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Essays on Local Political Economy in Brazil and the United States

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ABSTRACT

This dissertation covers different aspects of political institutions and fiscal policy in local governments. The first essay examines the political consequences of an increase in the district magnitude (the number of open seats) for legislatures. The second essay studies how the size of a local legislature affects the size and composition of public spending. The third essay develops and tests a theory of how transaction costs might affect the use of earmarked revenues by local budgeting authorities. The last essay compares the relative impacts of factors that might make a local government more likely to adopt own-source revenues. These questions are examined in the context of Brazilian and US local governments. Individual chapter abstracts follow.

Chapter 1: Research has consistently identified district magnitude as an important institutional factor in political competition. The most familiar of these formulations is Duverger's hypothesis, which argues that district magnitude affects the number of parties and legislative fragmentation among parties. Yet parties play little to no role in structuring political competition in some polities. How might Duverger's rule apply in the absence of meaningful parties? Using the case of Brazilian municipalities, this paper estimates the influence of changes in district magnitude on alternative conceptions of political competition – the number of personalist political coalitions and opposition strength. Results indicate that large changes in district magnitude had a positive but minimal effect on the number of coalitions in government. The most consequential result of a larger district magnitude was a strengthened opposition, which increased its numbers. Evidence from fieldwork suggests that larger city councils in Brazil may be more autonomous from the executive and engender a better check on executive power.

Chapter 2. Many factors contribute to the size and composition of public spending. Research that examines the role of legislature size has traditionally focused on political systems where the

legislature has budgeting authority, and higher expenditures emerge as a result of logrolling. This paper develops an alternate view of legislature size and expenditures for a political system where an independent executive holds the budgeting authority and must spend fiscal resources to maintain his or her legislative coalition. I examine the theory in the context of Brazilian municipalities. Results indicate that larger legislatures led to higher public spending. An average municipality that expanded from 10 to 15 legislators in 2013 spent 3% to 4% more than a similarly situated municipality that maintained 10 legislators. This equals R$400k per year, or 65 minimum wage jobs, per additional legislator. There was an appreciable increase in urban infrastructure spending, while education expenditures did not change systematically in response to larger local councils. The overall increase and the pattern of the increase are consistent with the notion that Brazilian mayors use public spending to build and maintain their legislative coalitions, and that they must appropriate more public funds to achieve these goals when the legislature is larger.

Chapter 3. The question of whether earmarked public revenues are spent on their intended purpose has a long history in the academic literature. Theory suggests that earmarks should not matter since budget authorities can always shuffle money between accounts. However, empirical studies often find that much of marginal earmarked revenue is spent overwhelmingly on its intended purpose. There are many theories for this outcome, and this paper adds one more to the literature: transaction costs in the budgeting process. When transaction costs are low, governments optimize between expenditure categories. When the costs are high, the earmarked funds are spent exclusively on their intended purpose. Further development of this theory suggests governments that are highly reliant on earmarked revenues will face unnecessary funding shortfalls in some spending categories, and will be more likely to pay the costs of re-

allocating the revenues. The theory is tested empirically using the case of Oklahoma counties and their management of the county highway fund from 1973 to 2012. Results are in line with the theory, suggesting that a moderate amount of earmarked revenues stimulate specific expenditures, but the effect diminishes as earmarks become a larger portion of the government's total revenues.

Chapter 4. There is increasing recognition among scholars that the fiscal link between citizens and their governments is an important contributor to more efficient allocation of public resources and a more accountable government. However, many local governments in developing countries receive the majority of their funding from intergovernmental transfers, which severs that fiscal bond. There are some cases in which local governments, despite large intergovernmental transfers, have chosen to increase their own taxes. Understanding why local governments choose to adopt new own-source revenues is an important step in the search for policies that encourage more local fiscal effort. This paper examines this question in the context of a local lighting tax in Brazilian municipalities. Results indicate that Brazilian municipal governments are willing to engage in the politically difficult work of taxing their citizens in times of revenue shortfall and service need, but that political calculations and the influence of nearby municipalities play a bigger role in the decision to adopt a local tax.

ESSAYS ON LOCAL POLITICAL ECONOMY IN BRAZIL AND THE UNITED STATES

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1 CHAPTER 1: DISTRICT MAGNITUDE, POLITICAL COMPETITION AND OPPOSITION IN BRAZILIAN MUNICIPALITIES

1.1 INTRODUCTION

Scholars have consistently found that the number of legislative seats in a district plays an important role in the nature of political competition. Districts with more seats tend to have a higher number of parties in the legislature and more dispersion of power among political actors. The benefit of more parties is greater access to the political process for diverse social groups, which is often regarded as improved representation. The drawback, however, is that it is more costly to negotiate legislation among more political groups. This can take its toll on the ability to pass legislation and govern.

The logic presented above began with the seminal work of (Duverger, 1963), and additional landmark contributions include (Rae, 1967; Cox, 1997), and (Powell, 2000). Recent work has investigated the contextual factors involved in how district magnitude affects political competition (Moser & Scheiner, 2012). This paper examines how district magnitude affects political competition when parties have only a minimal role in structuring politics. Using the case of Brazilian municipalities, I argue that parties are not always the appropriate basis for political competition as conceived by Duvergerian electoral theory. Instead, loose coalitions based on personal relationships, rather than party affiliation, is the appropriate unit of political competition in Brazilian Municipalities. I show how changing district magnitude affects the political balance of personalist-coalitions in the legislature.

Cross-national studies of district magnitude and political outcomes face methodological challenges in establishing credible causal estimates. Comparisons across countries confront extensive heterogeneity in political systems, economic development, and social structure. It is exceedingly difficult to control for all these differences, especially given that the number of independent observations is limited. Cross national panel studies that compare countries across multiple elections are unlikely to encounter the level of variation in political institutions over time that would be necessary to use fixed effects methods. Some researchers have pursued a clever strategy of paired matching between upper and lower house elections (Moser & Scheiner, 2012; Desposato, 2006), and others have advanced controversial instrumental variable arguments (Acemoglu, Johnson, & Robinson, 2002). One strategy in empirical political economy has been a turn to subnational studies, especially in federal systems (e.g. Putnam, 1994). This option offers greater institutional homogeneity and potentially more observations. Additionally, there are often institutional rules that facilitate empirical strategies to correct for policy endogeneity. This paper leverages the institutional homogeneity and exogenous policy change in Brazilian municipalities to produces credible estimates regarding the impact of district magnitude on political competition.

I find that recent changes in district magnitude have important implications for the political structure of Brazilian legislatures. Among the most important of these is that the increased district magnitude brought many more participants into the political process. Political fragmentation as traditionally measured with respect to parties increased, but it was less pronounced with respect to electoral coalitions. The influence of the opposition, however, increased. While the percentage of the opposition in legislatures was not greatly affected, the

number of opposition legislators rose and this alone may have important implications for the independence of the legislature from the executive.

This paper begins by considering how the concept of political competition is used in electoral theory and what alternative measures might look like in the absence of a strong party system. The second section introduces the Brazilian district-magnitude policy that this paper uses as its source of exogenous variation. The paper then gives an overview of the mixed-methods approach that was used to generate and test theory. In the remaining sections, empirical results are presented for two separate outcome classes: How the policy of larger district magnitude affected political fragmentation and how it affected opposition strength.

1.2 POLITICAL COMPETITION

Competition for political power serves two purposes in a democracy. It provides choice in an election so that an unsatisfied citizenry may replace its leader (Schumpeter, 2008). Competition also serves an informational function so that society may be better informed (Mill, 1956), and elected officials may understand the mandates with which they are charged by the voters (Rousseau, 1968). Even in the liberal view of democracy, where modern social choice theory sees mandates as incoherent, democratic competition plays an important informational role. Adopting a liberal conception of democracy, I discuss the role of competition in the context of modern electoral theory, and I explain why the use of alternative concepts of competition might sometimes be appropriate.

1.2.1 Electoral Competition

Competition provides voters with choice in an election. The contours of this choice vary depending on which political divisions are salient within a society. If the political divisions are

an expression of social cleavages like class, religion, region or the urban/rural divide, then candidates should emerge to offer solutions tailored to the preferences of these groups. To the extent that these divisions are persistent over time, group leaders may invest in building organizations to promote the groups' political interests. These are political parties which are rooted in society. Alternatively, political elites may develop parties purely for electoral purposes that find it convenient to foment social division in pursuit of voter support. Regardless of how the parties came to be, they often reflect competing sets of social preferences, and political competition is structured based on parties.

Electoral systems theory studies how electoral institutions influence who wins office. To make empirical progress on this question, the notion of who is elected must be abstracted from the individual to a group level. A natural system of grouping is based on political parties, which ostensibly represent discrete sets of social preferences. Electoral systems scholars can then make statements about how electoral rules shape the aggregation and final distribution of the preferences, defined as a party, that win legislative seats[1].

In many countries, this is a sensible approach because parties are the natural unit of political competition. In the extreme case of closed list proportional representation (PR) electoral systems, voters select parties to represent them, not individuals. But even in less restrictive systems, the party is an important organizing force. Parties solicit and redirect campaign financing to their members, and they use this money to maintain the loyalties of individual legislators to the overall party goals. From the voter's point of view, a party affiliation may reduce the costs of screening candidates (Aldrich, 1995). Where voters trust that parties will

[1] Landmark contributions include (Duverger, 1963), (Rae, 1967), (Taagepera & Shugart, 1989), (Cox, 1997), (Powell, 2000), and (Moser & Scheiner, 2012).

screen and discipline their candidates, voters will align themselves with the party that most closely matches their preference. Competition then becomes a game in which parties seek to convince marginal voting blocks to defect from their old party allegiance and to vote with their party.

Empirical research on electoral systems theory has been productive where parties are the appropriate unit of political competition. The number of parties can be used as a key outcome variable to understand the extent to which electoral institutions aggregate preferences (Powell, 2000). Proportional Representation (PR) systems provide a relatively low level of preference aggregation; many parties exist and are elected to the legislature. PR legislatures are highly representative of social preferences and the body is divided among a large number of preference groups (parties). This division is known as fractionalization (Rae, 1967; Lijphart, 1994), and bargaining costs to reach final legislation are high relative to less fragmented legislatures. Majoritarian electoral systems, on the other hand, provide a high level of preference aggregation, where only a few parties are elected to the legislature. In single-member-district systems, often only two parties exist (Duverger, 1963). As such, they have low level of preference fractionalization (low representation), and the costs of bargaining to arrive at final legislation are lower than that of PR systems (Powell, 2000).

Parties are not always the most informative measurement of political competition. Scholars have identified weak parties and weak party systems as an important feature of Latin American politics (Mainwaring, 1999; Roberts & Wibbels, 1999). In these political systems, analysis of the electoral systems using number of parties as an outcome variable tells us less about the extent to which the political process is open to political groups. The relevant political organizing principle in these countries is that of clientelistic networks of personal relations. Electoral

coalitions are formed based on personal relationships and electoral math. Politicians, who join forces with other politicians to compete in an election, win office and allocate state resources, such as public sector jobs and contracts, among their winning coalition. Political competition is fierce, but party affiliation plays only a minor role in coalition and voter decisions. In this context, to say that larger district magnitude leads to more parties in government says nothing about how electoral rules affect the preferences represented in government. A more appropriate means to analyze the electoral system in terms of the extent to which electoral rules open the legislature to political groups, one should replace the number of parties with the number of coalitions as an outcome variable.

1.2.2 Competition outside of Elections

A common concern in the democratic accountability literature is that, "Where the election ends, tyranny begins (Madison, 1787, #53)." The fact that most modern democracies do not devolve into tyranny in non-election years has prompted contemporary scholars to search for the sources of democratic accountability. Madison's answer was that competent men of public spirit should be continually approved in frequent elections (Madison, 1787, #53). Contemporary literature echoes this argument using the language of principle-agent theory. Good agents are selected in the election process (prospective voting), and then their record is reviewed and approved or rejected in subsequent elections (retrospective voting) (Przeworski & Stokes, 1999). The same view is apparently held by many legislators in Brazil, where one explained, "The first election is about what you say you're going to do. The rest are about what you have done." In reality, it is never this clear. Journalists write extensively about the past semi-public work of first-time candidates, and many incumbents with poor records have won elections based on their next-term

agenda[2]. Nevertheless, it is sufficiently clear that if voters are to judge the fitness of their government for reelection, they need information on its performance. Voters gather much of this information from their experiences. Economic performance and public service quality are outcome variables that affect a voter's evaluation of his or her government. However, the voting decision will also benefit from information about the government's activities and effort, not just outcomes. Some outcomes are simply not observable to the general public. For example, is the government conducting its public bidding in a proper manner? Is the government investing sufficient resources in water transportation and storage? Is the government following budgeting procedures? Is it hiring based on competency or kin relations?

Political competition is useful not only for providing choice during an election, but also in helping the public monitor and control their representatives outside of election periods. Inter-branch competition (checks and balances) provides monitoring and enforcement. For example, the legislature supplies oversight to the executive branch, and can also take concrete steps to sanction other branches that encroach upon it. Intra-legislative competition, on the other hand, may bring about both monitoring and enforcement, but enforcement against the executive branch will be scarce if the executive controls a majority of the legislature. When the size of the legislative opposition falls below a set voting threshold, the opposition is powerless to take concrete actions against the majority. Its best alternative, in this case, is to use its intimate knowledge of the legislative process and government activities to embarrass the government in a public forum. For example, the key voting threshold in Brazilian Municipalities is 1/3. Without possession of 1/3 of the legislative seats, the Majority in the legislature can pass any legislation it

[2] The recent victory of Brazilian President Dilma Rouseff is an example of this. She was the incumbent with a history of poor economic management. In a change election, she ran on the platform of "more change," and won the election based on her agenda, not her track record.

likes. The opposition has no effective power. As one majority councilor put it, "Without 1/3 they can't affect the functioning of the council. All they can do is complain."

Yet public complaints and theater from the opposition can play an important role in holding the government accountable. When the opposition's representation is below the critical voting level, adding even just a few more opposition legislators can change the debate through agitation, delays, and public pressure.

1.2.3 Majority and Opposition Coalitions in Brazilian Municipalities

The district magnitude can affect the strength of the opposition, which is the set of political groups that are outside of the government, looking in. If multiple political groups are in the opposition, they will often unify to criticize the government in an attempt to eventually win back power. Opposition promotes accountability. At times the opposition's criticisms will be contrived and bombastic, but sometimes they will carry merit. Through public discourse, the ambitious opposition raises questions to which the majority must respond if it is to maintain power in subsequent elections. This is the manner in which competition generates information that is relevant to voter choice. One Brazilian opposition councilor described his experience as follows:

> *The mayor could run us over with a tractor. Anything he needs is going to pass, and pass quickly. His son is the President of the Legislature. A cynic would say that we're basically an extension of the mayor's office.*
>
> *When there were 10 councilors, the mayor had 8 in his coalition. Now there are 15 councilors and he has 11 or 12. Before, he won with no problem. Now, he wins at war. Nobody likes to win at war, so he has been more hands off.*
>
> *Because we don't have a majority, we only have two ways to put the mayor on the defensive (1) Invite lots of people to the sessions, so then the majority has less courage to pass the mayor's agenda. (2) We don't have access to the press, because they have contracts with the legislature and mayor's office. Social media is what saves us. Me and [another opposition councilor] have the most weight on Facebook. That's where we denounce the government.*

It is clear that just adding one or two opposition councilors, even while remaining below the 1/3 vote threshold, can pose challenges to the mayor's legislative agenda. In some cases, it might require more persuasion or fiscal resources to pass an important project. A city councilor observed,

> *The mayor needs to work harder to convince more people that something is a good project. In the past, he just had to convince 7 city councilors, but now he needs to convince 9 councilors.*

An increase in opposition legislators also brings the chance that some of them might be fanatical, as in the case of this legislator who believes his sole purpose as a legislator is to investigate the mayor's office:

> *I am religious and I know I was put here for a reason. I need to investigate and call out corruption in government.*
>
> *I have been denouncing several things since 2000. In 2008 I made a denunciation and I was sued for R$ 500,000. I had R$ 3 million in court cases against me and my newspaper when I decided the only way to change this was to enter politics. I decided to become a candidate in May of 2012. I didn't do any campaign strategy or planning. I created a 4 page brochure on what I was going to investigate, and I distributed 10,000 of them. That was my entire campaign.*
>
> *I ended last year with 500 official data requests to the mayor. This year, I have 400. I use my time to investigate and get answers. I'm known as the councilor who investigates. Most of the tips come to me through my blog or Facebook, but some people even send me denunciations on WhatsApp.*
>
> *I walk with security yes, because I get threats for the stuff that I do. For a while I had two bodyguards, and now I have just one.*

As important as opposition legislators might be for accountability, they are relatively uncommon. Without the mayor's help, it can be an uphill battle for an opposition councilor to win reelection. The mayor is uncooperative with data requests from opposition legislators, and he may even be slow to respond to service requests from the opposition legislator's constituents. During the campaign, opponents paint the opposition legislator as somebody who cannot provide for the community:

> *It's good to be seen as a sponsor of a public works project. If you're in the opposition, that project is still going to happen. But the Mayor won't invite you to the inauguration and he's going to praise another councilor at the ceremony.*

Equally bad, an opposition legislator will not have access to public sector jobs for his political supporters:

> *I was the mayor's guy in the legislature, but then I started to grow politically. The mayor felt threatened and so he retaliated. I had the right to 8 appointed jobs in the mayor's office, and then he took those jobs away from me.*

The payoff for majority members remaining loyal to the mayor is handsome. Majority legislators have access to the mayor and the public resources that he or she controls. These resources are an important leg-up when elections arrive. However, the majority trades the ability to criticize the administration, and they are expected to defend it against the opposition and against angry citizens. It can be painful for majority legislators to sit in session after session, bearing the brunt of the opposition's criticisms, especially when they are warranted. When the opposition consists of only one or two dissidents, it is easy to give them their turn to speak, and then move on with business. But when the opposition is three or four people, the psychological stress of the criticism mounts. Three or four opposition councilors can tie up debate and summon a vocal gallery and street protestors in a way that one or two councilors cannot. The practical effect of the ability to generate a protest of critical mass means the mayor cannot rely on the legislative majority to vote with him every time the opposition is against his agenda. The uncertainty associated with a stronger opposition means the mayor must be more discriminating in which legislative initiatives he promotes. As a result, the legislature increases its independence from the executive.

1.3 POLICY BACKGROUND

1.3.1 Government and Elections in Brazilian Municipalities

Brazil has been independent for almost 200 years, but the current State, the 5th Republic, is only a quarter of a century old. The Constitution was passed in 1988, and it determines the institutional order in all of Brazil. Article 18 of the constitution establishes a federal structure where municipalities are considered to be autonomous federal units:

> *Art. 18: The political-administrative organization of the Federal Republic of Brazil is composed of the Union, the States, the Federal District and the Municipalities[3], all autonomous, in terms of this constitution.*

Article 30 lists the responsibilities of the municipalities to deliver local services and legislate on matters of local interest. The largest expenditures of the municipalities in 2013 were Education, Health, Administration, and Infrastructure. Article 29 outlines the essential characteristics of the municipality, including the size of the legislature:

> *Art. 29: The Municipality will rule itself through an Organic Law…ratified by two-thirds of the municipal legislature in two separate votes, attending to the following principles:*
>
> *I – Election of a Mayor, Vice-Mayor, and City Councilors, for terms of four years, through a direct election simultaneously realized across the entire country.*
>
> *II – Election of the Mayor and Vice-Mayor up until 90 days before the end of the term of those whom they will succeed, following Article 77 [runoff required], if there are more than 200 thousand voters.*
>
> *III – Inauguration of the Mayor and Vice-Mayor on the 1st of January in the year following the election.*
>
> *IV – Number of City Councilors proportional to the population of the Municipality, observing the following limits*
>
> *a) A minimum of 9 and maximum of 21 in Municipalities with up to one million inhabitants*
> *b) A minimum of 30 and maximum of 41 in Municipalities with more than one million and less than five million inhabitants*
> *c) A minimum of 42 and a maximum of 55 in Municipalities with more than five million inhabitants.*

[3] Brazil has roughly 5,500 municipalities, each with a geographical extent comparable to that of U.S. Counties. Brazilian municipalities are typically composed of multiple urban centers surrounded by rural areas.

> *V – Remuneration of the Mayor, Vice-Mayor, and City Councilors fixed by the Municipal Legislature for the following legislature, observing the terms of [other constitutional articles]*.

In summary, the 1988 constitution defines municipalities as autonomous entities with significant responsibilities. Their institutional structures are highly standardized with a Mayor and Vice-Mayor who run on the same ticket, and a municipal legislature. They are all subject to the same electoral rules under the control of the Electoral Court System, whose highest body is the Supreme Electoral Tribunal (TSE). The fact that the electoral rules are outside the purview of local officials and applied in a rational manner offers a promising environment in which to study their effects.

1.3.2 Federal Guidelines for Size of Municipal Legislature

The number of municipal council seats has varied significantly over time from 2000 to 2012, with large change episodes occurring in 2004 and in 2012. Figure 1-1 shows this pattern in Brazil's 5,500 municipalities, as well as how the number of seats in each municipality are related to population. The large changes are evident with municipalities losing seats between 2000 and 2004, maintaining the same number of seats from 2004 to 2008, and then a large increase in seats in 2012. These large fluctuations were the results of deliberate policy changes over the past 15 years.

Article 29 of the 1988 Constitution sets a minimum of 9 and a maximum of 21 city councilors for municipalities under 1 million inhabitants. It also, in a clause that would later generate much confusion and litigation, required that the number of councilors be in proportion to the population of the municipality. The controversy emerged around whether the proportionality implied an arithmetic rule.

Throughout the 1990s and until 2002, "it was the TSE's understanding that that Constitution did not establish arithmetic criteria for the calculation of the proportionality, leaving the Municipality with the autonomy to set it, as long as it complied with the limits in Article 29, part IV.[4]" This approach resulted in a situation where the number of council seats bore little relationship to population. Some municipalities had too few seats given their population (e.g. Sumaré with 13 seats for 168,000 people), and some municipalities had too many seats (e.g. São Manuel with 21 seats for 38,000 people). This all changed in May 2004 with the Supreme Court's ruling in the Mira Estrela case.

Mira Estrela is a tiny municipality of three thousand inhabitants in the northwest of São Paulo state. It had established the size of its city council at 11 seats through an Organic Law, using the procedure laid out by the constitution. The choice of 11 seats was not well received by São Paulo's Public Ministry[5], who interpreted the law as unconstitutional. It argued that such a small municipality should have nine seats to meet the "proportionality" standard in Art 29, Part IV of the constitution. It sued Mira Estrela, and the case eventually ended up in the Supreme Court (STF). The lead Justice assigned to the Mira Estrela case was Maurício Corrêa. Justice Corrêa and the majority of his colleagues ruled that the concept of proportionality was "empty" without an established arithmetic rule, and they directed the TSE to implement one for the September 2004 municipal elections. In their decision, they defined a rule using the following reasoning: From the fact that municipalities with one million have 21 representatives, this implies one representative per 47,619 inhabitants. But since the 1988 constitution requires at least 9

[4] Page 378 of Recurso Extraordinário 197.917-8 São Paulo, Voto do Relator Ministro Maurício Corrêa

[5] The Public Ministry has no equivalent in the United States. It is a Prosecutorial office with broad powers to bring civil cases against governments, corporations, and individuals as it sees fit with the end goal of defending the constitution.

representatives per municipality, apply this number to any municipalities with fewer than 47,619 inhabitants, and add one more representative for each increment of 47,619 people. This formula generates a piecewise representation profile that rises quickly to the maximum of 21, and then flattens out at 47,619 + (11*47,619) = 571,428 inhabitants until 1 million inhabitants. Municipalities above one million, of which there are fewer than ten, receive a slightly different treatment. After 16 years of confusion, the Mira Estrela case finally established clear guidance on the number of seats in the municipal legislature.

The practical result of the Mira Estrela case was a sizeable reduction in the number of city council seats from around 60,000 to 50,000 in the entire country. Perhaps predictably, it also engendered angry responses from the political establishment. Many politicians felt that their legislative powers had been usurped by an activist Supreme Court, and an amendment was immediately introduced to reestablish the number of municipal legislature seats. The amendment took several years to work its way through the process and was finally ratified as the 58th Amendment on Wednesday, September 23 of 2009. While the impetus for the amendment was the Mira Estrela case and the issue of representation, Congress recognized that the public would not accept an increase in municipal legislature size without some kind of budgetary control. Accordingly, the 58th Amendment contained articles that modified the number of municipal representatives in Art. 29 IV, as well as tightened the budgetary caps that had previously been specified in the Constitution (Art. 29-A.)

The first article of the 58th amendment dramatically increased the maximum permissible number of representatives above what had been the Mira Estrela rule. It specified the maximum number of representatives for 23 separate population segments, clarifying the relation between

population and representation. The language for municipalities with up to 1,050,000 inhabitants was as follows:

Art. 29, IV: For the Composition of Municipal Legislatures, the following limits will be observed:
a) 9 councilors, in municipalities up until 15,000 inhabitants;
b) 11 councilors, in municipalities of more than 15,000 and up until 30,000 inhabitants;
c) 13 councilors, in municipalities of more than 30,000 and up until 50,000 inhabitants;
d) 15 councilors, in municipalities of more than 50,000 and up until 80,000 inhabitants;
e) 17 councilors, in municipalities of more than 80,000 and up until 120,000 inhabitants;
f) 19 councilors, in municipalities of more than 120,000 and up until 160,000 inhabitants;
g) 21 councilors, in municipalities of more than 160,000 and up until 300,000 inhabitants;
h) 23 councilors, in municipalities of more than 300,000 and up until 450,000 inhabitants;
i) 25 councilors, in municipalities of more than 450,000 and up until 600,000 inhabitants;
j) 27 councilors, in municipalities of more than 600,000 and up until 750,000 inhabitants;
k) 29 councilors, in municipalities of more than 750,000 and up until 900,000 inhabitants;
l) 31 councilors, in municipalities of more than 900,000 and up until 1,500,000 inhabitants;

Article 1 of the 58th Amendment, which permitted large changes in the size of the municipal legislature, entered into force with the 2012 municipal elections. The change in legislature size was substantial for some municipalities. For example, the municipality of Salto with 107 thousand residents expanded its legislature from 11 councilors to 17 councilors in 2012. This represents a greater than 50% increase in legislature size.

1.4 METHODS OVERVIEW

This paper uses an iterative mixed-methods approach (Lieberman, 2005) to understand the political effects of a change in district magnitude. I conducted an initial large-N analysis to uncover potential avenues of study and to inform case selection. I selected municipalities and city councilors, their staff, and journalists to interview about their experiences with the decision to expand the legislature and with the seat increase. I used semi-structured interviews to develop contextual knowledge and produce testable hypotheses about the impact the policy had on political competition. Excerpts from these interviews are interspersed throughout this paper

because they present a rich illustration of politics in Brazilian municipalities and because they are direct descriptions from people who experienced an increase in district magnitude first-hand.

The case selection proceeded primarily from the relationship between change in council size and change in the number of candidates running for office in São Paulo. Figure 1-2 shows how municipalities in the state of São Paulo experienced an increase in the number of candidates as they expanded their councils between the 2008 and 2012 elections. The increase in candidates presents little surprise, since the electoral rules reward electoral coalitions that grow their candidate lists in proportion to the number of seats. However, there is a large degree of variation in how the seat expansions affected the number of candidates. Some municipalities added only a few candidates per seat, and some added as many as 50 new candidates per seat. To discover what additional factors affect the number of candidates (and election dynamics in general), the case selection sought to choose municipalities that fit into one of four categories depending on whether the increase in candidates was expected given the change in number of seats and depending on the extent to which the municipality increased its legislature size. Table 1.1 shows how the selected municipalities fit into the given selection criteria. The goal in examining cities where candidate increases were expected is to see the causal mechanism in action under "normal" circumstances. Franco da Rocha and Salto experienced roughly average outcomes. Franco da Rocha added no seats and saw little change in the number of candidates from 2008. Salto added six seats and 150 new candidates, which is just above what would have been expected given a six seat increase. The "off the line" cases of Itu, Arujá, and Barueri are intended as challenges to the notion that larger district magnitude brings about more candidates. In each of these cases, I paid close attention to competing factors that affected the number of candidates in the race. I found that their "anomalous" behavior was due to mayoral political

competition. Council candidate totals were reduced where the mayoral race was a lock for an incumbent mayor, and they increased where the mayoral race was particularly tight. The nature of the race (i.e. incumbent or open) is clearly an important factor in candidate participation, which suggests it should also be included in any model that examines related outcomes such as number of parties or number of coalitions. Figure 1-3 shows the historical levels for number of seats and number of candidates for the past 3 elections. One can verify, even from this small number of cases that there appears to be a relationship between number of seats (solid line) and the number of candidates, though at least one municipality (Arujá) bucks the trend and one municipality, Barueri, seems over-sensitive to the seat change. Again, the missing factor that explains these trends were that Arujá had a particularly non-competitive mayoral election that year, while two well-known politicians ran for mayor in a hypercompetitive Barueri election.

Case selection also necessarily faced a practical constraint, which was that the municipalities were within reasonable travel distance of São Paulo. As such, the selected cases are all located within two hours of the city of São Paulo. I conducted approximately 25 interviews with city councilors, staff members, and journalists across the five municipalities during the fall of 2014.

1.5 POLITICAL FRAGMENTATION

The electoral systems literature has traditionally focused on the number of parties as an important outcome of the electoral institutions. This section shows how coalitions, not parties, are the appropriate grouping for political competition in the context of Brazilian municipalities. It also estimates the impact that a change in district magnitude has on the number of parties and on the number of mayoral coalitions.

1.5.1 Political Parties and Coalitions in Brazilian Municipalities

The literature in Political Science has traditionally seen Brazil as having an especially weak party system (Mainwaring, 1999). Over the past decade, scholarship on Brazilian Parties has noted substantial change. At the national level, party voting discipline has steadily improved and party switching is less endemic. Part of this strengthening at the national level is that parties have learned how to leverage the distribution of important electoral resources such as public campaign funds and advertising time to support candidates for national and state government. Furthermore, independent candidates are not allowed. A candidate must be a member of a party to run for any public office. The seat now technically belongs to the party (Brazilian Government, 1995), and parties are no longer required to automatically re-nominate their incumbent legislators. Consequently, Brazilian parties have increasing control over who they present as candidates.

