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Building Bond Repayment Capacity in Developing Countries: A Study on Property Tax Collections and Debt Affordability in Mexico

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Abstract

When properly structured, subnational bonds can become an excellent tool for infrastructure financing. A common concern when referring to developing nations, however, is the lack of an adequate bond repayment capacity. This article uses a multinomial regression model to analyze the bond repayment capacity of issuers of municipal bonds in Mexico. The study emphasizes the role that property and land-based taxes have in the enhancement of repayment capacity, as these are highly underutilized levies with important revenue raising potential. The findings show that in spite of this, there is no statistically significant link between such taxes, and the chosen proxy for repayment capacity. We consider this to follow from an institutional and legal framework that creates an artificial environment of fiscal solvency. The Mexican case is instructive on how not to create a subnational bond market.

Keywords: Property taxes; debt affordability; credit ratings; bond market development; Mexico

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1 Introduction

This article is anchored in two ideas. First, development of a market-based municipal borrowing system follows when institutional capacity of the system accurately assesses risk and provides commensurate rewards. Second, a robust property and land-based tax system enhances the menu of financing tools available to municipal governments, as these taxes can improve their bond repayment capacity and ease their access to capital markets. To verify such claims, we conduct a study that explores the link between own-source revenues, including property and land-based tax revenue, and the repayment capacity of municipal governments in a developing country like Mexico. In conducting the analysis, we observe whether the standard relationships between fiscal health variables and credit ratings hold. Our analysis shows that local efforts to improve fiscal health are not rewarded in the Mexican municipal credit market.

A framework for advancing municipal capital markets holds that three factors affect market development: two institutional capacity factors—legal and regulatory environment, and capacity of financial institutions to assess risk—and one borrower capacity factor, to manage fiscal health (Martell and Guess, 2006). Due to the primacy of the risk-reward relationship, the argument goes that the institutional factors drive market advancement, and capacity factors follow the incentives provided by the institutional factors.

The interplay that exists among the institutional and borrower capacity factors has not been well explored. Efforts to stimulate a municipal market may result in great strides, on one hand, and unintended retarding consequences, on the other. This study seeks to inform the outcome among the legal, institutional, and borrower factors by examining whether municipal efforts to enhance their own capacity are related to their assessed repayment capacity. Given the vast revenue generating potential of property and land-based taxation, investigating the causal connection among these taxes and the repayment capacity of bond issuers turns into a necessary condition.

A local government's repayment capacity is generally commensurate with good fiscal management of own-source revenues. Scholars like Peterson and Kaganova (2010) highlight the importance of linking land financing into subnational fiscal management due to the growing infrastructure needs in many developing countries. The role that municipal governments must play in financing large, capital-intensive, infrastructure projects has increased as a result of political and fiscal decentralization. Unfortunately, situations where the devolution of spending responsibilities to subnational governments is not paired with additional revenue-raising capacity abound. The insufficiency of own-source revenues leaves municipal governments in worrisome situations of financial dependence and poor creditworthiness.

Credit ratings are designed to capture a jurisdiction's probability of making full and timely bond payments, thus representing bond repayment capacity. This article argues that the bond repayment capacity, as credit quality proxies, of a municipal issuer is positively correlated with its own-source revenue collections, particularly the property and other land-based revenues. Improvements in these local tax collections over time will provide bond markets with positive signals on the debt affordability and repayment capacity of an issuer, thus enhancing its credit quality.

The claim is tested by using data on Mexican municipal bond issuers[1]. This developing country is considered as a good case study because of (a) conscientious efforts taken by Mexican policymakers in the early 2000s to stimulate a robust subnational credit market; (b) the creation of a legal framework aimed at promoting fiscal responsibility in subnational governments (SNGs) and reducing their fiscal dependency; and (c) federal government interest in a more effective property tax collection (which in Mexico, is among the lowest in Latin America). This environment exemplifies the opportunities for municipal governments that have fiscal space to increase own-source tax collection and finance infrastructure needs with bonds.

The article is organized as follows. Section two overviews the pertinent literature. Specifically, the literature elaborates on the theoretical framework presented above, discusses the measurement of repayment capacity, provides background information on Mexico's municipal bond market and property tax system, and presents research questions and hypotheses. Section three describes the study's methodology and data. Section four analyzes the information, presents the findings, and discusses its implications. Section five concludes and introduces policy implications and issues for further research.

