Do Bigger Legislatures Lead to Bigger Government? Evidence from a Brazilian Municipal Council Reform*

Evan Plous Kresch Henrique Veras
Rodrigo Schneider Mark Walker

Abstract

Do bigger legislatures lead to bigger government? We exploit a Brazilian reform that allocated the number of municipal council seats based on population thresholds in a regression discontinuity design. We find that larger councils have significantly higher expenditures on social goods, with no significant jump in spending on legislative costs. Increased spending is partly financed by significantly higher local tax revenues, and is driven by a less salient form of tax to voters - on services - than property taxes. As a potential explanation for our findings, we show that, consistent with Duverger's Law, more council seats led to greater political diversity, incentivizing politicians to provide goods for their base while spreading costs to the whole population.

Keywords: Legislature Size; Municipal Councils; Local Taxes; Government Expenditure; Regression Discontinuity; Brazil

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*Kresch: ekresch@oberlin.edu, Oberlin College & CDEP; Schneider: rschnei2@skidmore.edu, Skidmore College; Veras: hveras@oberlin.edu, Centre College; Walker: mwalker2@oberlin.edu, Oberlin College. We are grateful to Martin Abel, Baafra Abeberese, Michael Best, Carolina Castilla, Joana Naritomi, Kartini Shastry, and participants of the Virtual LAC development seminar and LAC Public/Labor Conference for comments on an earlier draft. Any remaining errors are ours alone.

One of the tenets of most modern democracies is the central role that representation – where voters choose leaders to craft and enact policy – plays in fiscal and social planning. Despite the ubiquity of representative systems across the world, the level of efficiency under which different governments perform the central functions of government (e.g. taxing and spending) is uneven across countries (Besley and Persson, 2014). One potential driver of these observed differences is the size of legislatures (Miller and Moe, 1983), however the effect of legislature size on the size and efficiency of government is not entirely clear. On the one hand, larger legislatures may create a weak "local Leviathan" - an overextended and poor bureaucratic system - with little checks on its growth and inefficient use of the available resources. Similarly, more representatives could lead to greater opportunities for gridlock and the ability to veto legislation. On the other hand, a larger number of representatives might increase diversity in political participation and increase voter enfranchisement. This diversity may ensure that a plurality of views are effectively addressed, creating the necessary incentives and checks on elected representatives to efficiently deliver public goods and services to their electorate.

This paper examines how legislature size affects the size of government and how governments collect and spend revenues. We address the issue of endogeneity in legislature size[1] by exploiting a 2004 Brazilian reform that allocated the number of seats on a municipal council based on population thresholds; cities received an additional seat on the council for each 47,671 inhabitants. Employing a regression discontinuity (RD) design, we find that municipalities with an extra council seat have significantly higher expenditures. Importantly, the increase in expenditures is not driven by "bloat" in the form of spending on legislative costs. Rather, the effect is driven by jumps in spending on "pro-social" goods, with a 32 percent increase in spending on education and a 42 percent increase in spending on housing and urban development.

To partly fund these increased expenditures, municipalities on the "high" side of the discontinuity raised significantly more local tax revenue. Brazilian municipalities primarily have two tax instruments at their disposal, on property and services. We find that service tax increases with council size, and do not find evidence of a similar jump in property taxes.

That the increase in tax revenues is driven by a jump in service taxes, with no observed discontinuity in property tax revenue is in contrast to Egger and Koethenbuerger's (2010) finding of increased property tax levying by Bavarian municipalities. Along the lines of

[1]One potential issue in causally identifying the effect of legislature size is the unobservable variation in institutions, norms, and cultures that shape the ways countries endogenously choose the type of government structure. Even within a country, differences in the relationship between local and state governments or changes in legal norms across state boundaries make it difficult to disentangle the role that larger local governments play in taxing and spending.

Cabral and Hoxby (2012), we argue that the decision to increase revenue through service taxes as opposed to property taxes is driven by salience. In Brazil, property owners receive their property tax bill in the form of a coupon book, with the full year's tax burden mailed to them in early February.[2] On the other hand, service taxes are fragmented and collected as a small fraction of transactions at point-of-sale, and thus are less obvious to citizens and easier to collect. Additionally, politicians up for reelection have an increased incentive to levy a less transparent tax on voters (Bordignon, Grembi and Piazza, 2017).

Two anecdotes are revealing in demonstrating the resistance to property taxes in Brazil. In 2006, the city of Manaus attempted to update property tax values (which had not been updated since 1983), but faced a legal challenge and was struck down by Brazil's very active court system.[3] On March 16th, 2015, the municipal council of Itapetininga in São Paulo unanimously vetoed a service tax on construction services. This event was unusual in the presence of media coverage and popular attendance; service taxes are not generally salient, and citizens became aware of the tax in this specific situation as it was being charged together with their property tax payments.[4]

Lastly, we present evidence that sheds light on a potential mechanism to rationalize the increased spending and taxation by larger councils. In a seminal work, Weingast, Shepsle and Johnsen (1981) predicts that a larger number of legislators would lead to higher government expenditures, as officials would have an incentive to increase spending to please their core supporters at the expense of the general community. Empirical evidence for this finding has been decidedly mixed (Egger and Koethenbuerger, 2010; Pettersson-Lidbom, 2012). We reconcile our findings in support of Weingast, Shepsle and Johnsen (1981) with the nature of representation in the Brazilian political system.[5] Consistent with Duverger's Law – as Brazil has a multi-member proportional representation system – we find that larger legislatures improve political diversity, as measured by the "effective number of parties" holding a seat. Increasing political diversity in local councils indirectly enfranchises a larger share of the population, leading to politicians incentivized to provide more "pro-social" public goods (Chattopadhyay and Duflo, 2004; Fujiwara, 2015; Ting, Hirano and Snyder Jr, 2018).

Our focus on local councils is of primary importance to policymakers concerned with

[2]This coupon book provides residents with bills for 10 equal monthly installments to be paid between March and December, although property owners are given the option to pay the entire bill as a single lump sum payment for a discount.

[3]A modified version of this reform was eventually implemented in 2011 that phased in reforms over a five year period. More information on the reform can be found in an article from one of the main Brazilian newspapers *O Globo (G1)*: link to article.

[4]The online portal *O Globo (G1)* highlighted the event: link to article.

[5]In a closely paper, Britto and Fiorin (2020) do not find evidence to support this theory in Brazil. However, they do not focus on local taxation and instead concentrate on analyzing the role of mayors in Brazil with respect to corruption.

economic growth and development. The ability of governments to raise and spend tax revenue is central to the building of state capacity (Besley and Persson, 2009; Gaspar, Jaramillo and Wingender, 2016; Sánchez De La Sierra, 2020). Increasingly, the role of spending and taxation is being decentralized to state and local governments; for example, tax revenue collection at the state and local level has increased in nearly 75 percent of OECD countries since 1995 (Shi and Tulli, 2020).

Our paper contributes to the literature on the relevance of legislature size – an old theme of political thought.[6] The previously mentioned Weingast, Shepsle and Johnsen (1981) developed the theoretical underpinning for this literature, predicting that spending should increase with legislature size as politicians free-ride on pork-barrel spending that benefits their base of support. Empirical papers testing this prediction have had decidedly mixed results, with some finding support for increased spending (Asatryan et al., 2017; Baqir, 2002; Egger and Koethenbuerger, 2010; Halse, 2016; Hirota and Yunoue, 2012), while others find a negative relationship between legislature size and expenditures (Chen and Malhotra, 2007; Garmann, 2014; Höhmann, 2017; Pettersson-Lidbom, 2012). The vast majority of these papers test the model using data from the developed world: the United States, Germany, Scandinavia, and Japan. Given the disparity in state capacity and public finances in the developing world, our paper provides a valuable test of Weingast, Shepsle and Johnsen (1981) in a developing country setting.[7]

This paper also relates to the literature on the importance of considering tax salience in public finance. The effect of tax salience has been studied on consumer behavior (Blumkin, Ruffle and Ganun, 2012; Bradley and Feldman, 2020; Cabral and Hoxby, 2012; Chetty, Looney and Kroft, 2009; Goldin, 2015), tax collection (Asatryan, Baskaran and Heinemann, 2017; Finkelstein, 2009; Slemrod, 2019), and voting behavior (Bordignon, Grembi and Piazza, 2017; Matějka and Tabellini, 2016; Sances, 2017; Sausgruber and Tyran, 2005). In the case of Brazil, where property tax compliance is only around 60 percent and property taxes are perceived as a political burden to municipal legislators (Ter-Minassian, 2012), the salience of property taxes to voters greatly influences the government's propensity to rely on it to finance expenditures. In contrast to the United States (Galletta and Ash, 2019) and Germany (Egger and Koethenbuerger, 2010), where property taxes play a large role in local finances, the ability of Brazilian municipalities to increase revenue from the significantly less salient

[6] As early as 1788, James Madison argued in *The Federalist Papers* No. 55 that the optimal number of members in the House of Representatives should not be fixed, but limited: the lower house should increase its size as more states were added to the union, however, it should be kept to a certain limit to enable coordination and avoid intemperance of discussion.

