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Issuer Sophistication in
Municipal Securities Markets**

Stephan Whitaker



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**Financial Innovations and Issuer Sophistication
in Municipal Securities Markets**

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When local governments default or file for bankruptcy, it is often because public officials misunderstood the risks associated with innovative financial products. If unsophisticated municipal bond issuers were to widely adopt a high risk financial product, this could harm taxpayers and investors, as well as destabilize the financial system. This analysis uses municipal bond issuers' total debt outstanding as a proxy for their sophistication and investigates the relationship between sophistication and adoption of financial innovations. Using comprehensive data on securities issued between 1992 and 2012, 25 innovations are identified. Products with these features were uncommon in the 1990s, and expanded their market share after 2000. The 600 issuers that back 75 percent of the outstanding debt adopted 21 innovations for a greater fraction of their new issuance, relative to the approximately 40,000 smaller market participants. When innovation-linked debt issuance is measured relative to annual expenditures, the mid-level jurisdictions adopted innovations to a significantly greater extent than either states and sophisticated jurisdictions or unsophisticated jurisdictions. The results suggest oversight should be concentrated on mid-level local governments where past innovations have made the greatest inroads.

Keywords: Financial innovation; Public financial management; Municipal bonds.

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1 Introduction

The use of an innovative financial instrument is one of the few themes that recurs in the histories of municipal defaults and bankruptcies. For example, the resolution of interest rate swaps has been a central issue in the recent bankruptcies of both Jefferson County, Alabama, and the City of Detroit (Howell-Moroney and Hall 2011; Devitt 2014). In 1994, Orange County, California, defaulted due to an ill-advised issuance of the innovative security of the time, pension obligation bonds (Noble and Baum 2013). Such incidents of acute financial distress for state and local governments have been quite rare, which could lead to the misconception that use of innovative financial products by municipal debt issuers is also rare. The adoption of municipal finance innovations was actually widespread during the last decade. Using a comprehensive data set of municipal debt issuance, I have identified 25 features of securities that were used with less than five percent of bonds by par value in the 1990s, and then significantly expanded their market share through 2007. At the peak of the business cycle, over 60 percent of new municipal debt was raised using bonds with features that were little known just a few years earlier. Understanding the patterns of adoption and the characteristics of the adopters can help us to improve the use of financial products by state and local issuers, identify any need for intervention by states or regulators, and inform financial stability oversight.

After linking the securities data to the Census of Governments (COG), we can see that the largest cities and smaller states were the most rapid adopters of innovations in terms of market share. If the innovation-linked debt issuance is measured relative to annual expenditures, it is the mid-sized cities, counties, school districts and special districts that appear to be the most aggressive adopters. The thousands of small cities, counties, and districts that occasionally issue debt were much less likely to use innovative products such as variable rate securities, derivatives, and put options. However, there were three innovations that were used most extensively by small issuers as they spread throughout the market, so there is precedent for the least-experienced and least-sophisticated issuers to be the primary

adopters of some innovations.

The recent reforms of financial regulation, centered around the Dodd-Frank Act, have tasked regulators with anticipating sources of financial instability. One potential source of destabilization that is being examined is municipal capital markets. Every financial crisis has some unique characteristics and reveals some downside risk that the market did not anticipate. If all risks were anticipated, they would be priced accordingly and insured against where possible. No systemwide financially destabilizing event has arisen from the municipal debt markets, so there is no case study, much less a series of events that could be empirically analyzed for regularities. The financial stability regulator must ask a question such as, “if unknown risks enter this market, how would they arise and spread?” A reasonable assumption would be that widespread financial distress among municipal debt issuers might display the characteristics seen in the few past municipal defaults and bankruptcies. In several cases, including those of Orange County, CA, and Detroit, MI, the municipal governments entered into unusual debt contracts that they did not fully understand. Any innovative product could be poorly understood. There is no history or track record to enable the measurement of risk. Sophisticated financial market participants may be able to piece together foresight using knowledge of analogous products and financial theory. Unsophisticated market participants routinely hire bond counsels and financial advisors because they lack expertise to structure even simple, traditional bond issues. These same public officials would stand little chance of identifying and estimating the potential risks of an innovative product.

This situation motivates the question of whether it is sophisticated or unsophisticated issuers who are adopting the municipal financial innovations. If it is the unsophisticated issuers, then we would be concerned about a number of adverse consequences. The debt instrument may cause hardship to taxpayers and recipients of municipal services if the instrument demands large, unanticipated payments in the future. Investors may be harmed if the issuers default. The financial system could be destabilized if hundreds of small, unsophisticated issuers experience financial distress due to a widely-adopted financial innovation.

In this case, technical assistance or oversight might be needed to help small municipal issuers understand the risks associated with an innovative product, and keep those risks at an acceptable level.

If financial innovation is concentrated among the larger, more-sophisticated debt issuers, the probability that risks are not understood may be lower, but the impact to the financial system from a detrimental product would be greater. If the largest 60 of the 40,000 municipal debt issuers all adopted an innovation that proved destabilizing, fully half of the \$3.7 trillion of municipal debt outstanding would be exposed.

Financial innovations present an opportunity as well as a risk. This opportunity might be of great interest to debt issuers, even if it is not a concern for regulators. Information asymmetries could preclude the functioning of an efficient market for innovative municipal securities. If we observed that only the largest, most-sophisticated debt issuers are using new products, we may ask if smaller, less-sophisticated issuers could also benefit from these products. Less-sophisticated issuers may not be aware of the innovations, or they may avoid them because they are unable to assess the risks. In this case, the technical assistance of sophisticated, disinterested intermediaries, such as state bond banks, may be able to remove the information asymmetries, realize lower borrowing costs for taxpayers, and create new investment opportunities for bond holders.

In this analysis, there is no attempt to classify any of the innovations as safe, risky, advantageous, or detrimental to issuers, intermediaries, or investors. That determination is left entirely to other research. The focus of this study is only on the patterns of adoption of features that were rare in the recent past. If a beneficial or malevolent innovation were to enter the market in the future, these past patterns of adoption are the best guidance we have regarding how the new product likely would spread.

The balance of this paper will proceed as follows. Section 2 will review the relevant literature on financial innovation and the sophistication of market participants. Section 3 will describe the data sets, the merging process, and the definitions of the variables in

the analysis. Section 4 explores the descriptive statistics, graphs, and fitted models that illuminate the patterns of adoption of the municipal finance innovations. Section 5 concludes with a brief discussion of the policy implications.

2 Literature

Research on financial innovation has grown as the pace of innovation itself has accelerated. Most of the focus has been on private sector financial innovation, but the concerns raised in this literature can also be extended to public sector finance, as in this analysis. Raghuram Rajan published a paper in 2006 that asked, “Has finance made the world riskier?” (2006) His answer was affirmative and his argument was that a new type of financial intermediary had arisen which had incentive to take on extensive risk. Herd behavior among these intermediaries meant that economies were “more exposed to financial-sector-induced turmoil than in the past.” The events of the financial crisis confirmed his misgivings to a great extent, as innovative financial products drew shocks from the tail of their risk distribution.

With hindsight, efforts are underway to create theoretical models that explain why financial service providers create innovative products and how these products affect financial crises (for example, see Thakor 2012). Korinek and Kremer have approached the question from a distributive perspective (2013). They argue that deregulation allows financial firms to take on more risk via financial innovations, which results in disruptions to the real economy. A regulator trading off efficiency in the financial sector against efficiency in the real economy may opt to increase regulation if the socialized losses exceed the financiers’ private gains. In the legal field, there have been suggestions regarding ways to regulate financial innovation, such as Posner and Weyl’s proposal for an FDA-like approval process for new financial instruments (2013).

In this analysis, I will use the term sophistication to refer to the ability to understand and assess the risks of an innovative financial product. Levels of sophistication will vary

enormously among municipal debt issuers. Market participants range from small towns with part-time elected officials and no staff to states that employ dozens of career professionals with advanced degrees in accounting and finance. There has been research conducted on financial sophistication and its impact on institutional operations. This analysis will contribute to that literature.

While a gap in sophistication between finance professionals and nonspecialists would be expected, past studies have identified variation in levels of sophistication even among finance professionals. Menkhoff, Schmeling, and Schmidt surveyed institutional investors, financial advisors, and nonprofessionals who invest their own savings (2010). They used several measures of sophistication based on the extent to which the respondents' portfolios reflected common investing heuristics and errors. They found that some institutional investors appeared more sophisticated than the amateur investors, but financial advisors actually fared worse than amateurs in general. Dreu and Bikker reviewed the portfolios of 857 Dutch pension fund investors (2012). Although all of their subjects were professionals, they did find that managers of larger funds employed more-sophisticated investment strategies. Another recent study asked a similar question regarding the sophistication of the financial managers at small family firms. Di Giuli, Caselli, and Gatti used the generation of the current owners (1st, 2nd, 3rd, etc.) and the presence of nonfamily shareholders and chief financial officers as proxies for sophistication (2011). They found that more-sophisticated small firms made use of more complex and innovative financial products. If the findings presented here are consistent with this literature, we will observe sophisticated financial professionals at the largest jurisdictions making more extensive use of the innovative products in municipal markets than their less-sophisticated peers.

One study that is perhaps closest in substance to this one arrives at an opposing conclusion. Pérignon and Vallée use data on loans to French municipalities and elections data for those same municipalities (2013). They find that investment banks sold interest rate hedges to French municipalities that were fixed for a single year and then reset, providing highly

profitable options to the banks. In hindsight, these “toxic loans” had little value for the municipalities. The authors present evidence that elected officials purchased them to shift risk and take advantage of the political cycles. There also appeared to be herding behavior in which municipalities were more likely to purchase the hedges if nearby municipalities had purchased them. In contrast to the investor studies discussed above, if this analysis is consistent with Pérignon and Vallée’s results, we may observe the least sophisticated municipal debt issuers adopting innovations earlier.

Differences in information and sophistication naturally lead to the question of agency. Some work has been done on the role of agency in municipal bond markets. Roden, Poe, and Braswell find that if bond counsels are involved in an issuance, the borrowing costs are significantly lower for the issuers (2003). In contrast, issues in which both an issuer’s counsel and the underwriter’s counsel are active result in higher borrowing costs. Vijayakumar and Daniel present evidence that issuers that employ the services of a financial advisor, in addition to the other professional assistance they employ, realize lower borrowing costs (2006).

The research presented here is a step toward thinking about the agency problem for municipalities contemplating innovative financial products. In previous research, the impact of agent behavior was primarily measured via the cost of borrowing. If differences in adoption of financial innovations exist, an agent’s positive contribution to the process may be guiding the information-disadvantaged issuer into a favorable innovative product, or helping the issuer avoid an unfavorable innovative product.

3 Data and Variable Definitions

The data used in the analysis originates in the Mergent Municipal Bond Securities Database and the Census of Governments (COG). The Mergent database contains bond-characteristic

data on 2,678,171 bonds issued from 1992 to 2012.¹ The Mergent issue database groups these bonds into 288,359 issue series and provides the name of the issuer. The Mergent data are merged with the COG data using the issuer name.

The COG is collected every five years, and this analysis makes use of the 1992, 1997, 2002, and 2007 censuses. The COG aims to enumerate every independent county, township, incorporated city or town, special district, and school district in the US. The total number of unique local governments in the four censuses is 98,280. Counts within each year are closer to 70,000 because between each census, some governments are incorporated and others dissolved. The COG observations are categorized into the types listed above. The first step in merging the bond data is to identify the level of government using keyword searches in the bond issuer name string. I then match on names within the state and category. This step links 184,946 of the issues to COG governments. Issues that have not matched within categories are then checked against the counties, cities, and state governments. This results in an additional 96,812 matches. These matches are primarily departments of the independent governments that can be matched using the jurisdiction name. For example, the Cleveland Metroparks is an independent, regional special district, and its bonds would be linked to its record in the COG in the first matching step. Bonds issued by the Cleveland Department of Parks would be linked to the City of Cleveland in the second step.

For the analysis, the government is the unit of observation, so the merged data sets are collapsed to the 26,938 governments that have bond issues observed. The large difference between the total number of governments and the count of unique issuers is due in part to the prevalence of regional or statewide aggregate issuers and bond banks. Many state agencies are established for the sole purpose of issuing municipal bonds and relending the proceeds to local governments. This set-up delivers economies of scale and lowers borrowing costs (Robbins and Kim 2003). More importantly for this analysis, these agencies employ

1. There are 262,069 observations dated before 1992, but the annual counts are generally less than half of the post-1992 counts. The pre-1992 observations may only represent a subset of all bonds issued, and the selection into that sample could be correlated with some of the characteristic measures that are key to the analysis.

career public finance professionals. They may serve as sophisticated, unbiased agents for local governments that could not develop financial expertise in-house. Most bond banks are organized as independent special authorities, so the COG includes separate measures of their finances. The agencies might not be tracked separately if they are organized as a department of the state government or as a nonprofit organization, rather than as an independent government.

