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The Performance of the Property Tax in Mexico: Asymmetric Assignment of Cadastral Management and The Role of Local Capacity

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Abstract

The property tax in Mexico is far from reaching its potential. It has grown little over the past 25 years due to both policy and administrative shortcomings. A major issue lies in the weak management of cadasters—the systems used to identify, register, and value properties—which are often outdated or poorly maintained because of lack of interest and capacity, and inconsistent federal and state support. The effectiveness of property tax collection hinges on a strong cadastral administration, which is complex, costly and often unpopular among citizens, especially in developing countries. The debate over whether cadastral functions should be centralized or decentralized centers on a trade-off between capacity (favoring centralization) and incentives for revenue collection (favoring decentralization). Using municipal-level data from 2016 to 2022, this study analyzes how different governance structures regarding cadastral administration affect property tax revenues in Mexico, with particular focus on the role of local capacity in shaping outcomes. It finds that municipalities with low administrative capacity benefit from state-managed cadasters, while those with high capacity perform better when managing their own. These findings support an asymmetric approach to cadastral management, tailored to local capacities, to enhance revenue collection.

Keywords: decentralization, property tax, cadastral management, intergovernmental fiscal transfers

** The opinions presented herein are those of the authors and thus do not represent the official position of the Inter-American Development Bank.*

1. Introduction

Property taxes in Mexico do not account for a significant amount of local government revenue and they have not increased much in the last 25 years. The reasons for low revenue relate both to tax policy and administration. In particular, there are problems with cadastral management, including a lack of interest and inability to implement and update cadasters. Federal and state policies to incentivize tax collections and help maintain the cadaster have been inconsistent and weak (Ahmad et al., 2019). Those problems get worse when social and economic differences among municipalities and regions are taken into account, and especially aggravated when political considerations are also considered (Espinosa et al., 2018; Takahashi, 2021; Unda, 2021).

The key to managing the property tax lies in the good performance of the basic administrative functions, principally, cadastral management -- the identification, registration, and valuation of parcels (land and buildings). Cadaster management is a complex and expensive process. It is generally unpopular to implement, especially in the developing world, as demonstrated by low rates of enforcement and compliance (Martinez-Vazquez and Sepulveda, 2011; Slack and Bird, 2014).

From a theoretical viewpoint the arguments for decentralization versus centralization of property taxation and the cadaster function run along two basic dimensions: technical capacity and incentives (Dillinger, 1991; Bird, 2015). On the one hand, higher levels of government tend to have higher technical and financial capacity, which suggests centralized management of cadasters. On the other hand, because in most cases the revenues collected are assigned to the decentralized governments, the larger incentives to perform better are naturally placed with decentralized governments. Thus, the issue of what is best for property tax assignment, and particularly, for the function of cadastral management, is an empirical question as to whether technical capacity trumps incentives to perform or vice versa.

In this paper, we study property taxation in Mexico and seek to understand the determinants of the lackluster and heterogeneous revenue performance among municipalities. We focus on the interplay between the asymmetric assignment of cadastral administration and local capacities and estimate the differential revenue performance of those variations. We use data at the municipal level, for the period 2016-2022, and multivariate regression analysis with matching techniques to try to disentangle the impact of centralized versus decentralized governance of the cadaster on per capita property tax collections. Mexico offers a suitable context to identify these causal relationships, given the current ad hoc and voluntary cooperation agreements between state and municipal levels to manage property taxation, which cover both centralized and decentralized cadastral management.

Our findings indicate that local capacity is an essential factor determining property tax collection levels. At the same time, municipalities with a low degree of organizational capacity can benefit from delegating their cadaster to the state government and thereby collect more property tax revenues. In contrast, municipalities with a high degree of capacity that fully manage their own cadasters can collect a significant amount of property tax revenues, much more than their peers that delegate this responsibility to the state.

These results suggest that, in some cases, the available institutional coordination and support from the states to the municipalities is working well, such as when local governments have limited technical and financial capacities. In other cases where local capacity is strong, it is more beneficial for municipalities to manage their own cadaster. In light of these findings, we argue that an asymmetric approach to cadastral management for property taxation should be formally adopted in Mexico, based on local capacities, to optimize revenue collection. Similar countries considering whether to further decentralize property taxation and cadastral management, or recentralize the function and responsibilities, could also benefit from these findings.

The balance of the paper is organized as follows. The first section provides an overview of municipal property taxation in Mexico, describing some elements of the property tax system and presenting a brief analysis of property taxes across states and municipalities. We next review the previous literature that has investigated the causes of heterogeneous performance, expanding on the key role of local capacity for cadastral management. The following section carries out an empirical analysis of the role played by different institutional arrangements in the centralized versus decentralized management of the cadaster, with local capacity and other institutional features used to explain the difference in revenue performance. The last section concludes by offering some implications and recommendations for Mexico, and potentially for other countries in similar situations, to devise asymmetric assignment schemes to property taxation, based on local capacities.

2. Context

Although the property tax in Mexico has been around for a long time, it has only been a municipal tax since 1983, when the reform of the Fiscal Coordination Law of 1982 transferred control of the tax from the states to municipalities. The Federal Constitution provides the legal foundation for the 2,477 local governments in Mexico and lays out provisions for municipal governance, responsibilities, and capacities, including the authority to collect the property tax. In turn, state and municipal legislation details the property tax policy, administration design, and implementation features and mechanics, including the possibility that municipalities within a state could have different tax policies and administrative arrangements, including tax rates, exemptions and collection approaches, among other policies.[1] Although municipalities enact property tax regulations in their annual revenue laws (i.e. tax rate and base definitions), these regulations must be approved by their state congress.

