much larger sample. Nevertheless, we perform checks to ensure that our results are not driven by effects claimed by Grimmer et al. (2011).

Following Grimmer et al. (2011)'s definition of structurally advantaged candidates, we test whether running as a candidate in incumbent governor party is associated with a higher probability of winning a close election.[31][32] The following Figure 8 plots the histogram of vote margin by the candidate from incumbent party for all races since 2005

shortcomings we discussed in Section 3.2. Second, Gao et al. (2019b) apply a much looser criteria defining "close elections" using the sample median 12% difference (i.e. 56% v.s. 44%). Under similar criteria, states traditionally viewed as deep blue such as Illinois, Connecticut, or states traditionally viewed as deep red such as Texas, South Dakota will be classified as swing states. It is thus unclear whether many elections, even in their close elections sub-sample, really introduce enough political uncertainty ex-ante. In the robustness checks presented in Table 7, we also try the sample median as an alternative definition of close elections and the coefficients shrink to ~ 0.15. In general, the effect of political alignment on municipal bond yield spread is roughly comparable to (or slightly larger than) the effect of political uncertainty

[29] As mentioned in the introduction, one caveat is that most of these estimates are in the primary market.

[30] They claim that the party of the Governor or election administrator or the party that dominates the state legislature might reflect advantages for a candidate for federal office in that state.

[31] This is different from the incumbent advantage documented in the literature as it does not restrict to same-candidate retention but only requires the candidate is affiliated with the same party as the current governor.

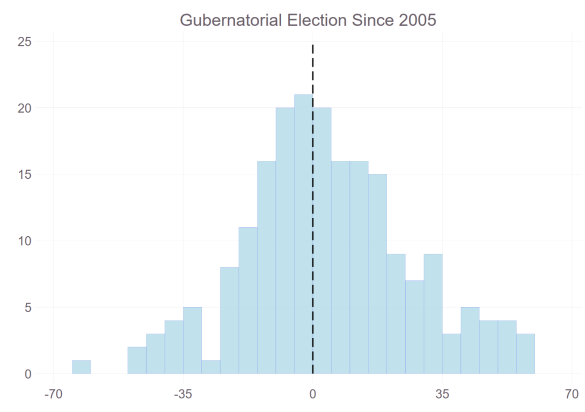
[32] We also performed similar tests looking at whether the candidate aligned with the state legislation is associated with a higher probability of winning a close election and results are very similar. The test regarding alignment with election administrator is not performed currently due to data limitation.

(Panel (a)) and as one can see, there exists no abnormal excess density to the right of the treatment threshold zero. Panel (b) shows the fit of a McCrary test of continuity around zero and it does not reject the null hypothesis that there are no jumps for the running variable around the zero cutoff, indicating that the candidates aligned with the ruling party do not have the ability to selectively push themselves across the winning margin.[33]

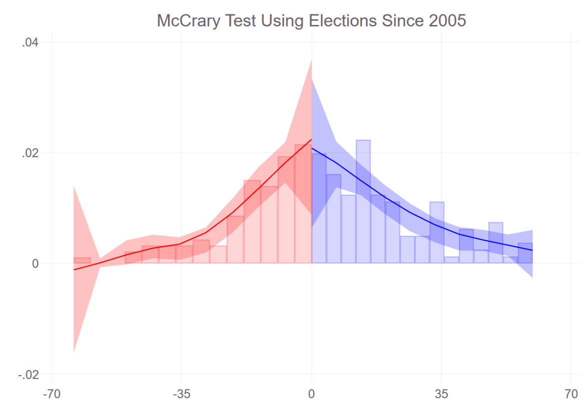
Using a similar exercise, Figure 9 presents the binscatter plot of winning margin against the fraction of winning candidates that were aligned with the incumbent state governor. In particular, we test for jumps at threshold zero and five (percent) and find no evidence supporting either one, i.e. the probability that candidates aligned with the incumbent state governor win a very close election is NOT significantly higher than (1) the probability that candidates from the challenging party win a very close election (2) the probability that candidates aligned with the incumbent state governor win a landslide election.

Figure 8: Distribution of Running Variable (Vote Margin)

Note: This figure shows the distribution of the winning margin of the incumbent party candidate for U.S. gubernatorial elections between 2005-2020, the sample used in the main specification. Panel A is a histogram of this margin. Panel B plots a nonparametric regression to each half of the distribution following McCrary (2008), testing for a discontinuity at zero.



(a) Histogram of Winning Margin of Incumbent Party Candidate

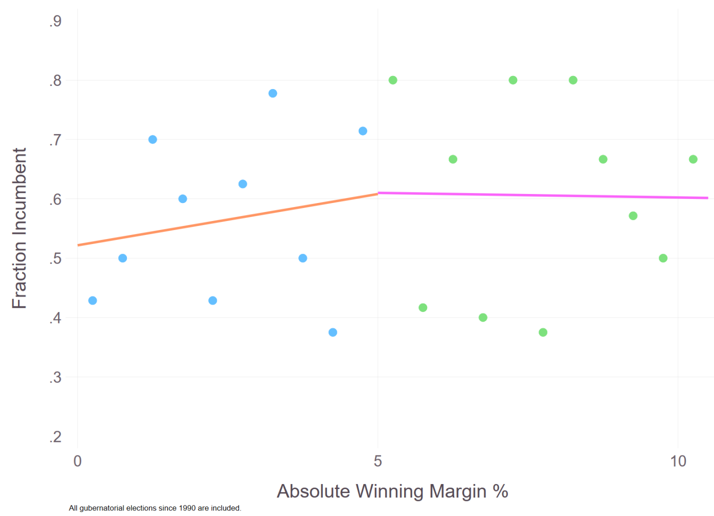


(b) McCrary Test

[33]Results using all races since 1990 show essentially the same results.

Figure 9: Distribution of Running Variable (Vote Margin)

Note: This figure shows the binscatter plot of winning margin against the fraction of winning candidates that were aligned with the incumbent state governor, using all gubernatorial election results since 1990. Each bin represents 0.5% of the winning margin.



4.3 Falsification Checks

In Table 6, we present results from two falsification checks to make sure that our results are not driven by randomness. The first check is to test whether we can find similar significant results for variables that should not be affected by political alignment changes. As we control for bond fixed effects in our main specification, time varying variables are needed. As most of the time-varying bond-level variables such as duration, convexity, are deterministic functions of time, finding insignificant regression coefficients are more of mechanical results.[34] Instead, we choose to search for (pre-determined) time-varying covariates on county-level to make falsification checks more meaningful. In particular, we use the (log) dollar amount and (log) number of municipal bonds matured in each month as the left hand side variables. The main argument is that the number or amount of municipal bonds matured in each month are predetermined at issuance by time to maturity, and given that the maturity of an average municipal bonds spans across several governor terms, changes of political alignment status following a recent close election should not affect objects determined by events in the past. Indeed, this is confirmed by results shown in columns (1)-(4).

As a second check, we also constructed fake election results where election winners are classified as "Republican" if the absolute value of vote margin is greater than 20% and as "Democratic" if the absolute value of vote margin is smaller than 20%. We constructed

[34]Empirically, they are indeed not statistically significant.

the political alignment measure accordingly. This fake "political alignment" measure should not convey any information about alignment and we indeed found statistically insignificant results. Moreover, we did not find opposite-sign results in columns (5)-(6). As a more general extension, we also experimented with random number generator to assign political alignment status, ran regressions using simulated alignment status, and noticed that our baseline results are at the tail of such distributions.

Table 6. Falsification Checks

Note: This table present results from three falsification checks. Odd columns use the subsample where the status quo was politically aligned before the nearest upcoming election, while even columns use the subsample where the status quo was politically misaligned before the nearest upcoming election. For column (1)-(2) and (3)-(4), observations are on county-time level. The left hand side variables are the (log) dollar amount (*Maturing Amount*) and (log) number of municipal bonds (*Maturing Number*) matured in each month respectively. Columns (5)-(6) have observations on bond-time level with yield spread as left hand side variable but political alignment defined using fabricated election results. Election winners are classified as "Republican' if the absolute value of vote margin is greater than 20%, and as "Democratic" if the absolute value of vote margin is smaller than 20%. County and time fixed effects are included in columns (1)-(4), and bond and time fixed effects are included columns (5)-(6). Standard errors are two way clustered on the county and time level.