From the COG data, one could derive at least six proxies for sophistication: long-term debt outstanding, population, own revenue, expenditures, financial administration expenditures, and central staff expenditures. The total long-term debt outstanding is the most direct measure, because it quantifies past experience with debt issuance and current experience with debt service. Population, own revenue (tax receipts) and expenditures provide a measure of the scale of government. Sophistication should be positively correlated with scale, but the connection is weak in some cases. Some municipal governments list high expenditures, but they are actually small operations that channel federal or state transfers. In other instances, a jurisdiction may collect a large volume of taxes but have little experience with debt issuance because capital improvements are handled by a geographically overlapping public works authority. Population could also be a poor proxy for sophistication in many cases. Consider that a small museum may technically serve its entire state's population. Port authorities that specialize in infrastructure financing usually report having no population at all. The COG-reported expenditures on central staff and financial administration are an intriguing possibility, as they would seem to provide a very good measure of sophistication. However, the values recorded are zero for at least 67 percent of governments. In two alternative specifications, I do investigate the differential adoption of innovations by municipalities that report nonzero central staff and financial administration expenditures.

From the COG one can also derive some indicators of fiscal health. These are included in one of the alternate specifications. Governments that are distressed, or are in an unusually strong fiscal position, may be more or less likely to adopt innovative financial products.

The fiscal health measures include changes in population, intergovernmental transfers, own revenue, and the per capita burden of long-term debt outstanding. The final fiscal health variable is an indicator of whether the jurisdiction ended the fiscal year with any short-term debt outstanding. Nearly all the local governments studied here strive to balance operating budgets within the year. Over 90 percent of the entities report no short-term debt in each census. Those carrying short-term debt into the next fiscal year may be experiencing distress.

The Mergent data include 28 variables that track features of municipal securities. Each category of the categorical fields was considered as a potential innovation, as were extreme values of the continuous variables. Forty-six variables were identified as potential innovations using the criteria that they were associated with less than five percent market share in the 1990s. Of these, 25 expanded their market share at some point after 2000, and therefore are considered innovations for this analysis.² Table 3 presents descriptive statistics for these innovations. The second column of the table notes which features are common and dominate the market share. The Mergent field called “coupon type” lists nine types of variable rates. The designation “variable” is the most common, but the other types of rate resetting are included in the measure. Mergent’s field “debt type” indicates that most securities are bonds. The debt-type category “derivative” displays the use pattern of an innovation. Twenty-one other debt types also have market shares below five percent in the 1990s. None of these other types grow to the same extent as derivatives, but together they represent a widespread adoption of formerly rare debt types. The “Purpose” and “Offer Type” innovations are also composites of the uncommon designations within their field.

The municipal market had been so dominated by untaxed securities that it is often

2. The uncommon features that did not expand their market share include: (1) Coupons more than two standard deviations above the mean (2) settlement dates more than 60 days (3) maturity amounts less than 100 (4) maturity amounts greater than 100 (5) coupon types other than fixed, premium, discount and variable (6) deferred interest conversion dates (7) security types other than general obligation or revenue (8) bond registration (9) having a depository (10) more than three bond counselors (11) using a depository agent (12) more than one escrow agent (13) more than one exchange agent (14) using an investor relations agent (15) more than one lead underwriter (16) using any other (uncategorized) agent (17) more than two paying agents (18) more than one registration agent (19) more than one transaction agent (20) more than one trustee (21) more than 10 underwriters.

referred to as “the exempt market.” The use of federally taxable bonds and bond subject to the alternative minimum tax grew substantially after 2000.³ The “small-insurer” innovation represents the use of any insurer other than the four “monoline” insurers that ruled the market for decades. Several dozen other insurers appear in the Mergent data, each of which has a market share well below five percent. The performance of these small insurers would not be as evident as that of the monolines, so purchasing insurance from them is a type of innovation. The use of some option features and agents also display the patterns of an innovation. Put options became common, as did unusual call types and frequencies. The Mergent data list all agents involved in a bond issuance. Several types of agents were rarely used in the 1990s but became more common after 2000. In the case of financial advisors, having one or two involved has always been common, but issuances after 2000 increasingly employed a third, fourth, and fifth financial advisor.

There are five instances in which pairs of the innovations have correlations above 0.7. However, in each of these instances one of the items appears without the other in at least 22 percent of the bonds that have the more frequent feature. They are all treated as separate innovations. The “any innovation” measure includes the par value of any bond with one or more innovative features. The par value is counted just once when the same bond employs multiple innovations.

There are two outcome variables that are explored in the analysis below. The first is referred to as “market share” and calculated as an issuer’s total innovation-linked par value within a year divided by the issuer’s total par value issued in that year. In all descriptions and models of this outcome, each observation is an equally-weighted issuer-year. The statistics and coefficients represent the typical issuer within each sophistication category. They are not

3. The Build American Bond program is great example of an innovation in the municipal securities market and unanticipated risks it can create. In the 2009 American Recover and Re-investment Act, Congress experimented with a long-discussed replacement of the implicit federal subsidy of municipal bonds (via federal tax exemption) with a cash interest subsidy. This was intended to make US municipal bonds attractive investments for foreigners who have no US tax liability. During the government shut-down and sequestration in 2013, the BAB subsidies were both delayed and reduced indefinitely (Lambert and Temple-West 2013). When municipal issuers were considering whether to participate in the innovative BAB program, it seems unlikely that they assessed the risk that federal government would fail to deliver the subsidies as promised.

dominated by the largest issuer or largest issue within the year. This market-share analysis is intended to allow us to make general statements about the actions of certain types of institutions.

The second outcome variable was chosen specifically to facilitate the discussion of financial stability issues. This outcome, referred to as the “ratio” is the total innovation-linked issuance within a year divided by the issuer’s annual expenditures. The ratio reflects the assumption that risks would be proportional to the par value of the innovative securities. Also, we assume that the larger the issuers annual expenditures, the more easily it can adjust to absorb any unanticipated costs associated with the securities. If, for example, an issuer issues innovative securities equal to one percent of its annual budget and finds that some provision forces the bonds to be repaid earlier than expected, the issuer can easily cover this cost within its operating budget. On the other hand, if the par value of the securities equals 50 percent of the issuer’s annual expenditures and an unanticipated rollover is needed, but no investors want to participate, the issuer is facing default. Obviously, this financial distress will impact the value of all the issuer’s other debts whether innovative or traditional. All parties holding that debt will be impacted.

In all analysis of the ratio, the issuers are weighted by their total long-term debt outstanding. In financial stability regulation, size and systemwide connectivity matters. The larger the outstanding debt of an issuer, the more widely held its debt is likely to be. Thus a greater portion of the financial system has some exposure to the risk of the issuer’s distress.

4 Results

4.1 Descriptive Statistics

The universe of state and local governments which participate in credit markets averages just under 41,000 entities in the years 2000 through 2012 (see Table 1). Incorporated cities are the most common, with just over 13,000 entities. School districts and special districts

each comprise about a quarter of the issuers. When the issuers are categorized so that each category corresponds to one-quarter of the debt outstanding in the year, the third and fourth quartiles contain approximately 40 states and 20 substate governments with the greatest debt outstanding. The second-quartile contains ten smaller states and approximately 560 midsized local governments. Frequency of participation in the market varies substantially with the size and type of issuer. All states are observed to issue some debt every year. Among the second, third, and fourth quartile local governments, a majority of the issuers are issuing in any given year. In contrast, only 14 percent of the first-quartile local governments issue in an average year. If all these small governments had similar credit market participation, they would come to market approximately every seven years. However, within this category there is still a full range of frequencies, from annual participation to only a single observed issuance in 21 years.

Table 2 summarizes the population, debt outstanding, and several other financial measures of the issuers. The local governments in the first-quartile average 24,000 constituents, while the second-quartile issuers are in the range of several hundred thousand. The zero population observations are special districts, such as the Port Authority of New York and New Jersey. Special districts can be among the largest borrowers while having no residents. From the first through the fourth quartile of debt outstanding, the average indebtedness increases over 1000 fold. No first-quartile issuer is observed carrying over \$500 million in debt, while no third-quartile issuer is observed with less than \$4 billion. The overlap between the categories arises because the categorization is defined within each year, and real indebtedness grows throughout the study period. The measures of total expenditures, own revenue, and expenditures on central staff reflect the same variance of scale. A majority of first- and second-quartile issuers report spending nothing specifically on financial administration. This strongly suggests that they are dependent on financial service providers for expertise in designing their debt issuances, and they likely lack the ability to evaluate the provider's recommendations.

Tables 4 and 5 give the mean and standard deviation of the market share for each quartile of issuer and each innovation. For the “any innovation” measures and 16 of the 25 individual innovations, the highest mean market share is observed for the third-quartile issuers. These means are above the second- and fourth-quartile means by at least a percentage point in nine instances. However, the standard deviations are quite large, so many of the differences would not be statistically significant. The first-quartile issuers display the highest market shares for debt-type innovations, small denominations, the use of fiscal agents, and the use of sinking fund depositories. If one expected the very largest bond issuers to be the greatest adopters of financial innovations, these descriptive statistics do not bear that out. In only one instance, the use of small market-share insurers, do the largest state governments (plus New York City) display the highest mean market share for an innovation.

Tables 6 and 7 mirror the market-share summaries, but present the ratio of debt issuance to annual expenditures, weighted by the debt outstanding. The patterns of peak values are quite different for the ratio measures. The second-quartile issuers, rather than the third-quartile issuers, have the highest ratio values overall and in almost all individual innovations. This is true in both the pre- and post-crisis era. Despite having the smallest denominators, the first-quartile issuers do not have the unique highest mean for the ratio measure associated with any of the innovations.

The time series charts in Figures 1 through 3 tell much of the story of innovations in municipal securities over the last two decades. The adoption of the innovations from obscurity to heavy usage is visible. There is the striking appearance of a boom-and-bust cycle in about half of the innovations. Total debt issuance dropped with the recession, but that would not necessarily change this market-share measure. It appears there was an accompanying abrupt shift to plain vanilla bonds and bonds with different innovative features.

With the exception of make-whole call features, all of the innovations were in use in the 1990s, but their use was growing slowly at relatively low levels. The growth of the

market share of six of the innovations (debt types, offer types, small insurers, corporate backers, small denominations, and auction agents) appears to accelerate after 2000, while nine other innovations continue pre-existing growth. Ten of the innovations (debt type, purpose, taxable, small denominations, call notices, whole-call frequencies, make-whole calls, fiscal agents, sinking-fund depositories, and placement agents) have spikes after the financial crisis, owing to falling interest rates, the introduction of Build American Bonds, and other changes in the markets.

The graphs give a preliminary answer to the question of which types of governments adopted the innovations sooner and more extensively. In 17 of the 25 innovations, the time series for the top three quartiles run distinctively above the first quartile's series. The smallest issuers keep pace with the larger issuers in their use of small insurers and fiscal agents. The least-sophisticated issuers appear to lead the adoption of uncommon debt types, small denominations, and sinking-fund depositories.

The time series plots show the peak market share for each innovation. In many cases this is well above the mean market share from Tables 4 and 5. Recall that all these innovations had total market share below five percent during the 1990s, except the composites of small shares held by small insurers and uncommon debt types. At their peak, variable-rate securities were over 30 percent of new issuance for issuers in the top three quartiles. Large issuers adopted novel interest rate calculations for a quarter of their bonds and involved tender agents and remarketing agents in deals representing approximately 20 percent of their totals. Use of any of these innovative features climbs from less than 20 percent to over 60 percent market share (see Figure 1, graph (a)).

4.2 Fitted models

To enhance our understanding of the patterns visible in the time series plots, this section will present the results of fitting a model to each innovation series. These models give a slope coefficient for the adoption or abandonment of each feature and enable us to determine if

the differences are significant. To the this end, the models include a constant, a de-meaned linear year measure, an indicator for the sophistication proxy category (quartile of debt outstanding), an indicator of post-crisis years (2008-2012) and interactions of each of these. With the interactions included, the coefficient on the year can be interpreted as the slope of adoption by the least-sophisticated issuers (the omitted category). Adding the coefficients from the interaction of the year and the sophistication proxy to the coefficient on *year* provides an estimate of the slope of adoption by the more-sophisticated group of issuers.

Tables 8 through 11 display pre-crisis trends that are significantly different than zero for the least-sophisticated issuers in all but two of the innovations. Interestingly, in several instances, the least-sophisticated issuers were decreasing their use of the innovations during this period. For example, the use of uncommon interest rate calculations was declining at the rate of 0.24 percent per year for the small issuers. These declines stand in statistically significant contrast to the increasing use by upper-quartile issuers. With regards to interest rate calculation frequency, the third-quartile issuers were increasing their use of this feature by 1.53 percent per year ($-0.24 + 1.77$).

The smallest issuers were increasing their use of uncommon debt types by 2.96 percent per year and their use of small-denomination bonds by 1.27 percent per year. The larger issuers were increasing their use of uncommon debt types, but at a pace of only 0.62 to 1.43 percent per year. The use of small denominations among second-, third- and fourth-quartile issuers was essentially flat during this period (the significant negative sophistication-year interaction coefficients just offset the year coefficient).

