Pay for Praise: Do rating agencies benefit from providing higher ratings? Evidence from the consequences of municipal debt 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 Fitch and Moody's 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 Fitch and Moody's 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 Fitch and Moody's 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 changing from an investor-pay model to an issuer-pay model in the early 1970's reduced the reliability of credit ratings. Specifically, academics, the popular press, and regulators suggest that issuers purchasing ratings will select the most favorable ratings, which 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 would deter ratings agencies from offering higher ratings for larger fees. This long-standing debate has received renewed interest due to the recent financial crisis.[1] 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 examine ratings shopping. 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. By observing ratings fees and an increase in credit ratings that is not associated with changes in credit fundamentals,[2] we can test whether increased ratings are associated with increased fees. Since not

[1] 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."
[2] 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]).

all municipal debt issuances are rated and many receive only one rating, we also examine whether ratings increases lead to market share increases.[3]

Our sample consists of bonds issued in two states, i.e. California and Texas, both of which collect and disseminate information about the bonds issued by a variety of governmental entities domiciled in their states. These disclosures, which include the amount of fees paid to agencies for bond ratings,[4] are advantageous because they allow us to directly examine the association between ratings and fees.

To identify the effect of ratings on fees we use the upward recalibration of municipal debt ratings by Moody's and Fitch in April 2010 that was designed to increase the comparability of ratings across asset classes. Prior to the recalibration, Moody's and Fitch used a Municipal Rating Scale, which historically measured default risk (Adelino, Cunha, and Ferreira [2017], Cornaggia, Cornaggia, and Israelsen [2017]). After the recalibration, both Moody's and Fitch moved to the Global Ratings Scale (used for corporate bonds, sovereign debt, and structured finance products), which combines default risk and expected losses given default. In contrast, S&P did not recalibrate their ratings, claiming that they did not employ a dual ratings system.[5] 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.

[3] In contrast to the U.S. public corporate debt market, where the major ratings agencies provide unsolicited ratings to issuers unwilling to pay for ratings (Mansi and Baker [2001]) our review of the Mergent database, and discussions with Moody's personnel indicates that unsolicited ratings are not commonplace in the municipal debt market.

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

[5] 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."

Cornaggia et al. [2017b] discuss the ratings recalibration in depth, focusing on whether the recalibration affected ratings and bond yields. They find that Moody's upward recalibration of over 509,000 bonds ($1.3 trillion worth of debt) led to decreases in yields for bonds more likely to be held by unsophisticated (retail) investors (compared to bonds not recalibrated).[6] Yields on debt issued by more opaque governmental entities also decreased. They conclude that investors mechanically rely on ratings when there is limited other information in the market.

We believe the ratings recalibration is an ideal setting to examine the effect of ratings upgrades on ratings fees and market share. First, the recalibration had a direct effect on ratings (which we confirm in our sample) but was unlikely to have a direct effect on fees (which we discuss more below). Second the recalibration appears to have yielded significant benefits to issuers in terms of reduced interest costs.[7] Given the oligopolistic nature of the ratings market, it is possible that the increase in ratings could lead to increases in both fees and market share.

To answer these questions, 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). For most analyses we restrict our sample to rated bond issues in the three years prior to the year of the recalibration (2010) and the three years after the recalibration (excluding 2010). This produces an overall sample of 9,802 bond ratings for 6,458 issues across the two states representing $107.7 billion of debt over this six-year period.

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

[7] Cornaggia et al. [2017b] estimate that the most conservative effect of the recalibration on yields was 15 basis points. They multiply this by the total amount of recalibrated bonds and estimate that municipalities incurred an extra billion dollars of interest costs due to the lower ratings on the old (MRS) scale. They also estimate that the recalibration reduced yields between 14 and 42 basis points per issuance.

We begin by investigating whether the increase in ratings due to the recalibration resulted in increases in fees and market share. Fee increases could result from Moody's and Fitch taking advantage of the oligopolistic ratings market to extract some of the interest savings from their existing clients. Moody's and Fitch could increase their market share either by attracting new clients that were unwilling to buy relatively lower ratings,[8] or by luring customers from S&P. [9] We begin by focusing on the broader question of whether fees and market share increase, and then investigate the channel through which they increase.

Our initial analysis uses the largest identifiable sample to examine whether ratings fees increase. We find that over the two, four, and six-year windows around (but excluding) the year of the recalibration the increase in ratings fees for Fitch and Moody's is larger than the increase in ratings fees for S&P.[10] This implies that after recalibrating their ratings, and increasing the average ratings for municipalities, Fitch and Moody's were able to increase their fees, compared to S&P.[11]

To isolate ratings fee increases from ratings shopping, and other selection issues, we next identify a sample of municipalities that have issued bonds rated by both S&P and Moody's in both the pre and post recalibration periods to hold constant the rated entities and bonds across rating agencies and recalibration periods.[12] Since each bond is rated by both S&P and Moody's, this sample eliminates concerns that our results reflect differential changes in bond fundamentals

[8] For both of these analyses, it is important to note that many issuers in the municipal market are not rated.
[9] Adelino et al. [2017] indicate that prior to the recalibration, when Moody's and S&P rated the same security, the Moody's rating was lower 53% of the time. After the recalibration this statistic drops to 17%.
[10] We use 2, 4, and 6-year windows around the year of the recalibration (but excluding 2010) throughout. While the recalibration occurred over a month long period, we do not have the exact date the ratings fees are determined. Thus ratings fees were likely negotiated in the pre period for some of our post observations issued immediately after the recalibration. As it is difficult to ascertain when fee decisions are made, 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.
[11] These tests include a host of control variables and a variety of different research designs to ensure robust results.
[12] While each issuer has bond offerings in both the pre- and post-recalibration periods, the number of bond issuance observations per issuer may differ in the pre- and post-periods.

across rating agencies. It also reduces concern for omitted variables, because any omitted variable that affects Moody's rating of a given bond should also affect S&P's rating of the same bond. Consistent with our main analysis, we find that over the 2, 4 and 6-year horizons Moody's charged more in ratings fees than S&P. This result is not sensitive to including bonds rated by Fitch, or to directly benchmarking Moody's fees against S&P (i.e., using difference in fees between the rating agencies of a given bond as the dependent variable). Overall, these results suggest that at least part of the fee increases are attributable to Moody's and Fitch increasing fees for existing customers by more than S&P.

We further investigate the direct relationship between municipality level changes in ratings fees and changes in ratings. We create a difference-in-difference measure that captures the relative change for Moody's and Fitch compared to the change for S&P in fees and in ratings and examine the association between the changes in fees and changes in ratings. We find that relative to S&P, a one-notch increase in ratings for Moody's and Fitch yields an additional $1,579 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.[13]

We conduct an additional exploratory analysis to isolate the potential source of fee increases by rerunning our tests on the sample of municipalities without consistent ratings agencies in the pre and post periods. This sample reflects municipalities that are selecting to be rated by a specific agency for the first time, those that did not issue debt in the post period, and those choosing to switch ratings agencies in the post period (these municipalities contribute to the changes in market share among ratings agencies). We find that the magnitude of the results for these

[13] The Mergent database includes a ratings recalibration indicator variable. It suggests that 99% of our sample observations were recalibrated. Thus, our Post*Moody's indicator almost always reflects ratings changes, and the results of this analysis provide more precision on how much additional revenue is earned from a one notch increase.

observations are either similar or slightly smaller than those in our matched pair analyses[14]. This implies that the effect of the recalibration was similar to municipalities that are being rated for the first time as well as to those being consistently rated by the same agencies over time.

