ASSESSING LOCAL GOVERNMENTS’ DEBT FINANCING STRATEGIES

Wei-Liang Lung

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APPROVED:

Simon A. Andrew, Major Professor
Robert L. Bland, Committee Member
HeeSoun Jang, Committee Member
Gary Webb, Chair of the Department of Public Administration
Thomas Evenson, Dean of the College of Public Affairs and Community Service
Mark Wardell, Dean of the Toulouse Graduate School

This dissertation assesses the importance of a specific debt instrument, the Certificate of Obligation in the state of Texas. It conceptualizes the Certificate of Obligation as a type of contractual debt that enables local governments to finance their capital projects. This dissertation is guided by three research questions: (1) What are the various types of debt instruments employed by local governments and what are their relative advantages? (2) How prevalent is the use of a specific debt instrument such as Certificates of Obligation? And why would some local governments prefer to issue them while others do not? (3) To what extent does the local institutional environment, e.g., the executive authority of city managers in the council-manager form of government, affect debt financing behaviors of local governments?

To examine the first research question, we created a typology to represent four ideal types of borrowing methods: (1) Contractual Debt, (2) Voter Approval/Special Tax Debt, (3) Guaranteed, and (4) Non-Guaranteed Debts. The typology examines whether or not the state mandates the referendum requirement for the use of each of these debt instruments, and at the same time determines whether each debt instrument is secured by multiple or single revenue sources.

Using data we collected among municipal governments in Texas, we conducted two empirical analyses. The first analysis tests the hypothesis that Certificates of Obligation have higher borrowing costs compared to GO bonds, since a GO bond is often issued under the pledge of the bond issuers’ full-faith credit and taxing authority. We employed a two-stage least square analysis to test the general proposition in the state of Texas. Based on 741 Certificates of Obligation and GO bonds issued between 2008 and 2011, our analyses show
that Certificates of Obligation are likely to incur True Interest Costs (TIC) similar to those of GO bonds.

The second analysis explores factors explaining the use of Certificates of Obligation in 225 Texas charter cities. Based on Heckman’s two-stage model, we found that a local government's decision to issue Certificates of Obligation to be partly explained by the characteristics of local population, i.e., median household income, population growth, and the percentage of senior citizens living in the jurisdiction. In the case of GO bonds, we found that population size, property tax rate, debt burden, and the percentage of population with at least a college education, to be an important determinant of GO bonds. The volume of GO issuance by local governments was also related to the level of regional competition, i.e., government density. Additionally, we found that local political institutions matter and that they affect debt financing behaviors of local governments.
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I dedicate this dissertation to my parents.
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CHAPTER 1

ASSESSING LOCAL GOVERNMENTS’ DEBT FINANCING STRATEGIES

Given the current economic recession, studying local government debts is becoming an increasingly important topic to understand the behaviors of local governments. Cohen (1989) argued that, during economic recessions, local governments are susceptible to default from their debt repayments. The ability of local governments to repay and finance their debts is linked to the boom and bust of market conditions. The city of Stockton (California), for example, failed to meet its obligation of bond repayment in 2012 because of a drastic decline in its tax revenues. In Harrisburg (Pennsylvania), where the local government invested $125 million in the construction of a new incinerator, it required the assistance of state government when the facility failed to generate sufficient revenues in order to repay its bond obligations. Martin et al. (2012) reported that local governments in New York and Pennsylvania are borrowing from state funds in order to make their debt payments. They also indicated that four municipalities in Michigan are headed by the “emergency financial managers,” appointed by the state governor, to avoid the possibility of bankruptcy.

Aside from the incidence of local governments defaulting, the use of debt financing at the local level often has implications on local government operations and residents’ tax burdens. First, the usage of debt financing can directly increase the operating costs of local governments because new investments often require additional employees to operate the new facilities. Bland and Nunn (1992), for example, have shown that, when local governments increase their capital expenditures in labor-intensive functions such as police, fire and parks, the operating expenditures of these functions will increase in subsequent years. Second, the usage of debt financing also has implications on local residents if local governments failed to generate sufficient revenues from their planned projects. Local residents would be levied a
higher property tax burden (Jung et al., 2009), sales taxes (Crabbe et al., 2005), and user charges (Biergabzl and Downing, 2004).

The strategies adopted by local governments to finance their borrowing present a theoretical puzzle. While ideally the appropriate fiscal conduct is to have a stable and balanced budget, why would residents allow local officials to issue debts if such actions could increase local taxes? In other words, local governments behave like an individual or a firm: "they would like to run up unlimited debts and never repay them, if they could do so without penalty" (Nicholson, 1995). Even if they could, they would shift the burden to the taxpayers. According to Moak (1982), and Regens and Lauth (1992), debt financing provides local governments with a means to distribute the costs of public infrastructures to future residents.

Unlike other forms of government services, infrastructure investments often require large capital outlays which benefit local communities in the long run. Because of the unique characteristics of public infrastructure, local governments can find ways to shift and spread the initial costs of public investments to future residents. Otherwise, the current residents will have to bear the full costs while new immigrants and future residents enjoy the benefits of the investment without paying the costs. In this view, debt financing extends the levy of the initial costs over a period of time and charges residents the costs of public infrastructure based on the potential benefits that can be generated. The theoretical puzzle implies the important trade-off for local governments, i.e., whether to issue debts or find alternative sources of funding. While some localities issued debts by going through state referendum requirements, others utilized less stringent requirements such as certificates of participation or certificates of obligations (Bahl and Duncombe, 1993; Sharp, 1986).
Demand Side of Government Capital Investments

The literature, based on the political economy perspective, often argues that local government decisions are constrained by local residents’ policy preferences. For example, according to the Tiebout’s model, local governments make decisions on public investments by adjusting to the preference or demand of local residents. In the model, citizens are assumed to be customers who have specific preferences for public services (Tiebout, 1956). Because of their preferences, citizens seek and move into a jurisdiction that satisfies their preferences for public services at a given level of local taxes. For example, preferences such as education, roads, and water shape a community with homogeneous preferences (Schneider, 1987; Stein, 1987). Given the homogenous preferences, local governments maintain the level of public infrastructure and services. They can reduce taxes when they issue less debt and produce services at lower costs. If local governments have higher taxes, but reduce the quantity of public services, local residents may choose to "vote with their feet," meaning that local residents will move to another locality if they perceive the bundle of goods and services are overpriced (Tiebout, 1956).

In addition to Tiebout’s “vote with their feet” assumption, Hirschman (1970) argues that local residents can also "voice out" their concerns over the decline by seeking improvement within the organization. Based on a proposition by Hirschman, local residents may use their votes in local elections to “voice out” whether they are satisfied with the current local investments in public infrastructures. As a consequence, the incumbent political officials may lose their positions as a result of initiating infrastructure plans which deviated from the aggregated preference of local residents (MacManus, 2004). Newly elected officials may have different policy preferences affecting local governments’ investments over public infrastructures (Clinger et al., 2008).
Gap in the Literature

While the literature strongly emphasizes the importance of local demand and preferences, there are still a limited number of studies that examine the “supply side” of public infrastructure investments. To mitigate the gap, the extant literature on debt financing tends to take on a macro approach, which examines institutional arrangements under which local governments make debt financing decisions (Farnham, 1985; Kiewiet and Szakly, 1996). Some scholars went further by examining the borrowing costs of different debt instruments. Other scholars continued examining innovative debt instruments utilized by local governments.

In the above lines of inquiry, the research related to debt instruments has largely been descriptive with lack of empirical evidence. The research on debt instruments not only underestimates the importance of debt instruments that are designed to meet local demand, but also fails to recognize the potential influence of debt instruments on local government capital investment decisions. To some extent, debt instruments matter because the risks and costs involved in using these instruments can encourage or discourage local governments’ investments over public infrastructures. In particular, the debt with low risk and costs may induce local governments to issue more debts.

To understand the potential influence of debt instruments on local government behaviors, several factors need to be addressed, such as the various types of debt instruments employed by local governments, the relative costs of these instruments, and how local political institutions affect local government decisions on capital investments.

Local Governments’ Uses of Innovative Debt Instruments

General obligation and revenue bonds have been viewed as the main debt instruments employed by local governments. The main difference between these two bonds is that the
issuance of general obligation bonds are under local governments’ full faith and credit; while the revenue bonds are guaranteed by revenue streams of public facilities, such as electric facilities (Kietwiet and Szakly, 1996). In addition, the issuance of general obligation bonds often needs to go through the bond election process (Pagano and Perry, 2008). Because of the specific arrangement related to these common debt instruments, the general obligation bonds are often viewed as an instrument with high political costs and low default risks; while the revenue bonds have relatively low political costs but high on default risks.

Empirical studies have shown that local governments would take on a high risk financial strategy through revenue bonds rather than take on political costs incurred through a bond election (Kelly and Massey, 1996). Subsequently, there have been a large number of revenue bonds issued by local governments, which can reduce local governments’ financial options in utilizing their tax revenues to repay their capital investment, particularly the property tax.

To encourage local governments to use their tax revenues in capital investments, state governments have often provided local governments with innovative debt instruments, such as certificates of participation and tax increment financing. These debt instruments do not have to go through the referendum requirement and thus allow local governments to use part of their tax revenues to repay the principal and interest of their debts. However, local governments rarely are allowed to use all their revenues as pledges for future bond repayments; instead, they can use their tax revenues from general funds. Because of this constraint, debts issued by local governments can be risky if they cannot generate sufficient revenues from their designated tax sources.

Borrowing Costs of Innovative Debt Instruments

The use of debt instruments is not without cost. The borrowing costs of an issued
debt can be captured either by the interests and/or by the fees paid to involved professionals. The high borrowing cost of an issued bond not only represents local government payments for getting external funding, but also the level of inefficiency of capital investments at the local level. Thus, understanding the borrowing costs of debt instruments can help us explain whether debt instruments are designed properly and the extent of local governments’ willingness to absorb the cost of borrowing.

The borrowing cost of issued debts is also subjected to interactions among local governments and the relevant actors, such as bond investor, bond rating agency, credit enhancers, and underwriters. Local government officials can reduce their borrowing costs by collaborating with underwriters to structure their bonds or obtain credit enhancers to secure bond repayments. Bond investors may charge high interest costs depending on the structure of the issued bond, the type of pledged revenues, and their familiarities with the issued bond.

Several empirical studies have examined the costs of borrowing of various types of debt instruments. Kidwell and Koch (1982), for example, compared the cost of borrowing between general obligation bonds and revenue bonds. They found a significant difference in interest costs between general obligation bonds and revenues bonds. The differences are counter-cyclical. Another study conducted by Robbins and Simonsen (2012 a) compared the cost of borrowing between conduit bonds and municipal lease payments. The results show that conduit bonds, on average, have higher borrowing costs than municipal lease payments. Although these studies examined the differences in the cost of borrowing of various debt instruments, none has directly compared the cost of borrowing between a traditional debt instrument (i.e., general obligation bonds, revenue bonds) and an innovative debt instrument (i.e., certificates of obligation, certificates of participation).
Local Political Institutions

Local political institutions also play an important role in explaining local government fiscal behaviors. This is because local institutions define the roles of local elected and appointed officials in the decision-making process. In the cases of debt instrument choices, municipalities with the council-manager form of government generally prefer to issue revenue bonds rather than general obligation bonds. This is because locally appointed and political officials in the council-manager form of government tend to prefer a lower tax portfolio than municipalities with the strong mayor-council form of government. Scholars argue that municipalities with strong city managers tend to employ low tax rates in order to attract private investments and promote economic development (Sharp, 1986). In addition, municipalities with the council-manager form of government tend to prefer Revenue Bonds because the debt instrument is flexible, less visible, and can be strategically manipulated (Cropf and Wendel, 1999). For these reasons, scholars argue that municipalities with council-managers will issue more revenue bonds than those with strong mayors.

However, what is puzzling is the association between the form of government and the choice it makes regarding various types of innovative debt instruments. For example, we can expect municipalities with a council-manager form of government to be more concerned with a potential increase in property taxes caused by an innovative debt instrument and therefore less likely to use such an instrument to finance their capital project. Yet, it is reasonable to expect municipalities with a council-manager form of government to prefer an innovative debt instrument if it is less visible to the public and more easily manipulated. The puzzle highlights the importance of associations between local political institutions and the choices made by local governments when considering innovative debt instruments.
Objectives of This Dissertation

This dissertation is guided by three research questions:

(1) What are the various types of debt instruments employed by local governments and what are their relative advantages?

(2) How prevalent is the use of a specific debt instrument such as certificates of obligation? And why would some local governments prefer to issue them while others do not?

(3) To what extent does the local institutional environment, e.g. the executive authority of city managers in the council-manager form of government, affect debt financing behaviors of local governments?

These research questions aim to increase our understanding about local governments’ debt financing in two ways. First, the research questions extend our understanding about certificates of obligation in Texas, which is an alternative way for local governments to get funding from the bond market without having to go to the voters. In addition to other forms of debt financing tools, local governments can provide public goods without relying heavily on the state government (Oates, 1999). However, like other forms of debt instruments, a certificate of obligation is neither neutral from risk, nor free from political costs. The inherent risks and costs shape the opportunity, as well as constrain local government behaviors to finance their capital projects.

The second lesson examines the extent to which local political institutions can affect local governments’ debt financing behaviors. Given the available debt instruments in Texas, local governments may behave differently given their local political and socio-economic conditions. According to the literature, local governments’ behaviors are often affected by their financial capacities, the stability of their revenues (Pagano, 2002), and political demands (Schwab and Oates, 1991). Moreover, when different concerns and demands converge into the local decision-making process, local political institutions often play a mediating role in influencing local governments’ debt financing behaviors. In this view, there is a need to
examine the role of local political institutions in explaining local governments’ debt financing behaviors.

Scope of This Dissertation

This dissertation empirically analyzes the relative advantages of issuing certificates of obligation—as a form of contractual debt---in the state of Texas. In particular, this dissertation examines the true interest cost (TIC) of certificates of obligation and compares it against the general obligation bond in order to determine the relative costs of contractual debt.

Contractual debt is defined as borrowing secured by annual contractual or lease payments of local governments. To utilize the debt instrument, local governments create a nonprofit or public authority to provide or produce services funded through the contractual debts. The entities created are responsible for the construction of public facilities and have the ownership and running of the properties. Local governments, as the future leasee of these properties, would sign rental contracts with private or nonprofit entities for the lease of these properties and promise that they will appropriate their annual operating expenses for the contractual obligations (Johnson and Mikesell, 1994).

Municipal governments in Texas are an appropriate unit of analysis to address the outlined research questions for the following reasons. First, municipalities in Texas are eligible for issuing the certificate of obligation, authorized by the state legislature under the Certificate of Obligation Act of 1971. The certificate of obligation---as a form of innovative debt instrument-- is distinctive compared to other types of debt instruments because it can be used to finance capital projects involving a contractual relationship between local governments and the nonprofit or private sector. In addition, the repayments on certificates of obligation are not limited to governments’ operational expenses, but can be repaid as
capital expenditures. Due to the flexibility of usage, the certificates of obligation can be viewed as a “quasi general obligation bond” without having to go through local voters. Moreover, the use of certificates of obligation by municipalities in Texas is inclined to be larger than other forms of debt instruments (see Figure 1-1).

Second, the debt information provided by the Texas Bond Review Board enables researchers to further analyze various types of debt instruments utilized by local governments in Texas. Prior studies have largely been constrained by limited accessibility of data sources and only analyzed local governments’ choices of debt instruments in terms of general obligation and revenue bonds (Cropf and Wendel, 1996; Sharp, 1986). The Texas Bond Review Board provides information on debts issued by local governments on an annual basis, thus providing insights on why municipal governments would select certain types of debt instruments over another.

Figure 1-1. Types of long-term debts issued by municipal governments in Texas (FY2000-FY2011)¹

Third, there are a limited number of studies examining debt financing behaviors of local governments in Texas. One such study was conducted by Thomas and

¹ Note: Other debts here include two types of debt. The first is refunding debt. The second type is the debt backed up by limited taxes or revenues, excluding property taxes.
Boonyapratuang (1993), which analyzed the way local governments in Texas issued local debts. The authors argued that county government decisions to issue debts were subject to the number of municipal government units and population density. They found that when the number of municipal government units was higher in a county, the amount of debts possessed by that county government was lower.

However, the research only examined 14 county governments in two metropolitan regions, thus ignoring the fact that municipal governments in Texas are also responsible for the provision of local public goods. For instance, compared to county governments, there is evidence to suggest municipalities and school districts also borrow money since they have the authority vested in them by the Texas state constitution and statute to borrow funds and finance their projects (Texas Education Code, chapter 45; Texas Government Code, chapter 1331; Texas Local Government Code, chapter 271).

Dissertation Overview

This dissertation is divided into five chapters. Chapter 2 examines local debt financing from a legal perspective in Texas. The objective of this chapter is to illustrate the extent to which Texas state government influences local debt financing strategies. Local government decisions are also determined by their fiscal autonomy. The first section of the chapter explores the level of financial autonomy possessed by different units of local governments in Texas, including county government, municipal government, and special districts. The chapter also examines borrowing methods available to local governments in order to explain patterns of local debt financing in Texas.

Chapter 3 provides an overview of certificates of obligation and general obligation bonds. The chapter also examines the benefits and costs of borrowing using either of these debt financing strategies. Data on municipal bonds in Texas – which includes various types
of debt issued by local governments, are also presented. The main question is to determine whether the costs of borrowing are relatively higher for certificates of obligation compared to general obligation bonds.

Chapter 4 explores factors explaining local governments’ decisions to choose certificates of obligation. The chapter employed an institutional theoretical framework to explain local government debt financing strategies. It does so by introducing the important institutional dimensions such as the council-manager form of government, local economic conditions, and demographic characteristics. This chapter adds to our understanding of the influence of local political institutions under specific state fiscal institutions.

Chapter 5 summarizes the general findings and provides suggestions for future research direction.
CHAPTER 2
LOCAL DEBT FINANCING IN TEXAS

Defining debt financing is complicated. For the most part, the strategies to finance and repay municipal debts are often referred to in the literature as "debt financing" (Clingermayer and Wood, 1995; Clinger et al., 2008). The term “debt financing” has also been described as a process where “state and local governments issue debt instruments called bonds that are sold to various investors, giving the government issuing the bonds that cash to build the infrastructure facility and giving the bond purchaser a claim on that government for future repayment of both the borrowed amount and interest” (Lee et al., 2007). While there are several terminologies used by scholars to describe debt financing, the term essentially highlights the ways in which local governments use their revenues as guarantees to borrow money within a period of time in the private market.

Given the definition of debt financing, instruments employed by local governments to borrow funds---borrowing methods--- can be viewed as a set of practical means used by governments for borrowing. Like individual borrowing, governments need to pledge their revenues or properties as the guarantee for their bond repayments. The arrangements over pledged revenue(s) often imply the odds that local governments may face default risks. Under extant state constraints, Texas local governments usually have two options to pledge their revenues. One is to pledge all their revenues; the other is to pledge a single revenue source, such as property taxes, sales and use taxes, or user charges. In most cases, the pledge of single revenue is restricted to specific public projects, including facilities-related projects, lease, transportation, and redevelopment. Overall, a debt instrument, which is secured by multiple revenue sources, should have a lower default risk than one secured by a single revenue source.

Another important characteristic of government borrowing is that governments rarely
make their debt financing decisions alone, but need to win approval of the residents. To conceptualize this process, it would be useful to think of debt financing as part of a provision and production decision. In making the decision, for instance, local governments can be treated as suppliers who propose one or multiple debt financing plans to address local demands for public goods and services. Local residents, as the customer, would be charged accordingly for their consumptions of the provision or production of goods and services. However, inefficiency may occur when local governments produce less-desired goods or desired-goods with high costs. Hence, Texas state governments, as the mediator, may set up mechanisms to ensure local governments and residents would negotiate with each other about the type and amount of desired public goods before providing or producing the goods and services.

This chapter examines local debt financing from a legal perspective in Texas. The objective is to illustrate the extent to which Texas state government can influence local debt financing strategies. Local government decisions are also determined by their fiscal autonomy as vested in the state constitution and statutes. The next section explores the level of financial autonomy possessed by different units of local governments, including the roles of county government, municipal government and special districts. The chapter also examines borrowing methods available to local governments in order to explain patterns of local debt financing in Texas.

This chapter also describes the characteristics of certificates of obligation and how the debt instrument is used in local governments’ debt financing strategies. More specifically, this chapter highlights local governments that are eligible to issue certificates of obligation and how certificates of obligation are issued. There are four sections in this chapter. The first section provides an overview on common patterns of state and local governments’ debt financing tools in Texas. The second section discusses the level of fiscal autonomy
possessed by different types of local governments in Texas. The third section discusses the advantages of certificates of obligation against other mandated borrowing methods. In the last section, based on information provided by the Texas Bond Review Board (TBRB), the patterns of certificates of obligation in Texas are discussed in relations to other debt instruments.