The advances in strengthening the Brazilian Party System at the Federal and State levels have been less pronounced in municipal politics. The same rules apply at the Federal and Municipal levels in that every candidate must be a member of a party and parties are the basic unit of competition defined in electoral law. In practice, however, local politicians say that mayoral coalitions, rather than parties, compete. In the words of one city councilor,

> *The parties don't have independence. The Mayor has control over all the parties. Our Mayor has 12 parties under his control. If he wants to pull people out of the [legislative] opposition and increase his majority, he does the following: He finds a councilor candidate that had good voting, but lost the last election. He creates a new party for that councilor and puts 10 more people in that party to get votes and make it strong in the next election…He installs a party that doesn't have a presence in town and he tells the state party, I'll pay (e.g. $10,000 per month) to operate the party here.*

The municipality of Barueri increased the number of seats by seven in 2012, and the number of candidates jumped by four hundred. The reasons for this show just how parties mean little

beyond a formal rule with which politicians must comply. The precipitous increase in candidates happened in Barueri because,

> *We used to have just one political group. Then there was a divergence between two of the main leaders. Gil Arantes put together a mega-group to run with him, and so Furlans had to do the same thing. They started to say, "I need you in the dispute." This had very little to do with candidates just deciding to run on their own. We ended up with more parties because we needed more boxes to hold all the new candidates."*

The mayoral candidates provide the bulk of the campaign financing to their coalition's council candidates. One councilor pointed out that companies do not give money to councilors. Businesses donate to the campaign funds of the mayors, and then the mayors use that money to finance their "team" in the legislature. Powerful rivals also mount mayoral campaigns with their own group of legislative candidates. Political endorsements are traded within these coalitions. Figure 1-4 illustrates that it is uncommon for a party to remain outside of a mayoral coalition. In over 3,000 of 5,500 municipalities in 2012, 100% of the parties joined a coalition. In 4,000 municipalities, over 90% of the parties were in a coalition. In short, joining an electoral coalition is standard procedure for most local Brazilian parties.

The party label is just as meaningless for new candidates, some of whom put surprisingly little thought into which parties to join. They understand that they must be in a party to run, but base their choices more on personal connections than ideological affinities. I witnessed an exchange between the secretary of a party president and a prospective candidate who had arrived at the office to join a party:

> ***Man**: I want to join the party.*
>
> ***Party Secretary**: Ok, but we can't start taking registration until next year. I'll call you in January if you leave your number.*
>
> ***Man** leaves his phone number, and begins to leave the office.*
>
> ***Party Secretary**: Oh, by the way, the party is PROS.*
>
> ***Man**: Sure, whatever.*
>
> ***Me**: Why did you come here to register instead of another office?*

***Man**: I've seen this councilor around town and I like him.*

I asked other councilors why they joined their parties, and they often said it was through their network of friends. Aside from PT councilors, most councilors regarded their parties as nothing more than a platform from which they ran for office.

The claim that coalitions are the primary unit of political competition at the local level is not to deny that some local parties are reasonably independent. Programmatic parties like the PT and PSOL are more responsive to party leadership, but even they face the cold, hard electoral math of electoral coalitions.

> *I'm the President of the PT in this town…If the PT's vote count falls in the next election, then we would be concerned about colligating with Sebastian [President of the PSCD party]. Ideologically, he is the party of the opposition. But also – mathematically – he has 1700 votes. One wants to take advantage of the other, but since you don't know exactly what is going to happen, you run the risk.*
>
> *We support the end of the electoral coalition, but meanwhile we are a political party. PSOL won't colligate for ideological reasons and they don't get elected. What is the point of that? The coalition distorts because you need to cooperate to get in, to not be out of the game, but two parties on opposite side gay marriage can be selected together.*

1.5.2 District Magnitude, Parties, and Coalitions in Brazilian Municipalities

The number of seats in a district, the district magnitude, is an important institutional driver of the extent to which political rivals coordinate before or after an election. The preceding discussion makes clear that electoral rivalry occurs at the level of coalitions and not parties.

We should expect an increase in the district magnitude to increase the number of candidates and the number of parties in a municipality. The number of candidates that a party or coalition is permitted to field is a proportional function of the number of seats, and parties benefit by having their lists as full as possible. It is true that there is a minor tradeoff between the quality and quantity of council candidates, since low quality candidates might not be worth the coalition's campaign funding. These considerations, however, seemed to take a backseat to the evaluation

among councilors that more candidates contributing their votes to the coalition was a preferable strategy. The immediate barrier to increasing the number of coalition candidates was the number of parties available to house these candidates. Mayors often created new parties to install the additional candidates, which is why we should expect to see that the number of parties increase as do the number of council seats.

Brazil's electoral coalitions must formally register with the electoral authority, so it is possible to objectively define a coalition. Using the coalitions as the unit of political competition[6], we should expect to see an increase in their numbers as the council size expands. A change in the number of coalitions reflects changes in pre-electoral coordination. If more political actors believe they have a chance to win office due to changes in electoral rules, then they will be less likely to join a big coalition. They might even go it alone, which would increase the number of coalitions. A change in the number of coalitions that win seats, beyond the increase in all coalitions, reflects factors such as the electoral formula (mechanical effect) and voter coordination (voter psychological effect). Research has found that voters have a difficult time voting strategically in districts with magnitudes greater than five seats (Cox, 1997). It is unlikely that voters are able to coordinate in these races, so the electoral effect is likely to be a pure mechanical effect of the electoral formula allowing more coalitions into office.

An increase in mayoral coalitions necessarily means an increase in the number of mayoral candidates. One might wonder what effect the change in seats has on the competitiveness of the mayoral race. Might more seats and more coalitions reduce the average vote share that wins

[6] If a political party does not join a coalition, it counts as a coalition for measurement purposes.

mayoral races? Might more candidates impede the ability of voters to coordinate their votes in a majoritarian election (Cox, 1997)? I test these considerations.

1.5.3 Model & Data

I estimate the effect of an increase in seats for several outcome variables, including for the number of parties, the number of parties winning a council seat, the number of coalitions, the number of coalitions winning a council seat, the number of candidates, the winning voteshare for the mayoral race, and the FS difference.

The FS difference is a modification of Cox's "FS ratio." It measures the difference in voteshare between the first and second loser of a majoritarian election, like the municipal mayoral race. An increasing FS difference is evidence that voters are strategically concentrating their votes in the top two candidates.

Brazilian mayors may be elected to two consecutive terms, and incumbency is a powerful advantage in the elections. Municipalities in which the mayor has experienced a good first term and is cruising to re-election will not engender as much competition. One would expect fewer parties and fewer candidates to join the race. The incumbency status may also be correlated with the probability that a municipality increase its council size. For example, incumbent mayors might be less likely to support council size increases since they know larger councils will make their work more difficult in their second term. Thus, an indicator is included to identify whether the election is one in which an incumbent is running.

All outcome variables are modeled identically, relying on the difference between the 2008 and 2012 elections for identification. The OLS model is:

$$\text{Outcome}_{\text{it}} = \beta_0 + \beta_1 \text{Seats}_{\text{it}} + \beta_3 \text{Incumbent}_{\text{it}} + \beta_4 \text{LogPop}_{\text{it}} + \gamma_i + \delta_t + \epsilon_{\text{it}} \qquad (1)$$

The parameter of interest is β_1, which estimates the effect of an increase in seats on the outcome variables. While incumbency is included in the model primarily as a control, β_3 is also intrinsically interesting. It shows the effect that an incumbent election has on the level of political competition, as measured by the outcome variables. The log of population is included as a control variable. Municipal fixed effects, γ_i, are included to factor out slow moving factors like political culture, economic development, or regional tendencies. A time fixed effect, δ_t, controls for general trends between the 2008 and 2012 elections. ϵ_{it} is the unexplained component of the model. In addition to an OLS estimation, the models are estimated using 2SLS to judge the robustness of the results. The instrument for seats is the ceiling proscribed by federal legislation discussed above.

$$\text{Outcome}_{\text{it}} = \alpha_0 + \alpha_1 \hat{\text{Seats}}_{\text{it}} + \alpha_3 \text{Incumbent}_{\text{it}} + \alpha_3 \text{LogPop}_{\text{it}} + \psi_i + \zeta_t + \nu_{\text{it}} \qquad \text{(2-A)}$$

The first stage is modeled using the seats instrumental variable and the other exogenous covariates that appear in equation 2-A.

$$\text{Seats}_{\text{it}} = \pi_0 + \pi_1 \text{SeatsIV}_{\text{it}} + \pi_3 \text{Incumbent}_{\text{it}} + \pi_3 \text{LogPop}_{\text{it}} + \theta_i + \lambda_t + \eta_{\text{it}} \qquad \text{(2-B)}$$

I obtained the data from Brazil's Electoral Authority (Tribunal Superior Eleitoral (TSE) do Brasil, 2015). It was necessary to calculate the dependent variables and the indicator for an incumbent election, since this information is not provided directly by the TSE.

1.5.4 Descriptive Statistics for Fragmentation Variables

There are approximately 5,500 municipalities covered here. Municipalities of greater than one million inhabitants are excluded because there are relatively few of them and the rules that determine their city council size are different than those under 1 million. Brazil has many small municipalities, which is apparent in the size of the electorate and the population in Table 1.2.

The average population for municipalities under 1 million residents is about 27,000 residents in both years, and 15,000 of them voted for a mayoral candidate. The average number of city council seats in 2008 was 9.27, and it increased to 10.25 in 2012. On average this is a one seat increase per municipality, which is just over a 10% increase. In practice, some municipalities increased their councils by a large amount (e.g. 40% or 50%), and others chose not to expand their councils at all. The variation in this independent variable is visible in Figure 1-1.

Table 1.2 is useful to obtain a baseline understanding of the outcome variables. For example, the average municipality has approximately 10-12 political parties, and about half of those parties are elected to the city council. There are fewer coalitions, as would be expected. The average municipality has just over 3 coalitions, which means they have approximately 3 mayoral candidates in a municipal election. On average, 2.5 of those coalitions win seats in the legislature. A high proportion of the elections are ones in which the incumbent mayor is running. In 2008, 57% of the elections were incumbent races, while that number was 44% in 2012. The incumbent certainly is advantaged, but he or she does lose. In 2012, the incumbent won 38% of the elections, and in 2012 the incumbent won 24% of the elections compared to the 44% of the elections in which the incumbent ran.

The average winning vote share for mayor was around 56% - 57%, with a standard deviation of around 13 percentage points. This highlights the fact that many mayors win office with less than (and sometimes significantly less than) the majority of the votes. In other municipalities, mayoral candidates win with 80% - 100% of the vote. The average difference in vote shares between the first losing mayor (second place) and the second losing mayor (third place), is substantial. The FS Share difference is around 24 percentage points, which means that on average, the third placed mayoral candidate does not come close to being competitive.

The number of council candidates running in the 2012 election increased dramatically. In 2008, the average municipality (with 27,000 people) had 56 city council candidates. By 2012, there were 73 candidates for councilor, a 30% increase. On a per seat basis, however, the number of candidates rose only moderately, from 5.8 candidates per seat in 2008 to 6.6 candidates per seat in 2012.

1.5.5 Multivariate Results for Fragmentation Outcomes

Four model specifications are estimated for the outcome variables. The baseline estimate is OLS without the regression controls of population or incumbent election in equation (1). The second specification is the OLS estimate with the population and incumbent election controls in equation (1). The third estimate is the 2SLS from equations (2) without the controls, and the fourth estimate is the 2SLS from equations (2) with the population and incumbent controls. Table 1.3 arranges these estimates into columns. Cells contain the estimates of the effect of a change in one seat on each of the outcome variables.

A series of rows at the bottom of Table 1.3 show how the model specifications are different. Estimates (1) and (3) do not use controls beyond municipal and year fixed effects. Estimates (3) and (4) replace the number of seats with a predicted number of seats given the federal ceiling. The estimates are relatively stable across several specifications that are quite different. Furthermore, the model has enough precision to say that the estimates of seats on party and coalition formation are statistically different from zero.

The model estimates an increase in the number of parties by 0.25 for each additional seat. Municipalities that added four seats could therefore expect one additional party to be created. The model estimates an increase in the number of parties that win a seat by approximately 0.4 per additional seat. Thus, municipalities that expanded their legislature size by two or three seats

could expect another party to be elected. Of course, the discussion above suggests that these parties are not meaningful in the sense that they don't introduce new representation into the legislature.

The effect of the seat increases on the number of coalitions in a municipality is positive but minimal. The estimates suggest that 0.10 coalitions are formed as a result of an additional seat. Thus, a municipality would have to add ten seats in order to expect an additional coalition to be formed in the municipality. The number of seats necessary to elect a new coalition to the legislature is only marginally different. Given that the estimate is 0.15 new coalitions in the legislature per seat, a municipality would have to increase its legislature by six or seven seats in order to bring a new mayoral coalition into the legislature. While these estimates are not practically large, they are interesting in that they show that there is less pre-electoral coordination among coalitions when there are more legislative seats available.

The estimates suggest that the increase in the number of seats did not significantly influence the voteshare with which the mayor won the election. The signs of the estimates are generally negative, but they are also very close to zero, practically speaking. The three negative estimates are generally around one tenth of one percentage point per seat. Assuming these estimates are correct, even the addition of five seats would only reduce the winning voteshare by 0.5 percentage points.

Overall, the estimates show that the increase in the number of seats had the effect in the generally expected direction, but that these effects are not particularly large. This is somewhat expected, given that the district magnitude was already quite high (10 – 15) for these municipalities. However, if we consider opposition rather than fragmentation as an outcome variable, the results show that this reform could potentially have a large impact.

1.6 OPPOSITION

Brazil's system of government is often referred to as Parliamentary Presidentialism. This applies at all levels of government, from the federal government, to the states, and in the municipalities. While the executive is elected independently of the legislature, he or she has the responsibility of constructing a legislative coalition to pursue an agenda. Academics originally expected this arrangement to create political deadlock (Ames, 2001), but Brazilian executives have been generally successful in passing their policy agendas (Melo & Pereira, 2013). The executive is able to offer public sector jobs, pork-barrel spending, and even campaign funds to prospective members of the majority in exchange for their legislative support. The unequal relationship between the executive and the legislature in municipalities means that democratic accountability has taken on a distinct parliamentary style. The shift to larger legislatures in the municipalities has the potential to change the accountability style from one of parliamentarism to something closer resembling presidentialism.

Parliamentary accountability is characterized by a narrower chain of delegation from the voter to the government's activities (Strøm, 2000). The voters hold the ruling party or coalition responsible because they know that the opposition has limited opportunity to interfere or obstruct the ruler's policies. Presidential-style accountability, on the other hand, builds additional conflict into the institutional arrangement in order to increase competition and offer meaningful opportunities for the opposition to have their concerns heard and addressed.

Strøm points out that parliamentary accountability relies heavily on ex-ante selection of "good" politicians, since it is limited in its ability to generate meaningful ex-post monitoring and enforcement (Strøm, 2000). Parliamentary democracies typically achieve acceptable screening of candidates through their parties, which are well positioned enough to deny unacceptable

candidates a chance at office. In Brazil, however, there is a parliamentary accountability model (weak ex-post accountability) without strong ex-ante screening of candidates because politicians select their parties, not the other way around. This is a recipe for weak democratic accountability.

Policies that strengthen the legislative opposition will lead to better ex-post monitoring and potentially even additional enforcement. A stronger opposition improves intra-legislative monitoring, where opposition legislators hold majority legislators to account. It also improves the independence of the legislature, which is supposed to provide oversight over executive operations.

There are two ways in which the legislative opposition can improve its strength. It can improve its proportion, so that it controls a larger voting weight. There are three key thresholds, where an opposition with greater than 33% but less than 51% is in a position to block some legislation. An opposition share of 51% to 66% marks a minority government, and an opposition share of greater than 66% defines a super-minority government.

The opposition can also gain strength independently of how its voteshare changes. Even when voteshare stays constant or falls, additional opposition legislatures introduce an enhanced capacity to wage successful public relations campaigns against the majority. A larger group of opposition legislators, regardless of whether they attain a formal voting threshold, eventually reaches a critical mass where they can complicate parliamentary procedure and facilitate enough meaningful public protest to draw unwanted attention to the majority's actions.

It is not clear that a larger legislature would necessarily increase the proportion of opposition legislators elected to office, but one would expect that it should increase the number of

opposition legislators. There is at least anecdotal evidence that stronger oppositions, even if only in numerical but not proportional terms, encourage greater legislative independence. The effects of an increase in seats on opposition, measured both in numerical and proportional terms, are estimated in the next section.

1.6.1 Descriptive Statistics for Opposition Variables

The means and standard deviations for the key variables used in the opposition analysis appear in Table 1.4. Some of these variables are repeated from Table 1.2, like the seats, population, and proportion of elections with an incumbent. There are two new variables related to the strength of the opposition: the number of opposition legislators and the percent of the seats in the legislature that is occupied by opposition politicians. The table shows that there are typically three or four opposition legislators, which amounts to around 30% to 40% of the total seats. Remembering that 33% is the magic number with which the opposition can begin to impede the mayor's legislative agenda, we see the stakes of adding or subtracting just one opposition legislator. For many municipalities, just one more opposition legislator would be enough to change the formal relationship of the mayor with the legislature.

1.6.2 Multivariate Results for Opposition Variables

The estimates from equations (1) and (2), using the opposition variables as the outcome, are listed in Table 1.5. Opposition increases by between 0.4 and 0.5 legislators for an additional seat. Alternatively stated, a municipality that increases its legislature by two or three seats should expect one additional opposition councilor.

The percentage of councilors in the opposition does not change much as a result of the larger councils. The estimates are all less than an additional 1 percentage point increase per seat, and

three of the four estimates are not statistically different from zero. The instrumented models appear to make a sizeable difference in the estimates of percentage opposition. Using the estimate of 0.5 percentage point increase per seat, a municipality with an increase of five seats would only expand their opposition voteshare by 2.5 percentage points. This might be enough to take them over a threshold, but the effect will be important for only the most marginal elections.

1.7 CONCLUSION

The number of legislative seats in a district is an important institutional factor in political competition. Most scholar studies have used the number of political parties as an outcome variable, yet parties play little to no role in structuring political competition in some polities. This paper examines the effect of a change in district magnitude on alternative conceptions of political competition in Brazilian municipalities, including the number of coalitions and the size of the opposition. Results show that the change in district magnitude has a significant impact on the number of parties, but that the impact is only moderate with respect to the number of coalitions, which is the more relevant outcome variable for competition in Brazilian municipalities. The increase in district magnitude also increases the number of opposition legislators, albeit not necessarily their proportion. There is anecdotal evidence to suggest that a greater number of opposition councilors, even if they do not have increased voting power, may lead to additional independence of the legislature and government accountability.

1.8 FIGURES

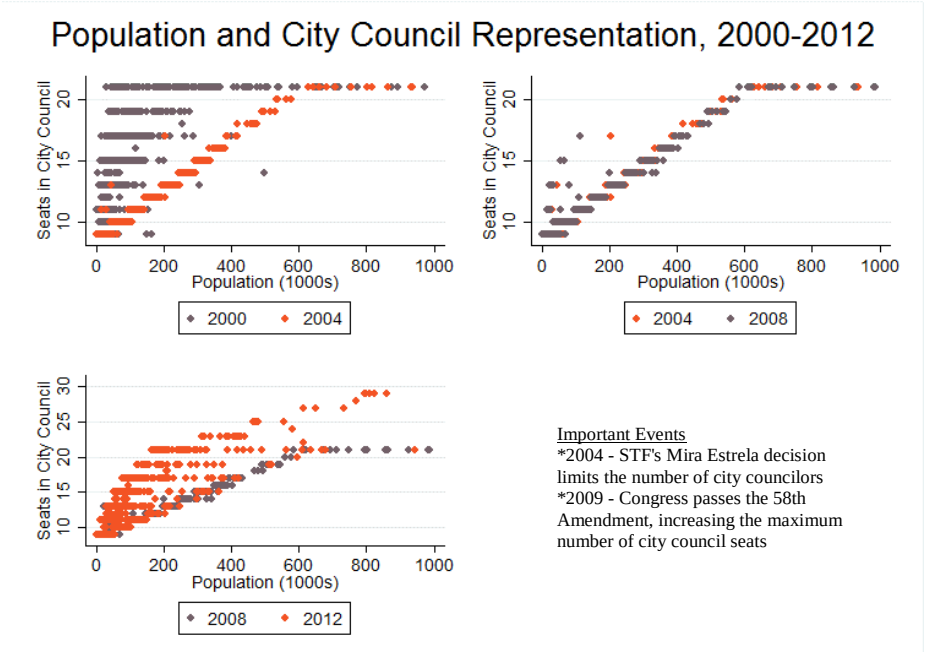


Figure 1-1: Municipal Population and City Council Representation, 2000 – 2012

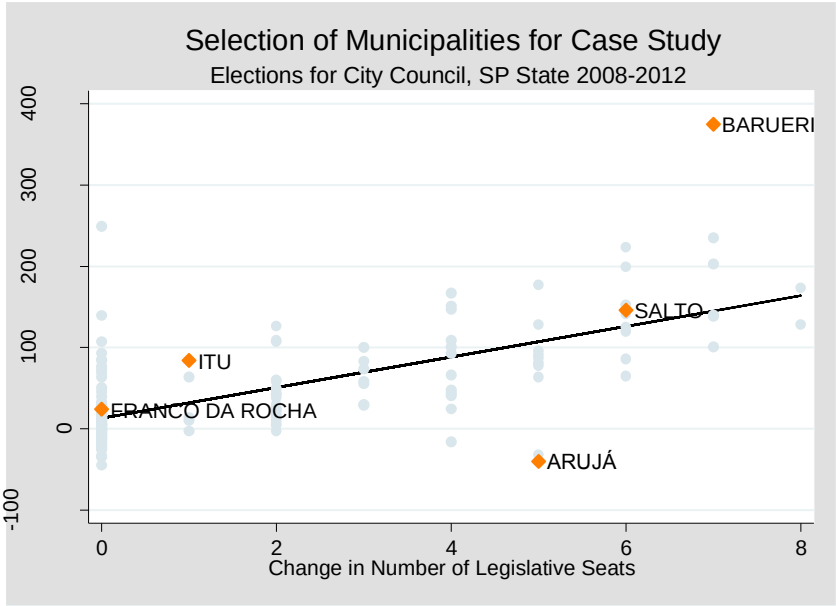


Figure 1-2: Selection of Municipalities for Case Study

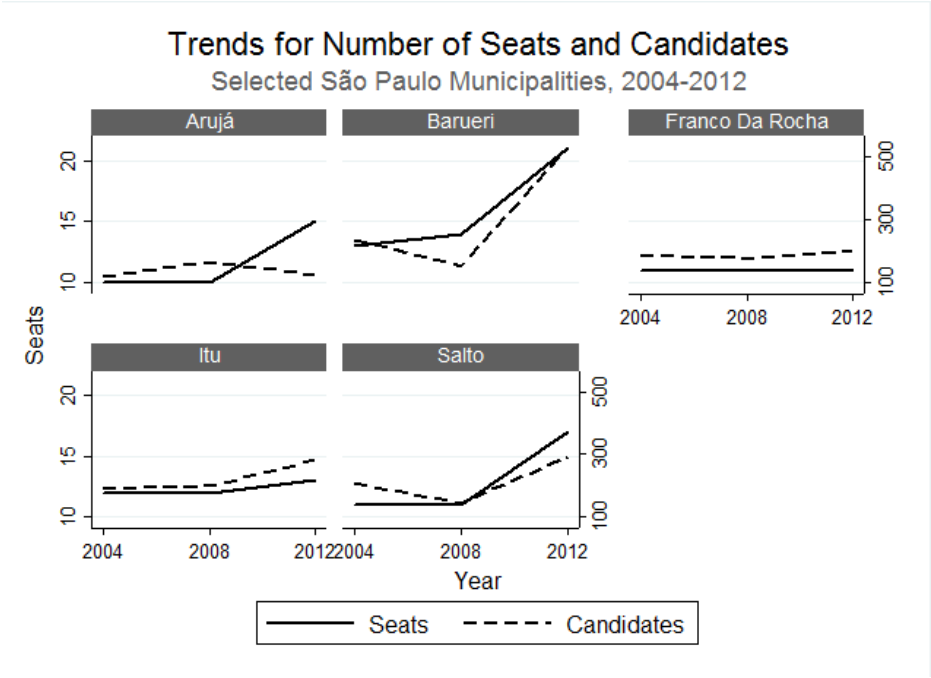


Figure 1-3: Trends for Number of Seats and Candidates in Selected Municipalities

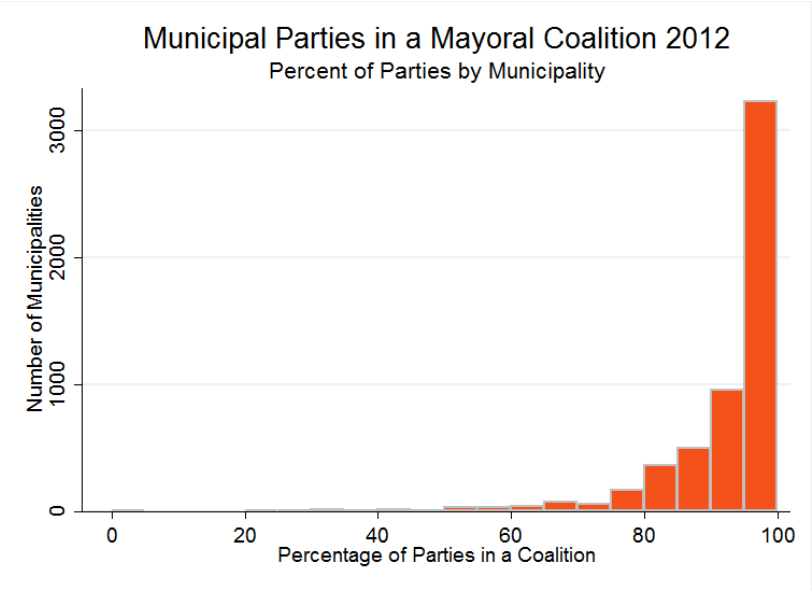


Figure 1-4: Incidence of Municipal Parties in a Mayoral Coalition

1.9 TABLES

Selected Municipalities for Interviews

	Candidate Increase Expected	Candidate Increase Not Expected
No Seat Increase	Franco da Rocha	Itu
Large Seat Increase	Salto	Arujá, Barueri

Table 1.1: Selected Municipalities & Case Selection Criteria

Descriptive Statistics for Fragmentation Variables

	2008		2012		
Variable	Mean	SD	Mean	SD	Notes
Size of Electorate	14970	33069	15150	32141	Votes for Mayor
Seats	9.27	1.16	10.24	2.42	Number of Seats
Population	27.2	64.3	27.3	62.4	1000s of people
Number of Candidates	56.12	44.28	73.35	66.44	
Number of Coalitions	3.32	1.48	3.22	1.50	
Number of Coalitions with Seats	2.63	0.90	2.62	0.96	
Number of Parties	10.94	4.80	12.64	5.33	
Number of Parties with Seats	5.59	1.54	6.40	2.00	
Incumbent Mayor Election	0.57	0.49	0.44	0.50	Yes/No
Incumbent Mayor Won Election	0.38	0.49	0.24	0.43	Yes/No
Number of Candidates Per Seat	5.82	3.44	6.62	3.83	
Winning Vote Share	57.08	13.80	56.08	12.92	Voteshare of winning Mayor Candidate
FS Share Difference	24.48	14.56	24.80	14.83	Mayor Race: First to Second Loser Voteshare
Number of Observations	5495		5501		
**Brazilian Municipalities with fewer than 1M population*					

Table 1.2: Descriptive Statistics for Fragmentation Variables

Summary of Effects of Seats on Outcome Variables

	(1)	(2)	(3)	(4)
Number of Parties	0.227***	0.215***	0.272***	0.255***
	(0.02)	(0.02)	(0.02)	(0.02)
Number of Parties with a Seat	0.416***	0.412***	0.430***	0.425***
	(0.01)	(0.01)	(0.01)	(0.01)
Number of Mayoral Coalitions	0.105***	0.108***	0.106***	0.112***
	(0.02)	(0.02)	(0.01)	(0.02)
Number of Mayoral Coalitions with a Legislative Seat	0.145***	0.147***	0.152***	0.156***
	(0.01)	(0.01)	(0.01)	(0.01)
Number of Mayoral Candidates per Legislative Seat	-0.030	0.131***	-0.034	0.133***
	(0.02)	(0.02)	(0.02)	(0.02)
Winning Mayoral Voteshare	-0.016	0.030	-0.128	-0.078
	(0.14)	(0.13)	(0.18)	(0.18)
FS Share Difference	-0.099	-0.121	-0.270	-0.320
	(0.22)	(0.22)	(0.31)	(0.31)
Municipal Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Seats Instrumental Variable	No	No	Yes	Yes
Population & Incumbent Controls	No	Yes	No	Yes
Number of Municipalities	5498	5498	5498	5498
Population	BR Munis < 1M residents in 2008 & 2012			

*Table shows coefficient estimates and standard errors in parenthesis. Estimates significantly different from zero at the 99% confidence level have three stars ****

Table 1.3: Summary of Effects of Seats on Fragmentation Outcome Variables

Descriptive Statistics for Opposition Variables

	2008		2012		
Variable	Mean	SD	Mean	SD	Notes
Seats	9.27	1.16	10.24	2.42	Number of Seats
Population	27.2	64.3	27.3	62.4	1000s of people
Incumbent Mayor Election	0.57	0.49	0.44	0.50	Yes/No
Number of Opposition Legislators	3.38	1.90	4.26	2.26	
Percentage of Opposition Legislators	36.52	19.97	41.51	18.90	
Number of Observations	5495		5501		
**Brazilian Municipalities with fewer than 1M population*					

Table 1.4: Descriptive Statistics for Opposition Variables

Summary of Effects of Seats on Opposition Outcome Variables

	(1)	(2)	(3)	(4)
Number of Opposition Legislators	0.441***	0.436***	0.489***	0.484***
	(0.03)	(0.03)	(0.03)	(0.03)
Percent Opposition Legislators	0.155	0.096	0.510**	0.455*
	(0.22)	(0.22)	(0.26)	(0.26)
Municipal Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Seats Instrumental Variable	No	No	Yes	Yes
Population & Incumbent Controls	No	Yes	No	Yes
Number of Municipalities	5498	5498	5498	5498
Population	BR Munis < 1M residents in 2008 & 2012			

*Table shows coefficient estimates and standard errors in parenthesis. Estimates significantly different from zero at the 99% confidence level have three stars ****

Table 1.5: Summary of Effects of Seats on Opposition Outcome Variables

1.10 REFERENCES

Acemoglu, D., Johnson, S., & Robinson, J. A. (2002). Reversal of Fortune: Geography and Institutions in the Making of the Modern World Income Distribution. *The Quarterly Journal of Economics*, *117*(4), 1231–1294. http://doi.org/10.1162/003355302320935025

Aldrich, J. H. (1995). *Why Parties?: The Origin and Transformation of Political Parties in America* (1 edition). Chicago: University of Chicago Press.

Ames, B. (2001). *The deadlock of democracy in Brazil*. Ann Arbor: University of Michigan Press.