Having established the effect of recalibration on fees, we next examine whether Fitch and Moody's were able to attract more business in the post period. We start by providing some univariate statistics comparing the extent to which municipalities are rated by Moody's Fitch, and S&P, and whether they chose to seek a single rating, two ratings or three ratings. For parsimony, we focus our discussion of this analysis on the 4-year window surrounding recalibration. After analyzing changes in the market share of Moody's and Fitch relative to S&P across the full sample of single-, double-, and triple-rated bonds, we find that the source of the increase in market share is predominantly in the debt issues which receive only a single rating. Moody's and Fitch have a 100% increase in single rated debt, while S&P had a 41% increase, and half of this increase appears to be due to municipalities seeking ratings when they had previously issued debt and not had the debt rated. We find there is a reduction in debt being rated by two and three agencies, which affects S&P and Fitch and Moody's in similar magnitudes.[15]

We next use a logistic regression to model the propensity to be rated by either Fitch or Moody's. Given the descriptive statistics above, we restrict our sample to municipalities rated by only one of the three ratings agencies, and investigate whether the propensity to use either Fitch or Moody's increased in the post period.[16] Consistent with the univariate analysis, we find that

[14] The coefficients on Post*Fitch_Moody's are not significantly different in the 2 and 4-year windows. The coefficients are significantly different in the 6-year window, but the coefficient is larger for the sample of dual-rated issues. Overall the results suggest that the selection either does not change the magnitude and significance of the results, or it *reduces* the magnitude of the results.

[15] In untabulated analyses, we examine whether there was significant switching between S&P and Moody's and Fitch. There does not appear to be a significant number of municipalities switching between rating agencies.

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

over the two, four, and six-year horizons centered on the recalibration date, governmental entities in Texas and California were more likely to use Fitch or Moody's after the recalibration.

We conclude our tests by examining the alternative explanation that the increases in fees charged by Moody's and Fitch represent price increases associated with a superior product. As part of the recalibration, both Moody's and Fitch incorporated loss given default estimates for each municipal sector and it is possible that issuers pay more as a result. We note that the following institutional details suggest that this is unlikely to be the case. Moody's provided a transition matrix up to three years prior to the actual recalibration, and offered to provide ratings on the Global scale upon request. Cornaggia et al. [2017b] find that the new ratings did not increase market liquidity beyond the first 90 days, and did not yield substantial increases in demand, suggesting the recalibration did not attract new investors to the market. Similarly, Gillette, Samuels, and Zhou [2018] find that the recalibration did not change in the percentage of retail versus institutional trades in the municipal market, suggesting that the overall mix of investors did not change. Finally, Moody's itself in a 2008 Congressional testimony indicates that the Global Scale is likely to be less informative. Specifically, Senior Managing Director, Laura Levenstein asserted that:

> *If municipal bonds were rated using my global ratings system, the great majority of my ratings likely would fall between just two ratings 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 for both investors and issuers (P. 122) (Joffe [2017], p. 7).*

Nevertheless, we conduct one additional analysis to provide evidence on whether the larger fees were due to "better" information. Moody's and Fitch indicate that loss given default is the lowest for general obligation bonds (GO bonds), because "the legal enforceability of the GO pledge ensures a high rate of recovery for GO bonds" (Moody's [2007]). As Director Levenstein points

out, and Moody's preliminary ratings transition matrix confirms, the recalibration pushed most of the GO bond debt into two or three ratings categories, providing investors with little information given there is virtually no loss given default for GO bond debt.

Thus, we partition our sample into low loss given default ("LGD") bonds (i.e. bonds issued by municipalities and counties that are more likely to have GO backing) versus all other bonds which have higher LGD (hospitals, colleges, sewer districts, etc.). We then examine whether the increases in fees are more heavily concentrated in bonds where loss given default, and thus the ratings under the Global Scale, are likely to be more informative (i.e. high LGD bonds). We find that both types of bonds experienced ratings increases, and increases in fees, and the increases in fees are generally larger for the bonds that have low LGD. If ratings became more informative this would be the opposite of what we should observe, making it unlikely that Moody's and Fitch are being compensated for providing superior credit ratings.

Our results are consistent with the economic significance of the recalibration documented by Cornaggia et al. [2017b]. They estimate that municipalities incurred close to a billion dollars of excess interest costs while they were in the municipal (MRS) scale. Our point estimate indicates that Moody's and Fitch were able to increase their fees by roughly $1,579, which represents about 10% of the average fee in the sample.[17] If we multiply that by the number of issuances rated by S&P and Moody's 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 note that Moody's municipal debt segment had a revenue

[17] This is estimated from our Texas dual rated sample.

increase of approximately $75 (30%) million over the three post recalibration years, and at least part of this increase is attributable to increased fees.

To ensure that our fee results are not attributable to some unique aspect of Texas and California, we also establish that the ratings and yield results in our sample are similar with those in Cornaggia et al. [2017b], which we report in the internet appendix. We find that in our sample post recalibration new issuance debt ratings were higher and new issuance yields were lower for Moody's and Fitch compared to S&P over the two, four, and six-year windows centered on the recalibration date, which is consistent with Cornaggia et al. [2017b].

Overall, our results demonstrate important consequences of the issuer-pay ratings model. The recalibration that resulted in an increase in the 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 of these effects, because not all states disclose ratings fees. Knowing that fees paid will become public information likely reduces the incentives for municipalities in Texas and California 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 (NSRSOs), as required by the Sarbanes Oxley Act and the Dodd Frank Act.[18] The

[18] 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]).

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. REGULATORY CONCERNS SURROUNDING NSRSOs

In 2002, Congress issued the Sarbanes Oxley Act in response to the Enron bankruptcy. As part of this Act, congress required the SEC to prepare a report on the role and function of credit ratings agencies in the operation of securities markets.[19] In this report, the SEC highlights the fundamental conflict of interest associated with the issuer pay model. Specifically,

> *"The practice of issuers paying for their own ratings creates the potential for a conflict of interest. Arguably, the dependence of rating agencies on revenues from the companies they rate could induce them to rate issuers more liberally, and temper their diligence in probing for negative information. This potential conflict could be exacerbated by the rating agencies' practice of charging fees based on the size of the issuance, as large issuers could be given inordinate influence with the rating agencies."*

The SEC also highlights the countervailing market forces that potentially mitigate the inherent conflict of interest, indicating that:

> *The fees received from individual issuers are a very small percentage of their total revenues, so that no single issuer has material economic influence with a rating agency. Furthermore, the rating agencies assert that their reputation for issuing credible and reliable ratings is critical to their business, and that they would be loathe to jeopardize that reputation by allowing issuers to improperly influence their ratings, or by otherwise failing to be diligent and objective in their rating assessments.*

Ultimately, the SEC decided to explore whether NRSROs should "implement procedures to manage potential conflicts of interest that arise when issuers pay for ratings (SEC, [2003], p.2)."

In 2010, at the end of the financial crisis, Congress passed the Dodd Frank Act, which once again required the SEC to study the NSRSOs.[20] Specifically, Section 939F(b)(1) of that bill

[19] See SEC [2003].
[20] See the Dodd-Frank Spotlight: Credit Rating Agencies (SEC [2014]).

indicates that "the Commission shall carry out a study of the credit rating process for structured finance products and the conflicts of interest associated with the issuer-pay and the subscriber-pay models."[21] The increased regulatory attention on the NSRSOs is likely attributable to their role in the financial crisis. For example, the final report issued by the Financial Crisis Inquiry Commission indicates that "the failures of credit rating agencies were essential cogs in the wheel of financial destruction. The three credit rating agencies were key enablers of the financial meltdown" (FCIC [2011], p.25).

In 2012 and 2013, the SEC responded to the Dodd Frank Act by issuing a series of studies on the Credit Ratings Agencies, and as part of those reports, the SEC once again described the independence issues that arise in issuer-pay models. The SEC responded to Congressional concerns regarding these conflicts of interests by adopting a series of measures over the period 2010-2014. These measures include improving the ratings agencies internal controls, and requiring "look-back" reviews to determine whether conflicts of interest led to ratings inflation. They also required ratings agencies to publish their methodologies and credit-rating histories and required that ratings be consistent across all asset classes. Despite the changes in the regulations, skeptics remain concerned that the issuer pay model retains inherent conflicts of interest that are likely to lead to future economic crises.[22]

We provide additional evidence regarding the conflicts of interest that arise under the issuer-pay models using the disclosure of ratings fees in the municipal debt markets and the recalibration of credit ratings which resulted in systematic upgrades of ratings to thousands of municipalities without any change in underlying credit risk. While the results of this analysis may not be generalizable to other debt markets due in part to structural differences in those markets and

[21] See the Report to Congress on Assigned Credit Ratings (SEC [2012], p.6).
[22] See, for example, Dayen [2014].

a lack of transparency in fees, the municipal debt market is sufficiently large ($3.7 trillion in 2010) that evidence of concerns with the issuer pay model in this market are likely to be important to regulators, market participants, and academics.

