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Municipal Net Revenue, Economic Activity, and the Cost of Borrowing

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ABSTRACT: We investigate the effects of state economic activity on the association of changes in the general fund (i.e., net revenue) and borrowing cost. Extant literature has established that net revenue is associated with municipal bond market metrics (e.g., true interest cost, bond yield spreads). Little is known, however, regarding the relationship between net revenue and borrowing cost when state economic activity is considered. Based on a sample of 1,970 general obligations bonds issued across 20 years by U.S. counties, we test whether the association between net revenue and borrowing cost is conditioned on state economic activity. We provide evidence that a state's economic activity moderates the association between net revenue and borrowing cost among county governments.

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Keywords: municipal bond market; information content; spending rate; net revenue; borrowing cost; financial crisis; general fund.

I. INTRODUCTION

Since Wallace (1981), governmental accounting literature has established that accounting information related to the general fund, a municipality's primary operating fund, and net revenue, the net of tax inflows and expenditure outflows, are associated with various

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responses in the municipal bond market (e.g., true interest cost, bond yield spreads). The extant literature suggests that governmental accounting measures related to the general fund have information content that is assimilated by market participants in pricing debt issues. Our interest lies in the importance of state economic activity as a moderator in the established association between borrowing cost of general obligation bonds and net revenue. We find that the weight placed on accounting information in determining market valuations is moderated through state economic conditions.

In addition to serving as a key financing source for critical infrastructure, the low default and tax-exempt benefits of the U.S. municipal bond market make it an attractive and relatively secure option for long-term investors. As of 2019, households directly owned approximately 46 percent of all municipal debt (Federal Reserve 2020). Thus, the viability and growth of the municipal bond market continues to have important implications for household investors.

Minimizing borrowing cost remains an important issue to maintain the nation's critical infrastructure. Higher borrowing cost siphons revenue resources away from investment in infrastructure and municipal services. In a public statement on the status of the U.S. municipal bond market, SEC Commissioner Luis Aguilar stated, "There is perhaps no other market that so profoundly influences the quality of our daily lives" (SEC 2015). Since 1981, the municipal bond market has experienced significant growth from an estimated $361 billion in outstanding debt to $3.7 trillion by 2012 (SEC 2012). As of 2019, the total municipal debt market is estimated to be $3.9 trillion (Federal Reserve 2020).

Prior work (e.g., B. Apostolou, N. Apostolou, and Dorminey 2014) suggests that the lowest borrowing condition for a municipality exists when net revenue is near zero (i.e., current revenues less current expenses of the general fund).[1] The association has been interpreted as the market's response (e.g., borrowing cost) to managerial performance, where managerial performance is evaluated better as net revenue approaches zero (e.g., Lewis 1994, 2003; Apostolou et al. 2014; Felix 2015; Beck 2018). In sum, the near zero condition reflects fiscal prudence and is associated with market responses.

Governmental accounting literature has affirmed the importance of signaling a balanced condition between revenues and expenditures. Felix (2015) finds evidence that municipal managers respond to external and internal pressures by maintaining the general fund's "bottom line" through interfund transfers. Costello, Petacchi, and Weber (2017) demonstrate that state governments in fiscal distress go through extra measures (e.g., asset sales, interfund transfers, raise taxes) to offset the shortfall or excess between revenues and expenditures at the risk of distorting inter-period equity, a deviation from GASB Concepts Statement No. 1. Beck (2018) advanced the literature with evidence of earnings management by municipal managers to maintain breakeven income in both government-wide (full accrual) and fund financial (modified-accrual) statements, suggesting that municipal managers strategically manage a balanced condition to avoid and/or to achieve certain fiscal outcomes.

In this study, we posit the ability of county officials to maintain equality between revenues and expenditures (i.e., net revenue = 0) may partly depend on prevailing and state economic activity. As an example, municipalities generally found it difficult to maintain a balance between revenues and expenditures during the financial crisis that started in 2007 (Gross, Huh, Sylvester, and

[1] We recognize that the governmental accounting literature (e.g., Apostolou et al. 1985; Plummer et al. 2007) refers to performance of the general fund with various terms (e.g., spending rate, modified accruals). For this study, we choose to strictly adopt the term "net revenue" to address this metric.

Zahradnik 2012; Atwell, Fehr, Huh, and Russell 2013). Most municipalities depended largely on property taxes as a major source of revenue. The large-scale deflation in housing prices from the financial crisis, and its prolonged recovery, had a direct and negative effect on municipal revenues (Gross et al. 2012). Moreover, the financial crisis also weakened states' abilities to provide aid to municipalities, further destabilizing the revenue base (Gross et al. 2012; Atwell et al. 2013). In the meantime, demand for public services grew. Simply stated, expenditures were "sticky" compared to changes in revenues.

Yet, despite the challenges from the financial crisis, there remained variability among state municipal economies and their ability to maintain fiscal health. For example, Atwell et al. (2013) reported on high-profile bankruptcies (e.g., City of San Bernardino, Jefferson County of Alabama) and various other states and municipalities that were able to weather the storm (e.g., all North Carolina cities, Cedar Falls in Rhode Island). In the post-crisis period, municipal managers also faced a reforming municipal bond market characterized by greater borrowing cost and less access to capital, essentially altering the options and strategies available to finance public projects (Martell and Kravchuk 2012).

Fundamentally, a municipality's financial health and ability to meet its financial obligations depends on state economic activity and not singularly on financial position or fiscal capacity (Mead 2006). Marlowe (2011) also specified state economic condition as a likely omitted variable to explain findings on states' credit quality and optimal slack resources, suggesting there is much outside the control of municipal managers in the determination of bond pricing and borrowing cost. To our knowledge, there has been little research in the governmental accounting literature that empirically incorporates state economic activity with accounting information and municipal market responses.

We raise a fundamental research question of whether the association between borrowing cost and net revenue is conditioned on state economic activity. Using the Federal Reserve's state leading indexes, we test for the significance of state economic activity in the established relationship between borrowing cost and net revenue across economic environments that span a 20-year period. Stated affirmatively, we expect that the market's evaluation of net revenue of the general fund is affected by the state economic activity faced by the manager in achieving the optimal metric (net revenue $= 0$). We also hypothesize that the market's evaluation is differential to whether the municipality is in a deficit condition (net revenue < 0) or in a surplus condition (net revenue > 0).

Our results demonstrate that the penalty (i.e., increased borrowing cost) assessed for departures from the optimal net revenue condition, is dependent on the state's economic environment. Our findings provide insight to the relevance of governmental accounting information reported under the framework of GASB Statement No. 34. First, we provide evidence that the information content of net revenue persists across varied and state economic conditions. Second, we provide evidence that a state's economic activity plays a meaningful role in moderating the association between net revenue and borrowing cost for county governments. Third, our study demonstrates that the state leading indexes compiled by the Federal Reserve is an important proxy for local economic activity.

In Section II, the relevant literature and hypotheses are presented. Section III explains the research design, variable definitions, model specifications, and sample selection. Section IV summarizes the analysis and results followed by discussion and limitations of the study. Section V provides the conclusion and suggestions for future research.

II. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Net Revenue and the Association with Borrowing Cost

Consistent with prior work (e.g., Apostolou, Giroux, and Welker 1985; Reck and Wilson 2014), we evaluate financial performance of a municipality's net revenue as total revenues less total expenditures. This metric possesses properties that resemble both cash flow and accruals-based earnings. Plummer, Hutchison, and Patton (2007) describe changes in the general fund measure as a "modified-accrual earnings measure . . . that resembles changes to working capital accruals." At fiscal-year end, the net revenue measure indicates whether the governmental reporting entity is in a current-year surplus (revenues $>$ expenditures), a current-year deficit (revenues $<$ expenditures), or a balanced condition (revenues $=$ expenditures).

The notion that participants in the debt markets evaluate financial performance (e.g., earnings) against a benchmark, and assimilate the accounting information with differential responses, has been established in the corporate literature. For example, Jiang (2008) found more salience in a firm's cost of debt for corporate bonds relative to earnings benchmarks. Easton, Monahan, and Vasvari (2009) also provide evidence that debt market participants are particularly sensitive when earnings convey bad news. Our assertion is that these same notions, albeit in different forms, apply in the municipal market as well. Extant literature has also identified net revenue as a signal to the market regarding the quality of fiscal management over revenues and expenditures in the current year (e.g., Pridgen and Wilder 2013; Beck 2018). Unlike corporate sector managers, municipal managers do not have an incentive to maximize "earnings" in the general fund (Zimmerman 1977; Felix 2015). Instead, municipal managers are evaluated in their ability to maintain balance in fiscal resources (i.e., net revenue $= 0$).