Brazilian Government. LEI Nº 9.096 - Political Party Law, LEI Nº 9.096 (1995). Retrieved from http://www.planalto.gov.br/ccivil_03/leis/L9096compilado.htm

Cox, G. W. (1997). *Making votes count: strategic coordination in the world's electoral systems*. Cambridge, U.K.; New York: Cambridge University Press.

Desposato, S. W. (2006). The Impact of Electoral Rules on Legislative Parties: Lessons from the Brazilian Senate and Chamber of Deputies. *Journal of Politics*, *68*(4), 1018–1030. http://doi.org/10.1111/j.1468-2508.2006.00484.x

Duverger, M. (1963). *Political Parties* (2nd English Edition edition). John Wiley & Sons.

Lieberman, E. S. (2005). Nested Analysis as a Mixed-Method Strategy for Comparative Research. *American Political Science Review*, *99*(03), 435–452. http://doi.org/10.1017/S0003055405051762

Lijphart, A. (1994). *Electoral Systems and Party Systems: A Study of Twenty-Seven Democracies, 1945-1990*. Oxford University Press, USA.

Madison, J. (1787, 1982). Federalist Paper #53. Bantam Books.

Mainwaring, S. (1999). *Rethinking Party Systems in the Third Wave of Democratization: The Case of Brazil*. Stanford University Press.

Melo, M. A., & Pereira, C. (2013). *Making Brazil Work: Checking the President in a Multiparty System*. Palgrave Macmillan.

Mill, J. S. (1956). *On Liberty*. (C. V. Shields, Ed.) (1 edition). Upper Saddle River, N.J: MacMillan.

Moser, R. G., & Scheiner, E. (2012). *Electoral Systems and Political Context: How the Effects of Rules Vary Across New and Established Democracies*. Cambridge: Cambridge University Press.

Powell, G. B. (2000). *Elections as Instruments of Democracy: Majoritarian and Proportional Visions*. New Haven, CT: Yale University Press.

Przeworski, A., & Stokes, S. C. (1999). *Democracy, Accountability, and Representation*. Cambridge University Press.

Putnam, R. D. (1994). *Making Democracy Work: Civic Traditions in Modern Italy*. Princeton University Press.

Rae, D. W. (1967). *Political Consequences of Electoral Laws* (Revised edition). New Haven: Yale University Press.

Roberts, K. M., & Wibbels, E. (1999). Party Systems and Electoral Volatility in Latin America: A Test of Economic, Institutional, and Structural Explanations. *American Political Science Review*, *93*(03), 575–590. http://doi.org/10.2307/2585575

Rousseau, J.-J. (1968). *The Social Contract*. (M. Cranston, Trans.). Harmondsworth: Penguin Classics.

Schumpeter, J. A. (2008). *Capitalism, Socialism, and Democracy: Third Edition* (unknown edition). New York: Harper Perennial Modern Classics.

Strøm, K. (2000). Delegation and accountability in parliamentary democracies. *European Journal of Political Research*, *37*(3), 261–290. http://doi.org/10.1023/A:1007064803327

Taagepera, R., & Shugart, M. S. (1989). *Seats and votes: The effects and determinants of electoral systems*. New Haven: Yale University Press.

Tribunal Superior Eleitoral (TSE) do Brasil. (2015). *Electoral Statistics*. Retrieved from http://www.tse.jus.br/eleicoes/eleicoes-anteriores/eleicoes-anteriores

1.11 INTERVIEWS

Carlinho do Açougue. (2014, November 7). Interview with City Councilor Carlinho do Açougue of Barueri.

Cosmo. (2014, November 10). Interview with PT Staff Member Cosmo of Arujá.

Dario. (2014, November 7). Interview with PT Staff Member Dario of Franco da Rocha.

Dr. Bastos. (2014, October 24). Interview with City Councilor Dr. Bastos of Itu.

Edemilson. (2014, October 14). Interview with City Councilor Edemilson of Salto.

George. (2014, November 7). Interview with City Councilor George of Franco da Rocha.

Giva. (2014, October 13). Interview with City Councilor Giva of Itu.

Ivan Valenti. (2014, October 21). Interview with Journalist Ivan Valenti of Itu, Periscópio.

Jabes Campos. (2014, October 31). Interview with PT Staff Member Jabes Campos.

Jânio. (2014, November 4). Interview with City Councilor Jânio of Barueri.

Juliana Ferreira Salvador. (2014, October 13). Interview with House Staff Juliana Ferreira Salvador of Itu.

Lafaiete. (2014, October 14). Interview with City Councilor Lafaiete of Salto.

Matteus. (2014, October 13). Interview with City Councilor Matteus of Itu.

Nair Langue. (2014, October 21). Interview with City Councilor Nair Langue of Itu.

Renato. (2014, November 10). Interview with City Councilor Renato of Arujá.

Ricardo. (2014, October 14). Interview with House Staff Ricardo of Salto.

RoseÂngela. (2014, October 13). Interview with House Staff RoseÂngela of Itu.

Rubens. (2014, November 7). Interview with House Lawyer Rubens of Franco da Rocha.

Sergio Baganha. (2014, November 4). Interview with City Councilor Sergio Baganha of Barueri.

Sérgio Castanheira. (2014, October 13). Interview with City Councilor Sérgio Castanheira of Itu.

Topre. (2014, November 7). Interview with City Councilor Topre of Franco da Rocha.

Willhes. (2014, October 14). Interview with City Councilor Willhes of Salto.

Zetti Bombeirinho. (2014, November 4). Interview with City Councilor Zetti Bombeirinho of Barueri.

2 CHAPTER 2: LEGISLATURE SIZE AND PUBLIC SPENDING IN BRAZILIAN MUNICIPALITIES

2.1 INTRODUCTION

The determinants of public spending levels and composition have long been the subject of political and economic inquiry. Early research revolved around collective choice and recent literature focuses on the role that political institutions play in shaping expenditures. A strand of this work examines the importance of legislature size, particularly in political systems where the legislature has fiscal primacy. I seek to develop and test a theory of how the legislature size affects public spending in political systems where the president has principal budgeting authority and must build a legislative coalition. I do so using the case of Brazilian municipalities.

This paper also serves as a policy evaluation. The recent increase in city council size is a topic of controversy in Brazil, and academic work is underway to identify the effects of the policy. This paper examines how it affected Brazilian municipal public spending, not only in magnitude, but also in composition. Results indicate that larger legislatures led to higher public spending. An average municipality that expanded from 10 to 15 legislators in 2013 spent 3% to 4% more than a similarly situated municipality that maintained 10 legislators. This equals R$ 400k per year, or 65 minimum wage jobs, per additional legislator. There was an appreciable increase in urban infrastructure spending, while education expenditures did not change systematically in response to larger local councils. The overall increase and the pattern of the increase are consistent with the notion that Brazilian mayors use public spending to build and maintain their legislative coalitions, and that they must appropriate more public funds to achieve these goals when the legislature is larger.

2.2 PUBLIC SPENDING LITERATURE

Scholars have found that many factors, beyond legislature size, contribute to public spending magnitude and composition. Any empirical study of the relationship between council size and spending must consider these theoretical factors and provide a convincing rationale for how the research design excludes them from the causal effect attributed to council size. I discuss the general determinants of public expenditures before moving onto the role that political institutions and legislature size play in the size and composition of spending.

2.2.1 General Determinants of Public Expenditures

The seminal work on public goods expenditures was Paul Samuelson's a normative theory of public expenditures (Samuelson, 1954)[7]. He poses the optimal conditions for public sector expenditure level and composition. He notes that while it might be theoretically possible to solve his model for optimal public expenditures, it is not practically feasible for two reasons. First, the model requires information about the costs and benefits of public and private services. The problem that arises is that public sector benefits are unknown and cannot be easily discovered. Residents will underreport how much they expect to benefit from a new public service, lest costs end up allocated based on their reported benefits. Second, even if residents sincerely disclosed their benefits from public sector goods, this information would only be enough to calculate a Pareto-efficient frontier for production and consumption. In order to determine a single best outcome, Samuelson's model requires a social welfare function to determine the optimal level and composition of public spending.

[7] A review of the public expenditure literature is provided in (Shelton, 2007)

Importantly, the Samuelson model views public expenditures as resulting from the interaction between supply factors and collective demand. It is useful to organize our consideration of the determinants of public expenditures around this supply and demand framework. Some research has focused on the role that public sector efficiency and prices play in expenditures. The most well-known of these is the Cost-Disease theory by (Baumol & Bowen, 1967), where the authors suggest that rising costs of public services supposedly outpace the costs of private services. Other authors have suggested the importance in accounting for the level of difficulty of supplying public sector services in a given environment (Bradford, Malt, & Oates, 1969) and in the management efficiency of the public sector organization (Duncombe & Yinger, 2011).

The demand for public sector goods, however, has dominated the political economy literature. Scholars have sought to understand the underlying factors that determine the benefit people receive from consuming public goods. Two factors are mainstays in calculating the demand for a (public) good. They are income and population size (Bergstrom & Goodman, 1973). Richer countries tend to spend more money on public services, per capita. One longstanding theory, Wagner's Law, supplies a mechanical rational for this observation. The theory suggests that the income elasticity of demand is elastic for public services – perhaps because people only begin to value public goods after their basic needs are met. If this were true, then the demand for public goods would rise disproportionately faster than the demand for private goods as a society increases its wealth. There is also some evidence that public expenditures per capita decrease as population rises (Alesina & Wacziarg, 1998). The theory suggests that larger populations might be able to take advantage of scale economies in public services, but also that larger communities will tend to be more heterogeneous preferences and their ability to settle on a common set of public services could be inhibited for this reason.

Economic inequality may also drive demand for public services. In countries where tax-payers often pay different amounts based on their income levels but receive the same level of services, poorer residents face a lower "tax-price" for public goods and thus demand more public expenditures. This tax-price mechanism was put to work by (Meltzer & Richard, 1981) to show how greater inequality can lead to larger public expenditures in a democracy.

The notion that heterogeneous communities would have a lower demand for public services is prevalent in the literature because reduced expenditures where there is ethnic fragmentation is observed in the data with great regularity. Among the suggested reasons for this pattern are demand-side explanations such as preference heterogeneity and disutility of sharing public goods with outsiders (Alesina, Baqir, & Easterly, 1999). Other work on the role of ethnic fragmentation in the provision of public goods has suggested there might be a supply-side effect, where fragmentation inhibits the efficiency of provision (Habyarimana, Humphreys, Posner, & Weinstein, 2007).

Samuelson's model shows that even if we understood all the relevant supply and collective demand factors, the optimal public spending level and composition would not be obvious, since a social welfare function is not available. Another method must be used to determine the final spending level and composition. In a democracy, the principal method of collective decision-making is an election. Academic work has repeatedly found that changing electoral rules can generate different electoral outcomes from the same underlying voter preferences[8]. It is not a far reach to suppose that electoral rules and other political institutions might also affect public spending. In fact, scholars have found that proportional representation (PR) electoral rules

[8] See (Riker, 1982) for a review of the literature beginning with Condorcet.

generate higher levels of public spending (as transfers) than majoritarian electoral rules (Milesi-Ferretti, Perotti, & Rostagno, 2002) (Persson & Tabellini, 2004)[9]. The underlying logic here appears to be that politicians in majoritarian systems are motivated to bring home local public services, whereas politicians in proportional systems are rewarded for finding creative ways to transfer resources to their constituent groups. Presidential systems often spend less than parliamentary systems because the president is a separate line of accountability representing all voters and therefore internalizing the full costs of public spending[10]. Similarly, nationalized politics (national parties, unitary government) appear to create fewer pressures for public spending because public resources are less necessary to gain the support of local politicians (Lago-Peñas & Lago-Peñas, 2008).

A substantial literature has also developed regarding "political business cycles," where public spending rises and falls in line with scheduled elections. The literature initially focused on the incentives of government officials to stimulate the economy using monetary policy ahead of an election goals (Hibbs, 1977; Nordhaus, 1975), but scholars quickly broadened the inquiry to how incumbents use fiscal policy to achieve electoral (Drazen, 2001). The general argument is that when conditions permit, incumbents will use monetary or fiscal policy immediately before an election to stimulate the economy and then will adopt tighter policies after they are elected. The Political Business Cycle (PBC) theory has been applied to local governments as well, concentrating on their fiscal policy ahead of elections. There is anecdotal and statistical support for the theory at the municipal level, though the severity of it depends on several factors

[9] Samuelson's framework is primarily directed at the collective purchase of public goods, and not at transfers between political groups. The coercive nature of political institutions means that authors who focus on them as factors in public spending may also theorize about transfers. This is important because they are a growing part of public spending with the rise of the welfare state.

[10] See (Eslava, 2011) for a survey of the causes of fiscal deficits, which are situations where revenues and expenditures fail to balance.

including institutional controls and fiscal transparency (Khemani, 2004; Sakurai & Menezes-Filho, 2010).

2.2.2 Legislature Size and Public Expenditures

Another political institution that appears to affect public spending is the size of a legislature. The literature on legislature size and public spending draws on a theory of logrolling that was formalized in a paper by Barry Weingast in 1981 (Weingast, Shepsle, & Johnsen, 1981), where spending increases in proportion to 1/n, with n equal to the number of legislators. The intuition behind this model is a "tragedy of the budget commons," where the spending benefits accrue to legislators' districts, but the costs are spread over the entire country. The Weingast paradigm is appropriate for the single-member-district (SMD) characteristic of the United States' electoral system, where there are a large number of districts and only one representative per district. In this model political bargaining is between districts. However, the political reality in many other countries is one of multi-member districts, where the members serve as the political representation of diverse social groups. Political conflict is then no longer between districts, but rather between coalitions, and it can be expensive to hold them together into a governing coalition. Public spending is therefore an indispensable resource to the government for legislative support, and various works have found that spending is higher in Proportional Representation (PR) than SMD electoral systems (Persson & Tabellini, 2002). There have been various attempts to replace districts with coalitions in the Weingast model and to examine the empirical relationship between government fragmentation and expenditures under the political logic of coalition government. This literature was initiated as cross-national studies that observed higher spending for more fragmented governing coalitions (Roubini & Sachs, 1989) (Scartascini & Crain, 2002) (Bawn & Rosenbluth, 2006). More recent sub-national studies,

aimed at addressing methodological concerns with the cross-national studies, find similar results (Baskaran, 2013).

The relationship between legislature size and public spending has taken on a distinctly sub-national orientation in the empirical literature. Early empirical work tested the theory in US States (Gilligan & Matsusaka, 2001) and US cities (MacDonald, 2008). More recent studies, keeping with a general trend in the academic literature, have pursued better research designs to eliminate potential institutional endogeneity (Egger & Koethenbuerger, 2010; Pettersson-Lidbom, 2012). There are two causes for concern that a correlational relationship between legislature size and public spending are not necessarily causal. First is a reverse-causality story, where polities with larger public sectors expand their legislatures in response to high public spending. The optimistic version of this argument is that legislatures expand in order to provide proper oversight (and perhaps lower spending). The cynical version is that legislatures expand so that more of the political elite may extract benefits from society. If the benefits are limited only to higher spending in the legislature, then the causal effect of larger legislatures on overall public spending should be minimal. If, however, the new councilors are able to expand government outlays, then legislature size would have causal force with respect to public spending.

The second potentially confounding relationship could be that social or economic factors cause voters to have a preference for both a large public sector and a larger legislature. This is a more difficult argument to make on its face, since the main argument to have a larger legislature is to accommodate social heterogeneity. However, social heterogeneity is generally thought to be a factor in reducing public spending (Alesina et al., 1999) (Habyarimana et al., 2007), so one would expect size of the legislature and public spending to move in opposite directions.

In summary, the total level of public spending is influenced by many factors. As Samuelson and subsequent research has shown, we observe spending outcomes that are determined by more than just the supply and demand for collective purchases. We experience outcomes whereby the supply and demand factors that have been filtered through political institutions. The remainder of this paper focuses on how one of these institutions, legislature size, affects public spending in a specific political context.

2.3 LEGISLATURE SIZE AND SPENDING IN BRAZIL

Previous research that focuses on public spending as function of legislature size does not quite fit with the Brazilian experience. This is because in Brazil the ultimate budget authority rests with the executive, rather than with the legislature or parliament. While the legislative branch in local and national Brazilian governments formally approves a budget plan for each year, the executive makes all appropriation decisions. If he or she refuses to release funds for a particular budgeted item, then the spending simply does not occur. In this context, the logrolling paradigm pioneered by Weingast cannot provide the reason for why larger legislatures might lead to higher spending since the final appropriation decisions are made by the executive, who is accountable to all districts. Nor are the coalition adaptations of Weingast's theory a useful guide to the Brazilian experience (Bawn & Rosenbluth, 2006), since these theories assume that spending decisions are made in the legislature by parties behaving in an essentially logrolling-type way.

The connection between legislature size and public spending is different in Brazil because it is driven by the co-dependence of the executive and legislative branches. Brazil's political institutions are often described as "Presidential Parliamentarism," since the executive is independently elected and must build an electoral coalition of city councilors to carry out his

legislative agenda. Without 67% of the legislators regularly voting with him, the executive can expect opposition councilors to stymie his legislative agenda. City council elections are not cheap in Brazil, so legislators pursue all advantages. They seek public sector jobs to reward political operatives who supported them in the election, and they angle for public works projects to burnish their reputation as a champion of the people. Since the mayor controls both jobs and budget appropriations, he or she can credibly offer them in exchange for the legislators' support.

In the context of Brazilian Presidential Parliamentarism, one might speak of a market for votes in the legislature. The executive demands voting support for his or her agenda and pays for votes with budget appropriations destined to legislators projects[11]. Legislators supply voting support in exchange for the appropriations. This observation serves as the basis of the theoretical model presented below.

Brazilian municipalities have been used to analyze a wide variety of political-economy problems due to their broadly available data, high count, (formally) homogenous political institutions, and a plethora of federal legislation that facilitates convenient statistical identification of policy effects. Some of the more well-known work has investigated the response of voters to information about corrupt politicians (Ferraz & Finan, 2008) and the political resource curse (Brollo, Nannicini, Perotti, & Tabellini, 2010).

Brazilian municipal legislatures have undergone profound changes in recent years. Between 2000 and 2013, many of the country's approximately 5,500 councils have seen the number of seats reduced and then increased by as much as 40% - 50%. For some of the larger municipalities, it was not uncommon to experience a fluctuation from 17 seats to 13 seats, and

[11] The Mensalão scandal, discovered in 2005, was an example where the executive dispensed with indirect payment of legislators and instead offered cash for votes.

then finally back to 17 seats within the course of 8 years. This provides substantial temporal variation that is an excellent starting point for estimating the impacts of city council size.

The dynamic between the executive and the legislative branch is comparable between the Brazilian federal and municipal governments. In both cases, the executive is elected by majoritarian vote, and the legislature is elected by open-list proportional representation. This creates a situation at all levels of government where an independently elected executive must negotiate with a legislature composed of many political parties. "Presidential Parliamentarism" is in force at all levels of government, so the following theory does not distinguish between its applications to the federal or local level.

2.4 A MODEL OF A MARKET FOR LEGISLATIVE SUPPORT

We can formalize the above discussion to gain further insight into the relationship between legislature size and public spending in the Brazilian Presidential Parliamentary system. Figure 2-1 shows a special case of how an increase in legislature size would affect spending where the executive exchanges fiscal expenditures for legislative support.

In Figure 2-1, the executive's demand for votes in the legislature does not vary with respect to the "price" of the legislative support. The demand for votes is perfectly inelastic, shown as the vertical dotted lines D_1 and D_2. The demand is set to 2/3 of the total number of legislature seats[12], based on the logic that the Brazilian executive must obtain the support of 2/3 of the legislature in order to enact his or her agenda without interference. An inelastic demand for

[12] The values assumed to construct this graphic are original number of seats = M = 10, change in seats = V = 4, slope of S1 = b = 1, intercept of S1 and S2 = a = 1, slope of S2 = (slope of S1*original seats)/(original seats + change in number of seats). This last slope emerges from the geometry of the supply curve hitting the maximum price at the total number of legislative seats, M (or M+V in the case of S2)

votes would occur where the executive is willing to pay any price in public budget resources to ensure that he or she has 2/3 of the votes in the legislature.

The supply of votes in the legislature is responsive to the "price," which is the amount of public budget resources the executive appropriates for each legislator's projects. The present model assumes that there is a uniform market price. Additionally, the executive is able to obtain the total number of votes if he or she is willing to pay the maximum price. For example, in S_1 there are 10 seats, and the executive who pays P=11 will have the support of all 10 seats. In S_2 there are 14 seats, and an executive willing to pay 11 will have all 14 seats. This geometry facilitates analysis of the model.

Figure 2-1 shows how equilibrium spending changes between two periods as a result of a change in the number of legislative seats. At point A, there are 10 seats. The executive "pays" P* in order to obtain 2/3 of the seats[13]. When the size of the legislature expands, he or she will still want 2/3 of the new seats, so the demand curve shifts from $D_1 = \frac{2}{3}M$ to $D_2 = \frac{2}{3}(M + V)$, where M is the original number of seats and V is the change in the number of seats. With more total seats available, there is also a shift in the supply of seats from S_1 to S_2. These equations are defined by: $p_1^S = a + b\ m$, and $p_2^S = a + c\ m$, with $c = \frac{b*M}{M+V}$ to ensure that both supply curves attain full cooperation of all legislators at the maximum price.

Figure 2-1 depicts a situation where the new legislators have an overall profile where their willingness to accept a piece of the public budget in exchange for their vote is relatively similar

[13] The seats are assumed to be divisible to ease the analysis.

to the legislators in S_1. For this reason, the supply pivots to the right. The new equilibrium is point B.

Under this model, the total spending must necessarily increase when the legislature expands. At point B, the price must be identical to that of point A[14] and there are more transactions that occur because there are more seats. Total expenditures is equal to p*m, and increasing m while maintaining p constant must increase total expenditures.

The above conclusion, in which an increase in seats leads to larger public expenditures, holds true even in the general case where the slope of the demand curve is allowed to vary. In the general model, presented in the Appendix, it is possible for the "price" of the votes to decline and it will do so when twice the slope of S_1 is less than the absolute value of the slope of D_1. That is, the price of a vote can decline with the introduction of new seats when the legislators are relatively sensitive to price and the mayor is relatively price insensitive. However, any reductions in price are not be enough to overcome the increase in quantity of transactions in the general model. Thus, the total expenditures must always go up when new seats are added to the legislature.

2.5 POLITICAL AND BUDGETARY INSTITUTIONS IN BRAZILIAN MUNICIPALITIES

There are approximately 5,500 municipalities in Brazil. They share similar political and budgetary structure due to the 1988 Constitution and subsequent legislation. Elected officials include the mayor and councilors in each municipality. The mayor is selected by simple majority for municipalities with fewer than 200k inhabitants, and by absolute majority for larger

[14] The price before the change is $p_1^s = a + b\frac{2}{3}m$. After the expansion, $p_2^s = a + b\frac{2}{3}m$, so $p_1^s = p_2^s$

cites. He or she then appoints the administration ministers and sets government policy for the next four years. Councilors are elected at-large through an open-list proportional representation (PR) system. There are often over 100 council candidates in an election due to vote transfers among candidates and to the fact that councilors are generously compensated.

The budgeting process in Brazilian municipalities is regulated through the 1988 constitution[15] and the 2000 Fiscal Responsibility Law[16]. The Pluriannual Plan is proposed every four years, during the first year of a mayor's term and is adopted in the second year of the term. It aims to provide general guidance for the capital spending of the municipality. The Budget Direction Law (LDO) is passed on an annual basis. It establishes a primary surplus goal for the following year, and it projects expenditures and receipts for the next three years. Finally, the Annual Budget Law (LOA) establishes the maximum spending amounts permissible across different expenditure categories. The mayor appropriates money monthly and is permitted to spend less on an item than is legislated in the LOA, but he may not spend more without seeking authorization from the Legislature.

There are legal limits to municipal spending levels. The Fiscal Responsibility Law of 2000 imposed a debt ceiling on Brazilian municipalities. The municipalities were given 15 years to comply with a rule that limits debt to 120% of annual receipts[17]. After 2016, non-compliant municipalities lose their authorization to conduct credit operations and they become ineligible to receive a significant portion of intergovernmental transfers. However, compliant municipalities may take on additional debt as necessary and that might include when a mayor and legislature

[15] Title VI, Chapter 2, Section 2 (of Budgets). Art. 165 – Art. 169

[16] Lei Complementar No 101, 4 May 2000

[17] The 120% rule is from Senate Resolution #40, 2001.

has additional needs to spend money on coalition maintenance. Figure 2-2 shows that in 2012 and 2013 the modal debt as a percentage of revenues was 10%, well below the legal ceiling of 120%. As such, most municipalities have fiscal space to expand and contract public spending at their discretion.

Some municipalities run annual deficits, and just as many run annual surpluses. Figure 2-3 shows that on average, municipalities tend to gravitate towards a situation of balanced revenues and expenditures, where the Nominal Budget Deficit is zero[18]. It is also apparent from Figure 2-3 that nominal deficits were larger in 2013 than they were in 2012. From 2012 to 2013, almost all of the bins above zero nominal deficit grew larger. While this chart does not provide causal evidence that increased debts were a result of the seats expansions in 2013, the facts of Figure 2-3 fit with this overall story.

The number of municipal legislative seats grew significantly from 2012 to 2013. Figure 2-4 shows how the legislative seat count is distributed by city population in 2012 and 2013. From 2005 to 2012, the number of seats in each legislature was tightly regulated by population. According to the 2004 Mira Estrela Supreme Court Decision, each municipality under 1M inhabitants was granted nine seats for the first 47,619 inhabitants, plus one additional seat per 47,619 residents. This led to the seat-count pattern represented by the step-wise gray points in Figure 2-4.

The 58th Amendment was passed in 2009 and came into effect with the 2012 election. The new legislatures that were seated on January 2013 were significantly larger than those of 2012. For

[18] The nominal budget deficit includes spending on the interest of previous municipal debt.

municipalities with populations under 1.05 Million, the new seat limit amended Article 29, IV of the Constitution to limit seats as:

m) 9 councilors, in municipalities up until 15,000 inhabitants;
n) 11 councilors, in municipalities of more than 15,000 and up until 30,000 inhabitants;
o) 13 councilors, in municipalities of more than 30,000 and up until 50,000 inhabitants;
p) 15 councilors, in municipalities of more than 50,000 and up until 80,000 inhabitants;
q) 17 councilors, in municipalities of more than 80,000 and up until 120,000 inhabitants;
r) 19 councilors, in municipalities of more than 120,000 and up until 160,000 inhabitants;
s) 21 councilors, in municipalities of more than 160,000 and up until 300,000 inhabitants;
t) 23 councilors, in municipalities of more than 300,000 and up until 450,000 inhabitants;
u) 25 councilors, in municipalities of more than 450,000 and up until 600,000 inhabitants;
v) 27 councilors, in municipalities of more than 600,000 and up until 750,000 inhabitants;
w) 29 councilors, in municipalities of more than 750,000 and up until 900,000 inhabitants;
x) 31 councilors, in municipalities of more than 900,000 and up until 1,050,000 inhabitants;

This represented a sizeable increase for many municipalities. For example, a city with a population of 140,000 would have had 10 councilors in 2012 and then would have been permitted to expand to 19 councilors in 2013. This is almost a 100% increase from one year to the next, which provides a sizeable variation in the key explanatory variable from one year to the next. While not every municipality expanded to this extent, many did increase the size of their legislatures[19].

The advantage of large and sudden changes in the explanatory variable means that several of the potential determinants of public spending, as introduced in the literature review above, will not have time to vary. Thus, we can exclude them as factors driving a change in public spending from 2012 to 2013. For example, one could make a strong case that public service demand factors such as income inequality or population would be relatively fixed between these two years. Likewise, public sector supply factors such as factor prices and bureaucratic organization probably did not change greatly between these two years for most municipalities. Finally, political institutions, other than the size of the legislature, were also held relatively fixed from

[19] The decision to expand was made at the municipal level, which introduces a concern with policy endogeneity. Several estimation strategies are introduced below to check the potential bias that this would cause.

2012 to 2013. To identify the effect of a change of the size of the legislature, this paper relies on the slow-moving nature of many of the important factors that determine public expenditures, and the fact that a change in legislature size should have acute effects that materialize immediately. An instrumental variable strategy is also used to verify the robustness of the fixed effect model.

2.6 MODELS

This section establishes the empirical model used to estimate the effect of seats on public spending and its components. Aside from the number of seats in a legislature, the explanatory variables in the models are limited to time-variant factors that either have a large role in explaining the dependent variable, or are a potential source of omitted variable bias.

2.6.1 Total Public Spending

The total public spending for a municipality is modeled as:

$$\text{Spend}_{\text{it}} = \alpha_0 + \alpha_1 \text{Seats}_{\text{it}} + \alpha_2 \text{Receipts}_{\text{it}} + \text{X}\beta + \gamma_i + \delta_t + \epsilon_{\text{it}} \qquad (1)$$

The dependent variable, Spend, is the (log) of a municipality i's public spending, net of legislative costs, in year t. Legislative costs are deducted from the spending variable because the focus of this study is the extent to which a change in legislature size affects general public spending, not legislature operations. The parameter of interest is α_1, which estimates the percentage change in public spending for a percentage change in the number of legislative seats. It is important to note that while α_1 estimates the marginal change, many of the municipalities had very large changes in their legislature sizes. As such, a simulation is conducted in the results section to help the reader see the estimated effect of these larger changes, which were typical of the 2012, 2013 policy change. The Receipts variable represents the total municipal revenues for year t. There is no a priori reason to believe that its exclusion would cause bias in the estimate of

α_1. Nevertheless, it is time-variant and included in the model to take advantage of its strong predictive power for municipal spending and the precision that this generates for estimating other model parameters. An additional vector of control variables, contained in **X**, is included in the model. In one specification, X contains a flexible set of population variables and in another specification X also contains political variables to measure the strength of the opposition and political fragmentation among parties. The political variables change from 2012 to 2013 because there are separate legislatures sitting in these two years. Opposition strength and political fragmentation might be expected to complicate a mayor's ability to hold together a governing coalition, and thereby increase expenditures. These political variables might also be related to the municipality's decision to adopt an increase in seats. For example, one potentially problematic bias would be if incumbent mayors who faced strong opposition systematically increased legislature size and raised public expenditures to manage their coalitions. The municipality fixed effect, γ_i, absorbs all the slow-moving variables that theoretically affect public spending. Variables that are relatively fixed over the two-year time period that affect the supply and demand of public services and political institutions are contained in γ_i. The time fixed effect, δ_t, absorbs general Brazil-wide trends that increased or decreased spending in municipalities.

2.6.2 Spending Composition

The composition of public expenditures is also modeled to investigate whether there are general patterns in how larger legislatures affect spending. Research into spending composition must establish a meaningful typology of spending accounts. Studies conducted at a national-level have focused on a distinction between "universal" and "targeted" spending (Tabellini, 2002), or between "transfers" and "public-goods" spending (Milesi-Ferretti et al, 2002). In a local setting,

however, many of the social insurance programs are outside the discretion of the government. The relevant decision of the local government is to spend money on direct support of its political base (e.g. spending on appointed positions, targeted infrastructure projects) or on broad public services (e.g. health, education) for which it is more difficult for politicians to claim credit.