Municipalities determine the value of properties, following their state's cadastral law. The cadastral value takes both land and building values into account, based on its nature (urban/rural), use, dimensions, number of floors, and age. In most cases, cadastral values are calculated once (when the property is registered for the first time) and could be updated if there are changes (e.g., change of ownership, requirement for permits to modify the property, and so on). Each local authority keeps a record of the properties within its jurisdiction in the municipal cadaster. New properties or

[1] Other federal laws that regulate municipal responsibilities and competencies on taxation and budgeting include: The Fiscal Discipline Law for States and Municipalities, The General Governmental Accounting Law, The Fiscal Coordination Law, The Federal Budget and Fiscal Responsibility Law, The Annual Federal Revenues Law and The Annual Federal Budget Decree.

improvements to existing properties are added to the cadaster following a visit by the authority to the owner or the owner to the authority. All properties in the city's Cadastral Register constitute the tax base for that municipality.

Only 11 of the 31 states have specific regulations to update cadasters.[2] While municipal authorities have the responsibility to update their cadasters, few actually do it. Of the 2,477 municipalities surveyed in 2023, only 466 of these performed field inspections to update their registrar and only 177 reported implementing a formal program for updating property values.

It has been argued that, despite its well-founded legal basis, the deficiencies of the municipal cadaster are the primary cause for the lackluster performance of the property tax in Mexico (Takahashi 2021).[3] It is a complex, costly task to maintain the public inventories of property up to date, more so with constant changes arising from social dynamics and a high geographical dispersion of communities (i.e. migration patterns affecting growth in certain cities and states, violent acts impeding access to particular areas, etc.) . Practically all municipalities lack the financial and technical means to assemble accurate, comprehensive, and modernized cadasters.[4]

In many parts of the country, to counter these capacity problems, and to incentivize higher property tax collections, municipal and state governments have signed agreements whereby the state undertakes the responsibility to run the municipal cadaster and assumes the technical, administrative, and legal support functions. Local authorities maintain some competencies by remaining in charge of the collection and administration of the property tax and communicating with taxpayers (although in some instances municipalities also transfer the collection responsibilities to states).

Currently, there are over 600 cooperation agreements in force in one-third of the states. Under most agreements the state retains a percentage of the revenue collected and the municipality receives the rest; the split depends on the agreement in each state. There is also an incentive scheme in the intergovernmental fiscal transfer system, the *Fondo de Fomento Municipal*, that gives additional resources to those municipalities that sign those agreements with their respective state. Some have argued that the state government does not have the same interest in improving revenue collection since the revenues belong to the municipalities (Takahashi 2021). At the same time, municipalities are unlikely to develop institutional capacities to perform the task by themselves if they leave it to the state government, and on top of that they can receive an incentive to do so from the *Fondo de Fomento Municipal*.

The main source of revenue for local governments in Mexico is federal transfers (72%), while the property tax is the second largest source of revenue, accounting for only 16 per cent of total revenues. Property taxes are very small, and collection levels have remained almost unchanged for

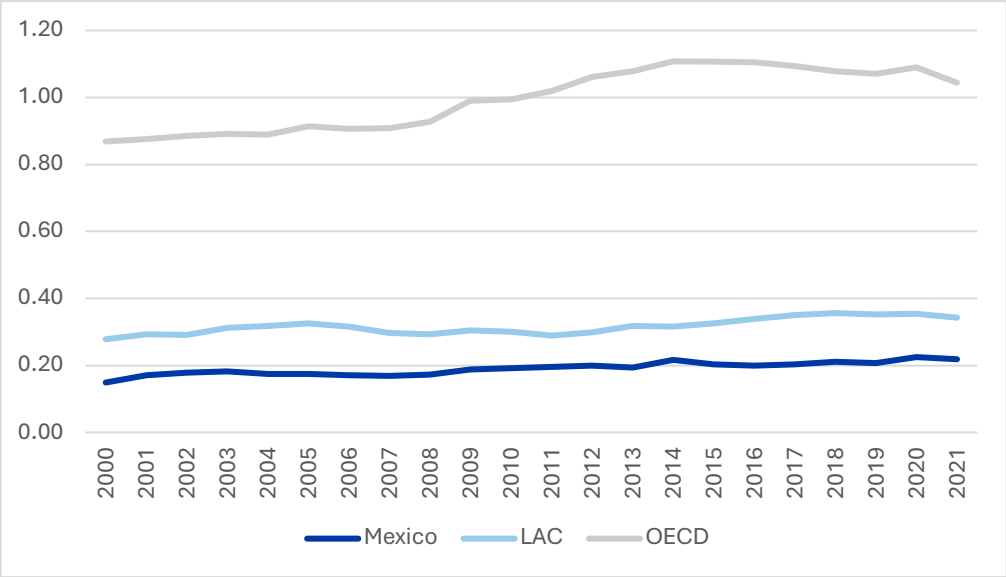
[2] These are Chiapas, Chihuahua, Durango, Guerrero, Hidalgo, México, Michoacán, Nuevo León, Puebla, Tamaulipas, and Yucatán.

[3] Unda Gutiérrez (2021), and Sepúlveda and Martínez-Vázquez (2012), offer additional arguments on the property tax performance.

[4] INEGI, 2016.

the past 25 years, accounting for only 0.25 percent of GDP in 2024. This level is low when compared to the average of Latin American and OECD countries (Figure 1).

Figure 1. Property Tax Collection as Percentage of GDP, 2000–21: Mexico, Latin America, the Caribbean, and OECD (averages)



As in many parts of the developing world, there is wide variability in property tax collection across states and municipalities in Mexico. In Nuevo León, for example, the difference was 5,101.4 pesos, between San Pedro Garza García, which collected 5,784.97 pesos per capita and Mier y Noriega, which collected 15.76 pesos per capita. In Quintana Roo, this gap was 4,279.31 pesos per capita; in the State of Mexico, 2,734.47pesos. Jalisco, Coahuila, and Querétaro also had significant differences between the lowest and highest ranging from 14 to 183 times. Moreover, as of 2021, the majority of property taxes were levied in a few municipalities and states: 50 cities from 22 states collected 65 per cent of property tax revenues. Half of those cities are in only five states: México, Jalisco, Nuevo León, Querétaro, and Chihuahua. The clear outlier is San Pedro Garza Garcia mentioned above, an industrial rich city in the northern state of Nuevo Leon, followed by Tulum, a rich touristic enclave in the in the of Quintana Roo where the property tax is 2,3747pesos per capita. However, the majority of the best performing municipalities collect less than 1,000 pesos per capita (about US$ 50).