2.2. ACADEMIC RESEARCH ON ISSUER PAY MODEL CONFLICTS OF INTEREST

The heightened regulatory interest in the conflicts of interest underlying the issuer-pay model has led to a host of academic studies investigating the extent to which borrowers' incentives to buy better credit ratings and the ratings agencies' incentives to retain their reputational capital influence the outcomes of the ratings process. Researchers have used a variety of different approaches to address this question.

For example, Cornaggia et al. [2017a] examine default rates by initial rating, accuracy ratios, migration metrics, instantaneous upgrade and downgrade intensities, and rating changes over bond lives for bonds across different asset classes. They find that the extent to which credit ratings agencies provide ratings inflation is monotonically related to the magnitude of the revenues generated by the asset class, and that asset classes tend to receive the most generous ratings in periods when they generate the greatest amounts of revenue. Similarly, He, Qian, and Strahan [2012] examine the relationship between ratings and the size of the issuer offering in mortgage backed securities (MBS). They find that larger issuers of MBS received better ratings than smaller issuers of MBS, and that investors priced this risk by offering larger issuers higher yields. The results of these papers are consistent with the independence issues associated with the issuer-pay model dominating the ratings agencies' incentives to maintain reputational capital.

Becker and Milbourn [2011] focus on the role of reputation in ratings by examining the effect of Fitch entering the corporate ratings market in 1999, which increased the competitiveness

of the overall market. They find that increased competition from Fitch coincides with lower quality ratings by S&P and Moody's. Specifically, for both Moody's and S&P, rating levels went up, the correlation between ratings and market-implied yields fell, and the ability of ratings to predict default deteriorated. They interpret these results as consistent with an association between rating agency reputation and the quality of the ratings they provide, arguing that as competition increases, the reputational rents decrease, and quality declines.

Both Bonsall [2014] and Jiang et al. [2012] examine the quality of the ratings at the time S&P and Moody's changed from investor-pay to issuer-pay. Bonsall [2014] finds that ratings quality improved, as ratings became more predictive of future economic outcomes, while Jiang et al. [2012] find that as issuers moved from investor-pay to issuer-pay, ratings increased. This suggests that ratings agencies offered higher ratings when paid by issuers.

Several papers examine the effects of the issuer-pay model by comparing ratings from issuer-paid ratings agencies to those from investor-paid ratings agencies (such as Egan-Jones and Rapid Ratings). For example, Beaver, Shakespeare, and Soliman [2006] find that certified rating agencies (i.e., issuer-paid ratings) are more conservative than investor-paid ratings because of their role in financial contracts. Similarly, Cornaggia and Cornaggia [2013] find that Moody's ratings exhibit less volatility but are slower to signal changes in default risk than investor-paid ratings. Finally, Xia [2014] finds that the presence of investor-paid rating agencies improves the quality of S&P ratings. Collectively, these papers conclude that issuer-paid certified rating agencies tend to be slower and provide less informative ratings than investor-paid ratings agencies. However, the evidence is mixed on whether the issuer-pay model induces an independence problem or the rating agencies act conservatively because of their contracting role.

From a theoretical perspective, Mathis, McAndrews, and Rochet [2009] develop a model showing the tradeoffs between the reputational concerns of the ratings agency and the borrowers' willingness to pay for ratings. The key insight from their model is that reputational concerns will dominate when the fraction of revenues from a particular asset class is small. In addition, Bolton, Freixas, and Shapiro [2012] model the ratings agencies incentives to provide better ratings (i.e., underrate risk) for an increase in their market share. In their model, the extent to which ratings agencies will underrate risk depends on whether the issuer will be a repeat customer and the general economic conditions. They suggest that during boom periods, both the nature of the clientele buying the bond (i.e. there are more naive investors) and the risk of bond failure are such that it is less costly to provide better ratings for riskier bonds.

Kedia, Rajgopal, and Zhou [2014] examine changes in the quality of Moody's ratings (relative to S&P) after Moody's became publicly traded in 2000. The authors find evidence that Moody's provided higher ratings (relative to S&P) after going public, consistent with the claim that the culture changed to one that focused on maximizing short-term revenue and market share as opposed to long-run reputation. Moreover, Kedia, Rajgopal, and Zhou [2017] find that Moody's provided relatively higher ratings for its largest shareholders after going public.

Overall, the existing academic evidence yields conflicting results on whether the issuer-pay model leads to more favorable ratings. Papers support both the reputational arguments and the conflict of interest arguments. We add to this literature by using the disclosures of ratings fees by municipalities to directly capture the fee revenue received by the rating agencies and the recalibration done by Moody's and Fitch in April 2010 to generate estimates that are largely free from confounding factors.

2.3. BOND RECALIBRATION AND RATINGS FEE DATA

There are two central issues that have made it difficult to assess whether better ratings are associated with larger ratings fees. First, neither the ratings agencies nor the bond issuers typically disclose fees. Second, better ratings could be associated with larger fees because they require more effort in determining the rating. We take advantage of some of the unusual elements of the municipal debt market to overcome these concerns.

First, the state level agencies that oversee municipal debt issuances in California and Texas each require municipalities to disclose various terms of their debt issuances, including the magnitude of their ratings fees. Texas requires these disclosures at the ratings agency level while California reports the combined ratings fees paid for the bond issuance.

Second, in April 2010 both Fitch and Moody's recalibrated municipal debt ratings to the Global Rating Scales.[23] This 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

[23] Studies of this event examine whether credit ratings still inform investors (Cornaggia et al. [2017b]), how local governments' financial constraints affect employment and growth (Adelino et al. [2017]), whether municipal bond ratings affect incumbent election prospects (Cunha et al. [2017]), and whether higher ratings reduce financial statement disclosure (Gillette et al. [2018]).

[24] E.g., 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].

ratings only reflect distance to default. For GO bonds, loss given default is typically close to zero. For other types of municipal debt, loss given default can range from 10 to 50%.[25]

These recalibrations appear to have been in response to legal pressure from municipalities on these agencies to adjust their ratings and to regulatory pressure for increased transparency. [26] For example, the Dodd Frank Act of 2010, section 938 Universal Ratings Symbols explicitly required the SEC to require each NRSRO to apply any rating symbol in a manner that is consistent for all types of securities. S&P claimed that they adopted one rating scale across all asset classes, and thus did not recalibrate their ratings. The Moody's and Fitch recalibration provides us a rare setting where, for one set of ratings agencies, there is a change in ratings without a corresponding change in underlying issuer fundamentals, and there is a control sample of ratings where there was no corresponding recalibration. Thus, we can isolate the effect of ratings fees resulting from the recalibration on ratings changes.

3. *Hypothesis Development*

We first hypothesize that after the recalibration both Fitch and Moody's will experience a larger increase in their ratings fees compared to S&P. As we discuss above, some of the existing research establishes that ratings agencies are concerned with their reputation, and thus one could expect that the recalibration will have no effect on fees. Alternatively, other papers suggest that the issuer-pay model creates conflicts-of-interest, and ratings agencies may be affected by these conflicts-of-interest and charge more for better ratings. These competing arguments suggest the effect of the recalibration on fees is unclear.

[25] See Moody's [2007].
[26] Cornaggia et al. [2017b] indicate that in 2010, households held 50% of the $3.77 trillion municipal debt market, while mutual funds held 14%, money market funds held 10%, property-casualty insurance companies held 9%, and U.S.-chartered depository institutions held 7% (www.federalreserve.gov/releases/z1/current/z1.pdf).

Next we hypothesize that after the recalibration, Fitch and Moody's 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. [2017b]). If the ratings recalibration resulted in improved credit ratings, then one would expect that issuers would be more likely to use the ratings agencies that offer better ratings. Further, evidence of a shift to the ratings agencies that recalibrated their ratings would be consistent with the hypothesis that issuers who pay for ratings have an incentive to use the ratings agency that will provide them with the best ratings. However, if the recalibration is associated with an increase in the ratings fee, then it is not clear that the costs of using Fitch and Moody's (increased fees) will exceed the benefits (better ratings). Thus the effect of the recalibration on rating agency market share is not known.

Our final hypothesis relates to whether the importance of the loss given default portion of the ratings change affects issuers when they are recalibrated. If measuring loss given default improves the quality of the credit ratings, then we should see larger fees being paid in the bonds where there is more variation in loss given default.

