Financing Dies in Darkness? The Impact of Newspaper Closures on Public Finance: Internet Appendix

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Appendix A. Analysis with call- and tax-adjusted yield spreads

In this section, we examine the effect of newspaper closures on call-adjusted municipal bond yields. Approximately 60% of the municipal bonds in our sample period are callable. For these bonds, the issuer has the right to repurchase the bond at a pre-specified strike price on a future date. The holder of the callable bond essentially has a long position in the straight municipal bond and a short position in the embedded call option. A callable municipal bond is priced lower than the equivalent straight municipal bond because the call option is valuable to the issuer; in other words, the yield on a callable municipal bond is higher than the yield on the straight municipal bond. The evidence in our paper indicates that newspaper closures significantly affect municipal bond yields, mainly through the government inefficiency channel. An alternative possibility is that newspaper closures generate uncertainty in the local municipal bond market, leading to higher call option values and thus higher yields for the callable municipal bonds. Thus, it is important to examine whether post-closure yield increases are being driven by this latter mechanism by adjusting yields for callable features.

We adjust the offering prices for our sample of callable municipal bonds that have not been pre-refunded by adding back the value of the embedded short call option that expires on the nearest call date. To calculate the value of the embedded call option, we use the Black (1976) model for pricing options on forward contracts, which is similar to the call adjustment in Novy-Marx and Rauh (2012). First, we calculate the forward price of the municipal bond at the first call date. This involves calculating the sum of the present value of all coupons between the offering date and first call date, subtracting this sum from the offering price, and then calculating the future value F_B of this difference on the first call date. This represents the forward price of the bond. The value of

the embedded call option C is then calculated as follows:

$$\begin{aligned} C &= e^{-r_f T} \times (F_B N(d_1) - K N(d_2)), \\ d_1 &= \frac{\ln(F_B/K) + \sigma_F^2 T/2}{\sigma_F \sqrt{T}} \\ d_2 &= d_1 - \sigma_F \sqrt{T}, \end{aligned}$$

where T is the number of years until the first call date, K is the strike price of the call option, σ_F is the volatility in forward bond prices with T years until maturity, r_f is the risk-free rate for a US Treasury bond with T years until maturity, and $N(\cdot)$ is the standard normal cumulative distribution function. Forward bond price volatility is calculated using trailing 60-day volatility in daily returns for forward contracts maturing in T years. Risk-free yields and forward bond prices are based on the off-the-run zero-coupon curve estimated in Gürkaynak, Sack, and Wright (2007).

The average call price in our sample of callable municipal bonds is about \$6.39, with a median call price of \$5.92 and a standard deviation of \$4.28. To obtain the call-adjusted offering yield, we add the call price to the offering price and then calculate the yield-to-maturity of the municipal bond using the call-adjusted offering price. The call-adjusted yield spread is then calculated by subtracting the coupon-equivalent risk-free yield, as in Longstaff, Mithal, and Neis (2005). We test the baseline regression in equation (1) of our paper using the call-adjusted offering yield spreads. The results are reported in column 1 of Table A-1. We obtain fairly similar results to the baseline regression in our main paper, with call-adjusted offering yield spreads increasing by 5.6 basis points in the postclosure period relative to the preclosure period. In column 3, we test the same regression model with call-adjusted offering yield spreads for the revenue bonds only, and we find that the spreads increase by 9.4 basis points. Overall, our evidence suggests that the increase in post-closure yields is not being driven by yield changes in the embedded call options.

Additional tests illustrate that our results are robust to adjusting municipal yield spreads for state taxes. Municipal bonds are typically exempt from federal taxes and are also typically exempt

from state taxes for state residents. US Treasury bonds, on the other hand, are exempt from federal taxes but not state taxes. To calculate tax-adjusted yield spreads, we subtract the tax-adjusted risk-free rate on the coupon-equivalent risk-free bond ($r_f \times (1 - \tau_s)$) from the offering yield on the municipal bond, where τ_s is the top marginal state tax rate. The evidence in column 2 indicates that the average tax-adjusted yield spread increases by about 5.4 basis points after a newspaper closure, which is similar to the results from our baseline regressions. In column 4, we examine postclosure tax-adjusted yields spreads for revenue bonds only and also find results that are similar to our baseline regressions, with yield spreads increasing by about 10.5 basis points. Overall, our evidence indicates that the long-run effect of newspaper closures on municipal bond yield spreads is not affected by state taxes.

