Financing Dies in Darkness? The Impact of Newspaper Closures on Public Finance*

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Abstract

We examine how local newspaper closures affect public finance outcomes for local governments. Following a newspaper closure, municipal borrowing costs increase by 5 to 11 basis points, costing the municipality an additional $650 thousand per issue. This effect is causal and not driven by underlying economic conditions. The loss of government monitoring resulting from a closure is associated with higher government wages and deficits, and increased likelihoods of costly advance refundings and negotiated sales. Overall, our results indicate that local newspapers hold their governments accountable, keeping municipal borrowing costs low and ultimately saving local taxpayers money.

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"The functionaries of every government have propensities to command at will the liberty and property of their constituents. There is no safe deposit for these but with the people themselves, nor can they be safe with them without information. Where the press is free, and every man able to read, all is safe" – Thomas Jefferson (1816)

1. Introduction

Local newspapers in the United States have been steadily declining in recent years, with circulation numbers down approximately 27% from 2003 to 2014 (Pew Research Center (2017)). Accompanying this change was a 35% decline in statehouse reporters, who play an important role in gathering information about local governments and reporting it to their readers. A recent Federal Communications Commission report (Waldman (2011)) further hints at the implications of this decline in local coverage: "...in many communities, we now face a shortage of local, professional, accountability reporting. This is likely to lead to the kinds of problems that are, not surprisingly, associated with a lack of accountability–more government waste, more local corruption, less effective schools, and other serious community problems." Related academic studies in the political economy space show that geographic areas with reduced local media coverage have less informed voters and lower voter turnouts (Mondak (1996), Gentzkow, Shapiro, and Sinkinson (2011), Hayes and Lawless (2015)), removing the incentives of local politicians to work hard on behalf of their constituencies (Snyder and Strömberg (2010)).

The real effects of media coverage on finance outcomes is a burgeoning area of research (Tetlock (2015)). Recent research in corporate finance provides evidence that the monitoring provided by journalists is useful for improving corporate governance and exposing corporate fraud (Dyck, Volchkova, and Zingales (2008), Dyck, Morse, and Zingales (2010)). Even the threat of media exposure helps to keep corporate entities in check. Additional research in asset pricing has shown that a lack of media coverage is associated with higher informational frictions and expected returns in the cross section of equities (Peress (2014), Fang and Peress (2009)). However, it still remains an

open question whether shocks to media coverage affect public finance outcomes in the long run. If a negative coverage shock such as a newspaper closure leads to increased government inefficiencies and informational frictions, then potential municipal lenders will likely demand higher yields to compensate for these effects. On the other hand, if there is high degree of substitutability between the affected media outlet and alternative, unaffected outlets, then there should be no effect on local financial markets in the long run. This effect could even be positive if these alternative sources of news provide more accurate and timelier information to their readers.

We empirically examine how shocks to local media coverage affect long-run public borrowing costs. The municipal bond market provides an ideal setting for our study because the individual bonds are largely bought and sold by local investors, providing a more direct link between local media shocks and securities prices. We use local newspaper closures as a proxy for local media shocks, as they effectively cause large, discrete changes in local media coverage. Our main finding is that newspaper closures have a significantly adverse impact on municipal borrowing costs in the long run. Specifically, following the three year period after a newspaper closure, municipal bond offering yields increase by 5.5 basis points, while yields in the secondary market increase by 6.4 basis points; these results are significant at the 1% level. Further, these results are robust to a comparison of yields between affected and unaffected counties in the pre-closure period. The effect of newspaper closures on revenue bonds, which are backed by cash flows generated by specific projects and more subject to misappropriation, is even stronger, with offering and secondary yields increasing by 10.6 and 9.9 basis points. In dollar terms, an additional 10 basis points increases the cost of an average issue by about $650 thousand.[1] Taken together, our evidence suggests that there is not a sufficient degree of substitutability between local newspapers and alternative information intermediaries for evaluating the quality of public projects and local governments.

A potential concern is that both municipal borrowing costs and newspaper closures are being driven by underlying economic conditions in the region. We address this concern in several ways.

[1]The average issue size and duration are about $65 million and 10 years in our sample. The $650 thousand estimate is obtained by multiplying $65 million by 10 basis points, and then by the average duration of 10 years.

Our first strategy involves examining the differential effect of a newspaper closure on borrowing costs in the county which contained that newspaper and a population-matched neighboring county with its own newspaper operation. Declining economic conditions in the region are likely to affect both counties. If a newspaper closure truly affects local borrowing costs, then we would expect a newspaper closure to affect borrowing costs in the closure county but not the matched control county. Consistent with this hypothesis, we find that the differential effect of a newspaper closure on offering yields in the closure county versus the matched control county is 7.3 basis points ($p = 0.012$). Corroborating this evidence, we also find that newspaper closures are evenly dispersed across states with different economic conditions and across our sample period, which includes both economic expansion and contraction periods.

Our second identification strategy involves examining newspaper closures in counties with a low number of newspapers versus counties with a high number of newspapers. The latter counties are unlikely to be significantly affected by a newspaper closure since there are still plenty of local newspapers in place to cover local issues. This is unlike counties with a low number of newspapers, which are typically left with only one or even zero newspapers following a newspaper closure. If newspaper closures were driven by underlying economic conditions, then we would observe similar yield increases in the low newspaper and high newspaper counties. However, our evidence indicates that a newspaper closure in a low newspaper county increases offering yields by 10.3 basis points, while a newspaper closure in a high newspaper county has no significant effect on offering yields, for a relative yield difference of 11.8 basis points ($p = 0.000$).

Our third identification strategy uses the expansion of Craigslist across the United States as an instrument for newspaper closures. Craigslist is an online database of classified advertisements which currently has over 60 million global users, and research has shown that advertising revenues for local newspapers were negatively affected by its expansion (Gurun and Butler (2012), Kroft and Pope (2014), Seamans and Zhu (2014), Gurun, Matvos, and Seru (2016)). The gradual rollout of Craigslist in the United States is useful for our purposes because its introduction to a

geographic area comprises a plausibly exogenous shock to the probability of a newspaper closure without directly affecting local municipal bond yields. We examine the effect of newspaper closures on municipal bond yields and use Craigslist entry as an instrument for newspaper closures. In the first stage regression, we find that Craigslist entry increases the probability of a newspaper closure by about 10 percentage points, which is consistent with the existing evidence showing that Craiglist negatively affected local newspaper advertising revenues. Importantly, in the second stage regression, we find that Craigslist-induced newspaper closures increase municipal bond yields by four to six basis points, further establishing a causal connection between newspaper closures and municipal borrowing costs.

Differences in state characteristics provide additional insight into the relationship between newspaper closures and public finance outcomes. Campante and Do (2014) show that the relative distance between a state's economic and political centers is a useful measure of the quality of public governance in that state, with longer distances being associated with lower quality governance. The marginal effect of external monitoring on governance quality is likely to be stronger in states with low quality governance. Thus, we hypothesize that the effect of a newspaper closure on borrowing costs will be higher in high isolation states compared to low isolation states. Consistent with this hypothesis, we find that a newspaper closure increases yields by 12.3 basis points in high isolation states and 5.5 basis points in low isolation states, for a difference of 6.8 basis points ($p = 0.027$). Newspaper closures have a significant effect on offering yields for both state types, but this effect is more than twice as strong in the low isolation states. This indicates that local newspapers are especially important in states that already have low quality governance.

Newspaper closures lead to higher borrowing costs in the long run, suggesting that alternative sources of media, such as the internet, are not acting as sufficient substitutes for these local newspapers. We test this latter assertion more directly by examining the effect of newspaper closures on public borrowing costs in states with high versus low internet usage, which we classify using internet usage data from the National Telecommunications & Information Administration (NTIA).

If the internet acts as a good substitute for local newspapers, then we should observe little-to-no effect in the high internet usage states. However, we find that the effect of a newspaper closure on offering yields is not significantly different across these two state types, further suggesting that online sources do not act as a perfect substitute for local newspapers, at least for our sample period.

There are two primary mechanisms through which newspaper closures affect municipal bond yields. The first mechanism relates to the increased government inefficiencies that result from the loss of a government watchdog after a newspaper closure, which is consistent with prior evidence showing that media monitoring improves corporate governance outcomes (Dyck et al. (2008), Dyck et al. (2010)). Government inefficiencies are costly and thus associated with greater default risk, an important determinant of municipal bond yields (Wang, Wu, and Zhang (2008), Schwert (2017)). The second mechanism relates to the increased informational frictions that result from a lack of press coverage (Peress (2014), Fang and Peress (2009)). Informational frictions are associated with lower liquidity (Kyle (1985), Glosten and Milgrom (1985)), and lenders demand higher yields to compensate for this effect (Ang, Bhansali, and Xing (2014)). First, we test the validity of the government inefficiency mechanism. We find that advance refundings of callable bonds, which Ang, Green, Longstaff, and Xing (2017) show are almost always negative net present value transactions, are more likely following a newspaper closure. The same holds true for the negotiated sales of municipal bond issuances (as opposed to competitive sales), which are generally associated with higher transaction costs (Robbins (2002)). We also directly examine the effect of newspaper closures on the following government efficiency metrics: the ratio of total county government employee wages to total county employee wages, the number of government employees per capita, tax revenue per capita, and county deficit per capita, where county deficit is calculated as the difference between total county government expenses and tax revenues. We find that a newspaper closure leads to a 1.3 percentage point increase in the government wage ratio. For the median county, this represents a total government wage increase of $1.4 million. Similarly, we find that the number of government employees increases by about four people per 1,000 residents, tax revenue per capita

increases by about $85, and the county deficit per capita increases by about $53. Collectively, this evidence suggests that newspaper closures lead to increased government inefficiencies. Finally, we test the informational friction mechanism by examining post-closure liquidity in the municipal bond secondary market. We find that the price dispersion metric from Jankowitsch, Nashikkar, and Subrahmanyam (2011), which is useful for measuring informational inefficiencies in over-the-counter markets, significantly increases by about 5% after a newspaper closure. This suggests that informational frictions also play a role in determining post-closure municipal bond yields.

