Do rating agencies benefit from providing higher ratings? Evidence from the consequences of municipal bond ratings recalibration

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ABSTRACT

We ask whether credit rating agencies receive higher fees and gain greater market share when they provide more favorable ratings. We investigate this question using Moody's and Fitch 2010 recalibration of their rating scales, which increased ratings in the absence of any underlying change in issuer credit quality. Consistent with prior research, we find that the recalibration allowed the clients of Moody's and Fitch to receive better ratings and lower yields. We add to this evidence by showing that the recalibration also led to larger fees and to increases in Moody's and Fitch market share. These results are consistent with critics' concerns about the effects of the issuer-pay model on the credit ratings market.

1. *Introduction*

Critics argue that credit rating reliability was reduced when Moody's and S&P changed from an investor-pay model to an issuer-pay model in the early 1970's. Specifically, academics, the popular press, and regulators suggest that when issuers purchase ratings they will select the ratings agency that will provide them the most favorable ratings.[1] This "ratings shopping" could prompt ratings agencies to upwardly bias their ratings in return for larger fees and market share. Industry supporters counter that the potential reputational harm from biasing ratings deters ratings agencies from offering higher ratings for larger fees. The recent financial crisis has led to a renewed interest in this long-standing debate.[2] We provide new evidence on this controversy by examining whether municipal debt issuers pay ratings agencies more for positive ratings, and whether more favorable ratings lead to increases in market share.

The existing academic research provides indirect evidence on how the issuer-pay model affects fees and market share. The general lack of disclosure of the fees charged makes it difficult to examine whether credit ratings agencies benefit from providing more positive ratings, and a lack of exogenous variation in ratings makes it difficult to separate the determinants of rating fees. We add to this literature by taking advantage of ratings fee disclosures in certain jurisdictions in the municipal bond market and a recalibration of the municipal ratings methodology by Moody's and Fitch. To the extent that we can observe increases in credit ratings and ratings fees and that are not caused by changes in credit fundamentals, we can test whether increased ratings result in increased fees and increased market share.[3]

In April 2010, both Moody's and Fitch recalibrated their ratings on municipal debt to increase the comparability of ratings across asset classes. Prior to the recalibration, Moody's and Fitch used a

[1] This is particularly relevant for municipal debt where unsolicited debt ratings are rare, and occur primarily in the largest debt issues according to Moody's senior personnel. This differs from the U.S. public corporate debt market, where issuers unwilling to pay for ratings receive unsolicited ratings (Mansi and Baker, 2001).

[2] For example, the Washington Post's Steven Pearlstein [2009] argued that ratings agencies failed as gatekeepers during the recent credit crisis when they were seduced to provide "triple-A ratings to stuff they barely understood."

[3] Moody's 2010 Rating Implementation Guidance states "This recalibration does not reflect an improvement in credit quality or a change in our credit opinion for rated municipal debt issuers." Fitch similarly asserts that the recalibration was merely a change to their Global scale ratings methodology (see Business Wire [2010]).

Municipal Rating Scale, which historically measured default risk (Adelino, Cunha, and Ferreira [2017], Cornaggia, Cornaggia, and Israelsen [2018]).After the recalibration, both Moody's and Fitch moved to the Global Ratings Scale (used for corporate, sovereign, and structured finance debt), which combines default risk and expected losses given default. As a result of this recalibration, over a half a million bonds rated by Moody's and Fitch received improved credit ratings without any corresponding reduction in default risk. In contrast, S&P did not recalibrate their ratings, arguing that they did not employ a dual ratings system.[4] The difference between a ratings agency with a systematic ratings recalibration versus one without provides us with a rare opportunity to isolate the effects of ratings on fees paid and rating agency selection that are largely free from confounding factors.

Cornaggia et al. [2018] discuss the ratings recalibration in depth, focusing on its affect on ratings and bond yields. They find that Moody's upward recalibration of over $1.3 trillion of debt led to increases in ratings of 1 to 3 notches depending on the debt type and pre-existing rating. The recalibration also led to decreases in yields compared to bonds not recalibrated, especially for bonds more likely to be held by unsophisticated (retail) investors and bonds issued by less transparent governmental entities.[5] They conclude that naive investors mechanically rely on ratings when other sources of information are limited.

We argue the ratings recalibration is an ideal setting to examine the effect of ratings upgrades on fees and market share. First, the recalibration directly affected ratings (which we confirm in our sample) but was unlikely to have directly affected fees (which we discuss more below). Second, the recalibration appears to have yielded significant reduced interest cost paid by issuers.[6] Given the oligopolistic ratings market, it is possible that the recalibration could lead to increases in both fees and market share.

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[4] For example, Cornaggia, Cornaggia, and Hund [2017] quote S&P's president, Devin Sharma as stating that, "We have always had one scale, a consistent scale that we have tried to adopt across all our asset classes."

[5] They investigate whether the yield effects are due to increases in liquidity or in demand for the bonds. They find a small, transitory liquidity increase over an initial 90-day window and no evidence of increases in demand.

[6] Cornaggia et al. [2018] estimate that the recalibration reduced yields by 15 to 21 basis points compared to our estimate of 7 to 19 basis points (see Internet Appendix). They provide a conservative estimate that municipalities paid an extra $1 billion in interest due to the lower ratings on the old Municipal Rating Scale.

To measure rating fees we identify municipalities with rated debt disclosed either to the Texas Bond Review Board or to the California State Treasurer (as compiled at the California State Treasurer Debt Watch website). Both of these agencies collect and disseminate information about the bonds issued by a variety of different governmental entities within these states, including information on the amount of fees paid to agencies for bond ratings.[7] Our sample consists of rated bond issues in the two years prior to and the two years after the recalibration year (excluding 2010). This produces an overall sample of 5,930 bond ratings for 4,237 issues in two states over this four-year period.

We initially focus on the broad question of whether rating increases due to the recalibration resulted in fee increases. We then investigate the channel through which they increase, including Moody's and Fitch sharing in existing clients' interest savings, attracting new previously unrated clients, or luring customers from S&P.[8] Our initial analysis uses the largest identifiable sample to examine whether ratings fees increase after recalibration. We find that over the four-year window around (but excluding) the recalibration year, Moody's and Fitch's ratings fees increase more than S&P's ratings fees.[9] This implies that after recalibrating their ratings, and increasing the average ratings for municipalities, Moody's and Fitch were able to increase their fees, compared to S&P.[10]

To isolate ratings fee increases from ratings shopping, and other selection issues, we next identify a sample of municipalities which issued bonds rated by at least two ratings agencies in both the pre- and post-recalibration periods. In addition, one of the ratings is provided by S&P and the other is by either Moody's or Fitch. In doing so, we hold constant the rated entities and bonds across rating agencies and recalibration periods. Since each bond is rated by both S&P and either Moody's or Fitch, this sample

[7] While Texas requires disclosure of fees paid to each rating agency, California requires disclosure only of total ratings fees. As a result, we only examine bonds rated by one ratings agency in California.

[8] For both of these analyses, it is important to note that many issuers in the municipal market are not rated.

[9] The recalibration occurred over a month-long period, but we do not have the exact date the ratings fees are determined. Thus, fees were likely negotiated in the pre-period for some of our immediate post-recalibration observations. Thus, we exclude the calendar year 2010 (5 months before and 7 months after the recalibration) from these analyses. Including these observations does not alter our conclusions.

[10] As a sensitivity test for our main analyses we replace the 4-year window around the recalibration year (but excluding 2010) with a 2-year and 6-year window and find qualitatively similar results.

eliminates concerns that our results reflect differential changes in bond fundamentals or other omitted variables, because factors that affect the Moody's or Fitch ratings fee for a given bond should also affect S&P's fee for the same bond. Benchmarking the Moody's and Fitch fee directly against the S&P fee for the same issue, we find that consistent with our main analysis, Moody's and Fitch had a larger increase in ratings fees than S&P. Overall, these results suggest that at least part of the overall fee increases we observe are attributable to Moody's and Fitch increasing fees for existing customers by more than S&P.

To provide more direct evidence that the change in fees that we observe in the constant sample reflect issuers' willingness to pay more for higher ratings we examine whether the change in fees is larger for frequent issuers during the pre-recalibration period (i.e. issuers that have more than one issue in the pre-period). We find that the change in fees is significantly large for these frequent issuers, suggesting that issuers who benefit the most from the recalibration are willing to pay the most in ratings fees.

We also investigate the possibility that the increase in fees reflects superior information provided by the recalibration. We use Moody's transition matrix which was made available 2 years prior to the recalibration to partition our sample into municipalities where the post recalibration rating was as predicted by the transition matrix and municipalities where the post-recalibration rating was unexpected. We find that municipalities whose Moody's rating in the post period can be predicted by the transition matrix had a larger increase in ratings fees than S&P after the recalibration. These results suggest that the fee increase is unlikely to be related to the existence of unexpected information.

We further investigate the direct relationship between changes in ratings fees and changes in ratings by creating a difference-in-difference measure that captures the relative change for Moody's and Fitch compared to the change for S&P. We find that a one-notch ratings increase for Moody's and Fitch relative to S&P yields an additional $1,420 in fees at issuance. The results from this analysis provide even more compelling evidence of the direct relationship between changes in fees and changes in ratings.[11]

[11] This analysis partially addresses the concern that the recalibration may not have affected all of our sample issuers. The Mergent database ratings recalibration indicator variable for bonds with a Moody's rating indicates that all of

Having established the effect of the recalibration on fees, we next examine whether Moody's and Fitch attracted more business in the post period. We start by providing univariate statistics comparing the extent to which municipalities are rated by Moody's, Fitch, and S&P, and whether they chose to seek one, two, or three ratings. We find that Moody's and Fitch experienced market share increases in the single-rated debt issues. Moody's and Fitch have a 100% increase in single-rated debt, and half of this increase appears to be due to issuers seeking "new" ratings (i.e., municipalities that issued unrated debt in the pre period sought ratings from Moody's or Fitch in the post period). We find that S&P had a 41% increase in single rated debt but a reduction in debt being rated by two or three agencies.