[7] The paper most closely related to this one is Britto and Fiorin (2020). In that paper, they examine the same discontinuity in local legislature size in Brazil, however their analysis focus on how council size affects corruption.

tax on services makes it the preferred option to fund the increased size of government.

The rest of the paper is organized as follows. Section I provides background on the election to and fiscal responsibilities of municipal councils in Brazil. Section II describes the data and section III discusses the empirical strategy. Estimation results, robustness checks, and extensions of the main empirical findings are presented in section IV, a potential mechanism is discussed in section V, and section VI concludes.

I Institutional Background

The Brazilian political system is a federation with three levels: federal, state, and municipal. The lowest level—municipalities (*municípios*)— is a local government comprised of an elected mayor (executive), municipal council (legislative), municipal court (judicial).

Municipalities enjoy some degree of political autonomy, guaranteed by the constitution. Specifically, municipalities enact their own laws (*lei orgânica*) and, every fiscal year, the mayors produce a budget proposal detailing the public expenditure and investments for the subsequent year, based on the expected tax revenue. Municipal councilors are responsible for evaluating and voting on the mayor's proposal, as well as any other proposal put forward by themselves. Once the proposed budget is approved, it becomes the Budgetary Law (*Lei Orçamentária*) dictating the destination of the tax revenue collected at the municipal level.[8]

Municipalities collect local tax revenue from two main sources: property and services. Property taxes are levied annually on ownership (IPTU) and over real estate transactions (ITBI).[9] While Brazilian Law 10,257/2001 limits the IPTU rate to be at most 15 percent, this value is much higher than the 1-1.5 percent rate that is usually charged across municipalities in Brazil and, therefore, is likely not biding.

Service taxes (ISS) are levied on every transaction that involves the exchange of services within the municipality boundaries. Municipal counselors have the autonomy to legislate the tax rate for any type of local service, as long as they respect the constitutional range of 2 to 5 percent.[10] The municipal councils, therefore, can use legislation to add or remove services to be taxed according to their interpretation of the services covered by this law, and also change the tax rate of the services that are already being taxed.

[8]The Law of Fiscal Responsibility (*Lei de Responsabilidade Fiscal*), enacted in 2000, imposes further restrictions to the municipal administration (on the executive, legislative and judicial branches), limiting discretionary expenditures, including an upper limit of 60% of the total net revenue spent on personnel and total transparency on the destination of the resources.

[9]Our discussion focuses on IPTU, as ITBI, a tax on property transfers, accounts for less than half of one percent of overall taxation in Brazil (Afonso, Soares and Castro, 2013) and is a significantly smaller contributor to municipal revenue.

[10]This limit was set by Complementary Law 116/2003.

Municipal councils are active in updating and altering ISS tax schedules.[11] For example, on March 27, 2018, the municipal council of Boa Vista in Roraima approved an amendment to include six new services to the list of activities taxed via ISS.[12] Conversely, on March 16, 2015, council members of Itapetininga in São Paulo voted to eliminate housing reform from the list of service taxes. More recently, the city of São Paulo approved a tax rate increase for banking services from 2 percent to 5 percent in March 2020.

Municipal councils are directly elected by the population for a four-year term. However, unlike the mayor - who is elected by a simple majority rule – municipal councils are elected based on an open list proportional representation system, in which parties' share of seats is proportional to the quantity of votes cast to their candidates. Municipal councils, on average, have a wage that is 2.6 times the average in their municipalities (Colonnelli, Teso and Prem, 2017). Nonetheless, most of them have an outside job as they are only required to be in the council on average four days per month (Ferraz and Finan, 2011). Their main duty is to approve local legislation, such as tax adjustments and the municipal budget. They are also involved in the submission of bills and request for public works and monitoring the executive for its use of public resources.

With the objective of reducing municipal expenditures on administration and personnel, the Brazilian Supreme Electoral Court in 2004 expedited a resolution assigning the number of seats to each municipality according to a strict rule based on population size. This ruling came into effect for the 2004 election cycle. Each municipality received a minimum of 9 council seats, adding one additional seat for each 47,619 inhabitants, up to 21 seats for municipalities with less than 1 million inhabitants.[13] Table 1 describes the assigned number of seats according to the established population thresholds for the first ten cut-offs.

Importantly for our empirical strategy, the court ruling occurred only seven months before the 2004 elections and used the 2003 population estimates from the IBGE to determine the population thresholds. Given the abrupt timing of the ruling and use of the previous year's population, candidates faced an exogenous shock to electoral competition for seats and were unlikely to anticipate the new political reality. Moreover, municipalities were not able to endogenously react to the new ruling before the start of elections. Figure 1 shows the distribution of municipalities by population and council size for the 2005-2008 council term. As we discuss in more detail in Section III, cities on either side of their respective population

[11] Although we do not have a comprehensive database on the variation in ISS tax rates across municipalities, a list constructed by the private security union of the state of São Paulo (SESVESP) provides some insights. SESVESP collected the ISS rate for private security in each of São Paulo's 645 municipalities; this tax varies from 2 percent to 5 percent, with and average 3.66 percent (std. 1.18) across municipalities.

[12] For example, crane services became taxed at a 4 percent rate.

[13] This increment was determined by the Court's ruling that a municipality with less than one million inhabitants should have at most 21 councilors: 1,000,000/21 = 47,619.

threshold are therefore comparable, allowing us to causally identify the impact of legislature size on local expenditure and taxation decisions.

II Data

Data comes from three main sources: *Secretaria do Tesouro Nacional* (STN - Brazilian National Treasury), *Instituto Brasileiro de Geografia e Estatistica* (IBGE - Brazilian Institute of Geography and Statistics), and *Tribunal Superior Eleitoral* (TSE - Superior Electoral Court). We describe the variables used in the analysis from these three sources in turn.

Data on public finances comes from the National Treasury. All finance variable are provided at the municipal level, and we restrict our attention to the 2005-2008 electoral cycle. Relevant data includes the destination of yearly public expenditures and source of tax revenue. Table 2 provides summary statistics of our main outcome variables for the full regression discontinuity sample, as well as for the municipalities in the optimal bandwidth as discussed in greater detail in Section III. Panel A presents summary statistics for municipal tax revenue, and Panel B presents expenditures on various public goods. We use tax revenue as the outcome variable, as no reliable data on individual tax rates for all Brazilian municipalities exist (Dahis and Szerman, 2020); this is true for many other settings as well, including the United States (Galletta and Ash, 2019).

One important point to note from Table 2 is that municipal tax revenue makes up a relatively small portion of a municipality's total budget revenue, which includes state and federal transfers. This paper focuses on municipal tax revenue since municipalities have complete discretion over its implementation, although we discuss the implication of federal transfers in an extension of the main results in Section IV. Also important to note is the degree of variation across municipalities in levying service and property taxes; Appendix Figure A.1 shows the fraction of total municipal tax revenue derived from property taxes (IPTU), and displays considerable spread with most municipalities generating less than 25 percent of tax revenue from property assessments.

We also collect municipal-level characteristics to use as control variables in the main empirical specification, which come from the IBGE. Pre-treatment control variables include municipal population, GDP, and household characteristics from the 2000 census. These pre-treatment variables should not vary at the population threshold, and we present a balance table of these variables in Table 3, discussed in greater detail in Section III. Population estimates from the IBGE are used to construct the running variable relative to the population cut-offs in the regression discontinuity design.

Electoral data is provided by the Superior Electoral Court. Outcomes of interest include

the number of legislative council seats in a municipality, characteristics and party affiliation of council members, and electoral outcomes from the 2004 election cycle.

III Empirical Strategy

This section outlines the regression discontinuity design utilizing the 2004 resolution that determined the number of municipal council seats based on strict population thresholds. This setting provides a unique opportunity to implement a Sharp Regression Discontinuity Design (RDD), with council size as the treatment variable and population as the running variable. The underlying identifying assumption of this strategy is that municipalities with similar population levels around the cutoffs would have similar expenditures and tax revenues in the absence of the 2004 resolution.

Let pop_m be the population of municipality m, with C_m defined as the closest population cut-off determined by the 2004 reform presented in table 1. We define the treatment variable indicating whether municipality m falls on the right side of a given population cutoff as $D_m = \mathbb{I}(pop_m \geq C_m)$. Pooling the population cut-offs and normalizing them to zero, our empirical specification takes the following form:

$$y_m = \alpha + \gamma D_m + \beta \cdot f(pop_m - C_m) + \delta \cdot g(pop_m - C_m) \times D_m + \mathbf{X}_m + \epsilon_m \tag{1}$$

where y_m is the outcome of interest; government expenditures or tax revenues averaged over the period between 2005–2008, which encompasses the complete mayoral and municipal council term. Following Calonico, Cattaneo and Titiunik (2014), we restrict attention to the endogenously chosen mean squared error optimal bandwidths to account for biases arising from the choice of large bandwidths.[14] We present results for local linear and quadratic fits of the running variable on either side of the population cut-off within the optimal bandwidth.[15]

Following Brollo et al. (2013), we pool the population cut-offs and normalize the running variable in order to leverage the statistical power of the larger aggregate sample (Cattaneo et al., 2016). One potential issue associated with this pooling and normalizing of approach is if municipalities close to different population cutoffs differ in a range of characteristics (Bertanha, 2020; Cattaneo et al., 2016; Eggers et al., 2018). Since our estimation method produces an average of Local Average Treatment Effects (LATEs) across all population thresholds, pooling municipalities with no covariate adjustments might introduce bias to our

[14]The trade-off of choosing a smaller bandwidth is loss of precision due to a smaller sample (Calonico, Cattaneo and Titiunik, 2014)

[15]We strict our attention to first and second degree polynomials as higher order polynomials might introduce bias to our estimation (Gelman and Imbens, 2019).

results. We address this concern by controlling for several observed municipality characteristics ($\boldsymbol{X_m}$ in our model), including population size in 2001, the average of population size between 2005 and 2008; number of council seats in 2001; and average GDP per capita between 2005 and 2008. We control for population numbers to capture the assignment to treatment rule, whereas council size in 2001 might be an important factor determining changes in the number of seats in 2004 (Mignozzetti and Cepaluni, 2019). Finally, GDP per capita might explain differences in the efficiency of the public sector, which might contribute to the ability of municipalities in collecting taxes. Besides improving consistency of estimates across multiple cutoffs, adding controls to our RD framework improves efficiency of our estimates Calonico et al. (2019).