Interestingly, the underperformance of the tax is not exclusive to small, rural municipalities; some principal cities also had disappointing results. For example, in 2021, among the top 100 cities with the highest property tax per capita, only 29 of them had more than 200,000 inhabitants. Similarly, those municipalities with populations between 50,000 and 100,000 had higher property taxes per capita than most municipalities in the other population ranges. Thus, property taxes in Mexico do not seem to be tightly and exclusively related to population size or household income. It thus appears

that tax collection may depend on factors such as the capacity and effectiveness of the local authorities and the state of the cadasters.

3. Conceptual Framework

There is a large body of literature examining the determinants of property tax performance (Bird and Slack, 2004; Bahl, Martinez-Vazquez and Youngman, 2010). The studies identify key socioeconomic factors such as the size, profile and growth of the economic base, and population (i.e. urbanization and economic growth and employment rates, location at coastal and touristic cities vs. rural areas), which determine the demand for properties and property values (IMF, 2016; Espinosa et al., 2018; Unda, 2021).

Another set of factors related to the design of the intergovernmental fiscal framework can discourage local tax effort and often lead to lower tax rates, undervalued properties values, and less frequent reassessments. For example, central government fiscal transfers can undermine incentives for property tax revenue mobilization (Pineda et al, 2015; Unda and Moreno, 2015; Canavire-Bacarreza and Zúniga, 2015), leading to lower revenues and reinforcing dependence on higher levels of government. Furthermore, the availability of other local taxes and debt instruments can make these revenue sources more palatable to decision-makers than property taxes (Bonet et al., 2014). Finally, in some cases, the existence of national taxes that also capture local immovable property in their base can create taxpayer resistance as property taxes are perceived as double taxation (Porto, 2014).

There are also intrinsic characteristics of the property tax that make it hard to reform, affecting the will of local authorities to tax effectively and undermining the tax morale of taxpayers (Bird and Slack, 2015). One is its visibility or salience. Unlike income or sales taxes, the property tax generally has to be paid directly by taxpayers in periodic, large lump sum payments (Cabral and Hoxby 2012), and citizens often perceive that the rate is not commensurate and adequate vis-a-vis the services provided to them by the taxing authority (Simonsen and Robbins, 2003). Also, the property tax creates liquidity challenges for some taxpayers, as it does not reflect a real cash flow but rather an imputed one that may not necessarily reflect the owner's current income situation and liquidity. This situation is particularly problematic for seniors on fixed incomes whose property taxes have increased. This type of presumptive tax is also often perceived as regressive, unfair and arbitrary (Johannesson-Linden and Gayer 2012; Bird, Slack and Tassonyi 2012). It is also inelastic as revenues do not change as much or as fast with economic growth, compared to other taxes. In good economic times, this inelasticity feature discourages local governments, as their revenues do not expand and they have to raise rates to maintain revenues in real terms, while in times of recession, local taxpayers may again be very unhappy because their property taxes do not go down as quickly as their incomes and probably not as quickly as the value of their properties.

Political factors also disincentivize property tax revenue mobilization (Ahmad et al., 2019). Studies show that revenue collection is lower in electoral years or with the presence of a closer election race (Unda, 2021), when there are conflicting views or party misalignment between the executive and legislative branches (Aguilar, 2021), or affinity between parties between levels of government (Nelson, 2000).

But, perhaps, no form of taxation is more dependent on administration than the property tax, where the administrative and technical capacity to manage the tax is essential. Poor tax administration is an impediment to implementing the property tax and is often considered one of the main reasons why revenue mobilization in less developed countries is so low. Ahmad et al. (2019) argue that the problem with the property tax in Mexico is largely administration, while Unda (2021) finds that greater institutional capacity of treasuries and cadasters play a positive role in collections. Takahashi (2021) argues there is both a lack of interest and insufficient capacity among municipalities, resulting in outdated cadaster records and a high degree of tax evasion. Moreover, the availability of up-to-date property records, including the extent of the property cadaster and institutional capacities related to property information management, is missing. These factors, he argues, translate into generous exemptions and low tax rates, obsolete and infrequent property value (re)assessments, incomplete registries and cadasters, and a lack of willingness and means to enforce the tax. The result is low revenue mobilization.

An important policy question with regards to property tax administration is who should be responsible for doing it. Should it be the central government (or state governments in a federal system) or local governments? As discussed already above, the choice comes down to the capacity to administer the tax versus the incentive to collect revenues (including the incentive to be responsible and accountable for how the tax revenues are spent) (Goodfellow 2017; Dillinger, 1991).

An argument for local administration of property taxes is that local authorities are more knowledgeable about where properties are located, who owns them, what renovations or additions have been made, and so on. Another argument is that local governments have an incentive to collect the taxes if they get to keep the funds. But the very same proximity of local governments to their residents makes them resistant to collect the tax or they may be exposed to local capture, a la Prud'Homme (1995). Many local authorities simply do not have the capacity to administer the tax, however. Many administrative functions are performed manually rather than being computerized, for example. Sometimes, the revenue base does not include all taxable properties, collection rates are low, and enforcement is almost non-existent. Many countries have problems updating values on a regular basis, even where the local administration is fairly good.

Recognizing some of these difficulties with local administration, many countries involve higher-level governments in various aspects of property tax administration, notably the assessment function. National or state cadastral and tax agencies tend to have greater resources and technical capacity to assess properties and collect taxes than local governments. Central tax agencies also hold a large amount of data on taxpayers that could assist in implementing property taxation and they may be able to enforce payment more easily because they have greater political and institutional strength. Some have argued that corruption and misuse of funds are easier to identify and punish at the central level, but there is not much evidence to support this statement (Goodfellow 2017). Even with central administration, however, the results may leave much to be desired, since higher-level administrations often have little incentive to respond to the needs of local governments for up-to-date and accurate tax base information because they get none of the revenues.