Appendix B. Robustness checks for baseline results

This section provides robustness checks for the baseline results presented in the main paper. In our original analysis, we examine the effect of newspaper closures on offering yield spreads, but only consider newspaper closures in counties with more than three newspapers in the pre-closure period. In Table A-2, we report the newspaper closure effect when we impose the original three newspaper pre-closure threshold, a four newspaper pre-closure threshold, a five newspaper pre-closure threshold, and no pre-closure threshold. For each threshold, we find that the effect of a newspaper closure on offering yield spreads equals 9.5 basis points ($p = 0.000$), 5.0 basis points ($p = 0.039$), 5.3 basis points ($p = 0.015$), and 4.0 basis points ($p = 0.057$), respectively. The lower point estimates from these regressions largely corroborates our evidence in column 1 of Table 4 of the main paper showing that the newspaper closure effect is strongest in the low newspaper counties, which are the counties with three or fewer newspapers before a newspaper closure.

In the original analysis, we examine the long-run effect of newspaper closures on offering yield spreads, and we define the postclosure period as occurring at least three years after a newspaper closure. In Table A-3, we test the robustness of our baseline results to alternative definitions of the

postclosure period. Specifically, we redefine the postclosure period as occurring one to five years after the newspaper closure. When the postclosure period is defined as occurring one year after the newspaper closure, we find that the offering yield spread is approximately 6.0 basis points higher in the postclosure period relative to the preclosure period ($p = 0.004$). For the two-year, three-year, four-year, and five-year definitions, we find that the offering yield spread increases by 7.4 basis points ($p = 0.002$), 9.5 basis points ($p = 0.000$), 10.0 basis points ($p = 0.000$), and 9.6 basis points ($p = 0.001$), respectively, in the postclosure period relative to the preclosure period. Our results indicate that the newspaper closure effect on offering yields stabilizes after about three years.

Some of the newspaper closures in our sample occur because a newspaper was absorbed by another newspaper. For this type of closure, it is more likely that the set of journalists in the area covering local government issues remains mostly intact. Thus, we would expect offering yield spreads to also remain mostly unchanged. We retest the baseline offering yield regressions from columns 1 and 3 of Table 3 of the main paper with the closure indicator variable redefined so that it only equals one for newspaper closures that result from a newspaper merger. These results are reported in columns 1 and 2 of Table A-4. For these types of closures, we find that the postclosure offering yield spread increases by a statistically insignificant 3.2 basis points ($p = 0.189$) for all bonds and a statistically insignificant 5.5 basis points ($p = 0.129$) for the subset of revenue bonds. For comparison purposes, we also retest the baseline offering yield regressions from columns 1 and 3 of Table 3 of the main paper with the closure indicator variable redefined so that it only equals one for newspaper closures that were not the result of a newspaper merger. These results are reported in columns 3 and 4 of Table A-4. For these types of closures, we find that the postclosure offering yield spread increases by 8.3 basis points ($p = 0.000$) for all bonds and 12.9 basis points ($p = 0.000$) for the subset of revenue bonds. The point estimates from these two tests are larger than those reported in the baseline tests from columns 1 and 3 of Table 3, indicating that the newspaper closure effect on offering yield spreads is even stronger after removing closures that are due to newspaper mergers.

References

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Table A-1

Call- and tax-adjusted yield spreads around newspaper closures.

Municipal bond offering yields on callable bonds in columns 1 and 3 are adjusted for the embedded call option that expires on the nearest expiration date using the Black (1980) model for pricing options on futures. Municipal bond offering yield spreads in columns 2 and 4 are adjusted for state taxes (τ_s) by multiplying the coupon-equivalent risk-free yield benchmark by $(1 - \tau_s)$. Columns 1 and 2 examine all bonds and columns 3 and 4 examine revenue bonds only. Characteristic controls includes whether the bond is insured, the number of years to maturity, the inverse of the number of years to maturity, the natural log of the size of the bond, and whether the bond is general obligation (GO). County controls includes the annual county population level (in millions), average per capita income level (in thousands of dollars), the latest percent change in the population level, and the latest percent change in the employment level. Rating controls includes whether the bond is rated and, conditional on being rated, an indicator variable for each possible credit rating assigned by Moody's. Callable controls includes whether the bond is callable, and, conditional on being callable, the number of years until the first call date and the inverse of this variable. Standard errors are double-clustered by issue and year-month. t-statistics are reported below the regression coefficients. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	All bonds		Revenue bonds	
	Call-adj. yield	Tax-adj. yield	Call-adj. yield	Tax-adj. yield
	(1)	(2)	(3)	(4)
Closure	0.0528***	0.0541***	0.1067***	0.1051***
	(3.77)	(4.45)	(4.77)	(5.08)
Preclosure	-0.0029	-0.0010	0.0136	0.0112
	(-0.33)	(-0.14)	(0.94)	(0.92)
Closure - Preclosure	0.0556***	0.0551***	0.0931***	0.0940***
t-statistic	(3.40)	(3.92)	(3.58)	(4.00)
SE clustering	Issue-YM	Issue-YM	Issue-YM	Issue-YM
Fixed effects	State-Year	State-Year	State-Year	State-Year
Characteristic controls	Yes	Yes	Yes	Yes
County controls	Yes	Yes	Yes	Yes
Rating controls	Yes	Yes	Yes	Yes
Callable controls	No	Yes	No	Yes
N	348,299	348,377	172,687	172,751
R-Squared	0.565	0.635	0.588	0.638

Table A-2
The effect of newspaper closures on offering yields with different newspaper thresholds.
In columns 1, 2, and 3, we test the effect of newspaper closures on offering yields, but only for closures that occur in counties with a maximum of three, four, and five newspapers in the preclosure period, respectively. In column 4, we do not impose any newspaper threshold. Standard errors are double-clustered by issue and year-month. *t*-statistics are reported below the regression coefficients. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels.