This section of the paper examines the hypothesis that additional funds were directed to four functional spending categories: (A) Administration (B) Urban Infrastructure (C) Health, and (D) Education. These are the four largest functional spending categories in Brazilian municipal government over the past decade. The functional categories unfortunately mix current and capital spending. For example, a new school or new hospital construction would fall into Health or Education spending. Urban Infrastructure includes current and capital expenditures on public works.

Elected governments must provision funds for direct administration and capital spending, but there is also evidence that governments in politically underdeveloped areas tend to overspend in these areas relative to "human development" expenditures on health and education (Delavallade, 2006; Mauro, 1998). Administration and urban infrastructure spending is potentially more useful to shore up a political base, since it is spending for which credit can be claimed by individual politicians. In the case of administration, many jobs are appointed at the discretion of political leadership. In the case of infrastructure, mayors imply in public fora that a neighborhood legislator was instrumental in procuring a given public work (if he happens to be part of the government coalition, of course). Additionally, infrastructure spending is more conducive to corruption since contracts are large, complex and ripe for kickbacks.

Health and education spending is less traceable to any particular politician since it passes through a bureaucratic organization before arriving to the general population. The public service is

provided by professionalized corps of teachers and health workers, and is typically distributed only on the pre-condition of being a member of the community. Given its retail-style nature, it is more difficult (and less profitable) to ration in exchange for political support.

The four spending categories are modeled as:

$$\text{SpendCategory}_{\text{it}} = \pi_0 + \pi_1 \text{Seats}_{\text{it}} + \pi_2 \text{Receipts}_{\text{it}} + \text{X}\theta + \psi_i + \lambda_t + \nu_{\text{it}} \qquad (2)$$

The model in equation (2) is identical to that of equation (1), except that the dependent variable is spending on Administration, Infrastructure, Health, or Education. All measures are the same and the unit interpretations of the parameters in (2) are equivalent to equation (1).

2.6.3 Model Estimation

To obtain unbiased causal estimates of α_1 and π_1, one must ensure that the size of the legislature is not correlated with any omitted factors that also explain the size or composition of public spending. The main issue of concern is that the choice to increase the number of legislature seats in 2013 is a decision that is made by each municipality. Cities with larger legislatures might also be the same kind of cities that have higher spending levels. As such, any systematic correlation between Seats and Spending could actually be driven by those unobserved features of the politics or society those certain municipalities. I use two approaches, fixed-effects and instrumental-variable estimation, to address these research challenges.

As discussed above, the large variation in seat sizes and the theoretical absence of lag effects prove suitable to the use of municipal fixed effects. The baseline estimation provided below is OLS using fixed effects to remove persistent municipal features like social, economic, or political structure. The standard errors are clustered by municipality.

The model is also estimated using Two Stage Least Squares (2SLS) as an additional check that the fixed effect model has addressed the potential endogeneity. The first stage estimates the predicted number of seats that a municipality would have based on the federal guidelines in 2012 and 2013. The change in guidelines between these two years is exogenous to the choices of the municipalities, provides adequate temporal variation, and is significantly predictive of the change in number of seats in municipalities.

The model is estimated using the log of the dependent variable, non-legislative spending. Models are also estimated where the independent variable of interest, the number of seats, enters into the model untransformed (level) and as a logged variable. The correct model depends on whether we think the percentage change in expenditures is a reflection of the change in number of seats or a change in the percentage of the number of seats. For example, the effect of an increase of five seats would be seen as equivalent by the Log-Level model across all municipal sizes, but for the Log-Log model it would make a difference if those five seats were added to a small legislature vs added to an already large legislature. The Log-Log model is correct if we think there is diminishing effect of adding seats on spending. Both approaches are estimated and shown to be roughly similar across the relevant domain of legislature sizes.

2.7 DATA & DESCRIPTIVE STATISTICS

Municipal spending and revenue data are from the "Finances Brasil" (FINBRA) dataset, published annually by the Brazilian Treasury in the Ministry of Finance. The spending categories are based on the FINBRA accounts, which are documented in Brazil's system of public accounts (Brazil National Treasury, 2013). The spending and revenue data are deflated to 2010 Reais using the World Bank's country deflator series for Brazil. This paper uses the

population data from FINBRA. It was cross-checked with the official population data from the Brazilian Census Bureau (IBGE) and is nearly identical.

All data for political variables are from the Brazilian Electoral Authority, the Tribunal Superior Eleitoral (TSE). For each election, the TSE publishes candidate-level information for all municipalities. Information on Mayoral and Council races is available country-wide, and is used not only to measure the number of seats available in each year, but also to measure the size of the opposition and number of parties in each municipality. The size of the opposition is defined as the number of legislators that are elected to the council from coalitions that are not affiliated with the mayor-elect's coalition. It is true that there is significant pressure on city councilors to join the mayor's coalition, even if they were not originally elected as part of that coalition, so this measure is likely to be an imperfect proxy for opposition. The imprecision is likely more severe in the 4th year of a term (e.g. 2013) rather than in the first year of a mayoral term (e.g. 2013), because legislators have more time to switch parties.

Table 2.1 shows the descriptive statistics for the variables and observations used in the model. The research is restricted to municipalities with populations under 1 million and over 10,000 in line with (Pettersson-Lidbom, 2012) and other work that excludes small jurisdictions on the apparent grounds that the politics of small communities limits the extent to which politicians can expand or contract public spending to deal with maintenance of political coalitions. As a result, the sample is roughly 2500 municipalities. On average, the total spending is 108 in 2012 and 122 in 2013, indicating an approximate 13% jump in real expenditures between these years. The average number of Legislature Seats also grew from 9.5 to 11. The average percentage of opposition in the legislatures saw a mild increase and so did the number of parties in each legislature.

Spending on Education (34.2%), Health (23.9%), Administration (14.0%), and Infrastructure (8.0%) were the largest municipal expenditure categories in 2013[20]. Together, these four categories accounted for 80% of all municipal expenditures. Since 2002, there has been a general trend of increasing the priority of education (up from 29.8%) and health expenditures (up from 18.7%), while the share of expenditures to administration (down from 16.7%) and urban infrastructure (down from 9.9%) has fallen.

The distribution of the shares spent on the big four municipal services is shown in Figure 2-5. The numbers cited above are averages, and Figure 2-5 illustrates the large variance in spending on services. This variation in our dependent variables will likely reduce the precision of the estimates in the spending category models.

2.8 RESULTS

The estimates for equation (1) are listed in Table 2.2. The first row of coefficients are from the Log-Log model, where the log of the total expenditures is regressed on the log of the number of seats (and control variables). The third row of the table contains coefficients from the regression of the log of total expenditures on the non-logged number of seats. Each column provides a variation on equation (1). The first two models are the OLS and instrumented versions without the additional controls. The third and fourth models are the regular and instrumented versions of equation 1 with the additional controls.

The estimates of the effect are consistent across each of the model rows, although the estimates are less precise for the 2SLS estimates due to a loss of power associated with the two stages.

[20] Again, this is for Brazilian municipalities with greater than 10k and fewer than 1M people.

Nevertheless, the inclusion of the 2SLS models shows that the fixed effects method does a good job of managing bias from the endogeneity of public spending and legislature size.

The Log-Log model indicates that α_1 is approximately equal to 0.09. This means that a one percent change in seats is associated with a 0.09% increase in total expenditures. Municipal legislatures experienced seat changes of 40% or 50%. These increases are sufficiently larger than 1% that a simulation is preferable to understand the expected increases associated with such large expansions of the legislature. Comparing the predicted values of two average municipalities (those with the mean values of the regression population on every variable except the number of seats), with 10 seats and 15 seats, the effect of 50% more legislators is 3.2%[21]. The same exercising comparing a change between 10 and 15 seats with the Log-Level model leads to an estimated effect of a spending increase of 3.17%[22].

The estimates suggest that a municipality that increased its legislature from 10 to 15 representatives would expect to see an increase in spending of approximately 3% - 4%. Given that the average municipality has expenditures of around R$ 65 million per year (in 2010 Reais), an increase of 3% is R$ 1.95 million. Considering a 2010 minimum wage of R$ 510, this kind of spending increase would support approximately 320 annual minimum wage jobs. Split 5 ways between the new legislators, this is R$ 390k of additional spending per additional legislator, or 64 minimum wage jobs, in the average municipality of 50,000 residents.

[21] Predicted spending on non-legislative activities for an average municipality with a legislature of 10 is R$ 65,170,996, and 67,631,400 for a legislature of 15. The percentage effect is (67,631,400 – 65,170,996) / 65,170,996 = 3.8%

[22] The percentage effect is (66,829,960 – 64,779,624)/64,779,624 = 3.2%

2.8.1 Results for Spending Subcategories

The estimates for the effect of legislative seats on the big four municipal expenditures are shown in Table 2.3. The coefficients represent the percent change in categorical spending for a one % change in seats, or a one seat change, depending on whether one looks at the log-log or log-level model.

The estimated effect of a change in seats on urban infrastructure spending is the most pronounced. The OLS estimates are statistically positive, and the 2SLS estimates for urban infrastructure, while not statistically different from zero, indicate that the OLS estimates may have some downward bias. Using π_1 = 0.3 for the log-log model, this indicates that an increase of 0.3% of spending is expected for a 1% change in seats. For municipalities that increased their legislatures by 40% or 50%, that is a substantial increase in infrastructure spending of approximately 10%.

The estimates for the effect of a change in seats on health or administration spending is more ambiguous. For health spending, the OLS estimates indicate half the size of the effect as is associated with urban infrastructure spending, but the 2SLS estimates suggest that there is some bias and adjusting for it makes the estimate close to zero and with large confidence bounds. The effect on health spending appears as if it might be moderately positive since it is consistently estimated as so across all specifications, but the error bounds are just large enough to prevent us from saying they are statistically different from zero at conventional confidence levels.

The effect of a change in seats on education spending is estimated near zero with small enough standard errors that we can say that the effect is statistically and economically close to zero. Education spending, in other words, appears less sensitive to changing legislature size, at least in

the short run. This makes sense, because municipal education spending is highly regulated by the federal government.

On the other hand, the expected change in spending for urban infrastructure due to a change in seats is very high. The estimates are approximately 0.25 to 0.3 for the OLS models, and approximately 0.43 for the 2SLS models. The 95% confidence interval for the OLS models is between 0.2 and 0.4, meaning that a municipality where seats increased from 10 to 15 could expect to see a 10% - 20% increase in infrastructure spending in 2013. The estimates would be even higher if we resort to the 2SLS estimates. The estimates for administrative and health spending are too noisy to conclude they are different from zero, but they are clearly below the effect that seat expansion has on infrastructure spending.

This change in spending patterns indicates that the increase in public spending due to the increase in legislature size falls disproportionately into categories like urban infrastructure (and perhaps administration) that are more discretionary and less programmatic than health and education. While programmatic spending on health and education is electorally useful to the executive, its encompassing nature is less beneficial to individual legislators. The empirical findings fit broadly with our model, where the public sector grows with a larger legislature because the executive exchanges public spending for legislative support.

2.9 CONCLUSION

Over half a century of research in public finance and political sciences have identified a broad range of factors that contribute to the level and composition of public spending. Recent literature has focused on political factors including how the legislature size affects spending. The dominant theoretical approach to the impact of legislature size on spending has been that larger legislatures

lead to higher spending through log-rolling. This paper follows a different approach that applies to coalition governments where the executive has ultimate budget authority and must spend fiscal resources to maintain his or her coalition. A model is developed that shows how expansions of the legislature in Presidential-Parliamentary systems must lead to higher cost of coalition maintenance, and a larger public sector.

The paper estimates the extent to which larger municipal legislatures affected public spending and public composition in Brazil, where the data and institutional context are conducive to estimating this relationship. Results indicate that a 50% increase in legislature size from 10 to 15 seats leads to an expansion of between 3% and 4% in public expenditures. Education expenditures hardly change in response to legislature growth, whereas urban infrastructure spending grew by approximately 10% for a 50% increase in legislative seats. The large growth in infrastructure can be squared with the smaller growth in overall spending, since infrastructure spending represents a smaller share of the municipality's overall budgetary commitment. These findings are in line with other scholarship that points to the political usefulness of infrastructure spending and are also consistent with previous literature that points to larger legislatures as a source of higher public expenditures.

2.10 FIGURES

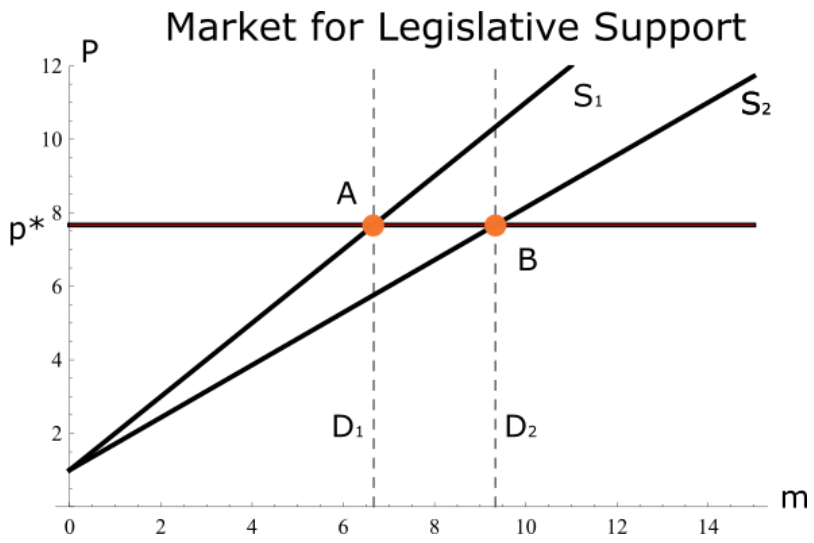


Figure 2-1: Market for Legislative Support

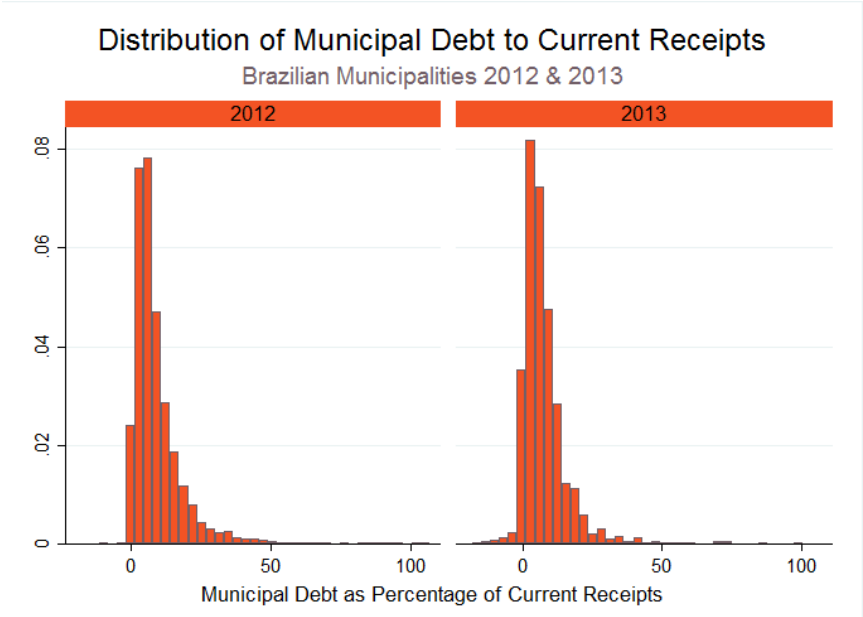


Figure 2-2: Distribution of Municipal Debt to Current Receipts

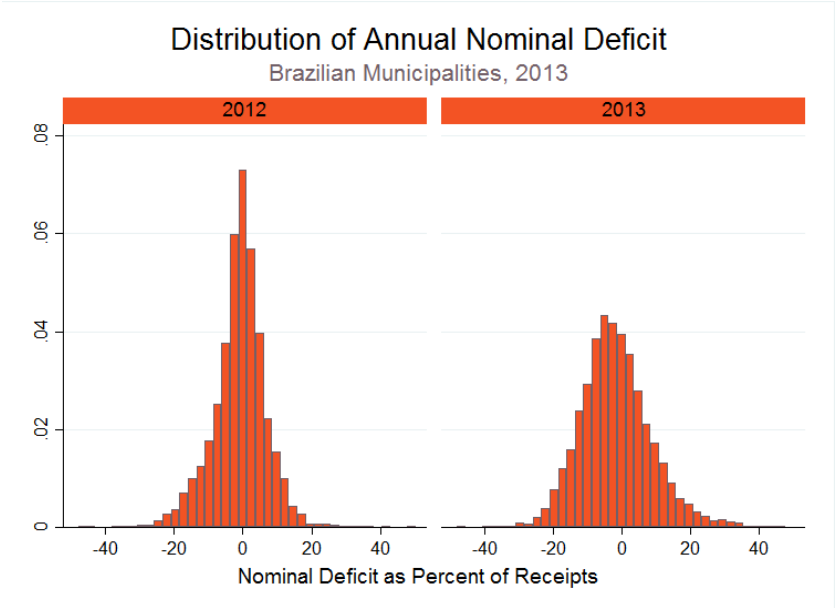


Figure 2-3: Distribution of Annual Nominal Deficit

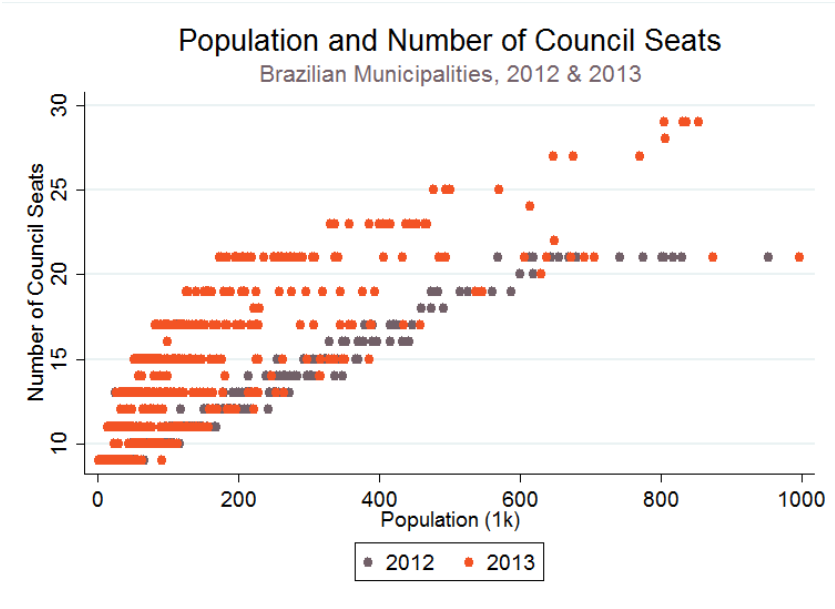


Figure 2-4: Population and Number of Council Seats

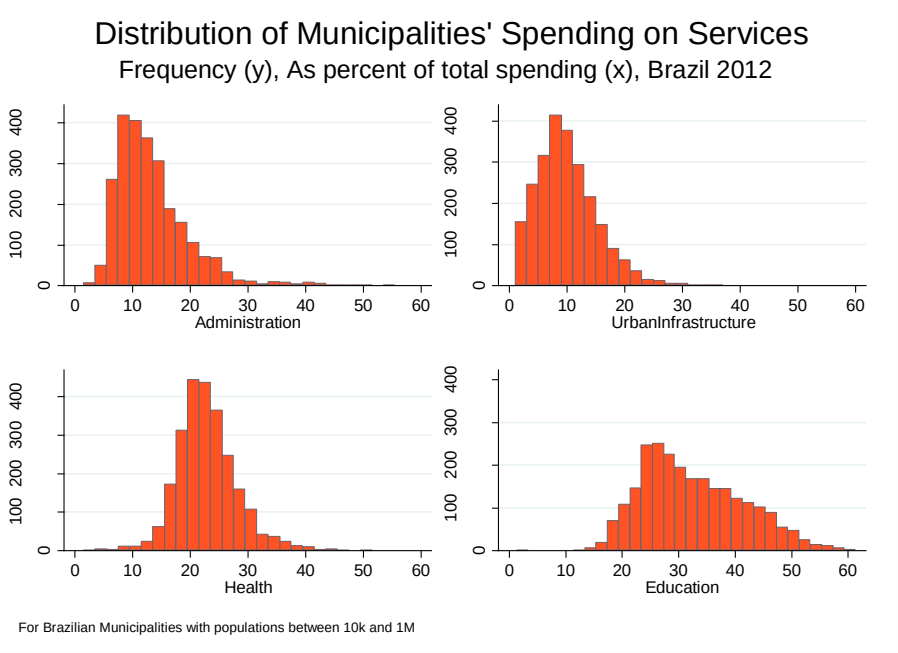


Figure 2-5: Distribution of Municipalities' Spending on Services, 2012

2.11 TABLES

Descriptive Statistics

	2012	2013	Units
Total Spending	108	122	Million Reais (2010)
	(219)	(253)	
Seats	9.57	11.08	Count
	(1.6)	(2.9)	
Revenues	114	129	Million Reais (2010)
	(236)	(270)	
Population	48670	47099	People
	(84573)	(83020)	
Opposition	45.1	48.9	Percent
	(19)	(19)	
Parties in Legislature	5.97	7.14	Count
	(1.6)	(2.1)	

**Means and (standard deviations) for 2012 and 2013. Population is all Brazilian Municipalities between 10k and 1M inhabitants.*

Table 2.1: Descriptive Statistics

Public Spending in Brazilian Municipalities, 2012 & 2013

	OLS1	2SLS1	OLS2	2SLS2
Number of Seats (Log-Log)	0.091***	0.073	0.094***	0.089
	(0.025)	(0.056)	(0.028)	(0.066)
Number of Seats (Log-Level)	0.006***	0.006	0.006***	0.007
	(0.002)	(0.004)	(0.002)	(0.005)
Additional Controls	No	No	Yes	Yes
Instrumented	No	Yes	No	Yes
County Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
N	5120	5120	5022	5022

Dependent variable is the Log of total municipal spending, net of direct spending on the legislature. Standard controls include logs of Total Receipts, Population, Population Squared, and Population Cubed. Additional controls include logged opposition percentage and the Number of Parties. Population of interest is Brazilian Municipalities with between 10k and 1M inhabitants. Robust standard errors are shown in parentheses below point estimates. Within r2 are about 0.97, and between r2 are 0.93. Statistical significance is indicated at the 10% (*), 5% (**), and 1% (***) levels.

Table 2.2: Public Spending in Brazilian Municipalities

The Effect of a Change in Number of Legislature Seats on Public Spending Categories

Spending Category \ Model		OLS1	2SLS1	OLS2	2SLS2
Administration	Log-Log	0.165***	-0.051	0.180***	-0.040
		(0.052)	(0.125)	(0.060)	(0.151)
	Log-Level	0.010***	-0.009	0.007	-0.010
		(0.004)	(0.010)	(0.007)	(0.012)
Urban Infrastructure	Log-Log	0.293***	0.434*	0.245**	0.427
		(0.100)	(0.247)	(0.112)	(0.295)
	Log-Level	0.022***	0.039**	0.016**	0.039*
		(0.007)	(0.020)	(0.008)	(0.024)
Health	Log-Log	0.047	0.115	0.066*	0.158*
		(0.031)	(0.076)	(0.036)	(0.091)
	Log-Level	0.004	0.009	0.004	0.012
		(0.002)	(0.006)	(0.003)	(0.007)
Education	Log-Log	0.036*	0.037	0.030	0.028
		(0.021)	(0.061)	(0.025)	(0.074)
	Log-Level	0.002	0.002	0.001	0.001
		(0.001)	(0.005)	(0.002)	(0.006)
N		~5100	~5100	~5100	~5100
Additional Controls		No	No	Yes	Yes
Instrumented		No	Yes	No	Yes
County Fixed Effects		Yes	Yes	Yes	Yes
Year Fixed Effects		Yes	Yes	Yes	Yes

**The dependent variables are logged Brazilian Reais (2010 real) spent on Admin, Infrastructure, Health, or Education. The explanatory variable of interest is logged or level number of legislative seats. Standard controls include logs of Total Receipts, Population, Population Squared, and Population Cubed. Additional controls include logged opposition percentage and the Number of Parties. Population of interest are Brazilian Municipalities with between 10k and 1M inhabitants. Standard errors, robust and clustered by municipality, are shown in parentheses below point estimates. The exact number of observations is not given, since there is minor variation across each of the spending categories. Statistical significance is indicated at the 10% (*), 5% (**), and 1% (***) levels.*

Table 2.3: The Effect of a Change in Number of Legislature Seats on Public Spending Categories

2.12 REFERENCES

Alesina, A., Baqir, R., & Easterly, W. (1999). Public Goods and Ethnic Divisions. *The Quarterly Journal of Economics*, *114*(4), 1243–1284. http://doi.org/10.1162/003355399556269

Alesina, A., & Wacziarg, R. (1998). Openness, country size and government. *Journal of Public Economics*, *69*(3), 305–321. http://doi.org/10.1016/S0047-2727(98)00010-3

Baskaran, T. (2013). Coalition governments, cabinet size, and the common pool problem: Evidence from the German states. *European Journal of Political Economy*, *32*, 356–376. http://doi.org/10.1016/j.ejpoleco.2013.09.009

Baumol, W., & Bowen, W. (1967). Review. *College Music Symposium*, *7*, 127–142.

Bawn, K., & Rosenbluth, F. (2006). Short versus Long Coalitions: Electoral Accountability and the Size of the Public Sector. *American Journal of Political Science*, *50*(2), 251–265. http://doi.org/10.1111/j.1540-5907.2006.00182.x

Bergstrom, T. C., & Goodman, R. P. (1973). Private Demands for Public Goods. *The American Economic Review*, *63*(3), 280–296. http://doi.org/10.2307/1914361

Bradford, D., Malt, R., & Oates, W. (1969). The rising cost of local public services: some evidence and reflections. *National Tax Journal*, *22*(2), 185–202.

Brazil National Treasury. (2013). Finance Brazil Database (FINBRA). Ministério da Fazenda. Retrieved from https://www.tesouro.fazenda.gov.br/pt/prefeituras-governos-estaduais/sobre

Brollo, F., Nannicini, T., Perotti, R., & Tabellini, G. (2010). *The Political Resource Curse* (Working Paper No. 15705). National Bureau of Economic Research. Retrieved from http://www.nber.org/papers/w15705

Delavallade, C. (2006). Corruption and distribution of public spending in developing countries. *Journal of Economics and Finance*, *30*(2), 222–239. http://doi.org/10.1007/BF02761488

Drazen, A. (2001). The Political Business Cycle After 25 Years. In *NBER Macroeconomics Annual 2000* (Vol. 15). MIT Press. Retrieved from http://www.nber.org/chapters/c11055.pdf

Duncombe, W., & Yinger, J. (2011). Making do: state constraints and local responses in California's education finance system. *International Tax and Public Finance*, *18*(3), 337–368. http://doi.org/10.1007/s10797-010-9159-3

Egger, P., & Koethenbuerger, M. (2010). Government Spending and Legislative Organization: Quasi-Experimental Evidence from Germany. *American Economic Journal: Applied Economics*, *2*(4), 200–212.

Eslava, M. (2011). The Political Economy of Fiscal Deficits: A Survey. *Journal of Economic Surveys*, *25*(4), 645–673. http://doi.org/10.1111/j.1467-6419.2010.00647.x

Ferraz, C., & Finan, F. (2008). Exposing Corrupt Politicians: The Effects of Brazil's Publicly Released Audits on Electoral Outcomes. *The Quarterly Journal of Economics*, *123*(2), 703–745. http://doi.org/10.1162/qjec.2008.123.2.703

Gilligan, T. W., & Matsusaka, J. G. (2001). Fiscal Policy, Legislature Size, and Political Parties: Evidence from State and Local Governments in the First Half of the 20th Century. *National Tax Journal*, *54*(1), 57–82.

Habyarimana, J., Humphreys, M., Posner, D. N., & Weinstein, J. M. (2007). Why Does Ethnic Diversity Undermine Public Goods Provision? *American Political Science Review*, *101*(04), 709–725. http://doi.org/10.1017/S0003055407070499

Hibbs, D. A. (1977). Political Parties and Macroeconomic Policy. *The American Political Science Review*, *71*(4), 1467–1487. http://doi.org/10.2307/1961490

Khemani, S. (2004). Political cycles in a developing economy: effect of elections in the Indian States. *Journal of Development Economics*, *73*(1), 125–154. http://doi.org/10.1016/j.jdeveco.2003.01.002

Lago-Peñas, I., & Lago-Peñas, S. (2008). Does the nationalization of party systems affect the composition of public spending? *Economics of Governance*, *10*(1), 85–98. http://doi.org/10.1007/s10101-008-0051-x

MacDonald, L. (2008). The impact of government structure on local public expenditures. *Public Choice*, *136*(3-4), 457–473. http://doi.org/10.1007/s11127-008-9308-8

Mauro, P. (1998). Corruption and the composition of government expenditure. *Journal of Public Economics*, *69*(2), 263–279. http://doi.org/10.1016/S0047-2727(98)00025-5

Meltzer, A. H., & Richard, S. F. (1981). A Rational Theory of the Size of Government. *Journal of Political Economy*, *89*(5), 914–927. http://doi.org/10.2307/1830813

Milesi-Ferretti, G. M., Perotti, R., & Rostagno, M. (2002). Electoral Systems and Public Spending. *The Quarterly Journal of Economics*, *117*(2), 609–657. http://doi.org/10.1162/003355302753650346

Nordhaus, W. D. (1975). The Political Business Cycle. *The Review of Economic Studies*, *42*(2), 169–190. http://doi.org/10.2307/2296528

Persson, T., & Tabellini, G. (2002). Do constitutions cause large governments? Quasi-experimental evidence. *European Economic Review*, *46*(4–5), 908–918. http://doi.org/10.1016/S0014-2921(01)00224-0

Persson, T., & Tabellini, G. (2004). Constitutional Rules and Fiscal Policy Outcomes. *The American Economic Review*, *94*(1), 25–45.

Pettersson-Lidbom, P. (2012). Does the size of the legislature affect the size of government? Evidence from two natural experiments. *Journal of Public Economics*, *96*(3–4), 269–278. http://doi.org/10.1016/j.jpubeco.2011.07.004

Riker, W. H. (1982). *Liberalism Against Populism: A Confrontation Between the Theory of Democracy and the Theory of Social Choice*. Prospect Heights, Ill.: Waveland Pr Inc.