The international practice with property tax administration is varied. In Latin America, at one end, in Chile, the Dominican Republic and in Brazil and Uruguay for rural properties, the administration of the local property tax (with revenues allocated to the local governments) is completely centralized. In contrast, at the other end, there is almost complete decentralization in the administration of the urban property tax in Brazil and Venezuela, very similar to that existing in the United States. Between these two extremes, there are intermediate approaches where cadaster and valuation are more centralized and collection more decentralized. In a number of countries with better property tax performance, the centralization of the cadaster management is asymmetric, where the largest city(s) retain their own cadaster and valuation, as well as the collection function, and smaller local governments rely on a centralized cadaster function. For example, in Uruguay, with the exception of Montevideo, the cadaster and valuations are the responsibility of the central government (through the National Directorate of the Cadaster), or in Colombia, where the capital city of Bogotá and the other large municipalities have their own cadaster, but for the rest of the municipalities the cadaster management is carried out by the Agustín Codazzi Geographical Institute (IGAC).

Notwithstanding the theoretical and practical debates about the question of property tax assignment, there is little if any empirical evidence on the relative merits of each approach, and particularly, on the role that local capacity may play in selecting the type of cadastral management that best improves property tax performance. This paper seeks to fill this gap by providing evidence of whether centralized or decentralized cadastral management leads to higher property tax collection. The mix of central and local government cadastral management systems across municipalities in Mexico provides a natural experiment setting that facilitates the identification of impacts on revenue mobilization of the different cadastral management options within the same country.

Subnational governments in Mexico face a conundrum because managing the cadaster is administratively complex and expensive and, at the same time, incentives for collecting property taxes are low for both states and municipalities. In this context, who should manage the cadaster and how do you make that decision? Municipalities may benefit from delegating their cadastral management to state governments that can reap economies of scale in managing the cadaster. In addition, state governments may have more resources for procuring the technology required for effective cadastral management and can also address the lack of incentives of neighboring municipalities to update cadastral values (i.e. race to the bottom competition). Given that the state government now has to recover the costs of managing the centralized cadaster, they may have an incentive to pressure local governments into collecting more property tax. Thus, we hypothesize that:

> H1: Municipalities that delegate their cadaster to the state will collect more property taxes than municipalities that manage their own cadasters.

Although the incentives for enforcing property tax may be low from an electoral standpoint, decentralization and effective property taxation can improve all aspects of governance and service delivery at the local level. Research shows that local governments that build and maintain their own infrastructure have an incentive to collect additional resources, while greater tax responsibilities can exert accountability from local politicians and improve governance. In this context, local governments

with greater administrative, technical and institutional capacity may benefit from managing their own cadaster:

> H2: Municipalities with a higher degree of capacity that manage their own cadasters will outperform equivalent municipalities that delegate cadaster management to the state government.

4. Empirical Strategy

Data

The empirical analysis uses subnational fiscal data for municipalities across Mexico. The National Institute of Statistics and Geography (INEGI in Spanish) compiles and publishes their Public Finance for States and Municipalities (EFIPEM in Spanish) database on an annual basis. It contains data from over 2,400 municipalities and is consistently updated with corrections as well as standardizing line-items across municipalities and time periods. This data source facilitates the comparison of property tax collection within and across municipalities. Many municipalities do not collect property taxes because they are too small or are governed under differing arrangements based on indigenous practices (*usos y costumbres*).

To identify which municipalities have delegated their cadaster management to the state government, we extract information from the Census of State Governments (Censo Nacional de Gobiernos Estatales, CNGE in Spanish) conducted by INEGI. The survey asks officials at each State government to list the municipalities they manage the cadaster for. State governments are also asked which municipalities they support with property tax collection, but this is usually a shared arrangement and thus difficult to precisely identify and evaluate. Instead, we simply focus on who manages the cadaster as our independent variable. The question on cadaster management begins in the 2017 survey which asks state governments about their 2016 arrangements. The question is asked in each annual survey and thus gives us a time period from 2016 through its most recent iteration in 2022.

Estimation Model

We estimate the following regression model:

$$y_{mt}=\beta_0+\beta_1 z_{mt+2}p_{mt+3}z_{mt}p_{mt}+\boldsymbol{W}_{mt}\boldsymbol{\delta}+\boldsymbol{K}_t\boldsymbol{\zeta}+\epsilon_{tm}, \qquad (1)$$

where y_{mt} is the dependent variable for municipality m in year t, for which we use two alternative variables (the logged values of property tax collection and the logged values of property tax per capita); β_0 is the intercept, while the variable z_{mt} is a binary variable where 1 indicates that the municipality manages cadaster and 0 indicates that the cadaster is delegated to the state, for each municipality m and year t. Variable p is an administrative capacity proxy measured by the logged value of total per capita annual expenditures for each municipality across time (further discussed below). The β_3 coefficient is the interaction of the cadastral management responsibility with municipal capacity, to compare revenue performance across varying degrees of capacity. Lastly, we include controls for each municipality in vector $\boldsymbol{W}_m$ and year fixed effects in $\boldsymbol{K}_t$.

Measuring administrative capacity is a difficult task. Data on municipal infrastructure, personnel, or technology are rare and inconsistent between municipalities of varying capacity. As such, available proxies for capacity contain information on those most capable of reporting it. Instead, we turn to the EFIPEM data and extract the line-item value for a municipality's total annual expenditures and transform them into per capita values. We use expenditures per capita as a proxy for administrative capacity based on the assumption that municipalities that spend more in per capita terms must have more qualified personnel and general administrative capacity to manage that spending than those with smaller budgets. There are of course particular nuances between municipalities with similar expenditures, but we try to control for those outliers. On average, though, more capacity should lead to more spending, and more spending demands more capacity.

