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ARTICLE

Legislature size and welfare: Evidence from Brazil

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Abstract

How does legislature size impact public service provision? Despite the importance of institutional design for democratic governance, the effect of legislative features on citizen welfare remains little understood. In this article, we use a formal model to show that increasing legislature size improves public goods delivery. We argue that changes in bargaining costs depend on whether additional legislators share the executive's party affiliation: More opposition members reduce the equilibrium public goods provision, while more government-aligned members increase it. We test this theory by exploiting sharp discontinuities in city-council size in Brazil. We show that an additional city councilor has a 91% chance of belonging to the mayoral coalition, and this significantly improves primary school enrollment and infant mortality rates. To explore possible mechanisms, we surveyed 174 former city councilors and analyzed 346,553 bills proposed between 2005 and 2008. This article has implications for the design of representative institutions.

Legislative institutions are crucial for citizen welfare and public service provision in democratic countries. Historically, the separation of powers and the birth of representative governments placed legislatures at the center of the political stage. Today, these institutions check and veto other political powers, determine taxation, and oversee public programs at all levels of government (Auriol & Gary-Bobo, 2012; Poulsen & Varjao, 2018; Stasavage, 2011; Weingast et al., 1981).

Regardless of eventual differences in electoral rules, social composition, or internal procedures, all legislatures share one common feature: They are collective bodies. As such, the number of representatives has important consequences for the whole polity. Legislature size has a significant effect on the bargaining power between state branches, public expenditures, and representation (Crain, 1979; Freire et al., 2021; Gerring & Veenendaal, 2020; Primo & Snyder Jr, 2008; Rogers, 2002; Weingast et al., 1981). However, how legislature size impacts social welfare remains less understood. Larger legislatures may reduce political particularism and increase overall government spending, which leads to more public goods (Gerring &

Veenendaal, 2020; Gilligan & Matsusaka, 2001; Weingast et al., 1981). But adding representatives to a legislature may exacerbate collective action problems, thus hindering service provision (Gottlieb & Kosec, 2019). Therefore, what is the effect of larger legislatures on public service delivery?

This article proposes a theory based on executive leadership and party politics to explain how city-council size impacts local public goods provision. We incorporate partisanship and mayoral first-mover advantage to Baron and Ferejohn's (1989) bargaining model. Mayors make the initial policy proposal, which consists of investments in public goods provision, rents for personal gains, and a vector of side transfers for councilors. If mayors fail to secure majoritarian support from councilors, a reversal stage occurs, in which the decision leaves the mayor's office and councilors propose the public investments. In this bargaining process, costs come from the side transfers required to secure a majority among councilors. We show that in a model without partisan concerns, bargaining costs always increase with larger city councils, which in turn lower public goods provision and rents. However, partisanship decreases bargaining costs when the chances of electing government-aligned councilors are sufficiently high. Lower bargaining costs release funds for mayors to

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invest in public goods. In this case, a larger city council may add more members to the government coalition, thus reducing the mayor's bargaining costs and increasing the equilibrium public goods provision.

We test these theoretical predictions by exploiting exogenous variation in city-council size in Brazil. Brazilian cities could freely determine their legislature size, but in March 2004, the Supreme Electoral Court unexpectedly reinterpreted the 1988 Constitution and added one councilor to each set of 47,619 inhabitants. Around these cutoffs, the decision represented an exogenous change in city-council size, allowing us to investigate the effects of increasing the number of local legislators in Brazil.

We find that larger city councils changed the composition of mayoral coalitions and the number of appointed bureaucrats in the municipality. The extra city councilor had a 91% chance of belonging to the mayor's pre-electoral coalition. With a larger coalition, mayors face lower bargaining costs and may boost public investments with fewer constraints. Each additional legislator also leads to 104 politically appointed bureaucrats, and research shows that political appointees improve public service provision and enhance accountability in Brazil (Toral, 2019).

To provide further evidence for our mechanisms, we surveyed 174 former councilors who served during the 2005–2008 term, the period we analyze in this article. They confirm that mayors indeed use bureaucratic appointments and political favors to secure legislative support. As our formal model shows, bargaining with councilors requires offering transfers to the representatives. Councilors also demand several job appointments, which are regarded as an effective means to boost their reelection prospects and improve municipal welfare. These findings are in line with quantitative results from a novel dataset we built with 346,553 laws passed in 63 municipalities within 10,000 inhabitants away from the cutoffs. While all municipalities mention public goods in their legislation, those with larger city councils had 15% more proposals about public service delivery.

Finally, we show that the increase in legislature size significantly impacts municipal education and health care. Increasing the city-council size by one legislator lowers infant mortality by 2.01 children per 1000 infants born and reduces postneonatal mortality by 0.90 children per 1000 infants who survived their first 28 days. Larger councils also increase enrollment by 2.58 children in elementary-education classrooms without reducing school quality. These services are crucial for citizen welfare and result from eased bargaining between the mayor and the city council.

This article contributes to four strands of the literature. First, this article dialogues with a large literature on multilateral bargaining. Repeated models

of multilateral bargaining started with Baron and Ferejohn (1989), and scholars have recently analyzed how endogenous recognition power, the size of the required majority, and partisanship impact these results (Agranov et al., 2020; Baranski & Morton, 2020; Calvert & Dietz, 2005; Choate et al., 2019). Here, we include the mayor's first-mover advantage and political partisanship to Baron and Ferejohn's (1989) model and investigate the often-overlooked effect of legislature size on bargaining equilibrium strategies.

Second, this article contributes to the literature on the effects of larger legislatures on service provision. Following the seminal contribution by Weingast et al. (1981), the "law of $1/n$ " posits that larger chambers provide incentives for legislators to provide targeted public goods to local supporters at the expense of the entire polity (Freire et al., 2021). This question has become more relevant since legislature size has increased consistently over time (Gerring & Veenendaal, 2020). The corollary of the "law of $1/n$ " is that increasing legislature size promotes excessive public spending, regardless of the partisan makeup of the legislature (Gilligan & Matsusaka, 2001).¹ However, the literature on the "law of $1/n$ " rarely mentions the relationship between public goods provision and welfare. To our knowledge, this article is one of the first to study how the number of local legislators affects citizen well-being.

Third, our article dialogues with the growing literature on municipal partisan politics. Most articles in this field estimate the effects of the mayor's party on political outcomes. For instance, de Benedictis-Kessner and Warshaw (2016) and Gerber and Hopkins (2011) find differences in governance when comparing Democratic and Republican mayors. Specifically about Brazil, Gouvea and Girardi (2021) show that social spending increases with left-wing mayors. Using discontinuities created by a constitutional amendment that reverted the thresholds we study here, Frey (2021) shows that changes in council size lower the support for mayor-backed candidates. Our article reinforces the view that partisanship matters locally, even in countries with weak ideological linkage.