Recent government accounting literature continues to support the evaluation of net revenue against a breakeven benchmark. Felix (2015) provides an explanation for why net revenue is optimal at or near zero; deficit performance suggests overspending while surplus performance suggests an over-accumulation of resources, an under-provision of public services, and/or possibly over-taxation of citizens. Beck (2018) also describes institutional pressures and reputational risks faced by municipal managers, mostly from citizens and creditors, to avoid both surpluses and deficits.

The relationship between net revenue and borrowing cost is salient in the governmental accounting literature. Apostolou et al. (2014) address prior mixed findings and empirically demonstrate that net revenue at or near zero (i.e., at equilibrium) is associated with minimal borrowing cost, measured as true interest cost. Importantly, they show that a departure from an equilibrium condition is associated with increased borrowing cost, regardless of the direction of departure. They find an asymmetric association between deficits and surpluses, whereby departures in the deficit condition are more severely penalized on borrowing cost than surpluses. Beck (2018) also provides new information on disproportionate management by managers for deficits versus surpluses. Her tests on pre-discretionary accruals show that prior to bond issuances, deficits are more heavily managed and avoided than surpluses, in both full accrual and modified-accrual financial statements.

Economic Climate and the Information Content of Accounting Numbers

Givoly, Hayn, and Katz (2017) provide evidence that the role of accounting information in the corporate debt market is conditioned on the macroeconomy (i.e., GDP). They focus on corporate

earnings information across 39 years and associated responses in the U.S. corporate bond market. Their findings suggest that accounting numbers generated by corporate entities have greater value relevance in debt markets when the macroeconomy worsens. Differential value relevance of accounting information is largely attributed to increased credit risk (i.e., probability of default) and frequency of losses.

Investor sentiment about the state of the economy can also play a role in the interpretation of earnings information. Conrad, Cornell, and Landsman (2002) examine whether reactions in the stock markets (i.e., stock prices) to good (bad) earnings shocks depend on the relative level of the market (i.e., "good" versus "bad" times). Conrad et al. (2002, 2509) explain that investor sentiment regarding "uncertainty about the state of the economy creates asymmetry in response to good and bad news." The authors find that when investors believe the economy is good, the receipt of good earnings news conveys less incremental information on future cash flow or uncertainty. However, news of bad earnings during good times resulted in stronger market reactions because of increased uncertainty. The opposite is true in a down market; good news in earnings information provides the potential for future positive cash flow but the reaction is reduced given the prevailing uncertainty in a down market, while more bad news in a bad market provides little incremental information. Importantly, Conrad et. al (2002) provide further evidence that accounting information (i.e., earnings) is associated with varied market responses; and that the response is relative to the state of the economy.

County Governments as Extensions of States

Primary county governments serve as intermediary authorities and are essentially the "administrative arms" of the state governments (Thomas 1996; Menzel 1996; McDonald 2015). Modern county governments have grown significantly in complexity and functionality. Not only do they operationalize and execute state authority, but they also serve as brokers and partners to augment and/or provide city services (Menzel 1996). Moreover, these responsibilities have grown both in scale and complexity with the expansion of urban and suburban areas. In fact, county governments have also grown faster than all local governments except for special districts (Park 1996).

The financial and economic models of county governments vary greatly among and within states. Cigler (1996) studied revenue diversification in county governments and highlights the need for modern county governments to achieve revenue flexibility. Achieving this flexibility, however, has depended less on financial-aid programs and more so on the economic base of the county, which, given its integrated role to carry out state's authorities, may also depend on the state's economy. On the other hand, McDonald (2015) highlights that county governments are still subject to state mandates on the provision of public services. As compared to cities or towns, this distinctive function placed on county governments makes them relatively more dependent on intergovernmental revenues from the state and potentially more susceptible to changes in state economies. From a practical standpoint, states have inherent incentives and interventions to ensure the economic health of county entities (e.g., preventing contagion for credit downgrades, preserving public health and safety, and ensuring economic growth and stability are driven through state action (Atwell et al. 2013)).

Although county governments have grown in their role and presence as major service providers, academic research specific to county governments is limited (DeSantis and Renner 1996; Benton 2005; Benton et al. 2007). Benton (1996, 163) notes a specific concern that numerous studies on fiscal issues use data that mix state and county samples, thus advocating

that "county governments should be the exclusive focus of study" in future studies. Accordingly, given that primary county governments inherently serve as extensions of their respective states, we rationalize that borrowing cost among county governments may also be susceptible to a state's economic conditions. Thus, we intentionally test the established relationship between net revenue and borrowing cost, by examining only primary county governments in conjunction with state economies across 20 years. Our findings are useful to researchers in public administration and governmental accounting communities, as well as practitioners seeking greater understanding of determinants of borrowing cost related to the municipal bond market.

Hypotheses

We seek to answer whether associations between borrowing cost and net revenue are conditioned on state economic activity. To address this research question, we establish the following objectives: (1) test whether state economic activity serves as moderator in the established association between borrowing cost of general obligation bonds and net fluctuations in the general fund, and (2) test whether departures from a balanced condition (net revenue = 0) are moderated asymmetrically by state economic activity, given a deficit (net revenue < 0) or surplus (net revenue > 0) condition.

Given Givoly et al. (2017)'s finding that corporate earnings information is conditioned to the macroeconomy, we anticipate that in the municipal bond market, state economic activity may also moderate the association between departures from net revenue equilibrium (net revenue = 0) and borrowing cost. Specifically, if the municipal bond market assesses negative departures from net revenue equilibrium similar to earnings losses in the corporate debt market, then municipalities with deficits should be assessed as being in higher risk of default (i.e., increased credit risk), which should further be associated with higher borrowing cost (i.e., true interest cost). It is also reasonable to rationalize that economic activity influences the relationship between borrowing cost and net revenue. Greater economic activity indicates growth and can generate greater revenues and expenditure activity. Declines in economic activity can have opposite and/or varied impact on both revenue and expenditures and with potentially lagged effects (Atwell et al. 2013).

We also draw from the logic offered by Conrad et al. (2002) to the municipal bond market, specifically, that municipal "earnings" (i.e., net revenue) may be interpreted differently based on the state of the economy. Unlike Conrad et al. (2002), we interpret good news on municipal net revenue to be evaluated against an absolute benchmark (net revenue = 0), while bad news corresponds to departures (i.e., surplus and deficit magnitudes) in either direction from equilibrium.

Net revenue surpluses and surplus magnitudes are also found to be positively associated with true interest cost (Apostolou et al. 1985; Plummer et al. 2007; Apostolou et al. 2014). In the municipal/governmental context, surpluses are not necessarily viewed favorably (Felix 2015; Beck 2018). Accordingly, we anticipate that the economic conditions will affect the association between net revenue and true interest cost. Thus, H1 is stated as follows:

H1: The association between net revenue magnitude and borrowing cost is conditioned on state economic activity.

Next, we test whether the association between deficit and surplus magnitudes are conditioned differently on state economic activity. Apostolou et al. (2014) provided evidence that the association between net revenue and borrowing cost is asymmetric for surpluses and deficits. They found that net revenue deficits were assessed a greater penalty on true interest cost relative to the penalty assessed on net revenue surpluses. Consistent with Apostolou et al. (2014), we

expect to find that negative and positive departures from equilibrium are both positively associated with borrowing cost, but that the effects are asymmetric.

The baseline expectation regarding the association between net revenue and borrowing cost is grounded in the notion that municipal expenditures are relatively static in the near-term and municipal revenues tend to fluctuate with economic conditions. In the case of a net revenue surplus, the market assesses the possibility that the municipality is either underservicing its constituency (low expenditures) or overtaxing its constituency. A municipality in a surplus condition can either reduce taxes or increase services to return to the equilibrium state. In a net revenue deficit, the market assesses the possibility that the municipality is providing services beyond its means, or insufficiently assessing taxes. A county in a deficit position is limited in its ability to cut services and is faced with justifying tax increases as a primary path to the equilibrium state. The condition is not sustainable and is therefore assessed a higher borrowing cost. Clearly the surplus condition, while demonstrably not optimal relative to borrowing cost, is certainly more desirable than the deficit condition.

Economic conditions can be reasonably expected to amplify the challenges faced in both revenue conditions. In the case of a surplus, the departure from equilibrium can be rectified through a reduction in tax assessments or expanding municipal service. This is all the more so when the economic context is positive. The surplus will continue to be assessed higher borrowing costs, but less severely so, as the imbalance is easily fixed without degradation to municipal services. In the case of a deficit condition, the path to equilibrium is more restricted. When economic times are strong and the deficit condition persists, the municipality has demonstrated its inability to return to the equilibrium condition, even when tax revenues are rising. The market assesses a higher cost of borrowing in this case.