There are three potential threats to the validity of our estimation strategy. First, our strategy relies on the assumption that the only difference between municipalities on either side of the cutoff should be the assignment to treatment (in our case, an additional seat in the municipal council). To address the plausibility of the assumption, we run our specification on a vast range of socioeconomic, municipal-level indicators to test whether there are any differences in these characteristics associated with the treatment assignment. Table 3 displays the results of these checks across several municipal characteristics, including public finance variables, electoral outcomes, and socioeconomic and demographic factors. We do not observe any statistically or economically significant differences on these characteristics across municipalities around the cutoff.

Second, if the population thresholds determining council size is also used for the implementation of other policies, the estimated coefficient and its interpretation will be biased. While no other government policy uses these precise population thresholds, other aspects of public finances in Brazil are partly determined by similar population threshold rules. To address this, we run placebo tests using different population thresholds to check whether our results can be attributed to other population-based laws and policies. The table and discussion are provided in Section IV.C. Reassuringly, we do not find evidence of statistically significant effects for any of the placebo thresholds.

The third threat to the validity is the possibility of manipulative sorting by government officials on either side of the threshold. Our results might be biased if the likelihood to successfully manipulating official population numbers is correlated with (unobserved) municipal characteristics.[16] This concern is mitigated due to the fact that the 2004 resolution was based on 2003 population estimates, which were already published prior to the decision

[16] Litschig (2012) finds evidence of politically motivated manipulation of official population numbers in the year 1991 in Brazil, suggesting that some municipalities enjoyed a larger share of the federal transfers in that particular year.

of the Supreme Electoral Court to establish the population-based rule for council size. Nevertheless, we formally address this concern in the Appendix by performing a density test to check for discontinuities in the population distribution around the cutoff, as suggested by McCrary (2008).

In addition to robustness checks and extensions presented in the main body of the paper, we test for an ancillary of different specifications in Appendix A.IV. Specifically, in figure A.5 we re-estimate our model to each year between 2005 and 2008 separately, and figure A.6 displays the results for different choices of Kernel densities. Our results are robust to these different specifications.

IV Results

A Government Expenditures

We start this section by examining the effect of increased council size on municipal expenditures. Panel A of Figure 2 plots the average log legislative expenditures binned over the municipal population relative to the normalized reform threshold. Global quadratic fits on either side of the cutoff are included in the figure as well. Figure 2(A) shows no significant increase in legislative expenditures due to the addition of an extra council member. This is in contrast to government expenditures geared toward social programs and assistance, shown in Figure 2(B), which display a clear jump at the discontinuity.

In Table 4, we present the corresponding estimates using estimating equation 1. Columns 1 and 2 present the estimated change in legislative expenditures with the addition of an additional municipal council seat using a local linear and quadratic approximation, respectively. Columns 3-8 present similar estimates for the components of the "social" expenditures aggregated in Figure 2(B). Corroborating Figure 2, we find no significant increase in legislative expenditures in municipalities on the high-side of the population threshold. While larger councils do not lead to increases in spending on the municipal councils themselves, there is a significant increase of government spending on educational and housing and urban development programs. Of the two largest social expenditures that municipalities are responsible to provide (i.e., health and education), we find a substantial increase of 32 percent in public expenditure in education and no change in health expenditures. We also find an increase of 42 percent in public expenditures for infrastructure relating to housing and urban development, which is associated with infrastructure projects that, according to Brollo and Nannicini (2012), are highly visible to voters.

The lack of a significant jump in legislative expenses implies that representatives on

larger councils were not motivated by individualistic purposes to directly benefit municipal councils, e.g., by increasing the wages of council members. Our findings suggest a story where the mechanical increase in the size of government does not lead to administrative "bloat", but rather to an increase in government spending on public goods. These findings complement those of Mignozzetti and Cepaluni (2019), which find significant gains in health and education as a result of this policy; larger council sizes lead to significant decreases in infant mortality and increases in kindergarten enrollment. These welfare gains are partly driven by an increase in government resources devoted to these sectors, and not solely from efficiency gains using existing resources.

B Tax Revenues

We next examine how larger municipal councils funded these increases in government expenditure. Panel A of Figure 3 displays the (log) total tax revenue raised by municipalities, average over population bins relative to the normalized cutoff. Quadratic fits overlaid on either side of the threshold show a significant jump in tax revenue for municipalities with an additional council member relative to similarly sized municipalities on the left side of the threshold. Columns 1 and 2 of Table 5 quantify the size of this discontinuous jump. We find that on average, one additional seat increases total tax revenue by a magnitude between 50 to 54 percent, depending on the specification choice of the local polynomial fit outlined in estimating equation 1.

We can decompose the increase in municipal tax revenues by its source. Panels B and C of Figure 3 display the RD plots for service taxes (ISS) and property taxes (IPTU), respectively. As seen in the Figure, the effect seems to be driven by a significant increase in service tax revenue, whereas property taxes do not seem to be significantly different across municipalities around the population cutoff.

That service tax drives the increase in total tax revenue can be seen in the associated regression estimates in Table 5. Columns (3) and (4) show a statistically significant increase in service tax revenue for municipalities with an additional council seat. This is contrasted with the estimate effect on property tax in columns (5) and (6), which show no significant impact on IPTU revenue in municipalities with larger legislatures. Our findings suggest an estimated increase of 61 to 66 percent (depending on specification choice) in services tax revenue, whereas point estimates for property tax are neither statistically nor economically significant.

It is important to note that although a 50 percent increase in tax revenue might seem implausibly large, the share of tax revenue collected directly by the municipality is fairly low

in Brazil.[17] The average share of service tax to total revenue- from all sources, including state and federal transfers- is approximately 4.1 percent, whereas the average share of property tax is around 2.65 percent in our sample. Thus the estimated increase in service tax revenue represents about 2 percent increase in total municipal revenue on average.[18]

Our finding that an additional seat at the municipal council increases tax revenue mainly through service taxes and not property taxes seems at odds with the Ramsey rule in regards to taxing more inelastic goods. Our results are also in contrast with Egger and Koethenbuerger's (2010) finding that increases in local spending in Bavaria are driven primarily by property taxes. Property taxes are economically more efficient to raise revenue than other types of taxes, given properties' immovable nature and, consequently, the difficulty of evasion. However, property taxes are relatively more salient than indirect taxes, such as services taxes (Slack and Bird, 2014).[19] Moreover, property taxes are deeply unpopular with voters (Ahmad, Brosio and Pöschl, 2015; Cabral and Hoxby, 2012; Sances, 2017). We therefore interpret our results as an indication that, given the relatively higher political burden of an increase in property tax, legislators have an incentive to raise tax revenue through the less transparent services tax.[20]

C Placebo Test: Population Thresholds

As mentioned in a potential threat to identification in Section III, we provide additional evidence from placebo tests that the main result is being driven by the increase in municipal council size, and is not due to other government policies. As our paper relies on a regression discontinuity framework to provide quasi-experimental variation in legislative size, the causal interpretation of our estimated treatment effect would be biased if the population thresholds determining council size were also used for the implementation of other policies. While, to the best of our knowledge, no other government policies employ the same population

[17] This is true in many settings with multi-level governments, although the amount of discretionary power to raise finances which is devolved to the local level has been growing over time (Shi and Tulli, 2020).

[18] Taking a municipality with service tax revenue equal to the median value in our entire sample (R$ 1,314,093), the average total revenue of that municipality is R$ 60,098,110. The share of service tax revenue for this median municipality is, thus, around 2.19 percent. The estimated magnitude of the impact of an additional seat at the municipal council on service tax revenue is between R$ 805,539.00 to R$ 864,673.20 for this median municipality.

[19] In Brazil, property tax payments are usually billed by the local authorities in the month of January to the property owner's address, as opposed to the indirect services tax, which are not explicitly displayed in the prices paid by the final consumer. Another important feature that distinguishes property tax from services tax is the fact that the former is levied as a single large tax relative to a given fiscal year, whereas the latter is collected in small amounts over the same fiscal year, which makes it difficult for consumers to fully account for the exact amount of yearly services tax paid.