Finally, this article also contributes to the literature on the causes and effects of legislature sizes. While most articles on legislature size analyze the trade-off between representation and efficiency (Frederick, 2008; Jacobs & Otjes, 2015; Stigler, 1976), recent articles have explored the effects of legislature size on lawmaking and partisanship in further detail. Kirkland (2014) shows that larger legislatures make it harder for politicians to know and collaborate with each other, so they

¹ Primo and Snyder Jr. (2008) show that legislature size may result in positive or negative expenditures, depending on factors such as the degree that local public goods can exclude nonlocals or deadweight costs associated with taxation.

rely more heavily on party cues and committee structures. Jacobs and Otjes (2015) show that population shifts tend to increase the number of local legislators, but legislature size tends to decrease during economic crises. Marland (2019) questions the latter mechanism, showing that political elites shrink legislatures mostly to signal to the public the priority of their austerity agenda. In this article, we show that council size affects welfare by changing the partisan composition of the legislatures.

A THEORY OF LEGISLATURE SIZE, LEGISLATIVE BARGAINING, AND WELFARE

Institutional design has a lasting impact on social welfare (Acemoglu & Robinson, 2012; Bueno de Mesquita et al., 2005). One issue that all polities face is how to determine the optimal size of their legislative bodies. The literature on this topic is extensive, and modern attempts to address the legislature-size problem started in the early 18th century with the Federalists versus Anti-Federalists debates (Stigler, 1976).

The literature on legislature size highlights that the number of legislators causes tension between representation and efficiency (Frederick, 2008; Jacobs & Otjes, 2015; Taagepera, 1972). On the one hand, larger legislatures improve representation and facilitate the electoral success of ethnic and political minorities (Allen & Stoll, 2014; Gerring & Veenendaal, 2020). On the other hand, better representation is often countered by the decline in efficiency in bigger legislatures (Weingast et al., 1981). In large councils, it is harder for members to collaborate with each other without some type of partisanship or formal legislative structure (Kirkland, 2014). Larger chambers also have more potential veto players, who may decrease policymaking efficiency (Tsebelis et al., 2002). In this sense, balancing representation and efficiency is key to find the optimal legislative composition (Auriol & Gary-Bobo, 2012; Taagepera, 1972).

However, two questions have often been overlooked in these debates. First, does legislature size matter in contexts where legislative bodies are not pivotal decision-makers? Second, what is the ultimate effect of legislature size on welfare? These gaps are likely generated by the predominance of the “law of 1/n” scholarship in this literature, which focuses mainly on the relationship between legislature size and over-spending. Since Weingast et al. (1981), 30 papers have tested the effects of legislature size on government expenditures (Freire et al., 2021), and the only paper which examined its effects on welfare found negative results (Lewis, 2019). Frey (2021) analyzes the Brazilian case after the 2009 change in legislature

size and finds a null effect in service provision from 2012 to 2016. Yet, Gilligan and Matsusaka (2001) find that in the United States legislature size is associated primarily with higher spending on geographically concentrated benefits, such as education and highways. These results suggest that the legislature size and welfare nexus need a dedicated theoretical and empirical assessment.

Model setup

In a mayor-council setting, consider a strategic interaction between a mayor (M) and $N \geq 3$ city councilors indexed in $i \in \{1, 2, \dots, N\}$. The mayor has the prerogative of proposing a vector of policies to be voted by the city councilors. The provision of public goods is then a bargain between the mayor and the city council. Policy proposals are a combination of public goods provision (g), rents for the mayor (r), and a vector of transfer for city councilors (\mathbf{x}).

The city council votes on the mayor’s proposal, which is implemented if councilors accept it. Otherwise, a reversal policy takes place. Reversal policy in this context means that the mayor’s proposal failed to secure the majority of council votes. The decision process leaves the mayor’s office and is transferred to the council. The types of reversal policies are crucial for our argument, as they change the relative strength of the council when legislators bargain with the mayor. Here we investigate two reversal policies: A baseline reversal with no parties and a hybrid mechanism with partisan and nonpartisan concerns. The difference between these two mechanisms is that the nonpartisan councilors only care about rents, while partisan councilors care about rents and policy.

The mayor must convince at least half of the city councilors to support her policy proposals. Similar to Bueno de Mesquita et al. (2005), we assume that the selectorate, that is, the individuals who have a say in the mayor’s policy proposals, are the N city councilors. The winning coalition, which is the minimum number of members that must be convinced to implement the policy, is equal to half of the selectorate. City councilors are motivated by policy concerns (p) and transfers (\mathbf{x}) received from the mayor or the councilor nominated as the proposer. We leave the definition of these transfers open, as this allows us to analyze how mayors combine transfers with other incentives to pressure city councilors. Examples of transfers are granting electoral favors, funding clientelistic brokers, spending in areas in which the councilor has political or personal interests, or providing portfolio (municipal offices) and public jobs within the bureaucracy. The use of transfers to influence the councilors’ choices generates a bargaining cost of C_G . Bargaining costs

vary according to the reversal mechanism and the size of the legislature.

Finally, after learning the bargaining costs, the mayor offers a level of public goods provision (g) and pockets rents (r). Public goods provision helps the mayor to get reelected. Rents are for the mayor's direct consumption and do not contribute to her electoral success. This makes the mayor's expected utility a sum of the gains from rents and the benefits from reelection (B_M). Both the utilities from rents $u(\cdot)$ and the probability of reelection $\pi(\cdot)$ are concave functions, meaning that more rents or public goods increase the utility at a decreasing rate. The probability of reelection is multiplied by the benefit from holding office. This benefit captures the tangible and intangible gains that the mayor receives from holding the public office. We assume that the benefits are high enough to rule out an equilibrium with only rents and transfers, which is equivalent to saying that mayors strongly prefer to be reelected. If the mayor's policy proposal is approved, then the expected utility for the mayor is:

$$EU(r, g) = u(r) + B_M \pi(g)$$

The policy choices of the mayor are subject to municipal budget constraints. The municipality has $R > 0$ resources and cannot run debts, meaning that the budget must be balanced. We also assume that there are enough resources for the mayor to govern.

Let C_G be the bargaining costs. The budget-balance constraint requires that the offers the mayor makes to the city councilors must satisfy the following inequality:

$$r + g + C_G \leq R$$

The expected utility for the city councilors depends on the type of reversal policy. In the baseline nonpartisan reversal, when the council rejects the mayor's proposal, a reversal stage starts with resources diminishing by a factor of $\delta \in (0, 1)$ and the random selection of one councilor. The selected councilor becomes the next proposer. If the new proposal is accepted, it is implemented. If councilors reject the offer again, the budget shrinks by δ , and another city councilor is nominated to propose. The process repeats until a proposal is finally accepted.

We then consider a situation that combines both partisan and nonpartisan legislature concerns. Each councilor has a party affiliation. Party affiliations are mutually exclusive, and if a city councilor is aligned with the mayor's party, then he belongs to the government coalition $G \subset \{1, 2, \dots, N\}$. Otherwise, the city councilor belongs to the opposition $O = \{1, 2, \dots, N\} \setminus G$. The mayor's policy generates a political value of $p > 0$ for the councilors, and whether it adds or

subtracts from the councilor's utility depends on the party affiliation of the councilor. If councilors reject the mayor's proposal, there are no partisan-alignment benefits ($p = 0$). Moreover, in equilibrium, we assume that city councilors would prefer to receive transfers instead of providing public goods.