LHS Var/Check	Maturing Amount		Maturing Number		Fake Alignment	
Status Quo	Aligned	Misaligned	Aligned	Misaligned	Aligned	Misaligned
Become Misaligned	0.0954		0.0713		0.158	
	(0.150)		(0.0905)		(0.151)	
Become Aligned		0.0400		-0.318		0.237
		(0.292)		(0.194)		(0.467)
R-squared	0.539	0.559	0.473	0.513	0.728	0.771
Num Counties	522	289	522	289	515	665

Standard errors are two-way clustered on security and time.
*** p<0.01, ** p<0.05, * p<0.1

4.4 Robustness

In this subsection, we present additional robustness checks in addition to the baseline results as well as results controlling for degree of political uncertainty presented in Table 5.

One recent study by Gao et al. (2019b) documented that political uncertainty leads to higher municipal bond yield spread. Ceteris paribus, closer elections are associated with greater political uncertainty. However, in principle, political uncertainty alone could not entirely explain away our baseline results.[35] Still, a simple but effective exercise to address

[35]By fixing the 0.05 bandwidth for gubernatorial elections, only sufficiently close elections are included in our analysis and we do not expect the degree of political uncertainties caused by these selected elections

this concern is to directly add in the regression the absolute value of voting margin, the most commonly used measure of political uncertainty in the literature (Boutchkova et al., 2012; Çolak et al., 2017; Gao et al., 2019b; Julio and Yook, 2012). As presented in columns (1)-(2) of Table 7, the regression coefficients have the same sign as before and they remain statistically significant.

Additionally in Table 7, we also performed a series of common robustness checks widely used in the regression discontinuity literature. Columns (3)-(4) use quadratic fitting for the underlying running variable.[36] Columns (5)-(6) use the sample median as the criteria for close elections. It is widely known that RDD results are sensitive to bandwidth choice and the sample median (corresponding to 56.5% v.s. 43.5%) seems a relatively loose definition of close elections. Our baseline results hold nevertheless despite reduced statistical and economic significance. Lastly, columns (7)-(8) use the sample median average voting margin at the county level as the criteria for partisan v.s. swing counties. As we can see, the results are robust across all alternative specifications.[37]

We apply several filters when constructing the main empirical sample and many of those filters have significant impacts on sample size, as show in Table 1. Although most of the filters are directly borrowed from Schwert (2017), we keep the asterisked ones in Table 1 off in the baseline results.[38] In Table 8, we vary the number filters applied and provide evidence that the results are not driven by specific choice regarding sample filters. Columns (1) and (2) use the full sample before applying any filters (except for state bonds, which are naturally excluded as they do not have the vertical political alignment measure). Columns (3) and (4) remove all trades three months after issuance in addition to the filters used in main analysis. Columns (5) and (6) remove all trades three months before maturity in addition to the filters used in columns (3) and (4). Columns (7) and (8) additionally remove all bonds with special risk mitigation strategies including tranche structure, sinking fund provision and bond insurance. Columns (9) and (10) additionally remove all bonds with embedded options, either put or call. As we can see, results remain very similar to the baseline in each of the alternative sample selection procedure, though the coefficients in the last two alternatives become somewhat large due to significantly

to be too different. More importantly, by splitting the sample according to different status quo before the nearest upcoming election, our hypothesis makes stronger predictions. The regression coefficients of "Become Misaligned" and "Become Aligned" both need to be significant and of the opposite sign. Even if a certain fraction of the effects is driven by political uncertainty, it is difficult to come up with a reason why such effects have opposite directions depending on different political alignment status quo.

[36]In the next draft we are currently working on, we also include results using higher degrees polynomials as well as nonparametric methods such as local linear regressions.

[37]Additionally, we also tried using different political leaning measures as well as excluding county-election records where the sum of vote share to Democratic and Republican candidates is smaller than 60% (i.e. third party candidates won a significant shares of votes in the election from that county). The baseline results still stand.

[38]With all the filters applied, the final sample analyzed in Schwert (2017) only consists of 1.08% and 1.70% of the original raw dataset in terms of number of bonds and number of trades respectively. Also note that the RDD used in empirical analysis in our paper imposes another layer of filters implicitly.

reduced sample size as the majority of municipal bonds are insured and have embedded options.

Table 7. Robustness: Alternative Specification and Bandwidth

Note: This table presents the regression results under several alternative specifications as robustness check. Odd columns use the subsample where the status quo was politically aligned before the nearest upcoming election, while even columns use the subsample where the status quo was politically misaligned before the nearest upcoming election. Columns (1)-(2) additionally control for the absolute voting margin to deal with political uncertainty. Columns (3)-(4) use quadratic polynomial to fit running variables on either side of the cutoff. Columns (5)-(6) use the same median (13) state-level vote margins as the bandwidth to define close gubernatorial elections. Columns (7)-(8) define partisan vs swing counties using the sample median (15) absolute value of "average political leaning". All columns share the same specifications as the one used for main analysis with the same set of control variables (not reported due to space constraint) and fixed effects. Standard errors are two way clustered on the county and time level.

LHS Var	Yield Spread							
Status Quo	Aligned	Misaligned	Aligned	Misaligned	Aligned	Misaligned	Aligned	Misaligned
Become Misaligned	0.295***		0.306***		0.153**		0.192***	
	(0.0887)		(0.0461)		(0.0742)		(0.0733)	
Become Aligned		-0.330**		-0.383***		-0.107*		-0.358***
		(0.134)		(0.132)		(0.0566)		(0.116)
R-squared	0.711	0.709	0.712	0.709	0.686	0.692	0.707	0.712
Num Counties	522	289	522	289	675	518	627	375
Bandwidth	5	5	5	5	13	13	5	5
Cutoff	20	20	20	20	20	20	15	15
Polynomial	Abs	Abs	Quad	Quad	Linear	Linear	Linear	Linear

Standard errors are two-way clustered on security and time.
*** p<0.01, ** p<0.05, * p<0.1

Table 8. Robustness: Sample Construction

Note: This table presents the regression results with different filters in the sample construction process. Columns (1), (3), (5), (7), (9) use the subsample where the status quo was politically aligned before the most recent election while columns (2), (4), (6), (8), (10) use the subsample where the status quo was politically misaligned before the most recent election. Columns (1) and (2) use the full sample before applying any filters (except for state bonds, which are naturally excluded as they do not have the vertical political alignment measure); columns (3) and (4) remove all trades three months after issuance maturity in addition to the filters used in main analysis; columns (5) and (6) remove all trades three months before maturity in addition to the filters in columns (3) and (4); columns (7) and (8) remove all bonds with special risk mitigation strategies including tranche structure, sinking fund provision and bond insurance; columns (9) and (10) remove all bonds with embedded options, either put option or call options. Details on these filters and their impact on the sample can be found in Table 1. All columns share the same specifications as the main analysis with the same set of control variables (not reported due to space constraint) and fixed effects. Standard errors are two way clustered at the county time level

Sample	Full Sample		Issuance		Mature		Insured		Option	
Status Quo	Aligned	Misaligned	Aligned	Misaligned	Aligned	Misaligned	Aligned	Misaligned	Aligned	Misaligned
Become Misaligned	0.272***		0.265***		0.251***		0.270***		0.347***	
	(0.0454)		(0.0510)		(0.0524)		(0.0675)		(0.0734)	
Become Aligned		-0.291***		-0.420***		-0.438***		-0.819***		-0.696***
		(0.0917)		(0.0966)		(0.103)		(0.102)		(0.0560)
Observations	613,655	303,108	465,119	224,364	459,840	221,662	201,392	112,930	103,065	58,767
R-squared	0.762	0.753	0.732	0.728	0.741	0.738	0.790	0.767	0.793	0.768

Standard errors are two-way clustered on security and time.
*** p<0.01, ** p<0.05, * p<0.1

4.5 Heterogeneity

The merged MSRB-Mergent dataset consists of over 1.8 million unique municipal bonds and the number is still over 120,000 in the regression analysis after all sample restrictions. Bond fixed effects included in the regression ensure that previous results are not just capturing compositional shifts in traded bonds. It is, however, possible that heterogeneity in bond/county characteristics leads to heterogeneous treatment effect even for the same shock in political alignment.

Most of the municipal bonds have relative low coupon rate with bond principal as the single largest repayment burden. Given that our sample only consist of close elections by regression discontinuity design, investors may speculate less about bonds matured in far future since the all the benefits/damages caused by political alignment status in the near term can be reverted if a candidate from the other party win the next election. In columns (1)-(2) of Table 9, we interact the changes in political alignment with an indicator for long term to maturity bonds, where a bond is defined as long term to maturity if it's maturity date is at least 10 years (roughly the sample median) after the tenure of the newly elected state government. As we can see, the interaction terms have the opposite sign compared to the main regression, regardless of the status quo (though the coefficient is not statistically significant when the status quo is misaligned), suggesting that longer maturity are less affected by changes in political alignment status.