In the use of seven of the innovations (variable rates, derivatives, offer types, corporate backing, interest calculations, large denominations, use of tender agents), the second-, third- and fourth-quartile issuers all display significantly faster adoption between 2000 and 2007 relative to the least-sophisticated issuers. Among the other innovations, either one or two of the high-sophistication categories displays significantly higher trends. As seen in the descriptive statistics and graphs, small issuers lead expansion in only three areas: uncommon

debt types, small denominations, and the use of sinking-fund depositories. The expansion of these three types of innovations was more rapid than the expansion by the second- and third-quartile issuers of all their innovations. In the model fitted for “Any Innovation,” the coefficient on the year trend suggests the smallest issuers were increasing the market share of innovative bonds by 5.19 percent each year. The fourth-quartile issuers were maintaining a similar pace. Second- and third-quartile issuers were also increasing their market share, but at a significantly slower pace of 3 to 4 percent each year.

In the post-crisis period, the general trends are those of abandoning the innovations. Despite spikes in market share for nine of the innovations, only the use of unusual call notices, make-whole calls and sinking-fund depositories achieved a statistically significant overall increase between 2008 and 2012. For taxable bonds, whole-call frequencies, partial-call frequencies, make-whole calls, and sinking-fund depositories, the trends are indistinguishable among the sophistication groups. The least-sophisticated issuers abandoned their use of unusual debt types, minor insurers, and small denominations faster than more-sophisticated issuers. In all other cases, the more-sophisticated issuers display a more rapid rate of decline in the innovation’s market share. This is determined in part by levels at which the innovations peaked. In the cases of variable rate bonds and derivatives, for example, the first-quartile issuers never raised their market share for these types of bonds above ten percent, so they could not have year-over-year declines of seven percentage points or more, as the more-sophisticated issuers had.

In Figures 4 to 6 and Tables 12 through 15, time series plots and models are presented for the ratio of innovation-linked bond issuance to annual expenditures, weighted by the issuer’s debt outstanding. These parallel the analysis described above for the market-share measures. As noted in the discussion of the descriptive tables (6 and 7), it is the second-quartile issuers that stand out in the ratio measures.

Browsing the time series graphs, the 10 states and 560 large local governments that constitute the second-quartile appear to have utilized innovative bonds to the greatest extent,

relative to their annual budgets. They were the most aggressive adopters of innovations associated with variable rates, derivatives, debt types, offer types, purposes, corporate backers, interest rate calculations and frequencies, as well as AMT, large denominations, put options, call notices, whole-call frequencies, partial-call frequencies, make-whole calls, auction agents, remarketing agents, tender agents, and placement agents. This results from the combination of these midsized issuers adopting innovation at the same market share as larger issuers, while having a higher debt-to-expenditure ratio in general. On average, the top 60 issuers have debt outstanding that equals about two thirds of their annual expenditures. The second-quartile issuers maintain an outstanding debt to expenditure ratio closer to one. If the ratio of innovation-linked debt to expenditures is informative regarding the introduction of risk into the market, these findings suggest risk could most easily enter via these 570 issuers in the second quartile and their quarter of the total debt outstanding.

Overall, there are far fewer significant differences between the four sophistication categories in the ratio regression (Tables 12 through 15) compared to the market share regressions. This is because market shares can only be observed in years when an issuer issues bonds. In the ratio calculation, a zero is observed in every year that an issuer does not issue bonds with an innovative feature. The sample sizes are much larger (543,016 vs. 76,756), with substantial weight on values of zero in each category. Despite the measure's disposition favoring null results, the 2000-2007 ratio time trend is significantly higher for second-quartile issuers for variable rates, derivatives, offer types, corporate backers, interest calculations, interest frequency, and large denominations. The pre-crisis ratio intercept is significantly higher for second-quartile issuers in 15 of the 25 innovations, and in the model fit for any innovation.

4.3 Alternate Specifications

This section describes the results of 10 alternate specifications of the market-share models. The results are available in an online appendix.

In Table 2, descriptive statistics are presented for four alternate proxies for sophistication. In the cases of total expenditures and own revenue, these can serve as alternate measures for ranking the issuers. The cut points between the categories are still chosen such that each group represents one-quarter of the debt outstanding. Expenditures, revenue, and debt outstanding are positively correlated, but they do lead to somewhat different groupings. However, upon examining the results, these differences in grouping do not translate into any qualitative differences.

The distribution of COG-reported expenditures on central staff and financial administration are much more skewed. These figures cannot be used to place issuers in quartiles because the debt outstanding of governments reporting zeros exceeds 25 percent of the principal outstanding each year. Instead, the model is specified to contrast issuers with zero and nonzero values. The assumption is that issuers reporting expenditures on central staff and financial administration are more sophisticated. The results for the two sets of models are very similar to one another. Issuers reporting staff expenditures are more rapid adopters of variable rates, derivatives, offer types, small insurers, interest calculations, interest frequencies, AMT, large denominations, and sinking-fund depositories. Issuers that do not report staff expenditures are more rapid adopters of debt types, corporate backers, taxable bonds, small denominations, partial call frequencies, and fiscal agents.

Dividing the issuers into quartiles is an arbitrary division, so we need to test the model's sensitivity to this decision. If we isolate the bottom tenth or the bottom third, model results display similar differences between these least-sophisticated groupings and the rest of the issuers. Including state fixed effects also makes no notable changes in the 2000-2007 slopes. Allowing each state to have its own intercept necessarily shifts some of the category intercepts.

Table 1 showed that states dominate the top two quartiles, while local governments are mostly distributed among the bottom two categories. If we treat the type of government as a proxy for sophistication, we observe some interesting trends. In the 2000-2007 period,

cities and towns were actually reducing their use of variable-rate debt, put options, and remarketing agents. Special districts adopted variable rates, derivatives, and uncommon offer types much more rapidly than cities or school districts. School districts definitely lead the adoption of sinking-fund depositories. In these models, each issuer is equally weighted, and the small issuers numerically dominate all four local government types (cities/towns, counties, special districts, and school districts). The contrast between the states and the omitted categories (cities and towns) reflects the differences between the omitted category in the main model and the top two quartiles.

If the proxy for sophistication, total debt outstanding, is transformed into a log scale, it becomes normally distributed. It is possible to estimate a model with the sophistication proxy in a continuous form rather than categories. The continuous models are not consistent with the categorical models in several instances because the categorical models are contrasting trends in three slices of the right tail versus the rest of the distribution, while the continuous model is reflecting the trends in the middle of the distribution, where the bulk of the observations lie. The results suggest the least-sophisticated issuers have higher rates of adoption of variable rates, uncommon debt types, alternative-interest calculations and frequencies, AMT bonds, small denominations, put options, and remarketing agents. This could potentially be a concern, if it suggested that the least-sophisticated issuers were experimenting with unknown financial products. However, adoption among these smallest issuers is only exceeding the slow adoption by slightly bigger small issuers, not adoption by large, sophisticated issuers.

The alternate specifications so far have introduced a few measures of the issuers that could arguably influence the adoption of financial innovations. These include the state (in the state fixed-effects model), which could mandate, forbid, or incentivize innovations. The type of government has been investigated. Another motivator for adopting innovations could be the fiscal health of the issuer. Issuers that are fiscally robust may have access to advantageous innovations. Issuers that are fiscally strained may have to choose between using an innovative

feature or being denied access to the market. As described in Section 3, I constructed five indicators of fiscal health using the COG. These are changes in population, intergovernmental transfers, own revenue, and debt burden, as well as an indicator of short-term debt. Short-term debt is measured as of the close of the fiscal year, so any outstanding balance can reflect a failure to balance the budget. The 2012 COG microdata are not yet available, so trends from 2007 to 2012 cannot be calculated. Models with fiscal-health measures have to be limited to the 2000-2007 period.

Including the measures of fiscal health does not change the patterns observed in the original market-share models. The fiscal-health measures are significant predictors of adoption of innovations in many instances. These relationships merit further investigation. Twelve of the innovations display what could be called healthy patterns. These innovations are adopted more by issuers with growing populations and revenue, and used less by issuers with growing debt burdens and short-term debt outstanding. None of the innovations displays a clear unhealthy pattern, in which distressed issuers use the innovation more extensively.

5 Conclusions

From the preceding analysis, we have learned that the municipal securities market has been effervescent with financial innovations. Using a comprehensive data set of municipal securities, we can identify 25 formerly obscure practices that expanded their market share after 2000, and in several instances, became commonplace. Adoption of the innovations was led by the state governments and the approximately 600 larger local governments that carry three-quarters of the total debt outstanding. The approximately 40,000 smaller local governments, which collectively service the remaining quarter of outstanding municipal debt, were extensive adopters of unusual debt types, small denominations, small insurers, and sinking-fund depositories. If the par value of innovation-linked bonds is measured relative to total annual expenditures, rather than total issuance within the year, it is the second-quartile issuers who

display significantly different adoption patterns. These issuers are midsized counties, cities, school districts, and special districts.

The results of this analysis should allay the worst fears that thousands of small municipalities are being lured into innovative debt contracts which they are not sophisticated enough to understand. If there is any need for policy intervention on behalf of small issuers, it would probably involve enabling them to access beneficial innovative products. Small jurisdictions might be missing out on the use of these products, if they exist, because they lack the financial expertise to seek them out and assess them.

If there is a risk of a potentially damaging product destabilizing the municipal finance markets, or the larger financial system, it would most likely enter via the jurisdictions that comprise the second-quartile of issuers in terms of debt outstanding. These issuers adopt innovations at the same pace as the largest issuers in terms of the market share of the bonds, but they carry more debt relative to their annual expenditures. In a single year, these issuers will sell innovation-linked bonds equivalent to 20 to 25 percent of their annual expenditures. A dangerous product could accumulate on their balance sheets very quickly. The larger issuers would have more flexibility to address unanticipated expenses because their innovation-linked issuance is smaller relative to their annual expenditures. If resources for oversight are limited, it would be advisable to focus them on the debt issuers in the second quartile.

A wide range of questions remain to be explored, and that research can build on the preliminary work done here. This analysis has been conducted in terms of flows, but the stocks of innovation-linked debt are also clearly important. Short-term securities may have volumes that are expanded by frequent roll-overs, while longer-lived securities may accumulate smaller issuances into large, persistent exposures to an innovative product. A network model could be specified that includes previous use of an innovation by the issuer and use of the innovation by similar governments in the same state or region. Spreading of innovations could be accomplished by particular underwriters, bond counsels, and other agents.

This data set contains agent identifiers that would enable us to test whether innovations are spread via specific financial service providers. All of these undertakings would enhance our understanding of the municipal market's channels of innovation and further focus regulatory and financial stability oversight.

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Average Frequency of Issuers with Debt Outstanding, 2000-2012							
Quartile of Debt Outstanding	States	Counties	Cities	Towns	Special Districts	School Districts	Total
First	-	2,171	12,842	4,765	9,870	10,541	40,188
Second	10	146	171	3	133	95	557
Third	32	3	13	-	3	1	52
Fourth	8	-	1	-	-	-	9
Total	50	2,320	13,027	4,768	10,006	10,637	40,806

Average Frequency of Issuers in a Calendar Year, 2000-2012							
Quartile of Debt Outstanding	States	Counties	Cities	Towns	Special Districts	School Districts	Total
First	-	604	1,928	415	456	2,035	5,438
Second	10	117	136	2	52	61	378
Third	32	2	13	-	2	1	49
Fourth	8	-	1	-	-	-	9
Total	50	723	2,078	417	510	2,097	5,874

Table 1: Counts of issuers by quartile of debt outstanding. Data are from the Census of Governments and the Mergent Municipal Bond Securities Database.

	Quartile of Debt Outstanding	Mean	SD	Min	Max
Population (millions)	First	0.024	0.057	0.000	1.198
	Second	0.391	0.714	0.000	9.948
	Third	3.692	3.738	0.000	22.860
	Fourth	14.255	8.642	3.350	36.132
Debt Outstanding (millions) (2012 dollars)	First	42.5	61.3	0.0	378.7
	Second	1,091.9	980.0	309.1	5,715.2
	Third	11,210.0	6,128.7	4,194.8	30,070.7
	Fourth	64,862.2	32,129.5	23,438.2	125,221.4
Total Expenditures (millions) (2012 dollars)	First	58.3	96.0	0.0	1,960.7
	Second	1,079.2	1,938.2	13.6	25,479.5
	Third	18,200.5	17,145.4	557.0	89,481.8
	Fourth	89,167.6	58,705.3	22,291.5	231,959.1
Own Revenue (millions) (2012 dollars)	First	32.2	55.1	0.0	1003.0
	Second	638.1	1,246.4	0.0	17,944.4
	Third	11,688.6	11,461.9	21.3	65,160.9
	Fourth	55,752.4	33,831.4	14,320.3	150,046.0
Expenditures for Central Staff (millions) (2012 dollars)	First	0.9	2.8	0.0	121.4
	Second	13.0	21.4	0.0	234.8
	Third	69.8	45.7	0.0	291.8
	Fourth	267.1	139.1	89.3	556.2
Expenditures for Financial Administration (thousands) (2012 dollars)	First	0.7	2.0	0.0	60.6
	Second	16.6	35.3	0.0	368.2
	Third	255.8	264.5	0.0	1,839.1
	Fourth	1,289.3	1,128.5	399.3	4,192.0

Table 2: Descriptive statistics of proxies for issuer sophistication by quartile of debt outstanding. Data are from the Census of Governments.