The solution concept we use in this model is the stationary subgame perfect Nash equilibrium. This solution concept requires that the strategies follow a Nash equilibrium in each subgame. Since the model may have infinitely repeated proposals, any strategy can be shown to be a Nash equilibrium. Thus, we solve for a stationary equilibrium. A stationary subgame perfect equilibrium requires that, at each given point of the game, if a politician accepts an offer at time $k + 1$, he should take the same offer at time k . Stationarity gives us a method to find a proposal that would be accepted at any stage of the game. Hence, we can characterize a sequence of offers for each point k in time. For the mayor, the optimal offer is at $k = 0$, representing a no delay in policy implementation. We assume that councilors play no dominated strategies, even when there is insufficient support for the policy.

For the solution to be of general interest, we solve the bargaining costs for the expected number of opposition and government-aligned city councilors. This is because the solution for each fixed number of opposition and government councilors does not help us understand the overall relationship between council size and bargaining costs.

The Mayor's decision stage

Solving the game by backward induction requires us to start with the councilors' strategies. To conserve space, assume that we solved the game for the councilors and found the equilibrium bargaining costs $C_G(N)$ when there are N city councilors. We now derive the optimal rents (r) and public goods provision (g) proposed by the mayor. The mayor benefits from public goods provision, as it increases the chances of her reelection. However, she prefers to invest as minimum as necessary in public goods and extract the remaining resources as political rents. The mayor's objective is to maximize her expected utility, subject to the municipal budget constraint.

$$\begin{aligned} & \max_{r, g} u(r) + B_M \pi(g); \\ & \text{s.t. } r + g + C_G(N) \leq R. \end{aligned}$$

In equilibrium, the budget binds, and the first-order condition for optimal public goods provision indicates that the marginal costs of providing public goods is

equal to the marginal benefits of reelection:

$$u'(R - g - C_G(N)) = B_M \pi'(g).$$

Proposition 1. *Public goods provision increases with legislature size if bargaining costs decrease with legislature size.*

All proofs are in Section A of the online supporting information. The proof's intuition involves finding what happens to the mayor's marginal utility when we increase both g and N . As N increases discretely, we use monotone comparative statics to derive the conditions for increasing differences (Ashworth & Mesquita, 2006). Increasing differences mean that higher N leads to higher equilibrium g .

Proposition 1 provides our first empirically testable hypothesis: *If bargaining costs decrease when legislature size increases, then public goods provision increases when legislature size increases.* Now we study each reversal mechanism to determine the condition under which the bargaining costs decrease when legislature size increases.

Baseline: Nonpartisan legislative bargaining

In the nonpartisan reversal mechanism, we assume that when the council rejects the mayor's office, a reversal stage starts with the random selection of one councilor. This formulation is similar to the closed rules proposal by Baron and Ferejohn (1989). To find a stationary subgame perfect Nash equilibrium, suppose there were $k-1$ rejections, and the game is at the k -th stage. A councilor accepts the proposer's offer if, and only if, accepting the offer at k is better than or equal to waiting until the next stage $k+1$. If the offer is x_i , then:

$$x_i \geq \frac{1}{N} \left(\delta^{k+1} R - \frac{N}{2} x_i \right) + \left(1 - \frac{1}{N} \right) \frac{x_i}{2}.$$

We place the offer on the left-hand side. There are two components on the right-hand side. The first is the amount that councilor i gets when he is the proposer. It is the chance that he is recognized as the proposer times the budget in the next round minus the offers he makes to convince half of the councilors. The second part represents the gains if the councilor rejects the current offer but still gets an offer in the following round. It is equal to the chance that he is not recognized as the proposer times the chance that he receives a transfer times the transfer's amount. Note that the offer the councilor makes as the proposer is the same

as the offer he wants to receive. This is because city councilors are exchangeable. The solution is symmetric for all councilors receiving an offer (this means that, without loss of generality, we could have dropped i in the solution). After some algebra, the offer x_i must be greater than or equal to:

$$x_i \geq \frac{2\delta^{k+1}R}{2N+1} \equiv \underline{x}(k, N).$$

The proposer always offers the minimum required to get the offer approved. In this case, the proposal at any given stage k is going to be equal to $\underline{x}(k, N)$.

Proceeding backwards, at the mayor's proposal stage $k=0$ she is going to offer $\underline{x}(0, N) = \frac{2\delta R}{2N+1}$ to half of the councilors. In this context, the bargaining costs for the mayor are:

$$C_G(N) = \frac{N}{2} \left(\frac{2\delta R}{2N+1} \right) = \frac{\delta RN}{2N+1}.$$

Proposition 2. *In the baseline nonpartisan reversal, bargaining costs always increase when legislature size increases.*

The intuition for the results is that every additional councilor demands more resources from the mayor. Thus, more councilors represent higher bargaining costs. And if the bargaining costs increase with legislature size, then any increase in public goods provision associated with legislature size has to come from a different mechanism. Below we demonstrate that partisanship is the key to understand how this relationship works.

Partisan and nonpartisan bargaining

In a reversal mechanism that incorporates partisan and nonpartisan motivations, a city councilor aligned with the government favors the mayor's offer if:

$$x_i \geq \frac{2\delta R}{2N+1} - p.$$

An opposition politician, in contrast, favors the mayor's offer if, and only if:

$$x_i \geq \frac{2\delta R}{2N+1} + p.$$

We decompose these costs into two components, which are the costs in terms of rents and the costs (or benefits) from political alignment. In this context, the bargaining costs depend on what the mayor offers for

councilors in her coalition versus what she provides to members of the opposition. As the chance of electing a government member is equal to γ , after taking the weighted averages, these costs become:

$$C_G(N) = \frac{N}{2} \left(\frac{2\delta R}{2N+1} - p \right) + \left(\frac{N}{2} - \gamma N \right) 2p.$$

Proposition 3. *In the reversal mechanism that incorporates partisanship, if $\gamma \geq \frac{1}{p} \left(\frac{1}{(2N+1)(2N+3)} \right) \equiv \underline{\gamma}$, then bargaining costs decrease when legislature size increases.*

The intuition for the proof is the following. As partisanship influences the costs and benefits of legislators, more government-aligned councilors make it easier for the mayor to govern. When the partisan benefit is higher than the additional cost that a legislator generates, adding a councilor will benefit mayors if the councilor has a higher chance of sharing the same party as the mayor. Therefore, a higher probability of electing a legislator aligned with the mayor reverts into lower bargaining costs.

Also, the threshold $\underline{\gamma}$ that captures the probability of electing a government supporter decreases along with the political value of policy p and the size of the legislature N . This means that intensive partisanship and larger legislatures make it easier to satisfy this electoral threshold.