One other prominent characteristics of municipal is revenue bonds versus general obligations. The guarantee of repayment for revenue bonds comes solely from revenues generated by a specific revenue-generating entity associated with the purpose of the bond while general obligation bonds, on the other hand, carry the full faith and credit of the issuing government unit and are secured by the issuing authority's pledge to use all legally available resources including tax credits and other revenues. Revenue bonds are generated perceived as being more risky (Kidwell and KOCH*, 1982; Swensen, 1974) and on average are issued with higher yield spread, compared to otherwise the same general obligation bonds. In our setting, however, as revenue bonds normally do not enjoy the benefit of issuers' other resources/revenues, their yield spreads should also be less sensitive to changes in such resources/revenues, which are further caused by changes in political alignment status. One concern is that there are still a lot of heterogeneity even within revenue bonds depending on the type of pledged revenues. Certain revenues bonds including education, hospital can be heavily affected by the overall financial strength of the issuing authority while risk profile of other bonds are more driven by idiosyncratic factors. We focus on utility bonds (including water, gas and other utilities) as these bonds are tied to "essential and conservative services" and columns (3)-(4) in Table 9 reports results adding the interaction between utility bonds with changes in political alignment status. As we can see, the coefficients are large and significant, with the opposite sign of the main regressors, confirming our conjecture.

Finally, at the county level, different counties depend on state transfer[39] or other benefits to varying degrees for operations or debt repayment. We use the fraction received state transfer as a fraction of total expenditure for each county as a measure of state transfer dependence and test whether being less dependent on state transfer is associated with less vulnerability to shocks in political alignment status. This is confirmed in columns (5)-(6) of Table 9.

5 Mechanism

Liquidity risk and credit risk are known as the two most important determinants of yield spread in municipal bond market, after adjusting for its tax-exempt status. The two combined can explain more than 95% of the variations in the municipal bond yield spread(Ang et al., 2014; Schwert, 2017). Pretty much all other factors uncovered in the literature can be partly or fully attributed to either liquidity risk or credit risk, or both, such as political uncertainty, underwriter spread, climate risk, etc.

In this section, we analyze the potential mechanism underlying our political alignment factor. Decomposing yield spread into liquidity risk and credit risk is a challenging task as these two factors are highly correlated in practice: bonds issued by large, high quality issuers have lower credit risk and they also tend to be more actively traded compared to bonds issued by small, low quality issuers. Instead, we will follow a heuristic approach and provide some suggestive evidence. A precise analysis requires CDS data or changes in pre-funding status (Schwert, 2017; Jiang et al., 2021) and reduces our sample size by over 99.5 percent, raising concerns on its generalizability.[40]

Finally, it is worth noting that our baseline results are bi-directional - the effects of becoming politically aligned and of becoming politically misaligned have opposite signs. Therefore, any candidate mechanism also needs to follow the same "symmetric" structure to be valid.

5.1 Municipal Bond Liquidity

Municipal bond trading is done over-the-counter with a high fraction of retail clientele. It has been documented in the literature that the secondary market is featured with low liquidity and high transaction costs, due to high dealer market power and search frictions(Green et al., 2007a,b; Li and Schürhoff, 2019; Schultz, 2012). Liquidity risk premium, thus, plays an important role in municipal bond yield spread variations. The following Figure 10 plots the distribution of one municipal bond liquidity proxy using

[39] See Section 5 for more discussion

[40] Another major limitation is that we cannot directly test the effects of political alignment on default probabilities as the actual default episodes of municipal bonds are rare both in our dataset and in the broad economy. From MMBSD data, defaulted bonds only consist of around 0.1% of all observations.

Table 9. Heterogeneity

Note: This table reports the interaction effects between changes in political alignment and bond/county characteristics. In columns (1)-(2), changes in political alignment (Become (Mis)aligned) are interacted with Long term to Maturity indicator, where a bond is defined as long term to maturity if it's maturity date is at least 10 years (~ sample median) after the tenure of the newly elected state governor. In columns (3)-(4), changes in political alignment are interacted with utility revenue bonds (water, gas and other utilities). In columns (5)-(6), changes in political alignment are interacted with whether a county's dependence on state transfer (measured by received state transfer as a fraction of total expenditure for each county) is below sample median. Odd columns use the subsample where the status quo is politically aligned (with the state governor) before the nearest upcoming gubernatorial element while even columns use the subsample where the status quo is politically misaligned (with the state governor). Time fixed effects and bond fixed effects are included in the regressions and standard errors are two way clustered at time and county level.

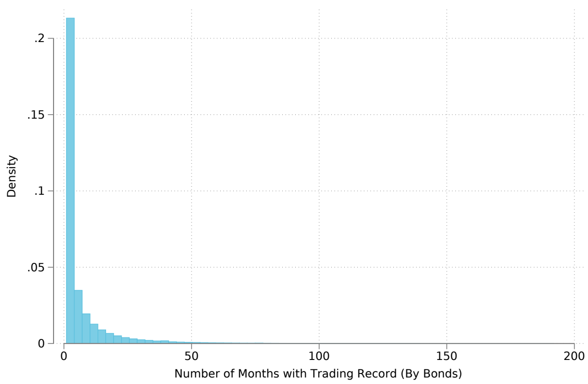
	Long Time to Maturity		Utility Bond		Dependence on Transfer	
VARIABLES	Aligned	Misaligned	Aligned	Misaligned	Aligned	Misaligned
Become Misaligned	0.270***		0.248***		0.362***	
	(0.0762)		(0.0858)		(0.0989)	
Become Aligned		-0.322***		-0.405**		-0.333***
		(0.0910)		(0.178)		(0.0866)
Become Misaligned*Long T2M	-0.116*					
	(0.0601)					
Become Aligned*Long T2M		0.0607				
		(0.131)				
Become Misaligned*Utility			-0.138***			
			(0.0357)			
Become Aligned*Utility				0.377***		
				(0.0959)		
Become Misaligned*Transfer Share					-0.130*	
					(0.0681)	
Become Aligned*Transfer Share						0.0389*
						(0.0218)
Constant	1.795***	1.024***	1.865***	1.177***	1.793***	1.021***
	(0.0232)	(0.0400)	(0.0214)	(0.0718)	(0.0227)	(0.0407)
Observations	630,669	320,111	445,519	236,138	630,669	320,111
R-squared	0.734	0.871	0.782	0.842	0.734	0.871

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

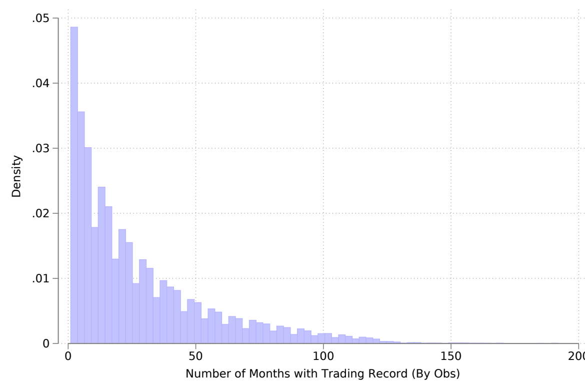
the number of months in which there are any trading records for a given municipal bond. Panel (a) plots the distribution at the bond level and Panel (b) plots the distribution at the sample observation level. As we can see, the distribution is highly positively skewed and the majority of bonds are only traded in the issuance month.

Figure 10: Municipal Bond Liquidity

Note: The following graph plots the liquidity of municipal bonds. The X-axis is the number of months and Y-axis is the relative frequency. Panel (a) plots the distribution of the number of months with trading records at the bond level while Panel (b) plots the distribution of the number of months with trading records at the sample observation level (i.e. multiple counts for one bond traded in multiple months).



(a) Liquidity by Bonds



(b) Liquidity by Observations

In Table 10, we test the municipal bond liquidity as a possible mechanism for changes in yield spread following changes in political alignment status. We first test whether there are any systematic changes in liquidity for bonds whose issuer counties just become politically aligned or politically misaligned. As we can see, the total par value traded in the market increases in either case, consistent with the price discovery hypothesis in Chae (2005). The author found that trading volume decreases inversely to information asymmetry prior to scheduled announcements (election results in our setting) and increases after the scheduled announcement. In columns (3)-(4), we replicate exactly the same exercise, but only include inter-dealer trades from the sample. The magnitudes of regression coefficients decreases by about half but remain positive and statistically significant. In columns (5)-(6), we include all trading records but use within-month yield spread standard deviations for each bond as the left hand side variable. Similarly, the two coefficients are both positive and significant. A possible explanation for this result is consistent with the price discovery process: market participants have more disagreement following changes in the status quo, leading to more within-bond trading price variations(Fama et al., 1969). The fact that both trading volume and within-bond price deviations rise regardless of how the status quo changes and at the same time municipal bond yield spreads react differently suggests liquidity issue is unlikely to be the reason for such change. As a final test, we replicate our baseline specification in columns (7)-(8) but only include the more liquid bonds (thus less subject to illiquidity concerns) in the regression. Both coefficients remain quantitatively similar as before, indicating liquidity reason may not be the main mechanism driving our empirical findings.