Overview of Texas State and Local Fiscal Relationship

According to the US Census Bureau, Texas is the second largest state in the U.S. both in terms of population size and political territory. Texas has a population more than 25 million, which is only less than the population of California. The state of Texas is approximately 695 thousand square kilometers. The population growth rate in Texas is also high compared to other states. According to Aaronson (2011), the population growth rate in Texas, from April 2010 to July 2011, is only second to Washington D.C.

Texas has a large number of local governments. For example, the number of county governments in Texas is 254, which is a relatively high number compared to other states in the Union (Newell et al., 2011). The number of municipal governments in Texas is large as well. According to the US Census, in 2007, the number of municipal governments in Texas is 1,209. The population size in each municipality in Texas is not equally distributed, however. More than half the municipalities have populations less than 5,000. In contrast, large municipal governments, such as Austin, Dallas, Fort-Worth, and San-Antonio, have millions in population.

Texas State statute mandates that municipal governments with populations over 5,000 can create their own city charters and, accordingly, provide the necessary services to their residents. As for municipalities with a population less than 5,000, they must follow the general laws to deliver and provide local services. An important difference between
municipalities with local charters and those subject to general law is that they are granted
different levels of authority in levying property taxes.

Aside from the general purpose governments, there are also numerous special-purpose
governments that are established to provide specific services, such as crime control districts,
school, and water service districts. For example, an independent school district is the most
common special-purpose government in Texas. According to the US Census (2010), the
number of school districts in Texas is 1,079, which is the largest in the United States. Water
districts and housing community development districts are the other two special-purpose
governments that are commonly established to provide special services in Texas (Magleby et
al., 2005).

Challenges Facing Local Governments in Texas

Local governments in Texas face several challenges. The extent to which local
governments effectively deliver services is largely affected by the fiscal system vested in the
state constitution and statutes. Within the statutory framework, the fiscal system is an
important factor to consider in order to understand how local governments decide to finance
their capital projects. Moreover, it also determines the responsibility and revenue sources
available to each level of local governments in that state. In particular, it provides
guidelines for state government to determine local revenue-sharing strategies when assisting
local governments to provide and produce local services.

Based on the Texas constitution and statutes, the fiscal system can be described as a
decentralized system because of the following three features. First, a clear assignment of
functional responsibility among general purpose governments for the provision of local
services. Based upon the constitution\(^2\), Texas state government is required to establish and

\(^2\) Texas Constitution, Article 7.
make suitable provision for the support and maintenance of an efficient system of public
schools, causing educational spending to be the largest spending category in the state budget
(Newell et al., 2012). As for county governments, they are responsible for the
implementation of state-imposed welfare programs (Newell et al., 2012) and the provision of
specific public facilities, such as jails, court-houses, bridges, and roads. Finally, municipal
governments are responsible for the provision of sewer, gas, and power systems.

Second, the decentralization system also provides a well-defined revenue allocation
system that determines which types of government have access to certain types of tax
revenue. It also provides guidelines on the maximum tax rate that each government can
impose on its residents. In Texas, local governments rely heavily on sales and property
taxes as their source of tax revenue.

Third, an intergovernmental transfer system provides the largest sources of funding
for education. Although the constitution and statutes define the taxing authority of each
type of local government, the state government can still alter or change local governments’
revenue structure by allocating and sharing state revenues with local governments. The
state government designed the grant system in order to provide assistance to local
governments. According to the website of Texas transparency, Texas state government
provided around $14.5 billion to local governments in 2013, which represents approximately
26.1% of total state expenditures. In particular, more than 90% of state grants went to local
government units that are responsible for educational services. The rest of the state grants
was distributed to various local government units, including county and municipal
governments, councils of governments, judicial districts, and other political subdivisions.

3 Texas Constitution, Article 11.
4 Texas Local Government Code, Chapter 51.
5 According to the Texas Constitution.
6 The government units here include school districts, junior colleges, senior colleges and universities.
Consequently, coupled with a strong economy and the population growth in recent decades\(^\text{7}\), local governments in Texas are fiscally independent. The fiscal decentralization system has an effect on the percentage of own-source revenues and creative ways local governments are using their debt financing tools. For example, local governments heavily relied on their own source of revenues rather than depending on state grants. A national study conducted by Connolly et al. (2010) showed that in 1992 state aid only represented about 29.3% of the total revenues of Texas local governments. That figure dropped to 24.7% in 2006, which is the fourth lowest compared to the rest of the states in the Union during that year. However, the self-reliance tendency of local governments varies. Pagano and Hoene (2010), for example, demonstrated that state aid only represents less than 7% of the total revenues for municipal governments in Texas.

Second, local governments in Texas heavily relied on debt financing tools for funding their capital expenditures. According to the Tax Foundation (2008), the total amount of local debt in Texas was approximate to $7,512 per capita in 2008, which represents the third largest level of local debt across 50 states in the Union. The total amount of local debt is rather large when considering that the total state debt in Texas is approximately $1,370 per capita during the same time period. As Figure 2-1 shows, since 2001, municipal governments and school districts issued more debt than other types of local governments in Texas.

\(^{7}\) According to a report published by the Texas Comptroller of Public Account, the total property tax in Texas has grown 188% between 1992 and 2010.
Table 2-1 lists the main tax rate limits for each level of local governments in Texas to levy a specific tax. The table suggests that not all local governments in Texas have the same fiscal authority. Based on the information collected from the Texas legislature council report, municipalities in Texas have relatively high fiscal autonomy compared to other forms of local governments in Texas. This is because municipal governments in Texas not only have access to multiple revenue sources but also can levy taxes at a higher high tax rate limit. County governments, although having the same level of fiscal authority as special districts (e.g., school and hospital districts), are subject to similar property tax rate limits as special districts. County governments can levy other forms of taxes, such as sales tax and hotel occupancy taxes, but are subject to stringent limits. Special districts can also levy the same or larger amount of taxes compared to county governments.
<table>
<thead>
<tr>
<th>Municipality</th>
<th>Property Tax</th>
<th>Sales and Use Tax</th>
<th>Hotel Occupancy Tax</th>
<th>Franchise Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General</strong></td>
<td>up to $0.80/$100 valuation</td>
<td>2%</td>
<td>up to 7%</td>
<td>Revenue limit: same value as 1998.</td>
</tr>
<tr>
<td><strong>Specific</strong></td>
<td>Population &gt;5,000: $2.50/$100</td>
<td>Economic development: up to 0.5%</td>
<td>Venue project: additional 2%</td>
<td>Municipality can adjust rates, but the rate cannot make the total charged franchise fee exceed the amount of 1998.</td>
</tr>
<tr>
<td></td>
<td>General cities: $1.50/$100</td>
<td>Reduce property taxes: up to 0.5%</td>
<td>Convention center: additional 2%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Street maintenance: up to 0.25%</td>
<td>Specific cities: additional 0.5-2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Venue project: up to 0.5%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>County</strong></td>
<td>up to $0.80/$100 valuation</td>
<td>City present: 0.5%, No city present: 1%</td>
<td>No Authority</td>
<td>No Authority</td>
</tr>
<tr>
<td></td>
<td>Special road and bridge: additional $0.15/$100 valuation</td>
<td>Landfill: up to 0.5%</td>
<td>Specific counties: 2-7%, but most are having 2% limits</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Criminal detention center: up to 0.5%</td>
<td>Venue projects: up to 0.5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>School district</strong></td>
<td>Maintenance: $1.50/$100 valuation Bond: $0.50/$100 valuation</td>
<td>No Authority</td>
<td>No Authority</td>
<td>No Authority</td>
</tr>
<tr>
<td><strong>Water district</strong></td>
<td>No limits but all subject to election</td>
<td>No Authority</td>
<td>No Authority</td>
<td>No Authority</td>
</tr>
<tr>
<td><strong>Hospital district</strong></td>
<td>up to $0.75/$100 valuation</td>
<td>Property tax relief: up to 2% General revenue: up to 2%</td>
<td>No Authority</td>
<td>No Authority</td>
</tr>
</tbody>
</table>

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8 Since 2006, Texas state government has adopted a new law to compress the property tax rate of school districts. Under the new laws, Texas school districts may not levy their property tax up to $1.17/$100 valuation for their maintenance expenditure. Specifically, if school districts want to raise their property tax rates, they have to hold a tax ratification election. If the majority of voters do not approve raising the property tax rate, the school districts must use the same rate as the one from the last fiscal year to levy their property taxes. All information above is collected from Texas legislative council (2002).
Borrowing Methods Available to Texas Local Governments

In order to understand debt financial strategies and instruments by local governments in Texas, I created a typology to represent four ideal types of borrowing methods that are available to local governments. The columns indicate whether or not the state mandates the referendum requirement for the use of this debt instrument. The rows indicate whether this instrument is secured by multiple or single revenue sources. Each ideal type of debt instrument may be presented as a different type of municipal bond in the bond market. The various forms of one ideal instrument reflect the fact that local governments do not always pledge their own-source revenues, but can also use revenues from other governments or local private business as the pledge for their issued debts.

Table 2-2
A typology of debt instruments

<table>
<thead>
<tr>
<th>Mandated Referendum</th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Contractual Debt</strong></td>
<td>Certificate of Obligation</td>
<td>Guaranteed Debt</td>
</tr>
<tr>
<td></td>
<td>Certificate of Participation</td>
<td>General Obligation Bond</td>
</tr>
<tr>
<td></td>
<td>Lease payment</td>
<td></td>
</tr>
<tr>
<td><strong>Pledged Revenue(s)</strong></td>
<td><strong>Non-Guaranteed Debt</strong></td>
<td><strong>Voter-Approved Special-Tax Debt</strong></td>
</tr>
<tr>
<td><strong>Multiple</strong></td>
<td>Industrial or Rental Revenue Bond</td>
<td>Sales Tax Bond</td>
</tr>
<tr>
<td></td>
<td>Moral Obligation Bond</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tax Incremental Financing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Revenue Bond</td>
<td></td>
</tr>
<tr>
<td><strong>Single</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Contractual Debt

Contractual debt is the debt secured by governments’ annual contractual or lease payments. To utilize the debt instrument, local governments can create a nonprofit or public authority to provide or produce services funded through the contractual debts. The entities
created are responsible for the construction of public facilities and have the ownership and running of the properties. Local governments, as the future leasee of these properties, would sign rental contracts with private or nonprofit entities for the lease of these properties and promise that they will appropriate their annual operating expenses for the contractual obligations (Johnson and Mikesell, 1994). In addition to the general funds, the local government can issue bonds, such as certificates of participation, and then use the borrowed money to pay the starting expenses and future rents. In general, funds raised through contractual debts represent the borrowing methods where local governments have maximum autonomy to raise funds. This is because the bond is neither treated as debt subject to state debt limitations, nor restricted by referendum requirements (Granof, 1984; Johnson and Mikesell, 1994).

Texas has taken a unique approach to manage bonds issued for governments’ contractual obligations. In this approach, no local governments in Texas may issue a bond that is solely secured by the local governments’ general fund. In addition, a new debt instrument, called a certificate of obligation, was created to assist local governments to use debts for their contractual obligations. The main difference between the Texas approach and the conventional approach is that the certificate of obligation is still viewed as a local debt, which can be repaid from all government legal revenues. Because of specific characteristics, the certificate of obligation is arguably a bond that brings more advantages to local governments than traditional contractual bonds.

Non-Guaranteed Debt

Revenue debts are the debt secured by specific revenue or limited tax revenue. Specific revenue here refers to the revenue of self-supporting facilities, such as water plants,

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9 Texas Certificate of Obligation Act.
utilities, transportation, (Farnham, 1985; Sbragia, 1996) or state grants. Limited tax revenue here mainly refers to the increase of property tax in a specific area (Davis, 1989). Furthermore, revenue debt is not subject to debt ceiling and referendum requirements mandated in state laws (Sharp, 1986; Utevsky, 1977). Utevsky (1977), for example, has explained that because taxpayers are not directly liable in the case of default on such bonds, the courts have ruled that constitutional debt limitations do not apply to state level non-guaranteed debts.

In Texas, most local governments can issue revenue bonds. For bonds secured by the revenues of public facilities, local governments are often required to submit bond proposals to state agencies and can only issue their revenue bonds after receiving their approval. As for the bonds issued in form of tax increment financing, local governments are required to go through another legal process. First, county or municipal governments need to designate a geographic area in their boundaries as the reinvestment zone, and then they must hold a public hearing to demonstrate the benefits of creating this reinvestment zone\(^\text{10}\). Finally, the county or municipal governments need to formulate a financial plan to demonstrate the percent of property tax in the reinvestment zone that will contribute to the tax increment fund\(^\text{11}\). Following this procedure, the county and municipal governments may issue tax increment bonds for financing their reinvestment plans\(^\text{12}\).

Guaranteed Debt

Guaranteed debt can be defined as debts that are issued with the full taxing power of government and that such power is used as a guarantee for making payments (Bahl and

\(^{10}\) Texas Tax Code, Chapter 311 Tax Increment Financing Act, section, 311.003.

\(^{11}\) Texas Tax Code, Chapter 311 Tax Increment Financing Act, section, 311.011 and section, 311.012.

\(^{12}\) Texas Tax Code, Chapter 311 Tax Increment Financing Act, section, 311.015.
Duncombe, 1993). The general obligation bond, for example, is the main type of full faith and credit debts that are issued by state and local governments. In the issuance of full faith and credit debt, all taxes or revenues of local governments are pledged to secure and repay the debt. If necessary, a higher tax levy will be used as an option for local governments to repay their guaranteed debts. Depending upon statutory requirements of state governments, local governments often require majority citizen approval for the issuance of guaranteed debts. In addition, the issuance of general obligation bonds is often subject to debt ceiling limitations (Pagano and Perry, 2008).

In Texas, every local government can issue a certain type of guaranteed debt. In the issuance of guaranteed debt, local governments are often required to go through bond elections and can only issue guaranteed debts with the approval of the voters. Aside from the referendum requirements, local governments are also subject to the constraints of the debt ceiling, the maximum amount of debts that can be issued. Texas statute has used different approaches to design debt ceilings for each type of local government. Some municipal governments must not have outstanding debts exceeding 10% of the appraised value of total properties in their jurisdictions. County governments have multiple debt ceilings designed for specific purposes, such as bridges, courthouses, and jails. School districts not only are subject to a general debt ceiling, but also have additional debt ceilings because of their status. As for water and hospital districts, they do not have a formal debt ceiling, but cannot levy taxes beyond tax rate limits for the repayment of the bond.

13 According to Texas Government Code, section 1331.051, the municipalities with population over 750,000 are subject to the statutory debt ceiling. As for other municipal governments, they are subject to the debt ceilings mandated in their city charters.
14 Texas Education Code, section 45.0031.
15 Texas Education Code, section 45.0011.
Voter-Approved Special-Tax Debt

Voter-approved special-tax debt is the debt secured by the special tax revenue that can only be levied under the approval of majority voters in a jurisdiction. In general, this debt instrument can be categorized as one type of dedicated-tax debt in which local governments are allowed by states to use their one specific tax revenue as the pledge of their issued debts. However, using the term “dedicated-tax debt” may be inaccurate when considering the fact that not all local taxes can be levied at will by local governments. Some specific local taxes, such as sales taxes, in most states can only be levied under the approval of majority voters (Goldman and Wachs, 2003). Otherwise, local governments do not have the taxing authority to levy local sales tax. Thus, the debt secured through limited tax revenues should be individually categorized as a special or specific borrowing method.

In Texas, local governments may issue this type of bond when they have the authority to levy local sales and user taxes. As mentioned above, the levy of the local sales tax in Texas often requires local governments to hold a bond election. If local governments intend to use sales taxes as the pledge of their issued bonds, they are required to demonstrate the purposes of a bond proposal and the percent of sales and user taxes that will be used for bond repayments\textsuperscript{16}. Notably, Texas municipal governments can only use 25\% of their sales and tax revenues for repaying their issued bonds\textsuperscript{17}.

Under the proposed typology, I investigated how Texas statutes regulate borrowing methods at the local level. Table 2-3 below lists the debt financing instruments available to local governments. According to Texas statutes, municipal and county governments can use multiple borrowing methods to finance their capital projects. County governments were found to be more constrained in using these borrowing methods than municipal governments.

\textsuperscript{16} Texas Tax Code, section 321.508 and section 323.105.

\textsuperscript{17} Texas Tax Code, section 321.508.
In addition, hospital districts are the only special district that can issue certificates of obligation when other special districts can only issue either revenue bonds or general obligation bonds for financing their capital projects. However, hospital districts do not have absolute power to decide on the issuance of certificates of obligation. They must obtain the approval of county governments before issuing the bond.

In the next section, I discuss whether the level of fiscal authority will lead local governments to have different preferences toward the use of debt instruments. I focus my attention on the certificate of obligation. I expect local governments with fiscal authorities to have a stronger preference to issue certificates of obligation than local governments with less authorities. This is because multiple fiscal authorities enable them to have the contingency to cope with potential revenue shortfall problems; and, in turn, reduce default risks. In contrast, local governments with a low level of fiscal authorities lack fiscal contingency to cope with the potential revenue shortfall; and, in turn, less likely to pledge all revenues for the issuances of the certificate of obligation. Hence, I expect the usage of certificates of obligation will vary among different types of local governments.

The Uses of Certificates of Obligation

Since the passage of the certificate of obligation act in 1971, Texas local governments are authorized to use a new method to borrow money. Certificates of obligation, unlike the extant borrowing methods, not only allow local governments to use all their revenue sources (including property tax), as the pledge of borrowings, but also make the mechanism of citizen approval conditional. The certificate of obligation is also beneficial to local governments because it can be issued for multiple purposes, making other restrictive borrowing methods become less attractive.

Given the characteristics of certificates of obligation, debates arise as to whether it is
suitable for local governments to continue using this type of borrowing method. While local officials designing the debt instrument can avoid administrative procedures and the long process of issuing local debts (Barbee, 2012), the debt instrument can be abused if local citizens are unaware of the purpose for which the debt is being issued. State officials have argued that the usage of certificates of obligation allows local governments to issue local debts without having to go through voters and, consequently, increasing the debt burden of local communities (Combs, 2012). In short, the debate surrounding the usage of certificates of obligation implies a tradeoff between government effectiveness and accountability.

To provide some evidence for these expectations, I used the debt issuance information provided by the Texas Bond Review Board. The Texas Bond Review Board, as a state agency, has compiled the debt issuance information in Texas since 1999. Specifically, the Texas Bond Review Board not only divides the debt issuance information by types of local governments, but also has complete information regarding the name of the bond issued by each type of local governments. The main advantage of using the information provided by the Texas Bond Review Board is that it enables us to analyze the borrowing methods taken by each type of local government over a period of time.

I took the following steps to conduct my analysis. First, I collected the debt issuance information regarding three types of local governments between 2000 and 2010\(^\text{18}\). These three types of local governments are county governments, municipal governments, and hospital districts. As Table 2-3 demonstrates, there are three types of local governments that are qualified to issue certificates of obligation.

Based upon the debt issuance information, municipal governments in Texas are the ones that have issued more municipal bonds than the other two local governments since 2000.

\(^{18}\) I found that the debt issuance information in 1999 has a different format compared to the information for following years and lacked the name of each issued municipal bond. Therefore, I decided to exclude this year’s information.
Table 2-3

Procedural and fiscal constraints over Texas local borrowing methods

<table>
<thead>
<tr>
<th></th>
<th>Contractual Debt</th>
<th>Nonguaranteed Debt</th>
<th>Guaranteed Debt</th>
<th>Voter-Approved Special-Tax Debt</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Certificate of Obligation</td>
<td>T.I.F.</td>
<td>Revenue Bond</td>
<td>GO or Combined Tax and Revenue Bond</td>
</tr>
</tbody>
</table>

**Municipality**

- **Procedural**: Election if petition received
- **Fiscal**: No state intervention
- **Procedural**: Limits on percent of property value
- **Fiscal**: Limits on percent of property value

- **Procedural**: Local Charter
- **Fiscal**: Some municipalities: 10% of total valuation
- **Procedural**: 25% of sales tax revenue
- **Fiscal**: Subject to tax rate limits

**County**

- **Procedural**: Election if petition received
- **Fiscal**: No state intervention
- **Procedural**: Limits on percent of property value
- **Fiscal**: Limits on percent of property value

- **Procedural**: Bond election
- **Fiscal**: Debt ceiling by purposes:
  - Courthouse: 2%
  - Jail: 1.5%
  - Bridge: 1.5%
- **Procedural**: Subject to tax rate limits
- **Fiscal**: Subject to tax rate limits

**School District**

- **Procedural**: No authority
- **Fiscal**: Can join but no initiate authority

- **Procedural**: Bond election
- **Fiscal**: 25% of property tax revenue

**Water District**

- **Procedural**: No authority
- **Fiscal**: State attorney general

- **Procedural**: Bond election
- **Fiscal**: Amount limits

**Hospital District**

- **Procedural**: Election if petition received
- **Fiscal**: No authority

- **Procedural**: Bond election
- **Fiscal**: Subject to tax rate limits
On average, municipal governments issue around 437 municipal bonds per year between 2000 and 2010. In 2005, municipal governments issued a total of 491 municipal bonds, which accounts for the maximum number of municipal bonds issued in recent years. County governments are the second largest bond issuers in my analysis. On average, county governments issued around 81 municipal bonds per year in the period between 2000 and 2010. In 2008, county governments in Texas issued a total of 107 municipal bonds, which accounts for the maximum number in my analysis. Finally, hospital districts, on average, issued around 14 municipal bonds between 2000 and 2010.