Main hypotheses

Our model provides two empirically testable hypotheses. Consider a municipality with a city council comprised of N legislators. Then the city increases the size of the council to $N + 1$. Thus, in a partisan setting:

- H1:** Bargaining costs decrease with legislature size when the chances of electing a government partisan are sufficiently high.
- H2:** Public goods provision increases if bargaining costs decrease with legislature size.

BACKGROUND ON THE BRAZILIAN CASE

In 2004, Brazil comprised 5560 municipalities. According to the 1988 Brazilian Constitution, each city must provide health care, primary education, transportation, and infrastructure to its citizens. Municipalities have the authority to enact local laws and collect taxes on housing and services. However, their room for fiscal manipulation is limited. On average, municipal taxes account for only 5% of the local budgets, while mandatory transfers from state and federal governments

correspond to the remaining 95%. This reduces the ability of municipal legislators to effectively increase local spending, which makes improvements in local services dependent only on the composition of their local investments.

With regards to their political organization, municipalities have one mayor and one city council. Citizens choose their representatives by direct vote in the same election. Mayors oversee the provision of public services and propose laws and amendments to the tax code. Proposals submitted by the mayor are subject to the approval of the city council. Councilors, in turn, have two primary duties. First, they should discuss and vote on legislation put forward by the mayors or their peers. Second, they oversee the public budget and sanction mayors who do not comply with fiscal legislation. Councilors and mayors also provide an array of public and personal services for their constituents, such as helping voters access public hospitals, facilitating school enrollment, and even paying their voters' utility bills (Lopez & Almeida, 2017; Nichter, 2011).

Until 2004, there was no specific regulation on the size of city councils. The Brazilian Constitution set only broad guidelines about the number of council seats in each municipality, allowing cities to determine how many legislators their local chambers should have. This led to severe imbalances in the representation ratio across the country. For instance, the Nova Russas municipality had 30,009 inhabitants and 21 councilors, or one legislator per 1429 citizens. In contrast, Sorocaba had only 15 councilors for 528,735 inhabitants, one legislator per 35,249 citizens. In 2003, this malapportionment problem gained national visibility when Mira Estrela, a small municipality with only 2651 residents, reduced its city council from 11 to 9 seats because of fiscal considerations. The change motivated a legal dispute that reached the Brazilian Supreme Court. The Court favored the city's decision and ruled that the size of every local council should follow population thresholds.

Following this ruling of the Supreme Court, in March 2004 the Electoral Court established a series of population cutoffs for all municipal legislatures. The Court specified that cities with up to one million residents should have between 9 and 21 legislators. The number of seats was allocated as follows. Each city starts with nine councilors, then adds one legislator for every 47,619 inhabitants until their councils reach 21 members. This threshold implies that cities with a population between 571,428 and one million should all have 21 legislators. Conversely, cities between one and four million inhabitants should have at least 33 councilors, and this number increases up to 41 members following the previous formula of one additional legislator per 47,619 inhabitants.

Brazil also adopts a unique formula to allocate seats, which combines the Hare quota and the D'Hondt

method and strongly favors larger parties (Nicolau, 2015). This poses a major obstacle for small parties to reach the electoral quorum, so they often join electoral coalitions to improve their chances of winning legislative seats (Ames, 2001, 68). In Brazil, mayors are usually members of the largest coalitions (Poulsen & Varjao, 2018), thus there is an incentive for candidates to side with the mayor before and after the election.

These factors make Brazil the ideal testing ground for our theory. Although an endogenous decision motivated the Electoral Court ruling, the population cutoffs created sharp discontinuities in the distribution of local council seats. Cities close to the cutoffs had very similar characteristics, but those just above the threshold gained a new legislator. Moreover, cities could not self-select into any group, as their population estimates were calculated using the 2003 projections by the Brazilian Census Bureau (IBGE). This change in council size also happened only seven months before the election, making it impossible for candidates to adjust their service provision strategies for the 2004 election. Therefore, the ruling allows us to study the effect of larger legislatures on public service provision during the 2005–2008 term while holding all else constant.

VARIABLES AND DATA SOURCES

We use four groups of city-level variables in our models. The first group includes pretreatment control variables that were not affected by the 2004 council-size resolution. We add them to the estimates to improve the balance between treated and nontreated units. The covariates are: (1) the number of council seats in the previous term; (2) city population; (3) city GDP; (4) the proportion of low-income families in each municipality. The data come from the Supreme Electoral Court and the 2000 Brazilian census.

Second, we look into municipal data, city councilors' characteristics, approved legislation, and an online survey with 174 former city councilors that served during the 2005–2008 term to investigate potential political mechanisms. The municipal data contain: (1) the number of councilors who belong to the mayor's pre-electoral coalition; (2) the number of appointed bureaucrats; (3) the councilor's gender and race; (4) the competitiveness of each city council seat; and (5) the proportion of laws proposed by the city council that was approved. The variables come from the Supreme Electoral Court (TSE), the Senate Legislative Data Service (InterLegis), and the Brazilian Bureau of Statistics (IBGE).

Third, we collected 346,553 bills from cities within 10,000 inhabitants from the 2004 population thresholds. We selected 63 out of 202 municipalities whose voting records were available online. We evaluated

proposal types, discriminating between local public goods, oversight, and other legislative activity. Examples of the local public goods are investing in a public health clinic, requesting school staff to accommodate an extra child, renovating sewage, and fixing potholes on a given street.² Oversight bills are accountability and transparency mechanisms meant to keep public services provision in check. Other legislation comprises bills that do not fit the previous categories, such as changes in street names, motions to honor citizens or groups, and legislative and internal city-council procedures. We provide further information about the legislation dataset and the city council survey in Sections M and N of the online supporting information.

The last set of variables quantifies social welfare. We focus on the impact of legislature size on education and health care, the two most important public services the municipal government should provide to citizens. According to the Brazilian Constitution, municipalities must spend 25% of their budget on education and 15% on health care. Consequently, the Ministry of Health and the Ministry of Education provide readily available, fine-grained data on health care and education at the municipal level, which we leverage in this study. We measure access to education with the average enrollment in primary (K–4) municipal public schools. We assess education quality with the Education Development Index (Índice de Desenvolvimento da Educação Básica–IDEB), which the Ministry of Education has issued biannually since 2007. The index is a weighted average of student scores in Portuguese and Mathematics (0–10), multiplied by the harmonic mean of public school promotion rates in a given year (0–100). To test the effect of the 2004 ruling on health care, we collect data on infant mortality per thousand children born and on postneonatal infant mortality, which is the death of infants who survived more than 28 days but died before one year of age. The Brazilian Ministry of Health Data Center (DataSUS) is the source of all health-care variables.

EMPIRICAL STRATEGY

We employ a regression discontinuity design (RDD) using the population thresholds established by the 2004 Supreme Electoral Court resolution as treatment indicators. Figure 1 displays the distribution of municipalities within each city-council size. These population thresholds remained in effect until 2009

²Our theory does not differentiate between clientelism and broad service provision, as it is hard to disentangle between the two in local legislation. A voter may request a particular service, such as fixing a pothole. Attending this request can be interpreted as a clientelistic practice. Still, the provision of the service generates nonexcludable benefits to the adjacent neighborhood.