Table 10. Mechanism: Municipal Bond Liquidity

Note: This table tests liquidity as a potential mechanism for changes in municipal bond yield spread following changes in political alignment status. The status quo before the nearest upcoming gubernatorial election for a county is being politically aligned with the state governor in odd columns and misaligned in even columns. Columns (1)-(2) use the total par value (in million US dollars) traded in each month as the left hand side variable. Columns (3)-(4) replicate the specification in columns (1)-(2) but only include inter-dealer transactions in the regression. Columns (5)-(6) include all the trading records and use within-month yield spread standard deviations for each bond as the left hand side variable. Columns (7)-(8) replicate the baseline results reported in Table 5 but only include liquid bonds in the sample, where the criteria of liquid bonds is to have 10 or more trading months in the full sample. Bond fixed effects and time fixed effects are included in the regressions. Standard errors are two-way clustered at the county and time level.

Specification	All		Inter-Dealer		Yield Std. Dev.		Liquid Bond	
Status Quo	Aligned	Misaligned	Aligned	Misaligned	Aligned	Misaligned	Aligned	Misaligned
Becoming Misaligned	0.860***		0.415***		0.061**		0.165***	
	(0.253)		(0.155)		(0.031)		(0.069)	
Becoming Aligned		0.186*		0.083**		0.151**		-0.317**
		(0.103)		(0.041)		(0.063)		(0.147)
Observations	908,637	1,357,042	530,777	797,542	653,300	985,754	498,857	248,231
R-squared	0.541	0.440	0.411	0.325	0.447	0.469	0.708	0.710

Standard errors are two-way clustered on security and time.
*** p<0.01, ** p<0.05, * p<0.1

5.2 Intergovernmental Transfer

A major share of both revenue and expenditure for local governments involves intergovernmental transactions. Governors can heavily influence local government fiscal conditions with their roles in state-wide economic and public finance policies, in particular the development of budget bills and allocation of intergovernmental transfer. Section 7.2 and Section 7.3 provide more information on institutional background of appropriations legislation and magnitudes of intergovernmental transfers respectively.

Correctly linking the budget with corresponding decision date is critical to disentangling the relationship between partisan control of the state government and state-local transfers. It is complicated by institutional details, special treatments as well as actual adjustments (compared to the proposed numbers in the budget bill) spread over the fiscal year. Being aware of the difficulties in perfectly addressing all the concerns, we follow a multi-step strategy to get our best measure. Starting from the (actual) inter-governmental transfers obtained from the Annual Survey of State and Local Government Finances (ASSLGF), we

- Set the base decision year to be

$$\text{fiscal year} + \begin{cases} -2 & \text{Annual Budget} \\ -2 & \text{Odd Budget \& Odd Fiscal Year} \\ & \text{Even Budget \& Even Fiscal Year} \\ -3 & \text{Odd Budget \& Even Fiscal Year} \\ & \text{Even Budget \& Odd Fiscal Year} \end{cases}$$

- Decision year=Base decision year+1 for selected states

Under ASSLGF's convention, fiscal year X starts from a month in year X-1 and ends in the same month in year X. Since the budget is drafted and reviewed by the budget office/state governor before the start of a new calendar year and the inauguration of newly elected state governors takes place in January, we need to subtract another year to link the budget and its actual decision year. For states with biennial budgets starting from odd years, the odd fiscal years are similar to the annual budget. Even fiscal years, on the other hand, are the second year in a budget cycle and we need to subtract one more year to get the corresponding decision year. The cases are exactly the opposite for states with biennial budgets starting from even years.

A few states including MI, AL start their fiscal years later than the widely used July 1st and the drafting/reviewing process by budget office/state governors is pushed back accordingly. In addition, several states establish special extension policies following election years to accommodate newly elected governors. We add one year back for these states to reflect such adjustments.[41]

A simple but instructive analysis on the relationship between partisanship and intergovernmental transfer is to directly compare the transfer to aligned counties and misaligned counties. To rule out confounding factors such as the Democratic party's strength in populous municipalities, we normalize total transfer by population. In Table 11, we present statistics separately for Democratic-leaning and Republican-leaning counties, for both state transfer and local transfer.[42] As we can see, for state transfer, when the state

[41] The results are, however, robust to the adjustment. The main reasons are two-fold:

- Election years only represent roughly 1/4 of the total number of observations and the adjustment for extension is yet a subset of these observations.
- Governors still have the chance to negotiate the budget items with the state legislature in later stages.

[42] From cities or other counties, local transfer includes transfers as payment for performing specific public functions, providing general financial support, serving as agents for other local governments in financial

government is under Democratic control (column (1)), Democratic counties get more transfer ($2,110 per person) than Republican counties ($1,760 per person). On the other hand, Republican counties are offered more state transfers ($1,890 per person) than Democratic counties ($1,720 per person) under Republican governors. Local transfers, as we expected, are on average much smaller in size and do not show such a "reversion" pattern.

Table 11. State vs Local Transfer

Note: This table reports per capita state and local intergovernmental transfer (in thousand US dollars) at the county level. Columns (1)-(2) report the state transfer and columns (3)-(4) report the local transfer. (1) and (3) indicate Democratic control of the state government (i.e. governor in the office is affiliated with the Democratic party) while columns (2) and (4) indicate Republican control of the state government. Rows (1)-(3) are mean, standard deviation and number of observations for Democratic-leaning counties and rows (4)-(6) are for Republican-leaning counties.

		State Transfer		Local Transfer	
		Democratic Control	Republican Control	Democratic Control	Republican Control
Democratic County	Mean	2.11	1.72	0.178	0.119
	Std	1.13	1.38	0.511	0.218
	Obs	6390	3195	6391	3161
Republican County	Mean	1.76	1.89	0.131	0.117
	Std	1.44	0.93	0.455	0.292
	Obs	2094	9062	2094	9063

Regression results are presented in Table 12. We take natural logarithm of the transfer variable to reduce skewness. The effect of the population is absorbed by county fixed effects so that regression coefficients can be interpreted in a per capita manner. Standard errors are two-way clustered at county and time level. The coefficients of both Become Aligned and Become Misalignedhave the expected sign, although the coefficients of Become Misaligned are only significant at the 10% level. In terms of economics magnitude, from politically aligned to politically misaligned, the drop of state level government transfer is $1-\frac{e^{0.663-0.0409}}{e^{0.663}}=4.5\%$. On the other hand, from politically misaligned to politically aligned, the increase of state level government transfer is $\frac{e^{0.531+0.0435}}{e^{0.531}}-1=6.5\%$. This evidence supports the hypothesis that state transfers are affected by political misalignment/alignment.

matters, or purchasing/selling commodities, property, services from other local governments. Here local transfer is more preferred to federal transfer as a benchmark for comparison due to the "pass-through" mechanism as the state government plays a role in determining the allocation of federal funding to local government.

Table 12. RD Evidence - Transfer

Note: This table presents the relationship between political alignment status and the size of the intergovernmental transfer. Columns (1)-(2) are for local transfer and columns (3) and (4) are for state transfer. The status quo for a county before the nearest upcoming gubernatorial election is being politically aligned with the state governor in odd-numbered columns and politically misaligned in even-numbered ones. The observation unit is county*time with county fixed effect and time fixed effects included in the regression. Standard errors are two-way clustered at the county and time level.

LHS Var	Local Transfer		State Transfer	
Status Quo	Aligned	Misaligned	Aligned	Misaligned
Become Misaligned	0.00553		-0.0391*	
	(0.0110)		(0.0208)	
Become Aligned		0.00797		0.0548**
		(0.00994)		(0.0255)
Observations	4,015	2,923	5,119	2,090
R-squared	0.701	0.706	0.734	0.821

Standard errors are two-way clustered on security and time.
*** p<0.01, ** p<0.05, * p<0.1

To test whether credit risk is a potential mechanism for changes in municipal bond yield spread following changes in political alignment status, In columns (1)-(2) of Table 13, we first replicate the baseline regression results for comparison. In columns (3)-(4), we include the credit rating of municipal bonds in the regression. We pool all ratings together and take the average in presence of multiple ratings from different credit rating agencies. We translate the credit ratings in a way that a smaller rating number is associated with a better credit rating.[43] Notice that credit rating agencies are revising their ratings over time by continuously incorporating the municipal bond's current status and future outlook, thus the credit rating variable is time-varying and survives the inclusion of bond fixed effects. The credit rating variable has the expected sign (higher value means lower rating and is associated with higher yield spread) and is highly statistically significant. Moreover, the inclusion of credit rating reduces both the size and significance of the political alignment variable. Such mediation test results suggest that a sizable fraction of political alignment's effect on municipal bond yield spread takes place via changes in credit risk. In columns (5)-(6), we directly include the amount of state transfer to a county in the current fiscal year[44]

[43] e.g. "AAA/Aaa" encoded as 1, "AA+/Aa1" encoded as 2, etc.