Accordingly, we expect that the association between borrowing cost and net revenue is affected by the direction of the departure from equilibrium and the attendant economic activity. We hypothesize that in periods of strong economic activity, a deficit position will be penalized more severely (i.e., borrowing cost) than that of a surplus position. The deficit position carries information regarding the risk of default, managerial competency, and overall municipal health. This is particularly so when economic activity is strong. The surplus condition, while not optimal relative to borrowing cost, is signaling potential growth in municipal service or potential reductions in municipal tax assessments. In sum, state economic activity will moderate surpluses and deficits unequally. H2 is stated:

H2: Deficit net revenue is assessed more severely on *TIC* than surplus net revenue when the state's economic activity is strong.

III. RESEARCH DESIGN

Variables

We measure borrowing cost as true interest cost (*TIC*). *TIC* includes several underlying costs related to bond issuance such as finance charges, discount points, possible late fees, prepaid interest, and the time value of money (Simonsen and Robbins 2002). *TIC* is also a continuous variable that better captures the effects of accounting information on borrowing cost (Plummer et al. 2007; Reck and Wilson 2014). Reck and Wilson (2014) note that *TIC* is superior to bond ratings since bond ratings are adjusted at longer intervals. In contrast, *TIC* captures the default risk in the market at the time of issuance.

Two independent variables are studied. The first independent variable is the magnitude of net revenue (*MNR* and *NR,* hereafter, for "net revenue"). The second independent variable, economic activity (*ECON*), is based on the state leading indexes that are produced by the Federal Reserve Bank of Philadelphia. State leading indexes serve as a six-month outlook of state economic activity. The state leading indexes for each state are similar to the Leading Index for the U.S., which relies on multiple economic indicators to capture economic trends (Puenpatom and Stark 2016). The leading indexes provide a composite measure of national and state economic inputs (Puenpatom and Stark 2016). Higher index scores indicate better economic conditions and *vice versa*. Bagley, Dorminey, McSwain, and Reed (2016) explain that the Leading Index for the U.S. provides a "smoothing effect that avoids much of the volatility reflected in individual components." Similar to the Leading Index of the U.S., the state leading indexes are based on a coincident index for each state and are further adjusted with additional lead indicators that capture unique measures related to growth at the state level (e.g., housing permits, unemployment, manufacturing surveys by the Institute for Supply Management that monitor for changes to production).[2] Puenpatom and Stark (2016) find that state leading indexes outperformed the national-level Leading Index for the U.S.

Our control variables fall into three categories: the unassigned fund balance, yield curve attributes, and bond characteristics. Governmental accounting literature provides evidence that a municipality's unassigned fund balance (*FB*) is significant to borrowing cost (e.g., Plummer et al. 2007; Reck and Wilson 2014). Unassigned fund balance represents the portion of total assets less total liabilities that is not subject to spending constraints. The unassigned fund balance is directly increased or decreased, based on *NR* deficits or *NR* surpluses for each accounting period. Consistent with prior research, we expect a negative association between *FB* and *TIC*. We also include an interaction term between *FB* and *NR* to control for the possibility that *FB* may influence the effect of *NR* on *TIC*.

We construct our own yield curve to capture the borrowing environment faced by municipalities. Doh (2011) suggests that the yield curve can be properly modeled with three components: the federal funds rate (*LEVEL*), the average maturity of the bond issue in years (*SLOPE*), and yield curve curvature (*CURVE*). A higher federal funds rate indicates higher cost for borrowing in the overall market. Importantly, Bernanke and Blinder (1992) conclude that the federal funds rate provides comparatively better information content for the movement of real macroeconomic variables at the national level. Specifically, the federal funds rate does not suffer from the same level of endogeneity with contemporaneous economic conditions, as do other measures of interest rate levels (Bernanke and Blinder 1992). Last, we also account for the effects of quantitative easing by the Federal Reserve Board with inclusion of the "shadow" federal funds rate in the *LEVEL* variable. Shadow federal funds rates are provided by the Federal Reserve Bank of Atlanta and estimated with models developed by Wu and Xia (2016). We believe including shadow rates for *TIC* estimations involving samples in and after 2009 is especially important to control for monetary policy, given the Federal Reserve's intervention that kept interest rates at or near zero—an unconventional monetary policy (Wu and Xia 2016).

Bond characteristics are also included: issue amount (*AMT*), pricing mechanism (*BID*), bond rating (*BR*), and call feature (*CALL*). Variable descriptions are summarized in Appendix A.

[2] The coincident index is published monthly by the Federal Reserve Bank of Philadelphia. The coincident index consists of four indicators: nonfarm payroll employment, average hours worked in manufacturing, the unemployment rate, and wage salary disbursements deflated by the average CPI for the municipality (Stock and Watson 1989).

Model Specifications

We employ two OLS model specifications to examine our expectation that economic activity is an important consideration in evaluating the association between *NR* and *TIC*. Both specifications are consistent with the following functional form:[3]

$$Borrowing\ cost\ =\ f(net\ revenue,\ state\ economic\ activity,\ interaction\ terms,\ control\ variables)$$

First Specification

In our first specification, we consider the restricted case when the coefficients on positive departures from the equilibrium point ($NR > 0$) and negative departures from the equilibrium point ($NR < 0$) are equal. That is, positive and negative departures from equilibrium are evaluated the same by the market. Therefore, the magnitude measure (*MNR*) is merely the absolute value of *NR*. In addition to including the economic activity variable (*ECON*), we also include an integration term between *MNR* and *ECON*. The estimated coefficient on the interaction term will demonstrate if *ECON* moderates the association between *MNR* and *TIC*.

$$\begin{aligned} TIC_{it} = {} & \beta_0 + \beta_1 MNR_{it} + \beta_2 ECON_{jt} + \beta_3 FB_{it} + \beta_4 MNR_{it} \times ECON_{jt} + \beta_5 MNR_{it} \times FB_{it} \\ & + \beta_6 SLOPE_{it} + \beta_7 CURVE_{it} + \beta_8 LEVEL_t + \beta_9 AMT_{it} + \beta_{10} BID_{it} + \beta_{11} BR_{it} \\ & + \beta_{12} CALL_{it} + State\ Effects_j + \varepsilon_{it} \end{aligned} \tag{1}$$

Second Specification

In our second specification we relax the restriction of a common coefficient for positive and negative *NR*. The restriction of the common coefficient for the interaction term is also relaxed. We identify deficit departures ($NR < 0$) as *DNR* and surplus departures from equilibrium ($NR > 0$) as *SNR*. We also introduce the corresponding interaction terms for positive (*SNR* × *ECON*) and negative departures (*DNR* × *ECON*) from the equilibrium.

$$\begin{aligned} TIC_{it} = {} & \beta_0 + \beta_1 SNR_{it} + \beta_2 DNR_{it} + \beta_3 ECON_{jt} + \beta_4 FB_{it} + \beta_5 SNR_{it} \times ECON_{jt} + \beta_6 DNR_{it} \times ECON_{jt} \\ & + \beta_7 SNR_{it} \times FB_{it} + \beta_8 DNR_{it} \times FB_{it} + \beta_9 SLOPE_{it} + \beta_{10} CURVE_{it} + \beta_{11} LEVEL_t \\ & + \beta_{12} AMT_{it} + \beta_{13} BID_{it} + \beta_{14} BR_{it} + \beta_{15} CALL_{it} + State\ Effects_j + \varepsilon_{it} \end{aligned} \tag{2}$$

Data and Sample Selection

The sample consists of general obligation (GO) bond issues by U.S. counties from 1995 through 2014. GO bonds issues are ideal for this study because they are backed by the "full faith and credit" of the municipality's taxing power, rather than by a particular revenue stream (e.g., Seymour 2014; Park, Matkin, and Marlowe 2017). Relative to other types of municipal bonds, GO bonds also largely reflect market interest rates (Reck and Wilson 2014).

[3] A partial replication of Apostolou et al. (2014) was conducted to determine the extendibility of the authors' findings for the financial crisis and recovery years (2007–2014). The partial replication was also conducted with a smaller but more homogenous sample that consisted of only GO bonds issued by primary county governments. Overall, results showed that their findings are largely replicable for linear estimations of net revenue (SR, same as *NR*), and that these findings are extendible into longer time horizons (i.e., 1995–2014).

TABLE 1

Summary of Sample Selection

Steps in Data Preparation	Sample Size
New general obligation (GO) bonds issued by primary county governments (1995–2014)	17,001
Less observations without values for *TIC*	12,638
Less duplicates, missing values, incorrect entries for counties	15
Less observations without matching CAFR data	2,377
Less removal of an unverifiable outlier for *TIC*	1
Final sample used in analyses	1,970

Table 1 presents the sample determination. Data are taken from four sources: Thomson Reuter's SDC Platinum for GO bonds, GFOA's financial indicators database for CAFR data, the Federal Reserve Bank of Philadelphia's database for state leading indexes, and the Federal Reserve Bank of Atlanta for federal funds rate data.