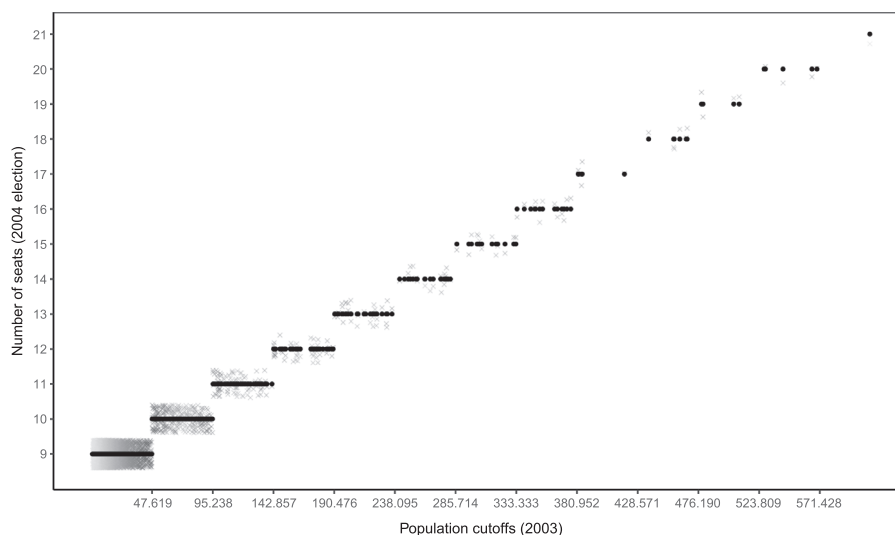


FIGURE 1 Distribution of municipalities by population and city-council size. *Note:* This figure shows in the *x*-axis the population in 2003, with each tick mark as the cutoffs determined by the Electoral Tribunal. In the *y*-axis, we have the city-council-size assignments.

when Congress amended the Brazilian Constitution. This study covers 2005–2008, which constitutes the full mayoral and city-council term following the 2004 Brazilian elections.

Our identification strategy relies on three assumptions. First, no municipality should be able to self-select into each side of the discontinuity. Second, as we estimate a sharp RDD, the council size should increase precisely as the law mandates. Third, this design assumes that the pretreatment variables, collected before the 2003 Supreme Federal Court decision, were not affected by the 2004 ruling on council size. Moreover, for all the actual models estimated here, we fitted placebo cutoffs between the actual ones to check whether the estimation technique leads to consistent results.

In Section C of the online supporting information, we assess distribution imbalances by running the McCrary (2008) and Cattaneo et al. (2020) tests. The tests show no distribution imbalances.

For the second assumption, running RDD in multiple thresholds may lead to inconsistent estimates when there are differences in the distribution of cases around the cutoffs (Cattaneo et al., 2016). In the dataset, there are 12 discontinuities (from 9 to 21 legislators). Still, if we pool all the discontinuities with no correction, we find an increase in council size of 1.63 councilors (see the first estimate in Table 1). This imbalance occurs because when we combine all the discontinuities, the model implies that municipalities below the 47,619 cutoffs (9–10 councilors) are comparable to changes in towns right above the 571,428 cutoffs (20–21 council members).

In Section E of the online supporting information we show by simulation that adding controls, especially

the variables responsible for the multiple threshold assignments (in our case, the population in 2003), improves the consistency and efficiency of the estimates. Relying on this fact, we add five controls to the estimates: population in 2003; GDP per capita; the number of seats in 2000; year; and a dummy for Northeast municipalities. The reason for the inclusion of first variable is the multiple threshold assignments. We add GDP per capita because wealthier cities tend to have better public services. We include the number of seats in 2000 because some municipalities could have experienced a change provoked by the previous council size, thus confounding our estimates. The Northeast dummy was added to control for the fact that the Lula administration invested heavily in the region from 2003 until 2010, improving several development indicators (de Macedo & Coelho, 2015). We included an indicator for year to improve efficiency and control for seasonal effects. Moreover, adding controls improves efficiency in RDD (Calonico et al., 2019) and enhances the consistency in the multiple thresholds RDD.

For the last assumption, there should be no changes in pretreatment covariates. These pretreatment covariates are measured before the primary outcomes. As the threshold rule selected by the Brazilian Electoral Court was unpredictable, we should not detect any variation before the thresholds were in place.

Tables 1 and 2 display the results of the validity checks. We present the first-stage regressions in Table 1, with and without covariates, for both actual and placebo cutoffs. In Table 2, we estimate the pretreatment covariate balance. In Sections F to L of the online supporting information, we run placebo checks for all the models using placebo cutoffs within the real ones.

TABLE 1 Validity checks—treatment effect on city-council size.

	Additional number of seats 2004 (without controls)	Placebo cutoffs additional number of seats 2004 (without controls)	Additional number of seats 2004 (with controls)	Placebo cutoffs additional number of seats 2004 (with controls)
Local average treatment effect	1.63** (0.51)	−0.31* (0.14)	1.00** (0.00)	−0.00 (0.00)
N left	5184	4621	5184	4621
N right	343	906	343	906
Effective N left	201	645	51	935
Effective N right	145	388	55	493
Bandwidth local polynomial	8.78	6.74	3.19	8.98
Bandwidth bias	13.64	12.20	5.32	13.94

Note: Regression Discontinuity local linear estimates using Calonico et al. (2014) optimal bandwidth and triangular kernel. Robust standard errors, clustered at the municipal level, in parentheses. Controls: population; GDP per capita; the number of seats in 2000; year; and a dummy for the northeast region. *N left* and *N right* represent the total number of observations on the left and right sides of the thresholds. *Effective N left* and *Effective N right* are the numbers of cases within the bandwidth. *Bandwidth local polynomial* is the bandwidth used to compute the Local average treatment effect, and *Bandwidth bias* is the bandwidth used to calculate the standard errors.

* $p < 0.1$; * $p < 0.05$; ** $p < 0.01$.

TABLE 2 Validity check—pretreatment regressions.

	Number of seats 2000	Population 2000 census	GDP 2000 census	Poverty 2000 census (%)
Local average treatment effect	0.17 (0.67)	−2055.17 (1920.89)	0.06 (0.18)	−9.71 (6.27)
N left	5178	5131	5131	5131
N right	343	343	343	343
Effective N left	211	224	205	195
Effective N right	148	157	146	145
Bandwidth local polynomial	9.02	9.46	8.87	8.59
Bandwidth bias	13.84	15.08	14.82	13.05

Note: Regression Discontinuity local linear estimates using Calonico et al. (2014) optimal bandwidth and triangular kernel. Robust standard errors, clustered at the municipal level, in parentheses. Controls: population; GDP per capita; the number of seats in 2000; year; and a dummy for the northeast region. *N left* and *N right* represent the total number of observations on the left and right sides of the thresholds. *Effective N left* and *Effective N right* are the numbers of cases within the bandwidth. *Bandwidth local polynomial* is the bandwidth used to compute the Local average treatment effect, and *Bandwidth bias* is the bandwidth used to calculate the standard errors.