Label	Standard Features	Innovation
Variable	Fixed, discounted, premium, and zero coupons	Variable rate, floating rate, index linked, flexible rate, and five similar types
Derivative	Bond	Derivative
Debt Type	Bond	Build America bonds, certificates of participation, tax/revenue anticipation notes, bond anticipation notes, warrants, certificates of obligation, promissory notes, and thirteen other types
Purpose	New filing or refunding	Remarketing/converted, restructured debt, cross-over refunding, and municipal forward
Offer Type	Competitive or negotiated offering	Remarketed, private placement or limited offering
Interest Calculation	Interest calculated at 30 days/mn 360 days/yr	Interest calculated as actual number of days / 360 days in year, actual number of days / actual number of days in year, or other combinations
Interest Frequency	Interest calculated semiannually or at maturity	Interest calculated monthly, weekly, quarterly, or at some other interval
AMT	Not subject to Alternative Minimum Tax	Subject to Alternative Minimum Tax
Taxable	Not federally taxable	Federally Taxable
Insurer	Municipal Bond Insurance Association, Ambac, Financial Security Assurance, and Financial Gauranty Insurance Company	National Public Finance Guarantee Corporation, Assured Guaranty Municipal Corp, Syncora, American Capital Access, and 35 others
Corporate	None	Corporate backer designated
Small Denomination	Denominations of \$5,000	Denomination <\$5,000
Large Denomination	Denominations of \$5,000	Denomination >\$5,000
Put Option	No put option	Put option
Call Notice	30 days	15, 25, 10, 20, 45, 60, 5, 3, 35, 14, 12, 31, or 50 days
Whole Call Frequency	Any time, any interest payment date, or unspecified	When interest adjusts, monthly, one time, every 35 days, every 28 days, weekly, date given and seven other designations
Partial Call Frequency	Any time, any interest payment date, or unspecified	When interest adjusts, monthly, one time, every 35 days, every 28 days, weekly, date given and seven other designations
Make whole call	None	Make whole call option
Remarketing Agent	None	Remarketing agent designated
Fiscal Agent	None	Fiscal Agent designated
Tender Agent	None	Tender Agent designated
Sinking Fund Depository	None	Sinking Fund Depository designated
Financial Advisors	One or two financial advisors designated	Three or more financial advisors designated
Auction Agent	None	Auction agent designated
Placement Agent	None	Placement agent designated

Table 3: Definitions of financial innovations in municipal securities. Data are from the Mergent Municipal Bond Securities Database.

	Quartile of				Quartile of		
	Debt Outstanding	Mean	SD		Debt Outstanding	Mean	SD
Any Innovation	First	49.9	45.4	Large Denomination	First	5.5	21.1
	Second	59.2	38.8		Second	19.6	30.4
	Third	66.2	26.8		Third	22.7	20.7
	Fourth	55.4	22.3		Fourth	15.9	14.9
Variable coupon	First	5.3	20.7	Put option	First	3.6	17.2
	Second	21.4	31.5		Second	13.6	26.4
	Third	24	21.2		Third	14.1	15.1
	Fourth	17.7	16		Fourth	10.9	11.6
Derivative	First	0.7	6.6	Call notice	First	0.1	2.9
	Second	4.3	14.1		Second	0.4	4.7
	Third	5.2	11.3		Third	0.5	3.3
	Fourth	3.2	3.5		Fourth	0.9	1.8
Debt type	First	17.6	36	Whole call Frequency	First	0.4	6.2
	Second	12.4	27.8		Second	1	6.6
	Third	10.1	18.9		Third	1.9	4.4
	Fourth	3.7	6.6		Fourth	0.9	2.4
Offer type	First	1.9	12.1	Partial call Frequency	First	0.6	7
	Second	7.5	18.4		Second	1.2	7.6
	Third	8.9	13		Third	1.9	4.3
	Fourth	6	5		Fourth	1.0	2.4
Purpose	First	1.1	9.4	Make Whole Call	First	0	0.9
	Second	3.2	13.4		Second	0.1	1.5
	Third	4.6	9.1		Third	0.2	1.8
	Fourth	3.5	4.1		Fourth	0	0.1
Insurer	First	20.6	35.3	Auction Agent	First	0.3	4.5
	Second	17.2	28.3		Second	2.7	12.5
	Third	17.1	20.1		Third	5.7	10.5
	Fourth	25.3	16.3		Fourth	4.6	6
Corporate Backer	First	2.9	15.8	Remarketing Agent	First	3.1	16.2
	Second	8.0	21.5		Second	11.3	24.5
	Third	8.6	14.0		Third	10.7	13.5
	Fourth	8.4	10.4		Fourth	7.7	8.3
Interest Calculation	First	4.1	18.5	Tender Agent	First	2	12.7
	Second	14.1	27		Second	7.9	19.3
	Third	15.2	17.8		Third	7.8	10.2
	Fourth	11.7	12.7		Fourth	5.8	6
Interest Frequency	First	4.8	20	Financial Advisors	First	0.4	6.1
	Second	16.2	29.2		Second	3.8	16.3
	Third	14.9	15.8		Third	11.1	23.7
	Fourth	12	11.8		Fourth	3.9	11.2
AMT	First	2.2	13.6	Fiscal Agent	First	4	19
	Second	7	19.7		Second	3.4	15.9
	Third	12.6	15.4		Third	3.4	12.8
	Fourth	6.3	8.1		Fourth	1.9	6.4
Taxable	First	2.4	13.3	Sinking Fund Depository Agent	First	2.4	15.1
	Second	4	13.8		Second	0.7	7
	Third	5.8	11.4		Third	0.4	2.6
	Fourth	4.6	12.3		Fourth	0.1	0.4
Small Denomination	First	3.3	16.9	Placement Agent	First	0.2	4.5
	Second	1.1	8.4		Second	0.5	5.3
	Third	0.4	1.7		Third	0.1	0.7
	Fourth	0.1	0.3		Fourth	0.1	0.4

Table 4: Innovation market shares 2000-2007. Data are from the Census of Governments and the Mergent Municipal Bond Securities Database. Observations are issuers' annual market shares.

	Quartile of			Quartile of			
	Debt Outstanding	Mean	SD		Debt Outstanding	Mean	SD
Any Innovation	First	56.5	46.8	Large Denomination	First	2.5	14.7
	Second	60.5	40.9		Second	11.9	27.4
	Third	67.6	28.3		Third	15.3	21.6
	Fourth	74.9	20.1		Fourth	11.9	14.1
Variable coupon	First	2	13.2	Put Option	First	1.5	11.3
	Second	12.4	28.2		Second	8.4	23.4
	Third	15.7	21.3		Third	10.2	16.3
	Fourth	13.6	13.2		Fourth	9.8	12.3
Derivative	First	0.5	6.1	Call notice	First	1.5	11.8
	Second	3.5	15		Second	4.7	18.2
	Third	2.3	5.5		Third	5.9	12.6
	Fourth	2.3	4.3		Fourth	6.8	8.6
Debt type	First	30.7	43.3	Whole call Frequency	First	0.2	4.1
	Second	24.7	35.4		Second	0.5	4.6
	Third	20.9	24.6		Third	1.4	4
	Fourth	20.1	20.4		Fourth	1.2	3.4
Offer type	First	1.9	12.7	Partial call Frequency	First	0.2	4.2
	Second	6.1	19.2		Second	0.6	5.3
	Third	6.1	10.7		Third	1.3	3.9
	Fourth	6.1	7.3		Fourth	1.1	3.2
Purpose	First	0.2	4.3	Make Whole Call	First	1.4	10.5
	Second	1.4	9		Second	5.5	17.3
	Third	1.7	5.7		Third	6.9	12.8
	Fourth	3.1	6.7		Fourth	8.9	14.7
Insurer	First	15.5	34.6	Auction Agent	First	0	0
	Second	8.9	23		Second	0	0
	Third	6.7	14.4		Third	0	0.2
	Fourth	8.5	12.9		Fourth	0	0
Corporate Backer	First	2.6	15.3	Remarketing Agent	First	1.4	11.1
	Second	9.2	25		Second	8.1	23
	Third	12.9	18.3		Third	9.4	15.4
	Fourth	16.7	13.3		Fourth	8.8	10.3
Interest Calculation	First	1.6	11.9	Tender Agent	First	1.4	11
	Second	9	24.1		Second	8.1	23
	Third	14.6	20.4		Third	9.2	14.6
	Fourth	11.6	12.3		Fourth	8.4	9.8
Interest Frequency	First	1.8	12.8	Financial Advisors	First	0.5	6.7
	Second	9.1	24.3		Second	5.6	21.1
	Third	11.7	17.3		Third	16.7	29.4
	Fourth	10.2	11.9		Fourth	13	29
AMT	First	0.3	5.2	Fiscal Agent	First	5.1	21.6
	Second	2.2	11.8		Second	5.2	20.5
	Third	4.5	10.9		Third	5.5	18.1
	Fourth	2	2.5		Fourth	11.6	24.1
Taxable	First	7.3	23	Sinking Fund Depository Agent	First	3.7	18.1
	Second	12.9	25.5		Second	2	11.5
	Third	13.2	16.4		Third	1.5	5.6
	Fourth	16.7	20.8		Fourth	1.8	6.1
Small Denomination	First	2.8	15.4	Placement Agent	First	0.3	5.6
	Second	1.4	10		Second	0.5	4.6
	Third	1.2	5		Third	1.4	3.9
	Fourth	7.3	21.7		Fourth	1.6	3.6

Table 5: Innovation market shares 2008-2012. Data are from the Census of Governments and the Mergent Municipal Bond Securities Database. Observations are issuers' annual market shares.

	Quartile of				Quartile of		
	Debt Outstanding	Mean	SD		Debt Outstanding	Mean	SD
Any Innovation	First	0.051	0.434	Large Denomination	First	0.010	0.222
	Second	0.264	0.897		Second	0.112	0.645
	Third	0.164	0.350		Third	0.048	0.095
	Fourth	0.229	0.294		Fourth	0.036	0.025
Variable Rate	First	0.010	0.228	Put Option	First	0.007	0.192
	Second	0.122	0.678		Second	0.078	0.502
	Third	0.051	0.100		Third	0.032	0.077
	Fourth	0.039	0.028		Fourth	0.024	0.018
Derivative	First	0.002	0.102	Call notice	First	0.000	0.044
	Second	0.032	0.333		Second	0.002	0.048
	Third	0.011	0.023		Third	0.001	0.005
	Fourth	0.008	0.009		Fourth	0.002	0.003
Debt Type	First	0.012	0.174	Whole call Frequency	First	0.001	0.063
	Second	0.033	0.238		Second	0.004	0.049
	Third	0.022	0.113		Third	0.003	0.007
	Fourth	0.011	0.018		Fourth	0.002	0.004
Offer Type	First	0.005	0.176	Partial call Frequency	First	0.001	0.064
	Second	0.061	0.496		Second	0.008	0.163
	Third	0.020	0.053		Third	0.003	0.007
	Fourth	0.014	0.013		Fourth	0.002	0.004
Purpose	First	0.002	0.118	Make Whole Call	First	0.000	0.012
	Second	0.031	0.302		Second	0.002	0.053
	Third	0.012	0.047		Third	0.001	0.008
	Fourth	0.008	0.008		Fourth	0.000	0.000
Insurer	First	0.024	0.294	Auction Agent	First	0.001	0.092
	Second	0.106	0.601		Second	0.024	0.319
	Third	0.068	0.258		Third	0.011	0.040
	Fourth	0.149	0.230		Fourth	0.010	0.009
Corporate Backer	First	0.006	0.191	Remarketing Agent	First	0.006	0.172
	Second	0.053	0.435		Second	0.060	0.417
	Third	0.015	0.040		Third	0.025	0.065
	Fourth	0.017	0.018		Fourth	0.017	0.013
Interest Calculation	First	0.007	0.193	Tender Agent	First	0.004	0.147
	Second	0.091	0.653		Second	0.047	0.358
	Third	0.031	0.068		Third	0.018	0.053
	Fourth	0.025	0.019		Fourth	0.013	0.011
Interest Frequency	First	0.009	0.220	Financial Advisors	First	0.000	0.046
	Second	0.102	0.675		Second	0.031	0.330
	Third	0.033	0.078		Third	0.037	0.119
	Fourth	0.027	0.021		Fourth	0.015	0.054
AMT	First	0.004	0.132	Fiscal Agent	First	0.003	0.089
	Second	0.038	0.300		Second	0.007	0.065
	Third	0.018	0.037		Third	0.009	0.057
	Fourth	0.011	0.010		Fourth	0.006	0.015
Taxable	First	0.003	0.113	Sinking Fund Depository Agent	First	0.002	0.071
	Second	0.014	0.103		Second	0.003	0.056
	Third	0.013	0.064		Third	0.001	0.011
	Fourth	0.036	0.243		Fourth	0.000	0.001
Small Denomination	First	0.002	0.076	Placement Agent	First	0.000	0.043
	Second	0.002	0.030		Second	0.001	0.021
	Third	0.001	0.003		Third	0.000	0.001
	Fourth	0.000	0.001		Fourth	0.001	0.002

Table 6: Innovations Ratio - Total Issuance/Annual Expenditures 2000-2007. Data are from the Census of Governments and the Mergent Municipal Bond Securities Database. Observations are issuers' annual ratios weighted by their total long term debt outstanding.