Second, I developed a coding system to capture the differences among these municipal bonds. In this coding system, I divided municipal bonds into four categories by identifying the names of each municipal bond\textsuperscript{19}. The first three categories are certificates of obligation, general obligation bonds, and revenue bonds. In these three categories, revenue bond refers to bonds that are secured by the specific revenue of one public facility, such as water and drainage facilities, toll roads, and hospitals. Based upon the information provided by the Texas Bond Review Board, I discover that most revenue bonds issued by municipal governments are secured by water and utility facilities. In a few cases, the revenue bond issued by municipalities may be secured by the revenues from airports, hotels, and golf courses. Unlike the municipal revenue bond, the revenue bond issued by a county government is solely secured by the revenue of toll roads, while the revenue bond issued by hospital districts is solely secured by the revenue of the hospital.

The fourth category is limited tax and revenue bonds. In this category, I included bonds with ambiguous names, such as public improvement, contractual obligation, as well as pension obligation and limited tax. In addition, limited tax and revenue bonds include

\textsuperscript{19} In the coding process, I found out that all these three types of local governments only issue a few tax increment financing and sales tax bond between 2000 and 2011. So, I do not create a specific category for each of these two bonds.
bonds that are secured by more than one government revenue, but do not have either certificate of obligation or general obligation in their names. Aside from the four types of bonds, local governments also issued refunding bonds and short-term notes. While a refunding bond represents the bond that is issued to retire previous bonds by the same government, a short-term bond is issued to cover government revenue deficits. To some extent, these two bonds are not issued for financing capital projects, and have relatively short maturity. Consequently, they were excluded from my analysis. Based on the coding system, I coded all bonds that have been issued by three types of local governments between 2000 and 2010.

Figure 2-2 shows the percentage of each borrowing method that has been taken by Texas hospital districts between 2000 and 2010. As mentioned above, Texas hospital districts have not issued as many bonds as other local governments. When hospital districts needed to issue debts, they generally preferred to issue revenue bonds or a bond backed up by limited tax revenues. In other words, they tended to issue less general obligation bonds and certificates of obligation. For instance, certificates of obligation were rarely used by Texas hospital districts for financing their capital projects. This can be explained partly by state statues, where hospital districts are strictly controlled by county governments in the issuance of certificates of obligation, and partly by a lack of preference to pledge all their revenues for the issuance of certificates of obligation.

Figure 2-3 shows the percent of each borrowing method utilized by Texas county governments between 2000 and 2010. Texas county governments, on average, issued around 30 certificates of obligation during the past 11 years, which represent 30% of the total debt issued by counties. However, there has been a tendency for county governments to

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20 Although I exclude short-term bonds in the analysis, it is still noticeable that there is a strong tendency for county governments to issue short-term debts. Between 2000 and 2010, the issuance of short-term bonds, on average, has represented around 20% of total issuance of county debts.
decrease the usage of certificates of obligation in recent years. In 2000, I note that the certificate of obligation was the bond most commonly issued by Texas county governments representing 46% of the total Texas counties’ issued bonds.

![Figure 2-2 Types of long-term debts issued by hospital districts in Texas (year 2000-2011)](image)

However, the use of certificates of obligation dropped considerably since 2000. In 2011, the total number of certificates of obligation that were issued only represents 15% of total county...
debts. Instead of issuing certificates of obligation, Texas county governments seemed to shift their debt financing patterns and issued more limited tax and revenue bonds or general obligation bonds.

Figure 2-4 shows the percentage of each borrowing method that has been used by municipal governments in Texas between 2000 and 2010. Compared to the first two types of local governments, Texas municipal governments are distinctive in two aspects. First, Texas municipal governments have a relatively stable pattern of debt financing between 2000 and 2010. In general, Texas municipal governments prefer to issue bonds secured by multiple revenues and demonstrate low preference to issue bonds secured by single revenues. Therefore, either revenue bonds or limited tax revenue bonds represent more than 20% of the total Texas municipal bonds in recent years. Second, there is a strong tendency for Texas municipal governments to issue certificates of obligation for financing their capital projects. Even though the percentage of issued certificates of obligation dropped during the recent economic downturn, the number of issued certificates of obligation (i.e., n = 155) still exceeds the number of issued general obligation bonds (i.e., n = 153) in 2011.
Conclusion

The number and amount of debts issued by local governments in Texas reveal interesting patterns. The issuance of certificates of obligation seems to be associated with different types of local government that have different levels of fiscal authority. When a local government has a high level of fiscal authority, the government is more likely to use certificates of obligation. As for the local government with a low level of fiscal authority, the certificate of obligation seems not to be an attractive option. Overall, my analysis provides some evidence to suggest an association between local governments’ fiscal authority and debt instruments or borrowing methods.

However, this analysis is limited. First, the aggregated information used in my analysis can only reveal general patterns of local government debt financing in Texas, but fail to take account of specific debt financing behaviors. Second, I recognize the number of cases included in this analysis may affect the validity of the proposed debt financing patterns. Aside from Texas municipal governments, I only have a limited amount of bond issuance information from Texas hospital districts and county governments. The limited amount of bond issuance information may affect the predictability of the suggested debt financing patterns.
CHAPTER 3
DEBT FINANCING: BORROWING COSTS OF CERTIFICATE OF OBLIGATION IN TEXAS

The strategies adopted by local governments to finance their borrowing present a theoretical puzzle. While ideally the appropriate fiscal conduct is to have a stable and balanced budget, why would residents allow local officials to issue debts if such actions could increase local taxes? In other words, local governments behave like an individual or a firm: "they would like to run up unlimited debts and never repay them, if they could do so without penalty" (Nicholson, 1995). Even if they could, they would shift the burden to the taxpayers. According to Moak (1982) and Regens and Lauth (1992), debt financing provides local governments with a means to distribute the costs of public infrastructures to future residents. The theoretical puzzle also implies an important trade-off for local governments, i.e., whether to issue debts or find alternative sources of funding. While some localities issued debts by going through state referendum requirements, others utilized less stringent requirements such as certificates of participation (COP) or certificates of obligations (CO) (Bahl and Duncombe, 1993; Sharp, 1986).

The objective of this chapter is to compare the cost advantage of certificates of obligation and general revenue bonds. In particular, I am interested to examine whether COs provide local governments with similar cost advantages compared to general obligation bonds. Theoretically, general obligation bonds should have a lower interest cost compared to certificates of obligation because they are often issued under the pledge of bond issuers’ full-faith credit and taxing authority (Kidwell and Koch, 1982). The pledge of taxing authority is important because it signals to the market that bond issuers can repay obligations by levying additional local taxes (Bahl and Duncombe, 1993; Fortune, 1991). However, it is also feasible that the CO generally have a lower interest cost than GO bonds since the COs
have less procedural constraints enabling local governments to take advantage of changing market demands.

I employed a two-stage least square (2SLS) regression analysis to test the general proposition in the state of Texas. I compiled my data from two primary sources: (1) Texas Bond Review Board (TBRB) and (2) Municipal Securities Rulemaking Board (MSRB). A total of 741 COs and GO bonds that were issued by Texas municipal governments between 2008 and 2011 was collected. The results of my analyses show that COs are likely to incur similar True Interest Costs (TIC) as GO bonds while controlling for the influence of refinancing bonds. The finding also reveals that bond investors are equally concerned with the number of revenues pledged for bond repayments. When bonds are secured by legal revenue sources, on average, the true interest costs are relatively low.

This chapter is organized in the following way. The next section frames debt financing as collective action problems before extending the argument in order to understand innovative debt instruments. I also discuss the advantages and disadvantages of certificates of obligation in Texas and then present my hypotheses. I explain the research design and data collection procedure before presenting the main results. The final section concludes the chapter with some limitations and future research.

Debt Financing and Certificates of Obligation

Given the current economic recession, studying local government debts is becoming an increasingly important topic to understand the financial behaviors of local governments. Cohen (1989) argued that, during economic recessions, local governments are susceptible to default from their debt repayments. The ability of local governments to repay and finance their debts is linked to the boom and bust of market conditions. The city of Stockton (California), for example, failed to meet its obligation of bond repayment in 2012 because of
a drastic decline in its tax revenues. In Harrisburg (Pennsylvania), where the local
government invested $125 million in the construction of a new incinerator, it required the
assistance of state government when the facility failed to generate sufficient revenues in order
to repay its bond, Martin et al. (2012) reported that local governments in New York and
Pennsylvania are borrowing from state funds in order to make their debt payments. They
also indicated that four municipalities in Michigan are headed by “emergency financial
managers,” appointed by the state governor, to avoid the possibility of bankruptcy.

Unlike other forms of government services, infrastructure investments often require
large capital outlays and benefit local communities in the long run. Because of the unique
characteristics of public infrastructure, local governments can find ways to shift and spread
the initial costs of public investments to future residents. Otherwise, the current residents
will have to bear the full costs while new immigrants and future residents enjoy the benefits
of the investment without paying the costs. In this view, debt financing extends the levy of
the initial costs over a period of time and charges residents the costs of public infrastructure
based on the potential benefits that can be generated. In other words, aside from the
incidence of local governments defaulting, the uses of debt financing at local levels often
have implications on local government operations and residents’ tax burden. The usage of
debt financing can directly increase the operating costs of local governments because new
investments often require additional employees to operate new facilities (Bland and Nunn,
1992). If local governments failed to generate sufficient revenues from their planned
projects, local residents would be levied a higher property taxes burden (Jung et al., 2009),
sale taxes (Crabbe et al., 2005), and user charge (Bierhanzl and Downing 2004).

The usage of debt instruments are not without costs. The borrowing costs of an
issued debt can be captured either by the interests and/or by fees paid to involved
professionals. High borrowing costs of an issued bond not only suggests local governments
have to pay a relatively high price for getting external funding, but also implies capital investments made at local level to be inefficient. The borrowing costs of issued debts are also subject to interactions of local governments with relevant actors, such as bond investor, bond rating agency, credit enhancers and underwriters. While local governments can reduce their borrowing costs by collaborating with underwriters to structure their bonds, they can also get credit enhancers to involve in securing bond repayments. Bond investors, however, would charge interest costs based upon the different structures of issued bonds, the types of pledge revenues, and their familiarities with the bonds that are to be issued.

Several empirical studies have examined various debt instruments and their borrowing costs. Kidwell and Koch (1982), for example, compared borrowing costs between GO bonds and Revenue bonds and found differences in interest costs between GO and revenues bonds are countercyclical. In addition, Robbins and Simonsen (2012a) compared the borrowing costs of conduit bonds and municipal lease payments. Their results show that conduit bonds, on average, have a higher borrowing cost compared to municipal lease payments. Although these studies examined the differences in borrowing costs between various debts instruments, none has directly compared the borrowing costs between traditional debt instruments (e.g., GO or revenue bonds) and innovative debt instruments (e.g., certificates of obligation and certificate of participation).

In the next section, I extend our understanding on innovative debt instruments, i.e., certificates of obligation in Texas and certificates of participation (COP) in general. The debt instrument is an alternative way for local governments to obtain funding from the bond market without having to go through the voters. In addition to other forms of debt financing tools, local governments can provide public goods without relying heavily on the state government (Oates, 1999). However, like other forms of debt instruments, CO is neither
neutral from risk nor free from political costs. The inherent risks and costs shape the opportunity as well as constraints over local government behaviors.

Innovative Debt Instruments

In the debt financing literature, there are many ways local governments can finance their capital projects. One method is through the usage of certificates of participation, which presents local governments with debt instruments that are an alternative to the general obligation bond and revenue bond (Bifulco et al., 2012; Johnson and Mikesell, 1994; Hildreth and Zorn, 2005). In the issuance of COP, for example, state and local governments first would reach a lease agreement with a third party for buildings, equipment, and facilities. The third party will be responsible for the constructions of new properties and holds the legal titles of the properties until the termination of the lease agreement. Under the lease agreement, local governments can issue COPs to get outside funding; and then provide the fund to the third party for the construction of leased properties. Once the planned properties are completed, the local government can use annual lease payments to cover the principals and interests of the issued COP.

The issuance of COP provides local governments with substantial advantages over the traditional debt instruments, i.e., general obligation and revenue bonds. For example, local governments can circumvent constitutional or statutory debt limitations since the issuance of COP is not viewed as direct debts owed by governments (Granof, 1984). The usage of COP allows local governments to avoid incurring political costs such as those

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22 When local governments do not have public facilities and do not want to go through the bond election, COP becomes a possible avenue to access the bond market (Dyl and Joehnk, 1978). However, local governments can only issue limited numbers and amounts of COP, which reduce its attractiveness to local governments as an alternative debt instrument. A study conducted by Johnson and Mikesell (1994), for example, shows that the issuance of COP only represents 3.36% of the total long-term municipal securities in 1993. They also indicate that COP often has a lower credit rating compared to General Obligation bonds and Revenue Bonds.
experienced through the general obligation bonds (Dyl and Joehnk, 1978). Moreover, local
governments are required to use general funds to repay issued COP, thus allowing them to
use tax revenues for bond repayments (Johnson and Mikesell, 1994). The COP also
provides flexibility to local governments in paying their debts if there is a non-appropriation
clause in the lease agreement (Hildreth and Zorn, 2005).

In Texas, as discussed further below, local governments can also utilize another
innovative debt instrument, i.e., certificates of obligation. As the name implies, a certificate
of obligation is similar to a COP because the issuance of certificates of obligation does not
require direct bond elections and can be repaid by local governments through their tax
revenues. However, a certificate of obligation is different from COP in terms of authorized
use, pledged revenues, and arrangements of ownership or property rights. Certificates of
obligation present local governments in Texas with an alternative to the COP for the
following reasons:

First, local governments in Texas can issue certificates of obligation without having to
go through direct bond elections. According to the Texas code, section 271.049, Texas local
governments are required to publish notices in local newspapers once a week for two
consecutive weeks before the issuances of certificates of obligation. Excepting the public
notice requirement, Texas local governments would only need to hold a bond election when
they receive a protesting petition signed by at least 5% of qualified voters in their
communities. Considering the difficulty for local voters to complete a legal petition, Texas
local governments are more likely to issue certificates of obligation without going through
the referendum process. Therefore, the design of certificate of obligation should be able to
reduce the political costs incurred in the bond issuance process as COP.

Second, local governments in Texas can use all their legal revenues in order to repay
debts issued through certificates of obligation. Unlike the COP, however, local
governments can use both their current and capital funds to repay the interests and principals of their issued CO. In addition, Texas local governments are allowed to pledge the same revenues for certificates of obligation as they can pledge for general obligation bonds\textsuperscript{23}. Under the regulations, certificates of obligation provide Texas local governments with more fiscal autonomy when making repayments of their certificates of obligation as compared to COPs.

Third, local governments in Texas can issue certificates of obligation for multiple purposes. According to the Texas code\textsuperscript{24}, Texas local governments can issue certificates of obligations for the construction of any public works and/or purchasing of material, equipment, machinery and properties, as well as professional services. Additionally, certificates of obligation can also be issued for building facilities, such as prison buildings, as well as bridges, and the restoration of historic structures.

An important difference between certificates of obligation and COP is that when local governments issue certificates of obligation, they are not required to sign a lease agreement, but a contract with the third party. Because certificates of obligation are often issued for repaying governments’ contractual obligations, the third party involved can only be regarded as the service provider; and the third party does not possess the property rights. In other words, local governments would hold the legal titles of newly constructed properties in the certificates of obligation issuance. For the most part, holding the property rights of newly constructed projects can reduce the transaction costs incurred in a long-term public-private capital construction (Bloomfield, 2006; Bloomfield et al., 1998). Despite the prevalent usage of certificates of obligations by local governments in Texas, few have systematically

\textsuperscript{23} Texas Code, Section 271. 052.

\textsuperscript{24} Texas Code, Section 271.045, Section 271. 046 and Section 271.0461
examined their characteristics and the costs of borrowing. The next section of this chapter examines the usage of certificates of obligations in Texas.

Certificate of Obligation in Texas

Municipal governments in Texas are eligible for issuing the certificate of obligation as authorized by the state legislature under the Certificate of Obligation Act of 1971. A certificate of obligation, unlike extant borrowing methods, not only allows local governments to use all their revenue sources, including property tax, as the pledge of their borrowings, but also makes the mechanism of citizen approval conditional. A certificate of obligation is beneficial to local governments because it can be issued for multiple purposes. It is also distinctive compared to other types of debt instruments because it can be applied to financing capital projects that involve contractual relationships between local governments and the nonprofit or private sector. The repayments on certificate of obligation are not limited to governments’ operational expenses but can be repaid as capital expenditures. Due to the flexibility of usage, the certificates of obligation can be viewed as a “quasi general obligation bond” without having to go through voters.

The usage of certificate of obligation by municipalities in Texas tends to be larger than other forms of debt instruments. This is understandable because certificate of obligation provides local governments an easy access to borrowing. According to Texas Local Government Code section 271.049, local governments in Texas can issue certificate of obligation only with public notice to local residents. In this process, local governments are required to publish the notice once a week for two consecutive weeks in a local newspaper. If there is no protesting petition after the public notice, local governments can make their final decisions over the issuance within and after the 30th day of the first notice.
Another reason for an increase in the usage of certificate of obligation is because the instrument can increase the probability of a local government to receive external funding from the federal government. Given the process of issuing certificate of obligation, a local government may use the financing tool to match financial requirements of specific funding programs. Take the city of Lancaster (Texas) as an example. In 2009, the federal government started the “Build American Bonds” under the American Recovery and Reinvestment Act. The city of Lancaster issued certificate of obligation in order to match the requirement of the Build American Bond program. The usage of certificate of obligation also indirectly facilitates intergovernmental cooperation; and, in turn, increases the opportunity for local governments to obtain lower borrowing costs to finance their new capital projects. For example, certificate of obligation can provide an additional solution to the problem of higher borrowing costs of water districts. According to the Texas code section 271.045, a municipality may issue a certificate of obligation to pay all or part of the obligation incurred by the construction of water facilities that are managed by another government entity or political subdivision. Because of this regulation, municipal governments may expand their roles in constructing new water facilities25.

However, given the general features of certificate of obligation, it has raised concerns as to whether certificate of obligation is suitable for local governments to use as a debt instrument. On the one hand, local officials may argue that certificate of obligation can help them avoid the long process of debt issuance (Barbee, 2012). On the other hand, certificate of obligation would allow local governments to issue debts without voter permission and,

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25 For example, in 1999, the City of Sweetwater, issued Certificates of Obligations for the construction of new water treatment plants. The bonds were issued through the Texas Water Development Board with funding from the "Drinking Water State Refunding Bond." After the issuance, the City of Sweetwater planned to use the revenues from the newly constructed water treatment plant to repay their Certificates of Obligation. In short, certificate of obligation may facilitate cooperation among different government units and reduce the cost of borrowing for local governments.
consequently, increase the local communities’ debt burdens (Combs, 2013). For instance, certificate of obligation may increase the odds of imprudent local debt financing strategies since local governments issuing certificate of obligation need only to supply local residents with public notices. Consequently, local voters have limited time to react and organize into groups against local governments’ issuance of debts. Moreover, according to the Texas code, section 271.049, local governments are only required to address in their public notices (1) the time and place set for the passage of issuing certificates of obligation, (2) the amount of planned certificates of obligation, and (3) what type of revenues will be used to make the repayment. There is no requirement to disclose further information such as the interest costs of issued bonds, the current state of debt burden in that community, or the stability and quantity of pledged revenues.

Another issue is related to risks of default, which in turn affects the total credit ranking of government units in Texas. An important feature of certificate of obligation is that it does not require local governments to pledge their future taxing authority for repaying debt. The importance of pledging future taxing authority is that it provides local governments some contingencies to levy additional taxes when the promised revenues cannot generate sufficient revenues for bond repayments (Kidwell and Koch, 1982). Because certificates of obligation are often issued without the pledge of future taxing authority, the extent to which local governments would fulfill their repayment obligations would be based on local political officials to commit themselves to make debt repayment26. If they do not intend or fail to do so, the bond default would be the expected result. The default of one

26 In fact, a similar issue has been addressed over the issuance of certificates of participation. It is because a certificate of participation is repaid from local governments’ general fund and is not secured by local governments’ taxing authority. Given the features of certificates of participation, both this bond and the certificate of obligation have the same problem, that is, local officials take a dominant role in making bond repayments than other nonguaranteed debts. In practice, Johnson and Mikesell (1994) reported how two local governments, Richmond school district (California) and Brevard County (Florida) faced financial difficulty in repaying their certificates of participation.
local government may cause systematic damage to the bond rating of the local governments in the same area or the same state (Kietwiet and Szakaly, 1996). In other words, the certificate of obligation may increase the default risk of local debts in Texas.