* $p < 0.1$; * $p < 0.05$; ** $p < 0.01$.

EMPIRICAL RESULTS

To test the predictions from our formal model, we present four sets of empirical results. First, we confirm the bargaining-costs hypothesis and find that the additional legislator also promotes more appointments of bureaucrats. This aligns with the councilors' descriptions of the strategies mayors employ to consolidate support from city councilors. Second, we show that municipalities with an extra city councilor approve more legislation about public goods provision in general and education and health care in particular. Third, we show that all these pieces of evidence result in improvements in infant mortality and elementary school enrollment, two vital services for welfare. Finally, we also find that our results are robust

to alternative channels for the influence of legislature size on welfare.

Council size, bargaining costs, and job appointments

The main premise of our model is that a larger legislature size produces lower bargaining costs when the chances of electing government-aligned politicians are sufficiently high. Moreover, the main bargaining chip between the executive and the legislative is job appointments, even more so when the city councilors are aligned with the mayor. A higher number of political appointees is associated with better service provision in Brazil, as their tenure in office depends

TABLE 3 Political effects of increasing the number of legislators.

	Mayoral coalition size	Number of politically appointed bureaucrats	Number of career bureaucrats	Number of council assistants
Local average treatment effect	0.91 ⁺ (0.50)	104.48 ⁺ (61.51)	73.02 (216.64)	2.08 (4.40)
N left	5179	15536	15531	5179
N right	343	1028	1027	344
Effective N left	244	372	540	100
Effective N right	162	343	400	101
Bandwidth local polynomial	10.03	6.25	8.26	5.23
Bandwidth bias	15.89	10.25	11.77	8.96

Note: Regression Discontinuity local linear estimates using Calonico, Cattaneo, and Titiunik. (2014) optimal bandwidth and triangular kernel. Robust standard errors, clustered at the municipal level, in parentheses. Controls: population; GDP per capita; the number of seats in 2000; year; and a dummy for the northeast region. *N left* and *N right* represent the total number of observations on the left and right sides of the thresholds. *Effective N left* and *Effective N right* are the numbers of cases within the bandwidth. *Bandwidth local polynomial* is the bandwidth used to compute the Local average treatment effect, and *Bandwidth bias* is the bandwidth used to calculate the standard errors.

⁺ $p < 0.1$; * $p < 0.05$; ** $p < 0.01$.

directly on the survival of the politician supporting them (Toral, 2019). Career bureaucrats pass a rigorous examination and cannot be fired once hired, which considerably constrains politicians' pressure. Finally, city councilors who want to influence policy may employ more staff members and assistants to their offices. This could influence policymaking through city councilors putting pressure on the bureaucracy, defying our hypothesized mechanism. Our theoretical expectations for these regressions are that larger council size affects the political alignment of city councilors and the number of politically appointed bureaucrats. It should not affect the number of career bureaucrats or city council assistants, as it is more valuable to have a political appointee that politicians can pressure, working directly with voters. Table 3 tests the first hypothesis about the nexus between city-council size and bargaining costs and explores the consequences of larger legislatures on the municipal bureaucracy.

Column 1 shows a 91% chance of the extra legislator belonging to the mayoral coalition. The model hypothesis stated that the probability of electing a city councilor who is aligned with the mayor is sufficiently high. Sufficiently high can be ambiguous, but in any case, 91% chance is a considerably large quantity. This strengthens the political position of the mayor and diminishes bargaining costs.³ Column 2 demonstrates that adding one councilor increases appointed employees by around 104 extra employees per additional city councilor. As expected, legisla-

ture size has a null effect on the number of career bureaucrats (column 3) and councilors' staff members (column 4).

Approved legislation and city councilor's survey

We built two novel datasets to provide evidence for our mechanism. First, we ran a survey with former city councilors, asking how mayors consolidate their coalition support within the city council. Second, we collected 346,553 laws approved in 63 municipalities within 10,000 inhabitants of the city-council size thresholds. We hand coded 3466 laws into four categories: public goods, oversight, education and health-care-related legislation, and other legislative duties. After hand coding these laws, we used a Supporting Vector Machine (SVM) algorithm to classify the remainder laws. From all of the algorithms we tested, SVM achieved the highest performance.

We assume that city councilors want to extract rents and be reelected. The rents come from continuing in the repeated game, and the partisanship discounts that benefit. Figure 2 shows that 65.9% of councilors mentioned that mayors use job appointments to consolidate their coalition support. Moreover, 59.0% of the surveyed councilors affirmed that mayors use personal favors, such as shifting resources to places where the councilors have electoral support, to solidify their governing coalition. This further proves that mayors offer city councilors the benefits they demand. In this regard, granting favors works as rent transfers for councilors. Job appointments are also convenient for the mayors because patronage in Brazil has positive results in terms of welfare (Toral, 2019).

³ The effect of city-council size on the number of mayor-aligned politicians stems from the rounding rule adopted by the proportional representation system in Brazil. The rounding rule favors the coalitions with more votes, which is usually the mayor's coalition.

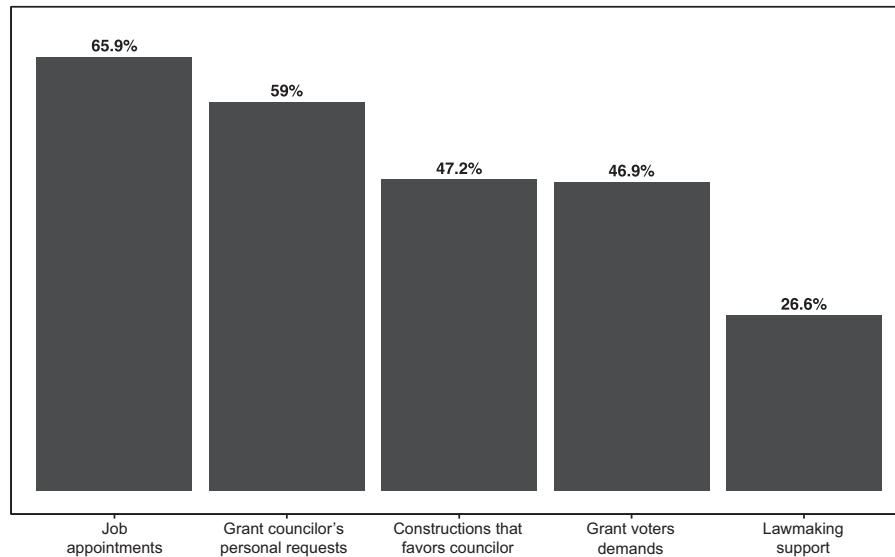


FIGURE 2 Mayoral instruments for securing councilors' support. *Note:* This figure shows the frequency with that city councilors agreed that mayors used the instruments listed in the x-axis to secure support in the council.