	Quartile of Debt Outstanding				Quartile of Debt Outstanding		
		Mean	SD			Mean	SD
Any Innovation	First	0.046	0.406	Large Denomination	First	0.005	0.164
	Second	0.160	0.568		Second	0.055	0.458
	Third	0.108	0.166		Third	0.026	0.072
	Fourth	0.102	0.089		Fourth	0.018	0.030
Variable coupon	First	0.004	0.145	Put Option	First	0.003	0.140
	Second	0.059	0.479		Second	0.045	0.412
	Third	0.027	0.076		Third	0.018	0.051
	Fourth	0.020	0.030		Fourth	0.014	0.023
Derivative	First	0.001	0.063	Call Notice	First	0.002	0.087
	Second	0.014	0.184		Second	0.016	0.215
	Third	0.005	0.026		Third	0.005	0.014
	Fourth	0.004	0.011		Fourth	0.009	0.014
Debt Type	First	0.019	0.208	Whole call Frequency	First	0.000	0.049
	Second	0.049	0.304		Second	0.003	0.130
	Third	0.029	0.053		Third	0.001	0.005
	Fourth	0.036	0.051		Fourth	0.001	0.003
Offer Type	First	0.003	0.136	Partial call Frequency	First	0.000	0.049
	Second	0.031	0.350		Second	0.004	0.130
	Third	0.013	0.063		Third	0.001	0.005
	Fourth	0.009	0.014		Fourth	0.001	0.003
Purpose	First	0.001	0.058	Make Whole Call	First	0.002	0.092
	Second	0.017	0.285		Second	0.014	0.112
	Third	0.003	0.015		Third	0.013	0.042
	Fourth	0.004	0.010		Fourth	0.016	0.035
Insurer	First	0.016	0.250	Auction Agent	First	0.000	0.000
	Second	0.036	0.314		Second	0.000	0.000
	Third	0.016	0.054		Third	0.000	0.000
	Fourth	0.018	0.040		Fourth	0.000	0.000
Corporate Backer	First	0.006	0.201	Remarketing Agent	First	0.003	0.136
	Second	0.039	0.322		Second	0.044	0.416
	Third	0.013	0.030		Third	0.016	0.046
	Fourth	0.023	0.025		Fourth	0.012	0.020
Interest Calculation	First	0.004	0.142	Tender Agent	First	0.003	0.135
	Second	0.053	0.463		Second	0.043	0.407
	Third	0.025	0.064		Third	0.017	0.049
	Fourth	0.018	0.027		Fourth	0.012	0.019
Interest Frequency	First	0.004	0.151	Financial Advisors	First	0.001	0.067
	Second	0.055	0.510		Second	0.020	0.178
	Third	0.018	0.049		Third	0.039	0.109
	Fourth	0.015	0.024		Fourth	0.012	0.024
AMT	First	0.001	0.064	Fiscal Agent	First	0.003	0.086
	Second	0.007	0.087		Second	0.007	0.048
	Third	0.007	0.024		Third	0.007	0.026
	Fourth	0.003	0.004		Fourth	0.010	0.019
Taxable	First	0.007	0.151	Sinking Fund Depository Agent	First	0.004	0.109
	Second	0.027	0.142		Second	0.004	0.051
	Third	0.020	0.046		Third	0.003	0.014
	Fourth	0.027	0.057		Fourth	0.002	0.004
Small Denomination	First	0.001	0.057	Placement Agent	First	0.000	0.053
	Second	0.003	0.070		Second	0.002	0.077
	Third	0.001	0.007		Third	0.001	0.004
	Fourth	0.004	0.012		Fourth	0.002	0.003

Table 7: Innovations Ratio - Total Issuance/Annual Expenditures 2008-2012. Data are from the Census of Governments and the Mergent Municipal Bond Securities Database. Observations are issuers' annual ratios weighted by their total long term debt outstanding.

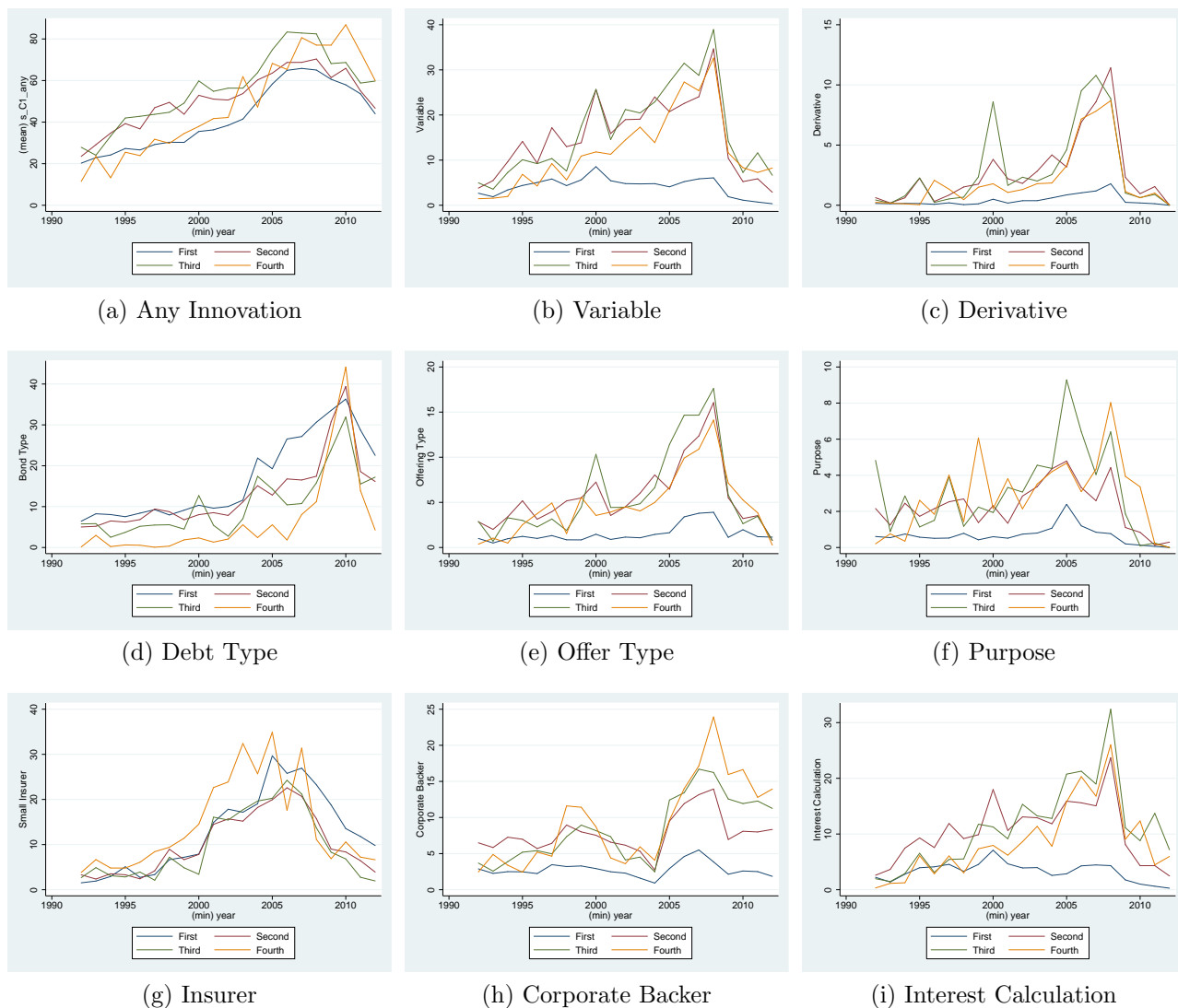


Figure 1: Financial innovations market share by year and quartile of debt outstanding. Data are from the Census of Governments and the Mergent Municipal Bond Securities Database.

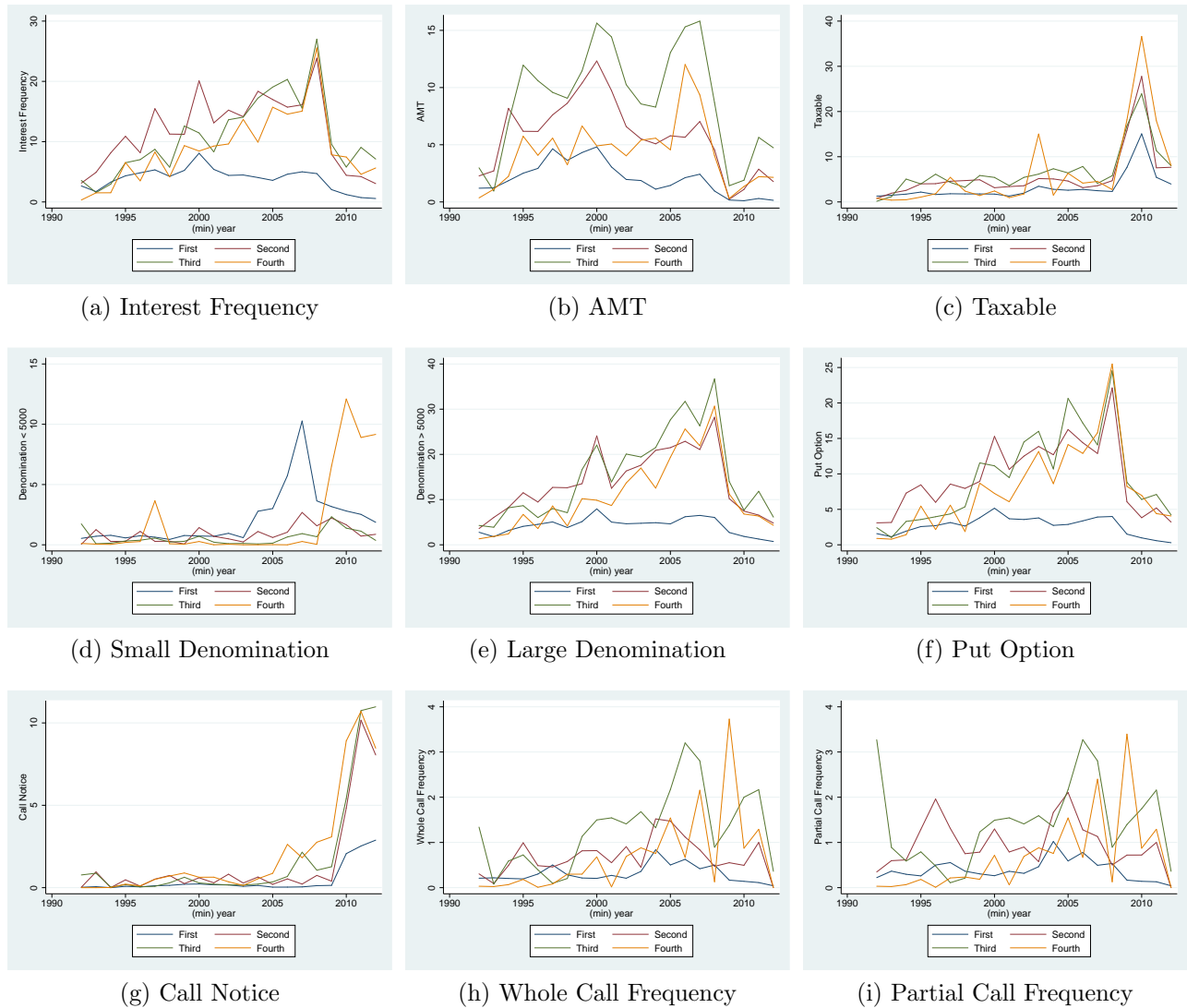
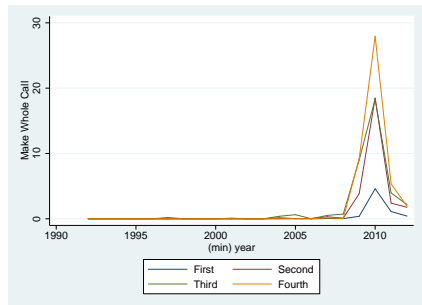
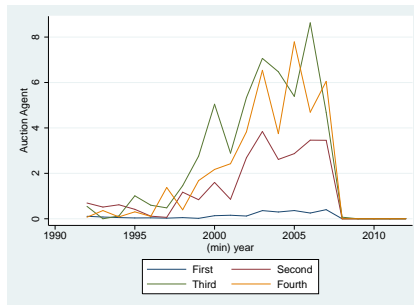


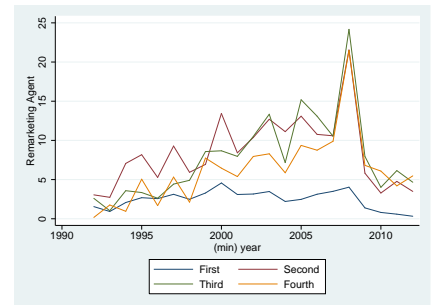
Figure 2: Financial innovations market share by year and quartile of debt outstanding. Data are from the Census of Governments and the Mergent Municipal Bond Securities Database.