We also control in the regression for potential confounders that may influence property tax collection. Municipalities of varying sizes may simply have different tax bases. Thus, we restrict our analysis to municipalities with more than 30,000 people to ease the comparison of cases across states. This restriction reduces our sample to roughly 30 percent of all municipalities in the country but still covers over 85 percent of Mexico's population. We in turn include the logged value of each municipality's population size. Economic development is also a predictor of property taxes, where municipalities with higher levels of development have a wealthier tax base from which to extract resources. Ideally, we would include the municipal GDP or per capita or household income, but these data are not produced at the municipality level. In lieu of GDP or income measures, we use the CONAPO's Marginalization Index, which serves as a proxy for the overall development level of a municipality and covers areas such as the local economic output, access to education, and the quality of health services. From CONAPO we also estimate the annual unemployment rate for each municipality to account for regional variation in workforce participation. Geographically larger states may also see their cadasters stretched out over large swaths of land, so we also control for the number of municipalities in a given state. We also control for a state's gross regional product, with data provided by the Mexico's Central Bank to distinguish between poorer and wealthier regions.

In addition to the above structural factors, we control for the value of unconditional transfers from the central government. From the EFIPEM we pull the total value of *participaciones federales* which is the revenue sharing mechanism used by the central government to fund municipalities. The revenue sharing is based on a formula that, among other things, rewards municipalities for collecting more of their own taxes and, for that reason, should also be correlated with property taxes. We alternatively use the per capita values of this intergovernmental transfer. Summary statistics are presented in Table 1.

Table 1. Descriptive Statistics

#	Variable	Mean	SD	Min	Max
1	Municipal Property Tax ($MXN)	$21,334,428	$103,492,903	$34	$2,491,065,112
2	Total Municipal Expenditures ($MXN)	$744,220,468	$1,234,982,495	$62,141,219	$12,494,995,385

3	Municipal Capacity (PCA Score)	0.66	1.58	-0.33	12.99
4	Municipal Population	150,807	237,358	30,017	1,922,523
5	Unconditional Transfers ($MXN)	$273,430,955	$476,997,658	$18,625,037	$4,767,693,706
6	Unemployment Rate	0.03	0.02	0.00	0.18
7	Marginalization Index	54.35	5.11	22.22	65.27
8	Total Municipalities by State	101.93	101.34	5.00	551.00
9	State GDP ($MXN)	$639,599	$463,363	$91,086	$1,608,137

Results

Figure 2 shows that the total number of municipalities that manage their own cadasters is twice the number that delegate this function to their state governments. Although there is variation over time, and municipalities may enter or exit these cooperation agreements, we do not further exploit that information. From the CNGE survey data it is difficult to parse out when cadaster arrangements are implemented or modified, making it difficult to generate a temporal analysis that exploits the change in responsibility.

Figure 2: Temporal Evolution of Cadastre Management

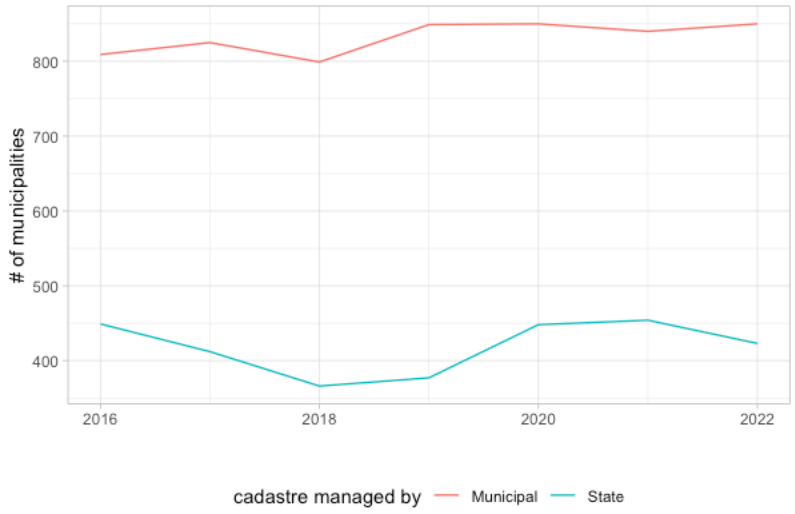


Table 1 presents the results of four different OLS regressions where the dependent variable is the logged value of municipal property taxes collected each year. Table 2 estimates the same OLS regressions but with the logged values of property tax per capita. To facilitate the interpretation of these tables, we present the marginal effects of our independent variables of interest.

Figures 3 and 4 visualize the results from column 1 in both Tables 1 and 2. Across both specifications we observe that municipalities that manage their own cadasters largely outperform municipalities that delegate this function to the state. We observe a lot of variation in the municipalities that delegate the cadaster to the state, as highlighted by the width of the error margins which imply the

existence of an unseen confounder. This simple model may not be fully capturing the nuances between cases, in particular, the differences in capacity that exist between municipalities.