Our paper is related and contributes to the literature on the governance or "watchdog" role of the media - particularly the local news media - and finance. Dyck et al. (2010) emphasize the governance role of media, acting as a whistleblower for fraudulent activities. However, some authors point out the limitations of news media. Gurun and Butler (2012) illustrate that local media outlets can be captured or compromised because of advertisement revenues generated by local businesses. Shapira and Zingales (2017) present anecdotal evidence that the local news media was reluctant to antagonize DuPont, an industrials firm that was easily the largest employer in the area. The local media downplayed and suppressed news about a DuPont-related environmental disaster caused by emissions of a toxic chemical named C8. In this case, the media had a mostly ineffective external governance role. In our context, the local news media has an important and uncompromised external governance role, as media capture by the local government, which is typically not an important source of revenue for the municipality, is unlikely. This is important because local newspapers continue to play a crucial role in informing local residents. Based on survey evidence, the Pew Research Center concludes the following in a research report: "Among all adults, newspapers were cited as the most relied upon source or tied for most relied upon for crime, taxes, local government activities, schools, local politics, local jobs, community/neighborhood events, arts events, zoning information, local social services, and real estate/housing. This dependence on newspapers for so many local topics sets it apart from all other sources of local news. The internet, which was cited as the most relied upon source for five of the 16 topics, was a distant second to newspapers in terms of

widespread use and value" (Pew Charitable Trusts (2011)). As a consequence, the closure of a local newspaper creates a local information vacuum. Moreover, it is unlikely that such a vacuum can be easily filled by other sources of media. First, local issues are not topical enough for the national news media, which faces a much broader audience. Second, non-traditional media outlets, which are primarily online, have not sufficiently filled the investigative journalism gap that has resulted from newspaper closures (Waldman (2011)). Instead, these non-traditional outlets have primarily been in the business of content dissemination rather than the production of new information.

Our paper is also closely related to the literature that explores local news media and political economy. Mondak (1996) and Gentzkow et al. (2011) examine the impact of media coverage on political elections and show that newspaper closures are associated with less informed voters and lower voter turnouts. Snyder and Strömberg (2010) show that governments become less efficient when a newspaper is no longer there to monitor the government operations. This literature was fundamental for our empirical design, as we similarly explore how newspaper closures affect real outcomes. Importantly, we focus on the effect of newspaper closures on public finance outcomes, which has never been explored, to the best of our knowledge. This strand of literature also provides us with a plausible political economy foundation for developing our hypotheses of how public finance might be influenced by the loss of monitoring that results from local newspaper closures.

The rest of this paper is organized as follows. Section 2 provides theoretical background and motivating anecdotal evidence for the empirical analysis. Section 3 describes the data used in this study. Section 4 presents summary statistics about newspaper closures and municipal bond characteristics and provides preliminary, univariate tests of municipal bond yields around newspaper closures. Section 5 presents our baseline results showing the effect of newspaper closures on municipal bond yields in a multivariate setting, and also includes several identification tests that support these baseline results by ruling out alternative explanations. Section 6 explores the mechanisms through which newspaper closures may be affecting municipal bond yields, specifically government inefficiencies and informational frictions. Finally, Section 7 concludes.

2. Theory and Anecdotal Evidence

Prat and Strömberg (2013) provide a useful review of the political economy literature on the influence of media on politics and policy. In Section 5 of their review, they develop a theoretical model which illustrates the effect of media on political accountability and public policy. In particular, they assume that there is an incumbent politician who allocates his budget across a set of public goods and keeps any residual funds for himself. Informed and uninformed voters choose to vote for the incumbent or a challenger, who keeps the residual funds if she wins. In a pure strategy equilibrium, the incumbent chooses a public good allocation that is directly related to his budget level and the share of informed voters. An implication of this equilibrium, according to Proposition 3 of Prat and Strömberg (2013), is that an increase in the share of media users or the amount of media coverage on a specific issue leads to an increase in the budget allocation and expected competence of politicians for that issue. This is highly relevant to our study, as a newspaper closure represents a structural shift in the distribution of local media coverage which should, in theory, lead to reduced government efficiency in the post-closure equilibrium. From a public finance perspective, a newspaper closure should lead to worsened municipal borrowing outcomes since it is riskier to lend to inefficient local governments, all else being equal. This reasoning forms the basis of our empirical tests of how newspaper closures affect public borrowing costs in the long run.

Anecdotal evidence of newspaper closures in the United States suggests that long-run public finance outcomes deteriorate following a newspaper closure. First, consider the *Rocky Mountain News*, a newspaper operating out of Denver, Colorado with a circulation of approximately 250,000 subscribers. Declining circulation numbers and advertising revenues led the newspaper to close in 2009. A search of *Rocky Mountain News* articles suggests that they provided valuable coverage of local government issues, including an audit of questionable federal funds that were allocated to the local sheriff's department, a handshake deal between the city government and Lufthansa Airlines which may have violated federal law, the lack of oversight for the 390 "special taxing districts" established in the Denver metropolitan area, and an "under the table" scheme at the

Denver International Airport in which employees were being paid for undeserved wages. These examples suggest that the *Rocky Mountain News* was an important monitoring agent for the local government, providing information to local residents about how their tax dollars were being spent. Following the newspaper closure, the average (median) yield spread for newly issued local municipal bonds increased by 37.1 (5.3) basis points, despite the continued positive growth in population and per capita income in the area. We emphasize the latter point to illustrate that newspaper closures are not necessarily driven by local economic conditions.

A second example is *The Cincinnati Post*, a newspaper with a circulation of approximately 25,000 subscribers that serviced the Cincinnati area and nearby suburbs of Kentucky. This newspaper closed in 2007 due to declining circulation numbers and the conclusion of a 30-year joint operating agreement formed in 1977 between *The Cincinnati Post* and *The Cincinnati Enquirer* (Schulhofer-Wohl and Garrido (2009)). *The Cincinnati Post* provided important coverage of the city government, reporting about the altering of internal audits of city workers by a city manager, a lawsuit alleging that the city conspired with local churches to evict low income families to redevelop apartment buildings into condominiums, and the formation of a pension task force to refine the budgeting of annual retiree healthcare costs. Like the *Rocky Mountain News*, it is clear that the newspaper played an important government watchdog role. Schulhofer-Wohl and Garrido (2009) examine the closure of *The Cincinnati Post* in detail and show that voter turnout and campaign spending significantly declined following the closure in regions that were the most reliant on this newspaper. Importantly, we find that the average (median) yield spread for newly issued, local municipal bonds increased by about 66.1 (64.5) basis points following the closure, further suggesting that newspaper closures have negative implications for public finance outcomes.

The loss or absence of a local newspaper in a particular county can also have serious consequences for government efficiency outcomes. Consider the case of Bell, California, a suburb of the city of Los Angeles with a population of about 37,000 people and a median annual household income of about $30,000. According to a 2011 Federal Communications Commission (FCC) report (Waldman

(2011)), residents of Bell "wondered for a long time how their town officials managed to live like the rich and famous." One prominent example was Robert Rizzo, the Bell town manager hired in 1993 who owned a beachfront mansion and a 10-acre horse ranch outside Seattle. In July 2010, reporters from the Los Angeles Times conducted an investigation of Bell government employee salaries and found that Rizzo was earning $787,637 per year, up from his initial starting salary of $72,000 per year in 1993, as a result of large and regular annual raises. The police chief of Bell, meanwhile, was earning $457,000 per year, 50% more than the police chief of Los Angeles. Two months following this investigation, the district attorney of Los Angeles County filed charges against eight Bell officials, alleging that they stole $5.5 million in public funds. The FCC report suggests that the corruption in Bell, California went unchecked for such a long time because of a lack of local newspaper coverage. Community activist Christina Garcia stated that "a lot of residents tried to get the media's attention, but it was impossible. The city of Bell doesn't even have a local paper; no local media of any sort." Although the city did have a local newspaper called the *Bell, Maywood, Cudahy Community News*, this newspaper shut down in the late 1990s. The FCC report also adds that the closest television stations, located in Los Angeles, rarely covered Bell. Further, the staffs at the major newspapers in Los Angeles were already spread so thin that they could barely provide coverage to surrounding municipalities like Bell. Terry Francke, founder of Californians Aware, a nonprofit organization which advocates for open governments, summed up the problem thusly: " . . . the Bell spectacle is what happens to communities without their own old-fashioned diligent news coverage by veteran newspaper reporters, or at least smart reporters led by veteran newspaper editors. The result need not be on paper, but it must be done with the community memory and professional savvy almost unique to newspaper-trained journalists with experience watching small-town politics" (Waldman (2011)).

A simple textual analysis of newspaper articles from 1996 to 2015 that were published in now-defunct newspapers illustrates that these newspapers provided significant coverage of government issues. We collect text information from articles that appeared in these newspapers in the years

leading up to their closures using the NewsBank database, which contains tens of millions of news and information articles from state, local, and regional newspapers worldwide. Compared to other familiar newspaper databases such as Factiva, NewsBank's coverage of local newspapers is more comprehensive, although the database still does not cover all local newspapers. We identify all newspaper articles in this sample of newspapers that contain either of the following keyword combinations: "government and budget," "city council and budget," or "mayor and budget." Figure 1 plots the cross-sectional average number of these government articles that previously appeared in a closed newspaper from $t = -5$ to $t = 0$, where t represents the year relative to the newspaper closure. For comparison purposes, we also plot in the same figure the cross-sectional average number of articles containing the keyword "football" by year. The first takeaway from this figure is that coverage of local governments is fairly substantial, with an average of about 150 articles per year from $t = -5$ to $t = -2$. This represents one-fifth of the average number of articles during the same period that covered football (about 750), a popular topic that is commonly covered by most newspapers. The second takeaway is that there is a significant decline in coverage from these newspapers that begins about one year before a newspaper closure, with an average of 130 government articles per year at $t = -1$ and 80 government articles per year at $t = 0$. We find a similar proportional decrease in football articles during these years, suggesting that the resources allocated to government coverage relative to football coverage remained about the same over time.

3. Data

We collect U.S. daily newspaper data from 1996 to 2015 using two data sources. The first source is the United States Newspaper Panel, constructed by Gentzkow et al. (2011). This database includes information on U.S. daily newspapers for every four years from 1872 to 2004. We collect information for the years 1996, 2000, and 2004 from this panel data. The information for the remaining years from 1996 to 2015 is hand-collected from the Editor and Publisher Yearbook, an annually published directory of U.S. newspapers. The combined data set contains the name, city,

and state of every daily newspaper in each year from 1996 to 2015. Following Gentzkow et al. (2011), we match newspapers to counties based on the cities in which they are located. We use the 2010 U.S. Census county definition to find the county in which a city resides.[2] If a newspaper is located on the border of two counties, we match the newspaper to both counties. This matching yields 1,596 newspapers serving 1,266 counties at some point between 1996 and 2015. We exclude counties which have never had a newspaper in our sample period from our analysis, as these no-newspaper counties tend to be small and very sparsely populated.