2 Background

There is a growing interest among scholars and practitioners in developing opportunities that a robust and disciplined SNG bond market can offer (Canuto and Liu, 2010; Canuto and Liu, 2013; Freire and Petersen, 2004; Freire, 2013). Private capital is starting to play an important role in the subnational finances of many developing economies in spite of the disruptions of the 2008-09 financial crisis (Canuto and Liu, 2010). One of the ways in which private capital participates in development is through bond markets. The literature on subnational bond markets touches upon various areas: the design of frameworks to reduce the risk of insolvency, the restructuring of troubled debt markets, the enactment of reforms to align the incentives of bond issuers and investors, and the institutional arrangements needed to overcome moral hazard problems, strengthening repayment capacity, and accurately assessing and pricing risk (Leigland, 1997; Peterson, 2000; Martell and Guess, 2006).

The work of Martell and Guess (2006) provides a framework for examining the development of municipal credit markets. They argue that effective bond markets are built by developing both institutional and borrower capacity, but that institutional capacity is a necessary condition as it determines the incentives to create a system where the market rewards risk and to encourage good fiscal behavior on the part of the borrower.

According to their framework, institutional capacity is comprised of both the legal and policy environment and the ability of financial institutions to assess risk. The legal and policy environment refers to the higher-level structures that dictate the parameters for market growth, and includes developing corporate and public bond markets, improving information flow through legislation and regulation, facilitating local debt management, and mobilizing private capital to finance infrastructure (Leigland and Thomas, 1999). The capacity of financial institutions to

assess risk refers to providing information, maintaining the relationship between risk and reward, developing borrower reputations, assuring a probable return on investment, and letting markets increasingly evaluate a borrower's creditworthiness (Attinasi and Brugnoli, 2001). Borrower capacity refers to the more traditional measures of fiscal management, related to own-source revenue generation and debt management. Scholarly interest in developing sustainable debt markets has focused on devising policy measures to expand the creditor's repayment capacity (Peterson, 2000). Improving the creditworthiness of a borrower may require changes in local financial management, changes in the intergovernmental financing structure, or changes in the way loans are assessed.

Given institutional and borrower capacities, the framework suggest that municipal credit markets will advance given a broad regulatory framework and established local debt policy, and risk assessment that preserves the risk-reward relationship. Given the institutional capacities, and incentives for good local government fiscal behavior, borrower capacity for own-source revenue generation, fiscal management, and debt management follows, ultimately resulting in greater market access and lower borrowing costs.

2.1 Own-source revenue

Development efforts from the 1990s onward have emphasized the importance of aligning budgetary responsibility with revenue authority, and the decentralization movement has encouraged own-source revenue generation at the local government level. In a municipal market system, typically own-source revenue generation is rewarded, and is often a necessary condition of market borrowing. Own-source revenues refers to revenues for which "the jurisdiction has discretionary power to determine the tax burden on citizens" (Gómez Sabaini and Jiménez, 2012: 147), rather than those transferred from another level of government. The power of taxation is levied through tax administration, setting tax rates, and determining the tax base. In Latin America, the share of subnational own-source revenue has been slowly trending upward, but still pales in comparison to the revenues subnational governments receive by transfer. Subnational taxing authority remains largely weak.

While local governments can and do draw from a number of local revenue and fee bases, among the largest sources of revenue are property taxes and land-based revenues. However property taxes and land-based revenues in many developing nations remain largely underutilized. Property taxes in Latin American countries offer an illustrative example of this situation: In Mexico, collections from this tax represent a meager 0.2 % of GDP (the lowest ratio in the continent); in Bolivia, 0.3%; in Brazil, 0.7 %; in Colombia, 1.3 %; and in Argentina, 1.7 %. By comparison, the average tax collection in OECD countries is 2% of GDP (Revilla, 2013).

While the subject of political resistance, property taxes are recommended as a source of revenue due to the benefits of being progressive, imprinting discipline in land markets, raising taxpayer awareness of the cost of local public goods, improving government transparency, allowing for local government autonomy, and advancing decentralization efforts (De Cesare, 2012; Sepulvelda and Martinez-Vazquez, 2012). Fiscal space is created not only from property taxes,

but from other land-based instruments, including betterment levies, urban revitalization areas, real estate property and transfer taxes, sale of development rights, and sale or concession of publicly owned assets (Vetter and Vetter, 2011; Peterson and Kaganova, 2010). The potential for revenue collection, especially in smaller jurisdictions, is dampened by legal obstacles, equalization measures inherent to many transfer systems, inadequate municipal administrative and technical capacity to update cadastres, and lack of popularity and political will (Sepulvelda and Martinez-Vazquez, 2012; Afonso et al., 2012; McCluskey and Franzsen, 2014). However, own-source revenue generation is vital to a subnational government's debt affordability.