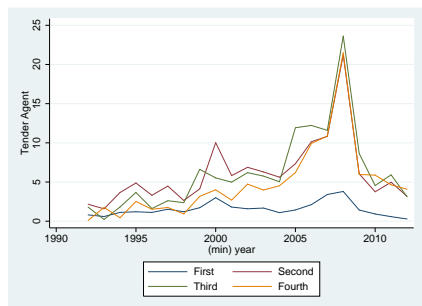
(a) Make Whole Call



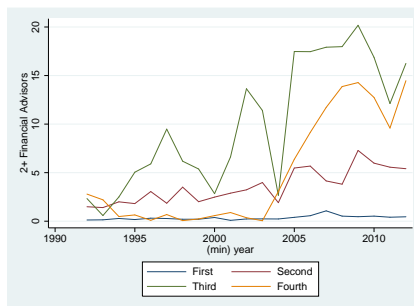
(b) Auction Agent



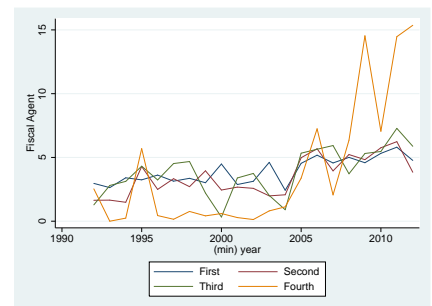
(c) Remarketing Agent



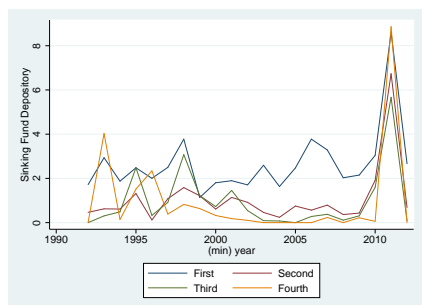
(d) Tender Agent



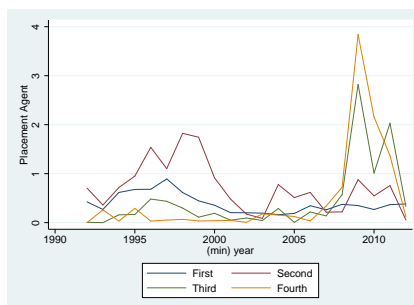
(e) Financial Advisor



(f) Fiscal Agent



(g) Sinking Fund Depository



(h) Placement Agent

Figure 3: Financial innovations market share by year and quartile of debt outstanding. Data are from the Census of Governments and the Mergent Municipal Bond Securities Database.

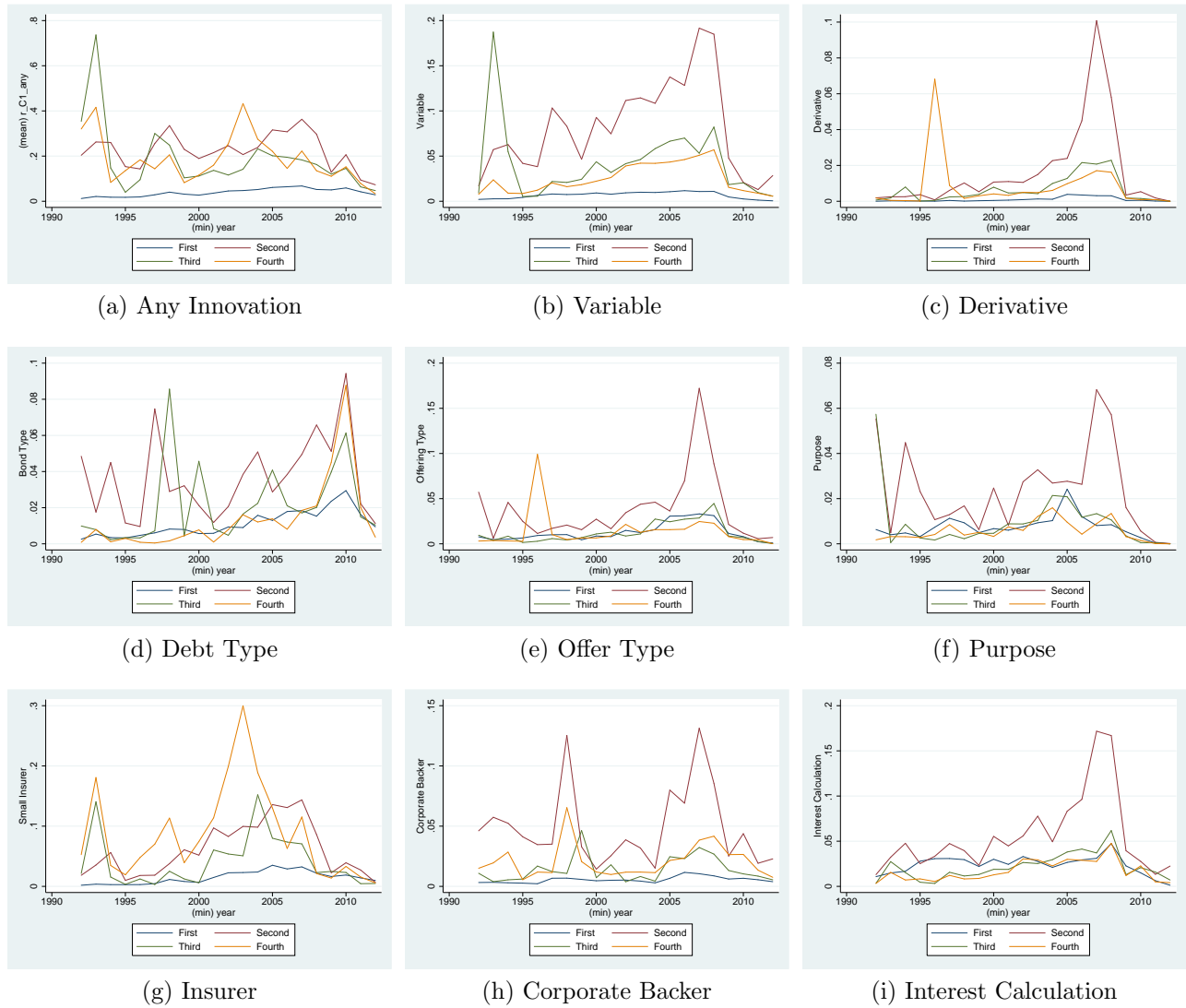


Figure 4: Ratio of par value of bonds with innovative features to annual expenditures. Annual means are weighted by total long term debt outstanding and grouped by quartile of debt outstanding. Data are from the Census of Governments and the Mergent Municipal Bond Securities Database.

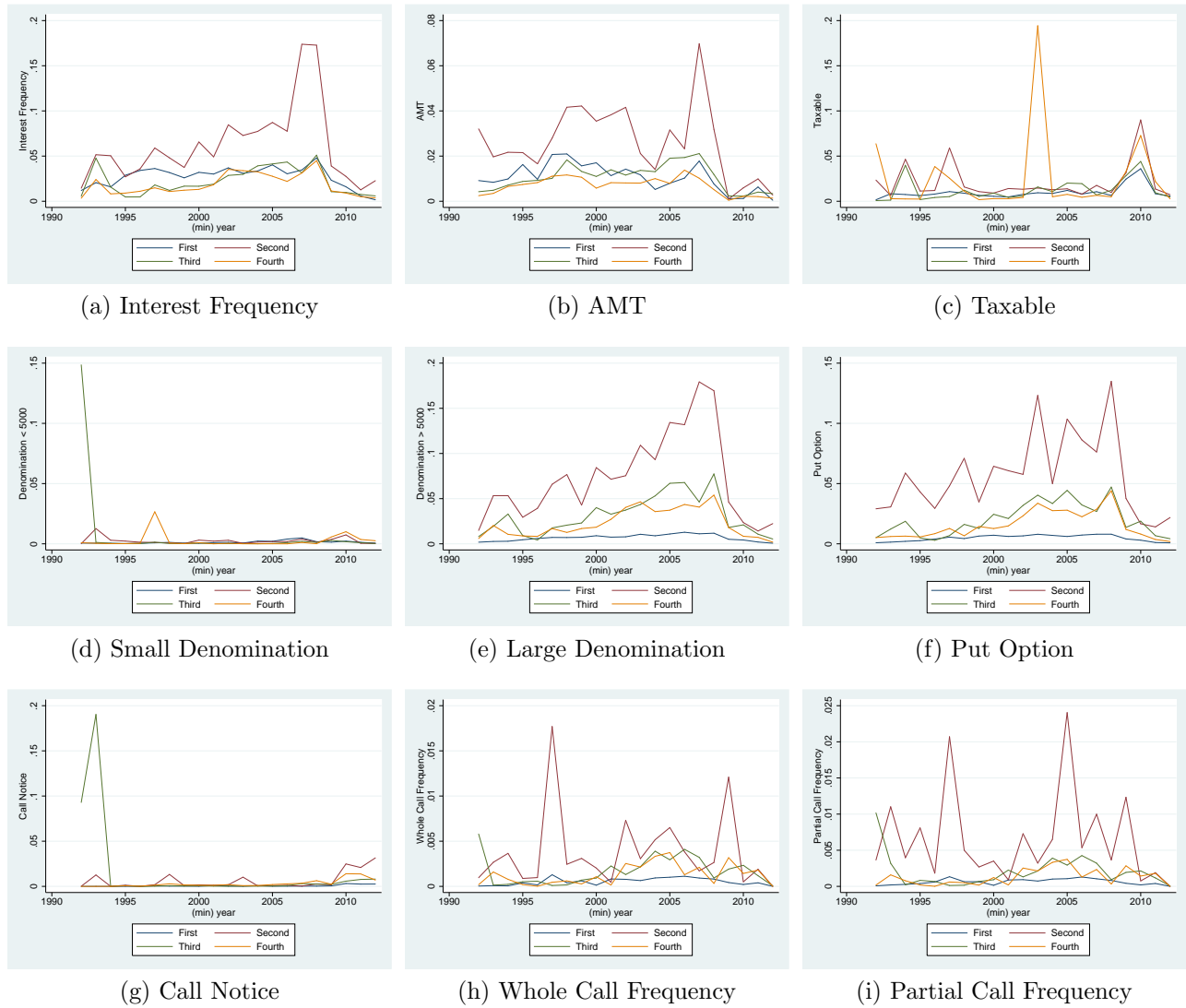


Figure 5: Ratio of par value of bonds with innovative features to annual expenditures. Annual means are weighted by total long term debt outstanding and grouped by quartile of debt outstanding. Data are from the Census of Governments and the Mergent Municipal Bond Securities Database.



Figure 6: Ratio of par value of bonds with innovative features to annual expenditures. Annual means are weighted by total long term debt outstanding and grouped by quartile of debt outstanding. Data are from the Census of Governments and the Mergent Municipal Bond Securities Database.

Market Share	Any Innovation	Variable	Derivative	Debt Type	Offer Type	Purpose
Constant	66.784*** (0.430)	4.664*** (0.197)	1.111*** (0.077)	27.266*** (0.428)	3.197*** (0.141)	1.453*** (0.090)
2nd Quartile	2.264 (1.596)	18.309*** (1.232)	5.851*** (0.612)	-10.206*** (1.384)	7.685*** (0.766)	2.364*** (0.471)
3rd Quartile	14.756*** (2.836)	24.514*** (2.434)	6.640*** (1.213)	-14.840*** (2.548)	9.952*** (1.376)	5.155*** (1.068)
4th Quartile	9.169** (3.950)	21.070*** (5.620)	5.444*** (0.971)	-21.405*** (2.103)	6.575*** (1.311)	2.873*** (1.044)
Year	5.185*** (0.096)	-0.194*** (0.047)	0.137*** (0.016)	2.961*** (0.085)	0.395*** (0.030)	0.121*** (0.019)
2nd Quartile*Year	-2.193*** (0.324)	0.680** (0.268)	0.668*** (0.128)	-1.532*** (0.258)	0.627*** (0.163)	0.077 (0.094)
3rd Quartile*Year	-0.878* (0.464)	1.664*** (0.462)	0.573* (0.315)	-2.301*** (0.500)	0.813** (0.350)	0.453** (0.195)
4th Quartile*Year	0.568 (0.979)	2.452*** (0.878)	0.797*** (0.144)	-2.345*** (0.281)	0.659*** (0.252)	0.119 (0.198)
Post	4.141*** (0.696)	1.124*** (0.290)	0.446*** (0.144)	9.515*** (0.629)	0.285 (0.248)	-0.723*** (0.119)
2nd Quartile*Post	2.777 (2.107)	8.996*** (1.775)	3.227*** (1.079)	1.485 (1.666)	4.735*** (1.374)	1.162 (0.779)
3rd Quartile*Post	-1.698 (3.014)	5.584** (2.823)	-0.561 (1.503)	0.593 (2.709)	3.448 (2.205)	0.168 (1.399)
4th Quartile*Post	6.052** (2.620)	2.687 (3.734)	0.534 (1.245)	12.950*** (3.085)	5.377*** (1.351)	5.440** (2.172)
Post*Year	-10.039*** (0.213)	-1.080*** (0.086)	-0.507*** (0.040)	-4.999*** (0.194)	-0.938*** (0.070)	-0.290*** (0.030)
2nd Quartile*Post*Year	1.730** (0.689)	-6.509*** (0.569)	-2.760*** (0.333)	2.423*** (0.557)	-3.446*** (0.391)	-0.874*** (0.211)
3rd Quartile*Post*Year	0.264 (1.192)	-7.112*** (1.096)	-1.988*** (0.393)	3.794*** (1.083)	-3.877*** (0.563)	-1.728*** (0.403)
4th Quartile*Post*Year	0.544 (2.378)	-6.486*** (1.853)	-2.174*** (0.509)	1.656 (1.332)	-3.218*** (0.657)	-1.929*** (0.627)
R ²	0.052	0.056	0.027	0.047	0.020	0.009

Table 8: Financial innovations market share models. Data are from the Census of Governments and the Mergent Municipal Bond Securities Database. Observations are issuer-years. N=76,756. Significance key: *** p<0.01, ** p<0.05, * p<0.1.