Roubini, N., & Sachs, J. D. (1989). Political and economic determinants of budget deficits in the industrial democracies. *European Economic Review*, *33*(5), 903–933. http://doi.org/10.1016/0014-2921(89)90002-0

Sakurai, S. N., & Menezes-Filho, N. (2010). Opportunistic and partisan election cycles in Brazil: new evidence at the municipal level. *Public Choice*, *148*(1-2), 233–247. http://doi.org/10.1007/s11127-010-9654-1

Samuelson, P. A. (1954). The Pure Theory of Public Expenditure. *The Review of Economics and Statistics*, *36*(4), 387–389. http://doi.org/10.2307/1925895

Scartascini, C., & Crain, W. M. (2002). *The Size and Composition of Government Spending in Multi-Party Systems* (SSRN Scholarly Paper No. ID 1353462). Rochester, NY: Social Science Research Network. Retrieved from http://papers.ssrn.com/abstract=1353462

Shelton, C. A. (2007). The size and composition of government expenditure. *Journal of Public Economics*, *91*(11–12), 2230–2260. http://doi.org/10.1016/j.jpubeco.2007.01.003

Weingast, B. R., Shepsle, K. A., & Johnsen, C. (1981). The Political Economy of Benefits and Costs: A Neoclassical Approach to Distributive Politics. *Journal of Political Economy*, *89*(4), 642–664.

2.13 APPENDIX: THE MARKET FOR VOTES, A GENERAL MODEL

The structure of the supply curves remains the same as introduced in the body of the paper. When the number of legislative seats changes by V, the supply of votes shifts from S_1 to S_2. Notice that at the maximum price, the supply curve is consistent with the total number of seats, either M or M+V.

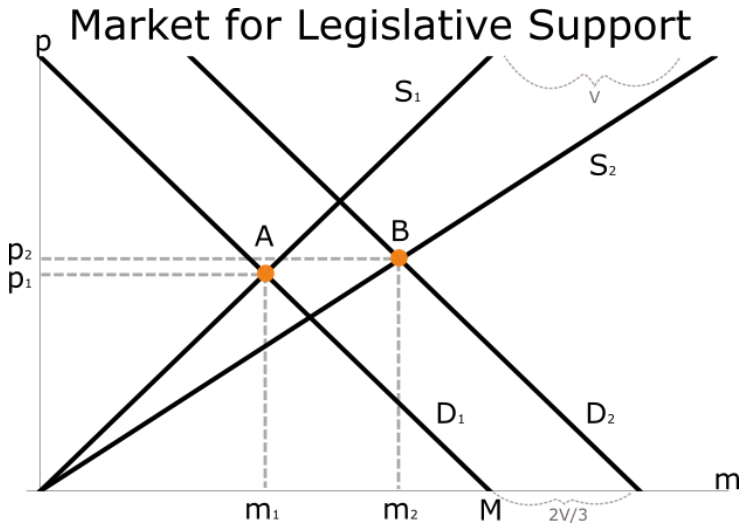


Figure 2-6: Market for Legislative Support (General Model)

The primary difference between this model and that introduced in the text is that the slope of the demand curve is allowed to vary. As before, the task is to identify whether a change in the number of seats leads to a larger or smaller level of public spending, where the executive "buys" votes by making special appropriations for legislator's projects. The quantity of votes purchased is m, and the price at which they are purchased is p. The equations for the supply and demand curves before (1) and after (2) the change in legislative seats (V), are:

$$S_1\colon\ p_1^S = a + bm \qquad \text{(A1)}$$
$$S_2\colon\ p_1^S = a + cm \qquad \text{(A2)}$$
$$D_1\colon\ p_2^D = j + dm \qquad \text{(A3)}$$
$$D_2\colon\ p_2^D = k + dm \qquad \text{(A4)}$$

A number of parameters can be calculated once we have a, b, d, the original number of seats, M, and the change in the seats, V. We can calculate $c = \frac{b\,M}{M+V}$, since S_2 is restricted to attaining the same maximum price as S_1 at the maximum number of potential seats. $j = -d\,M$, since all votes will be demanded at a price of zero. $k = -d * (\frac{2}{3}V + M)$ since D_2 is a rightward shift of $\frac{2}{3}V$ from D_1. In order to illustrate these relationships, Figure 2-6 assumes that the demand curve slope is d = -1. The supply curve intercept, a, is shown as a = 0, and the supply curve slope for S_1 is b = 1.

To reiterate the main goal, we want to understand how spending changes with respect to a change in the size of the legislature. Spending is equal to the total number of votes purchased times the cost of the votes, so $\text{Spending} = p * m$. Both price and quantity change with respect to the change in the number of seats, dV, so find the concept of interest using:

$$\frac{\partial \text{Spending}}{\partial V} = p\frac{\partial m}{\partial V} + m\frac{\partial p}{\partial V} \qquad \text{(A5)}$$

Where p and m are the equilibrium price and quantity of votes exchanged in the first period. Calculate these values first. They are:

$$m_1^* = -\frac{a+dM}{b-d} \qquad \text{(A6)}$$

$$p_1^* = -\frac{d(a+bM)}{b-d} \qquad \text{(A7)}$$

Calculate how m and p change with respect to V by first finding the equilibrium quantity and price in the second period (when V has been introduced), and then take their derivatives with respect to V.

$$m_2^* = -\frac{(M+V)(3a+3dM+2dV)}{3bM-3d(M+V)} \qquad \text{(A8)}$$

$$p_2^* = -\frac{d(3a(M+V)+bM(3M+2V))}{3bM-3d(M+V)} \quad \text{(A9)}$$

$$\frac{\partial m}{\partial V} = \frac{-3abM+d(2d(M+V)^2-bM(5M+4V))}{3(bM-d(M+V))^2} \quad \text{(A10)}$$

$$\frac{\partial p}{\partial V} = -\frac{bdM(3a+(2b+d)M)}{3(bM-d(M+V))^2} \quad \text{(A11)}$$

Before proceeding to the final equation, it is worthwhile to examine the components of A5 individually. The following are acceptable ranges for the parameters.

$$-\infty \leq a \leq \infty$$
$$0 \leq b \leq \infty$$
$$0 \leq m \leq M$$
$$0 \leq p \leq a + bM$$
$$-\infty \leq d \leq 0$$
$$-\infty \leq V \leq \infty$$
$$0 \leq M \leq \infty$$

m_1^* and p_1^* will always be positive. This leaves whether total spending goes up or down to the terms $\frac{\partial m}{\partial V}$ and $\frac{\partial p}{\partial V}$. Further assuming that the change in seats, V, is positive, then $\frac{\partial m}{\partial V}$ could be signed if it were not for the "a" term in the numerator. However, *a* must be sufficiently large to prevent $\frac{\partial m}{\partial V}$ from going negative. In the numeric case similar to what we have been using above where M = 10, V = 3, b = 1, d = -1, then *a* would need to be greater than 32, which is even bigger than k = 12 in this case. In other words, an increase in seats almost always increases the number of votes exchanged, practically speaking.

The key factor is $\frac{\partial p}{\partial V}$, which can be either negative or positive. In the case that it is positive, then total spending must increase, since it is the only term that can possibly be negative. If it is

negative, then it must be sufficiently negative to offset the increase in seats exchanged and cause total spending to decrease. Most of equation (A11) can be signed except two terms make its direction indeterminate. The *a* term can cause the whole equation to be negative if a is sufficiently negative, but the magnitude to which this must be true is substantial. The more important issue is the term, (2b+d). Since d is a negative number, we do not know whether this whole term is negative or positive. If 2b > -d, then price will increase with respect to an increase in seats. In other words, the relative slopes of the supply and demand curves play a key role in deciding whether vote price goes up or down in response to an increased number of seats.

To determine the total effect, substitute equations A6, A7, A10 & A11 into equation A5. The result is complex and difficult to simplify. If, however, we assume that a = 0 as in our above examples, then a more tractable result emerges.

$$\frac{\partial \text{Spending}}{\partial V} = \frac{bd^2M(bM(7M+4V)-d(M^2+4MV+2V^2))}{3(b-d)(bM-d(M+V))^2} \qquad \text{(A12)}$$

Here, we can sign $\frac{\partial \text{Spending}}{\partial V}$ as positive. That is, if the *a* term is within a reasonable range, then spending must increase with respect to an increase in the number of seats.

3 CHAPTER 3: REALLOCATION OF EARMARKED HIGHWAY FUNDS UNDER A COSTLY BUDGETING PROCESS

3.1 INTRODUCTION

The practice of earmarking, or designating the proceeds from particular revenue sources to specific expenditure categories, is a common concern in public budgets. Scholars have asked whether the practice is economically efficient, whether it increases public expenditures (Buchanan, 1963, Athanassakos, 1990), and why it happens (Bös, 2000). Many have also asked whether authorities actually comply with the spirit of the earmarking laws, given that monies can be reshuffled across accounts to ensure merely formal compliance (Nesbit & Kreft, 2009). On this last point, the theoretical expectations and empirical findings in academic literature have long been at odds. If a government already spends in excess of new earmarked revenue, the budget authorities can claim that they are in formal compliance with the earmarking law (Wilde, 1968). They are then free to allocate money as if the earmarking law was never imposed. In this case, the theory goes, they will simply allocate the budget to various expenditure categories based on their marginal propensity to consume those goods out of new income. The result is that marginal increases in the earmarked revenue will lead to less than a one-for-one increase in spending on the earmarked good.

Empirical research often finds the contrary: An extra dollar of earmarked revenues leads to larger spending changes than would be suggested by the marginal propensity to consume that good from income. When intergovernmental aid leads to overall larger public expenditures than if all taxpayers had been given the same money, this is the "fly-paper effect" in the academic research[23]. The "flypaper" term has also been used more loosely to describe situations where federal aid fails

[23] See (Fisher, 1982) and (Hines & Thaler, 1995) for reviews of this literature.

to crowd out other state spending (Knight, 2002), and when earmarks fail to crowd out spending on earmarked spending categories (Gamkhar, 2000, 2003; Nesbit & Kreft, 2009). A number of mechanisms have been proposed to explain why the empirical results diverge so greatly from the theory. This paper adds one more: costly budgeting procedures.

The seeming contradiction between theory and experience disappears when the administrative costs of re-appropriating earmarked money are considered. If reallocation costs are zero, then the normal view of earmarks prevails in that expenditures should grow in line with the marginal propensity to consume from new (earmarked) income. On the other hand, a perfect flypaper effect is obtained by assuming reallocation costs are infinite. Infinite reallocation costs entail that 100% of the earmarked income will be spent on the earmarked category.

Legislators can typically reassign earmarked funds with some effort, which suggests that the realistic assumption is that costs are positive but not infinite. Furthermore, heterogeneity among governments means that some will be willing to pay these costs to optimize their expenditures, while others will not find it worthwhile. Aside from costs, I introduce another important source of heterogeneity, which is the extent to which governments rely on earmarked expenditures. Given equal income and preferences, governments that receive a larger share of the revenues as earmarks have more to gain from re-allocation. I suggest that these governments should be more willing than others to undertake a costly budgeting process in order to re-allocate earmarked funds to other uses.

The theory is developed and illustrated using data from Oklahoma County governments from 1973 to 2012. The context within which the theory is explored is a familiar one. Natural resource revenues are earmarked for spending on infrastructure projects. In 2013, 34 US States had severance taxes, and 24 of those states had earmarked the revenues for a particular use. The most

common dedicated uses are for highways, education, conservation, and natural resource management (Brown, 2013). As shale gas production in the US has increased, there has been additional interest in levying severance taxes and much of the proposed legislation makes provisions for earmarking the additional revenue. The literature on earmarking and the flypaper effect is useful for understanding the effects of marginal funding changes.

I present results that indicate evidence is in line with the theory. I find that the typically large spending effect of earmarked revenues is mitigated by a county's reliance on those revenues as a share of its overall budget.

The implications of this theory are important. It implies that the ability of earmarks to stimulate specific expenditures will be effective at low levels, but lose force as they become a larger portion of a budget authority's total revenues. Earmarked revenue can increase expenditures in a desired policy area if the costs of re-allocating those funds are sufficiently high. However, as the earmarked funds play a mounting role in the overall budget of the government, there will be an increasing push to incur the re-allocation costs and appropriate the funds for more beneficial uses.

3.2 THEORY AND LITERATURE

Consumer theory is often used to understand the behavior of governments that receive aid (Wilde, 1968). The parallel is drawn between governments that receive earmarked vs. general transfers and individuals who receive in-kind vs. lump-sum assistance. Those who receive lump-sum assistance are at least as well off, and possibly better off, than those receiving in-kind assistance since they can allocate the fungible dollars however they see fit. In the case where the in-kind transfer is not practically binding, then they should offer the same welfare increase. Several authors have recognized that the parallel between consumer theory and government budgeting is

not perfect because of the collective nature of the government decision making process (Bradford & Oates, 1971; Wilde, 1968). However, the consumer theory analysis still provides a valuable starting point. It is depicted in Panel A of Figure 3-1, which illustrates the budget allocation decisions of a government choosing between highway spending and expenditures on all other government activities. The government has a limited amount of total budget resources, shown by the budget constraint line S.

3.2.1 Budgeting Costs

Given the shape of its utility curves, the government selects the optimal point on the budget constraint S, point A, where it has allocated its resources to purchase half highways and the other half government services[24]. If the government were to receive an influx of highway-earmarked funding, then its budget constraint would shift horizontally to the right to S'. To stay in formal compliance with the earmarking law, the government would have to spend at least the amount of the earmarked revenue on highways. Graphically, it would have to buy more highway than the location of the kink in the second budget constraint. This would not be a problem in the illustrated case, since the earmark is not practically binding. In other words, it will easily spend the minimum required by the earmarking rule. Just as in the case of a transfer of general funds, the government has just received an influx in income it will expand its purchases in line with its marginal propensity to consume out of new income. Thus, conventional economic theory reasons, the municipality will end up at point B. The government is formally in compliance with the earmarking law at point B, and it is also maximizing the welfare of the community.

[24] This is not so different than the allocation made by Oklahoma counties. On average, they spend about 40% of their revenues on highways.

The trouble with this rationale is that a great deal of academic literature finds that new earmarked income does not cause expenditures to expand from point A to point B. Earmarked income is somehow different from general income, in that it appears to cause expenditures to expand from point A to point C. That is to say that the full amount of the marginal highway-earmarked revenues is allocated to highway expenditures. Explanations for the causes behind this phenomenon and the closely related flypaper effect are numerous, but none point to transaction costs in the budgeting process as a potential mechanism.

The budgeting process of a government is a costly, time-intensive affair. This is true even for relatively small governments. Earmarked revenues often flow directly into designated accounts, called Funds. When a government has the authority to transfer money away from these funds, it often does so. As McCleary describes a World Bank survey on earmarking highway funds found:

> *Allocations for road funds appear to depend on the condition of the general budget. When money is tight, earmarked funds may be temporarily frozen (as happened in Ghana) or diverted to other uses (as in Mali)…(McCleary, 1991, p92)*

These experiences are common, and they show that reallocating earmarked funds is possible. However, this does not mean that diverting money away from an earmarked fund is free or easy. A budget committee must convene meetings, review reallocation proposals, hear stakeholders, and ultimately rule on how much money to transfer, and to which accounts. Unless there is pressing need to reallocate money, legislators and the budgetary authority might not be willing to spend their time and effort on this task, especially since budget debates tend to re-open previously settle decisions.

The decision to reallocate money away from an earmarked fund differs under the conditions of a costly budgeting process. In terms of Panel B in Figure 3-1, the decision to reallocate earmarked revenues incurs a fixed cost, labelled L, which shifts the government's budget constraint inward

to the dotted line, labeled S". If a government wanted to re-allocate the funds, it would pay L and end up at point D. If the cost of reallocating revenue is positive, then the traditional narrow view of an optimizing budget committee does not hold. Put differently, the government cannot move to point B because that point is not available in the presence of budgetary transaction costs. Under a budgeting procedure that incurs sufficiently large costs, the government achieves the welfare-maximizing result by avoiding paying those costs staying at point C. This can be seen in Panel B of Figure 3-1, with large costs inducing the government to stay at point C where it gains utility of U" rather than falling to the lower utility level of U''' associated with point D.

Where the budgeting costs are smaller, such as those shown in Panel C of Figure 3-1, the government may elect to pay those costs in order to optimize its consumption bundle. The Panel C scenario suggests that a government facing a small L would move to point D since the utility levels, U''', associated with it are higher than the utility levels associated with a 100% increase in highway funding, U''. If the costs go to zero, then the situation converges upon the traditional analysis of lump-sum vs. earmarked revenues depicted in Panel A. Governments should immediately optimize their consumption bundle since there is no cost to their doing so.

Finally, there exists a budgeting cost that induces the government to be indifferent between re-allocating to point D and staying put at point C. This situation is shown in Panel D of Figure 3-1. Regardless of its decision, the government will find itself on utility curve U''. In Panel D, a re-allocation of expenditures generates utility gains that are perfectly offset due to negotiation costs.

3.2.2 Reliance on Earmarked Revenues

The other important factor in a government's decision to re-allocate is the proportion of its budget that come from highway-earmarked revenues[25]. The more dependent a government is on the earmarked highway fund revenues, the rightward shift in budget constraints from S to S' will be greater in magnitude[26]. The government has more to gain by paying the cost of the negotiation and shifting some of the revenues to other government purposes. Empirically, we would expect governments more reliant on the highway revenues to reallocate a greater proportion of incoming earmarked revenues than governments who are less reliant on the earmarked revenue source.

A government budget committee might choose to reallocate funds if that reallocation leaves the municipality better off. Formulated in terms of consumer theory and in reference to Figure 3-1, consider a budget committee with Cobb-Douglas preferences, $U(H,G) = H^{a}G^{1-a}$, with quantities of highway (H) and general government services (G), respectively. The budget constraint is $M = P_H H + P_G G$, where M is total revenue. P_G and P_H are the relative prices of these goods and they are set to parity. To distinguish general revenue from highway-earmarked revenue, use subscripts so that $M = M_g + M_h$.

In scenario D, where the committee pays a fixed negotiation price[27], L, to optimize its consumption bundles, the quantity demanded of highways and general government goods and services can be inferred from the Cobb-Douglas solutions as:

$$H_D^* = a\big(M_g + M_h - L\big) \quad \text{and} \quad G_D^* = (1-a)(M_g + M_h - L)$$

[25] There is a parallel literature in consumer theory that suggests that the same income, received in different ways, affects spending behavior. See (Lundberg, Pollak, & Wales, 1997).

[26] Technically speaking, general income must also fall to keep total revenues constant.

[27] Again, this cost could be interpreted as Legislative bargaining costs including costs to the committee members to attend meetings, gather information, and carry out the necessary administrative procedures to reallocate the funding.

In scenario C, where the committee must spend its earmarked revenues on highways, the quantity demanded of H and G is:

$$H_C = a(M_g) + M_h \quad \text{and} \quad G_C = (1-a)M_g$$

The committee will select point D over point C if:

$$U(H_D^*, G_D^*) > U(H_C, G_C)$$

Another way of phrasing this would be that the committee elects to pay L if the above conditions hold. Substituting the quantities demanded above into the utility functions, the condition becomes:

$$(a(M_g + M_h - L))^a((1-a)(M_g + M_h - L))^{1-a} \quad > \quad (aM_g + M_h)^a((1-a)M_g)^{1-a}$$

Solving for L reveals that the committee will pay L to reallocate[28] their spending if the cost is less than some quantity:

$$L \ < \ (M_g + M_h) - \frac{(\sqrt{M_g})(\sqrt{aM_g + M_h})^a}{(\sqrt{a})^a}$$

The first term in parenthesis on the right hand side is the total revenue. Call the second term on the right hand side ρ. To better understand the ρ term, normalize the total municipal revenue so that $m_g + m_h = 1$, where m_g and m_h are the shares of revenues from general sources and highway earmarks. l is the negotiation cost as a share of total revenues. This implies that $m_g = 1 - m_h$, and the above equation can be re-written as:

$$l < 1 - \frac{(\sqrt{1-m_h})(\sqrt{a + m_h - am_h})^a}{(\sqrt{a})^a}$$

[28] Take logs of both sides. The (1-a) terms cancel out. Log terms containing L can be combined. Isolate the L by raising that term to e and cancelling.

This reveals that the decision of the budget committee to switch from position C to position D in Figure 3-1 is based on the budget reallocation costs (L), the share of the revenues from earmarked funds (m_h), and the preference parameter (a) for highway consumption. An alternative form of this statement is

$$l < 1 - \rho(a, m_h)$$

There is no closed-form solution to $\rho(a, m_h)$, but we do know that the Cobb-Douglas preference parameter lies in the range $0 \leq a \leq 1$. So does the share of revenues from highway earmarks, so $0 \leq m_h \leq 1$. Plotting ρ as a function of m_h and for different given values of a, Figure 3-2 shows that $\rho(a, m_h)$ can be approximated by $\rho(m_h)$ for any given value of a.

Figure 3-2 shows $\rho(0.1, m_h)$ with a dashed concave curve and $\rho(0.5, m_h)$ with a solid concave curve. The solid line drawn directly from (0,1) to (1,0) is shown for reference. ρ is insensitive to movements in a that we can approximate the decision equation with:

$$l < 1 - \rho(m_h)$$

Importantly, Figure 3-2 shows that ρ varies between 0 and 1 for the relevant domains of m_h and a. The share of revenues from earmarked highway sources is related to the value of ρ. ρ falls as $m_h$rises, indicating that the whole right hand side of the decision equation gets larger as m_h rises. A larger right hand side makes it more likely that the budget committee will elect to reallocate the earmarked funds. Additionally, a larger (smaller) left hand side, l, will make it less (more) likely for a committee to reallocate funds. This was the relationship that we illustrated with the charts in Figure 3-1.

It is also informative to consider what would happen at extreme values. If the re-allocation cost, L, were to go to zero, then the committee would be certain to optimize and it would end up at point B in Figure 3-1, which is the traditional view of general transfers. If the re-allocation cost were 1, then budget committees would always stay at point C. If m_h were zero, then the budget committee would never re-allocate, and if m_h were 1, then the budget committee would always re-allocate. These values fit well with the above theory and general intuition.

3.3 EMPIRICAL EVALUATION

County governments in Oklahoma receive a significant portion of their revenues through an earmarked Highway Fund, administered by the state. The relative importance of the Highway Fund in each county's budget varies markedly both across counties and over time. In terms of the model presented above, Oklahoma county governments face different potential gains from reallocating part of their Highway Fund to non-highway uses. In the graphical language of Figure 3-1, counties experience different amount of rightward shift in their budget constraints due to influxes to the Highway Fund. The budget process of each Oklahoma county government is regulated by the County Budget Act of 1981, which prescribes a list of procedures that each county must follow to adopt a legal annual budget[29]. The budget act provides substantial homogeneity in budgeting procedures, although there is some allowance in the budget act for the counties to establish their own conventions for the conduct of individual meetings. Given this budgeting environment, budgeting costs are assumed to be relatively fixed for each municipality across time. To the extent that they do change over time, due to adoption of computers for example, these changes are assumed to be available to all counties at the same time. Using an empirical strategy where fixed

[29] Oklahoma Statute (OS) §19-1401. (State of Oklahoma, 2015)

effects control for budgeting costs, this section uses the Oklahoma county data to test the hypothesis that higher levels of dependence on earmarked revenues will lead to greater reallocation away from highway funds and to other general expenditures.

3.3.1 Activities, Expenditures, and Revenues of Oklahoma Counties

Oklahoma adopted its constitution and was admitted to the Union in 1907. The constitution delineates the boundaries of 75 counties. Harmon County was created from Greer County in 1909, and Cotton County was carved out of Comanche County in 1912 (State of Oklahoma, 1907). Oklahoma has neither created nor merged counties since 1912, which makes for a set total of 77 counties throughout the study period of 1973 to 2012. In addition to counties, local governments in Oklahoma include towns, cities, and special districts.

Oklahoma Counties perform a wide range of functions because they are the primary local government in unincorporated lands. They are responsible for maintaining the peace and property by fielding a sheriff and administering a county court system. Counties build and maintain roads and other transportation infrastructure. They are responsible for public record keeping regarding property and marriage, and even public welfare for "inhabitants who, by reason of age, infirmity, or misfortune, may have claims upon the sympathy and aid of the county (State of Oklahoma Constitution, Title XVII-3)." A look at the average expenditure shares shows that while the counties do indeed spend money on all these functions, they spend a large share of their budgets on the construction and maintenance of highways.

The counties receive, on average, approximately 40% of their revenue from intergovernmental aid. Nearly 30% of their revenue is from intergovernmental aid through the county highway fund. The other 60% are own-source revenues, which are evenly split between property taxes, other taxes (e.g. sales), and miscellaneous charges and revenue sources.

3.3.2 Budgetary and Earmarking Rules for Oklahoma Counties

The Oklahoma County Budget Act establishes the institutional framework for the budgeting in each county. Each county has a "county budget board," which is chaired by the chairman of the board of county commissioners. The members include all elected county officials, who each have one vote[30]. At the beginning of a budget cycle, the county budget board requests estimated revenues and expenditures from each county department or office[31]. It then prepares a budget that is published at least 30 days prior to the beginning of a new fiscal year[32]. Each departmental officer has the right to be heard by the county budget board before the final draft budget is published. Any transfer of money between Funds is required to be "*shown as a transfer from the one fund and as a transfer to the other fund*[33]."

The budget board must hold a public hearing on the budget no less than 15 days prior to the beginning of the new fiscal year. Any person may "present comments, recommendations, or information on any part of the proposed budget" at the hearing[34]. The adopted budget is to be examined and approved by the county excise board, who then "shall compute the appropriations and levy the taxes necessary for the county for the budget year in accordance with this act.[35]" Any taxpayer may file a protest against illegality in the budget within 15 days of the county filing its budget with the State Auditor and inspector[36].

These budgeting procedures describe a lengthy and bureaucratic (and democratic) process where there is significant labor cost involved in allocating public money. Re-allocation of earmarked

[30] OS §19-1407.
[31] OS §19-1411.
[32] OS §19-1410.
[33] OS §19-1410.
[34] OS §19-1412.
[35] OS §19-1414.
[36] OS §19-1415.

funds is flagged by the budgeting procedures as an activity that must be negotiated, documented and subject to public review. In short, there is clear evidence that budget committees bear significant time costs and incur additional scrutiny from re-allocating funds away from earmarked categories. It is also clear that they have the authority to make reallocation decisions, so the cost of doing so is not infinite.

3.3.3 The County Highway Fund and its Components

The highway fund is an indispensable source of revenues for some counties. Figure 3-5 shows how the importance of the fund (as a percent of the total revenues) varies across counties and across time. Counties are ordered across the horizontal axis based on their median reliance value. The "reliance value" is on the vertical axis, with some counties counting on the highway fund as less than 5% of their total revenue (on the left), and some counties rely on revenues from the highway fund for over 60% of their revenues. The boxplots show the distribution, from 1973 to 2014 for each county. The median value is the horizontal line in the middle of each box, with the 25^{th} and 75^{th} percentiles determining the bottom and top of the box, respectively. Outlier observations are noted as points.

There is substantial variation within each county over time. Variation on this dimension is particularly important for the empirical analysis discussed below, since county fixed effects cause us to compare a given county to itself over time. It is not unusual for counties to experience an interquartile range of 10 percentage points over the study period, and the importance of highway funds for some counties is highly variable reaching an interquartile range of 40 percentage points.

I provide additional evidence that the fixed effects are enough to provide identification on the parameter of interest through a robustness check, which uses components of the highway fund to instrument for the full fund. The county highway fund receives money from three primary sources:

Vehicle Taxes and Licenses, Motor Fuel Taxes, and the Gross Production Taxes (GPT). In fiscal year 2014, the total distributions to the county highway funds equaled $291 million dollars. $126 million was from Fuel Tax. $76 million was from the Gross Production Tax, and $89 million was from motor vehicle licenses. Figure 3-6 shows how these proportions have varied over time. The motor fuel tax has gradually become less important, and the motor vehicle tax has become increasingly important. The Gross Production Tax played a larger role in the early 1980s and mid 2000s when the prices of oil or natural gas were relatively high.

The State of Oklahoma levies a severance tax as an ad-valorem charge on the gross market value of Oil[37], Gas, and Mineral production[38]. The Gross Production Tax has typically been set at 7% of the gross value of oil and gas, though there are provisions in the law to reduce the percentages in the case that price of oil falls below $17 per barrel or gas below $2.10 per thousand cubic feet (mcf)[39]. Of these receipts, approximately 7% are apportioned to the county highway fund. These distributions appear as the GPT component of the highway fund in Figure 3-6. The funds are distributed so that, "*Each county shall receive a proportionate share of the funds available based upon the proportion of the total value of production from such county in the corresponding month of the preceding year*[40]." The annual lag in payments means that county authorities are able to calculate with a high level of certainty the amount of GPT money that will be available to their highway fund in an upcoming fiscal year.

[37] "there is hereby levied upon the production of oil a tax as set forth in this subsection on the gross value of the production of oil based on a per barrel measurement of forty-two (42) U.S. gallons of two hundred thirty-one (231) cubic inches per gallon, computed at a temperature of sixty (60) degrees Fahrenheit." OS §68-1001.
[38] OS §68-1004.
[39] OS §68-1001.
[40] OS §68-1004.

The county highway fund receives substantial contribution from the gross production tax in counties that are endowed with natural resource production. The GPT is levied on petroleum and natural gas production. Figure 3-7 shows that the counties who are large oil producers are not necessarily important natural gas producers, and vice-versa. It also shows that the GPT is an important part of many county's budgets, which is relevant because this provides variation in the extent to which a county's budget is composed of highway revenues. The importance of the GPT in county budgets varies significantly by county and over time. The right column in Figure 3-7 shows how GPT played an important role in county budgets in 1980s, its effects waned in the 1990s and then it picked up again in the 2000s. The revenues in the 1980s were due to petroleum, while the revenues in the 2000s are due to natural-gas production. Note that because of the distinction between petroleum and natural gas, petroleum-rich/natural gas-poor counties for whom the GPT was an important revenue source in the 1970 never saw their revenue shares rebound in the 2000s. Together, these trends across time and across counties provide important underlying variation in the extent to which counties rely on the highway fund for their revenue base.