We next estimate a logistic model of the propensity to be rated by either Moody's or Fitch. Given the univariate evidence that market share increases predominantly arise from single-rated debt issues, we restrict our sample to issuers rated by only one ratings agency, and investigate whether the propensity to use either Moody's or Fitch increased in the post period.[12] Consistent with the univariate analysis, we find that Texas and California issuers were more likely to use Moody's or Fitch after the recalibration.

Our results are consistent with the economic significance of the recalibration documented by Cornaggia et al. [2018]. They estimate that municipalities incurred close to $1 billion of excess interest costs while they were under the Municipal Rating Scale. Our point estimate indicates that Moody's and Fitch were able to increase their fees by roughly $1,420 per notch of incremental increases in ratings, which represents about 10% of the average fee in the sample.[13] If we multiply that by the number of issuances in our sample alone, it translates into $10 million of additional fees. Moody's and Fitch also significantly increased the number of issuances they rated, which also likely increased their fee revenue. While it is ultimately quite difficult to determine the overall revenue impact of the recalibration, we do

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the issuers in this analysis were affected by the recalibration, and about 95% of them have outstanding issues being recalibrated up at least on notch. The results are robust to dropping the few issuers recalibrated zero notches.

[12] Together, Fitch, Moody's, and S&P provide virtually all of the municipal ratings. Thus, municipalities rated by S&P with two ratings must also be rated by either Moody's or Fitch.

[13] A November 15, 2011 Bloomberg article estimates that Moody's municipal fees rose by as much as 21% during the year (Zeke [2011]).

note that Moody's municipal debt segment had a revenue increase of approximately $75 million (30%) over the three post recalibration years, and at least part of this increase is attributable to increased fees.[14]

Overall, our results demonstrate important consequences of the issuer-pay ratings model. The recalibration that resulted in increased credit ratings for thousands of municipalities, without a corresponding change in credit quality, led to an increase in municipalities' use of the ratings agencies that provided higher credit ratings, and to an increase in the fees these ratings agencies charged. We note that our results likely provide a lower bound estimate, because not all states disclose ratings fees. Knowing that fees are disclosed likely reduces municipalities' incentives to buy better ratings.

Our results should be of interest to both academics and regulators. Our paper complements existing academic research considering the pros and cons of issuer-pay models in both the audit market and credit ratings settings by demonstrating that in the municipal debt market, borrowers' incentives to obtain improved credit ratings affect their choice of ratings agency and the fees they are charged. The Securities and Exchange Commission (SEC) has conducted several research reports on the independence and the conflicts of interests of nationally recognized statistical rating organizations (NRSROs), as required by the Sarbanes Oxley Act and the Dodd Frank Act.[15] The evidence that municipal debt issuers do pay higher fees for higher ratings raises concerns about the incentives created by an issuer pay model.

2. ***Background and Literature Review***

2.1. Background on Recalibration

In early 2001, Moody's surveyed municipal debt issuers and investors to determine the demand for a single ratings scale. The survey results indicated that the vast majority of respondents preferred that Moody's retain the Municipal Debt Scale although there was some interest in having taxable municipal

[14] To ensure that our fee results are not specific to Texas and California, we also confirm post recalibration new issuance ratings and yield results similar to those in Cornaggia et al. [2018] (see internet appendix). To reduce concerns that our results are attributable to using S&P as a control, we compare issuers who Moody's or Fitch predominantly rated AAA to those rated below AAA pre-recalibration. We find no evidence of a post-recalibration fee increase in AAA rated issuers and a significantly lower increase in fees compared to those not rated AAA. This result suggests that the use of S&P as our control sample is not driving our results.

[15] See, for example, the Report on the Role and Function of Credit Ratings Agencies in the Operation of Securities Markets (SEC [2003]), and the Report to Congress: Credit Rating Agency Independence Study (SEC [2013]).

debt rated on the Global Scale.[16] In response to this demand, in 2003 Moody's offered to provide Global Scale ratings for any new issues of taxable municipal debt issued by U.S. municipalities.[17]

In 2006 Moody's revisited the demand for a single rating scale by conducting a second survey. Respondents indicated that they would like for all taxable municipal debt, regardless of whether issued to investors within or outside the U.S. to be converted to the Global Scale (interestingly the survey also found that investors preferred that tax-exempt debt remain on the municipal scale). In 2007, as a response to the 2006 survey, Moody's provided investors with a mapping from the Municipal Scale to the Global Scale for all municipal debt (taxable and tax exempt) and allowed any taxable municipal debt (i.e. newly issued of issued years ago) to also be rated only on the Global Scale. Moody's indicates that between 2003 and 2008, only 18 U.S. issuers of taxable municipal debt chose to be rated on the Global Scale.[18]

The results from the initial experiment of moving taxable municipal debt to the Global Scale are important in understanding the market demand for Global Scale debt ratings through 2008. Taxable municipal debt represents about 10% of all municipal debt issuances, and averages roughly $30 billion per year.[19] Over the period 2003 – 2008 we observe only 18 instances where municipalities elected to have their debt rated on the Global Scale. This suggests that it was unclear to both Moody's and to market participants that there was a demand for a single Global Scale.[20] In fact, in 2007, as a response to the 2006 survey, Moody's provided investors with a mapping from the Municipal Scale to the Global Scale for all municipal debt (both taxable and tax exempt) for free. This suggests that at least through 2008 it was unclear whether Global Scale ratings would lead to additional revenues.

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[16] See page 125 of the Congressional record entitled "Municipal Bond Turmoil: Impact on Cities, Towns, States" at https://babel.hathitrust.org/cgi/pt?id=pst.000063523553;view=1up;seq=129.
[17] See page 71 of "Municipal Bond Turmoil: Impact on Cities, Towns, States" at https://babel.hathitrust.org/cgi/pt?id=pst.000063523553;view=1up;seq=83
[18] See page 79 of "Municipal Bond Turmoil: Impact on Cities, Towns, States" at https://babel.hathitrust.org/cgi/pt?id=pst.000063523553;view=1up;seq=83
[19] See https://www.principalglobal.com/documentdownload/51511
[20] See page 79 of "Municipal Bond Turmoil: Impact on Cities, Towns, States" at https://babel.hathitrust.org/cgi/pt?id=pst.000063523553;view=1up;seq=83

In 2008 both Moody's and Fitch faced mounting pressure for a unified scale across all debt markets. For example, in July 2008, the state of Connecticut sued all three credit ratings agencies for underrating municipal debt, arguing that the debt was actually less risky than the Municipal Scale.[21] Later that month Congress held a hearing entitled "Municipal Bond Turmoil: Impact on Cities, Towns, States" where members of Congress listened to testimony regarding whether municipalities faced increased interest costs under the dual ratings system.

The regulatory pressure increased in 2010 as there was another Congressional investigation into the role of the credit ratings agencies in the financial crisis and an SEC investigation on the same issue.[22] All of this scrutiny ultimately resulted in the Dodd Frank Bill, issued in July 2010, which mandated that there be consistent ratings across asset classes.

The apparent lack of demand through 2008 from issuers or investors for municipal debt rated solely on a single unified scale is described by Moody's Senior Managing Director Laura Levenstein:

> "Investors in corporate or structured securities typically have looked to Moody's ratings for an opinion on whether a security or an issuer will meet its payment obligations. Historically, this type of analysis has not been as helpful to municipal investors. If municipal bonds were rated using my global ratings system, the great majority of my ratings likely would fall between just two rating categories: Aaa and Aa. This would eliminate the primary value that municipal investors have historically sought from ratings—namely, the ability to differentiate among various municipal securities. I have been told by investors that eliminating that differentiation would make the market less transparent, more opaque, and presumably, less efficient both for investors and issuers."[23]

After the financial crisis the market for debt ratings changed. Municipal issuers argued that having two scales penalized them. Regulators and legislators both grew concerned with a lack of consistency in default rates across different scales and ultimately required NSRO's to have a single global scale when they enacted Dodd-Frank in July 2010. Both Moody's and Fitch responded to this mounting pressure by recalibrating all municipal debt to the Global Ratings Scale in April 2010, and S&P did not recalibrate, as they argued that they only had one ratings scale.

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[21] https://www.reuters.com/article/us-ratings-lawsuit-announcement/connecticut-sues-top-credit-rating-agencies-idUSN3048374820080730

[22] https://www.hsgac.senate.gov//imo/media/doc/Financial_Crisis/042310Exhibits.pdf?attempt=2

[23] http://haasinstitute.berkeley.edu/sites/default/files/haasinstitute_doublybound_creditratings_april11_publish.pdf

It is important to note that the recalibration has two elements. The first is analogous to a change in a unit of measurement, like converting inches to centimeters. Prior to the recalibration, municipalities were subject to a stricter rating standard compared to corporate bonds. This disparity in rating standards was argued to increase state and local governments' borrowing costs and resulted in lawsuits against the ratings agencies.[24] The 2010 rating scale recalibration led to an increase in ratings for most state and local governments of up to three notches to reflect the ratings bands under the Global Rating Scale (Moody's [2010]). The second element is that the Global Rating Scale reflects both default risk and loss given default, while historically municipal ratings only reflected distance to default. Loss given default can be as high as 55% for municipal debt other than GO bonds, where loss given default is typically near zero. [25]

2.2. Existing Research on Ratings Recalibration

A small number of studies examine the effects of Moody's municipal debt ratings recalibration. For example, Cornaggia et al. (2017) document a reduction in yields for the outstanding debt that was recalibrated primarily for issues that were likely to be held by retail investors. They further find that the reduction was unlikely driven by changes in market demand, shifts in liquidity, or changes in issuer intrinsic quality. They conclude that investors appear to functionally fixate on ratings, and the recalibration led investors to reassess the default risk underlying municipal debt and reduce yields.

Adelino et al. (2017) find consistent evidence that the recalibration released local government financing constraints, resulting in lower offer yields and greater credit access. They also find that municipalities that were recalibrated were more likely to increase their expenditures, employment, and spur local economic growth. Gillette et al. (2018) find that recalibrated municipalities reduce their disclosure, and Cunha et al. (2018) find that incumbents in municipalities that were recalibrated received higher vote shares and were more likely to be reelected.