Market Share	Insurer	Corporate Backer	Interest Calculation	Interest Frequency	AMT	Taxable	Small Denominator	Large Denominator
Constant	29.157*** (0.378)	4.258*** (0.178)	3.312*** (0.171)	3.897*** (0.187)	1.472*** (0.128)	2.943*** (0.127)	7.424*** (0.240)	5.554*** (0.210)
2nd Quartile	-6.456*** (1.175)	6.918*** (0.968)	11.484*** (1.035)	12.233*** (1.130)	3.480*** (0.738)	1.179 * * (0.499)	-5.797*** (0.470)	16.302*** (1.215)
3rd Quartile	-4.335* (2.500)	9.005*** (1.982)	17.372*** (2.367)	15.470*** (2.185)	11.680*** (2.175)	3.471*** (1.321)	-6.906*** (0.346)	23.070*** (2.475)
4th Quartile	1.426 (4.666)	9.374*** (3.428)	14.712*** (4.790)	11.769*** (3.925)	7.680*** (2.537)	3.026 (2.762)	-7.345*** (0.257)	18.014*** (5.610)
Year	2.614*** (0.076)	0.406*** (0.038)	-0.237*** (0.043)	-0.276*** (0.046)	-0.232*** (0.033)	0.153*** (0.026)	1.266*** (0.047)	0.019 (0.048)
2nd Quartile*Year	-0.944*** (0.236)	0.558*** (0.193)	0.451* (0.232)	0.267 (0.243)	-0.400 * * (0.160)	-0.115 (0.102)	-1.095*** (0.101)	0.659 * * (0.261)
3rd Quartile*Year	-0.439 (0.400)	0.915*** (0.318)	1.768*** (0.374)	1.546*** (0.373)	0.374 (0.387)	0.029 (0.206)	-1.224*** (0.071)	1.646*** (0.467)
4th Quartile*Year	-1.145 (0.909)	1.060* (0.594)	2.001*** (0.693)	1.311* (0.753)	1.027*** (0.366)	0.226 (0.455)	-1.267*** (0.049)	2.120*** (0.795)
Post	-3.572*** (0.610)	-0.594 * * (0.264)	1.032*** (0.257)	0.811*** (0.274)	-0.703*** (0.152)	3.848*** (0.274)	-3.370*** (0.280)	0.572* (0.311)
2nd Quartile*Post	-2.391 (1.708)	1.798 (1.258)	7.167*** (1.576)	5.932*** (1.535)	-1.111 (0.793)	4.761*** (1.091)	3.999*** (0.664)	4.792*** (1.715)
3rd Quartile*Post	-5.825* (3.197)	3.260 (3.042)	7.293*** (2.723)	3.623 (2.496)	-6.865*** (1.886)	3.245 (2.253)	4.568*** (0.759)	5.071* (2.839)
4th Quartile*Post	-15.917*** (4.016)	10.549*** (2.705)	5.941 * * (3.024)	6.660 * * (3.162)	-5.864*** (2.257)	3.758 (5.046)	4.456*** (1.155)	5.014 (3.947)
Post*Year	-6.029*** (0.169)	-0.766*** (0.079)	-0.692*** (0.076)	-0.691*** (0.081)	0.084* (0.043)	0.004 (0.078)	-1.683*** (0.082)	-1.234*** (0.089)
2nd Quartile*Post*Year	1.684*** (0.446)	-1.299*** (0.418)	-4.334*** (0.514)	-4.035*** (0.513)	0.211 (0.277)	0.005 (0.325)	1.229*** (0.206)	-4.704*** (0.541)
3rd Quartile*Post*Year	0.950 (0.779)	-1.581* (0.916)	-5.633*** (0.948)	-4.613*** (1.002)	-0.597 (0.675)	-0.292 (0.526)	1.460*** (0.182)	-6.769*** (1.152)
4th Quartile*Post*Year	3.694 * * (1.733)	-3.012* (1.537)	-5.546*** (1.712)	-4.653*** (1.522)	-1.069 * * (0.424)	0.660 (1.991)	3.744* (2.084)	-6.663*** (2.197)
R ²	0.031	0.013	0.033	0.033	0.021	0.023	0.019	0.042

Table 9: Financial innovations market share models. Data are from the Census of Governments and the Mergent Municipal Bond Securities Database. Observations are issuer-years. N=76,756. Significance key: *** p<0.01, ** p<0.05, * p<0.1.

Market Share	Put Option	Call Notice	Whole Call	Partial Call	Make Whole	Call
		Frequency	Frequency	Frequency	Frequency	Call
Constant	3.150*** (0.159)	0.018 (0.019)	0.616*** (0.060)	0.740*** (0.067)	0.025 ** (0.012)	
2nd Quartile	10.933*** (1.024)	0.296 ** (0.148)	0.567 ** (0.254)	0.728 ** (0.287)	0.150 ** (0.072)	
3rd Quartile	13.996*** (1.755)	1.186 ** (0.573)	2.125*** (0.521)	2.020*** (0.521)	0.419 ** (0.213)	
4th Quartile	12.146*** (4.052)	1.756*** (0.595)	0.999 (0.852)	0.974 (0.843)	0.037 (0.036)	
Year	-0.128*** (0.039)	-0.026*** (0.007)	0.053*** (0.012)	0.057*** (0.013)	0.005 ** (0.002)	
2nd Quartile*Year	0.288 (0.218)	-0.012 (0.037)	0.012 (0.049)	0.016 (0.059)	0.023 (0.015)	
3rd Quartile*Year	0.975*** (0.310)	0.218* (0.114)	0.174* (0.095)	0.175* (0.095)	0.067* (0.037)	
4th Quartile*Year	1.362 ** (0.607)	0.262 ** (0.120)	0.142 (0.147)	0.153 (0.142)	0.007 (0.007)	
Post	0.791*** (0.240)	-0.854*** (0.109)	-0.137 (0.089)	-0.235 ** (0.093)	0.890*** (0.075)	
2nd Quartile*Post	5.392*** (1.478)	-1.954*** (0.579)	-0.422 (0.275)	-0.463 (0.317)	3.306*** (0.529)	
3rd Quartile*Post	4.989* (2.562)	-3.248 ** (1.481)	-1.159 ** (0.567)	-1.121 ** (0.566)	6.148*** (1.183)	
4th Quartile*Post	7.757 ** (3.503)	0.153 (1.328)	0.535 (1.509)	0.368 (1.393)	8.003*** (1.946)	
Post*Year	-0.707*** (0.071)	0.827*** (0.055)	-0.150*** (0.026)	-0.159*** (0.027)	0.172*** (0.023)	
2nd Quartile*Post*Year	-3.516*** (0.501)	1.671*** (0.336)	0.047 (0.086)	0.028 (0.092)	0.179 (0.141)	
3rd Quartile*Post*Year	-4.378*** (0.802)	1.909*** (0.658)	-0.106 (0.170)	-0.105 (0.171)	-0.453 (0.291)	
4th Quartile*Post*Year	-5.196*** (1.480)	0.840 (0.805)	-0.315 (0.222)	-0.288 (0.227)	-0.203 (0.667)	
R ²	0.032	0.027	0.002	0.002	0.025	

Table 10: Financial innovations market share models. Data are from the Census of Governments and the Merger Municipal Bond Securities Database. Observations are issuer-years. N=76,756. Significance key: *** p<0.01, ** p<0.05, * p<0.1.

Market Share	Auction Agent	Remarketing Agent	Tender Agent	Financial Advisors (3+)	Fiscal Agent	Sinking Fund Depository	Placement Agent
Constant	0.386*** (0.045)	2.823*** (0.150)	2.239*** (0.132)	0.743*** (0.078)	4.637*** (0.205)	3.297*** (0.182)	0.246*** (0.044)
2nd Quartile	3.310*** (0.507)	8.454*** (0.923)	7.004*** (0.805)	4.202*** (0.852)	0.016 (0.861)	-2.699*** (0.355)	0.126 (0.170)
3rd Quartile	6.319*** (1.183)	9.862*** (1.393)	9.553*** (1.296)	17.220*** (4.239)	1.009 (2.197)	-3.270*** (0.269)	-0.100 (0.085)
4th Quartile	6.262*** (2.412)	6.727*** (2.038)	7.358*** (1.724)	9.126 (5.609)	-0.520 (2.057)	-3.263*** (0.205)	-0.025 (0.184)
Year	0.035*** (0.010)	-0.098*** (0.036)	0.079 * (0.032)	0.102*** (0.016)	0.198*** (0.039)	0.261*** (0.034)	0.003 (0.011)
2nd Quartile*Year	0.255 * (0.101)	0.096 (0.202)	0.333 * (0.173)	0.250* (0.147)	0.198 (0.155)	-0.287*** (0.069)	-0.029 (0.042)
3rd Quartile*Year	0.260 (0.201)	0.642 * (0.279)	1.037*** (0.232)	1.823*** (0.567)	0.444 (0.286)	-0.380*** (0.062)	0.001 (0.019)
4th Quartile*Year	0.533 (0.375)	0.607 * (0.274)	0.980*** (0.212)	1.565 (0.969)	0.432 (0.351)	-0.283*** (0.045)	0.026 (0.030)
Post	-0.386*** (0.045)	1.043*** (0.244)	1.501*** (0.236)	-0.208 * (0.106)	0.212 (0.294)	-2.081*** (0.236)	0.090 (0.094)
2nd Quartile*Post	-3.310*** (0.507)	7.177*** (1.561)	8.765*** (1.510)	0.298 (0.787)	0.666 (0.934)	1.283*** (0.424)	0.122 (0.282)
3rd Quartile*Post	-6.263*** (1.180)	7.913*** (2.541)	8.998*** (2.644)	2.374 (2.236)	-2.210 (1.579)	2.022*** (0.315)	1.501*** (0.490)
4th Quartile*Post	-6.262*** (2.412)	8.620*** (2.353)	8.156*** (2.676)	4.373 (4.643)	1.838 (3.352)	1.282*** (0.425)	2.436 * (1.040)
Post*Year	-0.035*** (0.010)	-0.729*** (0.069)	-0.870*** (0.066)	-0.121*** (0.030)	-0.109 (0.085)	0.582*** (0.077)	-0.000 (0.029)
2nd Quartile*Post*Year	-0.255 * (0.101)	-3.180*** (0.480)	-3.437*** (0.464)	-0.043 (0.291)	-0.394 (0.323)	0.204 (0.177)	-0.004 (0.070)
3rd Quartile*Post*Year	-0.274 (0.202)	-3.899*** (0.673)	-4.621*** (0.714)	-2.948*** (0.972)	0.094 (0.268)	0.060 (0.186)	-0.133 (0.142)
4th Quartile*Post*Year	-0.533 (0.375)	-3.246*** (1.065)	-3.803*** (1.110)	-1.893 (1.207)	1.275 (1.284)	0.304 (0.375)	-0.397* (0.212)
R ²	0.024	0.026	0.025	0.039	0.001	0.005	0.000

Table 11: Financial innovations market share models. Data are from the Census of Governments and the Mergent Municipal Bond Securities Database. Observations are issuer-years. N=76,756. Significance key: *** p<0.01, ** p<0.05, * p<0.1.