Information on GO bond characteristics and related borrowing cost are from the Securities Data Company's (SDC) Platinum Database maintained by Thomson Reuters Financial Services.[4] Reported accounting information for *NR* and general fund balances are from the financial indicators database maintained by the Government Finance Officers Association (GFOA). The GFOA compiles accounting information from audited Comprehensive Annual Financial Reports (CAFR) of governmental entities.[5] Prior research has shown that differences in the quality of financial reporting among local governments have significant effects on borrowing cost and bond ratings (Baber and Gore 2008; Henke and Maher 2016). Thus, we control for heterogeneity in financial reporting quality by only using accounting information from CAFRs that are awarded the GFOA's Certificate of Achievement for Excellence in Financial Reporting (COA).

Last, our sample is restricted to GO bond issuances by primary county governments based on rationale that the pricing of GO bonds by these entities would likely be more influenced by state economic activity. Primary county entities are viewed as extensions of the state government (Menzel 1996; Thomas 1996), and the financial health of the state is manifest in the financial health of the comprising counties. In restricting our sample to primary county issuers, we capture the entity closely tied to the state and the state economic conditions. Thus, the use of state leading indexes in conjunction with GO bond issuances from primary counties is relevant.

Data for yield curve attributes consists of combining data from SDC platinum for bond maturity information and from the Federal Reserve Bank of Atlanta for the federal funds rate. State leading indexes are gathered from the Federal Reserve Bank of Philadelphia.

The sample selection is summarized in Table 1. We extracted 17,001 observations from SDC Platinum that consisted of GO bond issues that were issued by primary county governments. From this data, we eliminated 12,638 observations that did not have an observation for *TIC*. Preparation of CAFR data also required verification of general fund revenue and expenditure values among 34 individual counties due to differences in naming conventions between the GFOA data and the SDC

[4] https://aaahq.org/GNP/Research/GNP-Data-Sources

[5] As of October 2021, CAFRs are now called Annual Comprehensive Financial Reports (ACFR) for financial reporting ending after December 15, 2021 (GASB 2021).

TABLE 2

Sample Distribution by Year

Year	GO Bond Issues	Percent of Sample (%)
1995	34	1.72
1996	73	3.70
1997	61	3.10
1998	86	4.37
1999	63	3.20
2000	66	3.35
2001	98	4.97
2002	95	4.82
2003	107	5.43
2004	117	5.94
2005	107	5.43
2006	105	5.33
2007	102	5.18
2008	99	5.03
2009	156	7.92
2010	169	8.58
2011	103	5.23
2012	118	5.99
2013	116	5.89
2014	95	4.82
Totals	1,970	100.00

Table 2 presents general obligation bonds issued by primary county governments over a twenty-year period of 1995–2014.

database (e.g., Miami-Dade versus Dade County). Some counties also required correction and reclassification (e.g., Nevada County was incorrectly listed under Nevada and verified to be in California). No CAFR observations were eliminated from this process. After merging GO bond data with CAFR data, our final sample was reduced to 1,970 observations.[6]

The number of issues in our sample by year is presented in Table 2. Table 3 provides a closer look at the distribution of the sample by state. Per Table 3, new GO bonds were issued by 294 counties among 36 states. Six states (Maryland, Wisconsin, North Carolina, Michigan, Minnesota, Texas) account for approximately half (50.31 percent) of the sample. Notably, a larger number of bonds were not necessarily issued by a larger number of counties. For example, only two counties (Clark and Washoe counties in Nevada) account for 3.96 percent ($n = 78$) of the full sample. In contrast, 17 counties in California issued $n = 46$ bonds, which equates to approximately 2.7 bond issues per county (46 issues/17 counties) over the sample period.

[6] As a point of reference, Apostolou et al. (2014) utilize a sample of 3,285 county-level GO bonds, which includes all GO issues from a variety of county-level issuers over a 13-year period. Our focused sample includes 1,970 observations exclusively from primary county government issuers over a 20-year period.

TABLE 3

Sample Distribution by State
(n = 1,970)

State	County Issuers	GO Bond Issues	Percent of Sample (%)
Maryland	14	224	11.37
Wisconsin	15	195	9.90
North Carolina	44	178	9.04
Michigan	22	155	7.87
Minnesota	13	128	6.50
Texas	26	111	5.63
South Carolina	17	106	5.38
Virginia	13	105	5.33
Washington	9	99	5.03
Tennessee	7	85	4.31
Nevada	2	78	3.96
New York	6	77	3.91
Florida	16	55	2.79
Iowa	5	53	2.70
Kansas	3	49	2.49
California	17	46	2.34
Illinois	7	41	2.08
Ohio	11	41	2.08
Oregon	9	36	1.83
Utah	3	19	0.96
Georgia	5	16	0.81
Pennsylvania	5	13	0.66
Louisiana	4	11	0.56
Colorado	3	6	0.31
Missouri	2	6	0.31
Kentucky	1	5	0.25
Montana	2	5	0.25
New Mexico	2	5	0.25
Delaware	2	4	0.20
Hawaii	2	4	0.20
Arizona	2	3	0.15
Idaho	1	3	0.15
Maine	1	3	0.15
Oklahoma	1	3	0.15
Indiana	1	1	0.05
North Dakota	1	1	0.05
Totals	294	1,970	100.00

Table 3 presents the sample distribution by state. The sample period is 1995–2014 and consists of 36 states.

IV. ANALYSIS AND RESULTS

Descriptive Statistics

Descriptive statistics are presented in Table 4. Over the sample period, the average *TIC* was 3.640 percent and ranged between 0.120 percent and 7.160 percent. Average *NR* is $87.0 per capita.[7] The highest *NR* deficit level is −$425.0 per capita (King County, WA in 1997) and the highest *NR* surplus level is at $1,394.0 per capita (Fairfax County, VA in 2001).[8] The sample largely consists of observations with *NR* surpluses (80.3 percent, n = 1,581), as compared to *NR* deficits (19.7 percent, n = 389). The average state leading index (*ECON*) was 0.978 and varies between −8.204 (Michigan in 2008) and 5.233 (Nevada in 2003). The average population is 551,296 with 97.3 percent (n = 1,916) of the sample representing counties that are classified as urban areas.[9] Corresponding population figures were also used to scale variables for testing (see Appendix A).

The average level of reported unassigned fund balance (*FB*) is $86.0 per capita. The years to maturity (*SLOPE*), a primary proxy for the yield curve, averages 15.6 years. Other proxies for yield curve attributes (*CURVE* and *LEVEL*) average 0.120 and 1.901, respectively.[10] The total amount of bond issues (*AMT*) average $37.2 million. Other variables for bond characteristics (*BID, BR, CALL*) consist of bonds that were competitively bid (94.6 percent, n = 1,865), rated "Aaa" per Moody's (n = 1,707), and callable (73.6 percent, n = 1,449), respectively.

Trends Across the Sample Period

We also study the overall trends for the primary variables (*NR, TIC, ECON*) against the federal funds rate (*LEVEL*). Figure 1 illustrates the averages of these variables across the sample period. As expected, *NR* remained close to zero while borrowing cost (*TIC*) shows a steady decline and reached the lowest around 2012. As described by Wu and Xia (2016), the federal funds rate (*LEVEL*) fell to and stayed below zero after 2009 due to quantitative easing by the Federal Reserve. The trends for *TIC* and *LEVEL* loosely correspond to a steady decline while the state leading indexes (*ECON*) show a more cyclical profile between years 1995 and 2009. Interestingly, average *ECON* shows a sharp increase in 2009 and continued to rise around 2010–2011, which is not in step with the trends for *TIC* and *LEVEL* in the corresponding period. Accordingly, our sample includes sufficient variability in economic conditions to facilitate detection of the associations with *ECON*.

[7] Table 4 reports all net revenue metrics and fund balance metrics as thousands of dollars per capita. In our discussion here, we refer to net revenue metrics and fund balance metrics as per capita amounts. For example, Table 4 reports the average *NR* statistic as 0.087, which represents thousands of dollars per capita. For ease of discussion, we convert to 87 dollars per capita in the text.

[8] *NR* surpluses in the 95 percent and above percentiles of the sample consist entirely of observations from three counties that surround the Washington D.C. metro area: Fairfax County and Loudon County in Virginia, and Montgomery County in Maryland. Per the U.S. Census Bureau, these counties are among the wealthiest counties in the U.S. based on median household income (https://www.census.gov/data/tables/2015/demo/saipe/highlights-tables-2015.html).

[9] Counties with population of 50,000 or greater are considered urban areas (https://www.census.gov).

[10] The *CURVE* variable was transformed to the inverse of years to maturity (i.e., 1/*SLOPE*).