2.2 Debt Affordability

The literature on debt affordability and the determinants of credit quality is useful to identify the impact of a diversity of factors in the repayment capacity of local government borrowers (Miranda and Picur, 2000; Blane, 2003; Lowry and Alt, 2001; Brecher et al., 2003; Kriz and Wang, 2013). Although there is nuanced difference between debt capacity and debt affordability, the terms are used interchangeably (Kriz and Wang, 2013). As credit rating agencies care about the probability of repayment, there is a very strong correlation among debt capacity, debt affordability, repayment capacity, and credit quality; and hence also among the determinants of debt affordability and credit quality.

Debt affordability is often measured by using credit ratings as proxies (Bahl, 1971; Loviscek and Crowley, 1990; Grizzle, 2010; and Palumbo and Zaporowski, 2012). Four factors affect debt affordability: Economic environment and base, financial condition, debt position, and administrative/management capacity (Kriz and Wang, 2013; Hildreth and Miller, 2002). Changes to these factors over time can result in a bond instrument being upgraded or downgraded.

Given that the economy is largely out of a local jurisdiction's control, internal financial control becomes critical to a municipal government seeking to improve its debt affordability. One would expect this to hold in both developed and developing countries. Yet, what is known of debt affordability in developing countries is limited. More specifically, what is known about the relationship between own-source revenues and debt affordability in developing countries is also limited.

As noted, property and land-based revenues in developing countries have a significant, but notoriously underused revenue generating potential. Certainly, transactions involving public land are turning into a widely used source of funding for capital projects in many developing nations (Peterson and Kaganova, 2010; McCluskey and Franzsen, 2013). The revenue generating potential of land derives from sale, lease, and property tax revenues and other land-based fees. A properly structured property and land-based tax system could increase the attractiveness of municipal governments when accessing local bond markets. While the property tax is a central part of many US municipal budgets[2], and thus forms the basis of credit quality, the precise value of this revenue source, vis-à-vis other sources, has not been empirically studied in developing nations. Moreover, little is known about how property tax collections respond to the institutional borrowing environment.

2.3 Mexico

The focus of our attention is on Mexican municipal debt financing. In this case, a general introduction to the institutional environment is followed by two lines of research that illustrate the current status of the debates on property and land-based taxes, and the repayment capacity of subnational governments.

Mexico has a federal system of government, comprised of 31 states, one federal district, and 2,439 municipalities (Gómez Sabaini and Jiménez, 2012). In 2010, the population was nearly 111 million. The 2009 GDP per capita was US $14,337 and the 2008 tax burden was 10.4% of GDP. These values, compared to other countries in Latin America, suggest that the wealth can support a higher tax burden. Subnational governments rely heavily on federal revenue sharing transfers, where non-earmarked *participaciones* and earmarked *aportaciones* mark the largest sources of subnational revenues. In 2008, the property tax accounted for 54% of municipal own-source revenues. Other municipal own-source revenues are generated by payroll taxes and a variety of fees, including those derived from commerce, licenses, inspections, transport, water tariffs, and public works. Generally speaking, both local tax effort and subnational debt levels are low (Revilla, 2013).

To reverse a common practice of federal bailouts of subnational government debts, in 2000 the Mexican Treasury introduced a new subnational borrowing framework based on two principles to reduce federal obligations and soft-budget constraints: eliminate implicit federal guarantees of subnational debt and encourage risk assessment in the lending process (Hochman and Valadez, 2004; Leigland, 2004; Espinosa and Mojica, 2012; Revilla, 2013). One reform measure requires banks to hold risk-weighted reserves and to seek credit ratings for local governments before making loans to them (Hochman and Valadez, 2004; Leigland, 2004; Canuto and Liu, 2010; Revilla, 2013). Another reform measure, designed to stimulate credit market development by protecting the investor's return without the federal government's guarantee, was to use fiduciary stock exchange certificates, known locally as *cebures*, as the bond instrument for local governments.

The *cebures* mechanism has dominated the local government bond market in Mexico. The structure of *cebures* requires bond issuers to set up a master trust (*fideicomiso irrevocable*) and deposit funds pledged towards repayment (Espinosa and Mojica, 2012). The trust is master in that it can accommodate multiple bond issues. It is an administrative trust, not a guarantee trust, whereby receivables are legally channeled, via "irrevocable instructions", to a third party special purpose vehicle, instead of to the local jurisdiction. In this future-flow arrangement, revenue sharing transfers, earmarked funds, as well as local revenue, are pledged to the trust for bond repayment (Leigland, 2004; Hochman and Valadez, 2004). Investors' returns are enhanced through irrevocable instructions, over collateralization, and covenants that allow bond holders to take remedial action for "credit events", such as increasing reserve or trapping cash (Leigland, 2004; Hochman and Valadez, 2004).