Figures 3 and 4

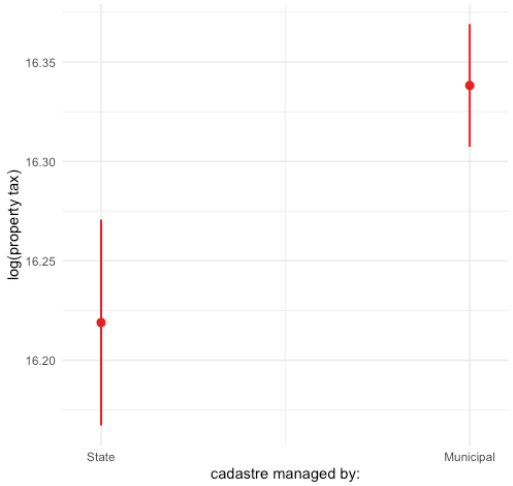


Figure 3

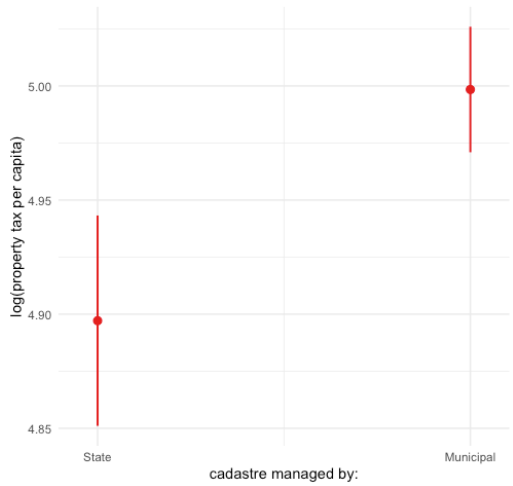


Figure 4

We estimate the interaction between the level of government that manages the cadaster and our proxy for municipal capacity—the logged value of per capita expenditures. This interaction allows us to compare property tax collections of municipalities with similar levels of expenditure that are differentiated by whether they delegate or manage their cadasters. Recall that as discussed above, ee argue that municipalities with a low degree of capacity will have lower levels of per capita expenditure and that municipalities with high capacity will have higher per capita expenditures over time.

Figures 5 and 6 present the marginal effects plot of column 2 in Tables 1 and 2. Across both specifications, we observe similar patterns. In municipalities with low capacity, as captured by the logged values of total expenditures per capita, those that delegate their cadaster to the state outperform those that manage their own. This result contrasts with the results of the previous visualizations. The marginal effects plots also suggest that at the other extreme, in cases where municipalities have a high degree of capacity it may be more beneficial to manage their own cadastral systems as these largely outperform their delegated peers.

Figures 5 and 6

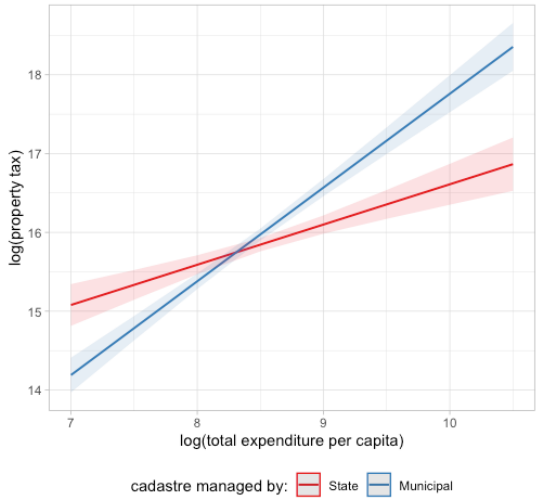


Figure 5

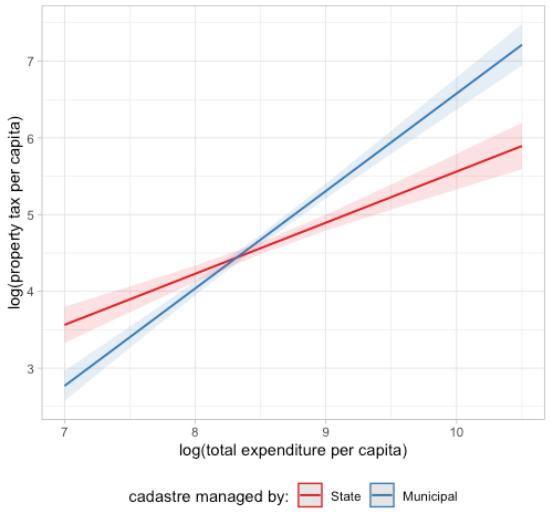


Figure 6

While these results support our second hypothesis, the approach used has some flaws that limit any potential inferences. In particular, a high degree of endogeneity exists, given that more property tax collection may lead to more expenditures, as well as that when there are greater spending needs, more property tax collection is required. There is also the possibility of self-selection, where the most capable municipalities elect to manage their own cadaster, thus reducing the pool of municipalities for comparison.

We attempt to correct for the problem of self-selection by performing a matching exercise to pair municipalities with similar characteristics that only differ on whether they manage their cadaster or delegate it to the State. We use an optimal pair matching algorithm that reduces the distance between matched samples (Hansen & Klopfer, 2006), and we restrict our sample to the year 2018[5]. In the first stage, the matching algorithm compares the distance between predictor variables and the outcome of interest, in this case we use all our control variables to predict the likelihood of a municipality managing or delegating the cadaster and use the distance between cases to build our subset of similar municipalities. This approach reduces our observations from 646 across a single year to just 133 pairs, totaling 266 matched cases. We use all control variables in the matching exercise and interact our treatment variable (specified as a municipal managed cadasters) with each control variable in the full estimation to account for group specific variation. Our control group includes municipalities that delegate their cadaster to the state level. The results are presented in column 3 of Tables 1 and 2.

5 This was the most complete year in the sample prior to the Covid-19 pandemic.

In Figures 7 and 8 we observe the marginal effect plots of the matched municipalities interacted by the logged per capita expenditures across both dependent variables. The overall trends hold but the separation between cases is less pronounced given the reduction in observations. Nonetheless, with this approach, we can discern that in cases with a high degree of local capacity, the matched municipalities that manage their own cadaster still outperform the municipalities that delegate it to the state.