General Hypotheses

Scholars and practitioners often use interest cost as an indicator of the cost of borrowing (Bland, 1984, 1987; Robbins and Simonsen, 2012a). An interest cost can be defined as a fee paid to lenders as compensation of using their money (see O’Sullivan and Sheffrin, 2003). Interest costs matter in explaining local governments’ debt financing behaviors because high borrowing costs are likely to dampen the incentive for local governments to get their capital funding from the bond market (Robbins and Kim, 2003). Consequently, they may seek other funding sources instead (Frant, 1997; Leigland, 1994).

Theoretically, GO bonds should have a lower interest cost compared to certificate of obligation for at least two reasons. First, GO bonds produce lower information costs to bond investors than CO. For instance, the main feature of GO is that it is often issued under the pledge of bond issuers’ full-faith credit and taxing authority (Kidwell and Koch, 1982). The pledge of taxing authority is important because it ensures bond issuers would unconditionally realize their repayment obligations by levying additional local taxes (Bahl and Duncombe, 1993; Fortune, 1991). In contrast, the issuance of CO does not require local governments to pledge their taxing authorities, which may induce bond investors to incur high information costs, i.e., to investigate the bond issuers’ financial conditions.

Second, compared to certificate of obligation, GO bonds are more familiar to bond investors. A general obligation bond, as a type of standardized product, is a common municipal bond sold in the bond market. To some extent, bond investors are familiar with the basic features of GO bonds and have primary criteria to evaluate an issued GO bond.
The familiarity reduces problems of information asymmetry. On the other hand, certificate of obligation --as a new creative bond product – is known to a limited number of bond investors. The lack of familiarity with certificate of obligation may lead to a relatively weak demand. Accordingly, underwriters, the private firms winning the bid for the right to sell a municipal bond, may need to spend a relatively longer period of time to find potential investors. Lack of demand, when coupled with high searching costs; require the issuer of certificate of obligation to pay relatively higher interest costs than GO bonds. As a result, I hypothesize that:

Hypothesis 1: General obligation bonds have a relatively lower interest cost compared to certificates of obligation.

It is also possible that certificate of obligation can incur a lower interest cost than GO for two reasons. First, certificate of obligation when compared to GO bonds, has relatively adaptive procedural constraints enabling local governments to take advantage of changing market demands. The GO bonds—as a traditional debt instrument adopted by local governments---are often constrained by referendum requirements (Kietwiet and Szakaly, 1996, Pagano and Perry, 2008). Due to this limitation, local governments face a time-lag between the decisions to borrow and the actual date of borrowing (Hildreth, 1993). The time-lag reduces local governments’ chance to issue their debts at a time when bond investors charged relatively lower interest costs. In contrast, the issuance of certificate of obligation is not directly constrained by the referendum requirement and thus allows local governments to respond faster to changing market conditions (Kidwell and Koch, 1982). If most local governments issued their certificates of obligation strategically, given the market condition, then they would be able control their borrowing costs. Thus, I hypothesize that

Hypothesis 2: General obligation bonds have a relatively higher true/interest cost compared to certificates of obligation.
The issuance of certificate of obligation may have the same interest costs as the GO bond chiefly because bond investors may charge interest rates to local governments based on risks of defaulting from their debts. Hsueh and Chandy (1989), for example, stated that when an issuer defaults on a regular bond, investors may lose the predetermined interest benefit, and/or the original investment. Because of the potential risk of defaulting, the bond investors may attach more weight to pledged revenues than other factors, such as information or marketability. The importance of pledged revenues is that it signals the ability of local governments to use a single or all of their revenue sources to meet their repayment obligation.

In general, the amount of revenue sources and the level of stability of pledged revenues have been regarded by bond investors as the two criteria to evaluate a local government’s default risks. For example, municipal bonds that are backed by multiple revenue sources are often viewed with less default risks than municipal bonds supported by single or limited pledged revenues (Peng and Brucato, 2004, Kidwell and Koch, 1982). The municipal bonds that are backed by a relatively stable revenue source tend to have a lower interest cost than those that are backed up by economic-sensitive revenues, such as sales taxes or the revenues of a recreational facility (Hopwell and Kaufman, 1977). If these two criteria are crucial in determining the interest costs of municipal bonds, then it is reasonable to assume that certificate of obligation would incur a similar interest cost as the GO bond. This is because both types of municipal bonds are backed by multiple revenue sources and both can use property taxes (the least economic-sensitive government revenues) as the pledged revenues.

Hypothesis 3: There is no difference in true interest rate costs between general obligation bonds and certificates of obligation.
Research Design and Data

The data for this study were collected from two primary sources: (1) Texas Bond Review Board (TBRB) and (2) Municipal Securities Rulemaking Board (MSRB). The TBRB, a state agency in Texas responsible for monitoring state and local debt financing, records and compiles data on local governments’ bond issuance and publishes them yearly on its website. Every year the TBRB uploads a spreadsheet entitled “All Local Government Issuance” and “City GO & Revenue Debt Outstanding,” listing municipal bonds issued by local governments in Texas. The spreadsheet contains specific information related to municipal bonds, such as issued amount, bond rating, and sales types. According to the available data from TBRB, Texas municipal governments, on average, issued 182 certificates of obligation and 100 GOs between 2000 and 2011.

The second data source was derived from the MSRB. The MSRB is a subdivision of the U.S Securities and Exchange Commission, which compiles official statements from dealers which they prepare on behalf of a municipal issuer in order to issue a new municipal bond. An official statement describes the essential terms of a newly issued bond, including the interest rates, the timing and manner of bond repayment, and whether the bond can mature prior to its maturity date. It also includes the financial sources, such as taxes or facilities revenues, that the bond issuer may use for bond repayments and the consequences if issuers fail to make the repayments. By collecting the official statements from MSRB, I have detailed information related to maturity and annual principal and interest payments, as well as methods of repayments.

Given the data sources, my sample was determined in the following ways. I took the lists provided by TBRB as the targeted sample. According to the TBRB’s data, Texas municipal governments issued an average of 182 certificates of obligation and 100 GOs between 2000 and 2011.

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27 According to MSRB’s website http://emma.msrb.org/EducationCenter/WhyReadOS.aspx, there is no mandated content for the official statements regarding new issued municipal bonds.
municipal governments issued a total of 1,217 Certificates of Obligation and GO bonds between 2008 and 2011. Official statements for each were gathered from the MSRB. Because no official statements were available for bonds that were sold in private placement\textsuperscript{28}, 476 targeted municipal bonds were excluded. Also excluded were 65 other municipal bonds because of insufficient information. The total includes 741 certificates of obligation and GOES bonds issued by Texas municipal governments. This sample represents approximately 60\% of the total municipal bonds that were issued as certificates of obligation and GO between 2008 and 2011.

**Dependent Variable**

The dependent variable in my analysis is the True Interest Costs (TIC) of municipal bonds. The TIC calculation ascertains a fixed interest rate which, when applied to each year’s interest and principal payment, produces an aggregate amount that equals the total money borrowed through a particular bond (Nauss, 1986). The method also assumes the interest rate will fluctuate over the life of a bond, but grow annually across the life of a bond. Therefore, the calculation of the TIC method squares the fixed interest rate annually against annual interest and principal payments. The fixed interest rate is viewed as the average interest rate of a municipal bond. While I recognize that the interest cost of a municipal bond can be calculated using other methods, i.e., Net Interest Cost (NIC) and Present Interest Cost (PIC), for the purpose of this paper, it is calculated based on Hopewell and Kaufman (1974). The summary statistics are presented in Table 3-1.

\textsuperscript{28} According to the information disclosed by the MSRB website, dealers may not submit the official statements to MSRB when the newly issued bonds are under $1 million, or sold to investors in units no less than $100,000 and are sold to no more than 35 “sophisticate investors”, meaning the investors have an asset net worth over 2.5 million and have earned more than $250,000 in the past two years before the bond issuance. Aside from MSRB’s requirements, I also found that bonds without bond ratings seem less likely to have official statements than the ones with bond ratings.
\[ TB = \sum_{n=1}^{m} P_n = \sum_{n=1}^{m} \frac{P_n + I_n}{(1 + r)^n} \]

where,

- \( n \) = number of years since bond issuance,
- \( m \) = number of years for the year of final maturity,
- \( r \) = A hypothesized fixed interest rate,
- \( I \) = amount of annual interest payment,
- \( P \) = amount of annual principal payment,
- \( TB \) = amount of total borrowed.

Table 3-1
Summary statistics of TICs (between 2008 and 2011)

<table>
<thead>
<tr>
<th>Year</th>
<th>Certificates of Obligation</th>
<th>General Obligation Bonds</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>.0431</td>
<td>.0042</td>
</tr>
<tr>
<td>2009</td>
<td>.0437</td>
<td>.0050</td>
</tr>
<tr>
<td>2010</td>
<td>.0381</td>
<td>.0050</td>
</tr>
<tr>
<td>2011</td>
<td>.0374</td>
<td>.0055</td>
</tr>
</tbody>
</table>

Independent Variables

Certificates of Obligation

The main independent variable is a dummy variable representing whether a bond is certificates of obligation or general obligation bond. If the debt was issued through certificates of obligation, it was coded 1, otherwise 0. Tables 3-2 presents the frequency distribution of certificates of obligation and GO bonds between 2008 and 2011. The total number of municipal bonds in my sample is 741, where about 51.3% is for certificates of obligation and 48.7% for general obligation bonds. Table 3-2 also shows a decline in the percentage of certificates of obligation that were issued in 2008 and 2011, i.e., from 62.9% to 43.5%. Between 2010 and 2011, more GOs were issued in Texas than certificates of...
obligation. Although the percentage of certificates of obligation and GO is not equally distributed in my sample, the pattern is somewhat similar to debt financing practices in Texas.

Table 3-2
Summary statistics for co and go

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Certificates of Obligation</th>
<th>General Obligation Bonds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>2008</td>
<td>159</td>
<td>100</td>
<td>62.9</td>
</tr>
<tr>
<td>2009</td>
<td>151</td>
<td>82</td>
<td>54.3</td>
</tr>
<tr>
<td>2010</td>
<td>215</td>
<td>104</td>
<td>48.4</td>
</tr>
<tr>
<td>2011</td>
<td>216</td>
<td>94</td>
<td>43.5</td>
</tr>
<tr>
<td>Total</td>
<td>741</td>
<td>380</td>
<td>51.3</td>
</tr>
</tbody>
</table>

Structure of Issued Bonds

To capture the structure of a municipal bond, I included years to maturity, size of debt, call provision, and the purpose to which the municipal bond is issued. The *year of maturity* is measured by the time length that municipal bond issuers plan to complete their principal repayments. I standardized the variable by using the natural logarithm of the number of years to final bond maturity. I coded the variable based upon the repayment schedules included in each bonds’ official statement. The literature points out that bond investors generally require a higher interest rate when issuing bonds with a longer maturity period than those with a shorter maturity (Bland, 1984; Hendershott and Kidwell, 1978; Roden and Bassler, 1996; Robbins and Simonsen, 2012). This is because a long term bond investment would increase the level of uncertainty for bond investors to predict whether this investment can reach its expected return (Fortune, 1991).

*Size of debt* is represented by the monetary amount of a municipal bond at the time when the municipal bond is issued. I used a natural logarithm of the size of the bond to
standardize the measurement. Due to economies of scale, a municipal bond that is issued in a large volume should have a lower interest rate than those that are issued with a small amount (Bland, 1985; Simonsen et al., 2001; Robbins and Simonsen, 2007).

*Call provision* is captured by a dummy variable. I coded the bonds with a call provision as 1, otherwise as 0. I coded the variable based on the section of optional redemption in each bond’s official statement. As presented in Table 3-3, 635 out of 741 municipal bonds in the sample, about 85.7% have the call provision attached. The municipal bond with the call provision is expected to have a higher interest rate than the one without this provision (Simonsen et al., 2001).

The bond issued for *multiple purposes* is measured by a dummy variable. The bond that is issued for multiple projects is coded as 1, otherwise as 0. Municipal bonds are expected to have a higher interest rate when they are issued for financing capital projects with unstable revenue streams; they are also risky if used for general purposes, such as economic development, environmental facilities, hospitals, and parking (Leonard, 1983; Kidwell and Koch, 1982; Peng and Brucato, 2004; Guzman and Moldogaziev, 2012). I examined the purpose of municipal bonds based on information available from the TBRB. I note that in the sampled bonds, they are rarely issued for high risk purposes (issued for more than two purposes, i.e., economic development, housing, and recreation). However, I found that based on 346 of the sampled bonds, about 46.6% are issued in order to finance multiple projects. I assume the bonds issued for multiple projects should have a higher interest rate than a single purpose bond.

I also controlled for municipal bonds designated for refining purposes. Refinancing purpose is measured as a dummy variable. When a municipal bond is issued

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29 In the preliminary analysis, I also coded the time length between the date of first issuance and the date of first redemption. However, this variable is highly correlated with the variable of call provision. Therefore, I decided to drop the variable representing the time length of first redemption.
for a refinancing purpose, it is coded as 1, otherwise as 0. The expectation is that municipal bonds that are issued for a refinancing purpose will have a lower interest rate than those that are not due to the sensitivity of refinancing bonds to the prevalent interest rate (Robbins and Simonsen, 2012). In the sample, based on 230 bonds, about 31% are issued for refinancing purposes; they are also issued in the form of general obligation bonds.

Bond Issuance Process

To capture the variations of the bond issuance process, I included three variables: bond rating, credit enhancement, and type of sales. The Bond Rating is measured by a dummy variable, which codes the bond with AAA rated as 1, otherwise as 0. The variable is based on the Standard & Poor’s (S&P) rating. I collected the S&P rating from TBRB’s dataset. In the sample, 93.2% of the total number of municipal bonds received a bond rating from S&P, and 345 out of the 691 bonds received a AAA rating from this bond rating agency. I controlled for the potential influence of bond rating because prior studies suggest that the presence of high bond ratings would lead to lower interest costs.

The variable credit enhancement is operationalized as a dummy variable. If a municipal bond has a third-party guarantee, it is coded as 1, otherwise as 0. I collected the information about credit enhancement based on TBRB’s dataset. A municipal bond with a third-party guarantee (e.g., private banks) is assumed to have lower borrowing costs than one without a third party guarantee, because they have a lower default risks (Kidwell et al., 1987).

The type of sale is measured by a dichotomous variable. When municipal bonds are sold as a competitive sale, it is coded as 1; if the bonds are sold as a negotiated sale, it is coded as 0. Competitive sale means that local governments select their underwriters through a bidding process. A negotiated sale is the method in which local governments
directly select their bidder. I collected the information on the type of sale from the TBRB’s dataset. About 27% of municipal bonds in the sample are sold in competitive sale. Prior studies suggest that the bond sold in a competitive sale is more likely to have lower interest costs than ones sold through the negotiated sale (Kidwell and Rogowski, 1983; Robbins and Simonsen, 2007).

Timing of Bond Issuance

I used market interest rate and year (as dummies) to capture the timing of bond issuances. The expectation is that when the interest rate is high in the bond market, the bonds issued at that time should also have a high interest rate. To measure market interest rate, I compiled information from the “20 GO Bond Index” between 2008 and 2011. The information was provided by the Bond Buyer website. Bond Buyer has provided different indices weekly since 1900. The 20 GO Bond Index, among other indexes provided by the Bond Buyer, is the average interest rate of 20 selected general obligation bonds issued in the same week. I believe the 20 GO bond index should be a reliable indicator of the approximate market interest rate.

I coded each bond’s issue date based upon the date stated in their official statement. Recorded date, unlike the closing date of issue, is the date when a municipal bond starts to incur its interest. I believe the market interest rate around the dated date will have a strong influence in affecting bond issuers’ decisions over interest rates arrangements. I coded the market interest rates based on the 20 GO Bond Index and the issue date of municipal bonds. The average market interest rate is 4.55% and the standard deviation is 0.34%.

The year dummies are used to represent the fiscal years when the sampled bonds are issued. I collected the bonds issued between fiscal year 2008 and fiscal year 2011. According to the fiscal year adapted by Texas state government, it begins September 1 every
year and ends on August 31 the next year. In my analysis, I used fiscal year 2008 as the base group. I compared the difference in TIC between the bonds issued in the other three years and the bonds issued at fiscal year 2008.

Table 3-3
Descriptive statistics (independent variables)

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year to maturity</td>
<td>741</td>
<td>17.46</td>
<td>5.32</td>
<td>3.00</td>
<td>31.00</td>
</tr>
<tr>
<td>Issued amount (log)</td>
<td>741</td>
<td>6.79</td>
<td>0.41</td>
<td>5.70</td>
<td>8.10</td>
</tr>
<tr>
<td>Bond buyer's GO 20 index</td>
<td>741</td>
<td>4.55</td>
<td>0.34</td>
<td>3.82</td>
<td>5.85</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>No</th>
<th>Yes</th>
<th>No (%)</th>
<th>Yes (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certificates of Obligation</td>
<td>741</td>
<td>380</td>
<td>361</td>
<td>48.7</td>
<td>51.3</td>
</tr>
<tr>
<td>Callable</td>
<td>741</td>
<td>106</td>
<td>635</td>
<td>14.3</td>
<td>85.7</td>
</tr>
<tr>
<td>Multiple purposes</td>
<td>741</td>
<td>395</td>
<td>346</td>
<td>53.3</td>
<td>46.7</td>
</tr>
<tr>
<td>Refinancing purpose</td>
<td>741</td>
<td>511</td>
<td>230</td>
<td>69.0</td>
<td>31.0</td>
</tr>
<tr>
<td>AAA rated</td>
<td>741</td>
<td>396</td>
<td>345</td>
<td>53.4</td>
<td>46.6</td>
</tr>
<tr>
<td>Credit enhancement</td>
<td>741</td>
<td>384</td>
<td>357</td>
<td>51.8</td>
<td>48.2</td>
</tr>
<tr>
<td>Competitive sales</td>
<td>741</td>
<td>541</td>
<td>200</td>
<td>73.0</td>
<td>27.0</td>
</tr>
</tbody>
</table>

Methods of Analysis

I employed a two-stage least square (2SLS) regression analysis to determine whether differences exist between TIC of CO and GO bonds. The 2SLS model is designed to overcome the problems of endogeneity and causality in using an ordinary least square regression model (OLS). According to Stock and Watson (2004), the endogeneity problem of OLS regression refers to the situation where explanatory variables correlate with the error term in the equation and has a biased estimated coefficient. In addition, causality problem refers to the situation in which there is an uncertainty about whether the variations of dependent variables may reversely explain the variations of explanatory variables.
To minimize the potential endogeneity and causality problems, the 2SLS model suggests that researchers can employ some instrument variables to approximate the variations of main explanatory variables, and create new values for this explanatory variable based upon the approximation. The instrumental variables should be the ones that are directly related to issuers’ choices over certificate of obligation and GO, but not directly related to variations of the unobservable variables influencing the average interest costs of issued municipal bonds. I included senior citizens, homeowner rates, and high school degrees as the instrumental variables. The choice of the first two instruments is based upon Capeci (1991), and Robbins and Simonsen (2012). Senior citizens, on the one hand, are likely to prefer bond issuance because they can enjoy the immediate benefits of capital infrastructures, while not likely to bear the full costs of these infrastructures. On the other hand, homeowners should prefer less new capital constructions than other groups of residents because the potential property tax rise caused by the use of debt financing may depreciate the value of their properties. Except for the above two instruments, I also included the average education level because residents with high average education levels in a community are likely to take actions against local governments’ coveted debt financing behaviors.

I collected the data for my instrument variables from the 2010 US Census Survey. In particular, I only collected the data for bonds issued by Texas chapter cities, which often have a population of more than 5,000. I expect that this sample should produce a similar estimated coefficient as the model excluding the GO refinancing bonds (Model 3). Overall, I lost 38 samples in the 2SLS model, which leaves the final sample size at 473 cases for the 2SLS model.

Based upon the logic of 2SLS regression, I built the estimations in two stages. In the first stage, I estimated the association between the instrumental variables and the main independent variable, certificates of obligation dummy. Thus, I built the first-stage
estimation by treating the probability of certificates of obligation selection as the dependent variable. Given the dependent variable, three instrumental variables were treated as independent variables.

\[
\text{Probability of issue CO} = \pi_0 + \pi_1 \text{Senior Citizen} + \pi_2 \text{Homeowner} + \pi_3 \text{High school degree} + V_i
\]

I took several steps to validate my first stage analysis. First, I employed a probit analysis to estimate the association among the probability of certificates of obligation issuance and the instrument variables. As Table 3.4 below shows, the percent of residents who are homeowners and have high school degrees are significantly related to the probability of certificates of obligation issuance. Second, I followed the Wooldridge’s procedure (2002) creating a continuous variable $$M$$ to represent the probability of a sampled bond to be certificate of obligations based upon the joint variations of my instrument variables. I included this variable in the second stage OLS regression.