[24] For example, State of Connecticut v. the McGraw-Hill Cos., Inc., case #08-4038927; State of Connecticut v. Moody's Corp., case #08-4038928; and State of Connecticut v. Fitch Inc., case #08-4038926; Bolado [2011].
[25] See Moody's [2007].

Overall the existing research suggests that the debt recalibration provided municipalities with a windfall, which is likely attributable to unsophisticated investors fixating on credit ratings in the pre-recalibration period, demanding higher yields on debt receiving lower ratings on the municipal scale. When the ratings were changed to a global scale, investors appear to have reduced their yields affording municipalities the opportunity to raise additional funds at lower rates. These additional funds led to an expansion in the local economy and favorable political outcomes for incumbents in districts affected by the recalibration.

We expand our understanding of the effects of the recalibration on the debt markets by investigating how the recalibration affected ratings fees and rating agency market share. Evidence on whether the recalibration affected fees or market share is important as it adds to the debate of the effects of rating agency independence and reputation concerns on the outcomes of the ratings process. Specifically, since the S&P and Moody's switched to an issuer pay model in the 1970's, there has been a debate among regulators, legislators, and academics on whether the independence issues associated with an issuer pay model overcome reputational concerns and affect the outcomes of the debt ratings process.

Research examining the independence issue has produced mixed results. One stream of research suggests that reputational concerns dominate and independence issues have a relatively modest effect on debt ratings (e.g. Bonsall [2014], Xia [2014], Bonsall, Koharki, and Neamitu [2017], DeHaan [2017] and Bonsall, Green and Mueller [2018]). A competing stream of research establishes that independence issues result in inflated ratings (e.g. Kedia, Rajgopal, and Zhou [2017], Cornaggia et al. [2017], He, Qian, and Strahan [2012], and Becker and Milbourn [2011]). Theorists have modelled the factors determining when independence concerns will dominate reputational concerns and lead to inflated ratings (Mathis, McAndrews, and Rochet [2009] and Bolton, Freixas, and Shapiro [2012]).

3. *Hypothesis Development*

We first hypothesize that both Moody's and Fitch will experience larger increases in ratings fees compared to S&P after the recalibration. While we consider several reasons for why this could be the

case, as discussed more below, it is important to note that some of the existing research establishes that ratings agencies are concerned with their reputation. If reputational concerns dominate ratings decisions, we could expect that the recalibration will have no effect on fees.

Within our first hypothesis we consider two possibilities for why increases in ratings could lead to increases in fees, both of which have implications for the issuer-pay model. Specifically, we hypothesize that, holding all else equal, issuers might be willing to "pay for praise" and pay higher fees to a rating agency that increases their ratings. Second, issuers might engage in "ratings shopping", where they use the ratings agency offering the best ratings even if the fee for these ratings are higher than for a worse rating.

We also acknowledge the possibility that ratings fee increases could arise for reasons not directly related to the issuer-pay model. If investors view the new ratings models used by Moody's and Fitch to be superior to the old ratings model then issuers may be willing to pay more for these ratings (similar to what might be observed in an investor pay model.)

Next, we hypothesize that after the recalibration, Moody's and Fitch will experience an increase in their market shares. Investors in the municipal bond market rely on credit ratings to assess the default risk of the bond, and municipalities with better ratings enjoy lower financing costs (Adelino et al. [2017], Cornaggia et al. [2018]). If the ratings recalibration resulted in improved credit ratings, then, holding all else constant, we would expect issuers to be more likely to use the ratings agencies that offer better ratings. However, if the recalibration is associated with an increase in the ratings fee, then it is not clear that the costs of using Moody's and Fitch (increased fees) will exceed the benefits (better ratings). Thus, the effect of the recalibration on rating agency market share is not known.

4. *Data and Sample Selection*

To identify our sample, we focus on municipalities that have rated debt disclosed to either the Texas Bond Review Board or to the California State Treasurer, since both Texas and California disclose

ratings fees.[26] It is noteworthy that while Texas provides ratings fees paid for each rating agency of a given bond issue, California only provides total ratings fees of a given issue. Since our analyses require us to identify fees paid to each individual rating agency, for California, we only include single rated bond issues. Both Texas and California provide initial ratings and initial fees for new bond issues. They do not provide data on ratings changes over time.

We collect additional information from the above data sources to construct various control variables, including par value, sale type (competitive or negotiated), issuer entity type (state, county, city, school district, utility authority, etc.), insurance type, name of the financial advisor, and date of sale. We specify 2008 and 2009 as the period before recalibration and 2011 and 2012 as the period after recalibration, omitting the recalibration year of 2010.

We focus on the underlying long-term rating associated with the bond issue. We delete the following observations: bonds that do not have a rating in the databasae even if the ratings fee is greater than zero, bonds that only have short-term ratings, bonds where the ratings fee is equal to zero but the bond issue reports at least one rating, and bonds where the number of ratings fees does not correspond to the number of credit ratings. We also delete observations with missing fees and where the spread equals zero. Our final sample consists of 5,930 bond ratings from 2008 to 2012 (excluding 2010), representing 4,237 unique bond issues from 1,893 unique municipalities.

5. *Research Design*

5.1. Ratings Fees After Recalibration

[26] The Texas Bond Review Board website is http://www.brb.state.tx.us/publications_local.aspx#AR. The California State Treasurer Debt Watch website is http://debtwatch.treasurer.ca.gov/ (last access 8/11/2018). We reached out to other states for data on fees and were not able to obtain detailed data on ratings fees on all municipal bond issues in these state around the recalibration period.

To test whether Moody's and Fitch charge more after they recalibrated their ratings for any reason including issuer ratings shopping, pay for praise, or providing superior information we use the difference-in-difference design described in Eq. (1):

$$Ln(Rating\ Fee) = \beta_0 + \beta_1(Moody's\_Fitch) + \boldsymbol{\beta_2(Post*Moody's\_Fitch)} + \beta_k(Controls) + Quarter\text{-}Year\ Fixed\ Effects + Issuer\ Type\ Fixed\ Effects + e. \quad (1)$$

The unit of analysis is the rating-bond issue, where some bond issues have multiple ratings. The dependent variable *Ln(Rating Fee)* is the natural logarithm of the ratings fee charged by a given rating agency. *Moody's_Fitch* is an indicator variable equal to 1 if the rating was assigned by either Moody's or Fitch. *Post* is an indicator variable equal to 1 if the bond issue is in the post-recalibration period (i.e., 2011 and 2012), and 0 otherwise. Because the model includes quarter by year fixed effects, it is not necessary to include the main effect of *Post*. The variable of interest is the interaction term *Post*Moody's_Fitch,* where the coefficient, β_2, captures the change in ratings fees paid to Moody's and Fitch before and after the recalibration relative to the change in ratings fees paid to S&P over the same period.

If Moody's and Fitch are paid more for their ratings after recalibration, we would expect β_2 to be greater than zero. In addition to including quarter by year fixed effects to control for the time effects, we include issuer type fixed effects (e.g., school, county, city, etc.) to control for the effect of government type on ratings fees. We correct standard errors to allow for clustering of errors at the issuer level. All continuous variables are winsorized at the bottom and top 1 percentiles.

5.1.1 Isolating "Pay for Praise"

While the specification in Eq. (1) can be used to address the broader question of whether fees charged by Moody's and Fitch increased, it incorporates multiple channels through which fees increased. To examine whether pay for praise incentives affect ratings fees, we isolate a set of municipalities whose bond issues were rated by S&P and either Moody's, Fitch or both in both the pre- and post-recalibration periods. We label this sample the "Texas constant sample." Since these municipalities issue bonds in

both periods and each bond issue is rated by both Moody's or Fitch and S&P, there is no change in their choice of ratings agency and no change in sample composition. This sample largely eliminates concerns that our results reflect differential changes in underlying issuer and bond fundamentals across rating agencies around the recalibration event.

In addition, for these municipalities there is no ratings shopping since they are being rated by the same rating agencies in both the pre and post periods. Similarly, these municipalities already have an S&P rating, whose Global scale ratings already include information on loss given default. For this sample, the recalibration is unlikely to provide any new information on loss given default, and thus unlikely to provide new information to market participants. Thus, we expect if the recalibration led to an increase in ratings fees because municipalities were willing to "pay for praise" then we should observe an increase in ratings fees for our Texas constant sample.

For this analysis, we collapse our sample to the issue level and rerun the analysis on ratings fees using the following regression model:

$$Rating\ Fee\ Diff = \beta_0 + \beta_1(Post) + \beta_k(Controls) + Issuer\ Fixed\ Effects + e. \quad (2)$$

where the dependent variable is the difference in ratings fees between Moody's and S&P (or Fitch and S&P) for a given bond issue. Our sample period is surrounded by other major events, such as the bankruptcy of Ambac, the financial crisis, and subsequent recession. By directly benchmarking Moody's or Fitch ratings fee of a given bond against that charged by S&P, we largely reduce the concern that our results are driven by macro conditions, because any macro variable that affects Moody's and Fitch fees should also affect S&P fees.[27, 28] We further include issuer fixed effects to absorb heterogeneity in differences in fees. This research design is akin to the approach in Khwaja and Mian [2008]. The variable

[27] Consistent with prior research (e.g., Jiang et al. [2012]; Kedia et al. [2014]), we demean the control variables in this analysis to ease the interpretation of the *Post* coefficient. The coefficient captures the change in the ratings fee difference between Moody's or Fitch and S&P for an average bond in the estimation window.

[28] This approach is similar to augmenting Eq. (1) at the ratings-bond issue level and including issuer-credit ratings agency (issuer*CRA) pair fixed effects. By including issuer*CRA pair fixed effects, we hold the municipality-rating agency pair constant and examine changes in fees before and after the recalibration. Thus, the coefficient on *Post*Moody's_Fitch* estimates the difference between the change in fees charged by Moody's and Fitch and the change in fees charged by S&P for a given issuer. We perform this analysis and find similar results (untabulated).

of interest in equation (2) is *Post*, which captures the average change in the ratings fee difference between Moody's/Fitch and S&P. If Moody's and Fitch were able to increase their fees to a greater extent than S&P after recalibration, we would expect β_1 to be positive.