Figures 7 and 8

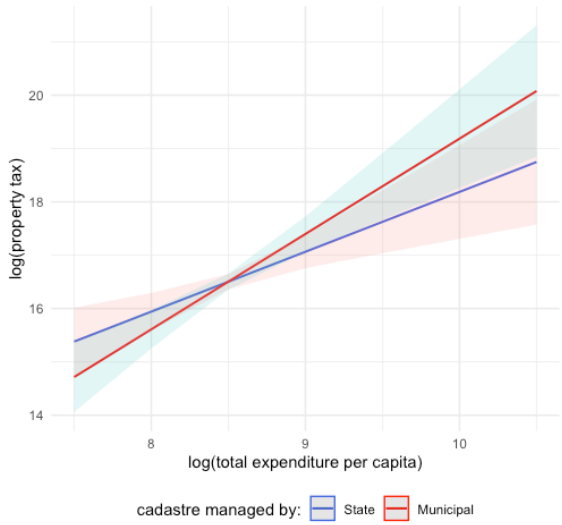


Figure 7

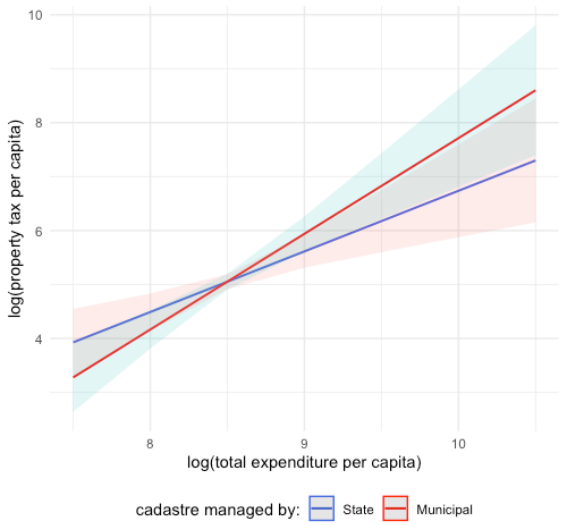


Figure 8

To improve the robustness of our analysis, we construct an alternative variable for municipal capacity, tapping again into the Census of Municipal Governments. We use the 2022 census that asks municipalities about the 2021 fiscal year. Although the census has questions on water works, social programs, security, and other government related services, we focus on the organizational capacity section. The survey contains about 300 questions, ranging from the number of government offices, the types of fiscal management arrangements, employees per department, the educational degree of employees, the number of vehicles owned, number of computers, and various other administrative items. Rather than focusing on a single response item, we used machine learning to construct a combined score of the shared variation across the 300 different measures of organizational capacity at the municipal level. The municipalities with the highest degree of administrative capacity will largely have better scores on these items so we mean-center each item and then use a principal component analysis (PCA) to combine the variation across all questions into a single index that we call "municipal capacity PCA". The raw score has wide variation between the lowest scoring and highest scoring municipalities, so we take the log of these values to reduce their exponential differences.

The municipal capacity PCA variable is highly correlated with the per capita municipal expenditures variable used previously, upwards of 0.95. This result is expected, given that the cost of managing

more employees, vehicles, and infrastructure increases total expenditure. Still, we rerun our analysis with the new capacity variable and again perform an optimal pairs matching algorithm and reduce our sample to municipalities that are similar to each other. The results of our regression analysis with municipal capacity PCA and matching are in column 4 of Tables 1 and 2. We visualize the interaction between which level manages the cadaster and our new measure of capacity, the marginal effects plots, in Figure 9 and 10.

Figures 9 and 10

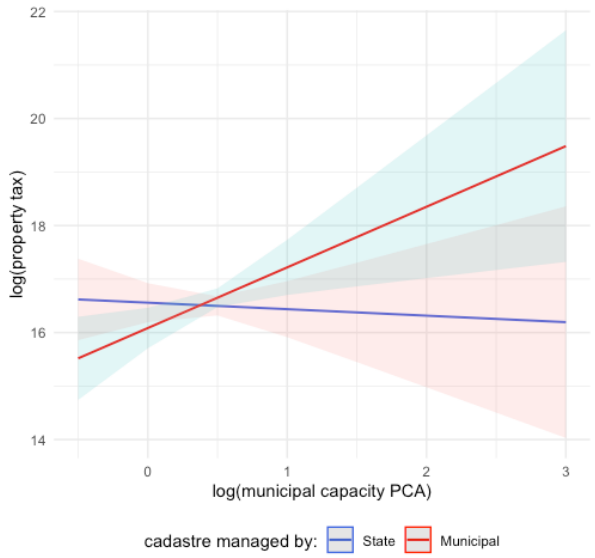


Figure 9

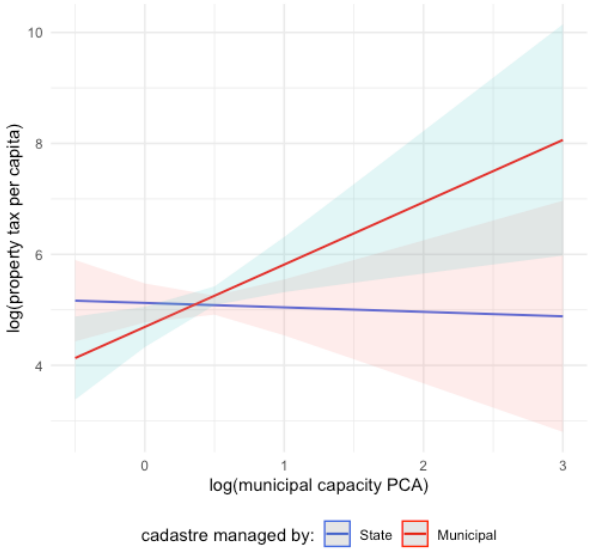


Figure 10

The marginal effects plot highlights that our municipal capacity PCA variable finds similar results. Municipalities with a low degree of organizational capacity can benefit from delegating their cadaster to the state government. In contrast, municipalities with a high degree of capacity that fully manage their own cadasters can collect significantly more in property taxes than their peers that delegate this responsibility. The municipalities to the furthest right are estimated to obtain roughly $160 million MXN more than municipalities that delegate cadaster. This implies that these municipalities are using that additional capacity effectively to extract more of their own resources. In contrast, the municipalities that delegate it to the state may simply not have the infrastructure or motivation to recoup their administrative expenses given that they can rely on the state government to manage them.