Table 3-4
Probit analysis for the probability of issuing certificates of obligation

<table>
<thead>
<tr>
<th></th>
<th>First Stage Probit Analysis</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior citizen (%)</td>
<td>1.674</td>
<td>1.386</td>
</tr>
<tr>
<td>Homeowner (%)</td>
<td>1.078**</td>
<td>0.483</td>
</tr>
<tr>
<td>High school degree (%)</td>
<td>-3.462***</td>
<td>0.794</td>
</tr>
<tr>
<td>Constant</td>
<td>2.659***</td>
<td>0.640</td>
</tr>
<tr>
<td>Pseudo $$R^2$$</td>
<td>0.0459</td>
<td></td>
</tr>
<tr>
<td>LR Chi²</td>
<td>25.1***</td>
<td></td>
</tr>
<tr>
<td>Log likelihood</td>
<td>-260.596</td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>473</td>
<td></td>
</tr>
</tbody>
</table>

*P< 0.1, **P<0.05, ***P<0.05
An OLS regression was used to estimate the TIC variation at the second stage of the 2SLS regression model\(^\text{30}\). The produced \(M\) in the first stage of the model replaced the values in my main independent variable (in the second stage model). The newly created variable is anticipated to covariate with other control variables in order to explain the variations of TIC. The OLS model at the second stage can be presented mathematically as following:

\[
\text{TIC} = \beta_0 + \beta_1 \text{Pr}(\text{Certificate of obligation}) + \beta_2 \text{Bond Structure} + \beta_3 \text{Issuance Process} + \beta_4 \text{Timing of issuance} + \epsilon_i
\]

However, when I ran the 2SLS analysis, I found a strong correlation between credit enhancement and AAA rated. Based on the Spearman’s rank correlation test, the correlation between these two variables is 0.69, which is significant at 0.01 level (two-tailed). The result implies that when Texas local governments involved a third party to jointly guarantee their bond repayment, their issued bonds were more likely to gain the AAA rating from the S&P rating agency. To minimize the problem caused by the high correlation, I decided to run two separate models, including one model comprising all explanatory variables, and the other excluding the variable representing AAA rated. The results suggest, when both credit enhancement and AAA rated are included, the dummy variable representing AAA rated is having a significant influence on the TIC. However, when I excluded the variable AAA rated bonds, I found the credit enhancement variable becomes statistically significant.

Given the preliminary results produced by 2SLS models, I ran several tests to ensure that the 2SLS models meet the methodological requirements\(^\text{31}\). First, I ran a first-stage F

---

\(^{30}\) I ran both linear and nonlinear estimations on the CO issuance. However, the results are the same in our analyses, thus, I report only the model using the linear estimation.

\(^{31}\) In 2SLS regression, researchers can also run Hansen J statistic to test whether the instrument variables are correlated with the error term and well selected. However, the test is more suitable for models with more instrument variables than explanatory variables. In this case, I only have three instrument variables but at least 11 explanatory variables. Thus, I did not run the test for the instrument variables.
test. The test result (F-value = 11.59, p < .000; 13.43) rejects the null hypothesis that the instrument variable is a weak instrument. This result suggests the 2SLS model in this research provides relatively consistent results compared to the OLS regression. Second, I ran an endogenous test to analyze the correlation between the created M and the error term in the second stage model. The result of the endogenous test cannot reject the null hypothesis that the instrument variable is exogenous, meaning that the variation of my instrument variable is not significantly correlated with the variation of error term in the second stage model. Finally, I ran the Kleibergen-Paap rk LM test to examine the correlation between the instrument and control variables at the second stage. The test result rejects the null hypothesis that the instrument is not correlated with my control variables. Overall, these tests confirm that the use of 2SLS model is appropriate.

Results

I used six models, including four OLS models and two 2SLS models, to examine the difference of TIC between certificate of obligation and GO bonds. In Table 3-4, I present the results of three OLS models exploring the association among certificate of obligation, GO and TIC. The first model is a base model in which I include all exploratory variables without specifying which GO bond is the refinancing bond. In the second model, I use a dummy variable to represent the GO refinancing bonds and explore the association between the exploratory variables and TIC. I exclude the GO refinancing bonds in the third model and explore the TIC difference between GO bonds and CO. The results from the base model suggest, on average, that the True Interest Costs for CO are generally higher than for

32 The VIF for all the exploratory variables are generally below 2.51 in the first and third models. However, when I included the dummy variable capturing the GO refinancing bonds in the second model, the VIF yields 3.95. Such a high VIF is expected because refinancing bonds can only be issued for GO bonds rather than Certificates of Obligation. I utilized the robust standard errors in order to control for heteroscedasticity.
GO bonds. However, when controlling for refinancing bonds, there is no statistical difference. A similar conclusion is reached when a third model is employed.

In Table 3-5, I present the base-model using OLS analysis and 2SLS results for Models 4, 5 and 6, respectively. The results suggest that there is no evidence that certificate of obligation and GO bonds differs significantly in term of TIC.

Other interesting results follow. The maturity period and the amount of municipal bonds that are issued by municipal governments tend to have a significant effect on the TIC. The bonds with long maturity generally have a higher TIC than those with a short maturity time-frame. The finding is consistent with prior studies in debt financing literature (Bland, 1985; Robbins and Simonsen, 2012; Roden and Bassler, 1996). In addition, the bonds issued in large amounts generally have higher TIC than bonds issued in small amounts. To some extent, the result is against the conventional wisdom (Robbins and Simonsen, 2007; Guzman and Moldogaziev, 2012). A possible explanation is that the bonds issued in large amounts may represent bonds that have a high level of default risks. In a period of economic recession, the regional economic situation may have an effect on the TIC.

Another observation is that municipal bonds issued for refinancing purposes and bonds that have a call provision, generally explain the level of TIC. According to Model 2, the TIC for refinancing bonds, on average, is 31 basis points (i.e., 1% = 100 basis point) lower than other bonds while holding other variables constant. The result is consistent with the general notion that refinancing bonds are likely to have a low interest rate because they are more often issued at the time when market interest rates are relatively low (Robbins and Simonsen, 2012a). In my analysis, the percentage of GO bonds treated as “refinancing bonds” tends to increase between 2008 and 2011 (from 8.2% to 47.7%), highlighting the importance of strategies taken by local governments to take advantage of low interest rates. To do so, they refinanced their debts.
The call provision also affects TIC. I found that when local governments issued GO refinancing bonds, the municipal bonds were more likely to have no call provision (in my sample, almost 40% of GO refinancing bonds have no call provision). The result means that local governments will have no rights to terminate bond repayments before the date of stated maturity. However, when I excluded the GO refinancing bonds, only 15 out of 511 of the sampled bonds (3%) do not have a call provision. Hence, the inclusion or exclusion of call provision in issuing different types of bonds can explain the reason why call provision is statistically significant in the Models 1 and 2, but not significant in the Models 3, 4 and 5. I also found the type of sales also influences the costs of borrowing. The municipal bonds that are sold through competitive sales, on average, has 0.12% (i.e., 12 basis points) lower TIC compared to the bonds that are sold through negotiated sales, holding other variables constant. The finding supports the conventional wisdom that competition would result in lower costs (Kessel, 1971; Robbins and Simonsen, 2007).

Surprisingly, there is no evidence to suggest credit enhancement and AAA rated have an effect on the TIC. Moreover, it is also unexpected that both variables are having a positive effect on the TIC. In other words, the municipal bonds with credit enhancement or AAA rated would incur a higher TIC compared to municipal bonds that do not have the credit enhancement or AAA rating. The results require additional explanation. Table 3-6 below shows the frequency for local governments to take credit enhancement in my survey period. The table shows that although 87.7% of bonds were issued under the additional credit provided by a third party in fiscal year 2008, only 31% of the bonds have credit enhancements in fiscal year 2011. Consequently, the bonds with credit enhancement or AAA rated are largely bonds issued in the fiscal year 2008 and 2009 when the market interest rates for municipal bonds were relatively high. Bonds with credit enhancement generally
have a high TIC in my sample, but this does not mean that the credit enhancement variable cannot reduce the cost of borrowing.

The timing of bond issuance has a strong influence on TIC. Models 4 and 5 suggest that when the market interest rates for GO bonds are high, the TICs are high as well. The result is consistent with prior research in debt financing (Rivers and Yates, 1997; Robbins and Simonsen, 2007; Robbins and Simonsen, 2012 a). In addition, I also found that the municipal bonds that were issued in fiscal year 2010 and 2011 tend to have lower interest rates compared to municipal bonds that were issued in fiscal year 2008 and 2009. For example, the average TICs for municipal bonds issued in fiscal years 2010 and 2011 was 28 basis points and 45 basis points lower than municipal bonds that were issued in 2008, holding other variables constant (Model 4). The 2SLS models show similar results, but larger effects. Take Model 5 as an example. The bonds that were issued in 2010 and 2011 have 30 basis points and 51 basis points lower TIC compared to the average TICs of municipal bonds that were issued in 2008.
### Table 3-5

OLS regression analysis for true interest costs

<table>
<thead>
<tr>
<th>Structure of Issued Bonds</th>
<th>Model 1 Base model</th>
<th>Model 2 Add refinancing purpose</th>
<th>Model 3 Exclude refinancing cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certificate of Obligation</td>
<td>0.0012***</td>
<td>0.0001</td>
<td>0.0002</td>
</tr>
<tr>
<td>Year to maturity</td>
<td>0.0008***</td>
<td>0.0007</td>
<td>0.006***</td>
</tr>
<tr>
<td>Issued amount (log)</td>
<td>0.0022***</td>
<td>0.0024</td>
<td>0.0020</td>
</tr>
<tr>
<td>Callable</td>
<td>0.0021***</td>
<td>0.0020</td>
<td>0.0022</td>
</tr>
<tr>
<td>Multiple purpose</td>
<td>0.0001</td>
<td>-0.0006</td>
<td>-0.0004</td>
</tr>
<tr>
<td>Refinancing purpose</td>
<td></td>
<td></td>
<td>0.0004</td>
</tr>
<tr>
<td>Bond Issuance Process</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AAA rated</td>
<td>0.0003</td>
<td>0.0001</td>
<td>0.0009</td>
</tr>
<tr>
<td>Credit enhancement</td>
<td>0.0005</td>
<td>0.0008</td>
<td>0.0003</td>
</tr>
<tr>
<td>Competitive sales</td>
<td>-0.0013***</td>
<td>-0.0017</td>
<td>-0.0012</td>
</tr>
<tr>
<td>Timing of Bond Issuance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bond buyer’s GO 20 index</td>
<td>0.0020***</td>
<td>0.0019</td>
<td>0.0039</td>
</tr>
<tr>
<td>Year_2009</td>
<td>-0.0010*</td>
<td>-0.0009</td>
<td>-0.0007</td>
</tr>
<tr>
<td>Year_2010</td>
<td>-0.0039***</td>
<td>-0.0036</td>
<td>-0.0030</td>
</tr>
<tr>
<td>Year_2011</td>
<td>-0.0051***</td>
<td>-0.0046</td>
<td>-0.0047</td>
</tr>
<tr>
<td>(Constant)</td>
<td>0.0007</td>
<td>0.0032</td>
<td>-0.0015</td>
</tr>
<tr>
<td>Adjusted ( R^2 )</td>
<td>0.6767</td>
<td>0.6854</td>
<td>0.5185</td>
</tr>
<tr>
<td>N</td>
<td>741</td>
<td>741</td>
<td>511</td>
</tr>
<tr>
<td>F-test</td>
<td>111.63***</td>
<td>105.42***</td>
<td>41.68***</td>
</tr>
</tbody>
</table>

*P< 0.10, **P<0.05, ***P<0.01
Table 3-6

OLS and 2SLS regression analyses for true interest costs

<table>
<thead>
<tr>
<th>Structure of Issued Bonds</th>
<th>Coefficient</th>
<th>Robust Std. Err</th>
<th>Coefficient</th>
<th>Robust Std. Err</th>
<th>Coefficient</th>
<th>Robust Std. Err</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certificate of Obligation</td>
<td>0.0001</td>
<td>0.0005</td>
<td>0.0036</td>
<td>0.0026</td>
<td>0.0027</td>
<td>0.0024</td>
</tr>
<tr>
<td>Year to maturity</td>
<td>0.0005***</td>
<td>0.0001</td>
<td>0.0006***</td>
<td>0.0001</td>
<td>0.0005***</td>
<td>0.0001</td>
</tr>
<tr>
<td>Issued amount (log)</td>
<td>0.0025***</td>
<td>0.0006</td>
<td>0.0026***</td>
<td>0.0006</td>
<td>0.0028***</td>
<td>0.0006</td>
</tr>
<tr>
<td>Callable</td>
<td>0.0022</td>
<td>0.0021</td>
<td>0.0022</td>
<td>0.0021</td>
<td>0.0022</td>
<td>0.0021</td>
</tr>
<tr>
<td>Multiple purpose</td>
<td>-0.0004</td>
<td>0.0004</td>
<td>-0.0003</td>
<td>0.0004</td>
<td>-0.0004</td>
<td>0.0004</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bond Issuance Process</th>
<th>Coefficient</th>
<th>Robust Std. Err</th>
<th>Coefficient</th>
<th>Robust Std. Err</th>
<th>Coefficient</th>
<th>Robust Std. Err</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAA rated</td>
<td>0.0009</td>
<td>0.0007</td>
<td>0.0013*</td>
<td>0.0007</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Credit enhancement</td>
<td>0.0005</td>
<td>0.0007</td>
<td>0.0001</td>
<td>0.0008</td>
<td>0.0010**</td>
<td>0.0004</td>
</tr>
<tr>
<td>Competitive sales</td>
<td>-0.0011***</td>
<td>0.0004</td>
<td>-0.0006</td>
<td>0.0005</td>
<td>-0.0008</td>
<td>0.0005</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Timing of Bond Issuance</th>
<th>Coefficient</th>
<th>Robust Std. Err</th>
<th>Coefficient</th>
<th>Robust Std. Err</th>
<th>Coefficient</th>
<th>Robust Std. Err</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bond buyer’s GO 20 index</td>
<td>0.0040***</td>
<td>0.0007</td>
<td>0.0042***</td>
<td>0.0007</td>
<td>0.0042***</td>
<td>0.0007</td>
</tr>
<tr>
<td>Year_2009</td>
<td>-0.0006</td>
<td>0.0006</td>
<td>-0.0008</td>
<td>0.0006</td>
<td>-0.0008</td>
<td>0.0006</td>
</tr>
<tr>
<td>Year_2010</td>
<td>-0.0028***</td>
<td>0.0005</td>
<td>-0.0030***</td>
<td>0.0006</td>
<td>-0.0030***</td>
<td>0.0006</td>
</tr>
<tr>
<td>Year_2011</td>
<td>-0.0045***</td>
<td>0.0006</td>
<td>-0.0051***</td>
<td>0.0008</td>
<td>-0.0051***</td>
<td>0.0008</td>
</tr>
<tr>
<td>(Constant)</td>
<td>-0.0056</td>
<td>0.0047</td>
<td>-0.0103*</td>
<td>0.0062</td>
<td>-0.0106*</td>
<td>0.0061</td>
</tr>
</tbody>
</table>

| Adjusted $R^2$            | 0.5249      |                 |             |                 |             |                 |

| Center $R^2$              | 0.459       |                 | 0.481       |                 | 0.481       |                 |
| n                         | 473         |                 | 473         |                 | 473         |                 |
| F-test                    | 40.8***     | 36.75***        | 41.81***    |                 |             |                 |

*P<0.10, **P<0.05, ***P<0.01
### Table 3-7

Percentages of credit enhancements (2008-2011)

<table>
<thead>
<tr>
<th></th>
<th>With Credit Enhancement</th>
<th>No Credit Enhancement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>2008</td>
<td>146</td>
<td>128</td>
</tr>
<tr>
<td>2009</td>
<td>114</td>
<td>54</td>
</tr>
<tr>
<td>2010</td>
<td>138</td>
<td>50</td>
</tr>
<tr>
<td>2011</td>
<td>113</td>
<td>35</td>
</tr>
<tr>
<td>Total</td>
<td>511</td>
<td>267</td>
</tr>
</tbody>
</table>

### Conclusion

This chapter aims to examine the difference of true interest costs (TIC) between certificates of obligation and general obligation bonds. In particular, I am interested to understand the extent to which certificate of obligation can provide local governments with similar cost advantages as the general obligation bonds. The results of my analyses show that certificates of obligation are likely to have a similar TIC as GO. The finding also reveals that bond investors may be more concerned with the number of revenues pledged for bond repayments than other factors. For example, when a municipal bond is secured by all sources of legal revenues, the interest costs for the municipal bond generally will be low.

However, I also recognize that my findings should be interpreted with caution given the period selected for the study was done during the economic recession and rapid population growth in Texas. I note that Texas is one of the states that experienced rapid population growth in recent years. The population growth not only demands municipal governments invest more in their public infrastructures, but also provides insurance that municipal governments would have a growing tax base i.e., revenues in the future. Given the population growth in Texas, the bonds issued by Texas municipal governments might also be favored by lending institutions or individual investors. As a result, the cost advantages of
certificate of obligation might be conditional upon the time when a rapid population growth is a common feature in Texas.

Another limitation is related to the time period selected for this study. TIC is strongly affected by national and regional economies. The influence of economic conditions not only can be observed through market interest rates when municipal bonds were issued, but also can be detected by the common issuances of GO refinancing bonds. It is uncertain as to the extent to which economic conditions affected local government decisions in the bond issuance process, especially when local governments reduced the usage of credit enhancement when issuing their debt. For instance, in fiscal years 2010 and 2011, local governments in Texas did use credit enhancement as frequently as they did in fiscal years 2008 and 2009.

Given the limitations of these analyses, I believe future research can address at least two issues related to the relative costs of debt financing. First, future research should take into account the interest costs of other types of debt instruments, such as certificates of participation (COP), bonds pledged by governments’ sales and excise taxes, and tax increment financing (TIF). Although the pledged revenues for these types of debt instruments are different, it is still uncertain whether they generate different levels of interest costs. A further understanding of the borrowing costs of these instruments may help to better explain local governments’ debt financing behaviors. Second, future efforts can also take into account the association between government actions and economic conditions. As Pagano (2003) indicated, local government decisions are likely to be affected by their revenue structures and economic conditions. Consequently, it is important to further explore the ways local governments formulate various strategies in order to cope with national economic condition.
Chapter 4

What Factors Explain Debt Financing?

This chapter explores factors which explain local governments’ decisions to choose certificates of obligation. Following Sharp (1986) and Wolff’s study (2004), a framework is developed to examine factors influencing local governments’ debt financing. The framework demonstrates how local governments' debt is a function of four broader sets of variables: (1) characteristics of local institutions that shape the local government decision-making process, which corresponds to the roles of local elected and appointed officials in debt financing decisions (Clinger et al., 2008); (2) economic characteristics of a city, which represent residents’ general demands for public goods (Ladd, 1992); (3) fiscal capacities; and (4) characteristics of local communities, which include residents’ specific policy preferences for public infrastructures (Schwab and Oates, 1991).

Based on the institutional framework, I explain local governments’ debt financing strategies in Texas. I selected 208 Texas municipalities and analyzed their debt financing behaviors between 2008 and 2011. These municipalities were selected because they have a relatively large population and a high level of fiscal authority compared to other municipalities in Texas. Given the sample size, a two-stage selection model was used to minimize the potential problems of nonrandom selection bias. The results presented by the two-stage selection model show several associations between my explanatory variables and the dependent variable (i.e., certificates of obligation and GO issuance). In the case of certificates of obligation, the association between a strong city manager authority and the level of tax burden correlated to the selection of certificates of obligation. On average, a local government decision to issue a high volume of certificates of obligation was largely affected by characteristics of local population, i.e., median household income, population growth, and the percentage of senior citizens living in the jurisdiction. In the case of GO
bonds, their selection was related to population size, property tax rate, debt burden, and the percentage of the college-educated population. Moreover, the volume of GO issuance by local governments was related to the level of regional competition, i.e., government density.

Theoretical Framework

The traditional approach, in studying local governments' debt financing strategies, relies heavily on assumptions presented by the Tiebout model. The model predicts that local governments increase efficiency in the provision and production of public services and maintain the same level of taxes in order to attract residents in their communities. By lowering the tax rate and providing the same bundle of goods and services, local governments compete with other localities for attracting businesses and residents, if not, residents will vote with their feet. However, empirical studies only provide partial evidence to support Tiebout assumptions. Schneider and Logan (1981), for example, indicated that wealthy communities reduced the use of debt financing in order to stabilize their tax rate. Poor communities, in contrast, often increased the issuance of debts beyond their capacities in order to attract new businesses and residents.

However, many of the current studies argue that local governments are motivated to finance their debts through the bond market for at least two reasons. The first is to cover the short-term revenue shortfall caused by economic fluctuations (Wassmer and Fisher, 2011). When the main sources of revenues, such as property and sales tax decline in one specific year or are not collected on time, local governments tend to issue short-term debts in order to balance their budgets. Debt financing, in this situation, is carried out through local taxes or state funds (Gramlich, 1976).

The second reason is to generate sufficient funds in order to invest in capital-incentive projects, such as roads and bridges, public buildings, recreation facilities, or utilities
To finance capital projects, local governments usually issue long-term debts and repay the borrowed funds during the life of the infrastructure (Gramlich, 1976). In general, local governments in the U.S. borrowed and issued debts for long-term capital projects rather than for short-term purposes (Bond Market Association, 2001), since capital investment has long been viewed as a means to encourage growth and economic development (Sbragia, 1996).