Following prior literature (e.g., Ely, Martell, and Kioko [2013]), we include a set of bond characteristics as controls. They are bond issue size (*Ln(Par)*), whether the bond issue is insured (*Insured*), whether the sale type is competitive bidding (*Competitive*), whether the bond is a revenue bond (*Revenue bond*), and whether the financial advisor involved in the bond issue is the leader in the state (Leadfin). Appendix A provides detailed variable definitions.

To provide more direct evidence that the change in fees that we observe in the Texas constant sample reflect issuers' willingness to pay more for higher ratings, we perform two cross sectional analyses. First, we test whether the change in fees increases more for frequent issuers that have more than one issue during the pre-recalibration period (*Frequent Issuer*). We interact this variable with the post variable in Eq. (2). Since frequent issuers have greater incentives to pay for higher ratings, a positive coefficient on *Post*Frequent Issuer* would be consistent with a "pay for praise" story.

Second, we note that our analyses described above examine how ratings affect fees by exploiting an intervention (i.e. recalibration) that has a direct effect on ratings, but we assume has no direct effect on fees. We appreciate that if the recalibration led to additional effort or information content then the recalibration could have a direct effect on fees that is not driven by the change in ratings. We argue that the institutional details surrounding the recalibration suggest that a direct effect is unlikely given Moody's statement that they did not examine any individual municipality or security and instead applied the recalibration uniformly based on the bond type and the rating prior to recalibration. Moreover, as mentioned above, our "Texas constant sample" should largely mitigate the concern on new information since these municipalities already have S&P ratings in the pre-recalibration period that incorporate loss given default.

Nonetheless, to test whether increases in fees are attributable to new information, we use Moody's ratings transition matrix (Moody's [2010]) provided shortly prior to the recalibration to examine

cases where there is likely to be new information versus those where there is not. We label issuers whose ratings on the first new issues subsequent to the recalibration are not as predicted by the transition matrix as those with new information (*New Information)*. We then interact this variable with our post variable in Eq. (2). If our results are purely driven by new information, we would expect this interaction term to be positive and the post variable (which captures the change in the fee difference for issuers whose post ratings were predicted by the transition matrix and thus carry no new information) to be largely insignificant.

5.1.2 Direct Link between Changes in Fees and Changes in Ratings

Thus far our tests examine whether municipal bond issuers paid higher fees for higher ratings after Moody's and Fitch recalibrated their ratings scale. In our next analysis, we directly link the change in fees to the change in ratings at the issuer level to better understand the effect of ratings on fees. We define the change in ratings and the change in fees by matching each bond in the post period to a comparable bond from the same issuer in the pre-recalibration period. Specifically, we require an exact match on issuer, insurance, and whether the bond is secured by general obligation funding or a specific revenue stream. If there are multiple matches, then we choose the bond with the closest par value. We delete observations without an exact match and in cases where the issuance dates differ by more than than 4 years (because the municipalities' fundamentals are likely to change decreasing the bonds comparability).[29]

To compare the changes from Moody's and Fitch to the changes from S&P for the same bonds, we require that each bond have two ratings, where one rating is from S&P. The dependent variable, *Relative Change in Rating Fees*, is the rating fee charged by Moody's or Fitch on a given bond in the post period less the fee charged on the matched bond in the pre period *less* the change in fees charged by S&P on the exact same bonds. Similarly, the independent variable of interest, *Relative Change in Rating*, is the

[29] Our results are similar whether we truncate the matches that are more than 4 years apart or not. They are also robust to using different cutoffs.

rating assigned by Moody's or Fitch to a given bond in the post period less the rating assigned to the matched bond in the pre period *less* the change in ratings assigned by S&P to the exact same bonds. In other words, we regress the change in rating fees *relative* to S&P on the change in ratings *relative* to S&P, to analyze whether getting a higher rating is associated with paying higher fees.

5.2. *The Effect of Recalibration on the Propensity to Use Moody's or Fitch*

To test our second hypothesis we analyze whether Moody's and Fitch were able to increase their market share after upwardly recalibrating their ratings. We use a logistic regression to test whether new bond issues are more likely to use ratings from Moody's or Fitch (as opposed to S&P) after the recalibration. For this analysis, we reduce the sample to bonds with only one rating. We focus our market share hypothesis on single-rated bonds because bonds with only one rating have greater potential (more choices) to switch to ratings agencies with higher ratings.[30] We test our hypothesis in Eq. (3) below.[31] If Moody's and Fitch are able to increase their market share because municipalities are more likely to obtain ratings from Moody's and Fitch rather than from S&P after recalibration, then β_1 will be greater than zero.

$$Pr\ (Moody's\_Fitch=1) = \beta_0 + \boldsymbol{\beta_1(Post)} + \beta_k(Controls) + e. \quad (3)$$

5.3. RATINGS AND YIELDS AFTER RECALIBRATION

In addition to the above two analyses, to ensure that the Cornaggia et al. [2018] results hold in our sample, we examine the change in ratings and yields for bonds issued before and after the recalibration. We employ a model similar to Eq. (1), except that we replace the dependent variable with bond ratings (*Rating*) and bond offering yields (*Yield*). *Rating* is the numerical equivalent of the bond issue's credit rating, where 16 is equivalent to a Moody's rating of Aaa and 1 is equivalent to B3 (the lowest credit

[30] Further, almost all dual rated debt, and by definition, all triple rated debt, is rated by S&P. Our univariate statistics in Section 6 indicate that the change in the distribution of market share for dual and triple rated debt is limited around the recalibration. Instead, the change in market share is predominantly concentrated in single-rated debt.
[31] Similar to Eq. (2), we demeaned the control variables to facilitate the interpretation of *Post*.

rating in the sample). We obtain the data on bond offering yields from the Mergent Municipal Bond Securities Database.[32]

Consistent with Cornaggia et al. [2018], we find that post-recalibration new issuance debt ratings were higher and new issuance yields were lower for Moody's and Fitch compared to S&P. We report these results in the internet appendix for interested readers.

6. *Results*

6.1. DESCRIPTIVE STATISTICS

Figure 1 depicts the average fees (in dollars) charged by the rating agencies over time for the Texas constant sample. In general, rating fees increase for all three rating agencies over time. Before the recalibration, the trends in fees between the two groups co-moved closely. After the recalibration, although we still observe the co-movement in fees, Moody's and Fitch increase their fees more than S&P and the gap between their fees continues to widen over time. Figure 2 depicts the proportion of single-rated bond issues rated by Moody's or Fitch instead of S&P over time. Prior to the recalibration, S&P increased their market share to a maximum of 92% of new bond issues in the first quarter of 2010. However, the market share of Moody's and Fitch increased after the recalibration, to a high of 28% in the second quarter of 2011. Overall, figures 1 and 2 provide descriptive evidence that Moody's and Fitch were able to charge larger fees and increase their market share subsequent to recalibrating up their ratings.

Table 1 provides the descriptive statistics by credit ratings agencies. About 60% (= 3547/5930) of our sample is composed of bond issues rated by S&P. On average, S&P charges a ratings fee of about $12,450, lower than the average ratings fee of $15,688 charged by Moody's and Fitch. However, the bond issues rated by S&P are on average smaller than those rated by Moody's and Fitch. The average par amount for S&P rated issues is $16 million, while the average par amount for Moody's and Fitch

[32] We match our sample to the Mergent Municipal Bond Securities Database by issuer name, issue par value, date of sale, name of the insurance agent, and sale type. Every match is manually verified to ensure accuracy.

rated issues is $23 million. Over the pre and post-recalibration periods, issues rated by S&P received a slightly lower average rating than issues rated by Moody's and Fitch. Revenue bonds comprise around 20% of the sample, and the vast majority of sales are negotiated (as opposed to competitive bidding).

Table 2 presents the correlations between the variables of interest. Most notably, ratings fees are negatively correlated with credit ratings and insurance, and positively correlated with bond issue size (par) and the number of ratings per issue. Credit ratings are positively correlated with bond insurance and the number of ratings. Finally, the post period is negatively correlated with credit ratings, bond issue size (par), the number of ratings per issue, and bond insurance.

6.2 REGRESSION RESULTS ON THE EFFECT OF RECALIBRATION ON FEES

Table 3 presents results of Eq. (1), where we examine whether Moody's and Fitch charge higher fees relative to S&P after recalibration. Column [1] presents the baseline result. The negative coefficient on *Moody's_Fitch* suggests that compared to S&P, Moody's and Fitch on average charged lower fees prior to recalibration. Consistent with Figure 1, we find that Moody's and Fitch increased their fees more than S&P after recalibration. The coefficient on *Post*Moody's_Fitch* is positive and significant. The estimate suggests that Moody's and Fitch increased their fees by an additional 12% relative to S&P after recalibration. With respect to the control variables, we find that on average revenue bond issues and larger bond issues pay higher ratings fees, whereas insured issues and issues placed by competitive bidding pay lower ratings fees.

In column [2], we interact *Post* with the control variables to allow their associations with ratings fees to change pre- and post-recalibration. However, most of the interaction terms are insignificant. The explanatory power of the model also does not improve. This suggests that the relations between the control variables and ratings fees remain stable during our sample period. Since the validity of the differences-in-difference design critically relies on the parallel trends assumption, in column [3] we show the dynamics of changes in ratings fees. Specifically, we replace *Post*Moody's_Fitch* with interaction terms between *Moody's_Fitch* and quarter-year dummies from 2008Q2 to 2014Q4; the benchmark thus

comprises the observations in 2008Q1. We observe statistically insignificant coefficient estimates of quarter-year dummy and *Moody's_Fitch* interaction terms in the pre-recalibration period, which provides no evidence that the parallel trends assumption is violated. More importantly, we observe generally positive and significant coefficients on the interaction terms between *Moody's_Fitch* and quarter-year dummies in the post-recalibration period, and the magnitude of the estimates remains stable post-2011Q3. Taken together, these results suggest that, compared to S&P, Moody's and Fitch charge higher ratings fees following recalibration.