A newspaper drops out of our data mainly for one of three reasons: (1) the newspaper was closed or absorbed by another newspaper (68 cases); (2) the newspaper turned non-daily, in that it publishes fewer than four days a week (152 cases); or (3) the newspaper was merged with another newspaper to form a new newspaper (59 cases). An additional 17 exits are attributed to other or unidentified reasons. In total, we observe 296 newspaper exits from 1996 to 2015. We do not analyze newspaper openings in our study because they are fairly infrequent during the sample period. Similar to Gentzkow et al. (2011), we identify the counties that experience a newspaper closure by calculating the annual change in the total number of newspapers for each county. A newspaper closure, our key event, occurs in a county in year t if the number of newspapers in the county decreases to two or fewer from year t to $t+1$. In our baseline tests, we do not focus on closures in which a county still has three or more newspapers, as the press coverage in that county is still significant. That is, our main focus will be on newspaper closures in which the county was left with two or fewer newspapers following the closure, resulting in a duopoly newspaper environment, at best. Studies have shown that competition among newspapers is important for competitive local politics (Schulhofer-Wohl and Garrido (2009)) and ideological diversity (Gentzkow, Shapiro, and Sinkinson (2014)). Therefore, we expect that counties where a newspaper closure results in two or fewer newspapers will also suffer from a decline in press coverage following the newspaper closure,

[2]Independent cities are considered as county equivalents by the U.S. Census Bureau. If an independent city serves as the county seat of an adjacent county, we consider the independent city and its adjacent county as one combined county equivalent. Otherwise, an independent city is considered as a county equivalent in itself.

despite still having their own local newspapers. We should also note that our results remain robust if we focus only on newspaper closures in which there are one or zero newspapers remaining after the closure.

We construct monthly U.S. municipal bond data from 1999 to 2015 using several data sources. Municipal bond transaction-level prices and yields are provided by the Municipal Securities Rulemaking Board (MSRB). The data consist of all intraday broker-dealer municipal bond trades for the period 1999 to 2015. Each observation includes the bond price, yield, par value traded, and whether the trade was a customer purchase from a broker-dealer, customer sale to a broker-dealer, or an interdealer trade. We study municipal bond secondary yields around newspaper closures at the monthly level. To convert the MSRB database to a monthly frequency, we take the average secondary yield of all customer buy transactions within each bond-month, weighted by the par value traded. The offering yield and attributes of each bond are collected from the Mergent Municipal Bond Securities Database. The attributes of individual bonds include the state of issuance, issue series, issuance date, type of issue sale (negotiated versus competitive), maturity date, coupon rate, bond size, as well as bond ratings from Moody's and Standard & Poor's (if the bond is rated). The Mergent database also provides information about whether the bond is general obligation, insured, and callable. We collect the county location of municipal issuers from Bloomberg and match bonds to counties based on the locations of the issuers. We also gather the type of municipal issuers from the Electronic Municipal Market Access (EMMA) system, which is operated by MSRB, to classify issuers into state governments and local governments.

We exclude municipal bonds with fewer than ten transactions in our sample period, a maturity of more than one hundred years, or a variable coupon rate. We also exclude bonds that are subject to federal taxes. We only include bonds that are issued in U.S. states, and thus not those issued in U.S. territories, as our newspaper database does not cover newspapers published in U.S. territories. To mitigate the effect of outliers, we exclude any transactions from the MSRB database that have non-positive yields or yields greater than 50 percentage points. We also exclude state-issued bonds

from our main analysis, as our study applies to local governments within a county.

4. Summary Statistics

According to the 2010 U.S. Census county definition, there are 3,129 counties in the U.S. In our sample period from 1996 to 2015, there are 1,596 newspapers serving 1,266 counties at some point. The remaining 1,863 counties do not have a daily newspaper operation located in that county in any year. There are 296 newspaper exits and 81 newspaper entries over the 20 years, resulting in 204 counties that experience a net decrease in the number of newspapers to fewer than three during our sample period. We call these 204 counties "Closure" counties. We call the remaining 1,062 counties that do not see a decline in their number of newspapers "No-Closure" counties.

Figure 2 displays the number of newspaper exits in each year of our sample period and illustrates that newspaper exits are evenly spread throughout the sample years. While the number of exits appears to increase toward the end of our sample period, we also observe a sizable number of exits in the early part of the sample. In addition, it appears that newspaper exits are evenly distributed across both economic recession and expansion periods. The recession years in our sample period are 2001 and 2007 through 2009; this represents 20% (4/20) of the years in our sample. There are 69 newspaper exits during these recession years, which represents about 23% of the total number of exits between 1996 and 2015. This is comparable to the proportion of recession years (20%) in the sample. Overall, this figure suggests that newspaper closures are not necessarily driven by economic conditions in the time series.

The newspaper closures in our sample also appear to be evenly distributed across geographic regions. Figure 3 provides a map of the United States indicating the counties that experience a newspaper closure. Newspaper closures do not appear to be clustered in a particular region; rather, they appear to occur in almost all of the states. States with higher populations tend to have more newspapers, which is why we generally observe more newspaper closures in those states. Texas, California, and New York, for example, experience 19, 12, and 8 newspaper closures, respectively.

Yet, we observe a sizable number of newspaper closures in states with lower population levels as well. Oklahoma, Missouri, and Colorado, for example, experience 12, 10, and 6 newspaper closures, respectively. Lastly, the political orientation of a state also does not seem to affect the incidences of newspaper closures, in that newspaper closures tend to occur in both Democratic and Republican states. This figure suggests that newspaper closures are not necessarily driven by the underlying economic conditions in the state cross-section.

Panel A of Table 1 presents summary statistics for the municipal bonds issued in the 204 counties that experience a newspaper closure ("Closure" counties) in our sample period. There are 92,397 bonds in Closure counties, which represent 4,516 issues. These bonds have an average bond size of $4.68 million, issue size of $63.67 million, and maturity of 13.2 years. Fifty-two percent of these bonds are insured. Eighty-eight percent of these bonds are classified as investment grade and 12% are unrated. Fifty percent of these bonds are general obligation, in that they are backed by the tax revenue of the issuing municipality. Finally, 61% of these bonds are callable.

For comparison purposes, Panel A of Table 1 also provides summary statistics for the municipal bonds issued in the 1,062 counties that have newspapers but do not experience a newspaper closure ("No-Closure" counties). There are 257,112 bonds in No-Closure counties, which represents 15,262 issues. These bonds have an average bond size of $4.8 million, issue size of $69.79 million, and maturity of 13.02 years. About 55.26% of No-Closure county bonds are insured. Eighty-eight percent of these bonds are classified as investment grade and 11% are unrated. Fifty-one percent of these bonds are general obligation and 61% of these bonds are callable. Overall, we find that the characteristics of bonds issued in Closure counties are similar to those issued in No-Closure counties, indicating that different bond types are not self-selecting into Closure or No-Closure counties.

The focus of this paper is on the long-run effect of newspaper closures on municipal finances, particularly municipal bond yields. As a preliminary univariate test, we divide bonds from Closure counties into those issued at least three years following a newspaper closure and those issued before that. Panel B of Table 1 reports offering yield summary statistics for bonds issued in

Closure counties during the pre-closure and post-closure periods. This panel also reports summary statistics for a control group of bonds in No-Closure counties, matched by state and year to the sample of bonds issued in Closure counties. Bonds issued in Closure counties during the pre-closure period have a slightly lower average offering yield than the bonds in the matched control group. Specifically, we find that the average offering yield for bonds issued in Closure counties during the pre-closure period is 4.047%, which is 1.5 basis points lower than the average offering yield from the matched control group (4.062%). In the post-closure period, we find that the average offering yield for bonds issued in Closure counties is 3.556%, which is 3.0 basis points *higher* than the average offering yield for the matched control group (3.526%).[3] The difference in offering yields in the post-closure period compared to the difference in the pre-closure period is 4.5 basis points, and this is significant at the 1% level. These preliminary results indicate that newspaper closures have a significant effect on long-run municipal bond yields compared to other bonds issued in the same state and year.

Panel B of Table 1 also reports summary statistics for the yield spread between a municipal bond and a coupon-equivalent risk-free bond in Closure counties and the matched control counties.[4] We obtain similar results to our univariate tests above for the offering yield. In particular, we find that the average offering yield spread for bonds issued in Closure counties during the pre-closure period is -0.264%. This is 1.9 basis points lower than the average yield spread for the matched control group. In the post-closure period, however, we find that the average offering yield spread for bonds issued in Closure counties is 3.6 basis points higher that the average for bond issued in matched control counties. In this case, the difference in offering yield spreads in the post-closure

[3]For both groups, the offering yields are about 0.5 percentage points lower because of a general downward trend in interest rates in our sample. In our main multivariate regression tests later in the paper, we will control for year fixed effects.

[4]We calculate the yield on the coupon-equivalent risk-free bond as follows. For each municipal bond, we calculate the present value of its coupon payments and face value using the U.S. Treasury yield curve, which is based on the zero-coupon yield curve estimated in Gürkaynak, Sack, and Wright (2007). This gives us the price of the coupon-equivalent risk-free bond. The risk-free yield-to-maturity is then calculated using this price, the coupon payments, and the face value payment. The yield spread is calculated as the difference between the municipal bond yield and the risk-free yield-to-maturity. This is similar to the yield spread calculation in Longstaff, Mithal, and Neis (2005).

period compared to the pre-closure period is 5.5 basis points, which is significant at the 1% level. Overall, the results in Panel B of Table 1 indicate that offering yields generally increase following a newspaper closure.

One might wonder if the difference in average offering yields between Closure and No-Closure counties is being driven by other differences between these counties such as local economic conditions. Table 2 provides county-level summary statistics for the Closure and No-Closure counties.[5] The average annual income per capita for Closure counties is $35,210, compared to $33,440 for No-Closure counties. Closure counties have a median population of 76,630, which is only slightly higher than the median population of 70,540 for No-Closure counties. Overall, these results indicate that there are minimal differences between these counties. This table also reports the average annual growth rates in population, employment, and total wages for Closure and No-Closure counties during our sample period. Closure counties have an average annual population growth of 0.67%, employment growth of 0.75%, and total wage growth of 1.94%, while No-Closure counties have an average annual population growth of 0.60%, employment growth of 0.59%, and total wage growth of 1.61%. The growth rates for Closure and No-Closure counties are fairly comparable, suggesting that newspaper closures are not strongly associated with deteriorating economic conditions during our sample period.