In Figure 3, we show that one additional city councilor increased the per capita amount of laws on public goods by 15.0%. Also, the number of laws that focuses on health care and education increased by 19.7%. Looking specifically into health care and education legislation, the proportion of laws discussing public goods increased by 15.7%, showing that policy proposals by the mayor and the councilors shift toward local and citywide public goods.

The effect of legislature size on welfare

We now study the impact of legislature size on education and health care. Table 4 shows that increasing the city council by one legislator generates welfare improvement in municipalities. Regarding health care, increasing the legislature size decreases infant mortality in 2.01 deaths per 1000 children born. This impact is significant in absolute terms and represents an effect of 0.14 in standard deviations. Moreover, post-neonatal mortality decreases by 0.90 casualties per 1000 births, which remains around the 0.14 standard-deviations improvement as infant mortality. Infant mortality is a primary outcome for welfare, and it correlates with several other indicators of well-being (World Health Organization, 2005). The fact that infant mortality improved in the Brazilian case shows that the increased mayor's support mechanism results in large welfare effects. As expected, placebo regressions were statistically insignificant.

In terms of education, with the addition of a city councilor, enrollment in elementary schools increased

by 2.58 children on average per school. This represents a change of around 0.20 standard deviations. Besides the influence of the mayoral support, enrollment can also directly impact the councilor's representation: Councilors can pressure the bureaucracy to accommodate a few extra students. With support from the mayor, they can help voters get access to schools, improving the welfare of voters. Education quality remains unchanged, but with more students in the classroom, it could potentially decrease. Again, the placebo regressions are insignificant.

Robustness to alternative mechanisms

Other pathways may also explain the nexus between city-council size and welfare. First, improvements in representation could change the provision of health care and education. Increasing legislature size without changing the population makes councilors represent fewer people. This facilitates the representation of minorities, as they have to gather fewer votes to elect a city councilor. A minority representative can advocate for policies that would improve the welfare of marginalized groups (Chattopadhyay & Duflo, 2004; Chin & Prakash, 2011). Diversity could also improve governance in municipalities (Rugh & Trounstone, 2011). For instance, more women in public offices may shift service provision toward welfare expenditure (Brollo & Troiano, 2016; Duflo, 2012; Funk & Phillips, 2019; Hernández-Nicolás et al., 2018). Therefore, an alternative hypothesis to explain the increased service

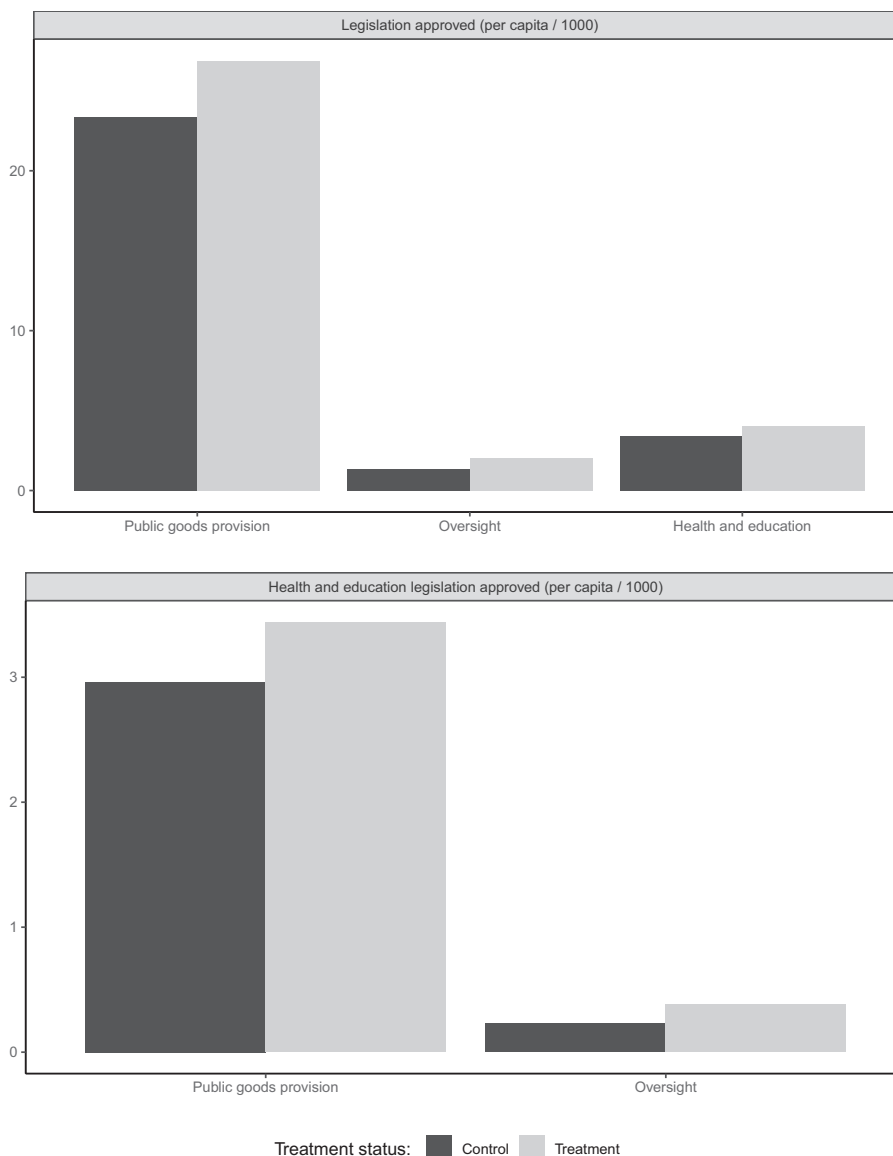


FIGURE 3 Legislation approval patterns in the municipalities closer to the city-council-size thresholds. *Note:* This figure shows the types of legislation approved in the municipalities below (control) and above (treatment) the cutoffs. Panel A depicts legislation approved per capita; Panel B shows only education and healthcare legislation per capita.

provision is that larger legislatures improve female and minority representation in Brazil.⁴

Second, more seats could increase the election competitiveness, forcing politicians to provide more services to remain competitive (Besley et al., 2010). In a political system with around 30 parties and a sample average of almost 10 parties in the municipalities we study, candidates per seat can increase exponentially. According to the Brazilian electoral law, each party can sponsor 1.5 candidates per seat. If a party forms a pre-electoral coalition, this number increases to two times the number of seats (Coneglian, 2008). Therefore, an alternative explanation for better service provision is

that a larger council size increases the competitiveness of the election.⁵

Finally, both the mayor and the legislature carry out the provision of services. As in firms, an extra employee can increase the firm productivity frontier by improving cooperation and synergistic outputs (Holmstrom, 1982). A similar argument would posit that the increase in council size increases the capability for municipalities to provide public services. As legislative productivity manifests itself as legislation, an alternative hypothesis to explain the increased

⁴ For a description of the barriers faced by non-White politicians in Brazil, see Janusz (2022).

⁵ Boulding and Brown (2014) and Gottlieb and Kosec (2019) show that more competition can increase budgetary pressure and lower social policy, leading to bargaining inefficiencies.