Ratio	Any Innovation	Variable	Derivative	Debt Type	Offer Type	Purpose
Constant	0.180*** (0.007)	0.046*** (0.005)	0.021*** (0.005)	0.034*** (0.002)	0.034*** (0.005)	0.014*** (0.003)
2nd Quartile	0.153*** (0.043)	0.111*** (0.033)	0.048** (0.020)	0.002 (0.006)	0.080*** (0.031)	0.034 (0.022)
3rd Quartile	0.013 (0.033)	0.016 (0.012)	-0.004 (0.006)	-0.013* (0.007)	-0.004 (0.007)	0.003 (0.005)
4th Quartile	0.081* (0.046)	0.002 (0.012)	-0.007 (0.006)	-0.018*** (0.006)	-0.012* (0.007)	-0.004 (0.004)
Year	0.013*** (0.001)	0.002* (0.001)	0.003*** (0.001)	0.003*** (0.000)	0.004*** (0.001)	0.001* (0.001)
2nd Quartile*Year	0.013* (0.007)	0.013** (0.006)	0.008** (0.004)	0.000 (0.001)	0.012** (0.006)	0.004 (0.005)
3rd Quartile*Year	0.001 (0.004)	0.003 (0.002)	-0.001 (0.001)	-0.002 (0.002)	-0.001 (0.001)	0.000 (0.001)
4th Quartile*Year	-0.010* (0.006)	0.001 (0.002)	-0.001 (0.001)	-0.001** (0.001)	-0.002* (0.001)	-0.001 (0.001)
Post	-0.010 (0.012)	0.015 (0.009)	-0.007 (0.005)	0.017*** (0.004)	-0.002 (0.006)	-0.004 (0.004)
2nd Quartile*Post	0.013 (0.058)	-0.001 (0.026)	-0.016 (0.015)	0.029* (0.016)	-0.031 (0.027)	0.011 (0.021)
3rd Quartile*Post	0.004 (0.021)	-0.011 (0.013)	0.007 (0.006)	0.004 (0.009)	0.013 (0.014)	-0.003 (0.005)
4th Quartile*Post	-0.070** (0.034)	-0.011 (0.011)	0.008 (0.005)	0.024* (0.012)	0.003 (0.006)	0.007 (0.006)
Post*Year	-0.035*** (0.003)	-0.015*** (0.003)	-0.006*** (0.002)	-0.009*** (0.001)	-0.011*** (0.002)	-0.003*** (0.001)
2nd Quartile*Post*Year	-0.045*** (0.016)	-0.036*** (0.011)	-0.016** (0.006)	-0.006 (0.004)	-0.023*** (0.009)	-0.015** (0.006)
3rd Quartile*Post*Year	-0.005 (0.008)	-0.003 (0.005)	-0.000 (0.002)	0.004 (0.002)	-0.002 (0.004)	-0.001 (0.001)
4th Quartile*Post*Year	0.007 (0.009)	0.001 (0.005)	0.001 (0.003)	0.001 (0.002)	0.004 (0.003)	-0.000 (0.002)
R ²	0.020	0.013	0.008	0.007	0.009	0.005

Table 12: Ratio of innovation-linked issuance to annual expenditures. Data are from the Census of Governments and the Mergent Municipal Bond Securities Database. Observations are issuer-years. N=543,016. Significance key: *** p<0.01, ** p<0.05, * p<0.1.

Ratio	Insurer	Corporate Backer	Interest Calculation	Interest Frequency	AMT	Taxable	Small Denomination	Large Denomination
Constant	0.094*** (0.004)	0.036*** (0.005)	0.028*** (0.004)	0.035*** (0.004)	0.011*** (0.003)	0.011*** (0.002)	0.007*** (0.001)	0.045*** (0.005)
2nd Quartile	0.045** (0.019)	0.054** (0.027)	0.101*** (0.032)	0.092*** (0.029)	0.030** (0.013)	0.003 (0.004)	-0.005*** (0.001)	0.112*** (0.033)
3rd Quartile	-0.012 (0.023)	-0.008 (0.008)	0.013 (0.009)	0.007 (0.011)	0.009** (0.004)	0.004 (0.006)	-0.006*** (0.001)	0.013 (0.011)
4th Quartile	0.055 (0.038)	-0.005 (0.008)	0.003 (0.007)	-0.004 (0.008)	0.000 (0.004)	0.008 (0.012)	-0.007*** (0.001)	-0.003 (0.009)
Year	0.009*** (0.001)	0.004*** (0.001)	0.000 (0.001)	0.000 (0.001)	-0.000 (0.001)	0.001** (0.000)	0.001*** (0.000)	0.002*** (0.001)
2nd Quartile*Year	0.004 (0.004)	0.009* (0.005)	0.014** (0.006)	0.011** (0.006)	0.002 (0.003)	-0.000 (0.001)	-0.001*** (0.000)	0.014** (0.006)
3rd Quartile*Year	-0.002 (0.002)	-0.000 (0.001)	0.003** (0.002)	0.003 (0.002)	0.002** (0.001)	0.000 (0.001)	-0.001*** (0.000)	0.002 (0.002)
4th Quartile*Year	-0.015** (0.008)	-0.000 (0.001)	0.002 (0.001)	0.001 (0.001)	0.001 (0.001)	-0.004 (0.003)	-0.001*** (0.000)	-0.000 (0.001)
Post	-0.039*** (0.005)	0.006 (0.008)	0.023*** (0.009)	0.017** (0.009)	-0.005 (0.003)	0.011*** (0.003)	-0.003*** (0.001)	0.013 (0.009)
2nd Quartile*Post	-0.027 (0.020)	0.006 (0.027)	-0.004 (0.032)	0.009 (0.027)	-0.011 (0.013)	0.013 (0.008)	0.009* (0.005)	-0.005 (0.026)
3rd Quartile*Post	-0.012 (0.021)	-0.004 (0.009)	-0.008 (0.011)	-0.014 (0.010)	-0.006 (0.004)	0.004 (0.009)	0.004*** (0.001)	-0.008 (0.012)
4th Quartile*Post	-0.081** (0.032)	0.009 (0.011)	-0.007 (0.012)	-0.007 (0.010)	-0.002 (0.004)	0.002 (0.013)	0.006** (0.002)	-0.003 (0.011)
Post*Year	-0.017*** (0.001)	-0.010*** (0.002)	-0.011*** (0.002)	-0.011*** (0.002)	-0.001 (0.001)	-0.002*** (0.001)	-0.001** (0.000)	-0.014*** (0.002)
2nd Quartile*Post*Year	-0.011** (0.005)	-0.022 (0.015)	-0.035*** (0.010)	-0.033*** (0.011)	-0.006 (0.004)	-0.000 (0.001)	0.001 (0.001)	-0.038*** (0.012)
3rd Quartile*Post*Year	0.004 (0.003)	0.001 (0.003)	-0.003 (0.004)	-0.001 (0.004)	-0.002 (0.002)	-0.002 (0.002)	0.001 (0.001)	-0.003 (0.004)
4th Quartile*Post*Year	0.020** (0.009)	-0.002 (0.004)	-0.000 (0.004)	0.001 (0.004)	-0.001 (0.001)	0.004 (0.006)	0.001* (0.001)	0.001 (0.005)
R ²	0.031	0.006	0.010	0.009	0.006	0.004	0.001	0.013

Table 13: Ratio of innovation-linked issuance to annual expenditures. Data are from the Census of Governments and the Mergent Municipal Bond Securities Database. Observations are issuer-years. N=543,016. Significance key: *** p<0.01, ** p<0.05, * p<0.1.

Ratio	Put Option	Call Notice	Whole Call Frequency	Partial Call Frequency	Make Whole Call
Constant	0.029*** (0.004)	0.001** (0.001)	0.003*** (0.001)	0.003*** (0.001)	0.000 (0.000)
2nd Quartile	0.061*** (0.020)	-0.000 (0.001)	0.002 (0.002)	0.006* (0.003)	0.003 (0.003)
3rd Quartile	0.006 (0.009)	0.000 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
4th Quartile	-0.002 (0.006)	0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.000 (0.000)
Year	0.001 (0.001)	-0.000 (0.000)	0.000** (0.000)	0.000** (0.000)	0.000 (0.000)
2nd Quartile*Year	0.005 (0.004)	-0.000 (0.000)	0.000 (0.000)	0.001 (0.001)	0.001 (0.001)
3rd Quartile*Year	0.001 (0.002)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
4th Quartile*Year	0.000 (0.001)	0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
Post	0.018** (0.009)	-0.002 (0.002)	-0.001 (0.001)	-0.001 (0.001)	0.005*** (0.001)
2nd Quartile*Post	0.013 (0.019)	-0.003 (0.005)	0.004 (0.004)	0.002 (0.005)	0.010 (0.006)
3rd Quartile*Post	-0.011 (0.010)	-0.001 (0.003)	-0.001 (0.001)	-0.001 (0.001)	0.010** (0.004)
4th Quartile*Post	-0.004 (0.010)	0.004 (0.003)	0.000 (0.001)	0.000 (0.001)	0.016*** (0.006)
Post*Year	-0.011*** (0.002)	0.003*** (0.001)	-0.001 (0.000)	-0.001 (0.000)	-0.000 (0.000)
2nd Quartile*Post*Year	-0.021*** (0.008)	0.004* (0.002)	-0.002 (0.001)	-0.002* (0.001)	-0.001 (0.001)
3rd Quartile*Post*Year	0.000 (0.003)	-0.001 (0.001)	-0.000 (0.000)	-0.000 (0.000)	-0.002* (0.001)
4th Quartile*Post*Year	0.000 (0.004)	-0.002 (0.001)	0.000 (0.000)	0.000 (0.000)	-0.001 (0.002)
R ²	0.009	0.005	0.001	0.001	0.011

Table 14: Ratio of innovation-linked issuance to annual expenditures. Data are from the Census of Governments and the Mergent Municipal Bond Securities Database. Observations are issuer-years. N=543,016. Significance key: *** p<0.01, ** p<0.05, * p<0.1.

Ratio	Auction Agent	Remarketing Agent	Tender Agent	Financial Advisors (3+)	Fiscal Agent	Sinking Fund Depository	Placement Agent
Constant	0.012*** (0.003)	0.023*** (0.004)	0.024*** (0.004)	0.007*** (0.002)	0.010*** (0.001)	0.007*** (0.001)	0.001*** (0.000)
2nd Quartile	0.015** (0.006)	0.056*** (0.021)	0.047** (0.019)	0.057*** (0.022)	0.004 (0.005)	-0.003 (0.003)	0.002 (0.002)
3rd Quartile	0.000 (0.004)	0.002 (0.006)	0.001 (0.006)	0.044*** (0.015)	-0.001 (0.004)	-0.007*** (0.001)	-0.001** (0.000)
4th Quartile	-0.001 (0.004)	-0.006 (0.005)	-0.006 (0.005)	0.037 (0.032)	0.002 (0.006)	-0.007*** (0.001)	-0.000 (0.001)
Year	0.001** (0.000)	0.000 (0.001)	0.002** (0.001)	0.001** (0.000)	0.001*** (0.000)	0.001** (0.000)	0.000 (0.000)
2nd Quartile*Year	0.001 (0.001)	0.006 (0.004)	0.006 (0.004)	0.007 (0.005)	0.000 (0.001)	-0.000 (0.001)	0.000 (0.000)
3rd Quartile*Year	-0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	0.005** (0.002)	-0.001 (0.001)	-0.001*** (0.000)	-0.000 (0.000)
4th Quartile*Year	-0.000 (0.001)	-0.000 (0.001)	-0.001 (0.001)	0.006 (0.005)	0.001 (0.001)	-0.001** (0.000)	0.000 (0.000)
Post	-0.012*** (0.003)	0.025*** (0.008)	0.024*** (0.007)	0.007 (0.005)	-0.004*** (0.002)	-0.003** (0.001)	0.002* (0.001)
2nd Quartile*Post	-0.015** (0.006)	0.005 (0.022)	0.018 (0.020)	-0.039* (0.021)	0.009*** (0.003)	0.001 (0.002)	-0.000 (0.004)
3rd Quartile*Post	-0.000 (0.004)	-0.011 (0.009)	-0.008 (0.010)	-0.001 (0.012)	0.004 (0.003)	0.003** (0.001)	0.001 (0.001)
4th Quartile*Post	0.001 (0.004)	-0.007 (0.010)	-0.007 (0.009)	-0.020 (0.017)	0.009 (0.007)	0.003* (0.001)	-0.000 (0.001)
Post*Year	-0.001** (0.000)	-0.010*** (0.002)	-0.012*** (0.003)	-0.003** (0.001)	-0.001 (0.001)	0.000 (0.000)	-0.001*** (0.000)
2nd Quartile*Post*Year	-0.001 (0.001)	-0.018** (0.008)	-0.020*** (0.007)	-0.008 (0.006)	-0.002 (0.002)	0.000 (0.001)	-0.001 (0.001)
3rd Quartile*Post*Year	0.000 (0.001)	0.002 (0.003)	0.001 (0.003)	-0.009** (0.004)	0.001 (0.001)	0.000 (0.001)	0.000 (0.000)
4th Quartile*Post*Year	0.000 (0.001)	0.003 (0.003)	0.003 (0.003)	-0.008 (0.008)	-0.003 (0.002)	0.000 (0.001)	0.000 (0.000)
R ²	0.004	0.007	0.008	0.009	0.002	0.002	0.001

Table 15: Ratio of innovation-linked issuance to annual expenditures. Data are from the Census of Governments and the Mergent Municipal Bond Securities Database. Observations are issuer-years. N=543,016. Significance key: *** p<0.01, ** p<0.05, * p<0.1.