[20] Bracco, Porcelli and Redoano (2019) finds a similar result for a relatively higher tax burden on less salient taxes in Italian municipalities when electoral competition is higher.

thresholds, there exist two other policies based on population cut-offs that could plausibly drive the results on local public finance. The policies are related to federal transfers and legislator salaries, and we analyze them in turn below.

Federal transfers to municipalities (*Fundo de Participação dos Municípios – FPM*) are partly determined by a formula based on population thresholds, as documented in Corbi, Papaioannou and Surico (2019), Litschig and Morrison (2013), and Rocha (2019). While FPM policy is based on a discontinuous function employing different population thresholds than the municipal council ruling, FPM transfers are a significant source of federal support for municipalities and could have a dominant effect on local public finance decisions. One concern is that municipalities just below an FPM threshold could be more strained in their financial resources, for which municipalities might compensate by taxing more.

Panel A of Table 6 displays estimated effects on tax revenues of an RD specification employing the FPM threshold instead of the municipal councils thresholds used in equation 1. That is, coefficients in Panel A are the estimated LATE for municipalities on the "high" side of the threshold that receive more federal transfers than those similarly sized municipalities on the "low" side of the discontinuity. As in equation 1, we aggregate municipalities and normalize the cut-off to the nearest population threshold. We do not find any robust evidence that the FPM threshold is driving the difference in tax revenues across municipalities with different legislature sizes. While the negative point estimates are suggestive of a compensating effect for municipalities with more federal transfers, the estimates are very imprecise, not statistically different from zero, and cannot be used as causal evidence for this mechanism.

An additional policy that may be relevant for local public finance concerns legislator salaries. As with FPM transfers, the maximum allowable wages for local legislators in Brazil are set by a formula partially based on municipal population thresholds (*see* Cunha and Manoel (2019) and Ferraz and Finan (2011)). The population thresholds employed in this salary policy are different than the ones employed in this paper, but the policy could nevertheless potentially drive our main results. Legislators' ability to increase their salaries above thresholds on the salary cap could necessitate greater tax revenues to cover these increased expenses.

We explore the role of legislator salaries on local tax revenue in Table 6, Panel B. The panel presents estimated coefficient from an RD specification using the thresholds related to legislator salary caps. As in Panel A, we do not find evidence that legislator salaries have a significant impact on tax revenue. The estimates for total and service tax revenue are very close to zero, and the estimates for property taxes are likewise imprecisely estimated and not statistically different from zero.

The lack of significance in either panel provides additional support to the fact that the differences in public finances observed in the main results are driven by differences in legislature size and not in coincident government policies that employ population thresholds across municipalities.

V Potential Mechanism: Electoral Diversity

In this section, we shed light on a potential mechanism to rationalize the increase in government spending and taxation across the population cut-off. We provide evidence that an increase in the number of council seats up for election increases the political diversity of parties represented in the local legislature. Consistent with the literature on public expenditure and political diversity, more politically diverse councils spend more on providing "pro-social" goods, such as education and housing, necessitating the need for greater tax revenue.

Our mechanism is driven by two key insights from the political economy literature. The first comes from the theoretical framework of the "law of $1/n$" proposed by Weingast, Shepsle and Johnsen (1981), which shows a positive relationship between the number of elected officials and public spending financed via taxation. The mechanism underlining this relationship is straightforward: public expenditures are financed via taxation, and voters reward politicians representing their district if their individual benefits are larger than their costs. Since voters have concentrated benefits from public goods but their costs are diffused among all voters, it is more likely that the perceived benefits of publicly-financed projects will surpass their costs. Therefore, politicians are incentivized to increase the size of the government to benefit their district.

Empirical evidence supporting this theory is mixed. Mignozzetti and Cepaluni (2019) find evidence of welfare increases from larger Brazilian councils—consistent with the theory and most likely an outcome of the increase in government expenditures on public goods shown in Section IV. However, Pettersson-Lidbom (2012), studying a similar reform in Sweden and Finland, finds that local government size is negatively related to government expenditure.

We reconcile these findings and support the predictions of Weingast, Shepsle and Johnsen (1981) in the Brazilian context using the insight of Duverger's Law. Duverger (1954) proposes that a multi-member proportional representation system, such as used in Brazilian local elections, favor multipartyism. This is in contrast to single seat elections, which favors two-party competition.[21] Therefore, in Brazilian local elections where more seats are open for

[21] This can be explained by the psychological effects this voting system has on voters; when voters realize the minor party they like most has no chance of winning, they strategically vote for the party that they least

competition, one would expect this increase to produce a wider array of potential candidates, and engender an increase in political diversity on larger councils.

To test Duverger's Law, we follow the empirical approach developed by Laakso and Taagepera (1979) in measuring political diversity. We define the effective number of parties in a given municipal council to be the inverse of the sum of the square of each party's proportion of all votes. Formally, for municipality m with $i = 1 \dots N_m$ political parties that received votes in the local election, we calculate the effective number of parties as:

$$ENP_m = \frac{1}{\sum_{i=1}^{N_m} p_i^2} \tag{2}$$

where p_i is the proportion of votes received by each party i in municipality m.

Table 7 presents the results of the RD specification outlined in equation 1, with the effective number of parties as the dependent variable. Under both a local linear and quadratic specification, we find that one more seat on a municipal council translates on average to slightly more than one effective party.[22] Therefore, the range of ideological positions in local councils increased—theoretically enfranchising voters' preferences that were not being previously represented in the legislative system. Politicians representing these newly enfranchised voters have an incentive to increase expenditures that will benefit them, raising tax revenue in the process.

Our finding that political diversity increases with council size corroborates evidence from the laboratory setting (Hix, Hortala-Vallve and Riambau-Armet, 2017) and in Indonesia (Lewis, 2018).[23] Moreover, we argue that this increase in diversity can explain the divergence from Pettersson-Lidbom (2012). In that paper the author finds suggestive evidence that in the case of Sweden and Finland, larger councils elected legislators that had a personal interest in lower taxes (e.g. business owners). The increase in political diversity of Brazilian councils is in line with higher expenditures: a candidate without countervailing interests (perhaps unlike the less diverse candidates in the Swedish and Finnish case) has an incentive to spend more money targeted at her group of supporters while costs are diffused across the city.

Our results are also consistent with other work in Brazil focusing on increasing voter enfranchisement. Fujiwara (2015) finds that an increase in electronic voting in Brazil led to greater *de facto* enfranchisement of poorer citizens, leading to an increase in spending

"dislike" within the top two options (Benoit, 2006; Fujiwara, 2011).

[22] It is important to note that ENP is a type of Herfindahl–Hirschman Index, and the increase we find translates to more diversity of political parties, and not necessarily an increase in one additional political party.

[23] In a related article, Lewis (2019) finds that larger local legislatures in Indonesia do not have a significant impact on expenditures. This is due primarily to the Indonesian context, where local governments are more fiscally constrained and councils have a more adversarial relationship with the mayor.

on social goods. Schneider, Athias and Bugarin (2019) find that the new voting technology caused an increase in municipal tax revenue and expenditures.[24] Similarly, Gouvea and Girardi (2021) find that more left-leaning mayors—who benefited from voter enfranchisement—increased social spending, particularly in the 2004-2008 term. Although the reform analyzed in this paper does not directly enfranchise voters in the same way as electronic voting, increasing the number of seats in local councils allows voters to be indirectly enfranchised, since their preferences have a larger likelihood of being represented as more parties can effectively participate in elections, increasing the range of ideological options.

VI Conclusion

This paper studies the role of legislature size on the size of government and government spending. Relying on discontinuous changes in the number of seats allocated to municipal councils in Brazil, we find that one additional seat leads to increases in spending on "social goods", and not on expenditures that solely benefit the larger legislatures. This increase in expenditures is partly financed by more municipal tax revenue, and is driven by service taxes, as opposed to property taxes that are deeply unpopular with voters.

Our findings are consistent with the "Law of $1/n$" proposed by Weingast, Shepsle and Johnsen (1981), which has mixed support from the empirical literature. We reconcile our findings against papers such as Pettersson-Lidbom (2012)—that find a negative effect of legislature size on spending—with evidence supporting Duverger's Law. As Brazil uses a multi-member proportional representation system, larger councils have greater diversity of party representation, leading to more indirect voter enfranchisement and incentives by politicians to cater to their base of support.

Our paper sheds light on the importance of institutional context in understanding the intrinsic relationship between representation and local state capacity, both in terms of political party structure, as well as the tools of taxing and spending that legislatures have at their disposal. Public policies aiming to improve these dimensions of local public finance might benefit from political reforms targeting greater political diversity and voters' enfranchisement.

[24] This result is consistent with the theoretical model constructed by Meltzer and Richard (1981) showing that, as poorer voters cannot be excluded from using public goods but pay a smaller share of the tax revenue used to provide these goods, they are more in favor of larger taxation and public spending than relatively richer voters.