Sharp (1986) and Wolff (2004) laid out a foundation for the study of local debt financing. Sharp (1986), for example, argues that city debt is a function of fiscal strain, background factors (such as population and region), and local political institutions. While fiscal strain refers to the level of difficulty that a city government faces with its current revenues in response to financial commitments, the background factors denote a city’s population characteristics, functional responsibility, and region. In addition, local political institutions account for the different managerial approaches employed by locally elected and appointed officials in managing their debts. She explained further that unreformed cities are more likely to raise tax revenue for debt repayment, in contrast to reformed cities which prefer to issue debts that do not directly increase residents’ tax burdens.

Wolff (2004) extends Sharp’s model by emphasizing the role of local interest groups. He contends that the residents in a city have different preferences for local public goods. The residents with a similar preference would organize as a group to protect their interests and demand the provision of specific public goods. However, the influence of the interest group would be based upon the number of group members. When an interest group has a large number of members, the group is likely to play an important role in the debt financing process. As a result, according to Wolff (2004), the city is likely to have a higher amount of long-term debt.
Local Political Institutions

Local political institutions play a mediating role in explaining local government debt financing behaviors. This is because local institutions define the roles of locally elected and appointed officials in the decision-making process. When a political actor is purposely given relatively high authority, this actor is likely to use the authority for personal gain. In this type of formulation, city mayors in mayor-council cities are often assumed to be the elected officials who are likely to exploit debt financing for their personal gains. Prior empirical researches have shown that mayor-council cities are likely to have a higher debt burden than council-manager cities (Sharp, 1986; Cropf and Wendel, 1998; Clinger et al., 2008).

However, prior researches are limited in the comparison between mayor-council cities and council-manager cities. For example, Cropf and Wendel (1998) have used a pool-time analysis to examine debt financing patterns of the 42 U.S. largest municipalities between 1980 and 1990. They found that municipalities with the mayor-council form of government tend to issue more GO bonds than those with the council-manager form. While they did not discuss ways in which local political institutions (in the context of council-manager cities) are likely to produce different policy outcomes, this line of research highlights the importance of local political institutions. I argue that debt financing behaviors of municipalities with the council-manager form of government are influenced by three identifiable institutional arrangements: (1) council electoral system, (2) mayor authorities, and (3) city manager authorities.

The council electoral system has an effect on local government debt financing strategies and fiscal outcomes (Baquir, 2002; Langbein et al., 1996). For example, the district system—as an electoral system—can induce members of elected councils to push forward projects with politically and demographically concentrated interests. They are able
to serve their political interests more in a district electoral system than in an at-large system (Childs, 1965). Moreover, council members in the district system have stronger incentives than those in the at-large system to work together to achieve their capital projects, which enables them to receive credit from their constituencies (Dalenberg and Duffy-Deno, 1991). In additional research, Rugh and Trounstine (2011) show that elected officials are likely to develop a multi-category bond package in order to satisfy different policy preferences at the district level. Therefore, I hypothesize that,

$$H_1: \text{Municipalities with a district electoral system tend to issue a larger volume of debts than municipalities with an at-large electoral system.}$$

The authority of mayors in municipalities with a council-manager form of government has also been linked to local government fiscal outcomes (Morgan and Watson, 1995). Although city mayors in council-manager cities do not possess the same executive authority as mayors in municipalities with the mayor-council form of government (Morgan and Watson, 1992), they can develop political influence through direct election, veto power (Morgan and Watson, 1992), and informal powers, such as agenda-setting and consensus-building (Svara, 1987; Wikstrom, 1979). Given their political influence, strong city mayors in council-manager cities can act as leaders to guide local policy, especially in debt issuance (Clinger et al., 2008). Thus, I hypothesize that,

$$H_2: \text{Municipalities with strong mayors tend to issue a larger volume of debts compared to municipalities with weak mayors.}$$

The authority of city managers also impact local government decisions to issue debts (Cropf and Wendel, 1998; Sharp, 1986). City managers are not only concerned with administrative values, such as efficiency, cost saving, and service quality (Folz and Abdelrazek, 2009; Jung, 2006; Stumm and Corrigan, 2008) but they also have information advantages compared with other political officials at the local level (Zhang and Feiock, 2010). However, the extent to which city managers consistently use their influence in
affecting local debt issuance can be affected by their formal and informal authorities. City managers with limited formal or informal authorities are less likely to be able to influence local governments’ debt issuance (see Clinger et al., 2008). Thus, I hypothesize that,

H3: Municipalities with weak city managers tend to issue a larger volume of debt than the ones with strong managers.

Economic Conditions

The wealth of a community has long been viewed as an indicator to predict local governments’ fiscal policies and outcomes. It has been argued that high-income residents are assumed to live in a community with similar policy preferences. They tend to prefer a higher level of public services compared to lower-income residents (Tiebout, 1961). However, Schneider and Logan (1981) have shown that municipalities with high-income residents may use less debt financing compared to the municipality with low-income residents. Their interpretation for this result is that the municipality with a higher number of low-income residents is still required to provide the same level of public services, and thus issues a high amount of debt in order to finance local services. Based upon Schneider and Logan’s study (1981), I hypothesize that,

H4: A relatively wealthy municipality (median household income and lower poverty rate) tends to issue a smaller volume of debts compared to a relatively poor municipality.

Prior researchers have also explained the debt financing strategies of a municipality based on population characteristics, such as size and growth (Clinger et al., 2008; Farnham, 1985; Ladd, 1992; Sharp, 1986). Population size, for instance, not only is used to represent local demands for public services, but also is interpreted as the fiscal capacity of local governments. Simonsen et al. (2001) argue that a municipality with a higher population size has a large number of employees. Large numbers of employees on the local payroll suggest local governments have the capacity to cope with procedures in issuing bonds. In addition,
population growth has been used as a proxy to represent emerging demands for public services (Ladd, 1992). Therefore, I hypothesize that

H₅: Municipalities with large populations (or a strong population growth) will have a large volume of newly issued debts.

Local Fiscal Capacities

Local government decisions on the amount of newly issued debts are also influenced by their fiscal capacity (Clingermayer and Wood, 1995; Wang and Hou., 2007). For example, fiscal capacities of local governments can be captured by the level of property tax rates. A high property tax rate would allow local governments to have a stronger fiscal capacity in providing public infrastructures. However, at the same time, it is also probable that a high property tax rate can reduce the likelihood of local governments to issue new debts. Based on the tax competition theory, a relatively high property tax rate in a community will make the community less attractive to new immigrants compared to its neighboring communities (Wilson, 1986). Thus, I hypothesize that

H₆: Municipalities with higher property tax rates tend to issue a smaller volume of debts compared to those with lower property tax rates.

The level of sales tax is also associated with the amount of local government debts. In the U.S., the level of sales tax has been largely used as an additional revenue source and often employed to alter local government revenue structures (Krmenec, 1991). Sales taxes not only reduce local governments’ reliance on property tax revenue (Hendrick, 2002; Jung, 2001), but also can be used as pledged revenues for newly issued debts (Goldman and Wachs, 2003; Jung, 2002; Crabbe et al., 2005). Considering the potential influences of the sales tax, I hypothesize that,

H₇: Municipalities with a higher sales tax rate will issue a larger volume of debts than those with a lower sales tax rate.

The extent to which local governments can afford to finance their services also
matters in determining their amount of debts (Farnham, 1986; MacManus, 1981).

Functional responsibility, for example, denotes the number of services that municipal
governments provide to their residents, highlighting the level of their debt burden. High
functional responsibilities not only drive municipal governments to produce various types of
goods and services (Stein, 1993), but also induce them to increase their debt issuance (Cropf
and Wendel, 1998). To capture municipalities’ functional responsibilities, debt burden can
be used as a useful indicator: a high debt burden in a municipality represents the current level
of municipal productions of public infrastructures. It reflects the level of commitment that
municipal governments must carry out in order to continue their level of capital production
(see Clinger et al., 2008). Therefore, I hypothesize that,

H8: Municipalities with high debt burdens will issue a larger volume of debts than
those with a low debt burden.

Scholars have also argued that high government density in regions plays a factor in
the behavior of local governments (Campbell, 2004; Carr and Karuppusamy, 2010). A
municipality located in a high government density region can exacerbate the competition
among neighboring municipalities (LeRoux and Carr, 2007), and therefore drive them to
reduce levels of their expenditures (Craw, 2008). Thus, I hypothesize that,

H9: Municipalities located in a region with high government density will issue a
smaller volume of debts than those with a low government density.

Community Characteristics

The characteristics of a community provide a partial explanation to the accumulated
debt in local municipalities (Alesina et al., 1999). Schwartz and Oates (1991), for example,
argued that residents in a community may not be well organized as a homogenous
community. The authors further argue that the Tiebout model only reveals a type of
community characteristic such as community wealth, and does not examine the local dynamic
in terms of residents’ ability to organize and protest. Moreover, a high level of community heterogeneity requires local governments to communicate and deal with various competing groups, resulting in relatively high communication costs to ensure a successful collective action (Feiock, 2007). To illustrate, in a municipality comprised of residents with diverse racial and ethnic backgrounds, local elected officials may pay high communication costs in order to reach a consensus regarding the issuing of bonds. Thus, I hypothesize that

\[ \text{H}_{10}: \text{Municipalities with diverse racial and ethnic compositions are likely to have a lower amount of accumulated debts.} \]

The resident composition in a community can also reveal specific community demands for services and government debt financing. In this regard, a municipal government decision on debt financing should at least partially reflect the demand of local residents. Empirical studies have long argued that interest groups with identical policy preferences are important in influencing local government decisions about the amount of debts. Homeowners, for example, have been theoretically assumed to prefer less tax-supported debts compared to renters. This is because a higher property tax in their communities can depreciate homeowners’ property values and/or increase their tax burdens (Stadelmann and Eichenberger, 2012).

In contrast, senior citizens may be viewed as residents who are more likely to support government debt financing because their shares of future local taxes are anticipated to be less than that of younger generations (Asefa, 1981). Empirically, highly-educated residents in a local community are more likely to support local governments’ debt financing (Ladd, 1992; Rugh and Trounstine, 2011). Consequently, I hypothesize that,

\[ \text{H}_{11}: \text{The higher the percentage of specific resident groups in a municipality (renters, a young population, and highly-educated residents), the higher the level of accumulated debts.} \]

Table 4-1 summarizes the assumed causal relationship between proposed explanatory variables and local governments’ debt financing behaviors.
Table 4-1

Determinants of local government debt financing

<table>
<thead>
<tr>
<th></th>
<th>Institutional Characteristics</th>
<th>Economic Characteristics</th>
<th>Local Fiscal Capacities</th>
<th>Community Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>At-large system</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>District system</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Executive authority</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>City mayor authority</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median household income</td>
<td>-</td>
<td>% Poverty (+)</td>
<td>Population (+)</td>
<td>% Population with at least some college (+)</td>
</tr>
<tr>
<td>% Poverty (+)</td>
<td>Population (+)</td>
<td>Population Growth (+)</td>
<td>% Population over 65 years old (+)</td>
<td></td>
</tr>
<tr>
<td>Population (+)</td>
<td>Population Growth (+)</td>
<td>Local Fiscal Capacities</td>
<td>% White (+)</td>
<td></td>
</tr>
<tr>
<td>Population Growth (+)</td>
<td></td>
<td></td>
<td>% Homeowner (-)</td>
<td></td>
</tr>
<tr>
<td>Property tax rate (-)</td>
<td>Sales tax rate (+)</td>
<td>Tax Debt Burden (+)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sales tax rate (+)</td>
<td>Tax Debt Burden (+)</td>
<td>Government Density (-)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tax Debt Burden (+)</td>
<td>Government Density (-)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government Density</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Research Design and Data

The primary data source of my research was gathered from the Texas Bond Review Board (TBRB). The TBRB, as a state agency, has collected and reported information regarding Texas local governments’ bond issuance since 1999. The TBRB also provides other municipal information, such as municipalities’ debt burdens, property tax rates, and municipal populations. The demographic information of each municipal government was collected from a 2006 American community survey. The data related to local political institutions were collected from various sources, i.e., the Texas Association of Counties, Texas Municipal League’s Home Rule Charter Survey, and three legal publishers’ websites, including the American Legal Publishing Corporation, Franklin Legal Publishing, and Municode. The data on local sales tax rates were collected from the website of the Texas Comptroller Office, Window on State Government. In total, I have 208 municipalities in the
sample, which represents 59.3% of Texas charter cities (351 in total) and 17.1% of Texas incorporated cities (1,216 in total).

My sampled cities have two main features: First, all the sampled cities are charter cities. According to the Texas constitution, municipal governments may create their own charter when their population is more than 5,000. By creating their local charter, they can mandate the form of government, election system, and local ordinances related to fiscal matters. Moreover, the charter allows municipal governments to levy property taxes at a rate of no more than 2.5% of the total assessed valuation, which is higher than the property tax rate (1.5%) formulated for general purpose cities in Texas. The advantage of using charter cities rather than all Texas cities is that charter cities are highly populated, and demonstrate a high level of fiscal autonomy.

Second, all cities in my sample are classified as having the council-manager form of government. In Texas, there is a tendency for municipalities to adopt the council-manager plan in designing their local charter. According to the Texas Municipal League’s charter survey (2010)\(^{33}\), almost 89% of responding cities are classified as adopting the council-manager plan. About 9% and 2% of the responding cities are classified as the “mayor-council” and the “commission” form of government, respectively. The Texas Municipal League (2010), however, reported that there are differences among council-manager cities, i.e., depending on the language of the local charter; authorities in council-election systems and the mayor’s office differ considerably. Thus, my sample allows us to examine whether various institutional arrangements within council-manager cities have an influence on local governments’ issuance of certificates of obligation.

\(^{33}\) In the Texas Municipal League’s 2010 charter survey, 254 out of 351 charter cities responded to the survey. Among the respondents, 29 cities are not classified as a council-manager form of government. Thus, I limited our sample to 225 charter cities. I also excluded 17 cities without information on the council electoral system, which leads to a final sample size of 208 cities.
Dependent Variable

The dependent variable is the total amount of accumulated debts measured for two types of debt instruments: certificates of obligation and general obligation bonds. I took several steps to measure my dependent variables. First, I collected the information of all debts that were issued by 208 municipalities between 2008 and 2011. Second, I coded the newly issued certificates of obligation and GO bonds based on the name of each bond. In the coding process, I excluded the GO bonds that were issued as refinancing bonds. This is because the GO refinancing bonds are issued for the purpose of reducing the interest costs of borrowing, but not for starting new capital projects. Third, I added the amount of the newly issued certificates of obligation and GOs between 2008 and 2011. I also categorized two dummy variables to represent whether a municipality has issued certificates of obligation or GO bonds in my observation periods. Fourth, I divided the aggregated amount of newly issued certificates of obligation and GO bonds by the 2008 population, i.e., amounts of certificates of obligation and GO per-capita. The standardization is consistent with prior research analyzing local governments’ debt financing behaviors (Clinger et al., 2008, Farnham, 1985 and 1988; Sharp, 1986).

However, the distribution of my dependent variables required us to refine my analytical methods and measurements. First, not all the sampled municipality governments had issued certificates of obligation or GO within the survey periods. In the cases of GO; for example, only 52 municipal governments have debts (i.e., 25% of the total sampled cities). In the case of certificates of obligation, only 147 municipal governments (i.e.,

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34 In fact, when I collected the debt issuance information for the sampled cities, I followed the data format generated by the Texas Bond Review Board. The Texas Bond Review Board used the fiscal year in organizing the debt issuance information. The fiscal year adapted by the Texas state government starts September 1st and ends on August 31st of each year. Thus, the real debt issuance information used in our research only represents debts issued between September 1st, 2007 and August 31st, 2011. However, I only used the fiscal year in collecting for the dependent variables. All independent and control variables were collected based on annual reporting.
70.7% of the total sampled cities) had issued such a debt. Given the frequency of distribution, I employed a two-step Heckman selection model to address potential problems caused by truncated data. Second, the frequency of distributions of my primary measurement potentially violates the normality assumption of Ordinary Least Square (OLS) regression. According to the rule of thumb, both frequency distributions of GO per-capita and certificates of obligation per-capita need to be normally distributed in order the OLS assumption of heteroscedasticity (i.e., $MEAN = 431.40, SD=405.77$ for GO per capita; and $MEAN = 717.25, SD=648.20$ for certificate of obligation per capita). However, the Shapiro-Wilk W tests for the dependent variables are significant at a 0.01 level, which rejects the null hypothesis that the distributions of dependent variables are normally distributed. As a result, I employed the logarithm of certificates of obligation and GO bond per-capita as my new measurements. After log transformation, the Shapiro-Wilk W tests for the new measurements failed to reject the null hypothesis suggesting the new measurements are normally distributed.

Table 4-2

Summary statistics of COs and GOs (2008-2011)

<table>
<thead>
<tr>
<th></th>
<th>Descriptive Statistics for Issued Municipalities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
</tr>
<tr>
<td>CO per-capita</td>
<td>717.25</td>
</tr>
<tr>
<td>GO per-capita</td>
<td>431.40</td>
</tr>
</tbody>
</table>

To better understand the distribution of the sample, I inspected six municipalities that had issued relatively high amounts of certificates of obligation and GOs per capita between 2008 and 2011. For example, the top three municipalities issuing the largest certificates of obligation per capita were found to be the cities of Fairview, Lubbock, and Rockport. The municipalities issuing the three largest GO bonds per capita were the cities of Boerne, Forney, and Wylie. Comparing the municipalities, I found those issuing the largest amount
of GO per-capita were similar with respect to population growth between 2000 and 2007 (i.e., from 41% to 124% population growth). They can also be categorized as median-sized municipalities (i.e., from 9,000 to 35,000). Their residents are highly educated, they have higher household annual incomes, and generally they have incomes over the poverty line. On the other hand, municipalities issuing the largest amount of newly issued certificates of obligation per-capita were different with respect to similar socio-economic characteristics. The City of Boerne, for example, has strong population growth and high household incomes, but not the cities of Lubbock and Rockport.

Independent Variables

I employed three variables to capture the institutional structure. The first variable is the city council election system. To measure the election systems, I used three categories: district systems, mixed systems, and at-large systems. While the district system is one in which all council members are separately elected by voters in the predetermined election districts, the at-large system is one in which council members are elected by all voters in that municipality. The mixed system combines both at-large and district systems to elect their council members.

For comparison, I used the at-large system as the base group. I expected that when council members are elected by a district or mixed system, they were more likely to negotiate projects with each other in order to approve bond proposals, compared to municipalities where councils were elected by district or mixed system. The municipalities with district or mixed election systems should incur higher amounts of debts than those with an at-large electoral system.

I took several steps when collecting information related to city council election systems. First, I gathered municipal charters for each city from three online legal publishing
websites: (1) American Legal Publishing Corporation, (2) Franklin Legal Publishing, and (3) Municode. I collected home-rule charters in order to gather information related to council election systems, i.e., from Articles of Election. Overall, I found that the frequency distribution of city council election systems exists as follows: 19.7% for the district system, 18.2% for the mixed system, and 62% for the at-large system.

The second variable is the level of mayoral authority. To capture the authority of city mayors, I modified an additive index developed by Krebs and Pelissero’s research (2010). The mayor authority index in this research consists of five items: (1) whether the mayor has the power to appoint boards and commissions, (2) whether the mayor has the responsibility for preparing the budget, (3) whether the mayor has the power to appoint department heads, (4) whether the mayor is directly elected by local voters, and (5) whether the mayor has veto power to change council’s decisions. I collected relevant information for each of these five items from the Texas Municipal League’s Home Rule Charter Survey. As Table 4-3 shows, the city mayors in my sampled cities, on average, have the score of 1.423. More specifically, city mayors in my sample often were directly elected; they also have the appointment power over boards and commissions. My expectation is that when city mayors have more authorities in a city, they were likely to issue a large volume of debts (Clinger et al., 2008).

The third variable is the level of authority of city managers. I created an additive index to represent the (1) city managers’ legal status, (2) discharge mechanism, and (3) executive authorities. In this index, I included six items: (1) whether the city charter has a clear statement about the appointment of a city manager; (2) whether a city has a similar statement appearing in a city ordinance; (3) whether a city manager can only be discharged by majority votes of council members; (4) whether the city charter requires a public hearing process when a discharging city manager; (5) whether a city manager can participate in
council members’ meetings; and (6) whether a city manager can appoint department heads without the intervention of council members.

I collected information related to authority of city managers from the Texas Municipal Leagues’ Local Charter Survey. As Table 4-3 shows, city managers in my sampled cities, on average, have a score of 3.529. The score on the city manager authority index reflects authorities based on three items: legal articles specified in their home rule charter, the power to participate in city council meetings, and the power of appointing department heads without the interventions of council members. I expect when municipalities with city managers possess more of such authorities, they are likely to have a lower amount of debts.