TABLE 4 Legislature size and welfare.

	Infant mortality	Postneonatal mortality	School enrollment	Education quality
Local average treatment effect	−2.01* (0.79)	−0.90+ (0.48)	2.52** (0.80)	−0.02 (0.13)
N left	12299	5441	10156	8597
N right	1030	672	686	670
Effective N left	495	324	206	411
Effective N right	378	244	208	291
Bandwidth local polynomial	7.49	7.56	5.43	9.08
Bandwidth bias	11.91	11.01	10.58	15.14

Note: Regression Discontinuity local linear estimates using Calonico et al. (2014) optimal bandwidth and triangular kernel. Robust standard errors, clustered at the municipal level, in parentheses. Controls: population; GDP per capita; the number of seats in 2000; year; and a dummy for the northeast region. *N left* and *N right* represent the total number of observations on the left and right sides of the thresholds. *Effective N left* and *Effective N right* are the numbers of cases within the bandwidth. *Bandwidth local polynomial* is the bandwidth used to compute the Local average treatment effect, and *Bandwidth bias* is the bandwidth used to calculate the standard errors.

+ $p < 0.1$; * $p < 0.05$; ** $p < 0.01$.

TABLE 5 Robustness: effects of legislature-size changes on representation, competitiveness, and legislative productivity.

	Number of female councilors	Number of non-White councilors	Candidates per seat	Proportion of laws approved council
Local average treatment effect	0.22 (0.38)	0.60 (0.85)	−0.19 (1.11)	−0.02 (0.08)
N left	5183	239	5184	3424
N right	343	158	343	270
Effective N left	195	47	179	227
Effective N right	145	47	132	142
Bandwidth local polynomial	8.62	2.96	8.14	11.09
Bandwidth bias	13.57	4.92	12.02	16.91

Note: Regression Discontinuity local linear estimates using Calonico et al. (2014) optimal bandwidth and triangular kernel. Robust standard errors, clustered at the municipal level, in parentheses. Controls: population; GDP per capita; the number of seats in 2000; year; and a dummy for the northeast region. *N left* and *N right* represent the total number of observations on the left and right sides of the thresholds. *Effective N left* and *Effective N right* are the numbers of cases within the bandwidth. *Bandwidth local polynomial* is the bandwidth used to compute the Local average treatment effect, and *Bandwidth bias* is the bandwidth used to calculate the standard errors.

+ $p < 0.1$; * $p < 0.05$; ** $p < 0.01$.

service provision is that more legislation is being approved by the city council.

Table 5 tests whether our results could stem from these different mechanisms. Columns 1 and 2 test the hypotheses that better representation of underserved groups could improve welfare. As we see, larger city councils do not increase the representation of females or non-Whites. Column 3 shows that the competition per seat in municipalities with larger city councils remains statistically equal to zero. Finally, Column 4 shows that the proportion of legislation passed by the city council remains unchanged when council size increases.

DISCUSSION

This article shows that partisanship considerably decreases bargaining costs and improves citizen wel-

fare. The main providers of public goods are the mayors, but they cannot do it alone. Legislatures provide a solid check to the mayor's agenda. Bargaining with legislators in a country plagued by corruption can be costly (Bertholini & Pereira, 2017). Therefore, an extra ally in the city council may ease the bargaining process and increase social welfare.

Increasing the council size results in gains in elementary school enrollment and in lower infant mortality. Education quality remains unchanged but increasing enrollment without affecting quality should be interpreted as a positive outcome. The analysis of the approved legislation shows that the frequency of laws discussing local public goods increases in municipalities above the council-size thresholds. Finally, our survey data demonstrate that councilors and mayors agree about appointing more civil servants to the public administration.

Ames (2001) argues that the Brazilian democracy is prone to deadlocks because the executive has its hands tied by legislators who demand consistent provision of private goods. Indeed, the most successful presidents after 1995 had to build extensive coalitions to secure legislative support (Limongi & Figueiredo, 1998; Raile et al., 2011). Despite evidence that side payments cemented these coalitions, many social and economic policies have since been implemented. For instance, education and health care notably improved during the Cardoso and Lula administrations (Acemoglu & Robinson, 2012). In contrast, presidents who challenged the coalition system did not succeed. For instance, former President Rouseff was impeached in her second term. Bolsonaro can be considered one of the most ineffective presidents in Brazilian history.

Municipalities work similarly. In this case, the stakes are lower and the negotiations involve only one legislative branch. But in a system such as Brazil's, with more than 35 registered parties (Samuels & Zucco, 2014), mayors face substantial challenges to approve their political agendas. Additional support in the council reduces governing costs and improves public goods provision.

However, we do not argue that these benefits result from the absence of corruption or clientelism. Both the formal model and empirical evidence provided by Britto and Fiorin (2020) show that corruption increases with legislature size. As the model shows, city councilors may receive a side transfer from the mayor to support her agenda. Mayors also divide the resources saved in the bargain into public goods and rents. The rate for the division depends on the marginal changes of the rents and public goods, but these two components receive the extra resources. In some cases, the mayor's rents may be primarily corruption, and the councilor's transfers can be clientelistic and aimed at improving his or her reelection prospects.

Our findings have implications that extend well beyond Brazil. A general form of our argument is that it is easier for a politician to negotiate with ingroup members (Abbink & Harris, 2019; Alt et al., 2018). Specifically, several countries have separate executive and legislative powers, such as the federal level of presidential systems, state governments, and local city councils. As political allegiances influence these institutions, the dynamics we expose here may be generalizable. Depending on legislative support, changing the legislature size could increase the chance of electing politicians not aligned with the executive, decreasing welfare. Despite the particular effects on political support and welfare, the logic described in this article would remain relevant for empirically accessing the effect of enlarged legislatures on welfare. Our findings may also help scholars understand why other countries in Latin America and Asia can generate

effective governance despite having strong executives and large coalitions (Pereira & Melo, 2012).

This article opens several questions for future analysis. First, if the mechanism we suggest is indeed at work, one may ask what should be the city councils' checking prerogatives, as they significantly reduce the provision of public services. The evidence so far is inconclusive, as Poulsen and Varjao (2018) show that checks for the mayors may also improve service provision. Second, future research could evaluate whether additional legislators help mayors gain access to federal or state transfers in countries where resources are centrally provided, such as Japan. As suggested by Catalinac, Bueno de Mesquita, and Smith (2020), in these situations the national government can create a tournament between municipalities and provide resources to those which offer more electoral support. Scholars might want to analyze whether this tournament structure interacts with the mechanisms we suggest in this article. Third, scholars might want to investigate whether our findings remain valid under different conditions. It is possible that the mechanisms we present here are nonlinear, with additional legislators having a positive or negative impact on welfare depending on certain electoral characteristics. Finally, it remains unclear how other legislative features affect citizen well-being. For example, city councils may vary in size, monetary compensation for councilors, committee structure, and internal power structure. Understanding how legislature size interacts with other features would improve our knowledge about how local and national legislatures impact public services. These questions are crucial for institution design and welfare in developing democracies.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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