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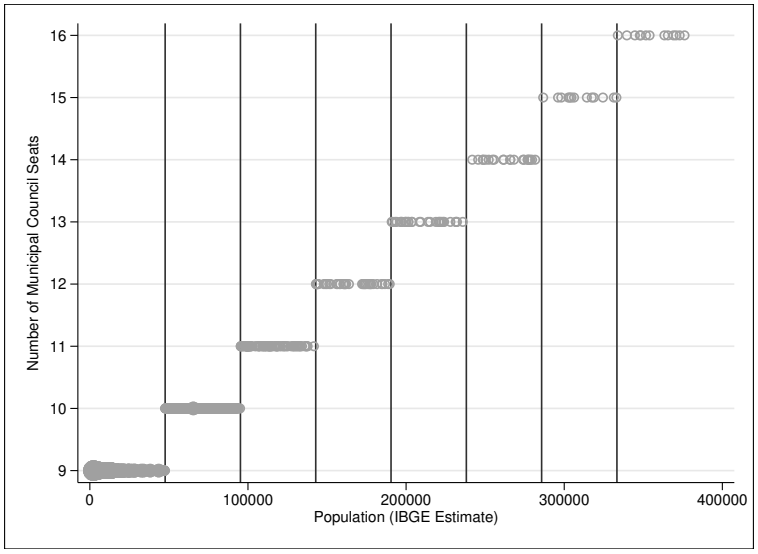
Figures

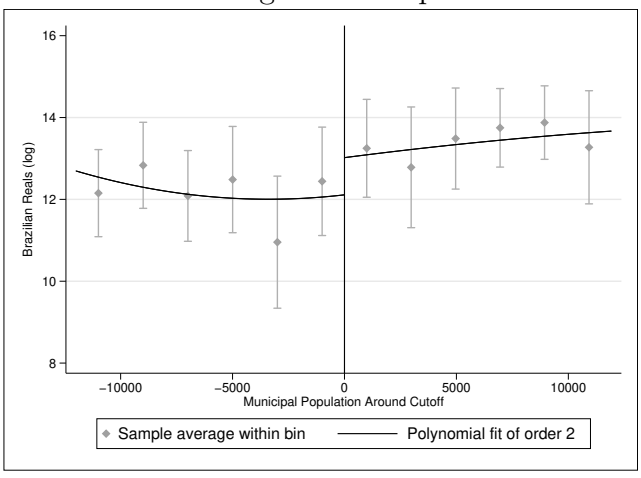
Figure 1: Municipal Council Sizes, 2005-2008



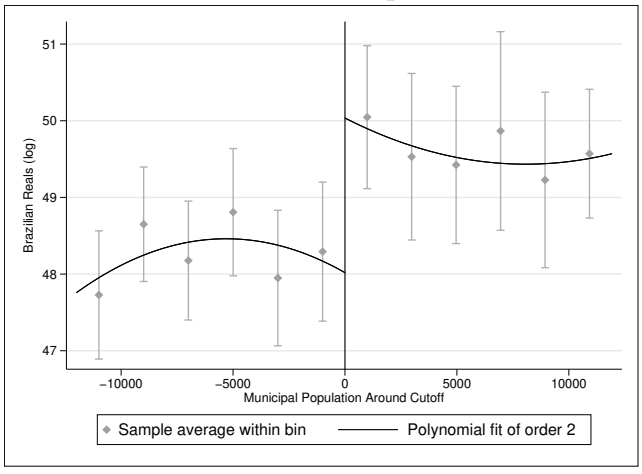
Notes: This figure shows the actual number of municipal council seats allocated to each municipality according to population size on the 2005–2008 electoral cycle.

Figure 2: RD Treatment Effects on Government Expenditures

Panel A: Legislative Expenditures



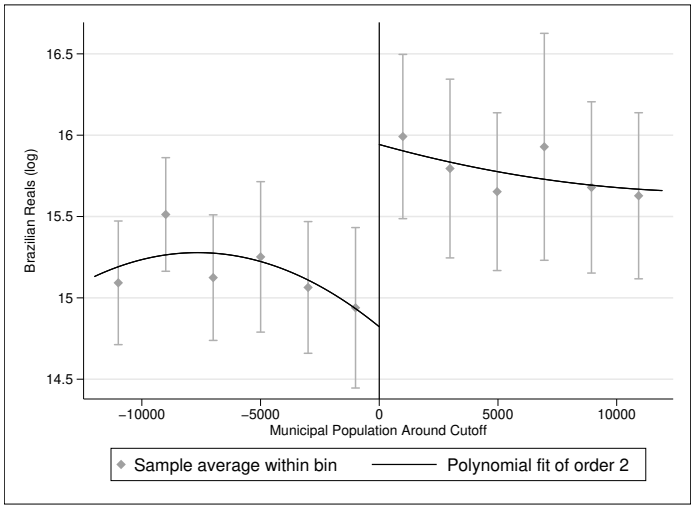
Panel B: Social Expenditures



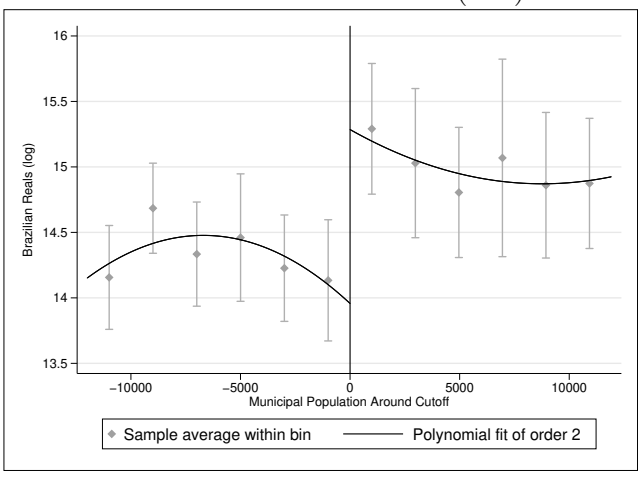
Notes: This figure shows the relationship between municipal council size and total tax revenue. RD estimates with locally smoothed cubic polynomial with a uniform kernel are displayed. Each dot represents sample average tax revenue within each bin of with 95% confidence intervals.

Figure 3: RD Treatment Effects on Municipal Taxes

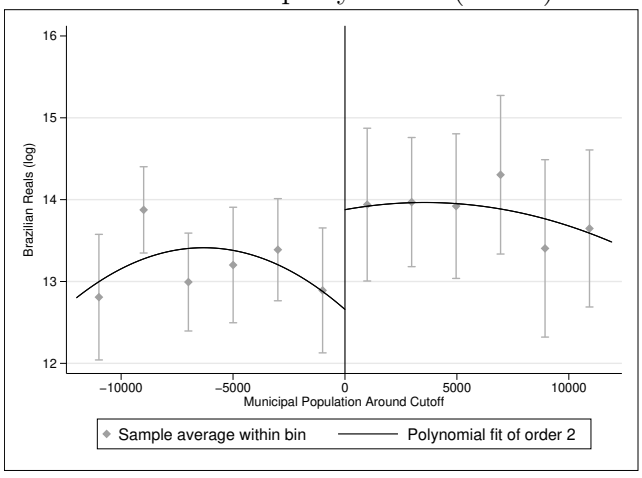
Panel A: Total Tax Revenue



Panel B: Service Taxes (ISS)



Panel C: Property Taxes (IPTU)



Notes: This figure shows the relationship between municipal council size and total tax revenue. RD estimates with locally smoothed cubic polynomial with a uniform kernel are displayed. Each dot represents sample average tax revenue within each bin of with 95% confidence intervals.

Tables

Table 1: Council Size Rule

Municipal Population	Number of Council Seats	Municipal Population	Number of Council Seats
[0 — 47,619]	9	[238,096 — 285,714]	14
[47,620 — 95,238]	10	[285,715 — 333,333]	15
[95,239 — 142,857]	11	[333,334 — 380,952]	16
[142,858 — 190,476]	12	[380,953 — 428,571]	17
[190,477 — 238,095]	13	[428,572 — 476,190]	18

The table displays the population brackets and associated number of seats each municipality was allocated in the 2004 municipal legislature elections, after the 2004 TSE Resolution.

Table 2: Municipal Finance Summary Statistics

	Full RDD Sample *(N = 1270)*				CCT Bandwidth Sample *(N = 381)*			
	Mean	Std Dev	Min	Max	Mean	Std Dev	Min	Max
Panel A: Tax Variables								
Municipal Tax Revenue	17,069	61,082	126.8	966,980	22,026	67,495	126.8	767,338
Service Tax Revenue (ISS)	8,371	30,589	40.90	396,516	10,694	34,016	45.61	395,450
Property Tax Revenue (IPTU)	5,400	21,003	0	356,857	7,081	23,044	0.0750	236,693
Total Budget Revenue incl. Transfers^	105,576	239,854	12,791	3,602,626	129,157	254,450	17,172	3,079,011
Revenue Share from Service Tax	0.0410	0.0367	0.00181	0.320	0.0451	0.0392	0.00227	0.320
Revenue Share from Property Tax	0.0265	0.0366	0	0.319	0.0307	0.0391	0	0.319
Panel B: Expenditure Variables								
Municipal Expenditures on...								
...Legislative Costs^	2,747	6,356	0	78,290	3,266	6,851	0	71,476
...Health^	27,533	73,006	254.8	1,310,178	34,392	76,279	2,787	1,073,209
...Education^	26,101	47,661	3,124	689,200	31,489	50,765	4,082	502,673
...Housing/Urban Development^	13,131	41,921	0	1,019,357	15,780	50,940	46.31	1,019,357
Total Municipal Expenditures^	54,379	108,427	7,752	1,563,737	65,729	112,447	9,779	1,097,964

The table displays summary statistics of tax revenues and public expenditures for the municipalities in our sample. Variables denoted with ^ are in ,000s Reals. Total budget revenue includes transfer to the municipality from state and federal governments. Panel A describes summary measures for the relevant tax variables, and Panel B presents summary statistics for the relevant expenditure variables. Summary statistics are presented for the full RDD sample, whereas Panel B restricts the sample to the municipalities within the bandwidth proposed by Calonico, Cattaneo and Titiunik (2014).