Cebures have advantage of increasing investor guarantee, and therefore lowering the price of capital for subnational borrowers. In fact the municipal debt market has grown substantially

since 2000, but municipal debt issuance still remains low (Revilla, 2013). A concern is that municipal governments are not issuing long-term debt, via *cebures*, in favor of contracting short-term debt with commercial banks (Benton and Smith, 2013). Unlike long-term debt, short-term debt does not need to be approved by the state congress, nor be reported as debt to the Ministry of Finance. However, it is more expensive because of higher interest rates, frequent turnover, and commission costs.

Cebures bring another host of cost and behavior limitations (Leigland, 2004). The arrangement is straddled with higher transaction costs—particularly legal, banking, and management—due to the fact that they are highly structured and require long lead time. Also, "enhancements like over-collateralization are expensive ways to mitigate portfolio performance risks" (Leigland, 2004: 31). Finally, the arrangement introduces moral hazard issues of over-borrowing, over-lending, and lack of stakeholder scrutiny. With *cebures*, subnational governments risk losing momentum to build long-term financial health and repayment capacity. A recent empirical study of subnational government yield spreads in Mexico shows that financial factors, such as revenue collection and expenditure responsibilities, do not affect the yield spread on *cebures* (Espinosa, 2013). Rather, the design of the borrowing instrument factor into market prices, not the financial capacity of the borrower. This is problematic, especially given the low levels of local tax effort, particularly for the one true local source of finance: property taxes.

The Mexican Constitution (Art. 115) allocates any real estate tax to the municipal level and 1999 reforms granted greater levels of autonomy to municipal governments. While the national government defines the property tax base, a salient aspect of the reform was that municipalities would be able to assess property values, set property tax rates, and collect property tax revenues (De Cesare, 2012; Ibarra Salazar and Sotres Cervantes, 2009)[3]. This has contributed to a diversity of organizational changes and policy actions aimed at improving tax collection, which have resulted in higher property tax revenues among some U.S.-border municipalities (Ibarra Salazar and Sotres Cervantes, 2009). Yet, the revenue generating capacity of the municipal property tax is hampered by legislative requirements and political will. "Municipalities need legal authorization from their respective state congresses to alter land assessments, and these legislative bodies have no incentive to increase the land assessment tables, since the citizens, especially in the capital cities, view such increases as unjustified—a situation that makes any decision to raise the taxes politically unpopular" (Gómez Sabaini and Jiménez, 2012: 155)."

The institutional arrangements were designed to stimulate credit markets, but there is little evidence to link property taxation and bond repayment capacity[4]. At the state level, Hernandez-Trillo and Smith-Ramirez (2009) explore how various political and financial factors are weighted in the construction of subnational bond ratings. The authors analyze jointly the determinants of state-level bond ratings for three rating agencies operating in Mexico (Moody's, Standard & Poor's, and Fitch)[5] and find that population, political affinity with the federal government, the ratio of own-to-total revenues, and investment influence ratings positively, while the ratio of debt-to-total income affects it negatively. No known studies examine the determinants of municipal debt affordability in Mexico.

In summary, the municipal credit market framework holds that institutional capacity is necessary to encourage borrower capacity. In a functioning municipal credit market, one would expect the traditional measures of debt affordability, especially own-source revenue generation, to impact credit ratings. This study examines the impact of own-source revenues, including property and other land based taxes, debt levels, and economic condition on credit ratings. The importance of property and land-based taxes in the municipal government finances of many developing countries is such that one wonders if improvements in their collection will lead to better perceptions of creditworthiness. Thus, we contribute to the conversation about the development of credit markets, the incentives of municipal governments to enhance their capacity, and the evaluation of creditworthiness.

2.4 Research Inquiry

Based on the market development framework and what we know of Mexican municipal finance, this research identifies the following research questions, which we explore in the context of Mexican municipalities:

(1) Which factors contribute to the evaluation of debt affordability? Specifically: Do own-source revenues—property taxes and other land-based revenue—impact credit ratings? Do debt levels impact credit ratings? Do measures of the economic base impact credit ratings?
(2) Do the data on debt affordability indicate the development of a municipal credit market?
(3) What policy choices should be considered to enhance market development?