[44] We acknowledge that this analysis is imperfect due to frequency mismatch: the bond trading data are collapsed at the monthly frequency while the intergovernmental transfer is reported at the yearly frequency. Matching them together requires duplicating transfer data by up to 12 times (not always equal to 12 as many

and we see quite similar results as in columns (3)-(4): the state transfer variable has the expected negative sign as more transfer is associated with better fiscal fundamentals and thus lower yield spread. Similarly, the sign and significance of political alignment measure shrink after the inclusion of state transfer, suggesting that changes in state transfer are important reasons why political alignment matters for municipal bond yield spread.

In columns (3)-(6) of Table 13, the coefficients of political alignment measures are NOT exactly 0 even after including credit rating or intergovernmental transfer. Several possible reasons may lead to this unexplained residual effect. First, there might be measurement error in yield spread since the market is not liquid enough and a small number of trading records dominate the calculation in many bond-month observations. Second, market participants are fast to incorporate new information such as political alignment (as suggested in Figure 7), and thus the trading yield spread in the market could already reflect expected changes in fiscal fundamentals soon after the release of election results. On the contrary, actual changes in intergovernmental transfer will not materialize until months after the inauguration of the new governor when s/he finally participates in the formulation or revision of the budget bill. Similarly, credit risk agencies do not revise their ratings on a real-time basis and it takes time for them to collect, validate and incorporate new data. In this sense, our political alignment measure could be viewed as a leading factor of the municipal bond yield spread.

bonds do not have trading records for every single month). Further collapsing trading records to yearly frequency yield similar results, although it becomes harder to compare with our baseline results.

Table 13. Mechanism: Credit Risk

Note: This table tests credit risk as a potential mechanism for changes in municipal bond yield spread following changes in political alignment status. The status quo before the nearest upcoming gubernatorial election for a county is being politically aligned with the state governor in odd columns and misaligned with the state governor in even columns. Columns (1)-(2) replicate the baseline regression reported in Table 5. Columns (3)-(4) include the then credit rating of municipal bonds in the regression, with "AAA/Aaa" encoded as 1, "AA+/Aa1" encoded as 2, and so on. Columns (5)-(6) include the intergovernmental transfer from the state government in the regression. Bond fixed effects and time fixed effects are included in the regressions. Standard errors are two-way clustered at the county and time level.

Mechanism	Baseline		Credit		Transfer	
Status Quo	Aligned	Misaligned	Aligned	Misaligned	Aligned	Misaligned
Become Misaligned	0.197***		0.121*		0.144*	
	(0.0745)		(0.0639)		(0.0788)	
Become Aligned		-0.288**		-0.134		-0.279
		(0.132)		(0.141)		(0.190)
Rating			0.166***	0.0999***		
			(0.00672)	(0.0203)		
State Transfer					-0.0327	-0.117*
					(0.0234)	(0.0626)
Observations	646,159	323,443	411,706	204,501	468,388	216,541
R-squared	0.711	0.709	0.663	0.663	0.712	0.712
Num Counties	522	289	378	225	428	232

Standard errors are two-way clustered on security and time.
*** p<0.01, ** p<0.05, * p<0.1

6 Conclusion

What consequences do election outcomes have for the local economies? In this paper, we examine a particular aspect of this question, namely the effect of political economy on the yield spread of municipal bonds issued by counties. Relying on the quasi-experiment driven by close elections, our empirical analysis shows that the yield spread of municipal bonds issued by counties that become politically aligned with the state governor decreases following the most recent gubernatorial election, while it increases for counties that become politically misaligned with the state governor following the most recent gubernatorial election. Being aligned versus misaligned with the state governor is associated with $\sim$ 20 bps difference in yield spread, all else equal. State governors appear to shape policy in such a way to favor counties where they enjoy stronger electoral support.

Additional results address the standard concerns in regression discontinuity designs and establish the robustness of our baseline findings. Following the municipal bond literature, we explore the potential mechanism of our results, and find that a big portion of the changes in municipal bond yield spread can be attributed to changes in credit risk rather than changes in the liquidity premium. As intergovernmental transfers from the state government consist of a substantial fraction of the local budget, an a priori explanation for (part of the) changes in credit risk is changes in transfer. Our results confirm this.

Both economics and political science literature have documented that partisanship affects the allocation of government funding, at the federal and state level. The results presented in this paper show that the market access to funding is also negatively impacted, in addition to the direct access to funding from the intergovernmental transfer. As this aspect is silent in existing literature but can be economically important for local government operations, economists and policymakers trying to quantify the cost of partisanship should take the indirect cost into account.

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7 Appendix

7.1 Gubernatorial Election Cycle

The following Table 14 summarizes the gubernatorial election cycles for different states. Almost all states hold elections in early November except for Louisiana, for which the election was held in later October in 1999, 2007, and 2011.

Table 14. Election Cycle

Note: This table summarizes the gubernatorial election cycles. The first column lists the cycle length and frequency and the second column displays the states that adhere to the corresponding U.S. gubernatorial election cycles listed in the first column. Off-cycle special/recall elections are not included.

Election Cycle	State (special month)
Two-year cycle starting from 1990	NH, VT
Four-year cycle starting from 1991	KY, LA (10/11), MS
Four-year cycle starting from 1992	DE, IN, MO, MT, NC, ND, UT, WA, WV
Four-year cycle starting from 1993	NJ, VA
Two-year cycle from 1990 to 1994, Four-year cycle starting from 1994	RI
Four-year cycle starting from 1990	Others

7.2 Appropriations Legislation

The frequency the budget for each state is released as well as the exact timeline for the budget cycle vary across states. States have the choice of using either annual or biennial budgets, though the overall trend over the past 70 years has been to switch to annual budgeting.[45] All states began fiscal year on July 1 with only four exceptions: NY (April 1), Texas (Sept 1), AL (Oct 1), MI (Oct 1).

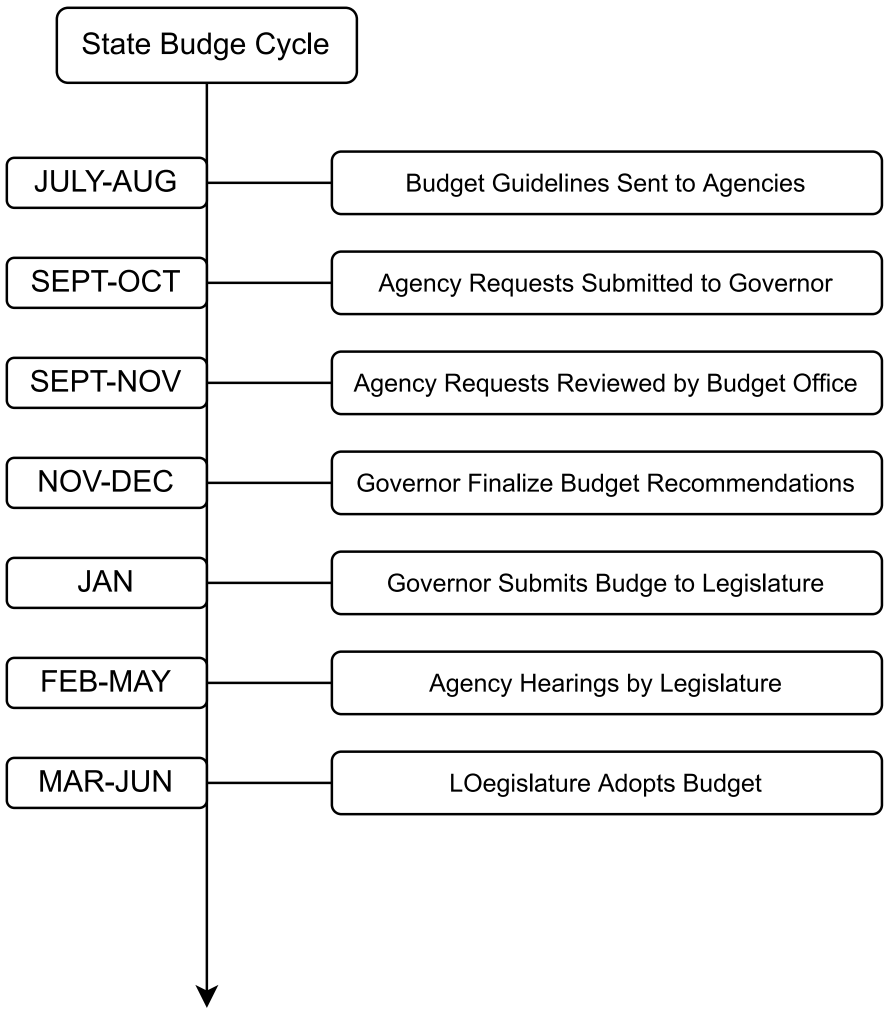
Figure 11 shows a typical budget cycle for an annual budget. A new budget cycle begins when the state budget office[46] provides guidance to agencies within state government to