Table 3: Balance of Predetermined Covariates

	Linear ($p = 1$)		*Quadratic* ($p = 2$)	
	Coefficient	(SE)	Coefficient	(SE)
Panel A: Public Finance				
Municipal Income	-0.097	(0.73)	-0.034	(0.86)
Transfers from Federal Government	0.151	(1.10)	-0.422	(1.55)
Transfers from State Government	-0.829	(0.82)	-0.845	(1.11)
Panel B: Year 2000 Election				
Total Votes for Councilors	0.191	(0.18)	0.198	(0.21)
Number of Council Candidates	0.253	(0.19)	0.219	(0.24)
Voter Turnout	-0.011	(0.02)	-0.023	(0.02)
Council Seats (2001)	-0.405	(0.90)	-0.924	(1.08)
Panel C: Census Characteristics				
Geographic Area	0.129	(0.33)	0.108	(0.46)
Distance to State Capital	-0.234	(0.25)	0.051	(0.42)
Fraction of Households with...				
...running water	0.069	(0.06)	0.056	(0.08)
...electricity	0.039	(0.03)	0.036	(0.04)
...refuse collection	0.03	(0.04)	0.036	(0.05)
...car ownership	0.053	(0.05)	0.049	(0.05)
...land ownership	-0.005	(0.02)	0.015	(0.03)
Theil Inequality Index	-0.023	(0.03)	-0.049	(0.04)

The point estimates are constructed using local polynomial estimators with a uniform kernel. Significantly different than zero at 99 (***), 95 (**), 90 (*) percent confidence. Each column presents the RD specification restricting the sample to bins of size h around the municipal population cut-off. Results shown using the optimal bandwidth h developed by Calonico, Cattaneo and Titiunik (2014). All specifications include additional controls for GDP per capita, population, pre-2004 council size, and average population from 2001-2004. Taxes are measured $log(Reals)$. $N^+ = \sum_1^n 1(c \leq X_i)$, $N^- = \sum_1^n 1(X_i \leq c)$, $N_h^+ = \sum_1^n 1(c \leq X_i \leq c + h)$, $N_h^- = \sum_1^n 1(c - h \leq X_i \leq c)$.

Table 4: Government Expenditures

			Social Expenditures					
	Legislative Expenditures		Education		Health		Housing	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
LATE	1.131	1.184	0.250***	0.291**	0.133	0.162	0.545***	0.607***
	(0.911)	(1.072)	(0.0934)	(0.116)	(0.107)	(0.125)	(0.160)	(0.213)
$N^-\|N^+$	912|356	912|356	912|356	912|356	912|356	912|356	912|356	912|356
$N_h^-\|N_h^+$	122|116	184|138	134|119	200|145	153|124	205|149	164|130	188|140
Bandwidth	6137	8249	6406	8520	6788	8713	7158	8339
Polynomial	1	2	1	2	1	2	1	2

The point estimates are constructed using a local polynomial estimator with a uniform kernel. Significantly different than zero at 99 (***), 95 (**), 90 (*) percent confidence. Each column presents the RD specification restricting the sample to bins of size h around the municipal population cut-off. Results shown using the optimal bandwidth h developed by Calonico, Cattaneo and Titiunik (2014). All specifications include additional controls for GDP per capita, population, pre-2004 council size, and average population from 2001-2004. Taxes are measured $log(Reals)$. $N^+ = \sum_1^n 1(c \leq X_i)$, $N^- = \sum_1^n 1(X_i \leq c)$, $N_h^+ = \sum_1^n 1(c \leq X_i \leq c + h)$, $N_h^- = \sum_1^n 1(c - h \leq X_i \leq c)$.

Table 5: Municipal Tax Revenue

	Total Taxes		Service Taxes		Property Taxes	
	(1)	(2)	(3)	(4)	(5)	(6)
LATE	0.494***	0.537***	0.613***	0.658***	0.0727	0.221
	(0.125)	(0.144)	(0.145)	(0.162)	(0.265)	(0.356)
$N^-\|N^+$	912|356	912|356	912|356	912|356	912|356	912|356
$N_h^-\|N_h^+$	155|124	253|170	168|130	300|193	209|150	234|163
Bandwidth	6843	10081	7397	11460	8820	9566
Polynomial	1	2	1	2	1	2

The point estimates are constructed using a local quadratic estimator with a uniform kernel. Significantly different than zero at 99 (***), 95 (**), 90 (*) percent confidence. Each column presents the RD specification restricting the sample to bins of size h around the municipal population cut-off. Results shown using the optimal bandwidth h developed by Calonico, Cattaneo and Titiunik (2014). All specifications include additional controls for GDP per capita, population, pre-2004 council size, and average population from 2001-2004. Taxes are measured $log(Reals)$. $N^+ = \sum_1^n 1(c \leq X_i)$, $N^- = \sum_1^n 1(X_i \leq c)$, $N_h^+ = \sum_1^n 1(c \leq X_i \leq c+h)$, $N_h^- = \sum_1^n 1(c-h \leq X_i \leq c)$.

Table 6: Placebo Tests

Panel A: Federal Transfers Threshold

	Total Taxes		Service Taxes		Property Taxes	
	(1)	(2)	(3)	(4)	(5)	(6)
LATE	-0.311	-0.397	-0.581*	-0.630	-0.106	-0.396
	(0.281)	(0.387)	(0.349)	(0.466)	(0.225)	(0.289)
$N^-\|N^+$	955|143	955|143	955|143	955|143	955|143	955|143
$N_h^-\|N_h^+$	53|49	67|53	49|41	69|56	53|47	57|49
Bandwidth	1575	1852	1460	1946	1565	1584
Polynomial	1	2	1	2	1	2

Panel B: Legislator Salary Threshold

	Total Taxes		Service Taxes		Property Taxes	
	(1)	(2)	(3)	(4)	(5)	(6)
LATE	0.0930	0.0935	0.0467	0.0372	0.267	0.416
	(0.111)	(0.156)	(0.141)	(0.192)	(0.261)	(0.294)
$N^-\|N^+$	585|381	585|381	585|381	585|381	585|381	585|381
$N_h^-\|N_h^+$	377|193	430|210	362|191	454|218	188|124	386|195
Bandwidth	17045	18328	16607	18944	10277	17302
Polynomial	1	2	1	2	1	2

The point estimates are constructed using local linear and local quadratic estimators with uniform kernels. Significantly different than zero at 99 (***), 95 (**), 90 (*) percent confidence. Each column presents the RD specification restricting the sample to bins of size h around the municipal population cut-off. Results shown using the optimal bandwidth h developed by Calonico, Cattaneo and Titiunik (2014). All specifications include additional controls for GDP per capita, population, pre-2004 council size, and average population from 2001-2004. Taxes are measured $log(Reals)$. $N^+ = \sum_1^n 1(c \leq X_i)$, $N^- = \sum_1^n 1(X_i \leq c)$, $N_h^+ = \sum_1^n 1(c \leq X_i \leq c+h)$, $N_h^- = \sum_1^n 1(c-h \leq X_i \leq c)$.