The hypotheses for the study are as follow: In general, given sound institutional and borrower capacity, we would expect that credit ratings are positively related to own-source revenue generation, especially property tax and other land-based revenue generation, and to a stronger economic environment. If the risk-reward relationship is maintained, then we expect credit ratings to be negatively related to debt levels. Too much outstanding debt would impede the repayment of future debt and would be viewed negatively by the markets. However, if as Leigland (2004) cautions, the *cebures* arrangement has moral hazard effects, then we would expect to see a breakdown of the risk-reward relationship and insignificance of traditional measures of debt capacity.

3 Methodology and data

The hypotheses for this study are tested using a multinomial logit regression model (MNLM) with the following structure[6,7]:

$$R_{i\ (base\ group=j)} = \beta_0 + \beta_1 X_1 + \beta_{2\ldots K} X_{2\ldots K} + u$$

Where:

$R_{i,j}$ =The odds of a municipality to be placed in credit rating group *i* vs. group *j*
β_0 = Constant term
$\beta_{2...k}$=Regression coefficient reflecting changes in the odds of being placed in a credit rating group, given a unit change in an explanatory variable
X_1 =Property tax revenues (Explanatory variable of interest)
$X_{2...k}$=Matrix of explanatory variables
u =error term

Our proxy measure for debt affordability is the credit rating for municipal bond issues from the company HR Ratings-Mexico[8]. Following convention in the municipal finance literature (Martell et al., 2013; Palumbo and Zaporowski, 2012; Palumbo et al., 2006), the data for this variable were coded and grouped in four categories. Table 1 illustrates the grouping and the frequency distribution of the dependent variable.

Table 1: Distribution of the dependent variable

Group	Credit ratings to be included in each category	Sample size (n)
1	AAA, AA, AA-	23
2	A+, A, A-,	40
3	BBB+, BBB, BBB-	60
4	BB+, BB, C-, D	8
Total (n)		**131**

In accordance with the literature, the model includes explanatory variables reflecting the revenue structure of municipal bond issuers (property tax revenues, revenue sharing transfers, taxes on urban infrastructure, user fees on water usage, and user fees on urban services and public works), as well as variables to control for differences in local revenue effort (ratio of own-source revenue to total revenues), debt levels (outstanding debt, ratio of debt to total revenue), and economic condition (municipal GDP). All financial variables are expressed in constant and per capita terms. Factors affecting the dependent variable that are not considered explicitly are to be captured by the error term (u)[9].

The information to calculate the explanatory variables was gathered from the Municipal Database System complied by Mexico's National Institute of Geography and Statistics[10]. Table two shows descriptive statistics for the variables included in this study.

Table 2. Descriptive Statistics

Variables	Mean	Std. dev.	Min	Max
Dependent variable				
Credit ratings for municipal bonds grouped by category (ordinal variable).	n/a	n/a	1	4
Explanatory variables*				
Property tax revenue (*predial*).	257.88	203.83	17.16	1,154.85
Revenue sharing transfers (*Participaciones*)	556.57	211.48	158.12	1,639.07
Taxes on urban infrastructure	3.50	24.98	0	258.72
User fees on water use	24.10	63.35	0	455.46
User fees on urban services	31.89	53.59	0	381.88
Outstanding debt	462.20	567.06	0	2,856.97
Ratio of own-source-to-total revenues	0.23	0.12	0.004	0.57
Ratio of total debt to total revenue	0.13	0.12	0	0.41
Municipal GDP	112,006.30	43,884.27	26,859.95	212,579.10

*Each explanatory variable is in constant peso, per capita terms. Base=2010.

4 Findings

Regression coefficients were obtained using Stata. The logarithmic results of the estimation, which cover the period 2008-2011, are depicted in Table 3(a). Eight observations were dropped due to missing data, leaving a final sample size of 123 observations.

Given a unit change in an explanatory variable, the multinomial logic coefficients show the probability of having a municipal bond in credit rating groups 2, 3, or 4, when compared with the probability of being in group 1. Given that the MNLM can be thought of as simultaneously estimating binary logits for all comparisons among the dependent variables, the relevant coefficients are to be compared with a base category (Long and Freese, 2001). Group 1 is the baseline category: It contains the highest credit ratings in the HR scale (i.e., AAA, AA, AA-), and represents the group of ratings that bear the lowest borrowing cost. The regression coefficients depicted in Table 3a, henceforth, reflect the effects on a unit increase in each of the explanatory variables on the odds that the issuer of a bond will have ratings in groups 2, 3 or 4, when compared to group 1

Table 3 (a): Regression results

Factors affecting bond repayment capacity: 2008-2011
Comparison to group 1
Multinomial Linear Regression Model (MNLM)
n=123
Confidence level: 90%
Pseudo R^2 = 0.1615