4. *Data*

4.1. 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.[27] 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

[27] 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/.

analyses require us to identify fees paid to 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 the maintenance fees paid to ratings agencies or 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, insurance type, name of the financial advisor, and date of sale. We specify 2007 to 2009 as the period before recalibration and 2011 to 2013 as the period after recalibration, omitting the recalibration event year of 2010.

For the bond issue samples in both states, we analyze the underlying long-term rating associated with the bond issue. We delete observations that are unrated, only have short-term ratings, where the ratings fee is greater than zero but the bond issue is unrated, where the ratings fee is equal to zero but the bond issue reports at least one rating, and when 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 9,802 bond ratings from 2007 to 2013 (excluding 2010), representing 6,458 unique bond issues from 2,409 unique municipalities.

4.2. RESEARCH DESIGN

We 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 affect fees. We appreciate that if the recalibration led to additional effort that affects fees then the recalibration could have a direct effect on fees that is not driven by the change in ratings. While we recognize the importance of the validity of the assumption that the recalibration does not directly affect fees, the institutional details

surrounding the recalibration suggests that a direct effect is unlikely to be true. Moody's indicated that they did not examine any individual municipality or security, instead the recalibration was applied uniformly based on the state the municipality is located, type of bond, the type of entity issuing the bond, and the ratings prior to recalibration. Also consistent with no required additional effort to incorporate loss given default in the recalibrated ratings, Moody's provided a ratings transition matrix years prior to the recalibration.

4.2.1. Ratings Fees after Recalibration

To test whether Fitch and Moody's charge more after they recalibrated their ratings we use the difference-in-difference design described in Eq. (1):

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

The unit of analysis is the ratings-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. *Fitch_Moody's* is an indicator variable equal to 1 if the rating was assigned by either Fitch or Moody's. *Post* is an indicator variable equal to 1 if the bond issue is sold after 2010 (i.e., the in the post-recalibration period), and 0 otherwise. Because the model includes year fixed effects, it is not necessary to include the main effect of *Post*. The variable of interest is the interaction term *Post*Fitch_Moody's*, 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.

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. There may be selection issues associated with which municipalities choose Moody's or Fitch compared to S&P, and the types of bonds rated by Moody's and Fitch may change over time. For example, larger bond issues tend to pay higher ratings fees. If Moody's and Fitch are more likely to rate large issues relative to S&P in the post-recalibration period, our results could be driven by changes in bond composition. To isolate ratings fee increases from ratings shopping, and other selection issues, we compile a sample of Texas issuers that have bond offerings both in the pre- and post-period, and each bond issue is rated by both Moody's and S&P. Since these municipalities issue bonds in both periods and each bond issue is rated by both rating agencies, 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.

We perform the analysis on ratings fees using two specifications on this sample. First, we augment Eq. (1) by including issuer-credit ratings agency (issuer*CRA) pair fixed effects. By including issuer*CRA fixed effects, we hold the municipality-rating agency pair constant and examine changes in fees before and after the recalibration. In doing so, the coefficient on *Post*Fitch_Moody's* estimates the difference between the change in fees charged by Moody's and the change in fees charged by S&P for a given issuer. Second, we collapse our sample to the issue level and rerun the analysis 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 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 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 fees should also affect S&P fees.[28]

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*), whether the financial advisor involved in the bond issue is the leader in the state (Leadfin). We interact these control variables with *Post* to allow their relations with ratings fees to vary pre- and post the event. We also include entity type fixed effects (e.g., school, county, city, etc.). Appendix A provides detailed variable definitions.

We estimate equations (1) and (2) using 6, 4, and 2-year windows surrounding the recalibration event. 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.

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

In our second analysis, we analyze whether Moody's and Fitch were able to increase their market share after recalibrating their ratings upwards. 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 rating agencies with higher ratings.[29] We test our hypothesis in Eq. (2) below. If Moody's and Fitch are able to increase their market share because

[28] 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 ratings fee difference between Moody's and S&P for an average bond in the estimation window.

[29] Further, almost all dual rated debt, and by definition all triple rated debt, is rated by S&P. Our univariate statistics indicate that dual rated debt declined slightly over the 4-year window, and increased slightly over the 6-year window.

municipalities are more likely to obtain Moody's and Fitch rather than S&P after recalibration, then β_1 will be greater than zero.

$$Pr\ (Fitch\_Moody's=1) = \beta_0 + \boldsymbol{\beta_1(Post)} + \beta_k(Controls) + e. \quad (2)$$

4.2.3. Ratings and Yields after Recalibration

In addition to the above two analyses, to ensure that the Cornaggia et al [2017b] 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 an S&P rating of AAA and 1 is equivalent to B- (the lowest credit rating in the sample). We obtain the data on bond offering yield from the Mergent Municipal Bond Securities Database.[30]

Consistent with Cornaggia et al. [2017b], we find that post recalibration new issuance debt ratings were higher and new issuance yields were lower for Moody's or Fitch compared to S&P over the two, four, and six-year windows centered on the recalibration year. We report these results in the internet appendix for interested readers.

5. *Results*

5.1 DESCRIPTIVE STATISTICS

Figure 1 depicts the average fees (in dollars) charged by the rating agencies over time. The sample incorporates dual-rated municipal bond issues from Texas from a sample of issuers with

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

both a Moody's or Fitch rating and S&P rating in the pre and post-recalibration periods. In general, rating fees increase for all three rating agencies over time. After recalibration in April 2010, Fitch and Moody's increase their fees more than S&P and the gap between their fees continue to widen over time. Before the recalibration, the trends in fees between the two groups co-moved closely, and S&P on average charged a higher fee than Moody's and Fitch. After the recalibration, although we still observe the co-movement in fees, Moody's and Fitch on average charged a higher fee than S&P.

Figure 2 depicts the proportion of single-rated bond issues rated by Fitch or Moody's instead of S&P over time. The black dashed (blue solid) line depicts the percentage of new bond issues with an S&P (Fitch or Moody's) rating in a given quarter. 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 Fitch and Moody's increased after the recalibration, to a high of 28% in the second quarter of 2011.

Table 1 provides the descriptive statistics by credit rating agencies. About 60% of our sample are bond issues rated by S&P.[31] On average, S&P charges a rating fee of about $12,500, lower than the average rating fee of $15,500 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 billion, while the average par amount for Moody's and Fitch rated issues is $23 billion. 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).

[31] 0.5926 = 5,382/9,082

Table 2 presents the correlations between the variables of interest. Most notably, rating 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. In untabulated analyses, these correlations are robust to using t-tests and chi-square tests as appropriate.

5.2 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. We perform this analysis using a two, four, and six-year window around the recalibration event and report the results in columns (1), (2), and (3), respectively. Across all three columns, the coefficient on *Fitch_Moody's* is negative, suggesting that Fitch and Moody's charged lower fees in the prior period, on average. Consistent with Figure 1, the results show that Fitch and Moody's increased their fees by more than S&P after recalibration. The coefficient on *Post*Fitch_Moody's* is positive and significant in all three columns. Using column (2), the coefficient estimate suggests that Fitch and Moody's increased their fees by an additional 13% relative to S&P after recalibration.[32] With respect to the control variables, the coefficients on *Revenue bond* and *Ln(Par)* are positive and significant, indicating that revenue bond issues and larger bond issues pay higher ratings fees on average. Most of the control variables do not change their association with ratings fees pre- and post-recalibration, as most of the interaction terms between *Post* and the controls are insignificant.

[32] These results are robust to including government entity fixed effects, state fixed effects, and clustering standard errors by bond issue.

Table 4 reports the results on the Texas dual rated bond issues, where the municipal entities issue bonds both in the pre- and post-recalibration periods. Panel A shows that the coefficient on *Post*Fitch_Moody's* remains positive and significant across all three windows. Based on the 4-year window surrounding the recalibration in column (2), the estimate suggests that for issuers with dual-rated bonds, Moody's charged 13% higher fees after the recalibration relative to S&P. Panel B collapses the analysis to the issue level and show similar results. Overall, these results indicate that our results are not solely driven by selection or changes in sample composition.