TABLE 4

Descriptive Statistics
(n = 1,970)

Panel A: Continuous Variables

	Mean	Std. Dev.	Min.	Max.	Relative Freq. (%)
Variables					
TIC	3.640	1.220	0.120	7.160	100.0
NR (no magnitude)[a]	0.087	0.204	−0.425	1.394	100.0
MNR[a]	0.102	0.196	0.000	1.394	100.0
SNR[a]	0.094	0.197	0.000	1.394	80.3
DNR[a]	0.008	0.033	0.000	0.425	19.7
ECON	0.978	1.515	−8.204	5.233	100.0
Control variables					
FB[b]	0.086	0.085	−0.177	0.793	100.0
SLOPE	15.574	7.148	0.364	99.000	100.0
CURVE	0.120	0.222	0.010	2.747	100.0
LEVEL	1.901	2.885	−2.986	7.070	100.0
AMT[c]	−9.984	1.254	−16.236	−6.973	100.0

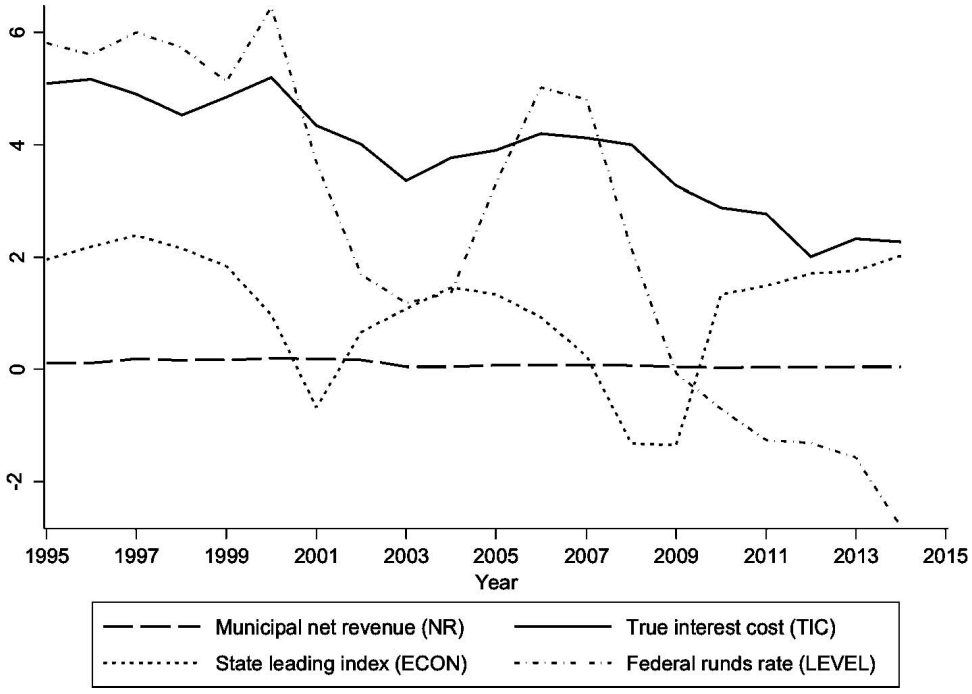
Panel B: Binary Variables

	Assigned Value		Relative Freq. (%)
Variables	0	1	
BID	105	1,865	94.6
BR	263	1,707	86.7
CALL	521	1,449	73.6

Table 4 presents descriptive statistics on all variables used in regression testing. In Panel A, we present transformed statistics for all continuous variables. Panel B presents frequencies of all binary variables.
[a] All *NR* variables are reported as thousands of dollars per capita.
[b] *FB* is reported as thousands of dollars per capita.
[c] *AMT* is the transformed variable computed as the face amount of the issue divided by county population.

In Table 5, we provide Pearson correlations for the variables in our study. As anticipated and consistent with prior literature, positive correlations are found for *TIC* at conventional levels with *NR, MNR,* and *SNR*. A negative correlation is found between *TIC* and *DNR*. The *ECON* variable is negatively correlated with *TIC* but shows no significant univariate association with *NR, DNR,* and *SNR. TIC* is negatively associated with unassigned fund balance (*FB*) and shows the anticipated correlations with the yield curve attributes of *SLOPE, CURVE,* and *LEVEL*. Other control variables also show correlations in the anticipated direction.

FIGURE 1
Average *NR, TIC, ECON,* and *LEVEL* Values from 1995 to 2014 (Inclusive)



This figure presents cross-sectional means for the dependent variable (*TIC*), independent variables (*NR* and *ECON*), and a yield curve attribute, the federal funds rate control variable (*LEVEL*). *TIC* shows an overall decline across the sample period. Relative to *ECON, NR* is fairly stable across the sample period. *ECON* shows dips below zero during recession years (early 2001 and the tech bubble; late 2007 financial crisis and subsequent recession). The overall average trend in *ECON* shows that it does not necessarily move in sequence with *LEVEL*.

Test of H1

In our first specification we test whether economic activity at the state level (*ECON*) moderates the association between the magnitude of net revenue (*MNR*) and *TIC*.[11] The specification restricts the coefficient on positive and negative departures from the equilibrium point ($NR = 0$) to be equal. A significant coefficient for the interaction term, $MNR \times ECON$, provides evidence of a moderating effect (Table 6, Column 2).

We estimate three models that incrementally build to our final specification of Equation (1). All results are reported in Table 6. Column 1 of Table 6 presents regression results when *ECON* is included, but the interaction term ($MNR \times ECON$) is excluded. This initial estimation was

[11] Given significant correlation among some of the variables, a check for multicollinearity was conducted by evaluating variation inflation factors (VIF). VIF scores near or above 10 indicate problems with multicollinearity in the model (Field and Miles 2010). The highest VIF among all the variables is 2.18 for *SLOPE*. Overall, the VIF analysis does not suggest that multicollinearity is an issue in our specifications. Given the potential for heteroskedasticity, the application of robust standard errors in all regressions was used. Results of the Hausman test ($p < 0.001$) confirmed the use of fixed effects over random effects. All models were estimated for the entire sample period (1995–2014).

TABLE 5

Pearson (r) Correlation Values for All Model Variables (n = 1,970)

Variables	*TIC*	*NR*	*MNR*	*SNR*	*DNR*	*ECON*	*FB*	*SLOPE*	*CURVE*	*LEVEL*	*AMT*	*BID*	*BR*	*CALL*
TIC	1.000													
NR	0.189***	1.000												
MNR	0.183***	0.945***	1.000											
SNR	0.189***	0.987***	0.986***	1.000										
DNR	−0.038*	−0.270***	0.060***	−0.110***	1.000									
ECON	−0.065***	0.030	0.039*	0.035	0.023	1.000								
FB	−0.175***	0.147***	0.171***	0.161***	0.056**	−0.025	1.000							
SLOPE	0.515***	0.164***	0.169***	0.169***	−0.003	−0.029	0.029	1.000						
CURVE	−0.340***	−0.089***	−0.085***	−0.088***	0.024	0.059***	−0.058***	−0.544***	1.000					
LEVEL	0.671***	0.216***	0.209***	0.216***	−0.046***	0.111	−0.157***	0.099***	−0.006	1.000				
AMT	−0.020	0.236***	0.266***	0.254***	0.063***	−0.023	0.315***	0.197***	−0.034	−0.034	1.000			
BID	0.028	0.052**	0.045**	0.049**	−0.028	−0.040*	0.081***	0.102***	−0.232***	−0.025	0.021	1.000		
BR	0.125***	0.085***	0.091**	0.089***	0.010	0.000	0.083***	0.235***	−0.458***	−0.003	0.081***	0.186***	1.000	
CALL	0.419***	0.117***	0.119***	0.119***	−0.006	−0.010	0.032	0.664***	−0.439***	0.076***	0.148***	0.140***	0.188***	1.000

*, **, *** Denote significance at $p < 0.100$, $p < 0.050$, $p < 0.010$ levels, respectively (two-tailed).

TABLE 6

Fixed Effect Estimation Results on the Moderation Effect of State Economic Activity on the Association Between Net Revenue Magnitude and Borrowing Cost (n = 1,970)

	Dependent Variable = *TIC*		
Variables	**(1) Base Model**	**(2) *ECON* Interaction**	**(3) *FB* Interaction**
Main Effects			
MNR	0.248**	0.054	−0.248
ECON	−0.052***	−0.065***	−0.067***
FB	−0.905***	−0.872***	−1.419***
Interaction Terms			
MNR × *ECON*	—	0.155**	0.188***
MNR × *FB*	—	—	2.734***
Control Variables			
SLOPE	0.054***	0.055***	0.055***
CURVE	−0.547***	−0.544**	−0.545***
LEVEL	0.268***	0.267***	0.266***
AMT	−0.051***	−0.052***	−0.054***
BID	−0.153**	−0.152**	−0.148**
BR	−0.059	−0.056	−0.056
CALL	0.377***	0.373***	0.375***
R^2 (within)	0.7174	0.7183	0.7195
F-statistic	488.40	445.66	410.83
Model p-value	< 0.001	< 0.001	< 0.001
State Effects	Included	Included	Included

*, **, *** Denote significance at $p < 0.100$, $p < 0.050$, $p < 0.010$ levels, respectively (two-tailed). Significance is computed with robust standard errors.