5. Newspaper Closures and Public Finance Outcomes

5.1. Baseline Results

We hypothesize that local newspaper closures negatively affect public finance outcomes in the long run. Our baseline tests focus on the effect of newspaper closures on local municipal borrowing costs. Define y_{ijt} as the municipal bond yield spread (measured in percentage points) for bond i in county j during year-month t. As before, the municipal bond yield spread is calculated as the

[5] Annual and population and per capita income data are collected from the U.S. Bureau of Economic Analysis, and annual employment and wage data are collected from the U.S. Bureau of Labor Statistics.

difference between the municipal bond yield and the yield on an equivalent risk-free bond. Further, define $Closure_{jt}$ as an indicator variable that equals one if t occurs at least three years after a newspaper closure in county j, and zero otherwise. We only focus on closures in counties that had three or fewer newspapers before the closure, as any county with a large number of newspapers is unlikely to be significantly affected by a single newspaper closure. With our key dependent and independent variables defined, we test the following ordinary least squares (OLS) regression model:

$$y_{ijt} = \beta_1 \cdot Closure_{jt} + \beta_2 \cdot PreClosure_{jt} + \gamma' X_{it} + \phi' Z_{jt} + \delta_{sy} + \varepsilon_{ijt}. \quad (1)$$

In this setup, we include an indicator variable ($PreClosure$) that equals one for any closure county that has not yet experienced a newspaper closure to control for potential yield differences between Closure and No-Closure counties in the pre-closure period. If a newspaper closure leads to higher local borrowing costs in the long-run, then we would expect $\beta_1 - \beta_2$ to be positive and statistically significant. We also include a set of control variables that are known to affect municipal bond yield spreads. X is a vector of bond characteristic control variables that includes the following: (1) the number of years until maturity and the inverse number of years until maturity; (2) the natural log of the issuance size of the bond; (3) indicator variables for whether the bond is general obligation and insured; (4) indicator variables for whether the bond has a credit rating and each possible credit rating; (5) an indicator variable for 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. These are standard control variables used in other studies of municipal bond yields such as Butler, Fauver, and Mortal (2009), Bergstresser, Cohen, and Shenai (2013), and Schultz (2013). Z is a vector of county characteristic control variables that is meant to control for local economic conditions and includes the following: (1) the county population level; (2) the per capita income level; (3) the percentage change in the annual population level; and (4) the percentage change in the annual employment level. δ_{sy} denotes state-year fixed effects and standard errors are double-clustered by bond issue and year-month. The inclusion of state-year fixed effects implies that the $Closure$

indicator variable captures the effect of a newspaper closure in that county compared to other counties that experienced no newspaper closures within the same state and year.

The results of the regression model in equation (1) are reported in Table 3. In column (1), we analyze the effect of newspaper closures on municipal bond offering yields, which is advantageous because offering yields directly represent the effective interest rates on the bonds at the time of issuance and are less subject to the illiquidity biases that pervade the secondary municipal bond market (Harris and Piwowar (2006)). According to this regression, a newspaper closure increases the average municipal bond offering yield spread for bonds issued in that county by 5.5 basis points. Relative to the pre-closure yield difference (β_2), the average yield spread increases by 5.7 basis points following a newspaper closure ($0.0549 - (-0.0017)$). These coefficients are both statistically and economically significant. To put the latter number in context, consider the average credit spread between Ba1-rated and Aaa-rated municipal bonds, which equals 42.2 basis points for our sample of municipal bonds. This implies that the average yield increase following a newspaper closure represents $5.7/42.2 = 13.5\%$ of the default spread. Thus, a newspaper closure leads to a significant increase in risk for municipal bonds issued in that county. Column (2) reports the results for secondary yields. In this case, we find that a closure increases the average secondary yield spread by 6.4 basis points, which is comparable to our results for offering yields. Overall, our results indicate that long-run municipal borrowing costs are higher following a newspaper closure.

Revenue bonds are commonly issued to finance local projects such as schools and hospitals, and are backed by the revenues generated by those projects. General obligation bonds, on the other hand, are typically used to finance public works projects such as roadways and parks, and are backed by local taxes and fees. Revenue bonds are rarely regulated by the state government and should be subject to greater scrutiny because of the free cash flows that these projects generate. A local newspaper provides an ideal monitoring agent for these revenue-generating projects, as mismanaged projects can be exposed by investigative reporters employed by the local newspaper. When a newspaper closes, this monitoring mechanism also ceases to exist, leading to a greater risk

that the cash flows generated by these projects will be mismanaged. Thus, we hypothesize that the adverse effect of a newspaper closure on borrowing costs will be even greater for revenue bonds. For similar reasons, we also focus on revenue bonds in our future tests of newspaper closures and municipal finance outcomes. In columns (3) and (4) of Table 3, we analyze the effect of newspaper closures on offering yields and secondary yields, respectively, for revenue bonds only. Consistent with our hypothesis, we find that the effect of a newspaper closure on municipal bond yields is more pronounced for this subset of bonds. In particular, we find that, following a closure, the average offering and secondary yields increase by 10.6 basis points and 9.9 basis points, respectively. These results are also highly robust to difference-in-differences tests that compare the post-closure and pre-closure yield differences, with statistically significant coefficients of 9.5 basis points and 11.6 basis points. Overall, this evidence indicates that the loss of monitoring due to a newspaper closure is especially detrimental to revenue-generating local projects.[6]

The bond characteristic control variables (X) in the regressions reported in Table 3 provide further insight into the drivers of municipal bond yields. Yields are lower for bonds that are insured, which is consistent with the evidence in Nanda and Singh (2004) showing that insurance adds value for the issuer. This is because the insurer essentially becomes an issuer of a tax-exempt security in the event of default, allowing them to provide lower prices on the insurance they sell to municipal bond issuers. In addition, fixed income investors are typically more risk-averse and thus willing to pay more for bonds that come with a third-party guarantee. We find that bonds with longer times to maturity have higher yields, as these bonds are subject to greater interest rate and inflation risk. Larger-sized bonds have lower yields on the secondary market, which is likely because these bonds tend to be more frequently traded, and thus are more liquid. However, we also find that larger-sized bonds have slightly higher yields at issuance, which likely reflects the

[6]In the Internet Appendix, we calculate call-adjusted yield spreads for the callable bonds in our sample using the Black (1976) model for pricing options on futures. This is similar to the municipal bond call adjustment in Novy-Marx and Rauh (2012). Our baseline results from Table 3 are similar if we analyze call-adjusted yield spreads around newspaper closures. In the same appendix, we also adjust yield spreads for the top marginal state tax rate and obtain similar results.

difficulty associated with raising large amounts of cash all at once. We find that unrated bonds have higher yields, reflecting the lack of credit risk information associated with the bond, and bonds with higher credit ratings have lower yields, reflecting their lower credit risks. The fact that newspaper closures have a significant effect on yields, even after controlling for credit ratings, also suggests that newspapers provide incremental information about municipal projects that is not always provided by the credit rating agencies. We find that callable bonds generally have higher yields, which reflects the risk that the issuer will call the bond when interest rates are low. Finally, we find that general obligation bonds have lower yields, as they are generally thought of as safer because they are backed by the tax base of the municipality instead of revenues generated by a single project.

The county characteristic control variables (Z) provide additional information about systematic determinants of municipal bond yields. Bonds issued in counties with higher populations tend to have lower yields, as higher populations tend to provide a good indication of the economic health of that area and a broader tax base. Bonds issued in counties with higher average per capita income levels also have lower yields for similar reasons. We also include the percentage changes in the county population and employment levels, but find that they do not have statistically significant relationships with municipal bond yields. Overall, our results indicate that county population and per capita income levels are the main county-level determinants of municipal bond yields.

5.2. Newspaper Closures in the County Cross-Section

It is possible that both newspaper closures and the subsequently higher municipal bond yields are being driven by deteriorating economic conditions in the geographic region. To address this concern, we consider a number of cross-sectional comparisons of how newspaper closures affect public finance outcomes. First, consider a county that already has many newspaper operations. An extreme example would be Los Angeles County in California, which has 14 newspaper operations in our sample. A newspaper closure in such a county is unlikely to have a substantial effect on the

media coverage of local governments. However, this will clearly not be the case for counties with few newspapers. The difference between "high newspaper" and "low newspaper" counties provides the basis for our first test.[7] If newspaper closures are driven by underlying economic conditions, then we would expect to observe yield increases in both the high and low newspaper counties. On the other hand, if yields are being driven by an appreciable decline in media coverage, then we would expect to only see an effect in the low newspaper counties.

Column (1) of Table 4 reports the differential effect of a newspaper closure in a low newspaper county versus a high newspaper county. As before, we include state-year fixed effects so that the comparison is done within the same state and year. To further account for within-state cross-county variation, we control for county-level differences in population, population growth, per capita income, and employment growth. We also include the bond characteristic controls utilized in our main specification. Our estimates illustrate that a closure event in a low newspaper county is associated with a 10.3 basis point increase in the offering yields of municipal bonds issued in those counties after the closure. On the other hand, a closure event in a high newspaper county has no significant effect on offering yields. The post-closure yield change in a low newspaper county versus a high newspaper county is about 11.8 basis points, which is statistically significant at the 1% level.

In our second test, we examine the differential effect of a newspaper closure on the county in which the newspaper operation is located and a neighboring county with a similar population size and its own newspaper operation. One may view this exercise as a refinement of our main specification in equation (1) where we match each closure county to a control county based on the demographics of those counties. The results are presented in column (2) of Table 4. We find that a closure significantly affects yields in the county where the newspaper was located, but not the matched neighboring county. Specifically, yields in the closure county increase by 6.4 basis

[7] As explained in the summary statistics section, a high newspaper county is defined as a county that has at least four newspapers and a low newspaper county is defined as a county that has at most three newspapers prior to a newspaper closure.

points while those in the matched neighboring county do not experience any significant change. The differential effect equals 7.3 basis points and is just under significance at the 1% level. This evidence suggests that the mean increase in yields following a newspaper closure is unlikely to be driven by deteriorating economic conditions in the region. Furthermore, the evidence in the summary statistics section showing that newspaper closures are evenly distributed across states and over time, which includes both economic expansion and contraction periods, corroborates this finding.

5.3. Newspaper Closures and Craigslist Entry

An additional concern is that newspaper closures and municipal bond yields are jointly determined by unobserved variables specific to that county. We address this concern by utilizing a plausibly exogenous variable that affects the probability of a newspaper closure but not municipal bond yields. In particular, we utilize the introduction of Craigslist to a county. Craigslist is an online database of classified advertisements that originated in San Francisco in the late 1990s. Originally exclusive to the San Francisco area, Craigslist slowly established "sites" in other cities in the U.S. and other countries over the next 10 to 15 years in response to high demand for its classified advertisement platform, making it one of the most visited classified advertisement websites in the world. As of November 2017, the number of Craigslist users was about 60 million, the average number of monthly pageviews was about 50 billion, and the average number of classified advertisements posted to the site per month was about 80 million.

The growing popularity of Craigslist in the 2000s came at a cost to traditional newspaper outlets, which largely rely on revenue from advertisement sales. Seamans and Zhu (2014) estimate that Craiglist entry led to a $5 billion loss in advertising revenues for local newspapers from 2000 to 2007. Kroft and Pope (2014) show that Craigslist had a large impact on job advertising in local newspapers, as employers were increasingly using online forums like Craigslist to advertise their job openings. Gurun and Butler (2012) provide evidence that Craigslist entry in Pittsburgh and St.

Louis significantly eroded advertisement sales for the *Pittsburgh Post-Gazette* and *St. Louis-Post Dispatch*, causing those papers to provide more favorably slanted coverage to local corporations that purchased advertisements in those newspapers. Gurun et al. (2016) provide further evidence that Craigslist absorbed a significant amount of mortgage-related classified advertisement revenue from local newspapers as well. Overall, the evidence suggests that Craigslist entry had a highly negative effect on advertisement revenues for local newspapers, and thus the viability of the print newspaper business model.