Table 4 reports the results on the Texas constant sample, consisting of dual or triple-rated bond issues where one of the ratings is provided by S&P and the municipal entities in the sample issue bonds both in the pre- and post-recalibration periods. This table collapses the analysis to the issue level, and uses the fee difference between Moody's (or Fitch) and S&P of the same bond issue as the dependent variable. By holding the issuers across periods and bond issues across ratings agencies constant, the results of this table are free from selection issues or changes in sample composition. We present the results in the format similar to Table 3; column [1] presents the baseline results, column [2] examines whether the association between control variables and dependent variable vary over time, and column [3] inspects the parallel trends assumption.

In column [1], we find that the coefficient on *Post* is positive and significant, suggesting that Moody's and Fitch increased their fees to a greater extent than S&P subsequent to recalibration. The estimate suggests that for bonds also rated by S&P, Moody's and Fitch charged 11% higher fees after the recalibration relative to S&P.[33] Consistent with Table 3, we find that the relations between control variables and dependent variable does not vary pre- and post-recalibration. Column [2] shows that none of the interaction terms between *Post* and control variables is significant. Finally, when we replace *Post* with quarter-year dummies from 2008Q2 to 2012Q4 in column [3], we find that none of these dummies in the

[33] Our results are robust to different specifications of the dependent variable, including the raw difference in ratings fees and the raw difference in fees scaled by par.

pre-recalibration period is significant, providing no evidence that the parallel trends assumption is violated. The fact that we find consistent results on issuers who were persistently rated by both S&P and Moody's or Fitch indicates that our findings are not solely driven by ratings shopping.

We provide more direct evidence that the change in fees that we observe in the constant sample reflect issuers' willingness to pay more for higher ratings in Table 5. In column (1) we report that the increase in fee difference is larger for frequent issuers. The interaction term *Post*Frequent Issuer* is positive and significant. Since frequent issuers benefit more from higher ratings, this result provides support for "pay for praise."

We further investigate the possibility that the increase in fees reflects superior information provided by the recalibration. We use Moody's 2010 transition matrix (Moody's [2010]) and the issuer's rating immediately prior to the recalibration to determine the issuer's "expected rating" post-recalibration. We then compare the "expected rating" with the Moody's rating on the first bond issue post-recalibration,[34] and if differ, we consider the new recalibrated rating potentially contains new information (*New Information = 1)*. To ensure that any change in ratings reflect new information, for insured bonds, we rely on the issuer's underlying rating provided by Texas Bond Review Board. Since this data item is not available for every insured issue, our sample for this analysis reduces to 117 issuers, of which 33 are considered to have new information in their post-recalibration ratings.[35] In column [2], we interact *New Information* with *Post* and find the coefficient insignificant. The sum of the coefficients on *Post* and *Post*New Information* is also only weakly significant (p=0.08). By contrast, the coefficient on *Post*, which captures the change in fee difference for issuers without unexpected information in their post-recalibration ratings, remains significant and of similar magnitude to the main results in Table 4. These results mitigate the concern that the recalibration results in new information that is valued by issuers.

[34] We use Fitch's rating when Moody's rating is not available.

[35] Moody's 2010 transition matrix was intended to apply to existing bonds in the secondary market. Since we can only observe ratings fees on new issues, we apply the matrix to new issues, and thus the variable *New Information* may contain measurement error.

Table 6 reports the results of examining the direct link between the change in fees and the change in ratings at the issuer level. We find a positive and significant coefficient on the R*elative Change in Rating* variable indicating that an increase in credit ratings is positively correlated with an increase in ratings fees. Specifically, a one-notch increase in ratings for Moody's and Fitch relative to S&P is associated with about a $1,400 increase in fees for Moody's and Fitch relative to S&P. Compared to the average ratings fee charge by Moody's and Fitch (Table 1), this indicates a 9% increase. Overall, the result is consistent with our interpretation of the previous tables and with the interpretation that municipal bond issuers "pay for praise."

6.3 CHANGES IN MARKET SHARE

Given that Moody's and Fitch provide higher ratings relative to S&P after recalibration, we test whether Moody's and Fitch are able to increase their market share. Table 7 provides descriptive statistics on the distribution of issues across ratings agencies before and after the recalibration. To provide evidence on changes in the market share of Moody's and Fitch relative to S&P, we analyze each market segment (i.e., single-, double-, and triple-rated bonds) separately. In addition, we consider the possibility that unrated issuers decide to obtain a rating after Moody's and Fitch changed their rating scale and analyze changes in the market for unrated to rated issuers. Our analysis suggests several mechanisms through which the recalibration could increase the market share of Moody's and Fitch.

Panel A shows that in the pre-recalibration period, Moody's and Fitch had a significantly smaller share of the single-rated bond market (18%) relative to S&P (82%). After the recalibration, Moody's and Fitch market share increased from 18% to 24%, with an increase in the number of single-rated bonds from 199 to 406 (over 100% increase).

Panel B describes changes in the unrated and rated markets. Specifically, this panel tabulates the number of rated bonds in the post recalibration period that are issued by municipalities who *only* issued unrated bonds in the pre period. The table shows that 188 (107+81) bonds with at least one rating in the post period are issued by municipalities who issued debt but did not get a rating on *any* of their bonds in

the two years prior to the recalibration. Almost all (89% =167/188) of these newly rated municipalities choose to be rated by a single rating agency, and Moody's and Fitch roughly split this market with S&P (42% versus 58%).

Panel C demonstrates changes in the occurrence of double and triple-rated issuers across the pre and post recalibration periods. By construction, all dual and triple-rated bonds have a Moody's or Fitch rating. As a result, we report changes in the proportion of double and triple-rated bonds across the sample period. The table shows that the number of double and triple-rated bonds are relatively stable in our sample period, with a slight reduction in the post-recalibration period relative to the pre-period.

The descriptive statistics reported in Table 7 present several interesting patterns. In the market for single-rated debt, Moody's and Fitch experienced an increase in market share. The largest change in the single-rated debt market share is driven by previously unrated issuers, with 70 out of 167 (42%) choosing to be rated by Moody's and Fitch (compared to their pre-period single-rated market share of 18%). In total, Moody's and Fitch increase the number of single-rated issuers from 199 to 406 bonds (207 bonds) in the post period, and 70 represent issuers that choose to participate in the rated market after the recalibration. The remaining observations represent new clients that switched from S&P to Moody's and Fitch, and existing clients that issued single-rated bonds in the post period. Moody's and Fitch enjoyed considerable market share in double and triple-rated bonds prior to the recalibration, and this did not change significantly as a result of the recalibration.

Given that the increase in Moody's and Fitch market share concentrates in single-rated issues, we focus our regression analysis in this market segment. Table 8 reports the results. We find that the coefficient on *Post* is positive and significant regardless of whether we relax the restriction on the association between the control variables and dependent variable. Based on column (2), the likelihood of choosing Moody's or Fitch over S&P is 52% higher in the post-recalibration period than in the pre-recalibration period for issues that are rated by a single agency.

6.4 ADDITIONAL ANALYSES

6.4.1 Alternative Control Sample

Our analyses thus far rely on S&P ratings fees as the counterfactual to assess whether recalibration led to an increase in Moody's and Fitch ratings fees. One concern is that S&P may respond to Moody's and Fitch recalibration by changing their fee behavior, rendering S&P fees as an inappropriate counterfactual. To address this concern, we restrict our sample to a set of issuers who have Moody's or Fitch ratings in both the pre- and post-recalibration periods. We then identify issuers whose uninsured bond ratings were Aaa in the pre-recalibration period. These issuers by definition cannot be upgraded, and thus their fees paid to Moody's and Fitch can serve as alternative counterfactuals.

There are 1,689 issues, representing 255 issuers with bond offerings rated by Moody's or Fitch in both the pre- and post-recalibration periods. Of these issuers, there are only 45 issues (5 issuers) whose uninsured bonds were consistently rated as Aaa before recalibration.[36] We assign *PreAaa* = 1 to these issues. We then regress Moody's and Fitch ratings fees on *Post*, *Post*PreAaa*, control variables, and issuer fixed effects.[37] The results from this untabulated analysis indicates that the change in Moody's and Fitch ratings fees is not distinguishable from zero for municipalities whose issues always received the highest ratings from Moody's and Fitch prior to recalibration. We find also that only issuers who can upgrade (i.e. issuers with some issues not rated AAA in the pre period) pay more to Moody's and Fitch relative to S&P after the recalibration. Overall, these results are consistent with our main findings in Tables 3 and 4. The fact that we are able to document consistent results using an alternative sample as counterfactual mitigates the concern that our findings are driven by S&P reducing their fees in response to Moody's and Fitch recalibration.

6.4.2 Other Robustness Tests

[36] For insured bonds, we rely on the "underlying ratings" whenever available.
[37] The issuer fixed effects absorb the main effect of *PreAaa*.

We perform a series of robustness tests in addition to those discussed above. First, we find that our results are robust to including state fixed effects, issuer fixed effects, rating fixed effects, and clustering standard errors by bond issue. Second, to further test whether there are some selection effects driving our results, we analyze whether the characteristics of bond issues changed over the pre and post periods using univariate analyses. We find that the characteristics of bond issues and the types of municipality issuers in the pre and post periods are largely unchanged except for par values and the use of insurance. This holds when analyzing whether the characteristics of bond issues rated by Moody's or Fitch and those rated by S&P changed over the pre and post periods. Again, we find no significant differences over the pre and post periods aside from changes in par values and insurance. Third, we ran the analysis comparing the last bond issue by a government entity to the first bond issue for that same entity after the recalibration, and the results are similar.[38] Forth, we rerun the analyses using 2 and 6 year windows around the recalibration, and find robust results.

We also recognize that it is possible that fees and ratings are simultaneously determined. To address this concern, we use the recalibration as an instrument for a change in ratings that is uncorrelated with a change in fees, other than through its effect on ratings. We then simultaneously estimate changes in fees and changes in ratings using a two stage least squares (2SLS) specification. Under this alternative research design, we find qualitatively (and quantitatively) similar results. For parsimony, we report these results in the internet appendix.