3.3.4 The Model

Highway spending in Oklahoma counties is a function of the revenues, population, and geographical extent of a county. The theory discussed above and the literature on earmarking suggests that Oklahoma counties might treat revenue arriving through the Highway Fund as different from general revenues, which requires that general revenues and highway revenues be included separately in the model. This paper proposes a theory whereby counties that are more reliant on earmarked highway funds for their total revenues will be more likely to transfer money away from highway spending, given fixed negotiation costs. That suggests the effect of the highway-fund revenues is conditional on the volume of total revenues other than those from the

highway fund. Population for county i in time t is included as a control variable, as is its square. Fixed effects are included for counties and for years. The county fixed effects, γ_i, pick up the effect of time-invariant factors such as the geographical extent of the county. The budgeting costs for each county are assumed to be relatively time-invariant, so they are also absorbed into the county fixed effect. To the extent that the budgeting costs might vary over time due to improvements in technology or changes in regulations, it is assumed that they change uniformly across all counties. The year fixed effect, δ_t, captures factors that change over time but are generally constant across counties. For example, this would capture the effect that a particularly bad winter in any given year has on necessary highway maintenance expenditures. It would also control for statewide factors that change over time and affect budgeting costs, such as the adoption of computers.

$$\mathrm{HwyExp_{it}} = \beta_0 + \beta_1 \mathrm{Rev_{it}} + \beta_2 \mathrm{HwyFund_{it}} + \mathbf{Pop_{it}}\boldsymbol{\alpha}_{1,2} + \gamma_i + \delta_t + \epsilon_{\mathrm{it}} \quad (1)$$

$$\mathrm{HwyExp_{it}} = \beta_0 + \beta_1 \mathrm{Rev_{it}} + \beta_2 \mathrm{HwyFund_{it}} + \beta_3 \left(\frac{\mathrm{HwyFund_{it}}}{\mathrm{Rev_{it}}}\right) + \mathbf{Pop_{it}}\boldsymbol{\alpha}_{1,2} + \gamma_i + \delta_t + \epsilon_{\mathrm{it}} \quad (2)$$

Highway expenditures and all revenues are measured in Thousands of USD (2010 real value), so the coefficients represent dollar changes in highway spending for a dollar change in revenues. This model is estimated with and without the highway reliance term. When it is estimated without highway reliance term, the coefficient of interest is β_2, which describes the dollar change in highway spending for a dollar change in highway funds, holding revenues constant. It should be positive, between zero and one, since it indicates the share of highway funds that are spent on highways. When the highway reliance term is added to the model, the coefficient of interest is β_3. It estimates the extent to which a higher reliance on highway funds, as part of the total budget, affects total highway spending (holding revenues and earmarked funds constant). The theoretical prediction is that counties that are more reliant on earmarked funds will be more likely to re-

allocate these funds away from highway expenditures, so we expect to estimate a negative coefficient for β_3.

An additional variation is estimated for models (1) and (2), where the effect of the highway fund is conditional on the population of the county. Each model is also estimated by including an interaction term between the highway fund size and population. One might imagine a scenario where additional highway fund revenue is appropriated differently depending on whether a county has a larger or smaller population. This model is estimated as:

$$\mathrm{HwyExp_{it}} = \beta_0 + \beta_1 \mathrm{Rev_{it}} + \beta_2 \mathrm{HwyFund_{it}} + \beta_3 \left(\frac{\mathrm{HwyFund_{it}}}{\mathrm{Rev_{it}}}\right)$$

$$+\beta_4(\mathrm{HwyFund_{it}} * \mathrm{Pop_{it}}) + \mathbf{Pop}_{\mathrm{it}}\boldsymbol{\alpha}_{1,2} + \gamma_i + \delta_t + \epsilon_{\mathrm{it}} \quad (2b)$$

3.3.5 Data

The primary sources of data are the US Census Bureau's Historical Finances of Individual Governments (IndFin) and the Oklahoma Tax Commissions records on county highway fund distributions. IndFin contains revenue and expenditure data for detailed accounts for 1967 and from 1972 to 2012 (U.S. Census Bureau, 2015). The county highway fund distributions are available for 1973 to 2014 (Oklahoma Tax Commission, 2014) . The common overlapping time period between the two data sources is 40 years, from 1973 to 2012. Accordingly, all models are estimated for all 77 counties over the course of 40 years from 1973 to 2012. This period captures significant temporal variation in highway funding and spending.

Not every county appears in every year due to the nature of the data collection procedures at the US Census Bureau's Individual Government Finances (IndFin) dataset. Figure 3-8 shows the

availability of these data with Oklahoma's 77 counties arranged alphabetically in columns, and years in rows. Shaded cells indicate data availability for a county-year.

All 77 counties appear in the dataset on five year intervals for years ending in 2 and 7 since the US Census of Governments was adminstered during these "benchmark" years. The US Census bureau carries out the "Annual Survey of State and Local Government Finances" between the benchmark years. The Bureau says that it randomly selects a sample of state and local governments every five years (in years ending in 4 and 9)[41]. However, it is apparent from Figure 3-8 that some counties always find themselves in the random sample for non-benchmark years, which suggests that the random sampling may be conditional on specific factors. Counties that are consistently included are overwhelmingly the highest populated counties (over 60,000 inhabitants) in the state. Random sampling stratified on population would be unlikely to bias our estimates since population appears as a control in the model for this paper. Nevertheless, an additional model (#3) is estimated for only benchmark years (ending in 2 and 7) to check whether sampling bias has been addressed.

3.3.6 Results

The results from equations 1, 2 and 3 are presented in Table 3.3. Additionally, the estimates for each model are shown for versions a and b, where model b adds an interaction term for highway revenues and population. Version a is the model without the Highway Revenue reliance term (HRev/TRev). This serves to facilitate comparison with estimates that disregard this factor. Models 1 and 2 are full sample estimates, while model 3 is the restricted sample estimate, using only benchmark census of government years.

[41] https://www.census.gov/econ/overview/go0400.html

The estimates from model one indicate that, on average, county highway spending rises 55 or 68 cents for every dollar of earmarked highway revenues. While these point estimates are meaningfully higher than 0.37, which is the average rate at which counties spent their money on highways in 2012, only 1b comes close to being statistically significantly higher at a 95% confidence level. So the evidence for a crowding out effect, whereby a disproportionately large portion of the highway fund revenues are being directed into highway spending, is suggestive but not definitive. It could be that the overall crowdout effect is weak, or it could be that the crowdout depends on some additional heterogeneity not included in this model. In that case, the average crowdout effect is weak, but this is deceptive since it is strong for some counties and weak for others. The theory described above suggests that the additional factor is the reliance of counties on earmarked highway funds for their total budgets.

Models 2a and 2b add the highway revenue reliance term (HRev/TRev) to control for the additional heterogeneity indicated in the theory section. The reliance term has a statistically significant effect[42] in the expected direction. Recall that the hypothesis is that a higher reliance ratio would lead to greater re-allocations away from highway spending. Thus, the expected effect on highway spending should be negative. The direction of the reliance effect remains negative and roughly similar in magnitude for models 2a and 2b. Taking model 2b as a preferred model since it incorporates both the highway revenue reliance term and an additional control, the magnitude of β_3 in equation 2b is \$28,000 dollars less spending for a 1 percentage point increase in reliance on highways funds[43]. This suggests that a county with a reliance ratio of 0.5 would spend \$1.4 million less on highways than a similarly situated county with all its budget coming from general funds (a

[42] The t-statistic on the reliance ratio term in model 2a is significant at p=0.054.
[43] All values are expressed in 2010 real prices.

reliance ratio of zero). Considering that the median county in Oklahoma spent $4.2 million per year on highways in 2012, this would represent a significant proportion of the budget that was transferred out of the highway fund into other uses.

The estimates in model 3 show that we reach the same conclusion even when using the restricted sample. The estimates from model 3 represent a reduction of $30,000 to $36,000 per additional percentage point of reliance on highway funding. So the estimates are close to that of model 2b. Any bias in the full sample is actually causing our estimates to be too low. The estimates from the restricted sample strengthen the conclusion that reliance on earmarked funds, holding revenue constant, is associated with lower highway spending.

The marginal effect of highway funds on highway spending in models 2a and 3a show that the displacement effect is conditional on revenue reliance and population. In other words, there is not just one crowdout effect. Rather, the magnitude of the transfer of funds out of highway spending depends on several factors. Overall, Table 3.3 gives strong evidence that highways who receive a greater proportion of their revenues as highway funding transfer more money out of their highway spending account, which is consistent with the hypotheses that emerge from the theory.

3.3.7 Robustness Check

An important concern with early empirical work on crowd-out effects was that external aid was endogenously determined by a recipient's preferences (Knight, 2002). Under these circumstances, it would look like communities spend 100% of the earmarked money on the earmarked category because that was what they were intending to spend the money on all along. One potential source of omitted variable bias could be that HighwayExpenditures could be correlated with HighwayFunds through each county's response to oil or natural gas prices. For example, higher

oil prices might increase the size of the highway fund due to higher fuel taxes, and also increase operating expenses of highway construction and maintenance. To address this concern, an additional model is estimated that instruments the highway fund with a component of the fund that varies in an essentially random way. A county's gross production tax (GPT) revenues are determined by a county's reserves and production of oil, natural gas, and minerals, and by the prevailing market prices of those commodities. Evidence is presented below that shows gross production tax revenues are conditionally uncorrelated with fuel-tax revenues, and that GPT revenues also have a strong first-stage correlation with highway fund, since the GPT is an important component of the fund[44]. The first stage of the 2SLS model is:

$$\text{HwyFund}_{\text{it}} = \alpha_0 + \alpha_1 \text{Rev}_{\text{it}} + \alpha_2 \text{GPT}_{\text{it}} + \mathbf{Pop}_{\text{it}} \boldsymbol{\alpha}_{3,4} + \theta_i + \lambda_t + u_{\text{it}} \quad \text{(R1)}$$

The second stage is estimated with:

$$\text{HwyExp}_{\text{it}} = \beta_0 + \beta_1 \text{Rev}_{\text{it}} + \beta_2 \hat{\text{HwyFund}}_{\text{it}} + \beta_3 \left(\frac{\hat{\text{HwyFund}}_{\text{it}}}{\text{Rev}_{\text{it}}}\right) + \mathbf{Pop}_{\text{it}} \boldsymbol{\beta}_{4,5} + \gamma_i + \delta_t + \epsilon_{\text{it}} \quad \text{(R2)}$$

3.3.7.1 Evidence for Validity of the Instrument for Highway Funds

The estimates in the instrumented model are consistent with those of the non-instrumented model for the coefficients of interest. Due to concerns that the size of the Highway Fund might be associated with energy price fluctuations that would also affect highway spending, an instrumental variables strategy is used. The instrument chosen is a component of the highway fund that is

[44] The instrumented variable also appears in the fractional term. For now, I have performed a manual 2SLS where I estimate the first stage using all exogenous variables that also appear in the second stage plus the instrument, and then I predict a value for highway funding. That predicted value is then used in the second stage by itself and part of the fractional term. This means that the standard errors are not corrected for 2SLS.

thought to be vary in an essentially random way with the extent to which fuel prices affect a county. A good measure are the fuel tax revenues, which are an important component of the highway fund.

Table 3.4 shows the results from a regression of the FuelTax on GPT and the other first stage covariates. The estimated (conditional) covariation between GPT and FuelTax is statistically insignificant with over 2000 observations and it is also practically near zero. This gives some confidence that the instrument is conditionally uncorrelated with the most obvious potential omitted variable.

The first stage of the 2SLS estimates is shown in Table 3.5. GPT is highly correlated with HwyFund, which is expected since a portion of the money earned through the gross production tax is legally obligated to be placed into the county highway fund. The fact that GPT is correlated with HwyFund, but it is not conditionally correlated with the most obvious source of omitted variable bias strengthens the case of the instrument.

3.3.7.2 IV Estimates

The instrument, however, turns out to not materially affect the above conclusions in that the direction and magnitude of the coefficients on the reliance ratio remain roughly similar, and also remains statistically significant. Table 3.6 compares equation 2 with and without instrumenting for highway funds. The effect for a 1 pp change in the reliance ratio is in the neighborhood of $25,000 USD. Additionally, the third column in Table 3.6 shows that the change in highway spending without the ratio variable in the model is approximately 0.7 cents per dollar. Again, this is well above the 0.37 average highway spending and thus suggestive that a flypaper effect is operating for earmarked highway revenues. Most importantly, the instrumented estimates provide additional evidence that a county's overall reliance on highway funds leads to lower

highway expenditures, all else equal. In other words, there is reason to believe that the crowd-out effect is conditional on the reliance ratio.

3.4 CONCLUSION

Academic literature often asks whether governments actually comply with their own earmarking laws. Empirical literature finds that they typically do, contrary to what would typically be expected of an optimizing budget authority. I propose a theory whereby a costly budgeting procedure can provide friction that accounts for at least some of the contradiction between theory and experience. If budget transaction costs are zero, then the normal view of earmarks prevails in that expenditures should grow in line with the marginal propensity to consume from new income. Alternatively, a perfect absence of crowding-out is obtained by assuming reallocation costs are infinite. I present results that indicate evidence is in line with the theory.

I also show that the amount of money diverted from earmarked funds is related to the share those funds make up of total revenues. Given that governments face different negotiation costs and different potential gains from reallocating funds, it stands to reason that there is not just one crowding-out effect. Rather, it varies based on the costs and benefits that communities face from the reallocations. I find that the typically large spending effect of earmarked revenues is greatly mitigated by a county's reliance on those revenues as a share of its overall budget.

The implications of this theory are practically important because it implies that the ability of earmarks to stimulate specific expenditures will be effective at low levels, but lose force as they become a larger portion of a budget authority's total revenues. In a world where earmarked taxes are suggested left and right by politicians, it is useful to have theory and evidence that they work well in moderation, but that there is a limit to what they can achieve.

3.5 FIGURES

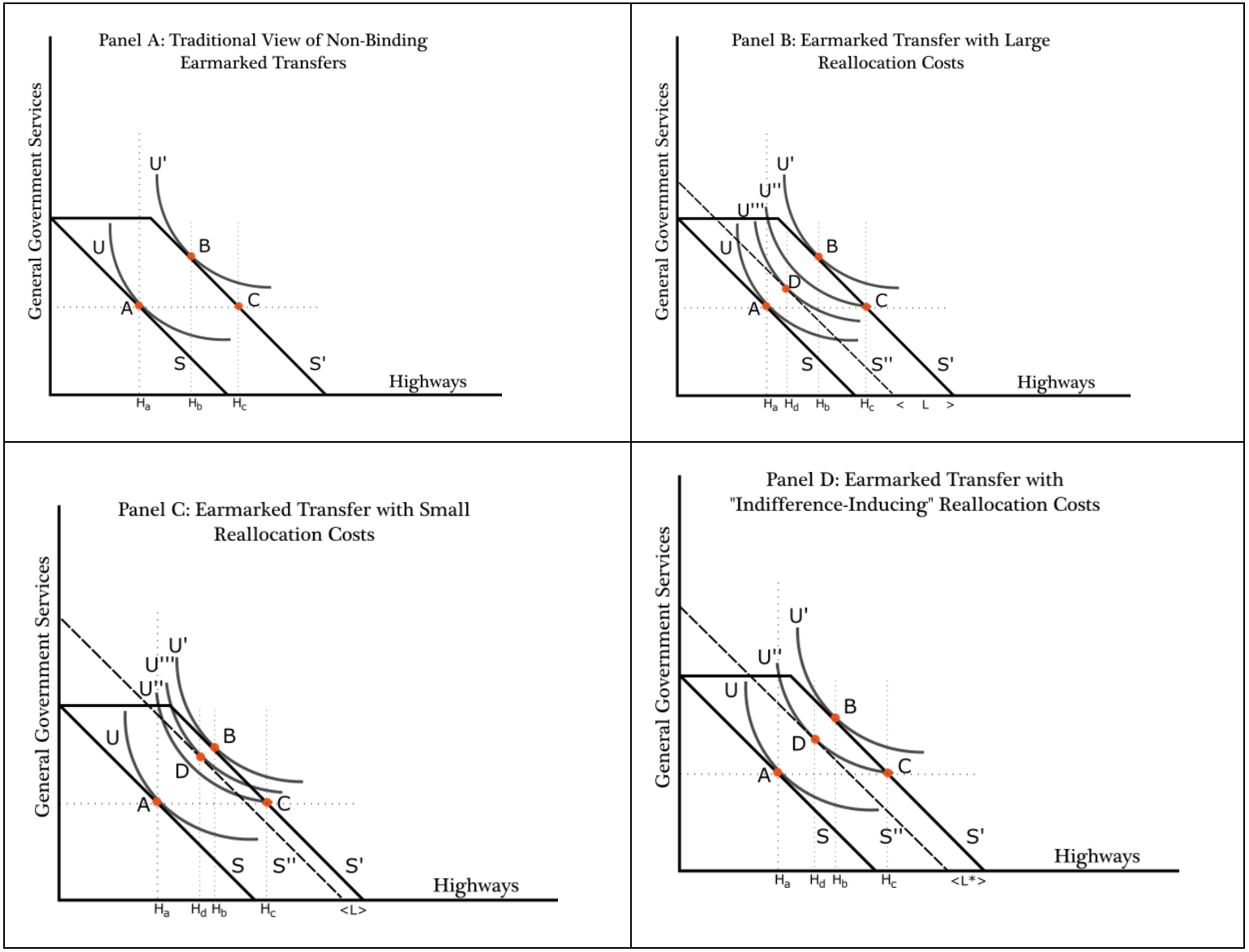


Figure 3-1: Decision to Reallocate Earmarked Funds given a Costly Budgeting Process

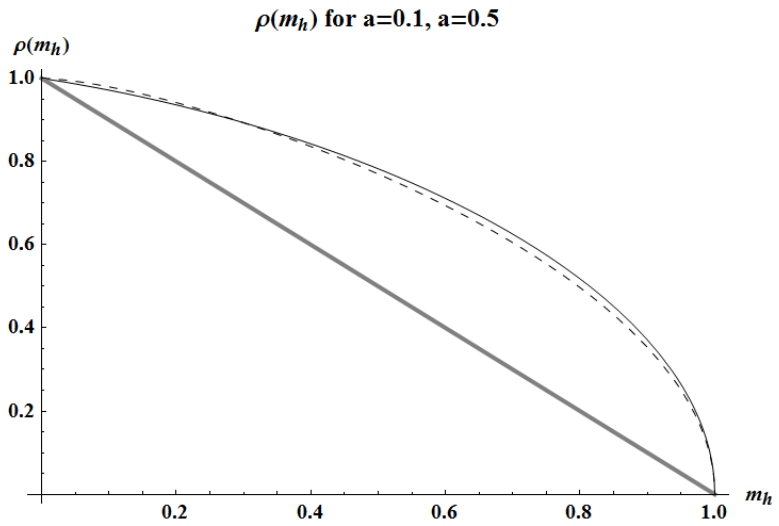


Figure 3-2: Behavior of rho as a function of share of revenues from highway earmarks

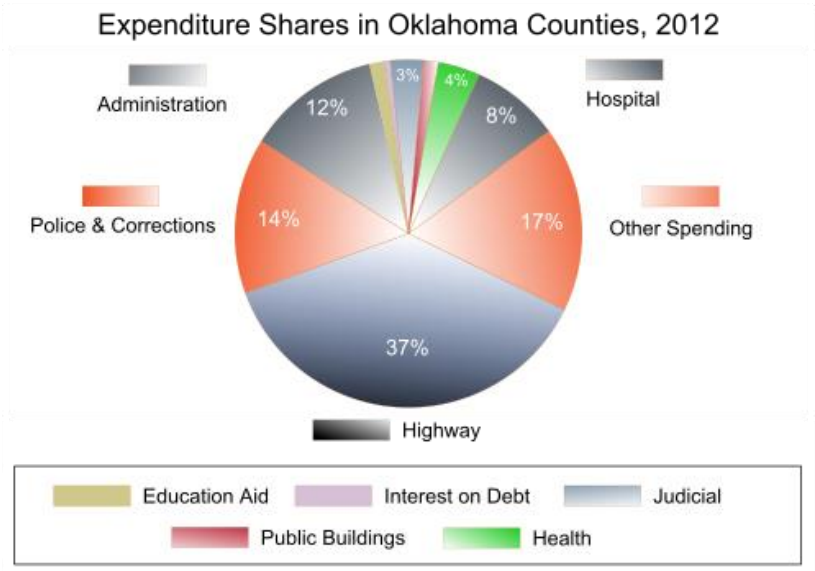


Figure 3-3: Expenditure Shares in Oklahoma Counties, 2012

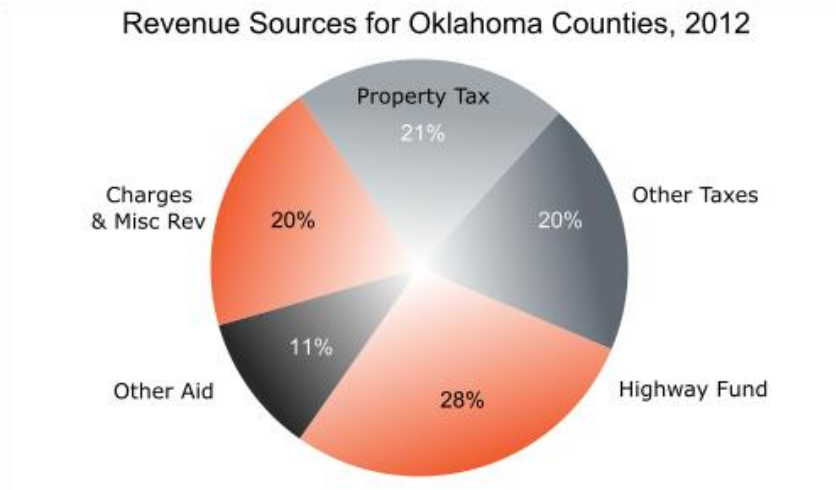


Figure 3-4: Revenue Sources for Oklahoma Counties, 2012

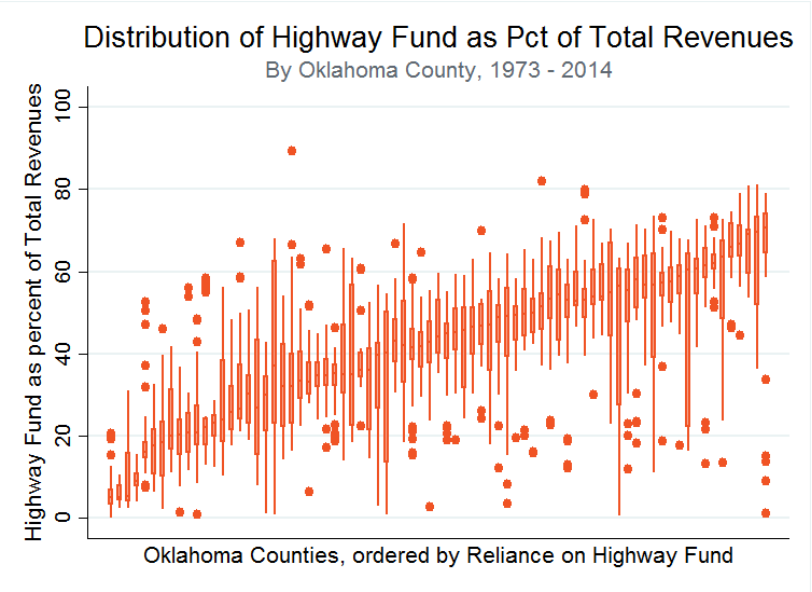


Figure 3-5: Distribution of Highway Fund as Percentage of Total Revenue

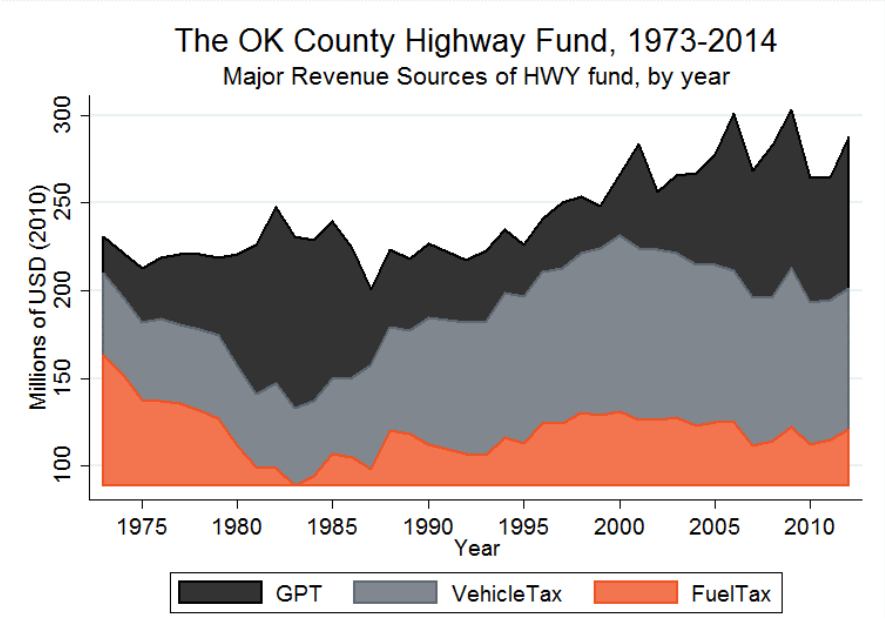


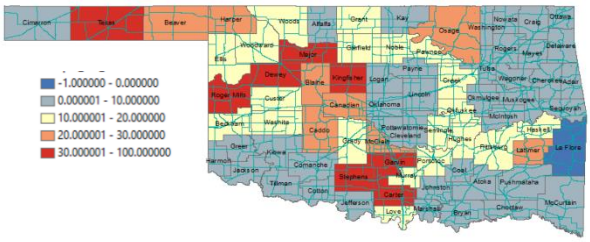
Figure 3-6: The Oklahoma County Highway Fund (Oklahoma Tax Commission, 2014)

OIL & GAS PRODUCTION & RELIANCE ON SEV TAX

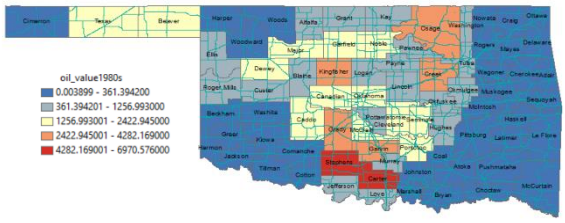
- Left Column: Production Values (in MM 2010 USD)
- Right Column: Severance tax as a percent of total county budget 1980s, 1990s, and 2000s. The scale is the same over time, so a county changing from red to orange means it fell below the 30% reliance threshold.

Sources: Oklahoma Corporation Commission (Production), US Census Bureau (GIS Shapefiles)

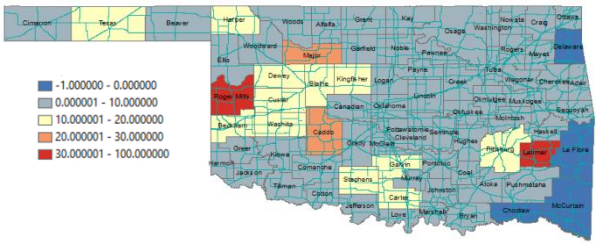
OKLAHOMA SEVERANCE TAX AS PERCENTAGE OF TOTAL COUNTY BUDGET (1980s)



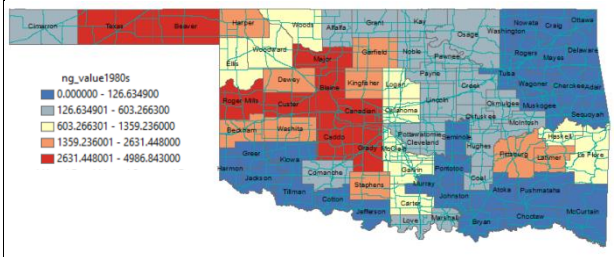
OKLAHOMA OIL PRODUCTION VALUE BY COUNTY (1980s)



OKLAHOMA SEVERANCE TAX AS PERCENTAGE OF TOTAL COUNTY BUDGET (1990s)



OKLAHOMA NATURAL GAS PRODUCTION VALUE BY COUNTY (1980s)



OKLAHOMA SEVERANCE TAX AS PERCENTAGE OF TOTAL COUNTY BUDGET (2000s)

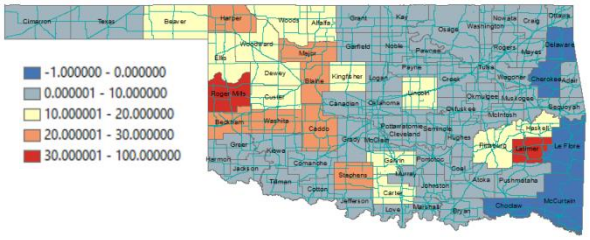


Figure 3-7: Oil and Gas Production and Reliance on Gross Production Tax Revenue

Figure 3-8: IndFin Data Availability for Oklahoma Counties, 1973 - 2012

3.6 TABLES

Expenditures in Oklahoma Counties, 2012 (Thousands)

	n	median	mean	sd	min	max
Population	77	22.12	48.72	107.37	2.48	718.63
Administration	77	1141	1936.77	3280.67	89	22997
Health	65	396	1086.71	3758.93	30	30247
Education Aid	5	2190	5305.20	8088.63	3	19370
Highway	75	4219	4959.25	3204.17	120	17046
Police & Corrections	76	1291	3467.46	8739.65	3	55717
Hospital	15	7241	25894.67	53318.27	3	205712
Judicial	74	277.5	685.81	1876.95	43	14978
Interest on Debt	19	163	1914.37	4750.67	7	17140
Public Buildings	33	158	1003.64	3405.99	1	19646
Other Spending	75	2013	3726.41	9022.40	51	70846

*Descriptive statistics are shown for counties that were observed to have non-zero expenditures in a given category. The number of observations below 77 represents the number of counties that reported zero expenditures on a given category in 2012.

Table 3.1: Expenditures in Oklahoma Counties, 2012

Revenue Sources for Oklahoma Counties, 2012 (Thousands)

	n	median	mean	sd	min	max
Population	77	22.12	48.72	107.37	2.475	718.63
Property Tax	77	1931	5772.91	14169.15	152	94654
Other Taxes	74	2272	4226.38	11372.17	233	97885
Highway Fund	75	3268	3644.93	2580.39	4	13945
Other IGR	76	980	2499.40	4796.06	39	30651
Charges and Misc Rev	76	1771	7537.68	24924	42	200368
Other Revenue	2	1604	1603.50	2212.54	39	3168
Hwy Rev Pct of Rev	77	26.56	28.36	18.12	0	61.43
GPT (Gross Prod Tax)	77	747	1164.50	1142.94	156.38	5401.31

*Descriptive statistics are shown for counties that were observed to have non-zero revenues in a given category. The number of observations below 77 represents the number of counties that reported zero revenues in a given category during 2012.