Key test variables are the magnitude of net revenue (*MNR*) and the state leading index (*ECON*). *MNR* is tested using the absolute value of net revenue (*NR*). *ECON* is the state leading index issued by the Federal Reserve for the relevant State and month in which a county's general obligation bond is issued

conducted to establish that *ECON* contained explanatory power for *TIC*. Results of this first regression show that the overall model is significant ($p < 0.001$) with 71.7 percent of the within-variation explained. *MNR* is positively associated with *TIC* with an estimated coefficient of 0.248 ($p < 0.050$) and supports the notion that departures from *NR* equilibrium in either a negative or positive direction are associated with higher borrowing cost. The estimated coefficient on *ECON* is −0.052 ($p < 0.010$) and indicates a direct main effect on *TIC*. Simply, as state economic activity (*ECON*) increases (i.e., better economy), the borrowing cost (*TIC*) is lower.[12] Both *MNR* and *ECON* appear to be properly included in the model.

[12] Particularly in the latest economic downturn, which is specifically included in our sample period, the actions of the Federal Reserve to increase liquidity at unprecedented levels provided extensive downward pressure on interest rates. Therefore, our finding here is less of a generalizable economic phenomenon as much as it is an artifact of monetary policy.

Column 2 of Table 6 reports the results of the estimation when an interaction term (*MNR* × *ECON*) is included. The overall model is significant ($p < 0.001$) with 71.8 percent of the within-variation explained. Regression results show a positive and statistically significant coefficient for the interaction term, *MNR* × *ECON* (0.155, $p < 0.050$). H1 is supported. The *MNR* variable is no longer significant in the presence of the interaction term, which suggests that the association between *NR* and *TIC* is fully dependent on the level of *ECON*. In the case of the initial regression (no interaction), a one unit increase in departure from net revenue equilibrium for a given level of *ECON* results in an increase in *TIC* of 0.248 percent. In the second regression (with interaction), a one unit increase in the departure from net revenue equilibrium for a given level of *ECON*, results in an increase in *TIC* of 0.155 percent. In sum, this suggests that the omission of *ECON* and its interaction with departures from net revenue equilibrium may result in a misstatement of the marginal effect of departures from *NR* equilibrium.

Column 3 of Table 6 reports the results of the estimation when we also include an interaction term *MNR* × *FB*. This interaction is included to control for the possibility that the association between *MNR* and *TIC* is also influenced by the level of *FB*. The overall model is significant ($p < 0.001$) with 72.0 percent of the within-variation explained. The estimated *ECON* coefficient is larger in magnitude (−0.067) and retains significance ($p < 0.010$). Additionally, the *MNR* × *ECON* coefficient is larger and significant at $p < 0.010$. Our support for H1 is strengthened.

Regression results show a positive and statistically significant coefficient for the interaction term, *MNR* × *FB* (2.734, $p < 0.010$). The sizable and positive coefficient on this interaction term suggests that as fund balances are larger, departures from equilibrium are penalized more severely in the form of higher borrowing costs than is the case when fund balances are lower.

One possible interpretation is that as the current period's net revenue departs from equilibrium, the municipality is either accumulating additional balances (*NR* > 0) beyond an existing fund balance. As the positive net revenue conditions suggests, concerns over excess taxation are met with an increase in *TIC*. In the negative net revenue condition, expenditures exceed revenues putting pressure on existing fund balances. The increase in *TIC* associated with the *DNR* × *FB* may be reflecting the market's assessment of a reliance on *FB* to cover current expenditures. Such a condition is not sustainable.

Test of H2

The second specification is intended to identify if *ECON* provides differential moderation for *SNR* and *DNR* in the association with *TIC*. We relax the restriction of a common coefficient for positive and negative *NR* and a common coefficient for the interaction terms. We identify negative departures (*NR* < 0) as *DNR* and positive departures from equilibrium (*NR* > 0) as *SNR*.[13] The corresponding interaction terms, *DNR* × *ECON* and *SNR* × *ECON*, are also included. All other aspects and variable definitions are identical to that of the first specification.

We estimate three models that incrementally build to our final specification in Equation (2). All results are reported in Table 7. Column 1 of Table 7 reports the results of the estimation excluding the interaction terms. The primary reason for this estimation is to establish that both the negative and positive departures are properly included in the model. The model is significant ($p < 0.001$) with 71.8 percent of the within-variation explained. As anticipated, the estimated coefficients for

[13] Both metrics are reported as absolute values. Thus, a positive coefficient is expected on both as increases in departure from equilibrium, regardless of direction, are expected to associate with increased borrowing costs (*TIC*).

TABLE 7

Fixed Effect Estimation Results on the Moderation Effect of State Economic Activity on the Association between Positive and Negative Net Revenue and Borrowing Cost (n = 1,970)

	Dependent Variable = *TIC*		
Variables	**(1) Base Model**	**(2) *ECON* Interaction**	**(3) *FB* Interaction**
Main Effects			
SNR	0.247**	0.042	−0.266
DNR	0.888**	−0.537	−0.929
ECON	−0.052***	−0.069***	−0.071***
FB	−0.921***	−0.915***	−1.483***
Interaction Terms			
SNR × *CON*	—	0.153**	0.187***
DNR × *ECON*	—	0.968*	1.046**
SNR × *FB*	—	—	2.789***
DNR × *FB*	—	—	3.060
Control Variables			
SLOPE	0.055***	0.055***	0.055***
CURVE	−0.547***	−0.541**	−0.541***
LEVEL	0.268***	0.267***	0.266***
AMT	−0.051***	−0.052***	−0.052***
BID	−0.149**	−0.154*	−0.154**
BR	−0.059	−0.058	−0.060
CALL	0.377***	0.374***	0.376***
R^2 (within)	0.7177	0.7189	0.7202
F-statistic	444.44	377.90	329.28
Model p-value	< 0.001	< 0.001	< 0.001
State Effects	Included	Included	Included
Post hoc test for equality of coefficients (F-statistic and significance reported):			
SNR = *DNR*	2.11		
SNR × *ECON* = *DNR* × *ECON*		2.48	2.77*

*, **, *** Denote significance at p < 0.100, p < 0.050, p < 0.010 levels, respectively (two-tailed). Significance is computed with robust standard errors.

Key test variables are the magnitude of net revenue surpluses (*SNR*), magnitude of net revenue deficits (*DNR*), and the state leading index (*ECON*). *SNR* and *DNR* are tested using the absolute value of net revenue measures. *ECON* is the state leading index issued by the Federal Reserve for the relevant State and month in which a county's general obligation bond is issued.

both *DNR* (0.888; p < 0.050) and *SNR* (0.247; p < 0.050) are positive, suggesting that departure from the equilibrium point is penalized through increased *TIC*. The estimated coefficient on *ECON* is negative and significant (−0.052; p < 0.010).

In Column 2 of Table 7, we report the results of the second specification with interaction terms. The model is significant (p < 0.001) with 71.9 percent of the within-variation explained. Both interaction terms show a positive coefficient. *SNR* × *ECON* shows significance (0.153; p < 0.050). The *DNR* × *ECON* interaction is marginally significant (0.968; p < 0.10). Neither *SNR* nor *DNR*

retain significance in the presence of the interaction terms. This suggests that the association between *NR* and *TIC* is fully dependent on the level of *ECON,* regardless of whether *NR* is a surplus or deficit. In the case of the initial regression (no interaction), a one unit increase in surplus is associated with a 0.247 percent increase in *TIC*. A one unit increase in deficit is associated with a 0.888 percent increase in *TIC*. In the second regression (with interaction), a one unit increase in the departure in the surplus direction, for a given level of *ECON,* results in an increase in *TIC* of 0.153 percent. The estimated coefficient for the *DNR* × *ECON* interaction term indicates that a one unit increase in the deficit direction, for a given level of *ECON,* results in a 0.968 percent increase in *TIC*. In a post-hoc test for equality between *SNR* × *ECON* and *DNR* × *ECON*, we find that the two estimated coefficients are not discernably different at conventional levels ($F = 2.48$, $p > 0.100$). Therefore, while the point estimated coefficients are numerically different, we cannot conclude that they are from different distributions. Therefore, H2 is not supported in the Column 2 estimation. Nonetheless, the effect of *ECON* on both *SNR* and *DNR* suggests that both conditions are moderated by broader economic conditions.