Variable	**MLNM coefficients** (Expressed as logarithms)		
	Group 2	**Group 3**	**Group 4**
Property taxes (*predial*)	0.001 (0.004)	0.006 (0.004)	0.005 (0.006)
Revenue sharing transfers	0.002 (0.003)	0.005* (0.003)	0.002 (0.003)
Taxes on urban infrastructure	-0.018 0.015	-12.24 (103000000)	-0.007 (0.037)
User fees on water usage	-0.0007 (0.003)	0.007 (0.010)	0.007 (0.014)
User fees on urban services and public works	-0.003 (0.006)	-0.011 (0.008)	-0.006 (0.010)
Outstanding debt	0.0002 0.001	0.002 (0.02)	0.001 (0.002)
Ratio of own-source revenue to total revenue	3.80 (4.61)	1.31 (4.75)	-3.16 (8.44)
Ratio of debt-to-revenue	1.57 (6.94)	13.64 (7.69)	-0.93 (11.14)
Municipal GDP	-0.00000828 (0.00001)	-0.00002* (0.00001)	-0.00003 (0.00002)
Constant	-0.59 (1.74)	-1.68 (1.80)	0.40 (3.02)

* p<.05 **p<.01 ***p<.001
Numbers in parenthesis indicate standard errors

Table 3 (b): Odds for statistically significant coefficients: Comparison to all groups

Variable	**Odds expressed as percentages** (For significant results only)		
	Group 2	**Group 3**	**Group 4**
Property taxes (*predial*)		0.50 (With respect to group 2)	
Revenue sharing transfers		0.35 (With respect to group 2) 0.54 (With respect to group 1)	

The MNLM regression rendered results that were largely contrary to the expectations of a developed credit market. One immediately notices that when the confidence level is set at 90%, the majority of the regression coefficients are not statistically significant, suggesting that the variables that impact debt affordability in developed markets do not impact debt affordability in this developing environment.

According to these results, the only coefficients that merit attention are the ones reflecting the impact of revenue sharing transfers, and municipal gross domestic product for group 3 (i.e., municipal bonds with a BBB+, BBB, BBB- credit rating). With respect to revenue sharing transfers, the results show that a unit increase in revenue sharing transfers increases the odds that a rating is in group 3 over group 1. Conversely, a decrease in revenue sharing will increase the odds of having a credit rating in group 1 over group 3. Similarly, a unit increase in municipal GDP decreases the odds of having a credit rating in group 3, relative to group 1. Thus, consistent with expectations, the lower the reliance on transfers and the better the local economy, the more that jurisdictions with ratings in group 3 have the chance to improve their credit rating to group 1.

However, the lack of statistical significance in all other own-source revenue coefficients is counter to expectation. Particularly puzzling is the insignificance of the property tax, which is one of the primary sources of own-source tax revenue for municipal governments in Mexico. For a unit increase in property tax revenue is not significantly related to being in any rating group. Given that this is a tax with substantial revenue generating potential, the initial expectation was that bond markets would take existing tax collection levels into account when assigning credit ratings. However, these results suggest that municipal efforts to collect revenue are not rewarded in the market, leading to a moral hazard problem.

Also counter to the expectation of a developed market, neither outstanding debt nor the ratio of debt to total revenue were significant, suggesting that the markets do not assign credit risk according to debt burden.

To facilitate interpretation, the coefficients were transformed and expressed as percentage changes (rather than logarithms, as in Table 3a). Table 3b depicts the statistically significant coefficients, with respect to all credit rating groups.