[45]Forty-four states enacted biennial budgets in 1940 but only 16 states as of 2020. In addition, the difference between annual v.s. biennial budgeting is sometimes vague as a number of states effectively use a combination of annual and biennial budgeting in practice. For IA/MI, while classified as annual budgets, the governor will still release detailed spending recommendations for two fiscal years (though subject to additional revisions). In many of the states with biennial budget, they still have a detailed and thorough supplemental budget process for the second year of the biennial budget, effectively making the budget cycle annual.

[46]The state budget office can be within the governor's office or report directly to the governor's office or be within the Department of Treasury/Department of Finance/Department of Administrative Services etc and report indirectly to the governor's office.

submit budget requests. The budget office makes recommendations to the governor on the overall budget proposals after reviewing, consolidating, and analyzing those funding requests, while the governor reviews and makes additional direction/adjustment on the recommendations before presenting to the legislature, serving as a starting point for legislative deliberations. Legislature reviews the budget proposal in committee hearings in Winter/Spring, makes additional direction/adjustment and resolve differences between two chambers. The budget is then passed by legislature and sent to the governor. Governors may have the choice of approving or vetoing,[47] the entire bill or particular items, as described in Table 15.

Figure 11: State Budget Cycle



[47]This again varies across states: in most of the states a bill will become law unless it is vetoed by the governor within a specified number of days while in a smaller number of states, bill fails unless they are formally signed by the governor within a specified number of days

Table 15. Summary Statistics by State

Jurisdiction	Cycle	Ext	Dev	VETO							Override
				Line Item	FEPA	LAA	LFFA	PCL	Entire Bill	RSA	
AK	A		G	✓	✓	✓	✓	✓	✓	R	3/4
AL	A	✓	G	✓	✓				✓	S	1/2
AR	A	✓	J	✓	✓				✓		1/2
AZ	A		J	✓	✓	✓		✓	✓		2/3
CA	A		J	✓	✓	✓	✓	✓	✓	R	2/3
CO	A		J	✓	✓		✓	✓	✓		2/3
CT	E	✓	G	✓	✓				✓		2/3
DE	A		G	✓	✓				✓		3/5
FL	A	✓	G	✓				✓	✓		2/3
GA	A		G	✓	✓	✓	✓	✓	✓		2/3
HI	E		G	✓					✓		2/3
IA	A		G	✓	✓	✓	✓	✓	✓		2/3
ID	A		G	✓					✓		2/3
IL	A		G	✓	✓				✓	R	3/5
IN	E	✓	G						✓		1/2
KS	A	✓	G	✓				✓	✓		2/3
KY	O	✓	G	✓	✓	✓		✓	✓		1/2
LA	A	✓	G	✓	✓	✓	✓	✓	✓		2/3
MA	A	✓	G	✓	✓	✓	✓	✓	✓	R	2/3
MD	A	✓	G								1/2
ME	E	✓	G	✓	✓				✓	R	1/2
MI	A	✓	G	✓	✓	✓	✓		✓		2/3
MN	E	✓	G	✓					✓		2/3
MO	A		G	✓	✓	✓			✓	R	2/3
MS	A	✓	J	✓	✓	✓	✓	✓	✓		2/3

MT	E	✓	G	✓	✓	✓			✓		2/3
NC	E		G						✓		3/5
ND	E		J	✓	✓	✓	✓	✓	✓		2/3
NE	E	✓	G	✓	✓	✓			✓	R	3/5
NH	E		G						✓		2/3
NJ	A	✓	G	✓	✓	✓	✓	✓	✓	R	2/3
NM	A		J	✓	✓	✓	✓	✓	✓		2/3
NV	E		G						✓		2/3
NY	A	✓	G	✓	✓	✓	✓	✓	✓		2/3
OH	E	✓	G	✓	✓	✓	✓	✓	✓		3/5
OK	A	✓	G	✓	✓	✓	✓	✓	✓		2/3
OR	E	✓	G	✓					✓		2/3
PA	A	✓	G	✓	✓				✓		2/3
RI	A	✓	G						✓		3/5
SC	A		G	✓	✓	✓	✓	✓	✓		2/3
SD	A	✓	G	✓					✓		2/3
TN	A	✓	G	✓	✓				✓	R	2/3
TX	E		J	✓	✓			✓	✓		2/3
UT	A		J	✓					✓		2/3
VI	O		G	✓	✓	✓	✓	✓	✓	R	2/3
VT	A	✓	J						✓		2/3
WA	E		G	✓	✓	✓	✓	✓	✓		2/3
WI	E		G	✓	✓	✓		✓	✓	R, S	2/3
WV	A	✓	G	✓	✓	✓			✓	R	1/2
WY	O		J	✓	✓		✓	✓	✓		2/3

[a] Column Cycle reports the budget cycle of each state where "A" stands for annual budget, "E" stands for biennial budget starting from even years and "O" stands for biennial budget starting from odd years. Column Ext reports whether the state has special accommodations for newly elected governors including extended budget deadlines. Column "Dev" reports whether the governor's budget is introduced as bill(s) in legislature (G) or the

budget proposal is developed by a joint legislative body (J).

[b] Line item veto is a provision that allows a governor to reject particular items of the legislative budget on a line-by-line basis. FEPA/LAA/LFFA/PCL stands for the veto rights on funding for an entire program or agency, on language accompanying appropriation itself, on language in gootnote or following appropriation explaining how budget to be spent, on proviso or contingency language on expenditure of appropriation respectively.

[c] Column "RSA" stands for reduce (R) amounts or substitute (S) amounts for legislature to consider. Column "Override" stands for legislative votes required to override governor's veto

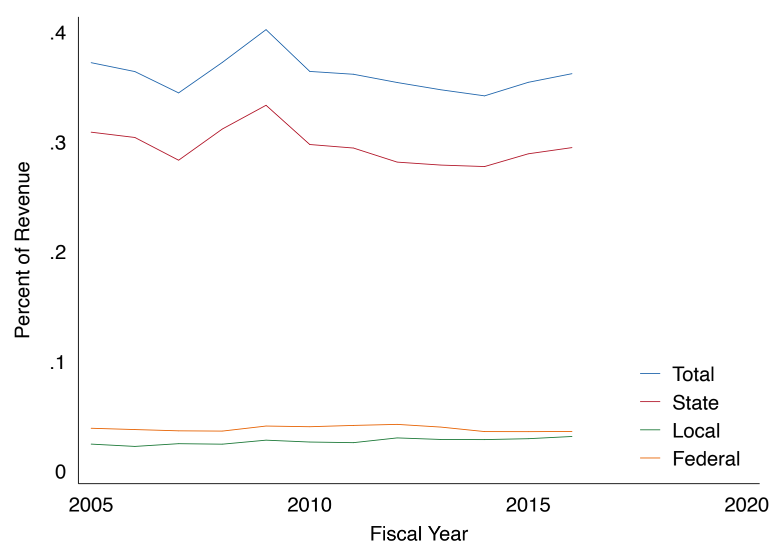
7.3 Intergovernmental Transfer

At the start of the sample in 2005, the transfers accounted for 38% of all local government revenues, ranging from a low of 19.2% in Hawaii to a high of 70.2% in Vermont percentage wise or a low of $400 million in Hawaii to a high of $91.5 billion in California in absolute value.

The following Figure 12 depicts the federal, state and local transfers to all local governments in the U.S. since fiscal year 2005. The scale of the figure is the magnitude of these transfers as a proportion of all local government revenues and, thus, reflects their relative importance as a source of financing for localities. Although intergovernmental transfers increased a lot in the last century, its relative importance has been relatively flat in the recently years. With rare exceptions, transfers from federal government to localities are modest and the exercise of federal regulatory powers over localities is mediated through state governments in most cases.