Our empirical approach in this subsection involves testing the predictive power of Craigslist entry to a geographical area for newspaper closures, and then testing the relationship between municipal bond yield spreads and the predicted probability of a newspaper closure. We obtain the list of Craigslist sites and their entry years from `www.craigslist.org`. For sites added after June 2006, the entry year is not provided by Craigslist. For these sites, we use a digital archive of the internet called the *Wayback Machine* to identify the entry year. With all of the Craiglist sites and their entry years identified, we then define *Craigslist* as an indicator variable that equals one if a county is located within an 30-mile radius of a Craigslist entry point, excluding the entry point itself. We include the latter condition because Craigslist likely self-selected into the most economically developed metropolitan areas during its expansion period, which would introduce bias into our tests because these areas tend to have lower municipal bond yields.[8] By focusing on the counties located immediately outside the entry area, we can examine the indirect effect of Craigslist entry on newspaper closures without these self-selection issues. Another reason is that the Craigslist entry points in our sample usually have many newspaper operations, implying that Craigslist entry would not have much of an effect on municipal bond yields through the newspaper closure channel for these cities. This is consistent with our evidence in the previous subsection that newspaper closures primarily affect yields in counties with a low number of newspapers.

We utilize a two-stage least squares regression approach to determine the effect of newspaper

[8]The earliest Craigslist entry points include San Francisco, Boston, Chicago, Los Angeles, New York, Portland, San Diego, Seattle, and Washington D.C.

closures on municipal bond yields through the Craigslist entry channel. In particular, we test the following model:

$$\text{First Stage:} \qquad Closure_{jt} = \psi_1 \cdot Craigslist_{jt} + \phi' Z_{jt} + \delta_s + \delta_y + \varepsilon_{jt} \tag{2}$$

$$\text{Second Stage:} \qquad y_{ijt} = \beta_1 \cdot \widehat{Closure}_{jt} + \gamma' X_{it} + \phi' Z_{jt} + \delta_s + \delta_y + u_{ijt}, \tag{3}$$

where $Closure$ and the control variables X and Z are defined as before, δ_s represents state fixed effects, δ_y represents year fixed effects, and standard errors are clustered by state-year. If a newspaper closure occurred before Craigslist entered the area, then we exclude those observations. The linear probability model comprising the first stage regression test provides a useful estimate of the incremental probability of a newspaper closure after Craigslist has entered the area (ψ_1). The second stage regression estimates the effect of the Craigslist-induced probability of a newspaper closure on yield spreads for municipal bonds issued in the area (β_1). The overall effect of Craigslist entry on yield spreads can then be calculated by multiplying the main coefficients from the first and second stage regressions ($\psi_1 \times \beta_1$).

Panel A of Table 5 reports the results of the first stage regression, with column (1) focusing on the effect of Craigslist entry on counties located within a 30-mile radius of the Craigslist entry point. Following Craigslist entry, we find that the probability of a newspaper closure increases by 9.6%, even after controlling for the general downward trend in newspaper operations via the year fixed effects. The tests in columns (2) and (3), which examine the effect of Craiglist entry on counties located within a 60-mile and 90-mile radius of the Craiglist entry point, respectively, produce similar estimates. This evidence is largely consistent with the findings in Gurun and Butler (2012) and Gurun et al. (2016) showing that Craigslist entry has a significantly negative effect on newspaper advertising revenues. Given that declining advertising revenues is a commonly-cited reason for newspaper closures, it is unsurprising that Craigslist entry also has a significant effect on newspaper closures.

Panel B of Table 5 reports the results of the second stage regression of yield spreads on the

predicted closure variable. Column (1) indicates that there is a strongly positive relationship ($\beta_1 = 0.437$) between these variables that is statistically significant at the 1% level. Using this coefficient and ψ_1 from the first stage regression, we can quantify the effect of newspaper closures on local municipal bond yields through the Craigslist entry channel: $\psi_1 \times \beta_1 = 0.096 \times 0.437 = 0.042$, or 4.2 basis points. When we expand the radius of the Craigslist entry variable to 90 miles around the Craigslist entry point in column (3), we find that the second stage coefficient is stronger, with an overall effect on municipal bond yields of $0.101 \times 0.606 = 6.1$ basis points, which is in line with the estimates presented in Tables 3 and 4. This suggests that Craigslist entry has a stronger effect on smaller communities located further from the Craigslist entry point, typically a major city. Overall, the evidence from our two-stage Craigslist tests establishes a clear connection between newspaper closures and local municipal bond yields.

5.4. Newspaper Closures in the State Cross-Section

A nice feature of the municipal bond market in the United States is its segmentation into 50 smaller markets, with one market for each state. One important reason for this segmentation, according to Schultz (2012), is the differences in tax treatments for in-state and out-of-state municipal bonds. Most states do not tax municipal bonds issued within their state, but do tax municipal bonds issued out-of-state. This encourages municipal bond investors to trade in local municipal bonds, leading to market segmentation. Municipal bond investors also tend to favor local municipal bonds because they possess soft information that is not readily available to outsiders about the underlying project, further contributing to market segmentation. The segmented nature of municipal bond markets allows us to explore how differences in state characteristics interact with local newspaper closure events to determine municipal borrowing costs.

Campante and Do (2014) propose that the distance between a state's economic and political centers is a useful measure of the quality of public governance and accountability in the state. Governments face less scrutiny by citizens and the media when the distance between these centers

is large, and Campante and Do (2014) show that the quality of governance is worse as a result. Governance quality at the state and local levels are likely to be correlated, as states with high-quality governance are more likely to have mechanisms in place for monitoring the operations of their local municipalities, leading to a positive trickle-down governance effect. We hypothesize that the effect of a newspaper closure on municipal borrowing costs will be weaker in high-quality governance states, as the monitoring provided by those states acts as a partial substitute for the monitoring provided by the local newspaper.

We use the publicly-available, state-level distance metric from Campante and Do (2014) to test the governance hypothesis. In particular, we classify each state as "high isolation" or "low isolation" based on whether the relative distance between their economic and population centers is above or below median. This allows us to examine the effect of a local newspaper closure on municipal financing costs across states with higher or lower quality governance. We interact the "high isolation" and "low isolation" indicator variables with our *Closure* indicator variable and examine how these interaction variables affect local municipal bond yields. The results are reported in Column (1) of Table 5. We find that while a newspaper closure has a positive and statistically significant effect on yields in both low and high isolation states, the effect is much stronger in high isolation states. In particular, following a newspaper closure, yields in low isolation states increase by 5.5 basis points, while those in high isolation states increase by 12.3 basis points, for a difference of 6.8 basis points that is significant at the 5% level. This evidence supports our hypothesis that newspaper closures lead to worse public finance outcomes in states with low quality governance. We also find evidence that yields are slightly higher in high isolation states (2.2 basis points), suggesting that states with low quality governance generally have higher borrowing costs, even without accounting for newspaper closures.

Do other forms of media fill the vacuum created by local newspaper closures? Ideally, we would like to have comprehensive information on household news consumption such as newspaper circulation data and internet website visit data aggregated at the county level so that we can test whether

there is any substitution between local newspapers and other forms of media. Unfortunately, we are somewhat constrained by data availability. However, we can still shed some light on this issue by examining cross-state variation in internet usage. We obtain state-level internet usage data from the National Telecommunications & Information Administration (NTIA). For a majority of the years from 1998 to 2015, NTIA provides data on the percentage of the state population that uses the internet at any location in the state.[9] We denote this variable $INTUSE$. Our maintained assumption is that internet usage is correlated with online news consumption. If there is a strong substitution effect between the information obtained from local newspapers and other sources of media, then a local newspaper closure event is unlikely to have much of an impact on public financing costs in states with high internet usage. In contrast, if the substitution effect is weak, then the impact of a local newspaper closure on public financing costs should be fairly strong, regardless of internet usage rates.

We divide states into "high internet usage" and "low internet usage" states based on whether the $INTUSE$ variable provided by NTIA is above or below the median value in that year. As in our previous test, we interact the indicator variables representing high and low internet usage states with our *Closure* variable and examine how these interaction variables affect municipal borrowing costs. We report our test results in column (2) of Table 5. Our results indicate that the impact of a local newspaper closure on municipal offering yield spreads in low internet usage states is about 9.0 basis points, while the impact in high internet usage states is about 6.6 basis points. While this differential impact of 2.4 basis points might suggest some degree of substitutability between information obtained from local newspapers and online sources, the difference is also statistically insignificant. Thus, our results suggest that online sources do not provide a sufficient substitute for the monitoring mechanism provided by local newspapers.

[9] We fill in the years with no data by interpolating the percentages from the surrounding years.

6. Newspaper Closures, Government Inefficiencies, and Informational Frictions

We have shown that newspaper closures lead to higher municipal borrowing costs in the long run, and in this section, we explore the channels through which this effect may be occurring. There are three major determinants of municipal bond yield spreads: default risk (Wang et al. (2008), Schwert (2017)), liquidity (Ang et al. (2014)), and taxes (Ang et al. (2014), Longstaff (2011)). One potential channel through which newspaper closures affect yields is default risk. A newspaper closure leads to a reduction in local reporters covering their governments and keeping wasteful spending in check. As a result, government inefficiencies become more pronounced, leading to greater default risk and thus higher yields. The increase in government inefficiencies is largely consistent with the evidence in Dyck et al. (2008) and Dyck et al. (2010) that the monitoring provided by the media and other watchdog groups helps to prevent bad corporate behavior. A second potential channel is liquidity. Following a newspaper closure, informational frictions become exacerbated (Fang and Peress (2009), Peress (2014), resulting in greater adverse selection risk and thus lower levels of liquidity (Kyle (1985), Glosten and Milgrom (1985)). As a result, lenders would demand higher yields to compensate for the post-closure low liquidity environment (Ang et al. (2014)).[10] In the next two subsections, we explore the default risk channel by examining the extent to which government inefficiencies are affected by a newspaper closure, and in the third subsection, we explore the liquidity channel.

6.1. Post-Closure Advance Refundings and Negotiated Sales

In our first test of government inefficiencies, we examine the likelihood of an advance refunding following a newspaper closure. An advance refunding occurs when a municipality retires an outstanding callable bond at least 90 days prior to its first possible call date by issuing new debt to

[10] Although taxes are also an important component of municipal bond yield spreads, we do not explore the tax channel because newspaper closures are unlikely to affect federal or state tax rates.

refund that bond; in effect, the municipality synthetically calls the bond. Ang et al. (2017) show that 85% of all advance refundings occur at a net present value loss, amounting to an aggregate loss of approximately $15 billion from 1995 to 2013. Further, they show that municipalities tend to advance refund their debt at a loss because they are financially constrained and need to reduce their short-term cash outflows. Taken together, their evidence suggests that advance refundings are symptomatic of government inefficiencies. If newspaper closures lead to higher borrowing costs through the government inefficiency channel, then we should observe higher incidences of these transactions following newspaper closures.