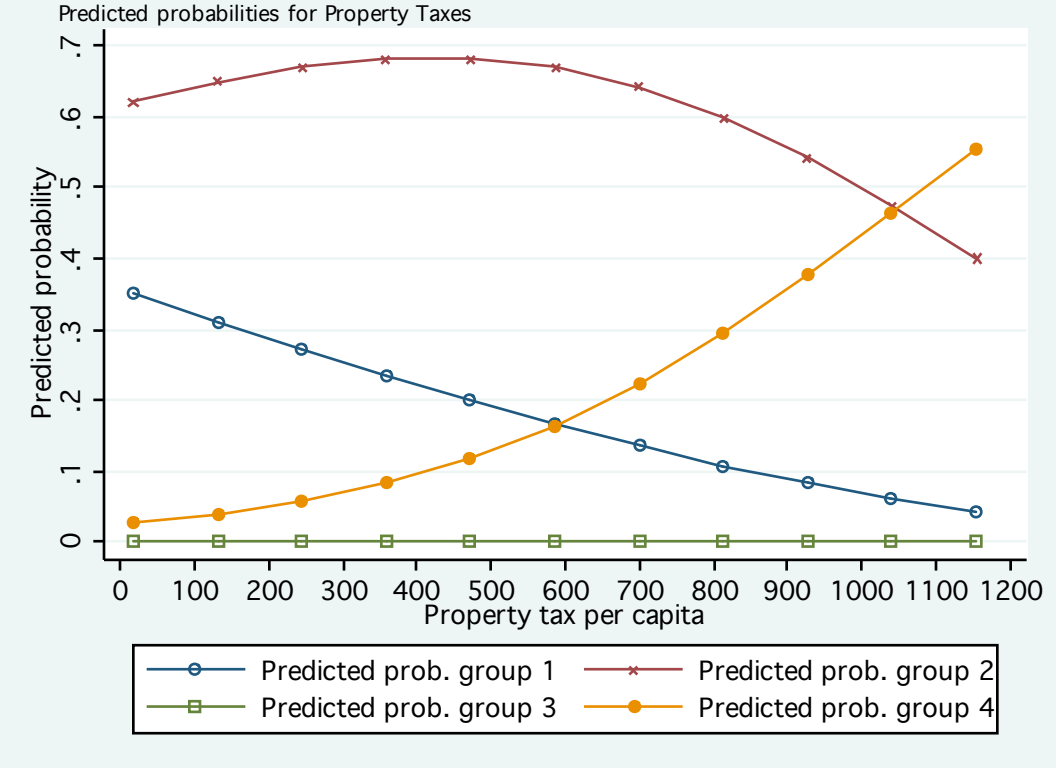
According to these coefficients, an increase in $1 peso per capita in property taxes would increase the odds of being in credit rating group 3 (as opposed to group 2) by 0.50%[11]. Conversely, a unit increase in revenue sharing transfers per capita, on the other hand, will increase the odds of being in credit rating group 3 (as opposed to group 2) by 0.35%, and by 0.54% when compared to group 1. This means that the rating agency (HR, which is the source of the credit rating data) penalizes municipalities for property tax revenue increases and rewards them for revenue sharing transfer increases.

To explore further, figure 1 displays the predicted probabilities of credit ratings across a range of property tax revenue collections. The predicted probabilities of ratings in group 1 fall when property tax revenue collections are at high levels, suggesting an inverse relationship between property tax collections and the probability of being in group 1. Group 1 appears to have reached a saturation point, since the expected probability of being in the highest credit rating category will diminish as property taxes per capita increase. Similarly, the predicted probabilities of ratings in group 2 initially increase, but then fall sharply, beginning when property tax revenues per capita reach $500 pesos. When this occurs, the probability of having a bond with a grade A+, A, A- will decrease. The level of property tax revenues has no bearing on the probability of being in group 3. Municipalities whose bonds are currently receiving ratings of BB+, BB, C-, or D should not expect an improvement in their current situation as property tax revenues increase. The predicted probabilities of being in rating group 4 increases steadily when property tax revenues reach high levels. Alternatively stated, as per capita revenues increase, the probability is that the credit rating will be dominated by groups 2 and 4. After about $1000 pesos per capita, the probability is that the credit rating will be in group 4. Combined, the predicted levels indicate that jurisdictions with higher property tax revenue collections are generally penalized by the rating system.

4.1 Implications

In light of these findings, we return to our inquiry. While the economic base does impact credit ratings, as expected, most of the standard determinants of debt affordability do not hold in the case of Mexican municipalities. Contrary to the literature and expectation, own-source revenues do not impact the credit ratings of Mexican municipalities. Moreover, no land-based revenue statistically impacts ratings, and property tax revenues only do for jurisdictions with ratings of A+, A, and A-. In all other cases, the credit rating does not reflect property tax revenues. Also contrary to expectation, debt levels do not impact credit ratings. Thus, the municipality's financial health and debt burden provide no signals to the market. These results are counter to those at the state level, which demonstrate that own-source revenue positively affects credit ratings and debt burdens negatively affect credit ratings (Hernandez-Trillo and Smith-Ramirez, 2009).

Figure 1. Predicted probabilities: Property tax revenue per capita



The legal framework in Mexico might explain the lack of statistical significance of determinants typically associated with debt affordability. Our sense is that the rampant use of the master trusts and *cebures* creates artificial signals of bond repayment capacity for the market, resulting in a broken connection between repayment capabilities and market access. The terms of the trust fund protect investors against the possibility of a municipal default. Despite there being no federal bailouts, *cebures* contracts and irrevocable instructions give the federal government the legal obligation to reduce future-flows of revenue sharing to a municipality if the event of default.