We also tabulate in Table 5 the results for the full sample in Table 3 less the observations in the analysis in Table 4. The results on this remaining sample may incorporate some selection. Table 5 shows that the coefficient on *Post*Fitch_Moody's* is positive and significant across all three windows. Importantly, when we compare the coefficients on *Post*Fitch_Moody's* between this sample and the Texas dual rating sample (Table 3 panel A), the coefficients are not significantly different in the 2 and 4 year windows (p=0.555 and 0.696, respectively), and is significantly smaller in the 6 year window (p=0.037). This suggests that any selection issue or change in sample composition either does not change the inferences of our results, or it *reduces* the magnitude of the results.

5.3 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 6 provides descriptive statistics on the distribution of bonds across rating 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. Panels A through C analyze changes in the single-, double-, and triple-rated bond market segments

individually, in addition to analyzing changes in the market for unrated to rated bonds. 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, Fitch and Moody's had a significantly smaller share of the single-rated bond market (18%) relative to S&P (82%). After the recalibration, Fitch and Moody's market share increased from 18% to 24%, with an increase in the number of single-rated bonds from 199 to 406 (207 bonds).

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.

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 decreased in the post-recalibration period relative to the pre-period.

The descriptive statistics reported in Table 6 present several interesting patterns. In the market for single-rated debt, Fitch and Moody's 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 Fitch and Moody's compared to their pre period single-rated market share of 18%. For those previously rated, 137 of the additional 418 bonds

(33%) issued in the post period are rated by Moody's and Fitch. In other words, 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 while the remaining 137 are new clients that switched from S&P to Fitch and Moody's, and existing clients that continue to issue single rated bonds in the post period. Fitch and Moody's 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 Fitch and Moody's increase in market share concentrates in single-rated issues, we focus our regression analysis in this market segment. Table 7 reports the results. We find that the coefficient on *Post* is positive and significant in the 2 and 4 years window, but only marginally significant in the 6 years window (10%, one tailed). Based on column [2], the likelihood of choosing Moody's or Fitch over S&P is 75% higher in the post-recalibration period than in the pre-recalibration period for bonds that are rated by a single agency.

5.4 ADDITIONAL ANALYSES

5.4.1 Direct link between changes in fees and changes in ratings

Thus far our results indicate that municipal bond issuers received higher ratings and paid higher fees 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 relation between changes in ratings and changes in fees In Table 8, we reduce the sample to a sample of Texas issuers with dual-rated bonds in both the pre and post periods.[33] We define the change in ratings and the change in fees by matching each bond in the post period to a comparable

[33] Our dataset is comprised of issuance data (rather than ongoing ratings), which is advantageous because it provides the ratings fee data. The drawback is that analyzing changes in fees and changes in ratings is not straightforward.

bond from the same issuer in the pre-recalibration period. Specifically, we require an exact match on issuer, bond type (e.g., water, sewer, hospital, etc.), 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 difference in issuance dates is greater than 4 years apart (because the fundamentals of the municipality are likely to change and decrease the comparability of the bonds).[34]

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 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.

Table 8 reports the results. We find that the coefficient on *Relative Change in Rating* is positive and significant, 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 nearly a $1,600 increase in fees for Moody's and Fitch relative to S&P. Given that the average ratings fee difference between S&P and Moody's and Fitch is about $3,000 (Table 1), this indicates an economically significant 50% increase. Overall, the result is consistent

[34] 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.

with our interpretation of the previous tables and with the interpretation that municipal bond issuers "pay for praise."

5.4.2 Is the increase in fee a result of a better product?

Although our results are consistent with "pay for praise," an alternative explanation is that Moody's and Fitch provided more informative ratings after the recalibration and issuers were willing to pay more for a better product. Specifically, one concern is that Moody's and Fitch ratings were indicative of distance to default in the pre period and after the recalibration, they were indicative of both distance to default and loss given default (i.e., recovery). We do not think this explanation is likely for the following reasons.

First, Moody's published the transition matrix matching existing ratings to recalibrated ratings in 2007 (Moody's [2007]), so investors could determine what the new ratings would be under the new scale years before the recalibration was implemented. This suggests that the recalibration should not bring new information to investors. Second the recalibration was done over 4 days each roughly a week apart, and it affected over 500,000 issues. Thus, there does not appear to be significant amount of effort per bond during the recalibration month. Third, as we previously discussed, Moody's claims that the recalibration did not bring new information to the market place, instead it made ratings noisier.

Although we do not think the increase in fees is due to new ratings incorporating loss given default information, we examine whether this explanation could be driving our results. If our results are driven by information about loss given default, we would expect Moody's and Fitch to charge higher fees for issuers with *higher* losses given default (lower recovery rates) after recalibration. This is because now these issuers' ratings reflect additional information, and may require additional effort for Moody's and Fitch to rate them.

We divide our sample into issuers with low loss given default (i.e., state, city, and county issuers) versus other types of municipal bond issuers (e.g., water, hospital, school, etc.). State, city, and county issuers have significantly higher recovery rates than other issuer types because they can levy additional taxes on residents. The loss given default for state, city, and county issuers is approximately 5-15% compared to 30-55% for other bond issuers (Moody's [2007]). Thus, if our results are driven by Moody's and Fitch ratings being a better measure of loss given default after the recalibration, then we would expect stronger results for bonds issued by issuers with *high* loss given default.

In Table 9, we do not find that this alternative explanation is supported by the data. In fact, we find that the increase in fees is stronger for the *low* loss given default issuers. For high loss given default issuers, the coefficient on *Post*Fitch_Moody's* is either insignificant (2 years window), or significantly *smaller* than that for low loss given default issuers (*p*-value = *0*.017 for the 4 years window and 0.003 for the 6 years window). The fact that ratings fees increased significantly for bonds issued by low loss given default issuers but less so for bonds issued by high loss given default issuers is the opposite of what we would expect if information about loss given default is driving the results. Instead, we find that ratings fees increased in the subsample of bond issues with lower expected losses given default and higher ratings increases.[35] Taken together, the results in Table 9 support the interpretation of "pay for praise" over payment for a better product.

5.4.3 Other robustness tests

We perform a series of robustness tests in addition to those tabulated in Table 4. First, we find that our results are robust to including state fixed effects, government entity fixed effects,

[35] In untabulated analysis, we find that the increase in ratings is larger for state, city, and county issuers than the other types of issuers.

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 Fitch or Moody's 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. Finally, we analyze changes in ratings fees after the recalibration where we include all bond issues in the pre period and only bond issues in 2011, 2012, and 2013, respectively. In other words, we perform the analysis on each year in the post period individually. We find that the increase in fees is significant in the periods right after the recalibration, and not driven solely from observations in 2013.

We 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 fee, other than through its effect on fees. We then simultaneously estimate fees and 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.

6. *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.

Examining a recalibration event that lead to an increase in the credit ratings for thousands of municipalities, without a corresponding change in credit quality, we find that the recalibrating rating agencies enjoy both a larger increase in fees and an increase in market share compared to the rating agency that does not recalibrate. These results are consistent with the concerns that an issuer-pay model creates incentives for issuers to pay more for higher ratings.

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 (NSRSOs).

Appendix A. *Detailed Variable Definitions*

VARIABLE	*DEFINITION*
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.
County	Indicator variable equal to 1 if the municipal bond entity is a county, and 0 otherwise.
Fitch Dummy	Indicator variable equal to 1 if the bond issue is rated by Fitch, and 0 otherwise.
Fitch_Moody's	Indicator variable equal to 1 if the rating fee or rating corresponds to Fitch or Moody's, 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.
Moody's Dummy	Indicator variable equal to 1 if the bond issue is rated by Moody's, 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.
Rating	The numerical equivalent of the bond issue's credit rating, where 16 is equivalent to an S&P rating of AAA and 1 is equivalent to B- (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.
SP Dummy	Indicator variable equal to 1 if the bond issue is rated by 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.

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

This figure depicts the average dollar amount of rating fees (y-axis) for each quarter between January 1, 2007 and December 31, 2013 (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 all dual-rated municipal bond issues from Texas for a sample of issuers with a Fitch or Moody's rating and S&P rating in both the pre and post-recalibration periods (similar to Table 4).