Table 3.2: Revenue Sources for Oklahoma Counties, 2012

Oklahoma County Highway Spending, 1973 - 2012

	Hwy Spending (1a)	Hwy Spending (1b)	Hwy Spending (Benchmark) (2a)	Hwy Spending (2b)	Hwy Spending (3a)	Hwy Spending (Benchmark) (3b)
General Revenue	0.025**	0.023**	0.022**	0.018**	0.035***	0.026**
	(0.01)	(0.01)	(0.008)	(0.008)	(0.012)	(0.011)
Highway Fund Revenue	0.566***	0.683***	0.663***	0.822***	0.793***	0.923***
	(0.175)	(0.178)	(0.212)	(0.218)	(0.178)	(0.173)
Population	32.417***	36.739***	29.051***	33.174***	39.361***	41.626***
	(8.547)	(7.895)	(9.198)	(8.165)	(10.325)	(9.613)
Pop^2	-0.067***	-0.048***	-0.062***	-0.039***	-0.055***	-0.027**
	(0.009)	(0.01)	(0.011)	(0.013)	(0.009)	(0.012)
HRev*Pop		-0.002***		-0.002***		-0.002***
		(0)		(0)		(0)
HRev/TRev			-22.728*	-28.429**	-30.382**	-36.441***
			(11.568)	(11.464)	(12.498)	(12.179)
Constant	607.836	339.916	1343.698***	1220.316***	876.660**	924.073**
	(502.614)	(507.447)	(336.635)	(328.375)	(422.153)	(408.332)
N	2110	2110	2110	2110	592	592
r2	0.362	0.386	0.375	0.406	0.44	0.462

Cells Contain Coefficients and (Robust Standard Errors). All models have county and year fixed-effects. All revenue and spending values are in 1000s of real USD (2010), and Population is 1000 residents.

* p<0.10, ** p<0.05, *** p<0.01

Table 3.3: Oklahoma County Highway Spending, 1973 - 2012

Conditional Correlation of GPT with FuelTax

	Coef.	Std. Err.
GPT	-0.009	0.0087
Rev	-0.001**	0.0005
Pop	11.17***	1.56
Pop*Pop	-0.0098***	0.0016

Year and County FEs, Robust Ses, N=2103

Table 3.4: Conditional Correlation of GPT with FuelTax

First Stage to estimate HwyFund

	Coef.	Std. Err.
GPT	0.907***	0.108
GRev	-0.006	0.004
Pop	24.2***	3.2
Pop*Pop	-0.016	0.004

Year and County FEs, Robust Ses, N=2103

Table 3.5: First Stage in Estimate of HwyFund

Oklahoma County Highway Spending, 1973 - 2012, robustness check

	Hwy Spending	Hwy Spending (IV)	Hwy Spending (IV)
General Revenue	0.022**	0.021***	0.026***
	(0.008)	(0.008)	(0.009)
Highway Fund Revenue	0.663***	0.844***	0.776***
	(0.212)	(0.09)	(0.1)
HRev/TRev	-22.728*	-25.141***	
	(11.568)	(4.149)	
Population	29.051***	21.312***	28.658***
	(9.198)	(7.585)	(8.114)
Pop^2	-0.062***	-0.055***	-0.064***
	(0.011)	(0.01)	(0.009)
Constant	1343.698***	1170.350***	21.996
	(336.635)	(438.944)	(423.004)
N	2110	2056	2056
r2	0.375	0.318	0.264

Cells Contain Coefficients and (Robust Standard Errors). All models have county and year fixed-effects. All revenue and spending values are in 1000s of real USD (2010), and Population is 1000 residents.

*** p<0.10, ** p<0.05, *** p<0.01**

Table 3.6: Oklahoma County Highway Spending, 1973 - 2012, robustness check

3.7 REFERENCES

Athanassakos, A. (1990). General fund financing versus earmarked taxes: An alternative model of budgetary choice in a democracy. *Public Choice*, *66*(3), 261–278. http://doi.org/10.1007/BF00125778

Bös, D. (2000). Earmarked taxation: welfare versus political support. *Journal of Public Economics*, *75*(3), 439–462. http://doi.org/10.1016/S0047-2727(99)00075-4

Bradford, D. F., & Oates, W. E. (1971). Towards a Predictive Theory of Intergovernmental Grants. *The American Economic Review*, *61*(2), 440–448.

Brown, C. (2013). *State Revenues and the Natural Gas Boom: An Assessment of State Oil and Gas Production Taxes*. NCSL. Retrieved from http://www.ncsl.org/research/energy/state-revenues-and-the-natural-gas-boom.aspx

Buchanan, J. M. (1963). The Economics of Earmarked Taxes. *Journal of Political Economy*, *71*(5), 457–469.

Fisher, R. C. (1982). Income and grant effects on local expenditure: The flypaper effect and other difficulties. *Journal of Urban Economics*, *12*(3), 324–345. http://doi.org/10.1016/0094-1190(82)90021-3

Gamkhar, S. (2000). Is the Response of State and Local Highway Spending Symmetric to Increases and Decreases in Federal Highway Grants? *Public Finance Review*, *28*(1), 3–25. http://doi.org/10.1177/109114210002800101

Gamkhar, S. (2003). The Role of Federal Budget and Trust Fund Institutions in Measuring the Effect of Federal Highway Grants on State and Local Government Highway Expenditure. *Public Budgeting & Finance*, *23*(1), 1–21. http://doi.org/10.1111/1540-5850.2301001

Hines, J. R., Jr., & Thaler, R. H. (1995). Anomalies: The Flypaper Effect. *The Journal of Economic Perspectives*, *9*(4), 217–226.

Knight, B. (2002). Endogenous Federal Grants and Crowd-out of State Government Spending: Theory and Evidence from the Federal Highway Aid Program. *The American Economic Review*, *92*(1), 71–92.

Lundberg, S. J., Pollak, R. A., & Wales, T. J. (1997). Do Husbands and Wives Pool Their Resources? Evidence from the United Kingdom Child Benefit. *The Journal of Human Resources*, *32*(3), 463–480. http://doi.org/10.2307/146179

McCleary, W. (1991). The Earmarking of Government Revenue: A Review of Some World Bank Experience. *The World Bank Research Observer*, *6*(1), 81–104. http://doi.org/10.1093/wbro/6.1.81

Nesbit, T. M., & Kreft, S. F. (2009). Federal Grants, Earmarked Revenues, and Budget Crowd-Out: State Highway Funding. *Public Budgeting & Finance*, *29*(2), 94–110. http://doi.org/10.1111/j.1540-5850.2009.00930.x

Oklahoma Tax Commission. (2014). *Distribution of Taxes to Counties for Roads*. Retrieved from http://www.tax.ok.gov/reports4.html

State of Oklahoma. (1907). *Constitution of the State of Oklahoma*. Retrieved from http://oklegal.onenet.net/okcon/

State of Oklahoma. Oklahoma Statutes, 19(1401), 68(1001) (2015).

U.S. Census Bureau. (2015). *Annual Survey of State and Local Government Finances and Census of Governments (1967,1970-2012)*.

Wilde, J. (1968). The Expenditure Effects of Grant-In-Aid Programs. *National Tax Journal*, *21*(3), 340–348.

4 CHAPTER 4: ADOPTION OF OWN-SOURCE REVENUE IN LOCAL GOVERNMENTS: THE CASE OF A PUBLIC LIGHTING TAX IN BRAZILIAN MUNICIPALITIES

4.1 INTRODUCTION

Local governments in many developing countries rely heavily on intergovernmental transfers for their revenues (Bardhan & Mookherjee, 2006; Brollo, Nannicini, Perotti, & Tabellini, 2010; Gervasoni, 2010). While there are good reasons for this practice[45], academic research has consistently found that own-source revenues drive a bevy of positive outcomes, including restrained government spending, lower corruption, and better government responsiveness. In many cases, local governments possess the authorization necessary to institute local taxes, so increasing own-source revenues depends on their decision to exercise taxing authority. A natural question then is, what factors might cause transfer-dependent governments to increase their own fiscal effort?

This paper lays out three categories of explanation (revenue need, politics and policy diffusion) and tests them against each other in the context of Brazil's municipal light tax. Results indicate that adoption of a local lighting tax was weakly associated with smaller revenues. The strength of the opposition in the legislature and the adoption of the tax by neighbors were strongly associated with the probability of adoption. I interpret these results as evidence that many of Brazil's municipal governments are open to taxing their residents if they are suffering revenue shortfall. However, political considerations play a significant role in own-source tax adoption.

[45] The two most common justifications are a lack of revenue collection capacity at the local level, and the need to provide for financial transfers to indigent communities.

4.2 LITERATURE

Own-source revenues are fiscal resources that a government collects from its residents in the form of taxation. Other major funding sources for governments include income from returns on owned assets (e.g. natural resource ownership) or through external aid. The distinction between these revenue types arises repeatedly in academic literature, and the general consensus is that own-source revenues are associated with greater economic efficiency and better governance outcomes.

4.2.1 The Benefits of Own-Source Revenue

This argument has a long and noble lineage, including in grand works that argue representation in the modern democratic state is the result of taxation (Huntington, 1993) (Bates & Lien, 1985; Huntington, 1993; Musgrave, 1992; Tilly, 1985). The theory, which draws heavily on European history, views government as a ruler or group of elites trying to maximize their wealth and glory. Where political leadership faces tight budget conditions and must tax its subjects, it will be forced to bargain with society. In exchange for tax revenues, leaders relinquish some control of decision-making institutions. Ross provides the first contemporary, cross-country econometric treatment of this theory and concludes that holding revenues constant, taxation without commensurate public service benefits is often followed by more democratic institutions within a few years (Ross, 2004). Using the case of Argentina, Gervasoni shows that this logic may also be applied to sub-national governments (Gervasoni, 2010).

Governments that receive non-tax revenues (e.g. from natural resource proceeds or through governmental aid[46]) find themselves in a position where they are able to provide public services

[46] See (Beblawi, 1987) and (Moore, 2004) for a discussion of natural-resource vs. territorial rents.

through minimal taxation of their citizens. Political accountability can subsequently deteriorate because the government is less dependent on its local residents for its revenues[47]. Empirical studies have pointed to many cases where governments with significant non-own-source revenues are more corrupt and supply inferior public goods, compared to what they would provide with comparable own-source revenues[48].

While studies continually find a robust connection between own-source revenues and better governance outcomes, the mechanisms by which this happens have not been settled. One set of explanations focuses on the incentives facing the ruling elite. Since governments with non-own-source revenues are typically larger[49] and more corrupt than governments funded out of own-source revenue, it is more valuable to hold power. This naturally requires the ruler to spend heavily on maintaining his position, which leads to more patronage, prevention of social group formation and repression[50]. Expenditures on these activities, at the very least, represent good money being diverted from public services. A more serious risk is that the diverted public monies are used to fund activities that undermine government institutions. Other scholars have hypothesized that poor service quality comes about because outside revenue is more difficult for citizens to track, especially where it fluctuates substantially from year to year. Unless the municipality is fastidious in its bookkeeping, political leadership has more latitude to

[47] The theoretical literature on the political aspects of the natural resource curse can be found in (Beblawi, 1987; Humphreys, 2005; Ross, 1999, 2001, 2013; Van der Ploeg, 2011). See in (Easterly, 2008) for a discussion of similar effects of international aid, and see (Gervasoni, 2010) for similar outcomes resulting from intergovernmental aid.
[48] (Brollo, Nannicini, Perotti, & Tabellini, 2010) and (Gadenne, 2012) offer evidence that larger transfers lead to corruption in Brazilian municipalities. (Fisman & Gatti, 2002) find larger transfers are associated with more corruption in US States. (Gadenne, 2012) shows that increases in own-source revenues in Brazil are more likely to be spent on education and health infrastructure than on administration.
[49] See the "flypaper effect" literature. See (Hines & Thaler, 1995) for a review, and (Remmer, 2004).

[50] See (Ross, 2001) for a list of "supply side" factors at the national level, and (Gervasoni, 2010) for a discussion of how the supply-side explanation operates at a sub-national level.

misappropriate public funds because citizens do not have a sense of how much money is in the coffers[51]. Finally, a surfeit of non-tax revenues means that rulers can avoid the need to bargain with, and make concessions to, representatives of various social groups.

Recent literature has increasingly focused on how citizens regard own-source revenues differently than outside public funds. In order to demand government fiscal efficiency, citizens require four conditions. They need information about the budget; they need an interest and ability to evaluate the budget; they need an interest and ability to mobilize for changes in the budget; and they need the ability to monitor and punish deviations from budget execution. This appears to be asking a lot, since citizens must overcome a collective action problem to make progress on demanding information, mobilizing against unjust budget arrangements, and investigating budget execution. However, angry taxpayers have been historically adept at sparking enough grievance and mobilization to overcome the collective action problem. In fact, recent research gives evidence to confirm that the "angry taxpayer" is an important factor in pressuring the government for better public services. (Broms, 2014) shows that there is a relationship between taxpaying and political interest at the individual level. (Paler, 2013) finds in a field experiment that people who go through the motions of taxation are more likely to want to monitor the governments budgets, and (Martin, 2014) finds that group members are more likely to monitor and sanction group leaders where group resources are procured by direct taxation.

The psychological mechanism by which this appears to happen is through loss-aversion[52]. In the context of public revenues, loss aversion means that the reduction in wellbeing that citizens

[51] This transparency argument is discussed in (Ross, 2013) and (Humphreys, 2005). It is also the mechanism that is assumed by (Gadenne, 2012).
[52] See (Hines & Thaler, 1995) for loss-aversion and the flypaper effect, and (Martin, 2014) for experimental research into how loss-aversion increases civic engagement (monitoring and sanctioning) of citizens in Uganda.

experience when they face curtailment of an existing public service is larger than the loss they feel when an expected equal increase in public service fails to materialize. Practically, this means that citizens will fight tooth-and-nail to defend small existing public services, but they may fail to organize and press for large beneficial changes. Lucy Martin tells a vivid story about how Ugandans poured fish refuse on the city hall when their trash collection stopped. However, despite heavy media coverage, there was little public protest when corruption in the Ugandan government put hundreds of millions of potential international aid dollars in jeopardy (Martin, 2014).

It is unlikely that all forms of taxation have the same effect on citizen monitoring. Intrusive and conspicuous taxes destined for local government probably generate more political interest than hidden taxes directed to a central government. The intrusiveness of a tax is measured by the amount of time and money that a taxpayer must spend. Property tax is intrusive because it requires a taxpayer to sit down and write a large check to her government. Income tax is intrusive due to its size, and also because of the administrative time it requires. However, income taxes are generally destined for a distant central or state government, where the taxpayer knows she has minimal influence. Sales taxes on day to day purchases, although transparent on the goods receipt, are less intrusive because of their relatively small influence on buying decisions. Excise taxes are the least intrusive, since they are built into the advertised price of a product and the consumer cannot easily know what shares of their expenditure goes to the government and to the supplier.

4.2.2 Endogenous Adoption of Own-Source Revenue

Own-source revenues likely play a role in good government as the literature suggests, but it is an uphill battle for politicians to adopt them. The revenue's conspicuousness, the very feature that

also makes it beneficial, makes its adoption politically difficult. For local public officials, it is politically advantageous to leave the difficult work of tax collection to the central government. As soon as a local government steps up and begins to collect intrusive taxes, it accepts a large political liability in that it must demonstrate that the money was well spent. Shrewd local politicians will want to avoid this scenario, so there is natural reticence for local governments to institute direct taxation when they can avoid it.

Central and state governments can push local governments to increase their fiscal effort, but the local authorities must ultimately choose to adopt the additional taxes. Federal reforms that unilaterally shift tax collection responsibility to the local level may run into problems if the local government refuses or is unable to collect revenues[53]. Thus, it is useful to understand what factors make municipalities more likely to undertake own-source revenue collections if the goal of policy is to push them in that direction. There are few examples of research that examines the factors that make adoption of own-source fiscal effort more likely[54], and even fewer in the context of developing countries. This paper aims to make progress on the broader question of own-source tax adoption by way of examining the case of a local lighting tax in Brazilian municipalities.

[53] Fiscal devolution without capable local tax collectors happened in Senegal, and it led to serious deterioration of local government services (Juul, 2006).

[54] (Sjoquist, Smith, Walker, & Wallace, 2007) investigates "time to adoption of local sales tax" in Georgia, USA, and (Gadenne, 2012) includes a selection model into a tax improvement program as part of her paper.

4.3 BACKGROUND

4.3.1 The Case of the Brazilian Municipal Public Light Tax

Brazilian municipalities depend heavily on transfer revenues from the Federal and state governments. A typical municipality receives 95% of its fiscal resources in the form of intergovernmental aid (Brazil National Treasury, 2013). Nevertheless, there are opportunities for a Brazilian municipality keen on adopting own-source revenue. Local legislatures can choose to impose a service tax (ISS) on local businesses. They may also adopt property taxes on urban and rural lands. The federal government has worked hard to encourage adoption of urban property taxes in recent years, though property taxes are a major source of revenue for only the largest municipalities. Taxation of rural property is rare, and even then it must be shared with the federal government. There is an important distinction in Brazilian tax law between taxes and contributions. While local taxes may be appropriated for any use, local governments are also permitted to adopt "contributions." Contributions are akin to user-fees in the sense that they are targeted at users of a specific public service and their revenues are earmarked for the service in question.

The public lighting contribution, also known as the Contribution to the Cost of Public Lighting (COSIP) was formally adopted by a constitutional amendment in December of 2002 (EC #39). Some municipalities had previously used a public lighting tax but critics challenged its constitutionality and won in the Supreme Court. The tax was re-authorized as an earmarked "contribution" and the COSIP amendment allowed municipalities to charge a lighting fee, designed by the city, on residents. Many municipalities that had previously been reluctant to adopt the lighting tax due to its doubtful legality were swift to approve the lighting contribution following the 2002 legislation. Figure 4-1 shows the percent of municipalities that charged some

kind of a light tax in 2002 and how that rate rose over the next ten years. Adoption was particularly swift in the four years following the amendment. The general trend was that approximately 50% of the municipalities used a light tax at the time the legislation was passed in 2002. By 2012, nearly 80% of the municipalities received revenues from a COSIP lighting contribution.

The proceeds from COSIP are formally earmarked for public lighting, and while the tax burden varies by municipality, a rough estimate is that it typically increases the light bill by 10%[55]. The Brazilian media regularly highlights the high cost of electricity, so an additional tax of 10% is a clearly unpopular policy choice that will draw attention. Nevertheless, public lighting, the service that citizens supposedly receive for this payment, is visible and valued. Thus the choice of adopting this tax is something that mayors and councilors are likely to weigh carefully because of its political salience.

COSIP is an especially expedient tax to study for the purpose of research into own-source revenue adoption due to its low administrative burden. Politicians considering whether to adopt the contribution need not concern themselves with the administrative costs or required investment to collect because these factors are negligible. The electric distributor places an ad-valorem or specific surcharge on light bills, depending on the design of the contribution. The distributor then transfers the tax revenues to the municipality throughout the year. As such, the tax is easy to calculate and piggybacks on a billing system that is already operational and effective.

[55] For example, the tax in the São Paulo Capital is approximately R$ 4 per month. On a home that uses 200 kWh per month at the standard rate of R$ 0.26 per kWh and pays R$ 56 per month for electricity, that represents a tax of 7%. In Rio de Janeiro, the tax is R$ 8.71 per month for COSIP and the electricity tariff of R$ 0.38 per kWh. Effectively, the same household is paying a tax of 11% on their light account. In RJ, the tax varies with consumption level.

COSIP offers Brazilian municipalities a relatively simple opportunity to increase their own-source fiscal effort. Given this context, I ask if it is possible to identify systematic factors that contribute to the adoption of the policy. If such factors do exist, are they primarily a result of a municipality's calculation of need for revenues and public lighting expenditures? Does political leadership, opposition strength, or ideology matter? Might adoption of this own-source revenue be due to the influence of the experience of other municipalities? These factors are tested in a comprehensive model to examine their contribution to the decision to adopt COSIP.

4.3.2 Factors in the Adoption of COSIP

A municipality's adoption of COSIP, an own-revenue source earmarked for public lighting, might be explained by three broad categories of factors: *revenue need, politics, and diffusion*. The most obvious is a need for revenue. This need could arise because market conditions favor an increase in the equilibrium quantity of public service, or because COSIP can compensate for shortfalls elsewhere in the budget. Since the adoption decision is made by political institutions, one could expect the nature of the institution and political leadership would affect the likelihood that new taxes are be adopted. Finally, local governments might be influenced by the adoption of a tax in nearby municipalities. This last category is typically studied under the rubric of policy diffusion.

Revenue need arises from an imbalance between revenues and a desired level of public service provision. One way to think about this is to imagine that two municipalities have a similar level of revenues and provide the same levels of public services. However, one municipality develops a higher demand for the service or a more efficient supply of the service. In this case, a relatively larger gap will emerge between the amount of the service provided and the amount of service demanded. An under-provision of goods will result, and the municipality will seek

additional revenue to meet that need. While we do not have information on the quantity of public lighting demanded in each Brazilian municipality, we can test demand-related factors as is typically done in the public finance literature. Population, income, and demographics are standard candidates. In the case of public lighting, it also makes sense that demand would be affected by the land area of the urban centers and the distribution of the population between the urban conglomerations and rural areas. We can also proxy for demand using prior levels of public lighting, where a municipality with levels well below what would be expected given its population, size, and other control factors should have a higher demand for public lighting. Likewise with the supply of the service, we do not know how much public lighting would be supplied at a given spending level. Cost-factors that are likely to significantly affect the supply include the price of electricity and regional labor costs. The number of urban centers within a municipality is also likely to affect cost of provision, since the light company suffers cost inefficiencies from having to service many small conglomerations rather than one large one. Larger distances between the urban centers also likely contributes to higher service costs. Where demand factors are relatively higher (all else equal) or supply factors are more favorable (all else equal), we should expect to see a larger desire for revenue and a higher likelihood of adopting COSIP.

Revenue need is also affected by a municipality's spending on services other than public lighting. Higher spending, given a fixed level of public revenues, leads to larger budget deficits. Brazilian municipalities face sanctions from the federal government if their balance sheets deteriorate too much. A mayor confronting a precarious budget situation would do well to adopt COSIP, even if the municipality did not need that money for additional public lighting. To the

extent that the mayor is already spending on public lighting, he may divert those funds for other purposes and replace them with the COSIP revenues.

Political institutions and leadership attributes in a municipality might affect the likelihood of COSIP adoption. Mayors that are ideologically left might be more reticent to impose additional taxes on the consumption of electricity, since consumption taxes are typically understood to be regressive. Mayors that are more fiscally conservative might push the tax to achieve a more balanced budget. There is a great deal of homogeneity in formal institutions for the budget and tax process in Brazilian municipalities, since they are defined in the constitution. One factor that has been found to be important for the adoption of new legislation is the number of veto points (Tsebelis, 2002). In Brazilian municipalities, one manifestation of this exists in the form of opposition councilors, who are able to block legislation. For that reason, it is worthwhile to compare the importance of the number of opposition members in the legislature during the times of non-adoption and of adoption.

Finally, the adoption of the tax might be influenced by the activities of neighboring municipalities. There are many examples where analysis finds neighborhood policy effects, but one must be careful to separate "influence" from "common contextual effects (Braun & Gilardi, 2006)." A finding of neighborhood influence often raises the question as to the mechanism by which the influence occurred. In their study of the diffusion of anti-smoking policies, (Shipan & Volden, 2008) cite four mechanisms that they call learning, economic competition, imitation, and coercion. Their concept of learning is quite general, but Braun and Gilardi usefully formalized it as "the acquisition of new relevant information that permits the updating of beliefs about the effects of a new policy (Braun & Gilardi, 2006, p306)." This is distinct from learning about

policy advocacy (which arguments work best) and policy implementation (which policy structure works best), but for Shipan and Volden it is part of the "learning" package.

In the public budgeting literature, (Sjoquist, Smith, Walker, & Wallace, 2007) separate diffusion mechanisms into spillover effects, tax competition, and copycat behavior. The first two could easily be grouped into the "economic competition" mechanism in the Shipan and Volden typology, and the copycat behavior is quite clearly imitation. It is difficult to see how the adoption of public lighting might be a matter of municipal competition, since this tax is imposed on the relatively immobile tax base of residential and commercial electricity connections, and it is just one tax in a list of many others. It is also unlikely that adoption of the COSIP is owed to coercion, since Brazilian municipalities are formally independent and generally left to their own devices on matters such as public lighting. Adoption of the COSIP could be due to "learning," in the sense described above. We might expect municipal governments look to their neighbors to evaluate the political fallout and the policy achievements of COSIP adoption. Adoption of the policy amongst one's neighbors has two distinct learning effects. First, it introduces the municipality to the notion that this policy exists and is potentially a reasonable and rational thing to do (awareness). Second, it provides an opportunity for the municipality to learn about the details of policy implementation (evaluation). As more neighbors adopt the tax, awareness rises and pressure mounts on the administration to go along with the neighbors and adopt the tax. However, additional adoption also provides local governments with the opportunity to evaluate the experience of the earlier adopters. As one might expect with tax initiatives, they are likely to be contentious until the administration proves that they are able to use the new revenues effectively.

4.4 DATA

I evaluate the relative influence of revenue need, politics and diffusion on the likelihood of policy uptake in the four years immediately following the constitutional amendment at the end of 2002. It was during this time that there was a flurry of adoption activity, with 1,370 municipalities choosing to implement the lighting tax. I rely on the Brazilian Census Bureau's survey of municipalities to flag whether a municipality had a light tax in a given year (IBGE, 2013), and adoption is inferred when a municipality transitioned from a negative to positive status regarding tax implementation. Also known as the "Profile of Municipalities," the IBGE's survey instrument asks a wide range of questions regarding administrative practices. It consistently inquires whether the city has a lighting tax, and has been tracking this information prior to the adoption of the lighting tax amendment in the end of 2002. As discussed above, many municipalities had already instituted some kind of public lighting tax by the time the amendment, so they are not included in the analysis. Observations for most municipalities are available in 2002, 2004, 2005 & 2006, the years in which there was rapid uptake of the tax. To infer whether a city adopted the tax during this time window, I examine whether municipalities that had not adopted as of 2002 had adopted as of 2006. For a small group a municipalities that did not appear in the 2006 survey, I used their 2005 adoption status.

Table 4.1 shows the number of municipalities in the dataset by their tax adoption status in a given year. There were 5,390 municipalities with observations in the 2002 profile. Of these, 2,648 already had a lighting tax in 2002, and 2,742 did not. Of the municipalities that had not adopted as of 2002, 1,370 of them had instituted the lighting tax by 2006, which is a 50% rate of adoption. 47.3% of the same population did not adopt during the four year window, and 2.7% of these municipalities did not have data available.

Table 4.2 shows the descriptive statistics for the population of municipalities that had not adopted as of 2002. For example, the city of São Paulo is not in this sample, since it adopted a light tax prior to December 2002. The lighting tax was adopted by 1370 of the 2667 observed municipalities, which means is a 51% adoption rate[56]. The values used for the independent variables are the mean values over the 2002-2006 timeframe. The largest city in this population is Rio de Janeiro, with over 6 million inhabitants. Six other cities with over 1 million residents had not adopted as of 2002. The analysis was conducted with and without these observations, but results did not differ significantly so these cities are included in the descriptive and multivariate analysis[57].

Table 4.3 shows the units of the variables as they appear in the descriptive statistics table and in the multivariate model below. Many of the variables are logged for inclusion in the multivariate model, some are in percent (from 0 to 100), and a few are indicator variables coded as either one or zero.

The data for lighting tax adoption come from the Brazilian Census Bureau's annual "Profile of Municipalities." (IBGE, 2013). Data on GDP, Population, and Municipal Geographic area are from IBGE (IBGE, 2012, 2014). Urban land area was computed and made available through a project sponsored by the Brazilian Agricultural Research Association (Embrapa) (Miranda, Gomes, & Guimarães, 2005). Microdata on the availability of public lighting in 2000 was collected as part of the 2000 census. Each examiner recorded whether a home had public lighting in its vicinity (IBGE, 2000). I summarize this measure at the municipal level by

[56] The 2667 number is equal to the count of municipalities (2,742) that had not yet adopted the tax in 2002 minus the number of these municipalities (75) that were not available in the 2006 dataset.
[57] The large cities that were tested as outliers are Rio de Janeiro, RJ; Belo Horizonte, MG; Curitiba, PR; Porto Alegre, RS; Guarulhos, SP; Goiania, GO; and Campinas, SP.

calculating the proportion of surveyed homes in a municipality that were located in neighborhoods with public lighting in the year 2000, two years prior to the beginning of the lighting tax adoption window. Municipal revenue and expenditure information is from the Brazilian Public Finance dataset published by the Ministry of Finance (Brazil National Treasury, 2013). It is interesting to note that the average budget position was 99%, meaning the average municipality spent about 99% of its total revenues over this time frame. All data on political variables is from the Federal Electoral Authority (Tribunal Superior Eleitoral (TSE) do Brasil, 2015).

Figure 4-2 shows the timing of the lighting tax implementation during the adoption window. Of the 2667 municipalities that had not adopted as of 2002, 1370 of them had adopted the tax by 2006, which left 1297 municipalities that had not yet adopted the tax. The Brazilian Census Bureau (IBGE) did not administer the survey every year. During the adoption window, the survey was completed in every year except for in 2003, which is the reason for the fact that 2003 is missing from Figure 4-2. Some of the adoptions that appear to have occurred in 2004 likely took place in 2003. The dependent variable in the model is a binary adoption indicator, so the exact timing of policy uptake is not critical to the analysis.

4.5 MODEL

I approach the analysis by modeling adoption in a conventional logit framework. The probability of adoption is a function, $F(V) = \frac{e^v}{1+e^v}$, of a linear combination of factors. The model is:

$$\text{PR}(\text{Adoption}_i) = F(X_i\beta + W_i\alpha + Z_i\gamma + \theta_r) \quad (1)$$

Adoption_i is coded as true if a municipality adopted the lighting tax in the 2002 to 2006 timeframe, false if they did not adopt over this period, and null if they had adopted prior to 2002, thereby being excluded from the model. There are four classes of independent variables, denoted as X, W, Z, and θ in the above equation. X_i is composed of the "revenue-need" variables. The model's X contains the demand factors: municipal GDP per capita, population size, public lighting availability immediately prior to the adoption window, the land area within a municipality that is "urbanized", and the land area of the entire municipality (Miranda et al., 2005). The public lighting supply factors such as wage levels and electricity prices are not included, but they should be relatively uniform on a regional basis, and would thus be addressed by the model specification with fixed effects. Revenue-need factors that are the result of budget tie-in are also contained in X. This includes total municipal revenues less contributions[58], and the budget position (spending as a percent of revenues). All the values in X vary somewhat by year, and so their average values over the adoption timeframe was used in this cross-sectional model.

W contains political leadership and institutional variables. It includes a dummy variable to indicate whether the mayor is affiliated with a classic liberal party or with the most cohesive left party - the workers party (PT). W also contains a measure for the amount of institutional friction caused by opposition presence in the legislature: the percentage of legislators that were elected from outside the Mayor's coalition (Tribunal Superior Eleitoral (TSE) do Brasil, 2015).

[58] COSIP is a contribution, and figures into the revenue accounts as such. It is typically a large part or the whole part of this account, so subtracting contributions from revenue is a way to estimate non-COSIP revenues.