These results indicate that the municipal credit market in Mexico continues to be underdeveloped from a market perspective. Returning to this article's framework, the expectation is that a local government's capacity develops more readily when institutional and legal arrangements incentivize local government capacity. Mexican municipal data tell a story that municipal financial efforts are not rewarded in the credit rating process. So, while Mexico took conscientious steps to mitigate the soft-budget constraint, reduce subnational reliance on federal guarantees, and encourage subnational credit market growth, those steps have had adverse consequences on the internal fiscal capacity development of municipal governments.

There are some worrisome conclusions. First, the institutional structure impedes the market's ability to assess inherent risk. Second, municipal governments are de-incentivized to improve

their financial condition and debt position. Third, as Leigland (2004) noted, the artificial borrowing market has the potential to inefficiently distort municipal borrowing, either by over-borrowing and over-lending in some cases, or by diverting municipalities to the short-term market due to the costs of long-term issuance in other cases.

As the municipal borrowing arrangements in Mexico have been held up as a model, it is worth considering that the arrangements have led to unintended outcomes, which can be useful in promoting municipal credit markets in other developing countries.

If institutional capacity is paramount, then policy recommendations that target the institutional and legal structure are appropriate. One policy recommendation for Mexico would be to require that a municipality demonstrate improvements in own-source revenue generation and debt management before being authorized to contract long-term debt. Another recommendation, as in the case of US municipal markets, is for rating agencies to assign credit ratings for both underlying and enhanced creditworthiness. Another policy option, designed to heighten citizen awareness of the tax-return relationship, is to engage the local citizens in the capital investment and financing process. These measures would increase the information provided to the market. As well, they would provide incentives for municipal governments to leverage own-source revenues. They may also provide incentives for municipal and state governments to align on the need to improve property tax revenues, and coordinate reform efforts accordingly.

5 Conclusion

Driving the inquiry is whether municipal markets in Mexico assess debt affordability according to the standard factors found in developed markets. Empirical exploration of municipal market data shows that own-source revenues, including property tax revenues, and debt levels are not significant predictors of municipal credit ratings. Further exploration show, however, that increases in property tax revenues for municipalities with "A" rated bonds can improve the credit rating of those municipalities. Yet, in general the institutional and legal arrangements for municipal bond issuance impede market signaling, leading to an artificial municipal market that does not incentivize municipal financial and debt capacity building. Based on the borrowing framework of Martell and Guess (2006), these results suggest that the municipal credit market can be further developed by altering the institutional arrangements to incentivize municipal own-source revenue generation.

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[1] In the literature on U.S. bond markets, the term "municipal bond" refers to financial instruments issued by state, city or county governments. In Mexico, the term is used to refer to bonds issued by municipal governments only. Since the focus of attention in this paper is on Mexico, the term will only encompass bonds issued by municipalities.

[2] The U.S. literature on Tax Increment Financing (TIF) offers guidance on some of the policies pertaining to property taxation that local governments have implemented to foster development. This literature is extensive. A good starting point is Weber (2013).

[3] Municipalities with limited technical capacity to assess values can transfer the responsibility to a state-level cadastre institute (De Cesare, 2012).

[4] Interested readers can review Hernández-Trillo, Díaz-Cayeros and Gamboa (2002), and Conesa, Schwartz, Somuano and Tijerina (2004).

[5] Their econometric model uses ordinal measures to depict the rating scores, and regress them on various continuous variables (e.g. population, annual income, own-to-total revenue ratio, debt-to-income ratio, among others), and various dummies aimed at capturing differences in SNGs' political environment (Hernandez-Trillo and Smith-Ramirez, 2009).

[6] The data were analyzed using various ordinal logit model specifications. We were not able to obtain regression estimates that did not violate the parallel regression assumption. By using a MNLM, the core assumption is that the categories for the dependent variable are nominal (unordered) outcomes.

[7] Empirically, debt affordability has been studied with both regression and ordered probit models. In a regression analysis of U.S. state debt capacity, Ramsey, Gritz, and Hackbart (1988) found that the most frequently used independent variables are revenue, personal income, population or population growth, assessed property value, and historical debt. Palumbo and Zaporowski (2012), modeling the rating process using an ordered probit regression, examine how the probability of default impacts the credit rating of a government's general obligation debt.

[8] See http://www.hrratings.com/en/index (Last retrieved on March 2014)

[9] Data limitations preclude us from including other traditional measures of debt affordability.

[10] See SIMBAD (*Sistema Municipal de Bases de Datos*) at www.inegi.gob.mx (Last retrieved on March 2014).

[11] As of March 2014, the exchange rate is about $1 Mexican peso for every 7 cents of a U.S. dollar.