We test the likelihood of an advance refunding following a newspaper closure using a probit regression framework. Similar to the methodology in Ang et al. (2017), we construct an annual time series for every callable bond in our database. Each time series begins the year the callable bond was offered and ends either the year the callable bond was advance refunded or, if the bond was not advance refunded, the year of the first call date. We define $\mathbf{1}^{AR}$ as an indicator variable that equals one if the bond was advance-refunded in that bond-year, and zero otherwise. Many of the callable bonds in our database are not advance refunded, meaning that $\mathbf{1}^{AR}$ equals zero for all the years in those bonds' time series. With this variable defined, we then test the following probit regression model:

$$\Pr(\mathbf{1}^{AR}_{ijy}|\cdot) = F(\beta_1 \cdot Closure_{jy} + \beta_2 \cdot PreClosure_{jy} + \gamma' X_{iy} + \delta_y), \tag{4}$$

where i, j, and y represent the bond, county, and calendar year, and δ_y represents year fixed effects. X is a vector of control variables that includes the number of years until the first call date and the number of years until maturity.

The results of the probit regression model are reported in column (1) of Table 7. We find that the probability of an advance refunding increases by about 0.42 percentage points per year after a newspaper closure compared to the pre-closure period. To put this number in context, we calculate the unconditional probability of a callable bond being advance refunded in a given year, and we

find that it equals about 3.05% in our sample. This suggests that the proportional increase in the probability of an advance refunding after a newspaper closure is about 13.8% (0.42/3.05). Our results are also robust to including only advance refundings that occur at least one year in advance of the first call date in column (2), and the inclusion of county-level control variables in column (3). Overall, the evidence from these probit regressions indicates that local governments are more inefficient following newspaper closures from the perspective of advance refundings.

Municipal bonds are generally sold through either a competitive or negotiated sale. In the latter case, the municipal bonds are sold directly to the underwriter by the municipality, and are typically associated with higher underwriter gross spreads and yields compared to competitive sales (Robbins (2002)). Thus, negotiated issues are generally seen as a costlier method for borrowing funds for municipal projects. Using the same sample of bonds and probit regression model, we test the effect of a newspaper closure on the probability of a negotiated issue, and we find a strongly positive effect. Specifically, according to column (4) of Table 7, the probability of a negotiated issue after a newspaper closure is about 3.5 percentage points higher compared to the pre-closure period. This evidence further suggests that local governments are more inefficient following newspaper closures.

6.2. Newspaper Closures and Government Efficiency Metrics

Local newspapers play a crucial role during every step of the political process under a democratic political system, providing information during election periods about political candidates and during non-election periods about the decisions of local officials. Incidentally, a lack of local newspaper coverage can lead to worsened political outcomes. Mondak (1996) and Gentzkow et al. (2011), for example, show that newspaper closures are associated with less informed voters and lower voter participation during local elections. Clearly, this lack of newspaper coverage and the associated lack of engagement by local citizens compromises the effective monitoring of elected officials. Snyder and Strömberg (2010) show that when this external governance mechanism is compromised, local politicians become less engaged. Consequently, this leads to a decline in real

outcomes for the municipality, with Snyder and Strömberg (2010) showing a subsequent decrease in monetary transfers from the federal government.

We empirically examine whether local newspaper closures lead to inefficient government outcomes at the county level. La Porta, Lopez-de Silanes, Shleifer, and Vishny (1999) provide a useful set of government efficiency metrics, and we examine a subset of these metrics around newspaper closures. Our first metric is the ratio of the total wages of all county government employees to the total wages of all employees in the county ($WAGE$). La Porta et al. (1999) utilize a similar metric in their cross-country study of government efficiency and show that higher government wages are associated with less efficient governments. We also examine the ratio of the total number of county government employees to the total county population (EMP), which is similarly meant to capture government spending. Our third measure is the ratio of total county tax revenues to the county population size (TAX), with the reasoning that higher government wages in the post-closure regime will likely be borne by local taxpayers. Finally, we calculate the county deficit per capita ($DEFICIT$), where county deficit is defined as the total county expenses minus tax revenues for that year.[11] Together, these four metrics are meant to capture how government spending changes after the loss of a local newspaper, an important government watchdog which normally helps to keep government spending in check. We then test the effect of newspaper closures on these county-level metrics using a simple OLS regression model. In this setup, we also include the following county and state-level control variables: county population level; county per capita income level; 12-month percentage growth in the state coincident index, which is designed to capture local economic conditions in the state; the state tax rate; 12-month percentage growth in house prices; and the pension funding ratio, which represents the ratio of state pension assets to state pension liabilities. Year fixed effects are also included to account for broader economic changes.

Table 8 reports our empirical findings. In particular, column (1) reports the effect of a newspaper

[11] Annual county government wage and employee data are obtained from the U.S. Bureau of Labor Statistics. Total county tax revenues and expenses are obtained from the U.S. Census Bureau, which collects this information every four years.

closure on the ratio of county government wages to total county wages. We find that a newspaper closure event is associated with a 1.3 percentage point increase in the $WAGE$ variable compared to counties in the same year that did not experience a newspaper closure. This 1.3 percentage point increase is equivalent to a 0.25 standard deviation increase in the $WAGE$ variable. For the median county, the 1.3 percentage point increase represents a total county government wage increase of approximately $1.4 million over the total county employee wage. Similar patterns emerge for the per capita number of government employees and local tax revenues. Specifically, column (2) illustrates that a newspaper closure is associated with a 0.43 percentage point increase in the number of government employees per capita, or four additional government employees for every 1,000 residents. This represents a 0.27 standard deviation increase in the EMP variable. Column (3) illustrates that a newspaper closure event is associated with an additional $84.60 tax dollars per capita. In our sample, the median annual employee wage is approximately $33,700, meaning that an additional tax of $84.60 represents about 0.25 percent of the median employee wage. Finally, column (4) illustrates that the county government deficit per capita increases by $52.76 after a newspaper closure, indicating that, all else equal, the county government begins to spend slightly more than it is taking in. Taken together, the evidence in Table 8 further suggests that government inefficiencies are exacerbated following a local newspaper closure.

6.3. Newspaper Closures and Informational Frictions

The evidence in the previous two subsections suggests that newspaper closures affect yields through the government inefficiency channel. However, it is also possible that newspaper closures lead to increased yields because informational frictions become exacerbated after a closure. Fang and Peress (2009) and Peress (2014), for example, show that stocks lacking media coverage have higher cross-sectional expected returns and lower informational efficiencies. In the context of the fixed income market, potential lenders would demand higher yields to compensate for the increased risk of lending to a lesser-known borrower or the increased cost of collecting information about

the borrower and the project, all else being equal. In this subsection, we explore how newspaper closures affect informational frictions in the municipal market.

A common feature in the extensive literature on market-making is that dealers quote higher bid-ask spreads when there is a greater risk of trading with an informed trader (see, e.g., Kyle (1985) and Glosten and Milgrom (1985)). When a local newspaper closes, there is less publicly available information about the local government and its public projects. As a result, traders who use public information to make investment decisions face a higher adverse selection risk of trading with better-informed traders who might specialize in processing and trading on private information, resulting in a less liquid market. The price dispersion metric from Jankowitsch et al. (2011) is a useful proxy for liquidity in over-the-counter markets, and we examine how this metric is affected by a newspaper closure. For each municipal bond, we calculate price dispersion as the standard deviation of price changes from consecutive customer-to-dealer secondary market transactions during the 90-day period after the initial bond offering. If a newspaper closure is associated with greater informational frictions in the municipal bond market, then we would expect this price dispersion metric to increase.

We test an OLS regression of price dispersion on the newspaper closure indicator variable. As in our baseline regressions, we include bond characteristic controls, county macroeconomic controls, and state-year fixed effects. The results of this regression are reported in column (1) of Table 9. We find that price dispersion increases by approximately \$0.0266 after a newspaper closure, or about 5.25% of the average price dispersion of \$0.508. Compared to the pre-closure period, we find that price dispersion increases by a statistically significant \$0.0224, indicating that the results cannot be explained by informational frictions that existed prior to the newspaper closure. In column (2), we utilize an alternative price dispersion metric that uses the trade-size value-weighted standard deviation of price changes from consecutive customer-to-dealer secondary market transactions, and we find results that are similar in magnitude and stronger in statistical significance. Finally, in column (3), we normalize the price dispersion metric from column (2) by dividing it by the average

interdealer transaction price over the post-offering 90-day period and find that this normalized metric increases by about 2.39 basis points after a newspaper closure relative to before the closure. Overall, our evidence indicates that informational frictions also increase after newspaper closures.

7. Conclusion

Newspapers play an important monitoring role for local governments. Other papers have shown that the loss of a local newspaper leads to worsened political outcomes in the region, and we illustrate that there are worsened financial outcomes as well. In particular, we show that long-run municipal borrowing costs increase by as much as 11 basis points following a newspaper closure, and we utilize several identification tests to show that these results are not being driven by underlying economic conditions in the region. We also show that government efficiency outcomes are substantially affected by newspaper closures. In particular, at the bond level, we find that the likelihoods of costly advance refundings and negotiated sales increase following a newspaper closure, while at the county level, we find that government wage rates, government employees per capita, taxes per capita, and county deficit per capita also increase. We provide further evidence that informational frictions are also exacerbated after a newspaper closure. From a finance perspective, our results suggest that local newspapers are important for the health of local capital markets.

We do not necessarily expect local newspapers to return to those counties where they have shuttered. Alternative news media such as online news outlets are fundamentally changing the way that people consume news, and they are likely to remain the dominant source for news consumption. However, these paradigm-shifting news outlets do not necessarily provide a good substitute for high-quality, locally-sourced, investigative journalism. In the long-run, perhaps an equilibrium will be reached in which these online-based organizations contract out work to local reporters and tailor their news to the local areas. In 2009, former Baltimore Sun reporter and famous television producer David Simon stated the following: "The day I run into a Huffington Post reporter at a Baltimore Zoning Board hearing is the day that I will be confident that we've actually reached some sort of

equilibrium." Our evidence suggests that economic growth at the county level will be better off in that equilibrium.