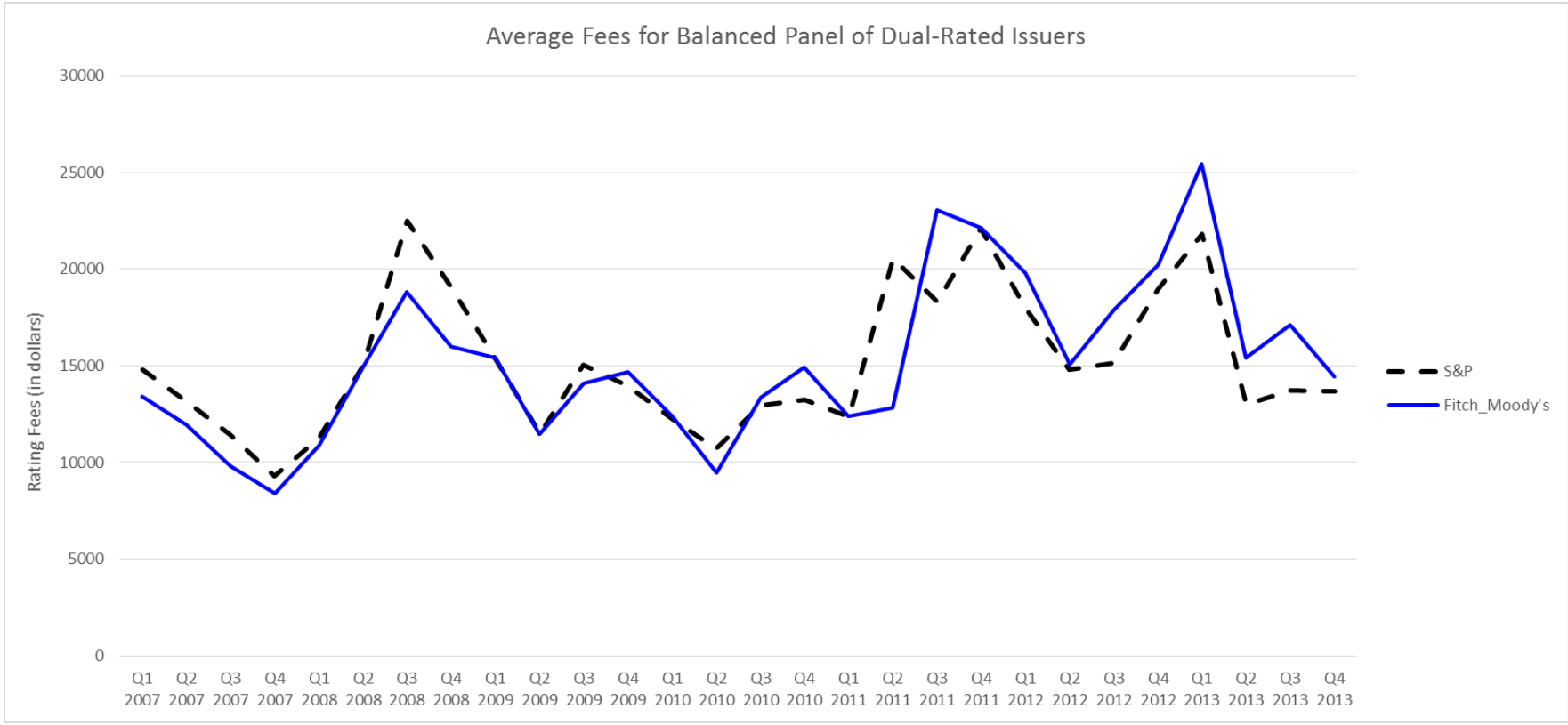

Figure 2. ***Market Share for Single-Rated Issuers***

This figure depicts the proportion of single-rated bond issues rated by Fitch or Moody's 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 (black dashed line) versus a Fitch or Moody's rating (blue solid line) per calendar quarter.

Table 1. ***Descriptive Statistics***

This table provides descriptive statistics for the ratings-issue sample of 9,082 observations consisting of 6,458 unique issues between 2007 and 2013 (excluding 2010). All variables are defined in Appendix A.

	S&P Ratings (n = 5382)			Moody's & Fitch Ratings (n = 3700)		
Variables	**Mean**	**Median**	**Std Dev**	**Mean**	**Median**	**Std Dev**
Rating	14.341	15	2.093	14.605	16	1.772
Rating fee	12,467	9,794	10,877	15,482	11,000	14,726
Ln(Rating fee)	9.184	9.190	0.688	9.316	9.306	0.812
Par	16,479,207	9,000,000	19,020,619	23,413,380	14,172,500	23,192,277
Ln(Par)	16.072	16.013	1.054	16.471	16.467	1.054
Insured	0.579	1	0.494	0.537	1	0.499
Leadfin	0.318	0	0.466	0.401	0	0.490
Revenue bond	0.170	0	0.375	0.201	0	0.401
Competitive	0.226	0	0.418	0.185	0	0.388

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	**-0.132**	**-0.263**	**0.191**	**-0.066**	**0.066**	**0.104**	**0.513**	**0.070**	**-0.221**	0.017
Fee	[2]		1	**0.114**	**0.247**	**-0.117**	**0.117**	**0.460**	**-0.172**	**0.036**	**0.370**	**-0.152**
Post	[3]			1	**-0.129**	**0.047**	**-0.047**	**-0.058**	**-0.241**	**-0.033**	-0.004	**-0.021**
No. of ratings	[4]				1	**-0.355**	**0.355**	**0.305**	**-0.174**	**0.220**	**0.096**	**-0.081**
S&P dummy	[5]					1	**-1**	**-0.162**	**0.041**	**-0.086**	**-0.040**	**0.050**
Fitch_Moody's	[6]						1	**0.162**	**-0.041**	**0.086**	**0.040**	**-0.050**
Par	[7]							1	**-0.043**	**0.035**	**0.099**	**-0.127**
Insured	[8]								1	**-0.081**	**-0.139**	**-0.028**
Leadfin	[9]									1	**0.021**	**0.020**
Revenue bond	[10]										1	**-0.113**
Competitive	[11]											1

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

This table presents 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)		
	2009 vs 2011	**2008, 2009 vs 2011, 2012**	**2007-2009 vs 2011-2013**
Variables	**[1]**	**[2]**	**[3]**
Fitch_Moody's	-0.072***	-0.091***	-0.091***
	[-2.685]	[-4.472]	[-5.559]
Post*Fitch_Moody's	0.091***	0.126***	0.138***
	[2.855]	[5.604]	[7.356]
Ln(Par)	0.455***	0.442***	0.465***
	[22.990]	[27.602]	[35.486]
Insured	0.023	-0.051	-0.021
	[0.557]	[-1.617]	[-0.644]
Leadfin	-0.046	-0.055	-0.081**
	[-0.953]	[-1.444]	[-2.480]
Revenue bond	0.483***	0.435***	0.433***
	[5.634]	[6.053]	[6.640]
Competitive	-0.051	-0.067	-0.068*
	[-0.898]	[-1.539]	[-1.847]
Post*Ln(Par)	-0.025	-0.019	-0.046***
	[-1.012]	[-1.141]	[-3.306]
Post*Insured	-0.048	-0.004	-0.001
	[-1.007]	[-0.107]	[-0.041]
Post*Leadfin	0.059	0.081**	0.072*
	[1.128]	[2.071]	[1.845]
Post*Revenue bond	0.004	0.019	0.019
	[0.049]	[0.290]	[0.318]
Post*Competitive	0.043	0.031	0.034
	[0.700]	[0.738]	[0.872]
Fixed Effects	Year, Issuer Type	Year, Issuer Type	Year, Issuer Type
Observations	2,835	5,930	9,082
Adjusted R-squared	0.552	0.535	0.543

Table 4: ***Rating Fees after Recalibration – Texas Dual Rating Issues***

This table presents analysis on relative changes in ratings fees between Moody's and S&P after recalibration on a sample of Texas issuers that have bond offerings in both pre- and post-recalibration periods, and each bond is rated by both Moody's and S&P. Panel A conducts the analysis at the issue-rating level, and Panel B 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).