	Newspaper threshold cutoffs			
Threshold value	Three	Four	Five	None
	(1)	(2)	(3)	(4)
Newspaper closure	0.106***	0.0689***	0.0706***	0.0645***
	(4.67)	(3.71)	(3.92)	(3.69)
Preclosure	0.0107	0.0193	0.0178	0.0243*
	(0.91)	(1.38)	(1.39)	(1.76)
Closure - Preclosure	0.0954***	0.0496**	0.0523**	0.0402*
t-statistic	(3.85)	(2.07)	(2.43)	(1.90)
SE clustering	Issue-YM	Issue-YM	Issue-YM	Issue-YM
Fixed effects	State-Year	State-Year	State-Year	State-Year
Characteristic controls	Yes	Yes	Yes	Yes
County controls	Yes	Yes	Yes	Yes
Rating controls	Yes	Yes	Yes	Yes
Callable controls	Yes	Yes	Yes	Yes
N	172,751	172,694	172,694	172,751
R-Squared	0.642	0.642	0.642	0.642

Table A-3
The effect of newspaper closures on offering yields with different closure year cutoffs.
In columns 1 to 5, we test the effect of a newspaper closure indicator variable on municipal bond offering yields, where the closure indicator variable equals one starting one to five years after a newspaper closure, respectively. Standard errors are double-clustered by issue and year-month. *t*-statistics are reported below the regression coefficients. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels.

	Postclosure event window				
	1 year	2 years	3 years	4 years	5 years
	(1)	(2)	(3)	(4)	(5)
Closure	0.0754***	0.0875***	0.106***	0.113***	0.114***
	(4.03)	(4.04)	(4.67)	(4.48)	(4.36)
Preclosure	0.0150	0.0131	0.0107	0.0132	0.0179
	(1.18)	(1.06)	(0.91)	(1.13)	(1.56)
Closure - Preclosure	0.0605***	0.0744***	0.0954***	0.1003***	0.0957***
t-statistic	(2.86)	(3.06)	(3.85)	(3.72)	(3.46)
SE clustering	Issue-YM	Issue-YM	Issue-YM	Issue-YM	Issue-YM
Fixed effects	State-Year	State-Year	State-Year	State-Year	State-Year
Characteristic controls	Yes	Yes	Yes	Yes	Yes
County controls	Yes	Yes	Yes	Yes	Yes
Rating controls	Yes	Yes	Yes	Yes	Yes
Callable controls	Yes	Yes	Yes	Yes	Yes
N	172,751	172,751	172,751	172,751	172,751
R-Squared	0.642	0.642	0.642	0.642	0.642

Table A-4

Offering yields and merger and non-merger closures.

Columns 1 and 2 examine the effect of newspaper closures on offering yields for all bonds and revenue bonds, respectively, where only newspaper closures that were the result of a newspaper merger are considered. Columns 3 and 4 examine the effect of newspaper closures on offering yields for all bonds and revenue bonds, respectively, where only newspaper closures that were not the result of a newspaper merger are considered. Standard errors are double-clustered by issue and year-month. t-statistics are reported below the regression coefficients. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels.

	Only merger closures		No-merger closures	
	All bonds	Rev. bonds	All bonds	Rev. bonds
	(1)	(2)	(3)	(4)
Newspaper closure	0.0118	0.0359	0.0836***	0.1399***
	(0.68)	(1.26)	(4.66)	(5.54)
Preclosure	-0.0205	-0.0187	0.0003	0.0110
	(-1.45)	(-0.71)	(0.04)	(0.90)
Closure - Preclosure	0.0323	0.0547	0.0833***	0.1289***
t-statistic	(1.31)	(1.52)	(4.21)	(4.49)
SE clustering	Issue-YM	Issue-YM	Issue-YM	Issue-YM
Fixed effects	State-Year	State-Year	State-Year	State-Year
Characteristic controls	Yes	Yes	Yes	Yes
County controls	Yes	Yes	Yes	Yes
Rating controls	Yes	Yes	Yes	Yes
Callable controls	Yes	Yes	Yes	Yes
N	267,252	129,265	329,402	165,756
R-Squared	0.649	0.652	0.644	0.644