Figure 12: Intergovernmental Transfer

Note: This graph plots the (average) state transfer, federal transfer and local transfer as a fraction of total revenue across counties, 2005-2017.



7.4 Data Matching

As the census and gubernatorial election information are reported at the county level,[48] we need to extract the county information from MSRB/Mergent database. One major difficulty is to match the municipal bonds with county partisanship as neither MSRB nor MMBSD directly reports the county/city government with which a particular municipal

[48]The exception is Alaska, which reports on house district level.

bond is associated. To do so, we perform both string matching and geocoding exercises outlined below.

7.4.1 String Matching

In MSRB database, researchers have access to security description data. The first method only uses such information to assign counties to each municipal bond traded on the secondary market from 2005 to 2020.

Step one assigns state information to each security. The 2005-2020 MSRB database contains secondary market transactions for $\sim 2.8M$ unique bonds. Researchers that have access to MMBSD could merge the two databases together and directly obtain issuing state information from MMBSD for $\sim$ 99% of all unique bonds in MSRB. We show below that our algorithm based on regular expression obtains an accuracy rate of over 96% for the sample of municipal bonds with states information provided by MMBSD.[49] For the remaining 1% of unique bonds where state information from MMBSD is missing, we use the state assignment algorithm to impute and are able to assign state to 94% of the remaining sample.

Table 16. Check State Matching

Note: This table shows the accuracy of state assignment algorithm based on regular expression. Each observation is a unique bond CUSIP. We take the state information from MMBSD as the target and focus on matching 49 states excluding AK as well as the state NA (not applicable) from MMBSD. *Correctly Matched* includes cases where the algorithm assigns the same state as given by MMBSD and cases where the algorithm does not assign any states and MMBSD assigns the state NA. *Missing* means the algorithm does not assign any states but the state information given by MMBSD is not NA. *Mismatched* means the algorithm assigns different states from those given by MMBSD.

	Freq	Percent	Cum
Correctly Matched	2,677,961	96.64	96.64
Missing	66,439	2.40	99.04
Mismatched	26,677	0.96	100.00

Step two assigns county information to each security using state information obtained from step one. Since municipal bonds can be issued by different affiliates of levels of local government such as state, county, and city (town), we obtain a list of all U.S. cities/counties

[49] MMBSD have 57 unique states. This includes the 50 US states plus DC, PR, GU, VI, AS, MP and NA (not applicable). For our purposes, we only focus on 49 of the US states excluding AK since partisanship could not be measured on county levels in those other states. To check our algorithm's accuracy, we compare with the 49 states and NA from MMBSD and count the not-assigned cases from our algorithm as being matched with NA.

from Simple Maps provided by Pareto Software LLC.[50] Within each state,[51] we use regular expression to match all the exact appearance of city/county names in security description given by MSRB. The matching process is done in the following steps:

1. [Preprocessing] We remove a list of special characters such as ",", "-" and compress successive spaces to improve the matching accuracy.[52].
2. [Direct County Match] We match bond description/issuer with county name+" COUNTY" keyword.
3. [Start of String Match] We match at the start of the bond description/issuer first with the city list and then using the county list.
4. [Full String Match] We match the full string of bond description/issuer first with the city list and then using the county list.
5. [Same Name Match] We skip a small subset of counties with the same name as their states in step 3-4 and we match them in this step

For each step described above, we preserve the results obtained in previous steps and only modify the county if it is not matched yet in case of a conflict. A record is flagged whenever such a conflict exists.[53] Such a design reflects the degree of confidence we have in each step: the match in step 1 is almost decisive and the accuracy is over 99.9% when we manually check a random sample. The match in step 2 is based on the observation that many of the security descriptions follow a pattern of Agency+(State)+Project+Series (eg: "**ADAIR** MEM HOSP **IOWA** HOSP PROJ SER A") and majority of public agencies start their name with location. This step also has over 98% accuracy in the manual checking step. Step 3 is to find the expand step 2 to other positions of the string beyond its start, it can capture cases such as "CENTRAL **LYON IOWA** CMNTY SCH REF" but the caveat is false positivity as some of the cities/counties take very general names (eg: city "HEALTH"

[50] We use the Professional version of the dataset for completeness. The database was built from the ground up using authoritative sources such as the U.S. Geological Survey, the U.S. Census, American Community Survey, etc., and covers 108,000 cities and towns from 3,243 counties in 50 states, DC and U.S. overseas territories.

[51] State-by-state assignment is necessary since county names are not unique across state borders in the US. For example, 12 counties in the US share the same name Adams in CO, ID, IL, IN, IA, MS, NE, ND, OH, PA, WA, WI. Within a state, no counties share the same name. There exists a small number of counties involving independent cities that share similar names (e.g. Baltimore City (FIPS 24510) and Baltimore (FIPS 24005) County in MD).

[52] For example, PRINCE GEORGE'S v.s. PRINCE GEORGES

[53] We only consider it to be a conflict when the associated county of two matches are different. For example, in state of Iowa, the record "**BURLINGTON IOWA** TAXABLE CORP PURP SER B" can possibly be matched twice, the first one is based on "BURLINGTON", which is a city located in county "DES MOINES", the second one is based on "IOWA" as there is also a county called "IOWA" in state Iowa. Such a record will be flagged for further manual checking. In contrast, records such as "**COOK** CNTY ILL CMNTY COLLEGE CITY COLLEGES **CHICAGO**" will not be flagged as both of the matches "COOK" and "CHICAGO" are associated with "COOK" county.

in county "MADISON" can be spuriously matched with "ARKANSAS DEV FIN AUTH **HEALTH** CARE REV"). Even so, this step still generates around 90% accuracy in manual check. Lastly, there are seven counties with the same name as the state they locate in: "ARKANSAS", "HAWAII", "IDAHO", "IOWA", "NEW YORK", "OKLAHOMA", "UTAH" and we can spurious assign state bonds to those counties (eg: "**ARKANSAS** DEV FIN AUTH ST AGY FACS REV REF & CONSTR JUSTICE BLDG PROJ"). We put the matching for such counties in the end of the line and records are matched with these counties only if they are not matched with anything else in previous steps. All such records are flagged for manual checking.

The steps above leave us 10% of the records to be checked manually. For counties with the same as states, we check state bonds by looking for a list of key words such as "DEV FIN AUTH", "ST WASTE DISP" etc. For records that are matched with multiple counties, we go through all the observations within each step priority. Most of the conflicts can be easily resolved with human reading, using less than 10 lines of code (for each state), although we had to spend more time on some of the complicated cases.

The following Section 7.4.1 presents descriptive statistics. We have approximately 2.5m unique bonds with 20m bond*month observations. The value-weighted average time to maturity at the trading time is about 18 years (221 months). The difference between maturity and the ratio of observations to bonds suggests that most bonds in our sample are only sparsely traded, and we must take care of this (with fixed effects) in a later section to make sure our results are not simply driven by trading on different classes of bonds during different political alignment. The overall matching rating is 0.80, which is pretty high given that a substantial fraction of municipal bonds are issued by the state government or its affiliates, for which no county should be matched by definition. There is non-negligible variation across states in matching rate, though states with low matching rate[54] issue smaller number of municipal bonds and thus they will be naturally downward weighted in our regressions.

Table 17. Sample Construction Statistics

Note: This table presents the statistics on our sample construction process with Mergent Municipal Bond Securities Database (MMBSD) full sample. Column *Bonds(No)* is the number of unique bonds (identified by CUSIP) in the raw MMBSD sample in each state; column *Match(No)* is the number of unique bonds that are matched with a county by our program; column *Match(No%)* is the percent of unique bonds that are matched with a county; column *Flag (No)* is the number of unique bonds that are flagged for manual check and column *Flag (No%) is the percent of unique bonds that are flagged for manual check*

State	Bonds(No)	Match(No)	Match(No%)	Match(Val%)	Flag(No)	Flag(No%)
AK	7216	2830	.39	.4	10	0
AL	42227	37570	.89	.7	1272	.03