Table 7: Effective Number of Parties

	Effective Number of Parties	
	(1)	(2)
LATE	1.008*	1.367*
	(0.524)	(0.701)
$N^-\|N^+$	917|356	917|356
$N_h^-\|N_h^+$	177|134	183|137
Bandwidth	7763	8198
Polynomial	1	2

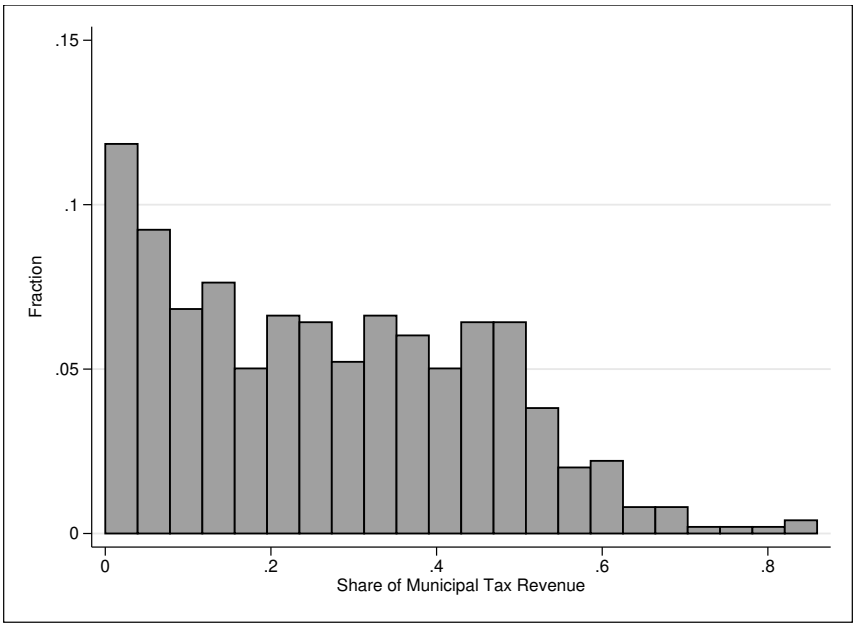
The point estimates are constructed using local linear and local quadratic estimators with uniform kernels. Significantly different than zero at 99 (***), 95 (**), 90 (*) percent confidence. Each column presents the RD specification restricting the sample to bins of size h around the municipal population cut-off. Results shown using the optimal bandwidth h developed by Calonico, Cattaneo and Titiunik (2014). All specifications include additional controls for GDP per capita, population, pre-2004 council size, and average population from 2001-2004. Effective number of parties is measured as standard. $N^+ = \sum_1^n 1(c \leq X_i)$, $N^- = \sum_1^n 1(X_i \leq c)$, $N_h^+ = \sum_1^n 1(c \leq X_i \leq c+h)$, $N_h^- = \sum_1^n 1(c-h \leq X_i \leq c)$.

A Appendix

A.I IPTU Share of Municipal Tax Revenue

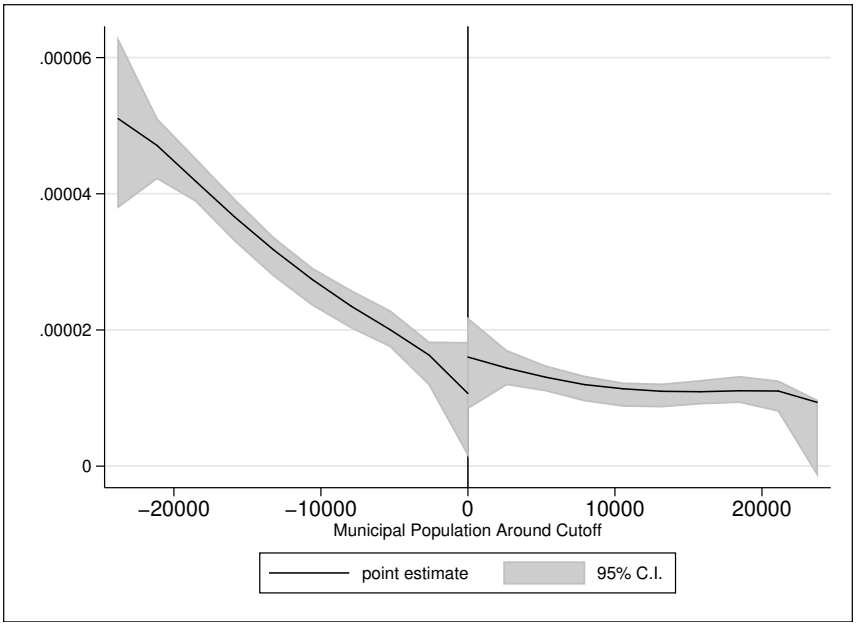
Figure A.1 displays the share of municipal tax revenue derived from taxes on property (IPTU) for municipalities used in the main empirical specification.

Figure A.1: Share of Municipal Tax Revenue from IPTU



A.II McCrary Density Test

Figure A.2: Manipulation Test Plot



The figure shows the results of the McCrary (2008) manipulation test with p=2, q=3

Table A.1: Manipulation Test

	Bandwidth		Observations		t-Test	
	left	right	left	right	t-test	p-value
$T_1(h_1)$	3628.24	3891.11	63	75	0.039	0.968
$T_2(h_2)$	12314.57	12100.28	325	202	0.957	0.338
$T_3(h_3)$	8942.21	9817.64	215	167	-1.056	0.291
$T_4(h_4)$	24689.24	20695.38	920	323	1.384	0.166

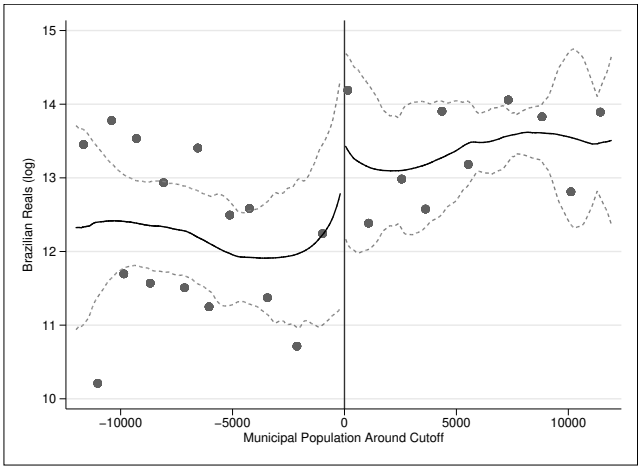
$T_p(h)$ is the manipulation test statistic of bandwidth h. p indicates the order of the local polynomial used to construct the density point estimator.

A.III Non-parametric RD Figures

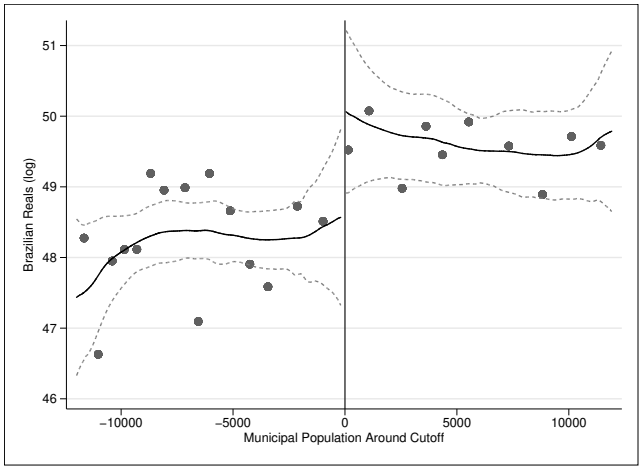
Figures A.3 and A.4 displays...

Figure A.3: Non-Parametric RD Estimates on Expenditures

Panel A: Legislative Expenditures



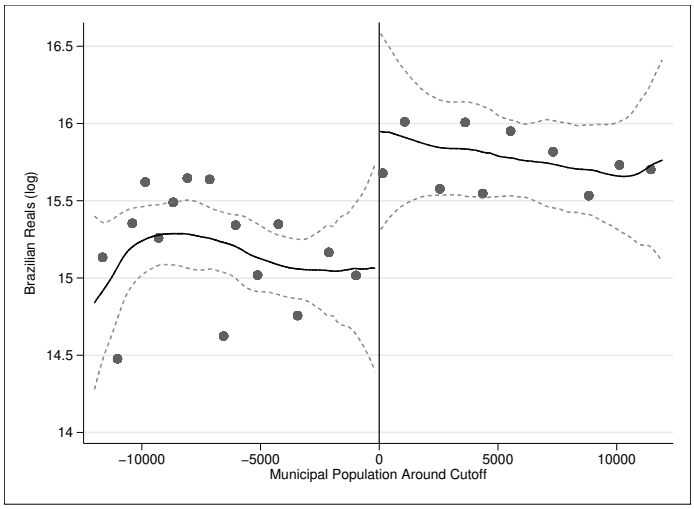
Panel B: Social Expenditures



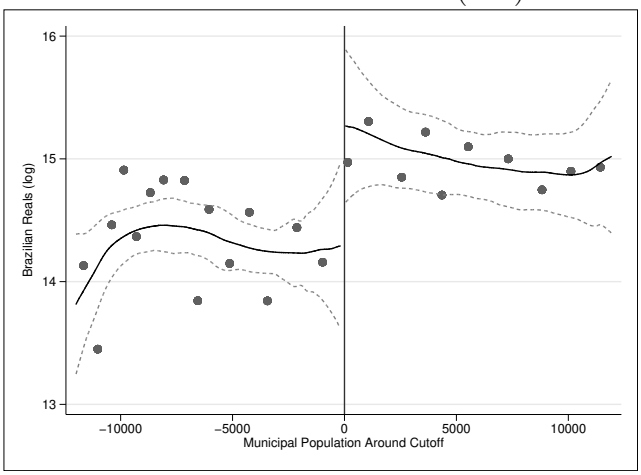
Notes: This figure shows RD estimates for each year of the electoral cycle (2005–2008). The point estimates along with 95 percent confidence intervals are constructed using local linear and local quadratic estimators with kernels specified by each symbol displayed in the legend. Each RD specification restricts the sample to bins of size h around the municipal population cut-off. Results shown using the optimal bandwidth h developed by Calonico, Cattaneo and Titiunik (2014). All specifications include additional controls for GDP per capita, population, pre-2004 council size, and average population from 2001-2004. Taxes are measured $log(Reals)$. $N^{+} = \sum_{1}^{n} 1(c \leq X_i)$, $N^{-} = \sum_{1}^{n} 1(X_i \leq c)$, $N_h^{+} = \sum_{1}^{n} 1(c \leq X_i \leq c + h)$, $N_h^{-} = \sum_{1}^{n} 1(c - h \leq X_i \leq c)$.