7. *Conclusion*

Rating agencies are considered by many to be important gatekeepers that help ensure the stability of financial markets. Over the last 50 years a variety of constituents have raised concerns about whether the issuer-pay model encourages these gatekeepers to be unduly influenced by their customers to provide better ratings in exchange for increased fees and allows issuers to shop for higher ratings.

[38] This also addresses concerns regarding the standard errors due to serial correlation in differences-in-differences estimation (Bertrand, Duflo, and Mullainathan [2004]).

Examining a recalibration event that led Moody's and Fitch to increase their credit ratings for thousands of municipalities, without a corresponding change in underlying credit quality, we find that the recalibrating rating agencies increased their fees by 10% more than S&P. In addition, Moody's and Fitch doubled the number of single-rated issuances that they rate. The increase in fees occurs for single-rated bonds and for a constant sample of dual and triple-rated bonds rated by both S&P and Moody's (and/or Fitch) in the pre and post-recalibration periods. These results imply that by increasing their ratings, Moody's and Fitch were able to garner new customers, and increase their fees for both their existing customers as well as for their new customers.

These results are consistent with the concerns that an issuer-pay model creates incentives for issuers to pay more for higher ratings. While we cannot measure any reputational harm associated with increased ratings, we are able to measure the benefits that ratings agencies receive when they inflate their ratings. Based on our point estimates, in our sample alone the recalibration led to $10 million of incremental fees (relative to S&P). When this is combined with the fees associated with the incremental market share that the ratings agencies were able to obtain, it suggests that there are substantial benefits for inflating ratings.

While our results may not be generalizable to other debt markets (such as the corporate bond market) due in part to structural differences in those markets and a lack of transparency in fees, the municipal debt market is sufficiently large ($3.9 trillion in 2010) that evidence of concerns with the issuer pay model in this market is likely to be important to regulators, market participants, and academics.

We argue that these results should be of interest to both academics and regulators. Several studies have used indirect approaches to investigate whether issuer-pay models compromise independence in the ratings market. Our paper complements this work using disclosed fee data to demonstrate that in the municipal debt market, the borrower's incentives to obtain improved credit ratings affect their choice of ratings agency and the fees they pay. These results should also be of interest to the SEC, who is responsible for evaluating the independence and the conflicts of interests of nationally recognized statistical rating organizations (NRSROs).

Appendix A. *Variable Definitions*

VARIABLE	*DEFINITION*
2008Q2 (2008Q3 – 2012Q4)	Indicator variable equal to 1 if the bond issue is in 2008 Q2. Similar definition applies to the other quarter-year variables (2008Q3 – 2012Q4).
Competitive	Indicator variable equal to 1 if the sale type is competitive, and 0 otherwise. Competitive sales are performed in a competitive bidding process as opposed to a negotiated contract.
Frequent Issuer	Indicator variable equal to 1 if the issuer has multiple bond offerings in the pre-recalibration period, and 0 otherwise.
Insured	Indicator variable equal to 1 if the bond issue is insured, and 0 otherwise.
Leadfin	Indicator variable equal to 1 if a leading financial advisor in the state is involved in the bond issue, and 0 otherwise. Leading financial advisor is defined as the company that has the highest sum of par value across issues is FirstSouthwest in Texas and Public Financial Management in California during our sample period.
Ln(Rating Fee)	The natural logarithm of the fee charged for a given credit rating.
Ln(Par)	The natural logarithm of the principal amount of the bond issue
Moody's_Fitch	Indicator variable equal to 1 if the rating fee or rating corresponds to Moody's or Fitch, and 0 otherwise.
Moody's_Fitch (Aaa)	Indicator variable equal to 1 if the rating fee or rating corresponds to Moody's or Fitch and the issuer always receives Aaa ratings (without enhancement from insurance) from Moody's and Fitch in the pre-recalibration period, and 0 otherwise.
Moody's_Fitch (No Aaa)	Indicator variable equal to 1 if the rating fee or rating corresponds to Moody's or Fitch and the issuer does not always receives Aaa ratings (without enhancement from insurance) from Moody's and Fitch in the pre-recalibration period, and 0 otherwise.
New Information	Indicator variable equal to 1 if the issuer's first Moody's or Fitch rated new issue in the post-recalibration period has a rating different from the rating predicted based on the Moody's transition matrix (Moody's [2010]) and the last new issue prior to recalibration, and 0 otherwise.
No. of Ratings	The number of ratings assigned to a bond issue.
Par	The principal amount of the bond issue.
Post	Indicator variable equal to 1 if the bond issue is sold after recalibration, and 0 otherwise.
PreAaa	Indicator variable equal to 1 if the issuer always receives Aaa ratings (without any enhancement of insurance) from Moody's and Fitch in the pre-recalibration period, and 0 otherwise.
Rating	The numerical equivalent of the bond issue's credit rating, where 16 is equivalent to a Moody's rating of Aaa and 1 is equivalent to B3 (the lowest credit rating in the sample).
Rating Fee	The fee charged for a given credit rating.
Relative Change in Rating	The change in rating assigned by Moody's or Fitch's pre- and post-recalibration *less* the change in rating assigned by S&P to the exact same bond issues.
Relative Change in Rating Fees	The change in rating fee charged by Moody's or Fitch pre- and post-recalibration *less* the change in fees charged by S&P on the exact same bond issues.
Revenue bond	Indicator variable equal to 1 if the bond is a revenue bond, and 0 otherwise.
S&P	Indicator variable equal to 1 if the rating fee or rating corresponds to S&P, and 0 otherwise.
Time	Number of days between the bond issue in the pre-recalibration period and the matched bond issue in the post-recalibration period.
Yield	The average yield to maturity of bonds per issue at the time of issuance

REFERENCES

ADELINO, M., CUNHA, I., FERREIRA, M. "The Economic Effects of Public Financing: Evidence from Municipal Bond Ratings Recalibration." *Review of Financial Studies* (2017): forthcoming.

BECKER, B., MILBOURN, T. "How Did Increased Competition Affect Credit Ratings?" *Journal of Financial Economics* 101 (2011): 493-514.

BERTRAND, M., DUFLO, E., MULLAINATHAN, S. "How much should we trust differences-in-differences estimates?" Quarterly Journal of Economics 119 (2004): 249-275.

BOLADO, C. "Conn. Settles Bond Ratings Row with Moody's, S&P, and Fitch." *Law360*. October 14, 2011. https://www.law360.com/articles/278198/conn-settles-bond-ratings-row-with-moody-s-s-p-fitch.

BOLTON, P., FREIXAS, Z. AND SHAPIRO, J. "The Credit Ratings Game." *Journal of Finance* 67 (2012): 85-112.

BONSALL, S. "The Impact of Issuer-Pay on Corporate Bond Rating Properties: Evidence from Moody's and S&P Initial Adoptions." *Journal of Accounting and Economics* 57 (2014): 89-109.

BONSALL, S. B., GREEN, J., AND MULLER, K. A. "Are Credit Ratings More Rigorous for Widely Covered Firms?" *The Accounting Review* (2018) In-press

BONSALL, S. B., KOHARKI, K, AND NEAMTIU, M. "When do differences in credit rating methodolo-gies matter? Evidence from high information uncertainty borrowers." *The Accounting Review* 92 (4) (2017): 53–79.

BUSINESS WIRE. "Fitch Announces the Recalibration of U.S. Municipal Bond Ratings." March 25, 2010.

CORNAGGIA, J., CORNAGGIA, K., HUND, J. "Credit Ratings across Asset Classes: A Long-Term Perspective." *Review of Finance* 21 (2017): 465-509.

CORNAGGIA, J., CORNAGGIA, K., ISRAELSEN, R. "Credit ratings and the Cost of Municipal Financing." *Review of Financial Studies* (2018): forthcoming.

CUNHA, I., FERREIRA, M., SILVA, R. "Can Credit Rating Agencies Affect Election Outcomes?" Working paper, London Business School, 2018.

DEHAAN, E. ""The Financial Crisis and Corporate Credit Ratings." *The Accounting Review* 92 (4) (2017): 161-189.

GILLETTE, J., D. SAMUELS, F. ZHOU. "The role of credit rating changes on opacity in the municipal bond market." Working paper, MIT, 2018.

HE, J., QIAN, J., STRAHAN, P.E. "Are All Ratings Created Equal? The Impact of Issuer Size on the Pricing of Mortgage-Backed Securities." *Journal of Finance* 67 (2012): 2097-2137.

JIANG, J., STANFORD, M., XIE, Y. "Does It Matter Who Pays For Bond Ratings? Historical Evidence." *Journal of Financial Economics* 105 (2012): 607-621.

KEDIA, S., RAJGOPAL, S., ZHOU, X. "Did going public impair Moody's credit ratings?" *Journal of Financial Economics* 114 (2014): 293-315.

KEDIA, S., RAJGOPAL, S., ZHOU, X. "Large shareholders and credit ratings." *Journal of Financial Economics* 124 (2017): 632-653.

KHWAJA, A., MIAN, A. "Tracing the impact of bank liquidity shocks: Evidence from an emerging market. *American Economic Review* 98 (2008): 1413-1442.

MANSI, S., BAKER, H. "Assessing Credit Ratings Agencies by Bond Issuers and Institutional Investors" Working Paper (2001), Virginia Tech.

MATHIS, J., MCANDREWS, J., ROCHET, J. "Rating the Raters: Are Reputation Concerns Powerful Enough to Discipline Rating Agencies?" *Journal of Monetary Economics* 56 (2009): 657-674.

MOODY'S INVESTOR SERVICE. "The U.S. municipal bond ratings scale: mapping to the global rating scale and assigning global scale ratings to municipal obligations." 2007.

MOODY'S INVESTORS SERVICE. "Recalibration of Moody's U.S. municipal ratings to its global rating scale." 2010.