Z holds the diffusion variable, which is intended to proxy the "learning" concept as laid out in Shipan and Volden. It is the percentage of neighboring municipalities in a micro-region that were using COSIP in the year prior to a municipality's adoption of COSIP.

The model contains the term θ_r, which represents area fixed effects for a micro-region. Microregions are sub-divisions within states, defined by the Brazilian Census Bureau (IBGE). Claims about causality in this model hinge on the extent to which we believe that all necessary covariates are included. Public lighting provision, wealth, and political culture are likely to vary regionally. To capture this regional heterogeneity, I include regional fixed effects to control for slow-changing unobserved differences, including for regional market variables such as electricity and labor prices. The regional fixed effects also address political variables that have regional ubiquity such as political culture or social conditions. There are sufficient observations available in this dataset for regional fixed effects. Altogether there are 556 microregions in Brazil. Figure 4-3 shows the number of municipalities in each microregion. It is most common for a microregion to contain between 5 and 10 municipalities, but there are several regions with up to 20 municipalities. Using regional fixed effects means that useful variation in the model's right-hand-side variables comes from temporal change and cross-sectional differences between municipalities only within the same region. The fact that the number of municipalities in each micro-regions is small means that the cross sectional variation employed by the model is substantially circumscribed. While not perfect, this approach goes a long way towards controlling for unobserved heterogeneity and thus limits concerns over policy endogeneity.

The goal of the model proposed in this paper is to test explanations in a comprehensive model specification as a way to evaluate their strength while controlling for the other explanations. Identification relies on two arguments. First is a theoretical argument that all relevant variables

have been included in the model. The safest way to view the model is one of covariates, with a broad set of theoretically motivated controls. Second, the case for identification is helped through the use of regional fixed effects to control for slow-moving factors in an entire region. The estimates are also compared across multiple specifications to test their stability.

4.6 RESULTS

There is evidence that several of the factors are closely associated with policy adoption. Among the most important of these include a municipality's size, sources of alternative revenues, a strong political opposition, and the influence of nearby municipalities. All variable classes (economic need, politics, and network effects) appear to be associated with the decision to adopt a tax. Perhaps just as important as discovering factors that are associated with adoption is the fact that there is significant room for improvement in the model. While the list of model factors is quite comprehensive, there are several factors beyond the usual suspects that influenced the decision to adopt the lighting tax.

Model estimates and marginal effects appear in Table 4.4. I present two model specifications; one without and one with micro region fixed effects. The logit coefficient estimates are listed in the last two columns, and the marginal effects for the average municipality appear in the left two columns[59]. Point estimates of the coefficients appear above their robust standard errors, in parentheses. The coefficients are reasonably stable across the two specifications, which increases our confidence that the marginal effects are reliable approximations of the partial relationships between the independent and dependent variables.

[59] Marginal effects are calculated for the mean value of each independent variable. For factors with log transformations, the mean value is the average of the logged value.

Several estimates merit consideration. A municipality's population is a strong predictor of the city's propensity to adopt a lighting tax. The model is based on the log of population, and the estimate is that a 1% increase in population is associated with a 0.23 percentage point increase in the probability of a lighting tax. It's not uncommon for Brazilian cities to grow at a 5% annual rate. Taken literally, this estimate suggests that each year a city experiencing stable 5% growth would, all else equal, increase its chances of adopting the tax by around 1% per year. Since the estimate is based off of a cross-sectional sample, the results stem from the fact that larger cities are more likely to adopt the tax. Despite a strong positive relationship between population and tax adoption, there were other factors in play. Several small municipalities that chose to adopt, and multiple large cities that avoided levying the tax. Another "need" factor is the availability of alternative revenue sources. The relationship is negative, with the estimate showing that a 1% increase in other revenue sources is associated with a reduction in the probability of adoption by 0.21 percentage points. Revenues are all measured in terms of 2010 real value. Annual increases (in real terms) vary significantly depending on the state of the national economy and federal tax collection, but even a large increase of 5%-10%, which was common during the boom years of the mid 2000s, would be roughly associated with an increase of only 1 to 2 points in the probability of adoption. This is not a particularly large effect, considering the fact that 5% of a municipal budget can easily amount to a million Reais, or jobs for a hundred people. Figure 4-4 shows the predicted probability of adoption given a municipality's population[60]. The solid gray line uses actual data, and the dashed orange line is the predicted adoption rate for the same municipalities with 5% lower revenues. The dollar amount of this revenue shortfall is shown by the dotted line (right axis). For example, a municipality with 30,000 people (and otherwise

[60] These simulation charts are based on Model (1), since the coefficients are roughly similar and it is estimated for nearly all of the observations in the population of interest.

average) had an expected probability of adoption of 0.6. A loss in 5% of revenue for this municipality would be approximately R$ 600,000, and that would be associated with a 1 percentage point higher probability of adoption. The model and magnitude of the estimate shows that while an administration's decision to adopt the tax is unmistakably influenced by a need for revenue, it is not an overwhelming decision-factor.

Increases in the chance of adoption are associated with more public lighting in 2000, prior to the adoption window. This likely captures an endogenous relationship, where municipalities that were previously good at providing public lighting were more likely to adopt the tax. Note that a zero or positive coefficient on this factor is evidence against the argument that mayors in laggard municipalities adopted the tax to close a "public lighting gap." If that had been the case, the coefficient would have been negative: previously low levels of public lighting would be associated with a higher rate of adoption.

Stronger opposition in the municipal legislature is associated with a lower rate of policy adoption. The magnitude of this effect is substantial, where a 10 percentage point increase in opposition increases the expected probability of adoption by 0.02 percentage points. Large fluctuations in the political composition of a municipal legislature is a fact of local Brazilian government. Figure 4-5 shows how an increase of the opposition by 20 percentage points leads to a change in the probability of policy adoption across population levels. That is, an opposition with 20 percentage points more seats in the legislature is associated with a 5 percentage point reduction in the probability of policy adoption. There are likely some threshold effects in this relationship, not modeled here. Nevertheless, this analysis strongly supports the notion that a robust opposition is associated with slower policy adoption, for better or worse.

Finally, the proportion of a municipality's neighbors that already had the tax in 2002 was associated with higher rates of adoption. The direction and magnitude is robust to the inclusion of regional fixed effects, suggesting that the result is not due purely to regional patterns of adoption. Adoption within microregions in 2002 ranged widely from 0 percent to 100% with a fairly uniform distribution. Figure 4-6 shows the increase in probability of adoption associated with a 20 and 50 percentage point increase in policy uptake of neighboring municipalities. If the proportion of nearby municipalities with the policy increased by 20 percentage points, this would be associated with an increase of 5 percentage points in the probability of adoption. With 50 percentage points higher adoption rate, a municipality would be 10 points more likely to implement the new tax policy. These effects are large, though they diminish as more nearby municipalities adopt the policy.

4.7 CONCLUSION

Many local governments in developing countries are highly dependent on intergovernmental transfers. The benefits of this arrangement are many and varied. Countries can take advantage of economies of scale in tax administration, the central government can use disbursements to maintain control over local governments and to bolster anticorruption efforts. Developing countries can also distribute resources across regions to address large income disparities within the country. However, recent academic literature has increasingly found virtue in increasing the fiscal effort of local governments. The fiscal link between citizens and their government is important because it appears to contribute to more efficient allocation of resources and a more accountable government. Since the adoption of own-source revenue is a decision that often must be made by local governments, its adoption is all but assured. Politicians are typically loath to

increase taxes, so the politics of fiscal effort become an important problem that merits policy and academic attention.

This paper examines several potential factors in local Brazilian governments' decisions to adopt a low-cost public lighting tax. Using a comprehensive model that includes fiscal, political, and neighborhood factors, I find that the most important factors in adoption are the size of the city, the availability of alternate revenues, the absence of a strong political opposition, and policy uptake among neighboring municipalities. The estimates are robust to specification with micro-regional fixed effects, which suggests that these relationships hold across the country and are not merely a reflection of regional differences.

Several interesting results emerge from the analysis. First, while the availability of other public revenues is associated with an identifiable increase in the probability of tax adoption, its influence is not particularly strong. Municipalities with lower public revenues (conditional on the other factors) were only marginally more likely to adopt the lighting tax. Similarly, the availability of public lighting prior to the tax adoption period showed a positive or no relationship with the likelihood of adoption. These observations are evidence against simple claims that the tax was adopted purely to raise revenue, or purely for historically disadvantaged municipalities to catch up in terms of public lighting service.

The size of the legislative opposition and the number of nearby municipalities that had the tax in 2002, prior to the adoption window, were particularly influential factors. A twenty percentage point increase in the proportion of opposition legislators translated into a decreased probability of adoption of 5 percentage points. Meanwhile, a twenty percentage point increase in the neighborhood adoption rate was associated with a 6 percentage point rise in the probability of adoption, even when controlling for diverse regional variation.

Some of these factors are relevant for policy considerations. Legislative opposition is not a feasible point of intervention, but network effects between neighboring municipalities appears to be a promising mechanism for introducing local governments to this policy option. Policies that raise the tax capacity of regional leaders and that facilitate the sharing of these experiences would fit with the findings of the research presented here. Overall, the Brazilian experience with the lighting tax and other efforts to increase the tax collection efforts of local governments has demonstrated progress towards a healthier fiscal relationship between citizens and the providers of their public services.

4.8 FIGURES

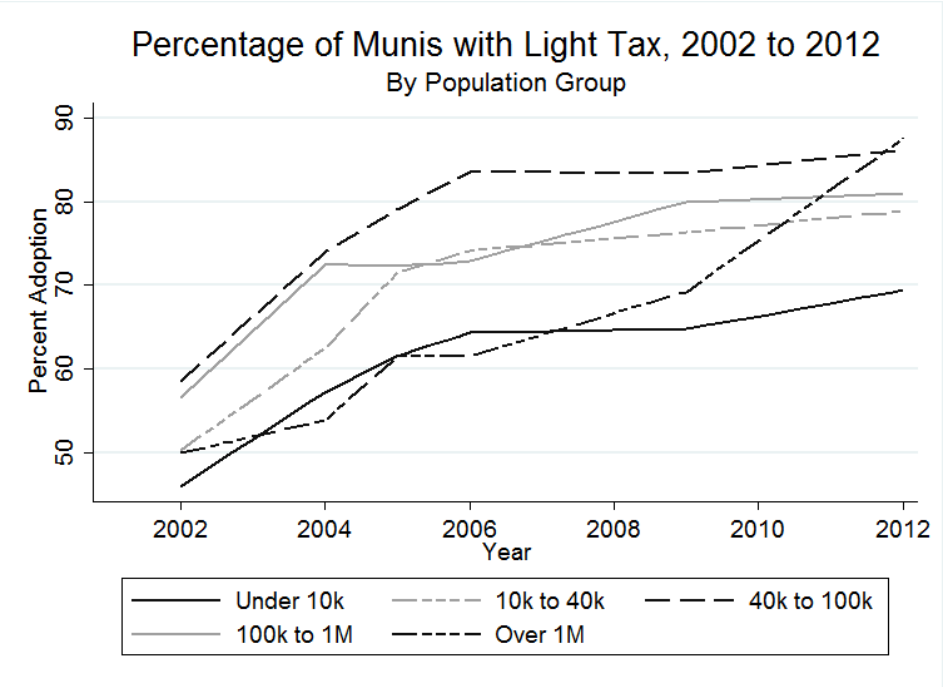


Figure 4-1: Percentage of Munis with Light Tax, 2002 to 2012

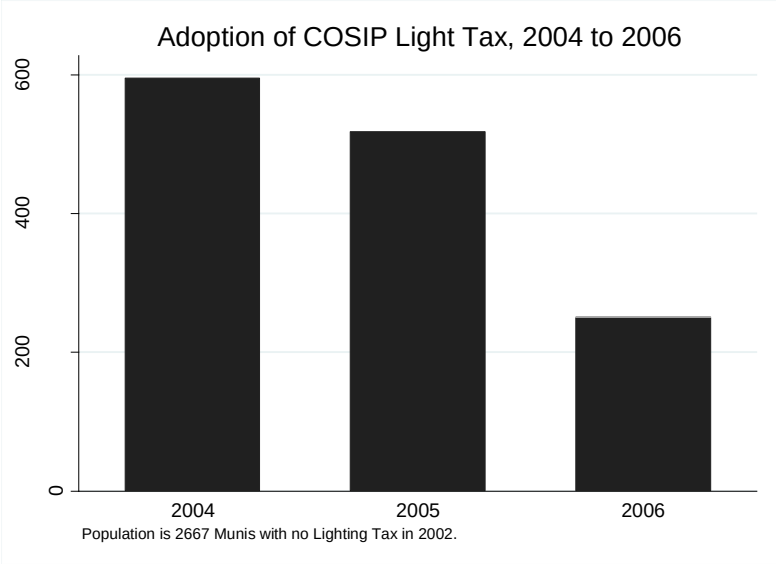


Figure 4-2: Adoption of Cosip Light Tax, 2004 to 2006

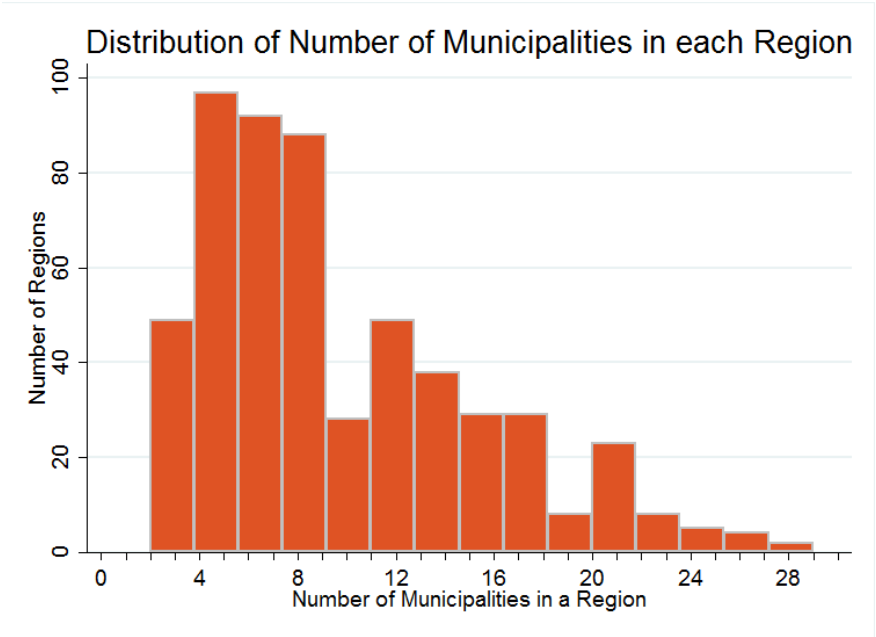


Figure 4-3: Distribution of Number of Municipalities in each MicroRegion

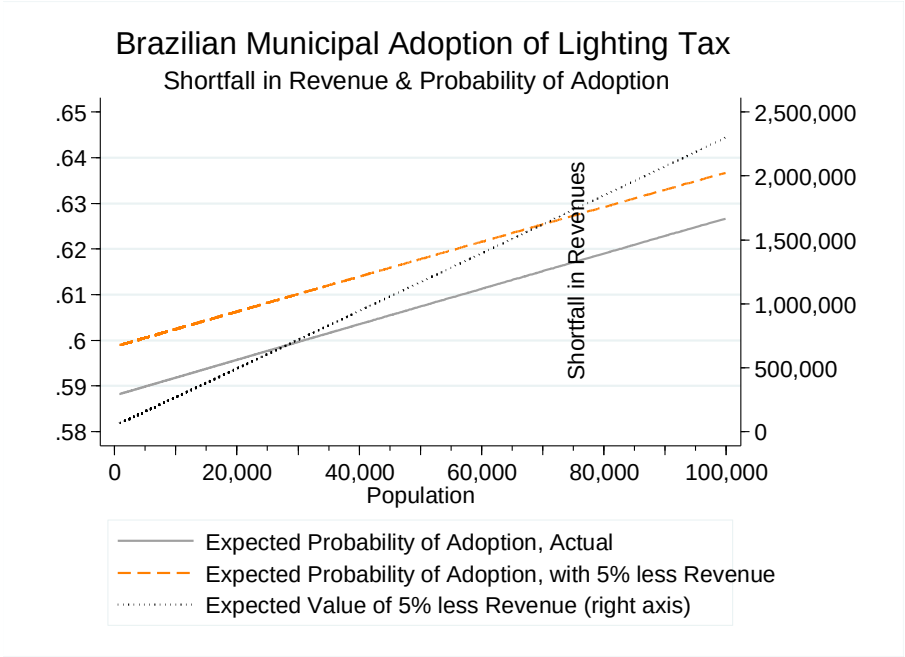


Figure 4-4: Adoption by Population & Shortfall in Alternative Revenues

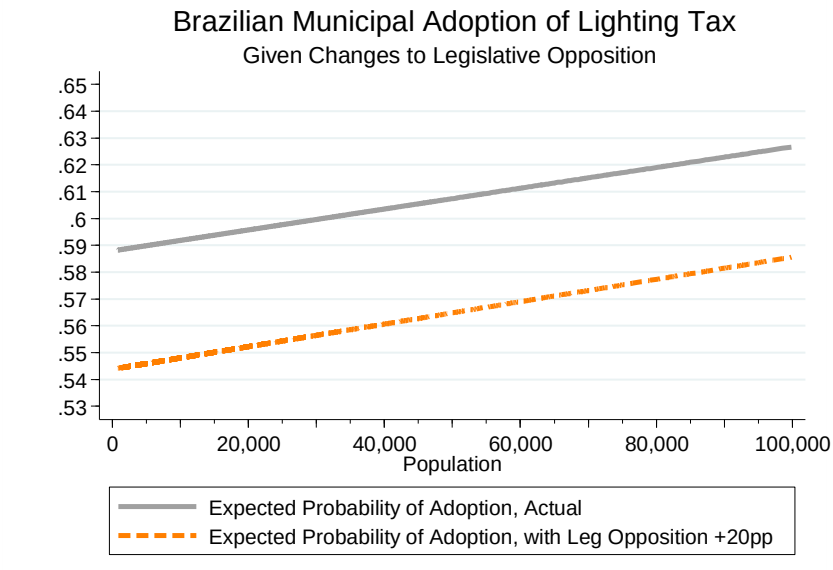


Figure 4-5: Probability of Adoption: Legislative Opposition

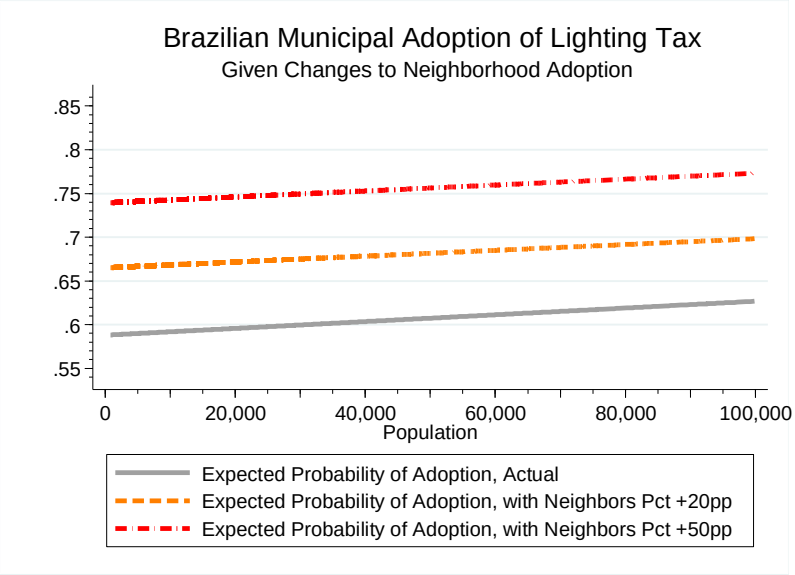


Figure 4-6: Probability of Adoption - Neighborhood Uptake

4.9 TABLES

Lighting Tax Adoption Status of Brazilian Municipalities

		Tax in 2006			
		No	Yes	Unknown	Total
Tax in 2002	No	1,297	1,370	75	2,742
	Yes	275	2,334	39	2,648
	Unknown	0	0	163	163
	Total	1,572	3,704	277	5,553

Source: Perfil dos Municípios

Table 4.1: Lighting Tax Adoption Status of Brazilian Municipalities, 2002-2006

Descriptive Statistics for BR Munis without Light Tax in 2002

	count	mean	sd	min	max
Adopted	2667	51%	0.50	0	1
GDP per Capita	2667	7,117	9,231	1,060	178,917
Population	2667	28,973	148,131	816	6,038,714
Non COSIP Revenue (Th)	2667	18,400	121,000	1,625	5,120,000
Budget Position	2667	99.04	4.05	76.29	122.98
Public Lighting in 2000	2629	67.51	21.86	1.83	100.00
Urban Land Area	2628	3.57	18.03	0.01	557.38
Muni Geographic Area	2667	1,485	5,112	3.57	107,603
Liberal Party Mayor	2667	0.38	0.38	0	1
Left Party Mayor	2667	0.08	0.21	0	1
Opposition %	2638	45.80	18.88	0	100.00
Neighborhood Adoption Pct	2667	31.41	22.74	0	92.86

See Table 4.3 for a description of units.

Table 4.2: Descriptive Statistics for BR Munis that did not have a light tax in 2002

Variable Descriptions and Units

Variable	Units	Units in Models
Adoption	Proportion	Yes/No
Years to Adoption	Years	
GDP per Capita	R$ 2010	Log R$ 2010
Population	People	Log People
Non COSIP Revenue	R$ 2010 (Th)	Log R$ 2010
Budget Position	Spending as Percent of Receipts	
Public Lighting in 2000	Proportion of Homes with Public Lighting	
Urban Land Area	Km2	Log Km2
Muni Geographic Area	Km2	Log Km2
Liberal Party Mayor	1 if Mayor from PSDB, PFL/DEM, PSL, PP, PSD	
PT Party Mayor	1 if Mayor from PT	
Left Party Mayor	1 if Mayor from PT,PSB,PCdoB	
Mayor Education	Years	NA
Mayor Age	Years	NA
Opposition Pct in Legislature	Percent	
Neighborhood Adoption Pct	Percent	

Table 4.3: Variable Descriptions and Units

Probability of Adoption of COSIP Lighting Tax					
	Marginal Effects			Logit Coefficients	
	(1)	(2)		(1)	(2)
GDP per Capita	0.038*	-0.036		0.152*	-0.147
	(0.022)	(0.051)		(0.087)	(0.203)
Population	0.228***	0.275***		0.912***	1.107***
	(0.037)	(0.056)		(0.149)	(0.227)
Non COSIP Revenue	-0.216***	-0.269***		-0.863***	-1.081***
	(0.044)	(0.070)		(0.176)	(0.282)
Prior Budget Position	-0.003	0.005		-0.012	0.020
	(0.003)	(0.004)		(0.011)	(0.016)
Public Lighting in 2000	0.000	0.003***		0.001	0.014***
	(0.001)	(0.001)		(0.002)	(0.004)
Urban Land Area	0.007	0.001		0.026	0.005
	(0.015)	(0.020)		(0.060)	(0.082)
Muni Geographic Area	0.017*	0.042*		0.066*	0.168*
	(0.009)	(0.024)		(0.036)	(0.095)
Liberal Party Mayor	-0.077***	-0.002		-0.308***	-0.006
	(0.028)	(0.038)		(0.113)	(0.154)
Left Party Mayor	0.053	0.050		0.212	0.202
	(0.051)	(0.071)		(0.206)	(0.284)
Opposition %	-0.002***	-0.003***		-0.009***	-0.011***
	(0.001)	(0.001)		(0.002)	(0.003)
Neighborhood Adoption Pct	0.004***	0.006		0.017***	0.025
	(0.000)	(0.007)		(0.002)	(0.029)
Constant				4.449**	4.144
				(1.800)	(2.989)
N	2600	2134		2600	2134
Microregion FEs	No	Yes		No	Yes

The dependent variable is adoption of COSIP Light tax. Values in parentheses are standard errors. Marginal Effects and Logit Coefficients are given for both model (1) and model (2), which is identical to model (1) except it adds microregion fixed effects. Logged variables include gdp per capita, population, non cosip revenues and km2 of municipality. Marginal Effects are taken at the averages of the logged variables.

Table 4.4: Probability of Adoption of COSIP Lighting Tax

4.10 REFERENCES

Bardhan, P., & Mookherjee, D. (Eds.). (2006). *Decentralization and Local Governance in Developing Countries: A Comparative Perspective*. The MIT Press.

Bates, R. H., & Lien, D.-H. D. (1985). A Note on Taxation, Development, and Representative Government. *Politics & Society*, *14*(1), 53–70. http://doi.org/10.1177/003232928501400102

Beblawi, H. (1987). The Rentier State in the Arab World. *Arab Studies Quarterly*, *9*(4), 383–398.

Braun, D., & Gilardi, F. (2006). Taking "Galton"s Problem' Seriously Towards a Theory of Policy Diffusion. *Journal of Theoretical Politics*, *18*(3), 298–322. http://doi.org/10.1177/0951629806064351

Brazil National Treasury. (2013). Finance Brazil Database (FINBRA). Ministério da Fazenda. Retrieved from https://www.tesouro.fazenda.gov.br/pt/prefeituras-governos-estaduais/sobre

Brollo, F., Nannicini, T., Perotti, R., & Tabellini, G. (2010). *The Political Resource Curse* (Working Paper No. 15705). National Bureau of Economic Research. Retrieved from http://www.nber.org/papers/w15705

Broms, R. (2014). Putting Up or Shutting Up: On the Individual-Level Relationship between Taxpaying and Political Interest in a Developmental Context. *Journal of Development Studies*, *0*(0), 1–17. http://doi.org/10.1080/00220388.2014.957276

Cameron, A. C., & Trivedi, P. K. (2005). *Microeconometrics: Methods and Applications*. Cambridge: Cambridge University Press.

Easterly, W. R. (Ed.). (2008). *Reinventing Foreign Aid* (First Edition edition). Cambridge, Mass: The MIT Press.

Fisman, R., & Gatti, R. (2002). Decentralization and corruption: evidence across countries. *Journal of Public Economics*, *83*(3), 325–345. http://doi.org/10.1016/S0047-2727(00)00158-4

Gadenne, L. (2012). *Tax me, but spend wisely: sources of public finance and government accountability*.

Gervasoni, C. (2010). A Rentier Theory of Subnational Regimes: Fiscal Federalism, Democracy, and Authoritarianism in the Argentine Provinces. *World Politics*, *62*(02), 302–340. http://doi.org/10.1017/S0043887110000067

Hines, J. R., Jr., & Thaler, R. H. (1995). Anomalies: The Flypaper Effect. *The Journal of Economic Perspectives*, *9*(4), 217–226.

Humphreys, M. (2005). Natural Resources, Conflict, and Conflict Resolution Uncovering the Mechanisms. *Journal of Conflict Resolution*, *49*(4), 508–537. http://doi.org/10.1177/0022002705277545

Huntington, S. P. (1993). *The Third Wave: Democratization in the Late 20th Century*. Norman: University of Oklahoma Press.

IBGE. (2000). Censo 2000. Retrieved from http://www.ibge.gov.br/home/estatistica/populacao/default_censo_2000.shtm

IBGE. (2012). Produto Interno Bruto dos Municipios 2012. Retrieved from http://www.ibge.gov.br/home/estatistica/economia/pibmunicipios/2012/default.shtm

IBGE. (2013). Perfil dos Municípios. Retrieved from http://www.ibge.gov.br/home/estatistica/economia/perfilmunic/default.shtm

IBGE. (2014). Cidades. Retrieved from http://www.cidades.ibge.gov.br/xtras/home.php

Juul, K. (2006). Decentralization, Local Taxation and Citizenship in Senegal. *Development and Change*, *37*(4), 821–846. http://doi.org/10.1111/j.1467-7660.2006.00503.x

Martin, L. (2014, September 18). *Taxation, Loss Aversion, and Accountability: Theory and Experimental Evidence for Taxation's Effect on Citizen Behavior*.

Miranda, E. E., Gomes, E. G., & Guimarães, M. (2005). *Mapeamento e estimativa da área urbanizada do Brasil com base em imagens orbitais e modelos estatísticos*. Campinas, SP: Embrapa Monitoramento por Satélite. Retrieved from http://www.urbanizacao.cnpm.embrapa.br

Moore, M. (2004). Revenues, State Formation, and the Quality of Governance in Developing Countries. *International Political Science Review*, *25*(3), 297–319. http://doi.org/10.1177/0192512104043018

Musgrave, R. A. (1992). Schumpeter's crisis of the tax state: An essay in fiscal sociology. *Journal of Evolutionary Economics*, *2*(2), 89–113. http://doi.org/10.1007/BF01193535

Paler, L. (2013). Keeping the Public Purse: An Experiment in Windfalls, Taxes, and the Incentives to Restrain Government. *American Political Science Review*, *107*(04), 706–725. http://doi.org/10.1017/S0003055413000415

Remmer, K. L. (2004). Does Foreign Aid Promote the Expansion of Government? *American Journal of Political Science*, *48*(1), 77–92. http://doi.org/10.1111/j.0092-5853.2004.00057.x

Ross, M. L. (1999). The Political Economy of the Resource Curse. *World Politics*, *51*(02), 297–322. http://doi.org/10.1017/S0043887100008200

Ross, M. L. (2001). Does Oil Hinder Democracy? *World Politics*, *53*(03), 325–361. http://doi.org/10.1353/wp.2001.0011

Ross, M. L. (2004). Does Taxation Lead to Representation? *British Journal of Political Science*, *34*(02), 229–249. http://doi.org/10.1017/S0007123404000031

Ross, M. L. (2013). *The Oil Curse: How Petroleum Wealth Shapes the Development of Nations* (Reprint edition). Princeton, N.J.: Princeton University Press.

Shipan, C. R., & Volden, C. (2008). The Mechanisms of Policy Diffusion. *American Journal of Political Science*, *52*(4), 840–857. http://doi.org/10.1111/j.1540-5907.2008.00346.x

Sjoquist, D. L., Smith, W. J., Walker, M. B., & Wallace, S. (2007). An Analysis of the Time to Adoption of Local Sales Taxes: A Duration Model Approach. *Public Budgeting & Finance*, *27*(1), 20–40. http://doi.org/10.1111/j.1540-5850.2007.00867.x

Tilly, C. (1985). War Making and State Making as Organized Crime. In *Bringing the State Back In* (pp. 169–191). Cambridge University Press.

Tribunal Superior Eleitoral (TSE) do Brasil. (2015). *Electoral Statistics*. Retrieved from http://www.tse.jus.br/eleicoes/eleicoes-anteriores/eleicoes-anteriores

Tsebelis, G. (2002). *Veto Players: How Political Institutions Work*. Princeton University Press.

Van der Ploeg, F. (2011). Natural Resources: Curse or Blessing? *Journal of Economic Literature*, *49*(2), 366–420.

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