Control Variables

I included three groups of control variables in order to better examine the marginal effect of local political institutions on municipal governments’ debt financing decisions. The control variables were used to capture community, economic, and physical characteristics. They account for “demands” for public infrastructures. Additionally, the fiscal characteristics captured the “supply” side of public infrastructures.

Economic characteristics are captured by the size of population, population growth, and median household income, as well as the level of poverty. The population size is measured by log transformation of the number of population in 2008. The population change is measured by the difference of population size between 2000 and 2007 and then divided by the total population in 2000. I collected the figures for the 2000 population size from the US Census Bureau. The figures for population size in 2007 and 2008 were gathered from the Texas Bond Review Board35.

35 Because the US Census Bureau only provides population information in certain years, such as 2000, 2006, and 2010, I supplemented additional population information for 2007 and 2008 from the Texas Bond Review Board. This allowed us to better capture population change and population
Table 4-3

Descriptive statistics, 208 Texas municipal governments

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>No</th>
<th>Yes</th>
<th>No (%)</th>
<th>Yes (%)</th>
</tr>
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<tr>
<td><strong>District System</strong></td>
<td>208</td>
<td>167</td>
<td>41</td>
<td>80.29</td>
<td>19.71</td>
</tr>
<tr>
<td><strong>Mixed System</strong></td>
<td>208</td>
<td>170</td>
<td>38</td>
<td>81.73</td>
<td>18.27</td>
</tr>
<tr>
<td><strong>At Large System</strong></td>
<td>208</td>
<td>79</td>
<td>129</td>
<td>37.98</td>
<td>62.02</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mayor Authority Index</td>
<td>208</td>
<td>1.422</td>
<td>0.741</td>
<td>0.000</td>
<td>5.000</td>
</tr>
<tr>
<td>Council Manager Authority Index</td>
<td>208</td>
<td>3.529</td>
<td>0.876</td>
<td>0.000</td>
<td>6.000</td>
</tr>
<tr>
<td>Median Household Income (thousand)</td>
<td>208</td>
<td>53.231</td>
<td>27.513</td>
<td>23.203</td>
<td>181.930</td>
</tr>
<tr>
<td>Poverty Level</td>
<td>208</td>
<td>0.156</td>
<td>0.088</td>
<td>0.004</td>
<td>0.375</td>
</tr>
<tr>
<td>Population Change (2000-2007)</td>
<td>208</td>
<td>0.226</td>
<td>0.564</td>
<td>-0.114</td>
<td>6.658</td>
</tr>
<tr>
<td>Population (log)</td>
<td>208</td>
<td>4.242</td>
<td>0.478</td>
<td>3.276</td>
<td>5.834</td>
</tr>
<tr>
<td>Property tax rate (I&amp;S)</td>
<td>208</td>
<td>0.133</td>
<td>0.091</td>
<td>0.000</td>
<td>0.393</td>
</tr>
<tr>
<td>Sales Tax Rate</td>
<td>208</td>
<td>0.016</td>
<td>0.003</td>
<td>0.010</td>
<td>0.020</td>
</tr>
<tr>
<td>Tax Debt Burden (per-capita)</td>
<td>208</td>
<td>1787.398</td>
<td>1598.644</td>
<td>0.000</td>
<td>11473.000</td>
</tr>
<tr>
<td>Government Density</td>
<td>208</td>
<td>1.969</td>
<td>1.658</td>
<td>0.016</td>
<td>7.874</td>
</tr>
<tr>
<td>At least some college</td>
<td>208</td>
<td>0.807</td>
<td>0.104</td>
<td>0.518</td>
<td>0.990</td>
</tr>
<tr>
<td>Senior Citizen</td>
<td>208</td>
<td>0.123</td>
<td>0.054</td>
<td>0.034</td>
<td>0.339</td>
</tr>
<tr>
<td>White</td>
<td>208</td>
<td>0.771</td>
<td>0.128</td>
<td>0.254</td>
<td>0.973</td>
</tr>
<tr>
<td>Home Occupancy</td>
<td>208</td>
<td>0.672</td>
<td>0.128</td>
<td>0.133</td>
<td>0.980</td>
</tr>
</tbody>
</table>

Note: The table excludes variables measured in the form of logarithms i.e., population in 2008 and the tax-debt burden in 2007.

I expect municipalities with relatively large populations (and strong population growth) to have a large volume of debts because of increasing or emerging demands for public infrastructures (see Gentry and Ladd, 1994). The median household income is measured by the median of total household incomes in a municipality and the poverty rate denotes the percentage of population with annual incomes below the defined poverty line. The data were collected respectively from the US Census Bureau’s 2006 American Community Survey and the 2010 US Census. My expectation was that a wealthy community generally favored lower amounts of debts than poor communities because local residents with higher incomes conditions in our sampled cities.
have strong incentives to avoid higher taxes (Aronson and Schwartz, 1973; Hirsch, 1977; Schneider and Logan, 1981)

Fiscal characteristics of local governments were measured using current tax rates, debt burdens, and service areas. I measured a municipality’s fiscal characteristics by using sales tax rates and property tax rates. The sales tax rate was measured by the local sales tax rate that was levied by municipal governments in 2007; the property tax rate was measured by the rate of interest and sinking fund tax rates (i.e., I&S rate) in 2007\textsuperscript{36}. I collected the local sales tax rate from the website of the Texas Comptroller Office, Window on State Government, and gathered the I&S rate and tax debt burden from the Texas Bond Review Board. Generally, I believe the municipalities with a high I&S rate would reduce the amount of bond issuance when they have a high sales tax rate.

I also included the levels of tax debt burden and government density. The tax debt burden refers to accumulated debts that were backed up by local tax revenues in 2007. The level of government density was captured by the service area for which municipal governments are responsible. I standardized each municipality’s tax debt burden by dividing the total amount of accumulated debts by the city population in 2007. Government density is operationalized by the number of municipal governments per one hundred square miles in a county (Carr and Karuppusamy, 2010). I collected the tax debt burden from the Texas Bond Review Board and collected the government density data from the Texas Association of Counties. My expectation was that when municipal governments have a large amount of accumulated debts (or located in a county with low government density), they tend to issue more debts than others.

\textsuperscript{36} In general, the property tax rate in Texas can be divided into two types: the rate for maintenance and operation (M&O rate) and the rate for interest and sinking funds (I&S rate). When the M&O rate is used to finance government general funds, the I&S rate is levied for governments’ capital expenditures. Thus, I believe that using the I&S rate should be superior in estimating local governments’ capital expenditures.
Community characteristics were measured by residents’ composition in a community. I operationalized local resident compositions by the percentage of homeowner, senior citizen, some college education, and percentage of whites. Among the measurements, the percentage of senior citizens was measured by the percentage of residents over 65 years of age. The percentage of at least college education was measured by the percentage of population with at least a bachelor degree or equivalent. All data related to the composition of a community was collected from the US Census Bureau’s 2006 American Community Survey. The expectation was that when a community has a high percentage of elderly people or homeowners, they are likely to prompt municipal governments to take on more debts.

Analyses

The hypotheses were first tested by employing an ordinary least square regression. In both OLS regression models, I included all the independent variables and the control variables, i.e., economic, fiscal, service, and community characteristics. I was also concerned with problems associated with reverse causality. Reverse causality denotes the problem that dependent variables may reversely affect the variations of proposed independent and control variables. To minimize the potential problem, I lagged data, i.e., before 2008. I collected the data from the 2006 American Community Survey for all the variables related to community characteristics, and the 2007 property tax rate, sales tax rate and tax debt burden to represent each municipality’s fiscal and service characteristics. As a result, I believe the potential problem of reverse causality was minimized in the OLS regression models.

Another common problem in OLS regression is the multicollinearity. Multicollinearity denotes the problem in which exploratory variables are highly correlated
with each other. When there is a multicollinearity problem in a regression model, the estimated coefficient of variables will be biased. I examined the Variance Inflation Factors (VIFs) in the regression model to detect for multicollinearity problems. The VIFs for most exploratory variables were below 3.39 and only the variable median household income has the VIF slightly above 4 (i.e., 4.01). According the rule of thumb, VIFs should not exceed 5, and therefore the multicollinearity problem in the model is not deemed to be a serious problem. I checked for the bivariate correlation among exploratory variables (see Table 4-4). The two highest correlations are between the poverty rate and residents’ education levels (i.e., \( r = .718 \)) and between the median household income and residents’ education level (\( r = .710 \)). Apart from these variables, the other bivariate correlations were all below .643. The level of multicollinearity was acceptable (see Choi and Choi, 2012).

I also examined the problem of heteroscedasticity for the models. The problem of heteroscedasticity refers to the condition in which the error terms in the regression models covariate with the variations of exploratory variables. When a regression model has a problem of heteroscedasticity, the standard errors of the estimated coefficient will be biased leading to problematic t-statistics. I used the Breusch-Pagan test to detect the heteroscedasticity problem in the models. The diagnosis test shows that the certificates of obligation model has no serious problem of heteroscedasticity at 0.05 level and the GO bond model has no problem of heteroscedasticity at 0.01 level (p-value = 0.0483).

Table 4-5 presents the results of the primary OLS regression models. The variable population size is the only variable that has a consistent influence on local governments’ certificates of obligation and GO issuance. The results also show that large municipalities have a lower debt issuance than small municipalities. The result reveals that large municipalities were vulnerable between 2008 and 2011, i.e., the time of the economic crisis. They preferred to take a conservative attitude when issuing debts. In addition, the amount
of certificates of obligation issuance was positively affected by municipalities’ economic
c Characteristics, such as median household income and population change. The GO issuance
was affected by municipalities’ fiscal characteristics, such as property tax rate and
government density. The regression models reveal that variables of local political
institutions do not have a statistically significant influence on local governments’ debt
issuance.

Several factors might explain my findings. Methodologically, the GO model has a
specification error because it cannot reject the null hypothesis of F-test that all the
exploratory variables do not have N explanatory power over the variations of GO issuance.
Moreover, I am concerned with OLS regressions that only included samples of municipalities
with bond issuance, but excluded municipalities without issuing certificates of obligation or
GO. Statistically, the exclusion of non-issuers from the sample can be treated as omitting
an important variable; and if unresolved can lead to a specification error of the proposed OLS
model (Heckman, 1979). For these reasons I decided to run two-stage selection models.

Heckman’s Two Stage Model

A two-stage selection model was adopted, where a separate analysis of municipalities’
bond issuance decisions was made: the decision to issue and the amount of issuance. At the
first stage, a probit model was used to predict the likelihood that municipalities in my sample
used both debt instruments, Certificates of Obligation or GO. A new variable, so-called
Inverse Mill’s Ratio, was created from the probit model to represent the likelihood that a
municipality will be selected at second stage (Heckman, 1976, 1979). At the second stage,
the created Inverse Mill’s Ratio and the explanatory variables were jointly used in an OLS
regression model for explaining the variation of certificates of obligation and GO issuance.
Using a two-stage selection model allowed us to include non-issuance cases into the final
analysis and thus avoid the non-random selection problem.

Under the logic of a two-step selection model, I created the dichotomous dependent variables ($Y_s$) to represent whether a municipality had issued certificates of obligation and GO at the first stage. This is referred to as the selection model. If a municipality had issued certificates of obligation or GO in my survey, then $Y_s$ will be coded as 1, otherwise, it would be coded as 0. To estimate the likelihoods of certificates of obligation and GO issuance, I included all independent and control variables. I expected that the likelihood of a municipal government to issue certificates of obligation or GO to be a function of municipalities’ local political, economic, fiscal and community characteristics. In the equation, all variables were captured by a vector of explanatory variables ($X_i$). The model for the selection stage can be presented mathematically as following:

$$Y_s = X_i \beta + \mu_1$$

I analyzed the amount of certificates of obligation and GO bonds issued at the second stage, which is also referred to as the outcome model. In the outcome model, the amount of newly issued certificates of obligation and GO per-capita (logged) was treated as the dependent variable ($Y^o$). To estimate the amount of certificates of obligation and GO bonds that were issued, I included all variables that were related to municipalities’ economic, fiscal, and social characteristics, but excluded variables related to local political institutions. I believe that local political institutional factors have a strong influence on the selection of debt instruments. All control variables, including municipalities’ economic, fiscal and community characteristics, ($Z_i$) and the Inverse Mill’s Ratio ($\theta$) jointly can explain the amount of debt issuance at the outcome stage. The mathematical equation of the outcome model is presented below:

$$Y^o = \alpha Z_i + \theta + \mu_2$$

Table 4-6 shows the results of my two-stage selection models. In the Certificates of
Obligation model, I included 61 municipalities that have not issued Certificates of Obligation between 2008 and 2011. In the GO bonds model, I included 156 municipalities that have not issued GO bonds between 2008 and 2011. The Wald $X^2$ tests for both models were significant respectively at 0.01 and 0.05 levels, which reject the null hypothesis that all coefficients in the model were significantly different from 0.

Results

Role Played by Local Political Institutions

The primary aim of this chapter is to explore the association between local political institutions and debt issuance. Both Models 3 and 4 have not provided strong evidence to suggest local political institutions played a prominent role in affecting local governments’ debt issuance. Both models show that municipalities with the district electoral system have higher amounts of debt than at-large systems, even though the association is not statistically significant. To some extent, the association is consistent with prior empirical research that suggests municipal governments with a district system have a strong incentive to use debt to promote district interests. This was found to be the case when compared to municipal governments with an at-large system (Dalenberg and Duffy-Deno. 1991). The council members in a mixed system also prefer to issue more certificates of obligation than GO bonds. One explanation is related to credit-claiming between council members with overlapping electoral districts.
### Table 4-4

**Bivariate correlations**

<table>
<thead>
<tr>
<th></th>
<th>1</th>
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<th>3</th>
<th>4</th>
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<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. CO per-capita(log)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>2. GO per-capita(log)</td>
<td>-0.107</td>
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<td>3. City manager authority index</td>
<td>-0.082</td>
<td>0.101</td>
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<td></td>
<td></td>
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<tr>
<td>4. Mayor authority index</td>
<td>-0.034</td>
<td>0.149</td>
<td>0.081</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>5. Median household income (thousand)</td>
<td>.203**</td>
<td>.286**</td>
<td>-0.077</td>
<td>0.08</td>
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<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Poverty rate (%)</td>
<td>-0.091</td>
<td>-0.308</td>
<td>0.11</td>
<td>-0.068</td>
<td>-.743**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Population change (2000-2007)</td>
<td>.258***</td>
<td>0.165</td>
<td>-0.049</td>
<td>0.052</td>
<td>.232**</td>
<td>-.298**</td>
<td>1</td>
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<td></td>
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</tr>
<tr>
<td>8. Population 2008 (log)</td>
<td>-0.251**</td>
<td>-0.420**</td>
<td>-0.01</td>
<td>-0.091</td>
<td>0.097</td>
<td>-0.075</td>
<td>-0.009</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Property tax rate (I&amp;S)</td>
<td>0.135</td>
<td>0.157</td>
<td>-0.034</td>
<td>-.161*</td>
<td>0.071</td>
<td>-.148*</td>
<td>0.105</td>
<td>.175*</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>10. Sales tax rate (%)</td>
<td>0.07</td>
<td>0.067</td>
<td>-0.014</td>
<td>0.136</td>
<td>-0.124</td>
<td>-0.01</td>
<td>.175*</td>
<td>-.160*</td>
<td>-0.06</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>11. Tax debt burden per-capita (thousand)</td>
<td>.252***</td>
<td>0.075</td>
<td>-0.115</td>
<td>-0.014</td>
<td>.318**</td>
<td>-.249**</td>
<td>.272**</td>
<td>0.012</td>
<td>.465**</td>
<td>0.042</td>
<td>1</td>
<td></td>
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<td>12. Government density</td>
<td>-0.053</td>
<td>-0.19</td>
<td>-0.03</td>
<td>0.092</td>
<td>.455**</td>
<td>-.502**</td>
<td>.160*</td>
<td>.202**</td>
<td>0.126</td>
<td>0.062</td>
<td>.143*</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. At least some college (%)</td>
<td>0.039</td>
<td>.315*</td>
<td>-0.083</td>
<td>0.129</td>
<td>.710**</td>
<td>-.718**</td>
<td>.244**</td>
<td>.187**</td>
<td>.193**</td>
<td>0</td>
<td>.301**</td>
<td>.463**</td>
<td>1</td>
<td></td>
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<tr>
<td>14. Senior citizen (%)</td>
<td>0.068</td>
<td>0</td>
<td>0.06</td>
<td>-0.006</td>
<td>-.333**</td>
<td>-.237**</td>
<td>-.284**</td>
<td>-.399**</td>
<td>-.139*</td>
<td>-.01</td>
<td>-.13</td>
<td>-.370**</td>
<td>-.222**</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. White (%)</td>
<td>0.115</td>
<td>0.239</td>
<td>0.077</td>
<td>0.054</td>
<td>.290**</td>
<td>-.269**</td>
<td>0.006</td>
<td>-.263**</td>
<td>-0.049</td>
<td>0.013</td>
<td>0.064</td>
<td>0.055</td>
<td>.279**</td>
<td>.248**</td>
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<tr>
<td>16. Home occupancy (%)</td>
<td>.187**</td>
<td>.370**</td>
<td>0.036</td>
<td>0.047</td>
<td>.643**</td>
<td>-.629**</td>
<td>.279**</td>
<td>-.146*</td>
<td>-.007</td>
<td>-.002</td>
<td>.171*</td>
<td>.305**</td>
<td>.396**</td>
<td>-.01</td>
<td>.328**</td>
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</tr>
</tbody>
</table>

*Note: I exclude the council election systems because they are dummy variables*

Some variables are measured by a logarithm of real value, including Certificates of Obligation per-capita, GO per-capita, Population 2008.

*P<0.10, **P<0.05, ***P<0.05*
### Table 4-5

OLS Models for CO and GO Issuance

<table>
<thead>
<tr>
<th>Political institution</th>
<th>Model 1 CO per-capita(log)</th>
<th>Model 2 GO per-capita(log)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
<td>Standard error</td>
</tr>
<tr>
<td>City manager authority index</td>
<td>-0.058</td>
<td>0.090</td>
</tr>
<tr>
<td>District system</td>
<td>-0.006</td>
<td>0.209</td>
</tr>
<tr>
<td>Mixed system</td>
<td>0.137</td>
<td>0.203</td>
</tr>
<tr>
<td>Mayor authority index</td>
<td>-0.072</td>
<td>0.099</td>
</tr>
<tr>
<td>Economic characteristics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median household income (thousand)</td>
<td>0.016**</td>
<td>0.006</td>
</tr>
<tr>
<td>Poverty rate (%)</td>
<td>1.448</td>
<td>1.571</td>
</tr>
<tr>
<td>Population change (2000-2007)</td>
<td>0.349**</td>
<td>0.120</td>
</tr>
<tr>
<td>Population 2008 (log)</td>
<td>-0.335*</td>
<td>0.174</td>
</tr>
<tr>
<td>Fiscal capacities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Property tax rate (I&amp;S)</td>
<td>1.362</td>
<td>0.967</td>
</tr>
<tr>
<td>Sales tax rate (%)</td>
<td>14.975</td>
<td>22.968</td>
</tr>
<tr>
<td>Tax debt burden per-capita (thousand)</td>
<td>0.030</td>
<td>0.051</td>
</tr>
<tr>
<td>Government density</td>
<td>-0.018</td>
<td>0.050</td>
</tr>
<tr>
<td>Community characteristics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>At least some college (%)</td>
<td>-1.687</td>
<td>1.255</td>
</tr>
<tr>
<td>Senior citizen (%)</td>
<td>3.283*</td>
<td>1.815</td>
</tr>
<tr>
<td>White (%)</td>
<td>0.047</td>
<td>0.598</td>
</tr>
<tr>
<td>Home occupancy (%)</td>
<td>-0.423</td>
<td>0.952</td>
</tr>
<tr>
<td>Constant</td>
<td>7.504***</td>
<td>1.596</td>
</tr>
<tr>
<td>Adjusted $R^2$</td>
<td>0.1431</td>
<td></td>
</tr>
<tr>
<td>$n$</td>
<td>147</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>2.52**</td>
<td></td>
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</table>
I also found that municipal governments with strong city mayors have different preferences when it comes to either certificates of obligation or GO bonds. Both Models 3 and 4 have not shown a statistically significant association between city mayor authority and debt issuance. However, the results of both models show that when there is a strong mayor in a municipality, the likelihood that the municipality would issue GO bonds was higher than the likelihood of using certificates of obligation. The result is similar to findings found by prior studies (Cropf and Wendel, 1998 and Sharp, 1986), i.e., compared to city managers, municipalities with city mayors are more likely to issue debts that are backed by governments’ tax revenues.