Figure A.4: Non-Parametric RD Estimates on Taxes

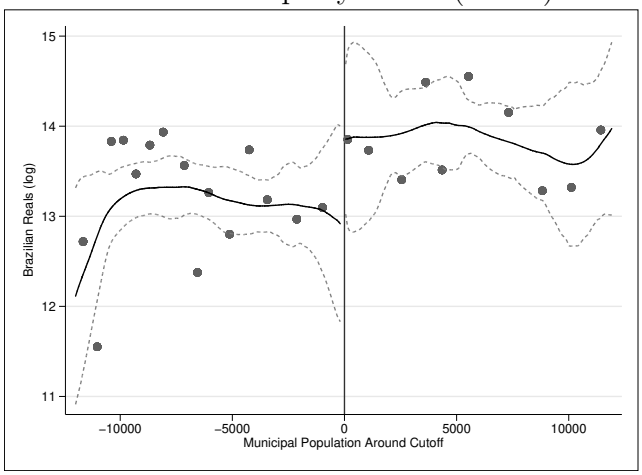
Panel A: Total Tax Revenue



Panel B: Service Taxes (ISS)



Panel C: Property Taxes (IPTU)



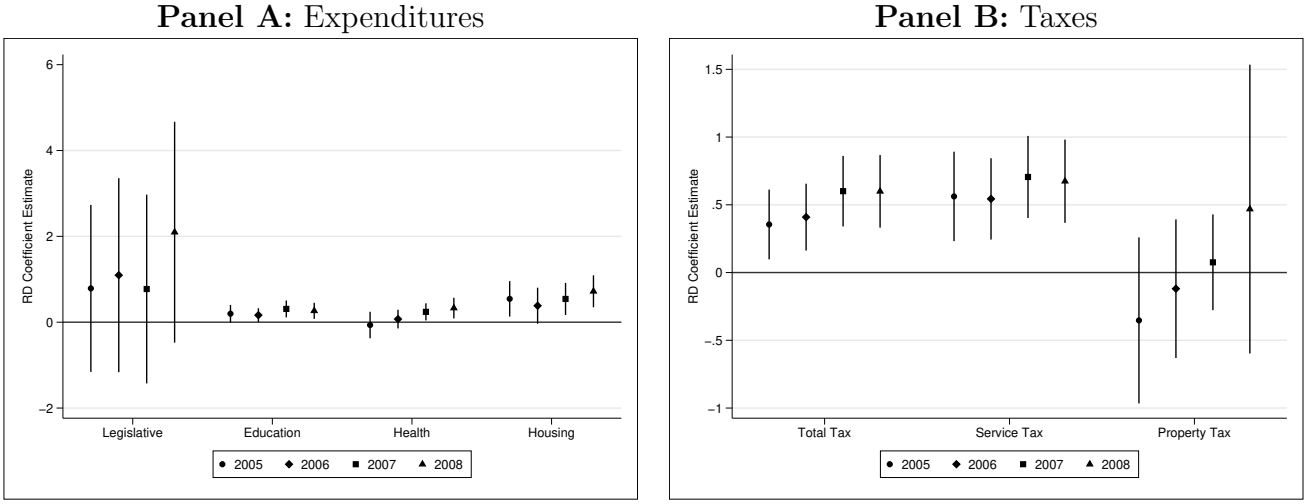
Notes: This figure shows RD estimates for each year of the electoral cycle (2005–2008). The point estimates along with 95 percent confidence intervals are constructed using local linear and local quadratic estimators with kernels specified by each symbol displayed in the legend. Each RD specification restricts the sample to bins of size h around the municipal population cut-off. Results shown using the optimal bandwidth h developed by Calonico, Cattaneo and Titiunik (2014). All specifications include additional controls for GDP per capita, population, pre-2004 council size, and average population from 2001-2004. Taxes are measured $log(Reals)$. $N^{+} = \sum_{1}^{n} 1(c \leq X_i)$, $N^{-} = \sum_{1}^{n} 1(X_i \leq c)$, $N_h^{+} = \sum_{1}^{n} 1(c \leq X_i \leq c + h)$, $N_h^{-} = \sum_{1}^{n} 1(c - h \leq X_i \leq c)$.

A.IV Robustness to RD Specification

Yearly Coefficients

Figure A.5 displays the RD estimates for each year of the 2005–2008 electoral cycle. The estimates show a fairly similar effect of an additional seat on total taxes across the analyzed period. The estimates further corroborate the aforementioned results that the effects are mainly driven by service tax, with no consistent effects on property tax.

Figure A.5: Point Estimates for Each Year 2005 - 2008

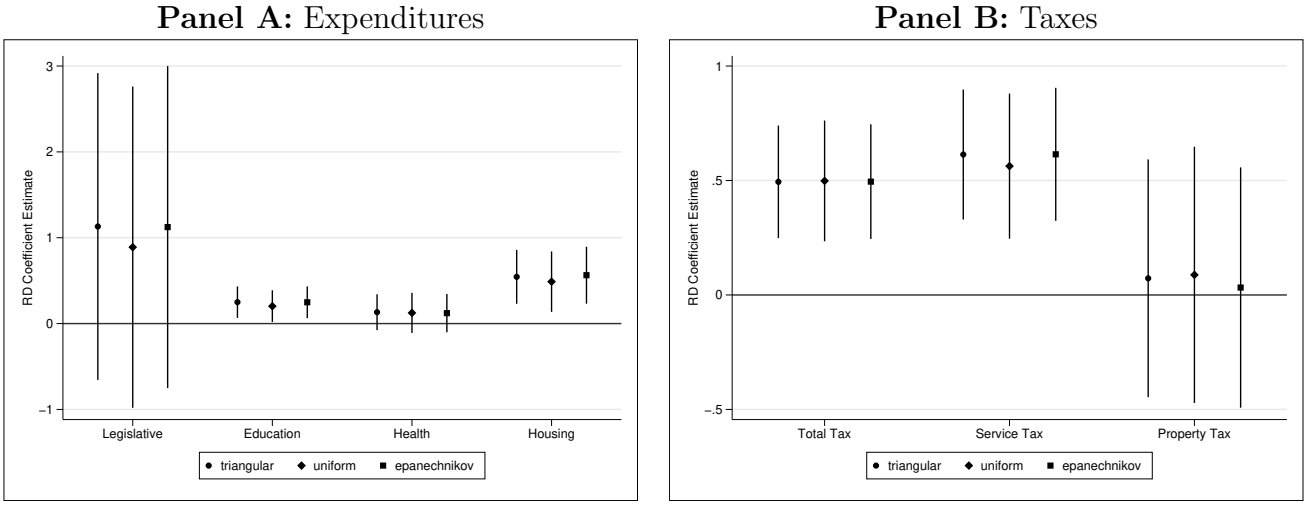


Notes: This figure shows RD estimates for each year of the electoral cycle (2005–2008). The point estimates along with 95 percent confidence intervals are constructed using local linear and local quadratic estimators with kernels specified by each symbol displayed in the legend. Each RD specification restricts the sample to bins of size h around the municipal population cut-off. Results shown using the optimal bandwidth h developed by Calonico, Cattaneo and Titiunik (2014). All specifications include additional controls for GDP per capita, population, pre-2004 council size, and average population from 2001-2004. Taxes are measured $log(Reals)$. $N^+ = \sum_1^n 1(c \leq X_i)$, $N^- = \sum_1^n 1(X_i \leq c)$, $N_h^+ = \sum_1^n 1(c \leq X_i \leq c+h)$, $N_h^- = \sum_1^n 1(c-h \leq X_i \leq c)$.

Choice of Kernel

Figure A.6 provides estimates of the RD model for different kernel densities. Specifically, we compare estimates of our main specification (uniform) for the effects of municipal council size on total tax revenue, service tax, and property tax with alternative specifications: triangular and Epanechnikov densities. The results are similar across kernel choices, alleviating concerns related to the specific choice of kernel.

Figure A.6: Point Estimates and Kernel Choice



Notes: This figure shows RD estimates for three different kernel choices: triangular, uniform, and epanechnikov. The point estimates along with 95 percent confidence intervals are constructed using local linear and local quadratic estimators with kernels specified by each symbol displayed in the legend. Each RD specification restricts the sample to bins of size h around the municipal population cut-off. Results shown using the optimal bandwidth h developed by Calonico, Cattaneo and Titiunik (2014). All specifications include additional controls for GDP per capita, population, pre-2004 council size, and average population from 2001-2004. Taxes are measured $log(Reals)$. $N^+ = \sum_1^n 1(c \leq X_i)$, $N^- = \sum_1^n 1(X_i \leq c)$, $N_h^+ = \sum_1^n 1(c \leq X_i \leq c+h)$, $N_h^- = \sum_1^n 1(c-h \leq X_i \leq c)$.