PEARLSTEIN, S. "Missing the Mark on Ratings-Agency Reform." *Washington Post*. September 18, 2009. http://www.washingtonpost.com/wp-dyn/content/article/2009/09/17/ AR2009091704608.html

SEC. "Report on the Role and Function of Credit Rating Agencies in the Operation of Securities Markets." January 2003. https://www.sec.gov/news/studies/credratingreport0103.pdf.

SEC. "Report to Congress: Credit Rating Agency Independence Study." November 2013. https://www.sec.gov/news/studies/2013/credit-rating-agency-independence-study-2013.pdf.

XIA, H. "Can Investor-Paid Credit Rating Agencies Improve the Information Quality of Issuer-Paid Rating Agencies?" *Journal of Financial Economics* 111 (2014): 450-468.

ZEKE, F. "Rating Fees Rising Faster than Inflation as Governments Cut." Bloomberg News, November 15, 2011.

Figure 1. ***Rating Fees over Time***

This figure depicts the average dollar amount of rating fees (y-axis) for each quarter between January 1, 2008 and December 31, 2012 (x-axis). The dashed line represents average fees charged by S&P, and the solid line represents average fees charged by Moody's and Fitch. The sample incorporates municipal bond issues from Texas for a sample of issuers with a Moody's or Fitch rating and S&P rating in both the pre and post-recalibration periods.

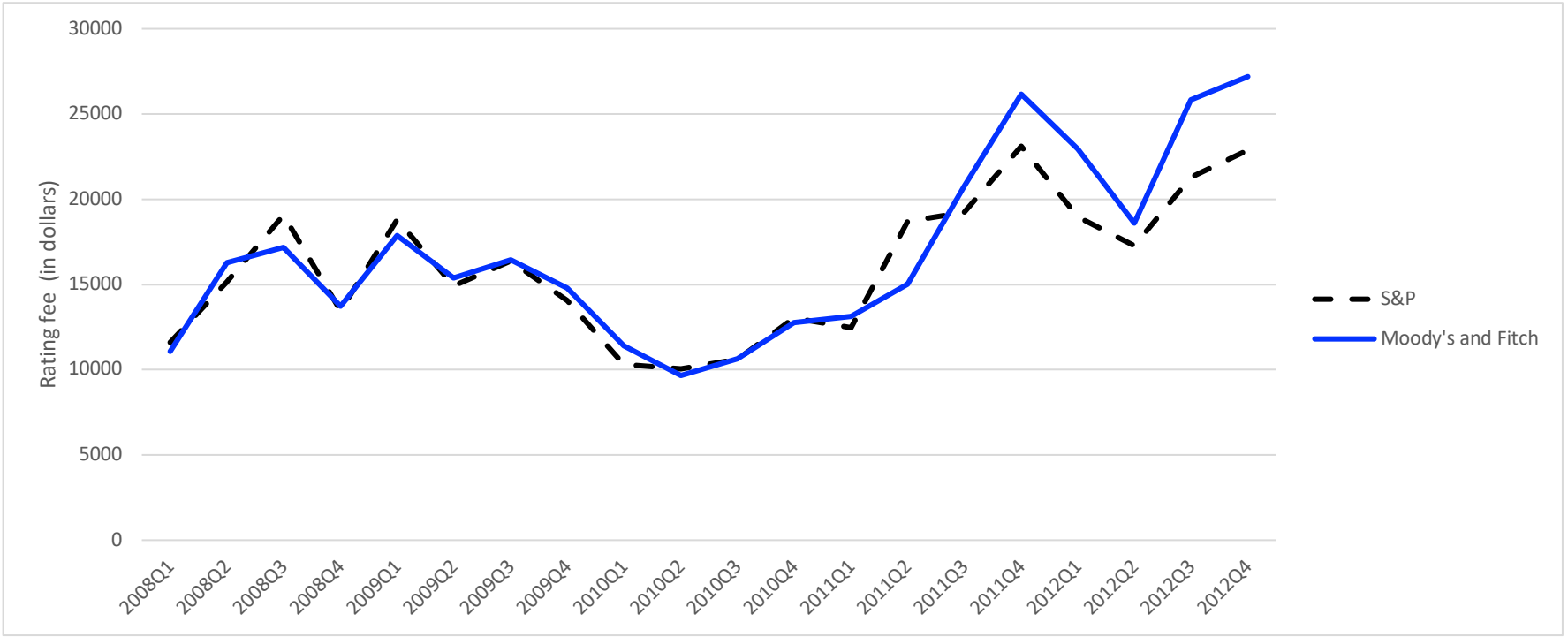

Figure 2. ***Market Share for Single-Rated Issuers***

This figure depicts the proportion of single-rated bond issues rated by Moody's or Fitch relative to S&P over time. The sample is comprised of bond issues with only one rating, and the y-axis represents the percentage of bonds with an S&P rating (dashed line) versus a Moody's or Fitch rating (solid line) per calendar quarter.

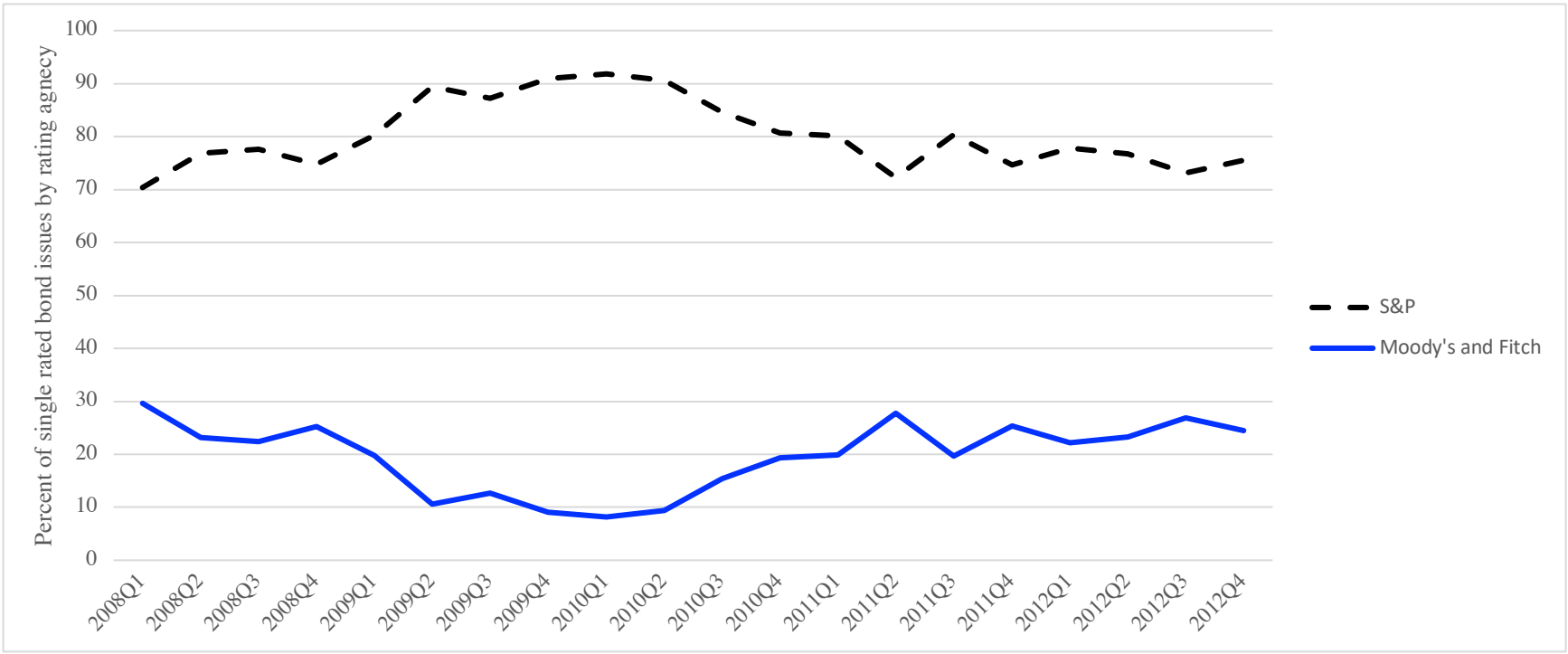

Table 1. ***Descriptive Statistics***

This table provides descriptive statistics for the ratings-bond issue sample of 5,930 observations consisting of 4,237 unique issues between 2008 and 2012 (excluding 2010). All variables are defined in Appendix A.

	S&P Ratings (n = 3547)			Moody's & Fitch Ratings (n = 2383)		
Variables	**Mean**	**Median**	**Std Dev**	**Mean**	**Median**	**Std Dev**
Rating	14.145	15	2.178	14.294	14	1.802
Rating fee	12,450	9,750	11,070	15,688	11,000	14,948
Ln(Rating fee)	9.179	9.185	0.690	9.326	9.306	0.817
Par	16,050,694	8,805,000	18,798,201	23,142,492	14,160,000	23,022,170
Ln(Par)	16.041	15.991	1.055	16.454	16.466	1.062
Insured	0.505	1	0.500	0.452	0	0.498
Leadfin	0.312	0	0.463	0.388	0	0.487
Revenue bond	0.176	0	0.381	0.216	0	0.411
Competitive	0.207	0	0.405	0.163	0	0.369

Table 2. ***Pearson Correlations***

This table provides Pearson correlations for the variables in the analyses. All variables are defined in Appendix A. Numbers in bold indicate 10% or less level of significance.