Municipal Socio-Economic Characteristics

Table 4-6 shows that socio-economic characteristics of local communities have a profound effect on the amount of certificates of obligation that are issued by local governments. On average, municipalities with a higher median household income were likely to issue a larger volume of certificates of obligation than municipalities with a lower median household income. A municipal government with a rapid population growth was also likely to issue a larger volume of certificates of obligation than their counterparts. The population of a municipality, however, has a divergent effect on the amount of certificates of obligation and GO bonds. Large municipalities generally acted strategically to reduce the volume of their certificates of obligation; they have a higher probability to issue GO bonds compared to smaller municipalities. The finding reveals that a large municipal government often receives public scrutiny and therefore, faces greater risks if taking covert debt issuance actions. The results of the two-stage selection model show that municipalities in my sample were likely to issue a large volume of certificates of obligation. They have done so in order to respond to the emerging or economic demands of their communities.
Municipal Fiscal Conditions

Fiscal conditions and service characteristics of local governments are related to GO bond issuance. A relatively high property tax rate, for example, was found to have an effect on a municipal decision to select GO bonds compared to certificates of obligation. The result reveals that local voters were sensitive to an increase in property tax rates. If local governments raise the property tax rate in order to repay their bonds, they generally prefer to share responsibilities with local voters rather than take unilateral action. Municipal governments with less competition generally issued a larger amount of GO bonds than their counterparts. The finding was consistent with my expectation that a high level of government density (or competition) would lead municipal governments to reduce the amount of debts being issued (Craw, 2008).

Even so, results from two of the models show that the local sales tax rate was not directly related to the selection of debt instruments, or the amount of debts being issued. The influence of the sales tax rate mattered less in the decision of local governments to issue local debts because sales tax revenues generally are unpredictable compared to property tax revenues. Interestingly, though, the debt burden of municipal governments has a contradictory effect on the likelihood of local governments to select certificates of obligation rather than GO bonds. The finding suggests that capital investments in a community require continued funding. If local voters do not approve bond proposals, municipal governments would risk losing their pre-investments in a public infrastructure. Subsequently, when local governments have a high volume of accumulated debts, they are likely to continue issuing certificates of obligation in order to finance their capital investments. Generally, findings from my analysis suggest that fiscal capacities influenced municipal government decisions to either select certificates of obligation or GO bonds in order to finance their capital projects.
Community Characteristics

Community characteristics have a marginal effect on local government decision to issue debts. A high percentage of senior citizens in a community was likely to influence local governments to issue a large volume of certificates of obligation. To some extent, the result reflects Wolff’s (2004) notion that senior citizens generally preferred capital investments because they can enjoy benefits of new public infrastructures without having to pay for the full cost. It is also possible that municipalities with a large percentage of senior citizens have a strong incentive to maintain their existing infrastructure in order to attract new immigrants into their communities.

I also found that municipal governments with a high percentage of residents with at least some college education have effect on its decision to issue GO bonds. The result suggests that residents with higher education levels have preferences for public investments, compared to their counterparts (Rugh and Trounstine, 2011). Residents with higher education levels also preferred to have higher government transparency and accordingly were more likely to initiate political campaigns if governments issued debts covertly. I also found that municipal governments with a higher percentage of whites in their population and homeowners have no direct effect on the selection or outcome of certificates of obligation and GO bond issuance.

Discussion and Conclusion

Based upon the institutional framework, I have explored how municipalities in Texas selected their debt instruments. The framework also explains the volume of debts that local governments generally issued. The results presented by the two-stage selection model show several associations between my explanatory variables and the dependent variable (i.e., certificates of obligation and GO issuance). In the case of certificates of obligation, the
association between a strong city manager authority and the level of tax burden was related to the selection of certificates of obligation issuance. On average, a local government decision to issue a high volume of certificates of obligation was largely affected by the characteristics of the local population, i.e., median household income, population growth, and the percentage of senior citizens living in the jurisdiction. In the case of GO bonds, the selection of GO bond issuance was related to population size, property tax rate, debt burden, and the percentage of population with at least some college education. The volume of GO issuance by local governments was related to the level of regional competition, i.e., government density.

I have shown that local political institutions, economic characteristics, fiscal and service characteristics, and community characteristics impact local government financial strategies. Nonetheless, my research has several limitations. First, the period of observation is limited to examining debts issued between 2008 and 2011. The period can only represent possible government debt financing strategies during an economic downturn. It is possible that municipal governments would take different debt financing strategies during an economic boom (Pagano, 2002). Second, nearly 40% of my sample (n=82) are small municipalities where population does not exceed 10,000 in the year 2008. It is possible that debt financing strategies differ between small and large municipalities. One option is to stratify municipalities by their population size in order to understand differences in strategies adopted by large and small municipalities (Folz and Abdelrazek, 2009).

Although my research is limited in its scope, the findings make several theoretical and empirical contributions. Theoretically, the research contributes to the literature of local political institutions. It emphasizes the importance of formal authorities possessed by city managers.
Table 4-6

Hackman selection models for CO and GO issuance

<table>
<thead>
<tr>
<th></th>
<th>Model 3 CO per-capita (log)</th>
<th>Model 4 GO per-capita (log)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Selection</td>
<td>Outcome</td>
</tr>
<tr>
<td>Political institution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>City manager authority index</td>
<td>-0.2079*</td>
<td>0.118</td>
</tr>
<tr>
<td>District system</td>
<td>0.2915</td>
<td>0.290</td>
</tr>
<tr>
<td>Mixed system</td>
<td>0.1431</td>
<td>0.288</td>
</tr>
<tr>
<td>Mayor authority index</td>
<td>-0.0025</td>
<td>0.134</td>
</tr>
<tr>
<td>Economic characteristics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median household income (thousand)</td>
<td>-0.0097</td>
<td>0.007</td>
</tr>
<tr>
<td>Poverty rate (%)</td>
<td>-0.1031</td>
<td>2.008</td>
</tr>
<tr>
<td>Population change (2000-2007)</td>
<td>0.4088</td>
<td>0.390</td>
</tr>
<tr>
<td>Population 2008 (log)</td>
<td>0.3734</td>
<td>0.266</td>
</tr>
<tr>
<td>Fiscal Capacities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Property tax rate (I&amp;S)</td>
<td>0.8077</td>
<td>1.370</td>
</tr>
<tr>
<td>Tax debt burden per-capita (thousand)</td>
<td>0.1834*</td>
<td>0.094</td>
</tr>
<tr>
<td>Government density</td>
<td>0.1165</td>
<td>0.078</td>
</tr>
<tr>
<td>Community characteristics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>At least some college (%)</td>
<td>-0.4449</td>
<td>1.704</td>
</tr>
<tr>
<td>Senior citizen (%)</td>
<td>-0.9424</td>
<td>2.331</td>
</tr>
<tr>
<td>White (%)</td>
<td>-0.4942</td>
<td>1.012</td>
</tr>
<tr>
<td>Home occupancy (%)</td>
<td>1.2344</td>
<td>1.151</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.2905</td>
<td>2.160</td>
</tr>
<tr>
<td>Lambda</td>
<td>-0.649</td>
<td>0.745</td>
</tr>
<tr>
<td>n (uncensored)</td>
<td>147</td>
<td></td>
</tr>
<tr>
<td>Wald test</td>
<td>35.47***</td>
<td></td>
</tr>
</tbody>
</table>
It emphasizes the importance of formal authorities possessed by city managers. In contrast, the literature on the council-member form of government often accentuates the importance of the informal authority of city managers, e.g. their management experience, rather than the institutional arrangements related to city managers. Few have explored the formal authority directly, however. My analysis provides evidence which shows that the level of formal authority matters in explaining local governments’ decision to issue debts. More specifically, the primary results show that city manager authorities, along with other municipal characteristics, do influence Texas municipalities’ debt financing behaviors. Municipalities with city managers are more likely to reduce the issuance of certificates of obligation when they possessed a high level of executive authority. The finding not only confirms the general notion that institutions play a role in explaining local government behaviors, but also suggests that it will be necessary to further understand the specific institutional arrangements within council-manager cities.

Empirically, this research demonstrates that local governments make decisions on debt issuance by considering fiscal conditions and service characteristics. The current literature on local governments’ debt financing often overemphasizes the potential influences of mandated limitations, though it rarely discusses the potential effect of municipal services and fiscal characteristics. The findings of my research provide evidence that fiscal conditions and capacities are important in understanding local governments’ debt financing behaviors.
CHAPTER 5
BORROWING COSTS, LOCAL POLITICAL INSTITUTIONS, AND LOCAL CHOICES OF DEBT INSTRUMENTS

This dissertation is guided by three research questions: (1) what are the various types of debt instruments employed by local governments and what are their relative advantages? (2) How prevalent is the use of a specific debt instrument such as certificates of obligation? And why would some local governments prefer to issue them while others do not? and (3) To what extent does the local institutional environment, e.g., the executive authority of city managers in the council-manager form of government, affect debt financing behaviors of local governments?

This chapter summarizes the general findings of the research and discusses the contribution to the field and practice. Several limitations are highlighted with potential areas for future research.

Types of Debt Instruments and Their Relative Advantages

In Chapter 2, I created a typology to represent four ideal types of borrowing methods: (1) contractual debt, (2) voter approval/special tax debt, (3) guaranteed, and (4) non-guaranteed debts. The typology examines whether or not the state mandates the referendum requirement for the use of each of these debt instruments, and at the same time, determines whether each debt instrument is secured by multiple or single revenue sources. Each ideal type of debt instrument reflects the fact that local governments do not always pledge their own-source revenues, but can also use revenues from other governments or local private businesses as the pledge for their issued debts.

Each type of debt instrument has its own advantages. For example, contractual debts – defined as debt secured by governments’ annual contractual or lease payments—provide
local government with an option to create a nonprofit or public authority in order to provide or produce services funded through the contractual debts. Examples of contractual debts include certificates of obligation, certificates of participation, and lease payments. While certificates of obligation allow local governments to borrow funds without having to go through the local electoral process or referendum, certificates of participation permit local governments to issue bonds and then utilize the funds to pay the starting expenses and future rent of a capital project.

Local governments can also utilize non-guaranteed debts to finance their capital project. In this instance, revenue debts are secured by specific revenue or limited tax revenue, i.e., the revenue from self-supporting facilities, such as water plants, utilities, transportation, or state grants (Farnham, 1985; Sbragia, 1996). In Texas, one advantage of non-guaranteed debts is that it (i.e., the revenue debt) is not subject to debt ceiling and referendum requirements mandated by state laws. In comparison, for municipal bonds that are secured by revenues from public facilities, local governments are required to submit bond proposals to state agencies. Only after state approval, can they issue these revenue bonds. As for the bonds issued in the form of Tax Increment Financing (TIF), local governments are required to go through yet another legal process.

Another type of debt instrument is guaranteed debt, which is issued with the full taxing power of local governments; such power is used as a guarantee for making payments (Bahl and Duncombe, 1993). An example of guaranteed debt is the General Obligation (GO) bond, which is a full faith and credit debt that is issued by state and local governments. In the issuance of full faith and credit debt, all taxes or revenues of local governments are pledged to secure and repay the debt. As a debt instrument, the issuance of a guaranteed debt is somewhat restrictive. In addition to debt-ceiling limitations, local governments are required to go through bond elections in order to issue guaranteed debts.
Local governments can also issue an alternative type of debt instrument, which I refer to as the voter-approved special-tax debt. An example of this type of debt instrument is the “dedicated tax,” which is secured by special revenues that can only be levied upon the approval of majority voters in a locality. Debts issued in this way are paid by of local sales and user taxes. While the voter-approved special-tax debt provides local governments an alternative way to raise funds to finance services, they must also demonstrate the purposes of a bond proposal, in addition to the percentage of sales and user taxes that will be used for bond repayments.

In Texas, between 2000 and 2011, the number and amount of debts issued by local governments revealed interesting patterns. The issuance of certificates of obligation, for example, was associated with different types of local government that have different levels of fiscal authority. I note that, according to Texas statutes, municipal and county governments have the authority to use multiple borrowing methods to finance their capital projects. Hospital districts, for instance, are the only special district that can issue a contractual debt, i.e., certificates of obligation. Other special districts can only issue guaranteed debts, i.e., revenue bonds or general obligation bonds. Even so, as specified by state statute, hospital districts do not have the absolute power to decide on certificates of obligation. They must first obtain the approval of county governments before issuing the bond. My research reveals that when a local government has a high level of fiscal autonomy, it is more likely to issue certificates of obligation. As for the local government with a low level of fiscal autonomy, the certificates of obligation seem not to be an attractive option.

I explore the issuance of Certificates of Obligation further in Chapter 3. I hypothesized that certificates of obligation have higher borrowing costs compared to GO bonds, since a GO bond is often issued under the pledge of bond issuers’ full faith credit and
taxing authority. While it is also feasible that certificates of obligation could have a lower interest cost compared to a GO bond, I anticipated no difference in their borrowing costs. The former hypothesis is based on the assumption that certificates of obligation have less procedural constraints, enabling local governments to take advantage of changing market demands. The latter hypothesis assumes that both debt instruments are backed by multiple revenue sources, and therefore can use their property taxes as the pledged revenues. I employed a two-stage least square (2SLS) regression analysis to test the general proposition in the state of Texas. Based on 741 certificates of obligation and GO bonds that were issued between 2008 and 2011, my analyses show that certificates of obligation are likely to incur similar True Interest Costs (TIC) as GO bonds, while controlling for the influence of refinancing bonds.

In Chapter 4, I analyze municipal government decisions regarding whether or not to issue certificates of obligation, and the amount issued. In the analysis, I separated the decision to issue bonds into two parts: first, the decision to issue either certificates of obligation or GO bonds, and second, the decision on the amount of bond issuance. Based on the Heckman’s two-stage model, I found that a local government's decision to issue certificates of obligation is partly explained by the characteristics of the local population, i.e., median household income, population growth, and the percentage of senior citizens living in the jurisdiction. In the case of GO bonds, I found that population size, property tax rate, debt burden, and the percentage of population with at least some college education to be an important determinant of GO bonds. The volume of GO issuance by local governments was also related to the level of regional competition, i.e., government density.

I also found that local political institutions matter and that they affect debt financing behaviors of local governments. Municipalities with strong city managers tend to issue a lower volume of certificates of obligation than municipalities with a weak council-manager
form of government. The finding is consistent with prior research that found municipalities with city managers having limited formal or informal authorities, are less able to influence local governments’ debt issuance (see Clinger et al., 2008). Other studies find that strong mayor-councils are likely to have higher levels of debt burden than municipalities with weak council-managers (Sharp, 1986; Cropf and Wendel, 1998; Clinger et al., 2008). Moreover, the results demonstrate that municipal governments with higher levels of authority are not only concerned with administrative values, such as efficiency, cost saving, and service quality (Folz and Abdelrazek, 2009; Jung, 2006; Stumm and Corrigan, 2008), but also have information advantages compared to other political officials (Zhang and Feiock, 2010).

Theoretical Contribution

My research makes several contributions to understand issues related to debt instruments, particularly on the usage of certificates of obligation in Texas. According to my empirical results, I found the issuance of certificates of obligation as one of the major strategies utilized by local governments in Texas. The issuance of certificates of obligation was an attractive strategy because it involved relatively low political costs, borrowing costs, and default risks. Although my research was limited in scope, it provides some insights on debt financing and local political institutions.

Prior research on debt financing usually minimizes the influence of state laws by narrowly emphasizing the importance of debt limits at the state level. In this line of research, local government behaviors were assumed to be constrained by state mandated debt-ceiling and referendum requirements. Depending on the type of local governments, the state statutory framework defined debt limits at the local level, i.e., they can issue a maximum amount of debts. Local governments in a state with strict debt limitations have
relatively conservative debt financing behaviors than ones with relatively broader debt limitations.

However, my research on certificates of obligation in Texas show that debt instruments---as a financial tool-- can shape the specific incentive system affecting local governments’ debt financing behaviors. In particular, the extent to which a debt instrument can influence local governments’ debt financing behaviors depends on how the instrument can free up local governments to use their own-source revenues as the pledges of issued debts; and, whether the debt instrument can reduce risks of default. If a debt instrument can meet these requirements, it can be expected to alter local government behaviors in a state. As suggested by Pagano (2002), local governments would utilize different types of debt financing behaviors based upon their revenue structures.

Second, I also examined the importance of institutional factors such as the forms of government, the electoral system, and the authority of council-managers. Prior research on local political institutions often emphasizes the difference in fiscal outcomes between municipalities with mayor-council and council-manager forms of government, but rarely addresses various fiscal outcomes within a specific local political institution, i.e., the authority of city managers in a council-manager form of government. Some scholars have developed different frameworks to conceptualize various forms of institutional arrangements.

My research is innovative in the sense that it directly tests the nature of authority embedded in local institutions. It does this by emphasizing institutional arrangements related to locally appointed officials, rather than political officials. My research shows that local appointed officials can influence local governments’ debt financing behaviors through their executive authorities. In Texas, for example, I found that municipal governments where city managers possess a high level of executive authorities, they are more likely to reduce local governments’ certificates of obligation issuance. The formal authority of city
managers complements current research on the importance of forms of government.

My research also contributes to this theory. The analysis, based on data collected in Texas, reveals the logic behind local governments’ decisions to issue certificates of obligation and GO bonds. Since the passage of the Certificate of Obligation Act in 1971, the debt instrument has not been thoroughly examined systematically by scholars. Yet, as presented in Chapter 2, the instrument has been widely used by various types of local governments to finance their services. My research represents a first step in overcoming the limited understanding of the debt instrument, and provides clues to practitioners on its usage, i.e., in terms of volume and the propensity to issue certificates of obligation. The empirical study also highlights factors influencing local government decisions for particular types of debt instruments, i.e., the importance of certificates of obligation (a form of contractual debt) and GO bonds (a form of guaranteed debt).

Limitations

This dissertation has several limitations. First, given the statutory framework in Texas, it is difficult to extend my findings to other states. It is not clear whether local governments in other states have similar types of contractual debts, i.e., certificates of obligation, to finance their capital projects. While much has been written about certificates of participation, almost none has addressed the debt instrument as it relates to certificates of obligation. Moreover, Texas municipal governments generally have relatively high fiscal authorities compared to municipal governments in other states (Pagano and Hoene, 2010), which suggests the importance of a state’s statutory framework to influence local governments’ debt financing behaviors. Because of the nature of debt instruments and the fiscal autonomy of local governments in Texas, it would be difficult to find comparable municipalities from other states. A future study on the variation across states is warranted.
The second limitation is related to the use of True Interest Cost (TIC) as a measure of borrowing costs. The calculation was based on data I collected during the recent financial crisis, i.e., 2008 to 2011. The financial crisis has seriously affected national and regional economies. Bond investors may have changed their investment portfolio as regards to municipal bonds and become more concerned with default risks during the crisis. Their perceptions on default risks may have influenced their preferences toward certificates of obligation, since they are generally secured by all of local governments’ legal revenues. As a result, certificates of obligation may have lower interest costs during the crisis than during the period of economic boom. Additionally during this period, the interest rate has been at its lowest point compared to the period before the crisis.

The third limitation relates to the number of municipal governments that were included in the final sample. I did not include all charter cities in Texas. Only 254 out of 351 charter cities responded to the survey conducted by the Texas Municipal League, which was the main source for variables related to local political institutions. Since some municipal governments either lack information on council-election systems or forms of government, they were excluded from the final analysis. Consequently, I have only 208 charter cities in my final sample, which accounts for 59% of total charter cities in Texas.

Future Direction

Future research should address the following issues: first, there is a need to further address the association between fiscal decentralization and local governments’ debt financing behaviors. I believe local governments would be aggressive in their debt financing behaviors if they are assigned to play an important role in the provision of local public infrastructures. A similar argument also applies if they have the fiscal capacities to issue various types of debts. In other words, if local governments rely heavily on state grants for
the provision of public infrastructures, but lack fiscal capacities, they are less likely to issue
debts on their own. It is important to understand the level of fiscal decentralization and its
effect on debt financing strategies before exploring the potential influence of debt instruments
in a state.

Second, it is necessary to further understand various types of debt instruments in
different states. The various types of debt instruments not only refer to the number of debt
instruments that are available to local governments; they also represent specific revenue
sources and procedural requirements related to their usage. Understanding these
requirements is significant because they often have implications on political costs, default
risks, and borrowing costs. Appreciating the effect of various types of debt instruments
would position us to improve my assessment of the influence of specific debt instruments and
predict local governments’ debt financing behaviors.

Third, future research should also address local governments’ strategic behaviors
during the issuance of municipal bonds, i.e., the issuance process. As discussed in chapter
3, local governments in Texas changed their debt issuance behaviors during the economic
crisis. For example, municipal governments reduced the usage of credit enhancement when
issuing their local debts. No empirical research exists which addresses factors explaining
local government behaviors during the economic crisis. A further grasp of this issue can
help us to decipher the interactions between bond issuers and investors during periods of

Fourth, future researches can also address the role of city managers in local
governments’ debt financing behaviors. Empirically, Clinger et al. (2008) have shown that
local governments are likely to increase their debt issuance when city managers are
discharged or leave their positions. My research shows that when city managers have more
executive authorities, their municipalities are less likely to issue certificates of obligation.
Both findings show that city managers are fiscally conservative when issuing debts. They are likely to manage local governments’ debt issuance when they possess a higher level of formal authorities. Future research should attempt to examine whether informal authorities of city managers makes a difference. Their experience, knowledge, and relationships with council members should also be examined to determine whether they have an effect on local governments’ debt issuance decisions.
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