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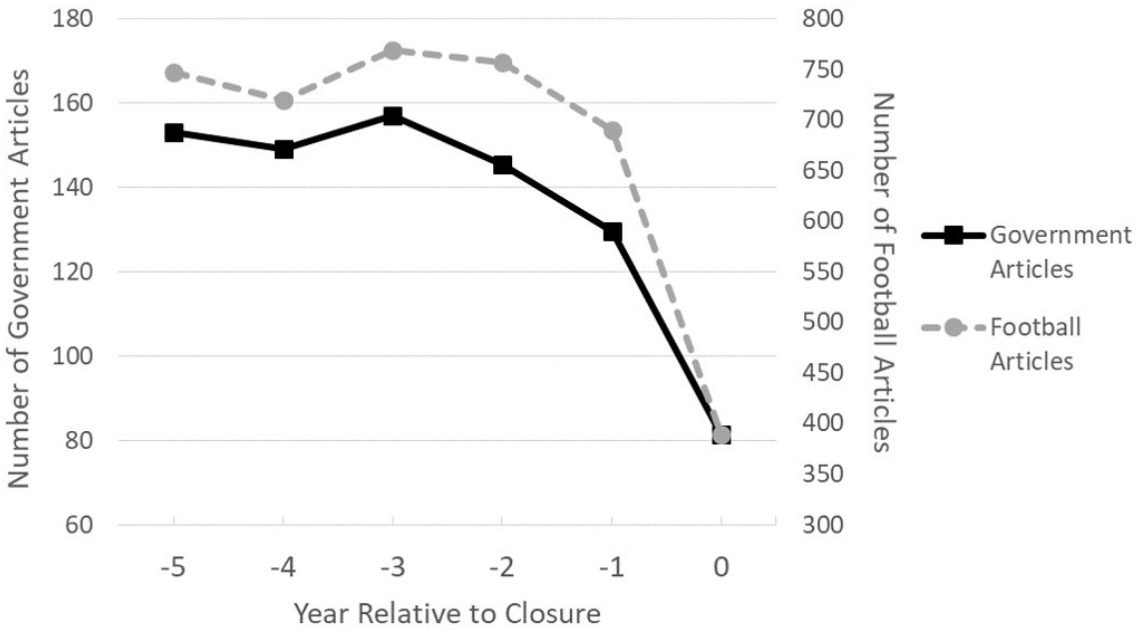


Fig. 1. **Average Number of Government Newspaper Articles per Year.** This graph plots the cross-sectional average number of government and football newspaper articles from closed newspapers in the years leading up to the newspaper closure. The left y-axis is for the average number of government articles and the right y-axis is for the average number of football newspaper articles. The x-axis denotes the year relative to the newspaper closure.

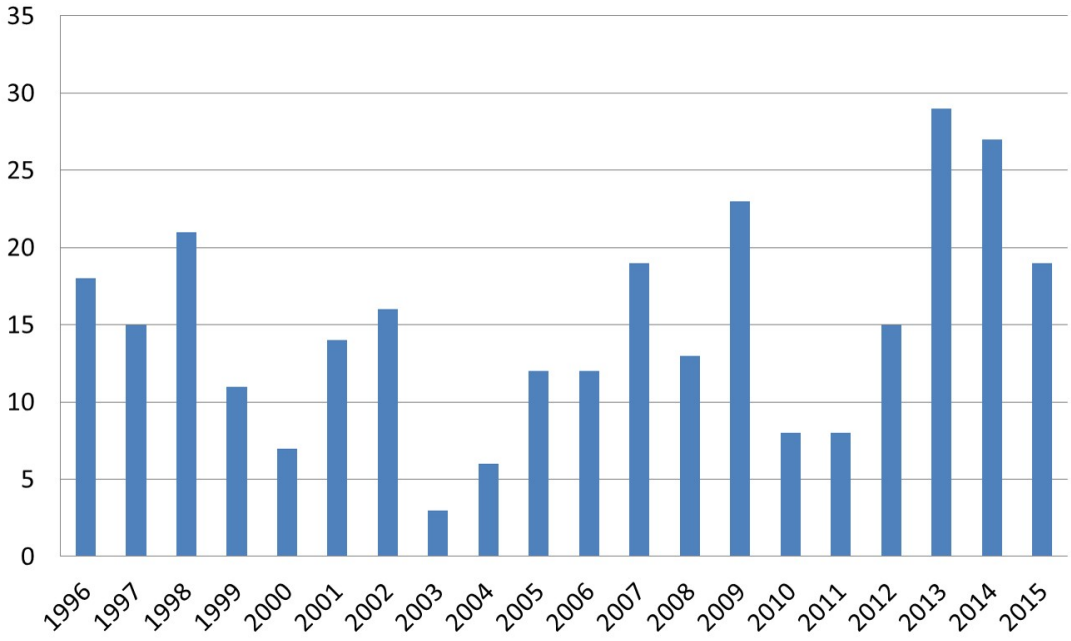


Fig. 2. **Number of Newspaper Exits per Year.** This graph displays the number of newspaper exits per year for the period 1996 to 2015.

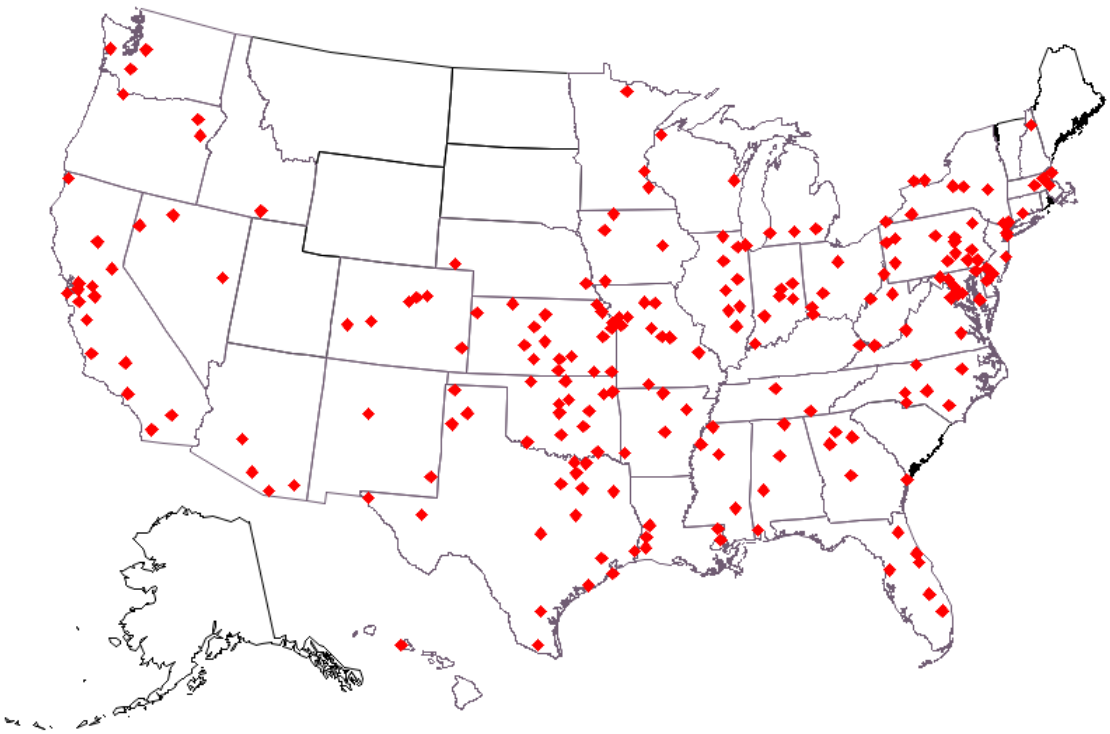


Fig. 3. **Newspaper Closures in the United States.** This map identifies the locations of newspaper closures in the United States during the period 1996 to 2015.

Table 1: Municipal Bond Summary Statistics. Panel A presents municipal bond summary statistics for bonds issued in counties that experience a newspaper closure versus bonds issued in counties that do not experience a newspaper closure. Panel B presents municipal bond offering yield summary statistics for bonds issued in counties that experience a newspaper closure versus a set of control bonds matched on state and year. For the difference calculations in this panel, ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Municipal Bond Summary Statistics

	Closure Counties	No-Closure Counties
Number of Bonds	92,397	257,112
Number of Issuers	4,516	15,262
Bond Size ($M)	4.68	4.8
Issue Size ($M)	63.67	69.79
Years to Maturity	13.2	13.02
Insured (%)	51.86	55.26
Investment Grade (%)	87.72	88.31
Non-Investment Grade (%)	0.34	0.33
Unrated (%)	11.94	11.35
General Obligation (%)	50.21	50.89
Callable (%)	61.31	60.55

Panel B: Municipal Bond Offering Yield Statistics

	Closure Counties	Matched Counties	Difference
Pre-Closure Yield (%)	4.047	4.062	-0.015***
Post-Closure Yield (%)	3.556	3.526	0.030***
Difference (Post minus Pre)	-0.491***	-0.536***	0.045***
Pre-Closure Yield Spread (%)	-0.264	-0.245	-0.019***
Post-Closure Yield Spread (%)	0.157	0.121	0.036***
Difference (Post minus Pre)	0.421***	0.366***	0.055***

Table 2: County Summary Statistics. Column (1) reports county-level summary statistics for bonds issued in counties that did not experience a newspaper closure during the sample period. Column (2) reports similar statistics for counties that did experience a newspaper closure during the sample period.

	Counties with No Closures	Counties with Closures
Number of Counties	1,062	204
Average Number of Newspapers	1.18	1.1
Average Per Capita Income ($K)	33.44	35.21
Median Population (K)	70.54	76.63
Average Population Change (%)	0.6	0.67
Average Employment Change (%)	0.59	0.75
Average Wage Change (%)	1.61	1.94

Table 3: Local Municipal Bond Yields following Newspaper Closures. This table displays the results of OLS regressions of local municipal bond yield spreads on a newspaper closure indicator variable. Rating Controls includes an indicator variable for whether the bond is rated and a set of indicator variables for each possible bond rating assigned by Moody's. Callable Controls includes a callable indicator variable, time-to-first-exercise (in years), and its inverse. Regression columns (1) and (2) include the full sample of municipal bonds and report results for secondary and offering yields, respectively. Regression columns (3) and (4) include revenue bonds only and report results for secondary and offering yields, 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, respectively.