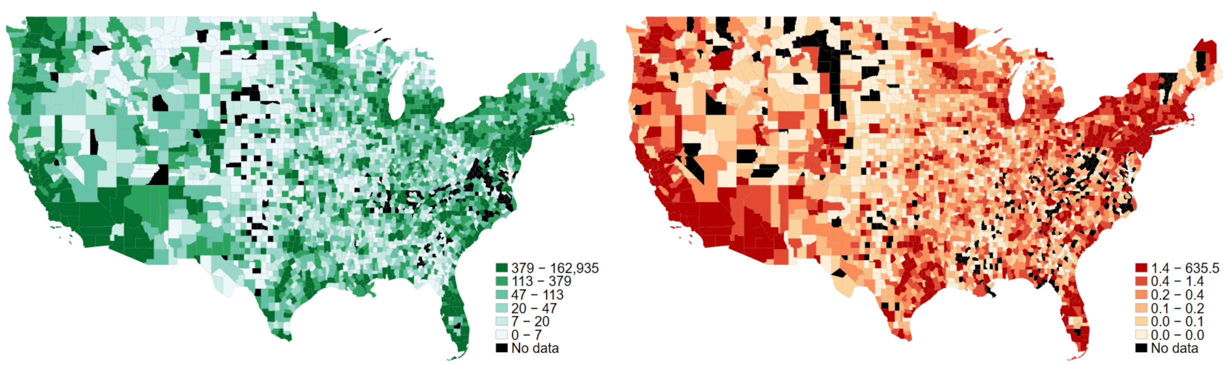
[54]Note that Alaska, one of the states with the lowest matching rate, only has voting records at the electoral district level. Thus all observations will be dropped in the regression due to missing of explanatory variable

AR	43040	35726	.83	.66	2460	.06
AZ	33614	26667	.79	.65	282	.01
CA	274759	217325	.79	.54	16083	.06
CO	42331	28118	.66	.49	845	.02
CT	43786	31289	.71	.35	842	.02
DC	4326	342	.08	.08	0	0
DE	3993	1468	.37	.16	43	.01
FL	71422	51932	.73	.63	3067	.04
GA	32813	27125	.83	.65	1695	.05
HI	6485	3671	.57	.36	105	.02
IA	58994	50256	.85	.52	648	.01
ID	8228	5082	.62	.27	409	.05
IL	110386	94230	.85	.56	10708	.1
IN	75504	63414	.84	.57	6730	.09
KS	52588	47770	.91	.75	4883	.09
KY	49123	40802	.83	.6	2561	.05
LA	25687	21096	.82	.49	643	.03
MA	75465	54858	.73	.27	1219	.02
MD	28678	18244	.64	.49	461	.02
ME	13849	6834	.49	.17	98	.01
MI	90709	74428	.82	.53	6295	.07
MN	108690	98543	.91	.65	9119	.08
MO	62675	52027	.83	.57	3848	.06
MS	21246	17145	.81	.38	1711	.08
MT	10178	7121	.7	.43	53	.01
NC	34662	26834	.77	.51	1926	.06
ND	14916	11979	.8	.62	213	.01
NE	66867	61170	.91	.55	4374	.07
NH	9981	5023	.5	.24	16	0
NJ	100843	85523	.85	.41	5035	.05
NM	16677	11540	.69	.38	377	.02
NV	13378	9636	.72	.81	28	0
NY	201517	155352	.77	.5	12836	.06
OH	92605	75270	.81	.63	7689	.08
OK	28765	21433	.75	.52	477	.02
OR	32047	20447	.64	.5	1153	.04
PA	135846	117720	.87	.65	35058	.26
PR	5029	128	.03	0	10	0
RI	11686	6263	.54	.37	18	0
SC	26707	20604	.77	.56	1641	.06
SD	10665	7376	.69	.3	306	.03

TN	37012	32566	.88	.75	1684	.05
TX	347411	305233	.88	.65	36473	.1
UT	18303	14341	.78	.55	90	0
VA	40799	25173	.62	.53	1595	.04
VT	4994	1080	.22	.17	11	0
WA	55698	43482	.78	.59	7283	.13
WI	55698	42489	.76	.55	1182	.02
WV	6313	3828	.61	.45	457	.07
WY	2409	2156	.89	.97	41	.02
All	2809786	2261858	.8	.54	195656	.07

As a validation, Figure 13 plots debt outstanding in 2016 (from the annual survey) and total bond value matched at the county level. As we can see, the density of our matching results, shown in the last map, closely match each other, alleviating the concern of systematic bias of our matching procedure. Similar patterns also apply for other related measures such as total fiscal expenditure, fiscal deficit, and county GDP. In addition, we calculate the changes in debt for adjacent years based on government census data and compare with the changes in debt in the same period based on our matched sample, taking into account new issuance and retirement. These two measures are again highly correlated.

Figure 13: GDP v.s. Matched Bond Value



(a) Total Debt

(b) Bond value matched

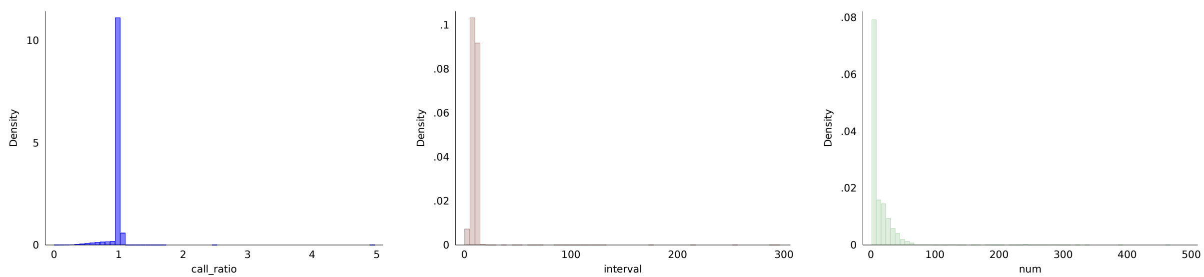
7.5 Option Adjusted Yield Spread

Roughly half of the municipal bonds in the market are callable,[55] and we need to adjust the yield of the bond accordingly. Following the standard of the literature (Longstaff et al., 2005; Gao et al., 2019b; Novy-Marx and Rauh, 2012), we use the Black (1976) model for pricing forward commodity contracts to calculate the value of the embedded call option. One problem is that most of the callable bonds are exotic in the sense that

[55]Less than 0.1% of bonds are putable.

they specify a collection of (Expiration date, Strike Price) at issuance (typically at a monthly/quarterly/yearly frequency), and the issuer can call back all or part of the bond according to any of the date and price. We calculate the value of the embedded call option that expires on the nearest call date relative to the first day of the trading month, similar to Gao et al. (2019b), in our baseline analysis and also try two alternative methods, including calculating the maximum of all non-expired options and only focusing on the option-free bonds.

Figure 14: Option Characteristics



(a) Strike to Face Value Ratio (b) Exercise Month Interval (c) Num of Call Options

We first discount the coupon and principal payment between the trading date and the call option expiration date using the zero coupon U.S. Treasury yield curve, calculated based on the method proposed in Gürkaynak et al. (2007).[56] We then calculate the difference between the trading price and the sum of the present value of future cash flow, discounting to call option expiration date to get the forward price of the municipal bond (F_B). Then the value of the call option is given by the Black (1976) pricing formula:

$$C = e^{-r_f T}[F_B N(d_1) - KN(d_2)]$$
$$d_1 = \frac{\log(F_B/K) + \sigma_F^2 T/2}{\sigma_F \sqrt{T}}$$
$$d_2 = d_1 - \sigma_F \sqrt{T}$$

Where K is the strike price of the call option, T is the time to the expiration date of the call option, r_f is the risk-free rate for the U.S. treasury bond with T maturity, and $N()$ is the CDF of standard normal distribution. The Volatility of the forward bond price σ_F is calculated using the 60-day ahead volatility in daily returns for corresponding contracts where the variation comes from variations in the yield curve and accrued interest.

The call option adjusted trading price of the bond is given by the observed trading

[56]Since in its nature yield curve can only be observed discretely, Gürkaynak et al. (2007) does the interpolation using the Nelson and Siegel (1987); Svensson (1994) form function with four parameters. In the current analysis, we use polynomial splines for simplicity but the results are quantitatively similar.

price plus the price of the embedded call option. The call-option-adjusted yield spread is defined as the difference between the call-option-adjusted yield and the risk-free yield of a synthetic risk-free bond with the same payoff structure, following the methodology of Longstaff et al. (2005)

The last step is to adjust for the tax rate for municipal bonds as the majority is tax-free.[57] A small literature study the marginal tax rate implied by municipal bond prices. Kueng (2014) find that financial markets forecast future tax rates well in both the short and long run. The short-term implied tax rates are slightly below the top statutory bucket and long-term implied rates are significantly lower. Due to data limitations and the scope of this paper, we do not plan to estimate the marginal tax rate ourselves. Instead, in line with the estimates in literature (Longstaff, 2011; Kueng, 2014; Cestau et al., 2019), we assume that the marginal tax rate for tax-exempt bonds is in the top income tax bucket. However, as we directly add bond fixed effects. The impact of tax rate on our main results is, however, rather minimal as it is largely absorbed by bond fixed effects.

[57]Only tax-exempt bonds are included in the main analysis