Panel A: Relative changes in ratings fees – issue-rating level analysis

	Dependent variable = Ln(Rating Fee)		
	2009 vs 2011	**2008, 2009 vs 2011, 2012**	**2007-2009 vs 2011-2013**
Variables	**[1]**	**[2]**	**[3]**
Post*Fitch_Moody's	0.071*	0.134***	0.196***
	[1.874]	[4.580]	[8.361]
Ln(Par)	0.502***	0.412***	0.448***
	[6.344]	[5.463]	[8.422]
Insured	-0.328	-0.045	0.018
	[-1.524]	[-0.408]	[0.213]
Leadfin	-0.216	-0.119	-0.068
	[-1.306]	[-0.866]	[-0.721]
Revenue bond	0.841**	0.559**	0.525***
	[2.519]	[2.470]	[2.958]
Competitive	0.074	0.099	0.049
	[0.415]	[0.888]	[0.706]
Post*Ln(Par)	0.100	0.081	0.042
	[1.228]	[1.391]	[1.014]
Post*Insured	0.155	-0.026	-0.043
	[0.671]	[-0.201]	[-0.429]
Post*Leadfin	0.182	0.126	0.048
	[1.462]	[1.539]	[0.727]
Post*Revenue bond	-0.184	-0.050	-0.062
	[-1.018]	[-0.383]	[-0.719]
Post*Competitive	-0.159	-0.202	-0.116
	[-0.727]	[-1.655]	[-1.302]
Fixed Effects	Issuer*CRA, Year	Issuer*CRA, Year	Issuer*CRA, Year
Observations	496	1,396	2,336
Adjusted R-squared	0.636	0.532	0.583

Panel B: Relative changes in ratings fees – issue level analysis

	Dependent variable = Ln(Moody's rating fee) - Ln(S&P rating fee)		
	2009 vs 2011	**2008, 2009 vs 2011, 2012**	**2007-2009 vs 2011-2013**
Variables	**[1]**	**[2]**	**[3]**
Post	0.101**	0.141***	0.183***
	[2.299]	[5.011]	[8.046]
Ln(Par)	-0.046	0.002	0.007
	[-0.858]	[0.072]	[0.423]
Insured	0.028	-0.032	-0.051*
	[0.287]	[-0.899]	[-1.881]
Leadfin	0.157	-0.066	-0.098**
	[1.222]	[-0.933]	[-2.009]
Revenue bond	-0.124	-0.081	-0.033
	[-1.162]	[-1.429]	[-0.775]
Competitive	-0.037	-0.098*	-0.085**
	[-0.283]	[-1.904]	[-2.262]
Post*Ln(Par)	-0.014	0.012	-0.004
	[-0.265]	[0.417]	[-0.198]
Post*Insured	-0.088	-0.074	-0.026
	[-0.605]	[-1.317]	[-0.603]
Post*Leadfin	0.004	0.074	0.112**
	[0.047]	[1.225]	[2.297]
Post*Revenue bond	-0.035	0.127*	0.050
	[-0.264]	[1.825]	[0.892]
Post*Competitive	0.028	0.039	0.060
	[0.191]	[0.534]	[1.065]
Fixed Effects	Issuer	Issuer	Issuer
Observations	248	698	1,168
Adjusted R-squared	0.335	0.372	0.346

Table 5: ***Ratings Fees after Recalibration – The Remaining Sample***

This table presents analysis on relative changes in ratings fees between S&P and Moody's and Fitch after recalibration on the portion of the full sample (Table 3) that is not dual rated (Table 4). 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)		
	2009 vs 2011	**2008, 2009 vs 2011, 2012**	**2007-2009 vs 2011-2013**
Variables	**[1]**	**[2]**	**[3]**
Fitch_Moody's	-0.074**	-0.105***	-0.088***
	[-2.267]	[-4.159]	[-4.554]
Post*Fitch_Moody's	0.099**	0.146***	0.137***
	[2.570]	[5.082]	[5.626]
Ln(Par)	0.457***	0.454***	0.466***
	[22.026]	[32.281]	[41.951]
Insured	0.024	-0.036	-0.013
	[0.586]	[-1.079]	[-0.388]
Leadfin	-0.046	-0.048	-0.071**
	[-0.960]	[-1.280]	[-2.088]
Revenue bond	0.373***	0.370***	0.370***
	[5.277]	[6.516]	[6.878]
Competitive	-0.014	-0.066**	-0.061**
	[-0.291]	[-2.081]	[-2.053]
Post*Ln(Par)	-0.043	-0.045**	-0.067***
	[-1.623]	[-2.576]	[-4.688]
Post*Insured	-0.048	-0.014	-0.010
	[-0.972]	[-0.370]	[-0.286]
Post*Leadfin	0.023	0.051	0.050
	[0.409]	[1.234]	[1.249]
Post*Revenue bond	0.026	0.007	0.002
	[0.361]	[0.120]	[0.045]
Post*Competitive	0.067	0.084**	0.072**
	[1.246]	[2.314]	[2.156]
Fixed Effects	Year, Issuer Type	Year, Issuer Type	Year, Issuer Type
Observations	2,339	4,534	6,746
Adjusted R-squared	0.566	0.573	0.577

Table 6: ***Descriptive Statistics on Market Share***

This table describes the distribution of bonds across rating agencies in the two periods before and after the recalibration. Across all panels, the sample contains bonds within the 4 years surrounding the recalibration (January 1, 2008 to December 31, 2012), excluding the year of the recalibration in 2010. 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 that were unrated in the pre period (defined as post-recalibration rated bonds issued by municipalities with only unrated bonds in the pre 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 7: ***The Likelihood of Using Moody's or Fitch over S&P after Recalibration***

This table presents analysis on the propensity to obtain a rating from Moody's or Fitch over from 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(Fitch_Moody's = 1)		
	2009 vs 2011	**2008, 2009 vs 2011, 2012**	**2007-2009 vs 2011-2013**
Variables	**[1]**	**[2]**	**[3]**
Post	0.911***	0.558***	0.138
	[5.548]	[5.129]	[1.641]
Ln(Par1)	0.158	0.261***	0.208***
	[1.097]	[3.090]	[3.477]
Insured	0.191	0.560***	0.465***
	[0.718]	[3.019]	[3.175]
Leadfin	-0.545	-0.306	-0.428**
	[-1.376]	[-1.323]	[-2.506]
Revenue bond	0.929***	0.923***	0.778***
	[3.129]	[4.927]	[5.526]
Competitive	0.389	0.264	0.314**
	[1.296]	[1.345]	[2.221]
Post*Ln(Par)	-0.091	-0.080	-0.018
	[-0.529]	[-0.747]	[-0.224]
Post*Insured	-0.256	-0.519**	-0.535***
	[-0.801]	[-2.337]	[-2.987]
Post*Leadfin	0.479	0.397	0.602***
	[1.059]	[1.462]	[2.878]
Post*Revenue bond	-0.711*	-1.092***	-1.171***
	[-1.916]	[-4.406]	[-5.729]
Post*Competitive	-0.838**	-0.583**	-0.665***
	[-2.149]	[-2.311]	[-3.478]
Constant	-2.106***	-1.721***	-1.429***
	[-15.107]	[-18.759]	[-21.486]
Observations	1,373	2,803	4,218
Pseudo R^2	0.0408	0.0284	0.0213

Table 8: ***Changes in Rating Fees Based on Changes in Ratings***

This table presents 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).