	All Bonds		Revenue Bonds	
	Off. Yield	Sec. Yield	Off. Yield	Sec. Yield
	(1)	(2)	(3)	(4)
Newspaper Closure	0.0549***	0.0639***	0.106***	0.0985***
	(4.44)	(3.99)	(5.05)	(4.00)
Pre-Closure	-0.0017	-0.0184*	0.0107	-0.0177
	(-0.24)	(-1.65)	(0.87)	(-1.05)
Insured	-0.109***	-0.205***	-0.196***	-0.303***
	(-7.51)	(-14.84)	(-9.83)	(-15.28)
Time to Maturity (TTM)	0.0326***	0.00529***	0.0323***	0.00840***
	(34.91)	(3.29)	(30.90)	(4.98)
Inverse TTM	0.295***	0.101***	0.169*	0.100***
	(3.75)	(17.91)	(1.73)	(15.39)
Log(Bond Size)	0.0106***	-0.0391***	0.00412	-0.0417***
	(3.18)	(-10.42)	(0.99)	(-8.47)
General Obligation	-0.135***	-0.242***		
	(-16.74)	(-20.68)		
Population (M)	-0.00433**	-0.0127***	-0.00758***	-0.0135***
	(-2.01)	(-4.23)	(-2.79)	(-3.43)
Per Capita Income ($K)	-0.00209***	-0.00315***	-0.00250***	-0.00317***
	(-7.50)	(-10.00)	(-6.53)	(-6.53)
% Change Population	-0.000933	-0.00705	-0.00320	-0.0103
	(-0.13)	(-0.99)	(-0.42)	(-1.23)
% Change Employment	0.00157	-0.00495	0.00117	-0.00772
	(0.26)	(-0.55)	(0.18)	(-0.83)
Closure - Pre-Closure	0.0566***	0.0822***	0.0954***	0.1162***
t-statistic	(4.47)	(4.71)	(4.00)	(3.95)

SE Clustering	Issue-YM	Issue-YM	Issue-YM	Issue-YM
Fixed Effects	State-Year	State-Year	State-Year	State-Year
Rating Controls	Yes	Yes	Yes	Yes
Callable Controls	Yes	Yes	Yes	Yes
N	348,377	7,647,911	172,751	4,474,139
R-Squared	0.644	0.354	0.644	0.350

Table 4: Identification Regressions. Column (1) examines the differential effect of newspaper closures on offering yields in counties with three or fewer newspapers pre-closure to counties with more than three newspapers pre-closure. Column (2) compares newspaper closures in each county to a neighboring county with a similar population size that did not experience a closure. 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.

Dependent Variable: Offering Yield

	(1)		(2)
Closure × Low NP County	0.103***	Closure × Treatment	0.064***
	(4.91)		(4.07)
Closure × High NP County	-0.0154	Closure × Neighbor	-0.009
	(-0.61)		(-0.37)
Closure × (Low NP - High NP)	0.118***	Closure × (Treat - Neighbor)	0.073**
p-value	0.000	p-value	0.012
SE Clustering	Issue-YM	SE Clustering	Issue-YM
Fixed Effects	State-Year	Fixed Effects	Year
Characteristic Controls	Yes	Characteristic Controls	Yes
County Controls	Yes	County Controls	Yes
Rating Controls	Yes	Rating Controls	Yes
Callable Controls	Yes	Callable Controls	Yes
N	172,716	N	77,853
R-Squared	0.642	R-Squared	0.684

Table 5: Craigslist Entry, Newspaper Closures, and Yield Spreads. Panel A presents the results from a first-stage regression of the newspaper closure indicator variable (*Closure*) on the Craigslist Entry indicator variable. Craigslist Entry equals one if the county is located within an X mile radius of the point of Craigslist entry, where X is specified in the column header. Panel B presents the results from a second-stage regression of monthly municipal bond offering yield spreads on the predicted value of *Closure* from the first-stage regression in the corresponding column of Panel A. Standard errors are clustered by state-year. t-statistics are reported below the regression coefficients. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: First Stage Regression (Y = Closure)

	30-Mile Radius	60-Mile Radius	90-Mile Radius
	(1)	(2)	(3)
Craigslist Entry	0.096	0.104	0.101
	(6.53)	(7.15)	(7.25)
Clustering	State-Year	State-Year	State-Year
County Controls	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
N	161,395	162,778	162,784
R-Squared	0.149	0.150	0.147

Panel B: Second Stage Regression (Y = Yield Spread)

	(1)	(2)	(3)
Pred. Closure (30 miles)	0.437		
	(2.93)		
Pred. Closure (60 miles)		0.533	
		(4.58)	
Pred. Closure (90 miles)			0.606
			(4.96)
Clustering	State-Year	State-Year	State-Year
County Controls	Yes	Yes	Yes
Bond Controls	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
N	161,395	162,778	162,784
R-Squared	0.615	0.617	0.616

Table 6: Newspaper Closures by State Type. Column (1) examines the differential effect of newspaper closures on offering yields in states with low population isolation to states with high population isolation, where the population isolation measure is based on Campante and Do (2014). Column (2) compares newspaper closures in states with low internet usage to states with high internet usage. In each column, "High" and "Low" are based on whether the state metric is above or below its median level. t-statistics are reported below the regression coefficients. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable: Offering Yield

	(1)		(2)
Closure × Low Isolation	0.0552***	Closure × Low Internet Usage	0.0897***
	(2.69)		(4.65)
Closure × High Isolation	0.123***	Closure × High Internet Usage	0.0658**
	(4.89)		(2.12)
Low Isolation	-0.0219**	Low Internet Usage	0.00141
	(-2.06)		(0.18)
Closure × (Low - High)	-0.0678**	Closure × (Low - High)	0.0239
p-value	0.027	p-value	0.497
SE Clustering	Issue-YM	SE Clustering	Issue-YM
Fixed Effects	YM	Fixed Effects	YM
Characteristic Controls	Yes	Characteristic Controls	Yes
County Controls	Yes	County Controls	Yes
Rating Controls	Yes	Rating Controls	Yes
Callable Controls	Yes	Callable Controls	Yes
N	171,949	N	172,716
R-Squared	0.745	R-Squared	0.744

Table 7: Advance Refunding and Negotiated Bid Probit Regressions. Columns (1) to (3) represent probit regressions of an Advance Refunding indicator variable on the Closure and Pre-Closure indicator variables for callable bonds. Column (1) defines an advance refunding as having taken place at least 90 days before the first call date. Columns (2) and (3) define an advance refunding as having taken place at least one year before the first call date. Column (4) represents a probit regression of a Negotiated Bid indicator variable on the Closure and Pre-Closure indicator variables for the same bonds. Standard errors are clustered by year. *t*-statistics are reported below the regression coefficients. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Advance Refunding			
	(> 90 Days)	(> 1 Year)	(> 1 Year)	Negotiated Bid
	(1)	(2)	(3)	(4)
Closure	0.0473**	0.0548**	0.0435*	0.1306***
	(2.26)	(2.33)	(1.79)	(5.56)
Pre-Closure	-0.0241	-0.0349	-0.0581*	0.0274
	(-0.95)	(-1.18)	(-1.72)	(1.06)
Time to Maturity	0.0058*	0.0059*	0.0056	
	(1.68)	(1.71)	(1.56)	
Time to First Call	-0.2012***	-0.1521***	-0.1528***	
	(-8.87)	(-12.39)	(-12.37)	
Population (M)			-0.0025	0.0785***
			(-0.34)	(10.85)
Per Capita Income ($K)			0.0036***	-0.0095***
			(3.96)	(-8.80)
% Change Population			0.0124	-0.0004
			(0.99)	(-0.02)
% Change Employment			0.0026	0.0070
			(0.63)	(0.59)
Closure Marginal Effect	0.0028**	0.0027**	0.0022*	0.0350***
Pre-Closure Marginal Effect	-0.0014	-0.0017	-0.0028*	0.0074
Difference	0.0042**	0.0044**	0.0050***	0.0276***
t-statistic	(2.20)	(2.51)	(2.61)	(3.28)
SE Clustering	Year	Year	Year	Year
Fixed Effects	Year	Year	Year	Year
N	4,453,091	4,453,091	4,391,325	638,925
R-Squared	0.168	0.129	0.131	0.231

Table 8: The Effect of Newspaper Closures on Government Outcomes. This table displays the effect of newspaper closures on the ratio of total county government wages to total county wages ($WAGE$), the number of county government employees per capita (EMP), the county government tax revenue per capita (TAX), and the county deficit per capita ($DEFICIT$), where county deficit is defined as the total county expenses minus the total county tax revenues. t-statistics are reported below the regression coefficients. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	County Government Metrics			
	$WAGE$	EMP	TAX	$DEFICIT$
	(1)	(2)	(3)	(4)
Newspaper Closure	0.0134**	0.00434**	84.60***	52.76***
	(2.54)	(2.05)	(19.59)	(4.40)
Population (M)	-0.0100**	-0.00502***	80.78***	142.33*
	(-2.50)	(-2.87)	(6.90)	(1.88)
Per Capita Income ($K)	-0.00209***	0.000101	61.44***	4.24
	(-9.26)	(0.56)	(48.47)	(1.46)
Coincident Index	0.0632	-0.00686	-1503.8	-5125.1***
	(0.75)	(-0.22)	(-0.97)	(-3.70)
State Tax Rate	0.00124***	0.000334**	-7.982***	58.164***
	(2.79)	(2.53)	(-2.73)	(16.83)
House Price Growth	0.0280	0.00251	-557.6	889.2
	(0.58)	(0.17)	(-0.55)	(0.28)
Pension Funding Ratio	0.00706	0.00538**	232.3***	681.8***
	(1.07)	(2.39)	(6.15)	(3.56)
SE Clustering	County-Year	County-Year	Year	Year
Fixed Effects	Year	Year	Year	Year
N	20,026	20,026	3,789	3,789
R-Squared	0.153	0.030	0.439	0.070

Table 9: Price Dispersion around Newspaper Closures. This table displays the effect of newspaper closures on municipal bond price dispersion. The price dispersion metric in column (1) is calculated by taking the standard deviation of price changes from customer-to-dealer transactions during the 90-day period following the municipal bond offering date. The price dispersion metric in column (2) is calculated by taking the trade-size value-weighted standard deviation of price changes from customer-to-dealer transactions during the 90-day period following the municipal bond offering date, which is based on the metric in Jankowitsch et al. (2011). In column (3), the dependent variable is the price dispersion metric from column (2) divided the average interdealer transaction price during the same 90-day period, and expressed in basis points. 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.

	Dependent Variable: Price Dispersion		
	Equal-Weighted	Value-Weighted	Value-Weighted (%)
	(1)	(2)	(3)
Newspaper Closure	0.0266***	0.0291***	2.951***
	(2.78)	(3.42)	(3.33)
Pre-Closure	0.0042	0.0058	0.564
	(0.92)	(1.63)	(1.55)
Closure - Pre-Closure	0.0224**	0.0233***	2.387**
t-statistic	(2.09)	(2.60)	(2.54)
SE Clustering	Issue-YM	Issue-YM	Issue-YM
Fixed Effects	State-Year	State-Year	State-Year
Rating Controls	Yes	Yes	Yes
Callable Controls	Yes	Yes	Yes
N	95,041	95,041	95,041
R-Squared	0.188	0.209	0.215

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 appendix, 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 U.S. 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 A1. 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 post-closure period relative to the pre-closure 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. U.S. 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 post-closure 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.

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Table A1: 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. 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)
Pre-Closure	-0.0029	-0.0010	0.0136	0.0112
	(-0.33)	(-0.14)	(0.94)	(0.92)
Closure - Pre-Closure	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
Bond 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