Column 3 of Table 7 reports the results of the estimation when we also include the interaction terms *SNR* × *FB* and *DNR* × *FB,* to control for the possibility that the association between the *SNR* and *DNR* variables and *TIC* is also influenced by the level of *FB*. The overall model is significant ($p < 0.001$) with 72.0 percent of the within-variation explained. Regression results show a positive and statistically significant coefficient for the interaction term *SNR* × *FB* (2.789, $p < 0.010$), but not for *DNR* × *FB*. The estimated *ECON* coefficient is slightly larger (−0.071) and retains significance ($p < 0.010$). In a post-hoc test for equality between *SNR* × *ECON* and *DNR* × *ECON*, we find that the two estimated coefficients are discernable ($F = 2.77$, $p < 0.100$). Taken together, the coefficients for *SNR* × *ECON* and *DNR* × *ECON* are consistent with our predictions that there are asymmetric penalties on *TIC*, when fund balance interactions with departures from equilibrium are considered. The estimation in Column 3 provides support for H2.

This estimation also includes two interaction terms: *SNR* × *FB* and *DNR* × *FB*. Only the coefficient on *SNR* × *FB* is significant and suggests that surpluses are additionally penalized when larger fund balances are present. When an accumulated fund balance already exists, further accumulation via positive net revenue is associated with higher borrowing cost. This implies that in such cases, ability to pay on the bond is not the sole factor in determining borrowing cost. The market's perception of agency issues or managerial competency may be a factor. The insignificant result on *DNR* × *FB* precludes interpretation of that coefficient and suggests that other factors may be responsible for varying levels of *TIC* when *NR* is in the deficit condition.

Additional Analyses

We conduct two additional analyses. First, we explore the possibility that peripheral observations may be driving the primary analysis results. We winsorize the net revenue variables (*MNR, SNR, DNR*) and the economic conditions variable (*ECON*) at the 1 percent level and re-estimate the entirety of our model. For all variables, the sign, relative magnitude, and significance corroborate the primary findings, suggesting that our findings are not the result of extreme or outlier observations. These results are reported in Table 8.

We also re-estimate the entirely of our models after converting the economic variable (*ECON*) to a binary form where positive economic value is coded as 1, and 0 otherwise. An important note is that because the *ECON* variable has been converted to binary, the negative economic activity is left in the model intercept, and the positive economic condition is now an incremental intercept to that of the model intercept. We expect to see changes in the magnitude of our coefficients, as we

TABLE 8

Winsorized *MNR, SNR, DNR,* and *ECON*
Fixed Effect Estimation Results on the Moderation Effect of State Economic Activity on the Association between Net Revenue Magnitude and Borrowing Cost
(n = 1,970)

	Dependent Variable = *TIC*					
	Magnitude of Net Revenue (H1)			Bifurcated Net Revenue (H2)		
Variables	(1) Base Model	(2) *ECON* Interaction	(3) *FB* Interaction	(4) Base Model	(5) *ECON* Interaction	(6) *FB* Interaction
Main Effects						
MNR	0.260**	0.052	−0.252	—	—	—
SNR	—	—	—	0.277***	0.059	−0.250
DNR	—	—	—	1.249*	−0.205	−0.612
ECON	−0.055***	−0.069***	−0.070***	−0.055***	−0.074***	−0.076***
FB	−0.906***	−0.871***	−1.412***	−0.914***	−0.913***	−1.506***
Interaction Terms						
MNR × *ECON*	—	0.159**	0.191***	—	—	—
SNR × *ECON*	—	—	—	—	0.163**	0.194***
DNR × *ECON*	—	—	—	—	1.195*	1.212*
MNR × *FB*	—	—	2.839***	—	—	—
SNR × *FB*	—	—	—	—	—	2.928***
DNR × *FB*	—	—	—	—	—	4.207
Control Variables						
SLOPE	0.054***	0.054***	0.055***	0.055***	0.055***	0.055***
CURVE	−0.546***	−0.544***	−0.544***	−0.547***	−0.539***	−0.540***
LEVEL	0.268***	0.267***	0.266***	0.268***	0.267***	0.266***
AMT	−0.051***	−0.052***	−0.053***	−0.051***	−0.059***	−0.053***
BID	−0.153**	−0.153**	−0.149**	−0.147**	−0.151**	−0.147***
BR	−0.060	−0.057	−0.060	−0.060	−0.058	−0.061
CALL	0.377***	0.373***	0.375***	0.377***	0.375***	0.377***
R^2 (within)	0.7175	0.7183	0.7196	0.7178	0.7190	0.7203
F-statistic	488.73	445.80	410.96	444.76	378.15	329.51
Model sig.	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
State Effects	Included	Included	Included	Included	Included	Included
Post hoc test for equality of coefficients on *ECON* interactions (F-statistic and significance reported):						
SNR × *ECON* = *DNR* × *ECON*					2.77*	2.62

*, **, *** Denote significance at $p < 0.100$, $p < 0.050$, $p < 0.010$ levels, respectively (two-tailed). Significance is computed with robust standard errors.

have changed the functional form of a key variable in our model. Nonetheless, such an implementation may assist in interpreting the effect of the economic conditions on *TIC*. We re-estimate the entirety of our analysis with *ECON* as a binary variable and report the results in Table 9.

A few apparent differences in the results of this alternative estimation are worth expanded discussion. First, in Column 3 of Table 9, *MNR* exhibits a negative coefficient. Joint consideration

TABLE 9

***ECON* in Binary Form**
Fixed Effect Estimation Results on the Moderation Effect of State Economic Activity on the Association Between Net Revenue Magnitude and Borrowing Cost
(n = 1,970)

	Dependent Variable = *TIC*					
	Magnitude of Net Revenue (H1)			Bifurcated Net Revenue (H2)		
Variables	(1) Base Model	(2) *ECON* Interaction	(3) *FB* Interaction	(4) Base Model	(5) *ECON* Interaction	(6) *FB* Interaction
Main Effects						
MNR	0.254**	−0.124	−0.489**	—	—	—
SNR	—	—	—	0.252**	−0.144	−0.504**
DNR	—	—	—	0.888**	−3.715**	−4.038**
ECON	−0.226***	−0.268***	−0.274***	−0.227***	−0.296***	−0.303***
FB	−0.880***	−0.856***	−1.385***	−0.896***	−0.919***	−1.442***
Interaction Terms						
MNR × *ECON*	—	0.445**	0.566***	—	—	—
SNR × *ECON*	—	—	—	—	0.449**	0.572***
DNR × *ECON*	—	—	—	—	4.896***	5.065***
MNR × *FB*	—	—	2.639***	—	—	—
SNR × *FB*	—	—	—	—	—	2.663***
DNR × *FB*	—	—	—	—	—	2.140
Control Variables						
SLOPE	0.054***	0.054***	0.055***	0.054***	0.054***	0.054***
CURVE	−0.557***	−0.555***	−0.557***	−0.558***	−0.552***	−0.553***
LEVEL	0.267***	0.267***	0.266***	0.268***	0.266***	0.266***
AMT	−0.050***	−0.051***	−0.052***	−0.050***	−0.052***	−0.053***
BID	−0.162**	−0.162**	−0.158**	−0.158**	−0.165**	−0.161**
BR	−0.060	−0.057	−0.059	−0.060	−0.057	−0.059
CALL	0.379***	0.377***	0.378***	0.378***	0.380***	0.381***
R^2 (within)	0.7188	0.7194	0.7206	0.7191	0.7207	0.7218
F-statistic	491.73	448.28	413.05	447.47	381.26	332.00
Model sig.	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
State Effects	Included	Included	Included	Included	Included	Included
Post hoc test for equality of coefficients on *ECON* interactions (F-statistic and significance reported):						
SNR × *ECON* = *DNR* × *ECON*					6.59**	6.64***

*, **, *** Denote significance at p < 0.100, p < 0.050, p < 0.010 levels, respectively (two-tailed). Significance is computed with robust standard errors.

of *MNR* and *MNR* × *ECON* have a positive effect. However, taken in the context of the *MNR* × *ECON* coefficient, the model demonstrates a net positive effect of *MNR,* consistent with prior iterations of our analysis. The same effect is found in Columns 5 and 6 of Table 9. Possibly the most interesting result of this estimation is the differential magnitude of the *SNR* × *ECON* and *DNR* × *ECON* interaction terms. The post-hoc test for equality in these coefficients provides the strongest evidence yet in support of our second hypothesis.

In sum, all our analyses provide support for the notion that the *ECON* variable is valuable in explaining the variability in observed *TIC*. The preponderance of evidence supports both of our hypotheses. Table 10 summarizes all results for interactions terms tested in H1 and H2.

Discussion

Across all tests, the control variable for bond rating (*BR*) showed no significance at conventional levels. Also, our R-squared values across all specifications exceed those achieved in prior work. We attribute our model performance to three primary factors: the use of a homogeneous sample, the implementation of the *ECON* variable, and the application of a state fixed effects estimation.[14] Substantial literature (e.g., Park 1996; McDonald 2015) discusses heavy reliance of counties on states, as well as the inextricable relationship between growing public expenditures in counties and the amount of intergovernmental aid from federal and state levels of government. Accordingly, we believe the improved R^2 values are also attributable to the introduction of the State Leading Index (i.e., *ECON* variable).