	Dependent Variable = Relative Change in Rating Fees
Variables	
Relative Change in Rating	**1579.39****
	[2.17]
Time	2.71
	[1.22]
Constant	-2722.63
	[-0.93]
Observations	260
Adjusted R-squared	0.038

Table 9: ***Rating Fees after Recalibration: Low Loss Given Default Issuers vs. High Loss Given Default Issuers***

This table presents analysis on relative changes in ratings fees between S&P and Moody's and Fitch after recalibration and partitions the sample on low loss given default (LGD) issuers versus high loss given default (LGD) issuers. 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)					
	2009 vs 2011		2008, 2009 vs 2011, 2012		2007-2009 vs 2011-2013	
	Low LGD issuers	High LGD issuers	Low LGD issuers	High LGD issuers	Low LGD issuers	High LGD issuers
Variables	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**	**[6]**
Fitch_Moody's	-0.129***	0.003	-0.181***	0.009	-0.185***	0.006
	[-3.560]	[0.074]	[-6.614]	[0.355]	[-8.285]	[0.286]
Post*Fitch_Moody's	0.097**	0.068	0.151***	0.073**	0.171***	0.095***
	[2.267]	[1.444]	[4.482]	[2.392]	[6.444]	[3.582]
Ln(Par)	0.498***	0.411***	0.486***	0.401***	0.496***	0.431***
	[14.484]	[20.863]	[20.243]	[20.465]	[22.222]	[28.974]
Insured	0.105	-0.065	0.013	-0.132***	0.028	-0.100**
	[1.441]	[-1.328]	[0.253]	[-3.081]	[0.525]	[-2.359]
Leadfin	0.040	-0.132**	0.005	-0.082*	-0.063	-0.076**
	[0.561]	[-2.280]	[0.080]	[-1.822]	[-1.228]	[-2.071]
Revenue bond	0.571***	0.320***	0.494***	0.319***	0.511***	0.300***
	[4.594]	[3.536]	[4.621]	[4.020]	[5.452]	[4.612]
Competitive	-0.038	-0.072	-0.016	-0.103***	-0.027	-0.095***
	[-0.372]	[-1.543]	[-0.201]	[-2.864]	[-0.406]	[-3.140]
Post*Ln(Par)	0.018	-0.025	0.009	-0.013	-0.000	-0.052***
	[0.394]	[-0.940]	[0.335]	[-0.652]	[-0.009]	[-3.279]
Post*Insured	0.143	-0.049	0.109*	0.062	0.130**	0.036
	[1.608]	[-0.777]	[1.650]	[1.226]	[1.983]	[0.741]

Post*Leadfin	0.044	0.097	0.091	0.051	0.141**	0.018
	[0.634]	[1.353]	[1.565]	[1.050]	[2.424]	[0.448]
Post*Revenue bond	0.040	-0.064	0.033	-0.024	0.014	-0.017
	[0.417]	[-0.718]	[0.373]	[-0.317]	[0.174]	[-0.287]
Post*Competitive	0.001	0.059	-0.043	0.086**	-0.032	0.084***
	[0.008]	[1.102]	[-0.559]	[2.058]	[-0.447]	[2.678]
Fixed Effects	Year, Issuer Type	Year, Issuer Type	Year, Issuer Type	Year, Issuer Type	Year, Issuer Type	Year, Issuer Type
Observations	1,279	1,556	2,570	3,360	3,921	5,161
Adjusted R-squared	0.577	0.554	0.561	0.527	0.561	0.544

Internet Appendix

Table 10: *Ratings after Recalibration*

This table presents analysis on relative changes in ratings 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 = Ratings		
	2009 vs 2011	**2008, 2009 vs 2011, 2012**	**2007-2009 vs 2011-2013**
Variables	**[1]**	**[2]**	**[3]**
Fitch_Moody's	-0.863***	-0.486***	-0.314***
	[-8.034]	[-6.564]	[-4.723]
Post*Fitch_Moody's	1.024***	0.773***	0.575***
	[6.202]	[4.852]	[4.262]
Ln(Par)	0.084***	0.089***	0.083***
	[3.386]	[3.413]	[4.124]
Insured	2.222***	2.157***	2.107***
	[21.600]	[15.782]	[16.988]
Leadfin	0.528***	0.391***	0.325***
	[3.881]	[3.684]	[3.672]
Revenue bond	0.460*	0.286	0.311*
	[1.776]	[1.600]	[1.905]
Competitive	0.384**	0.337***	0.325***
	[2.542]	[3.041]	[4.206]
Post*Ln(Par)	0.035	0.073*	0.056
	[0.588]	[1.722]	[1.092]
Post*Insured	-0.470***	-0.625***	-0.721***
	[-3.273]	[-4.260]	[-6.152]

Post*Leadfin	-0.311*	-0.060	0.105
	[-1.786]	[-0.540]	[1.082]
Post*Revenue bond	-0.618***	-0.401***	-0.552***
	[-2.726]	[-2.630]	[-4.040]
Post*Competitive	-0.186	-0.057	-0.024
	[-0.883]	[-0.403]	[-0.207]
Constant			
p-value for the F-tests:			
Fitch_Moody's + Post*Fitch_Moody's = 0	0.08	0.0048	0.0014
Fixed Effects	Year, Issuer Type	Year, Issuer Type	Year, Issuer Type
Observations	4,634	9,721	14,623
Adjusted R-squared	0.479	0.513	0.556

Internet Appendix

Table 11: *Bond Yields after Recalibration*

This table presents analysis on relative changes in bond yields between S&P and Moody's and Fitch after recalibration. Bond yields are averaged across all bonds within the same bond issue. 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 = Bond yields		
	2009 vs 2011	2008, 2009 vs 2011, 2012	2007-2009 vs 2011-2013
Variables	**[1]**	**[2]**	**[3]**
Fitch_Moody's	-0.036	-0.034	-0.019
	[-0.927]	[-1.377]	[-1.150]
Post*Fitch_Moody's	-0.190***	-0.085**	-0.071**
	[-2.954]	[-2.330]	[-2.524]
Ln(Par)	0.232***	0.133***	0.106***
	[5.365]	[4.604]	[5.184]
Insured	0.041	-0.026	-0.029
	[0.476]	[-0.436]	[-0.571]
Leadfin	-0.228**	-0.172***	-0.117***
	[-2.515]	[-2.741]	[-2.703]
Revenue bond	-0.078	0.033	0.002
	[-0.694]	[0.384]	[0.038]
Competitive	-0.100	-0.159***	-0.135***
	[-1.154]	[-2.862]	[-3.640]
Post*Ln(Par)	-0.080	0.007	0.013
	[-1.405]	[0.220]	[0.509]
Post*Insured	-0.280**	-0.060	0.024
	[-2.174]	[-0.796]	[0.385]
Post*Leadfin	0.062	0.037	0.059
	[0.513]	[0.531]	[1.019]
Post*Revenue bond	-0.027	0.053	0.164*
	[-0.166]	[0.534]	[1.953]
Post*Competitive	-0.122	0.050	0.074
	[-0.955]	[0.670]	[1.340]
Fixed effects	Year, Issuer type	Year, Issuer type	Year, Issuer type
Observations	3,459	7,124	10,365
Adjusted R-squared	0.178	0.415	0.491

Internet Appendix

Table 12: *2SLS*

This table presents analysis on relative changes in ratings fees between S&P and Moody's and Fitch after recalibration using 2SLS. The dependent variable for the first stage is the difference in ratings between Moody's (Fitch) and S&P, and the dependent variable in the second stage is the difference in ratings fees between Moody's (Fitch) and S&P. The sample is the balanced panel of dual-rated Texas issues (following Table 4). 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 =	**Rating diff 2009 vs 2011**	**Fee diff 2009 vs 2011**	**Rating diff 2008, 2009 vs 2011, 2012**	**Fee diff 2008, 2009 vs 2011, 2012**	**Rating diff 2007-2009 vs 2011-2013**	**Fee diff 2007-2009 vs 2011-2013**
Variables	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**	**[6]**
Post	0.885***		0.626***		0.444***	
	[8.606]		[9.280]		[7.228]	
Predicted rating diff		0.116**		0.227***		0.412***
		[2.519]		[4.040]		[4.775]
Ln(Par)	0.030	-0.057*	0.031	0.003	0.031	-0.007
	[0.611]	[-1.740]	[0.845]	[0.149]	[1.138]	[-0.353]
Insured	-0.785***	0.067	-0.198	-0.009	0.118	-0.112**
	[-4.080]	[1.178]	[-1.331]	[-0.188]	[1.146]	[-2.157]
Leadfin	0.138	0.120	0.187	-0.066	0.411***	-0.215***
	[1.175]	[1.340]	[1.456]	[-0.927]	[3.491]	[-2.709]
Revenue bond	0.077	-0.140*	0.047	-0.023	-0.021	0.001
	[0.371]	[-1.858]	[0.231]	[-0.399]	[-0.147]	[0.017]
Compeitive	0.122	-0.037	0.255***	-0.135***	0.136*	-0.113**
	[0.899]	[-0.553]	[2.961]	[-2.808]	[1.952]	[-2.410]
Fixed effects	Issuer type	Issuer type	Issuer type	Issuer type	Issuer type	Issuer type
Observations	248	248	698	698	1,168	1,168
Adjusted R-squared	0.473		0.234		0.110	