Variables		**[1]**	**[2]**	**[3]**	**[4]**	**[5]**	**[6]**	**[7]**	**[8]**	**[9]**	**[10]**	**[11]**
Rating	[1]	1	**-0.119**	**-0.167**	**0.177**	**-0.036**	**0.036**	**0.094**	**0.493**	**0.044**	**-0.218**	0.012
Fee	[2]		1	**0.093**	**0.238**	**-0.123**	**0.123**	**0.459**	**-0.185**	**0.049**	**0.390**	**-0.149**
Post	[3]			1	**-0.143**	**0.024**	**-0.024**	**-0.067**	**-0.114**	**-0.022**	0.007	**-0.044**
No. of ratings	[4]				1	**-0.360**	**0.360**	**0.318**	**-0.210**	**0.206**	**0.098**	**-0.084**
S&P	[5]					1	**-1**	**-0.166**	**0.053**	**-0.079**	**-0.049**	**0.056**
Moody's_Fitch	[6]						1	**0.166**	**-0.053**	**0.079**	**0.049**	**-0.056**
Par	[7]							1	**-0.082**	**0.035**	**0.116**	**-0.120**
Insured	[8]								1	**-0.108**	**-0.140**	**-0.024**
Leadfin	[9]									1	**0.024**	0.014
Revenue bond	[10]										1	**-0.119**
Competitive	[11]											1

Table 3: ***Rating Fees after Recalibration***

This table presents the analysis on relative changes in ratings fees between S&P and Moody's and Fitch after recalibration. All variables are defined in Appendix A. Reported in brackets are t-statistics calculated based on White heteroscedastic consistent standard errors and adjusted for clustering by issuer. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively (two tailed tests).

	Dependent variable = Ln(Rating Fee)		
Variables	**[1]**	**[2]**	**[3]**
Moody's_Fitch	-0.090*** [-4.447]	-0.091*** [-4.466]	-0.112** [-2.471]
Post*Moody's_Fitch	0.121*** [5.372]	0.123*** [5.426]	
2008Q2 *Moody's_Fitch			-0.038 [-0.632]
2008Q3 *Moody's_Fitch			0.060 [0.949]
2008Q4 *Moody's_Fitch			-0.045 [-0.601]
2009Q1 *Moody's_Fitch			0.090 [1.314]
2009Q2 *Moody's_Fitch			0.025 [0.399]
2009Q3 *Moody's_Fitch			0.085 [1.125]
2009Q4 *Moody's_Fitch			-0.007 [-0.098]
2011Q1 *Moody's_Fitch			0.099 [1.619]
2011Q2 *Moody's_Fitch			0.028 [0.462]
2011Q3 *Moody's_Fitch			0.184*** [2.911]
2011Q4 *Moody's_Fitch			0.167** [2.508]
2012Q1 *Moody's_Fitch			0.147** [2.455]
2012Q2 *Moody's_Fitch			0.123** [2.249]
2012Q3 *Moody's_Fitch			0.189*** [2.986]
2012Q4 *Moody's_Fitch			0.181** [2.558]

Ln(Par)	0.432*** [38.554]	0.442*** [27.935]	0.431*** [38.586]
Insured	-0.058** [-2.525]	-0.056* [-1.729]	-0.057** [-2.510]
Leadfin	-0.014 [-0.450]	-0.058 [-1.538]	-0.014 [-0.445]
Revenue bond	0.440*** [7.080]	0.428*** [6.050]	0.441*** [7.107]
Competitive	-0.055* [-1.666]	-0.067 [-1.527]	-0.055* [-1.678]
Post*Ln(Par)		-0.019 [-1.138]	
Post*Insured		-0.005 [-0.121]	
Post*Leadfin		0.084** [2.191]	
Post*Revenue bond		0.017 [0.259]	
Post*Competitive		0.027 [0.638]	
Fixed Effects	Quarter, Issuer Type	Quarter, Issuer Type	Quarter, Issuer Type
Observations	5,930	5,930	5,930
Adjusted R-squared	0.537	0.538	0.537

Table 4: ***Rating Fees after Recalibration – Texas Constant Sample***

This table presents the analysis on relative changes in ratings fees between Moody's and Fitch versus S&P after recalibration on a sample of Texas issuers that have bond offerings in both pre- and post-recalibration periods, and each bond has at least two ratings, one of which is provided by S&P. The analysis is performed at the issue level. All variables are defined in Appendix A. Reported in brackets are t-statistics calculated based on White heteroscedastic consistent standard errors and adjusted for clustering by issuer. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively (two tailed tests).

	Dependent variable = Ln(Moody's or Fitch's rating fee) - Ln(S&P rating fee)		
Variables	**[1]**	**[2]**	**[3]**
Post	0.110*** [5.088]	0.110*** [5.256]	
2008Q2			0.033 [0.497]
2008Q3			-0.031 [-0.493]
2008Q4			0.011 [0.190]
2009Q1			0.005 [0.069]
2009Q2			0.030 [0.414]
2009Q3			0.104 [1.081]
2009Q4			0.104 [1.532]
2011Q1			0.168* [1.945]
2011Q2			0.079 [0.933]
2011Q3			0.121* [1.756]
2011Q4			0.145** [2.154]
2012Q1			0.204** [1.991]
2012Q2			0.139** [2.263]
2012Q3			0.223*** [2.796]
2012Q4			0.143** [2.248]

Ln(Par)	-0.023*	-0.025	-0.022
	[-1.723]	[-1.162]	[-1.603]
Insured	-0.059**	-0.051	-0.031
	[-2.015]	[-1.477]	[-0.901]
Leadfin	-0.012	-0.044	-0.012
	[-0.212]	[-0.674]	[-0.200]
Revenue bond	-0.019	-0.046	-0.019
	[-0.539]	[-1.114]	[-0.583]
Competitive	-0.092***	-0.115***	-0.072**
	[-2.802]	[-2.663]	[-2.111]
Post*Ln(Par)		0.002	
		[0.073]	
Post*Insured		-0.023	
		[-0.481]	
Post*Leadfin		0.055	
		[1.133]	
Post*Revenue bond		0.049	
		[1.210]	
Post*Competitive		0.049	
		[0.873]	
Fixed Effects	Issuer	Issuer	Issuer
Observations	1,228	1,228	1,228
Adjusted R-squared	0.310	0.311	0.319

Table 5: ***Ratings Fees after Recalibration – Cross-sectional Analysis***
This table presents cross-sectional analyses on relative changes in ratings fees between S&P and Moody's and Fitch after recalibration on the Texas constant sample. All variables are defined in Appendix A. Reported in brackets are t-statistics calculated based on White heteroscedastic consistent standard errors and adjusted for clustering by issuer. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively (two tailed tests).

Dependent variable = Ln(Moody's or Fitch's rating fee) - Ln(S&P rating fee)		
	[1]	**[2]**
Post	0.040 [1.064]	0.128*** [4.979]
Post*Frequent Issuer	0.078* [1.741]	
Post*New Information		-0.026 [-0.404]
Ln(Par)	-0.023* [-1.772]	-0.018 [-1.063]
Insured	-0.061** [-2.055]	-0.057* [-1.676]
Leadfin	-0.013 [-0.231]	0.015 [0.276]
Revenue bond	-0.020 [-0.571]	-0.036 [-0.918]
Competitive	-0.091*** [-2.776]	-0.078* [-1.973]
Fixed Effects	Issuer	Issuer
Observations	1,228	966
Adjusted R-squared	0.311	0.361

Table 6: ***Changes in Rating Fees Based on Changes in Ratings***

This table presents the analysis on changes in rating fees as a function of changes in ratings as a result of recalibration on the sample of Texas issuers that have bond offerings in both pre- and post-recalibration periods, and each bond is rated by both Moody's or Fitch and S&P. All variables are defined in Appendix A. Reported in brackets are t-statistics. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively (two tailed tests).

Variables	***Dependent Variable = Relative Change in Rating Fees***	
Relative Change in Rating	1420.88 [1.89]	*
Time	3.29 [1.89]	
Constant	-3153.06 [-1.02]	
N	238	
R^2	0.04	
adj. R^2	0.032	

Table 7: ***Descriptive Statistics on Market Share***

This table describes the distribution of bonds across rating agencies. Panel A describes the distribution of single-rated bonds in the pre and post recalibration periods by rating agency. *No. Single-Rated Bonds* is defined as the number of bonds rated by a given rating agency in that period. *Market Share for Single-Rated Bonds* is defined as the number of single-rated bonds rated per rating agency divided by the total number of single-rated bonds in that period. Panel B provides statistics on the number of bonds that are rated in the post recalibration period issued by municipalities with only unrated bonds in the pre recalibration period. Panel C describes changes in the occurrence of double and triple-rated bonds from the pre to post recalibration periods.

Panel A: Single-Rated Bonds

Rating Agency	Pre or Post Recalibration	No. Single-Rated Bonds	Market Share for Single-Rated Bonds
S&P	Pre	910	82%
S&P	Post	1288	76%
Fitch & Moody's	Pre	199	18%
Fitch & Moody's	Post	406	24%

Panel B: Previously Unrated Issuers

Rating Agency	N	Single-Rated	Double-Rated	Triple-Rated
S&P	107	97	7	3
Fitch & Moody's	81	70	8	3

Panel C: Double-Rated and Triple-Rated Bonds

Rating Agency	Pre or Post Recalibration	Number of Double-Rated Bonds	Number of Triple-Rated Bonds
S&P	Pre	966	531
S&P	Post	920	455
Fitch & Moody's	Pre	1019	531
Fitch & Moody's	Post	976	455

Table 8: ***The Likelihood of Using Moody's or Fitch over S&P after Recalibration***
This table presents the analysis on the propensity to obtain a rating from Moody's or Fitch over S&P after recalibration. All variables are defined in Appendix A. Reported in brackets are t-statistics calculated based on White heteroscedastic consistent robust standard errors. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively (two tailed tests).

	Dependent variable = Pr(Moody's_Fitch = 1)	
Variables	**[1]**	**[2]**
Post	0.486*** [4.004]	0.564*** [4.478]
Ln(Par)	0.135** [2.081]	0.187* [1.938]
Insured	-0.027 [-0.189]	0.318 [1.453]
Leadfin	0.113 [0.637]	-0.213 [-0.785]
Revenue bond	0.116 [0.520]	0.835** [2.476]
Competitive	0.089 [0.583]	0.519** [2.181]
Post*Ln(Par)		-0.092 [-0.768]
Post*Insured		-0.604** [-2.338]
Post*Leadfin		0.497* [1.733]
Post*Revenue bond		-1.122*** [-3.149]
Post*Competitive		-0.692** [-2.512]
Fixed Effects	Issuer type	Issuer type
Observations	2,803	2,803
Pseudo R-squared	0.0770	0.0874