Table 1

	Dependent variable:			
	log(Property tax)			
	(1)	(2)	(3)	(4)
Constant	-19.286*** (0.617)	-15.547*** (0.943)	-13.350*** (2.524)	-11.486*** (4.065)
Municipal cadastre (ref: State)	0.119*** (0.034)	-5.645*** (0.989)	-7.390 (4.531)	3.395 (6.030)
log(Total expenditures per capita)	0.927*** (0.090)	0.511*** (0.123)	1.122*** (0.338)	
log(Municipal capacity PCA)				-0.121 (0.396)
log(Unconditional transfers per capita)	-0.012 (0.067)	-0.035 (0.067)	-0.429 (0.267)	0.310 (0.218)
Mun. marginalization index	0.258*** (0.012)	0.259*** (0.012)	0.316*** (0.034)	0.315*** (0.037)
Unemployment	1.699 (1.616)	2.010 (1.600)	-9.549*** (3.644)	-9.647*** (3.561)
log(Population)	1.299*** (0.026)	1.293*** (0.026)	0.727*** (0.154)	0.901*** (0.276)
# of muns in state	-0.001*** (0.0001)	-0.001*** (0.0001)	-0.001 (0.001)	-0.001 (0.001)
log(State GDP per capita)	0.151*** (0.020)	0.147*** (0.020)	-0.596*** (0.151)	-0.468*** (0.160)
Mun. cadastre x log(Total Exp.PC)		0.679*** (0.118)	0.665 (0.524)	
Mun. cadastre x log(Mun. Capacity PCA)				1.255** (0.596)
Mun. cadastre x log(Uncond. Transfers PC)			-0.203 (0.355)	0.057 (0.338)
Mun. cadastre x (Mun marginalization)			-0.130* (0.068)	-0.064 (0.072)
Mun. cadastre x Unemployment			18.313*** (5.503)	11.063** (5.295)
Mun. cadastre x log(Population)			0.697*** (0.202)	-0.238 (0.441)
Mun. cadastre x Num. Muns.			-0.001 (0.001)	-0.001 (0.001)
Mun. cadastre x log(State GDP PC)			0.805*** (0.198)	0.737*** (0.188)
Year FE	Yes	Yes	No	No
Observations	4,354	4,354	266	266
Adjusted R^2	0.797	0.800	0.825	0.806
Residual Std. Error	0.874	0.869	0.790	0.865
Note: OLS with Robust SE.				*p**p***p<0.01

Table 2

	Dependent variable:			
	log(Property tax per capita)			
	(1)	(2)	(3)	(4)
Constant	-18.843*** (0.575)	-15.518*** (0.878)	-13.141*** (2.513)	-10.936*** (3.936)
Municipal cadastre (ref: State)	0.101*** (0.031)	-5.023*** (0.905)	-7.301 (4.473)	4.373 (5.790)
log(Total expenditures per capita)	1.036*** (0.080)	0.666*** (0.108)	1.123*** (0.337)	
log(Municipal capacity PCA)				-0.080 (0.386)
log(Unconditional transfers per capita)	-0.089 (0.060)	-0.110* (0.059)	-0.430 (0.264)	0.298 (0.215)
Mun. marginalization index	0.244*** (0.010)	0.244*** (0.010)	0.307*** (0.032)	0.307*** (0.035)
Unemployment	2.420* (1.333)	2.697** (1.322)	-9.008*** (3.411)	-9.115*** (3.350)
log(Population)	0.294*** (0.024)	0.288*** (0.024)	-0.256* (0.150)	-0.105 (0.271)
# of muns in state	-0.001*** (0.0001)	-0.001*** (0.0001)	-0.001 (0.001)	-0.0005 (0.001)
log(State GDP per capita)	0.139*** (0.019)	0.135*** (0.019)	-0.580*** (0.147)	-0.453*** (0.157)
Mun. cadastre x log(Total Exp.PC)		0.604*** (0.108)	0.650 (0.520)	
Mun. cadastre x log(Mun. Capacity PCA)				1.204** (0.584)
Mun. cadastre x log(Uncond. Transfers PC)			-0.194 (0.350)	0.024 (0.329)
Mun. cadastre x (Mun marginalization)			-0.124* (0.066)	-0.078 (0.064)
Mun. cadastre x Unemployment			17.406*** (5.232)	9.802* (5.023)

Mun. cadastre x log(Population)			0.673*** (0.197)	-0.220 (0.431)
Mun. cadastre x Num. Muns.			-0.002 (0.001)	-0.001 (0.001)
Mun. cadastre x log(State GDP PC)			0.784*** (0.194)	0.700*** (0.184)
Year FE	Yes	Yes	No	No
Observations	4,354	4,354	266	266
Adjusted R^2	0.618	0.623	0.587	0.579
Residual Std. Error	0.779	0.774	0.773	0.833
Note: OLS with Robust SE.				*p**p***p<0.01

5. Conclusions

In this study we examine the determinants of property tax collection in Mexico, with a focus on the differential revenue performance of centralized and decentralized cadastral management approaches. We find that local capacity has a significant role in revenue collection and, more interestingly, in shaping the performance level of each approach. Specifically, we find that municipalities with low capacity raise more revenues when they delegate their cadaster to the state government. By contrast, municipalities with high capacity that fully manage their own cadasters collect more property tax revenues than their peers that delegate this responsibility to the state.

Making property taxes work more effectively in Mexico will continue to be a complex challenge requiring efforts in the many directions, but our results suggest promising trends for a more formal asymmetric approach to cadastral management, based on differential local capacities. The main recommendation for institutional arrangements is that more capable, perhaps larger and richer, municipalities should administer their own cadaster. For less capable, smaller, and relatively poorer municipalities, the state should do it. This approach could be considered to modify the Fondo de Fomento Municipal and thereby improve the targeting of the incentives.

For other countries in similar situations and debating whether to further decentralize property taxation or re-centralize it fully, our findings could help authorities avoid these extremes that overall may hurt collection. They could also consider an approach characterized by asymmetry and flexibility based on local capacity, leaving the administration responsibility to those municipalities that demonstrate capacity while centralizing at higher levels of government the function for those municipalities that do not.

Our study does have some limitations that future research should address. In particular, there is a need to further disentangle endogeneity and self-selection bias. It is also important to incorporate other factors that could shape property tax performance, particularly, different intergovernmental assignments of the collection and enforcement functions. In addition, our study does not explore the extent of the cooperation agreements for cadastral management between municipalities and states, and additional research is needed to identify the type of support provided by states to help identify the nuances that enable more effective management.

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