We also observe that the addition of interaction terms provided minor improvement to the R^2 values. Our interpretation of this result is that the *ECON* variable nearly and/or fully moderates the relationship between municipal net revenue (*NR*) and borrowing cost (*TIC*); thus, *ECON* is properly specified in the model. In sum, it stands to reason that a certain level of borrowing cost depends not only on the degree to which a municipality can maintain *NR* near zero, but also on the projected economic growth (or decline) of the state. Uniquely, the *ECON* variable is designed by the Federal Reserve to serve as a coincident index that indicates current and future economic activity at the state level. This perspective contrasts with that represented by *NR,* which indicates past performance. In sum, we believe our results, given the application of the interaction terms, suggest that past performance may be of less importance than the future opportunity for performance.

This study is limited in three ways. First, the sample selection was strictly based on primary county governments that corresponded directly to the CAFR data. This decision was made to provide greater homogeneity in the sample. Also, as with many panel data, the sample was unbalanced and thus, further limits the findings to counties that make up most of the observations in the sample. Second, our sample is heavily influenced by a few states. While our sample yielded results to perform a range of analyses, future research with a more robust sample can help to validate and/or inform our findings. Third, our study does not consider greater regulatory oversight stemming from the Dodd-Frank Act of 2010. Given data limitations, we did not include control variable(s) to account for changes related to Dodd-Frank. The full effects of this important legislation have yet to be extensively studied in the governmental accounting context. One provision that came from this legislation was a requirement for dealers to register with the Municipal Securities Rulemaking Board (MSRB) before engaging in municipal bond sales.[15] Whether greater oversight affected factors related to borrowing cost are yet to be fully understood.

[14] Specifically, we conducted a partial replication of the Apostolou et al. (2014) study. Their study included all general obligation bonds issued by county-level entities from 1995 to 2007 and applied a county-level fixed-effect estimation and reported a within R^2 of approximately 36 percent. In our partial replication, we used only general obligation bonds issued by primary county governments over the same time period and applied state-level fixed-effect estimation. We achieved an R^2 of approximately 56 percent with comparable coefficient to that of Apostolou et al. (2014). Based on the successful replication we moved forward with our analyses to investigate the importance of the economic activity (*ECON*) in determining borrowing cost.

[15] http://www.msrb.org/Regulated-Entities/MSRB-Registration.aspx

TABLE 10

Summary of Results for H1 and H2

	Primary Model (Tables 6 and 7)	Winsorized Model (Table 8)	Binary Model (Table 9)
Test for H1: The association between net revenue magnitude and borrowing cost is conditioned on state economic activity.			
Without *FB* interactions	$MNR \times ECON > 0$	$MNR \times ECON > 0$	$MNR \times ECON > 0$
	$SNR \times ECON > 0$	$SNR \times ECON > 0$	$SNR \times ECON > 0$
	$DNR \times ECON > 0$	$DNR \times ECON > 0$	$DNR \times ECON > 0$
With *FB* interactions	$MNR \times ECON > 0$	$MNR \times ECON > 0$	$MNR \times ECON > 0$
	$SNR \times ECON > 0$	$SNR \times ECON > 0$	$SNR \times ECON > 0$
	$DNR \times ECON > 0$	$DNR \times ECON > 0$	$DNR \times ECON > 0$
H1 Summary	Evidence supports H1	Evidence supports H1	Evidence supports H1
Test for H2: Deficit net revenue is assessed more severely on *TIC* than surplus net revenue when the state's economic activity is strong.			
Without *FB* interactions	$SNR \times ECON = DNR \times ECON$	$SNR \times ECON < DNR \times ECON$	$SNR \times ECON < DNR \times ECON$
With *FB* interactions	$SNR \times ECON < DNR \times ECON$	$SNR \times ECON = DNR \times ECON$	$SNR \times ECON < DNR \times ECON$
H2 Summary	Evidence supports H2 in the *FB* interaction model	Evidence supports H2 when the *FB* interaction is excluded	Evidence supports H2

V. CONCLUSION

We investigate the effects of state economic activity on the association between net revenue and borrowing cost. Our inquiry was motivated by the enduring pressures placed upon local governmental officials to maintain equality between revenues and expenditures and the reality that this optimal condition (i.e., net revenue = 0) is largely dependent on the state's economy. To our knowledge, no study has explored the relationship between the state's economic activity and its influence on the association between net revenue and borrowing cost.

We test our assertion using a sample of general obligation bonds issued by primary county governments across twenty years. Our results show that the information content of net revenue is fully conditioned on state economic activity. Specifically, we find that state economic activity positively moderates departures of net revenue from an equilibrium benchmark. Our finding shows that the municipal bond market assesses departures of net revenue from equilibrium more severely when economic conditions are good. While good economic conditions are associated with lower borrowing costs in general, departures from equilibrium are penalized more severely in good economic conditions than in bad. This suggests that the ability of county officials to maintain equilibrium is assessed more severely when times are good in the economy. In contrast, when there is a bad economy, the market's overall expectation of management's ability to balance revenues and expenditures is generally lower. In sum, these findings are consistent with our expectations that accounting information is interpreted differently when the state economy is considered.

The observed positive moderation of state economic activity persists in both the surplus net revenue and deficit net revenue conditions. This suggests that the potential problems associated with the surplus net revenue condition are considered more acute in periods of favorable economic conditions than in periods of poor economic conditions. When the economy is strong, managers should be able to achieve the equilibrium net revenue condition more easily. Results for the deficit net revenue condition also suggest that the penalty is higher in favorable economic conditions relative to poor economic conditions. In poor economic conditions, when the revenue generating capacity of the county is likely limited, the market concedes that the economic environment may be driving the deficit rather than managerial choice or competency.

The relative magnitude to the coefficients on the interaction terms for the surplus net revenue and deficit net revenue conditions with economic activity is of particular importance. The magnitude of the deficit net revenue interaction term is consistently larger than that of the surplus net revenue interaction terms throughout our analysis. Counties with surplus net revenue conditions are assessed less of a penalty than are counties reporting a deficit net revenue condition. Nonetheless, both deficit and surplus departures are assessed a penalty via borrowing cost. The effect on borrowing cost uniformly reflects greater investor doubts over the deficit net revenue condition relative to the surplus net revenue condition. In all cases, as economic conditions improve, the penalty for departure from the equilibrium increase, but always more severely in the deficit case.

Future research might examine whether state economic activity is also a significant variable in other established relationships between governmental accounting measures and market responses. We also suggest research that examines the incentives surrounding the importance of the benchmark of net revenue equilibrium and other potential consequences related to deviations from the same. Whether these collective actions are beneficial for the long-term, economic well-being of the municipality is uncertain. Unlike corporate earnings, the specific properties of net revenue and/or other similar performance measures in the governmental setting

have yet to be explored. Specifically, the modified-accrual basis of accounting makes net revenue a unique measure. Future studies might also apply the earnings quality framework from corporate literature to investigate the extent to which net revenue mimics earnings behavior versus cash flow behavior.

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APPENDIX A

Variable Definitions

Variable	Name	Definition
True interest cost	*TIC*	Interest expense incurred by county (*i*) issuer of municipal bonds; reported as a percentage.
Net revenue	*NR*	Total revenues minus total expenditures by population.
Magnitude of net revenue	*MNR*	Equal to the absolute value of *NR*.
Magnitude of net revenue (surplus)	*SNR*	Equal to the absolute value of *NR* if *NR* is in a surplus condition (i.e., $NR > 0$), and 0 otherwise.
Magnitude of net revenue (deficit)	*DNR*	Equal to the absolute value of *NR* if *NR* is in a deficit condition (i.e., $NR < 0$), and 0 otherwise.
State leading index	*ECON*	The leading index for the State (*j*) for the month in which the county issued the bond.
Unassigned fund balance	*FB*	Unassigned fund balance scaled by population.
Yield curve slope	*SLOPE*	The years-to-maturity of the bond issue.
Yield curve curvature	*CURVE*	The inverse of the years-to-maturity of the bond issue (i.e., inverse of the *SLOPE* variable).
Yield curve level	*LEVEL*	The combination of the effective federal funds rate (1995–2008) and the shadow federal funds rate (2009–2014), for the same month in which the bond was issued.
Bond issue amount	*AMT*	Natural log of the face amount of the bond issue scaled by population.
Pricing mechanism	*BID*	A binary variable assigned the value of 1 if issue was competitively bid; 0 if negotiated.
Bond rating	*BR*	A binary variable assigned the value of 1 if the issue carries the "Aaa" Moody's rating; else 0.
Call feature	*CALL*	A binary variable assigned the value of 1 if the bond issue is callable; else 0.