# Development via Administrative Redistricting: Evidence from Brazil*

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**Abstract**

We exploit a large redistricting episode in Brazil to examine if, and how, administrative unit splits impact local development. Using a rich panel of administrative and spatial data, we first document that poor and rural districts are more likely to initiate requests to split. Employing a difference-in-differences strategy with areas whose requests to split were never approved serving as a control group, we find that splitting leads to an expansion of the public sector, some improvements in public service delivery and children's education attainment, but no impacts on the private sector. Meanwhile, outcomes are unaffected in parent municipalities. Results are consistent with adaptations of policy to local preferences. Our results inform the equity-efficiency trade-off embedded in decentralization reforms worldwide.

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# 1 Introduction

Administrative redistricting has been widely implemented worldwide, particularly in developing countries (Bardhan, 2002; World Bank, 2004). The creation of smaller administrative units via splits[1] is often used as an instrument to fuel local economic development in disadvantaged geographic areas with the argument that, for instance, smaller administrative units gain more autonomy to better serve local populations with heterogeneous preferences (Oates, 1972; Alesina and Spolaore, 1997) or induce competition across areas, placing pressures on the provision of local public goods to attract residents (Tiebout, 1956). Smaller units may, however, lose economies of scale or elect inferior politicians into office (Boffa, Piolatto and Ponzetto, 2016).

In many cases, a relevant consequence of splitting is the reallocation of fiscal resources across space (Oates, 1999). Revenues are automatically channeled toward new administrative units of smaller size, and are often used to cover the costs of a local bureaucracy, such as infrastructure and personnel. At the same time, the higher autonomy obtained after splitting may spur improvements in the provision of public services, and larger public investments may also generate spillover effects on the private sector. Quantifying the consequences of splitting and identifying to what extent benefits are caused by mechanical increases in local revenues or by adjustments to local preferences are important for understanding whether administrative redistricting can increase aggregate welfare (Treisman, 2007).

This paper exploits a large episode of splitting across municipalities in Brazil to assess if, and how, administrative redistricting promotes local economic development. The country provides a compelling setting for studying this question for at least three reasons. First, it is a large developing country where municipalities hold substantial administrative, fiscal, and political decision-making power. Municipalities are responsible for providing a wide range of public services, hold discretion to collect local taxes and manage revenues, and have the same horizontal structure. In other words, the splitting process redistributes administrative, fiscal, and political autonomy to new jurisdictions. Second, our context allows us to use plausibly exogenous variation in whether a municipality splits. In the first half of the 1990s, Brazil experienced a 23 percent increase in the num-

[1] Other terms used in the literature for this particular process are "administrative unit proliferation" (Grossman and Lewis, 2014; Pierskalla, 2019) and "government fragmentation" (Grossman, Pierskalla and Dean, 2017).

ber of new municipalities, followed by an abrupt reform in 1996 that sharply reduced the ability of jurisdictions to split. During this window of time, various districts had their requests to split left unapproved. Third, the availability of high-quality and extensive data allows us to characterize the impacts of splitting on multiple outcomes capturing fiscal performance, public service delivery, and economic activity.

We start by outlining a simple model in which the municipality headquarters chooses the allocation of public goods to districts forming the municipality. The model illustrates two key predictions to motivate our empirical analysis. First, districts who apply to split are more likely to benefit from splitting if they are neglected by the headquarters, have lower preferences for public goods, or experience larger fiscal gains through transfers. Second, the consequences for headquarter districts may be negligible. These predictions suggest scope for welfare gains for some districts as they become municipalities without necessarily generating sizable welfare losses to their parents. We test the main predictions of the model empirically.

To construct our estimation sample, we collect and classify historical archives on splitting requests from 11 states initiated between 1989 and 1996, covering 42 percent of all states and 58 percent of total population. We link these split requests to other sources of spatial and administrative data. Using information from years prior to splitting, we show that requests to split are concentrated in underdeveloped areas that display worse economic conditions, are located farther away from the town hall, and are more likely to experience larger gains in transfers from the federal government since transfers are determined by a population-based rule that disproportionately benefits small municipalities.

We estimate the causal effects of splitting using a difference-in-differences strategy comparing areas whose requests to split passed to those whose requests did not. Because they also applied to split, these areas that *almost split* form an arguably valid counterfactual to those that split. Several of them ultimately failed to split due to either exogenous political reasons or the 1996 reform that left outstanding requests open. We show that municipalities with approved and unapproved requests to split exhibit similar levels and trends in outcomes prior to their initial year of splitting, corroborating the causal interpretation of the difference-in-differences estimates. We also document that it is difficult to predict splitting based on municipality baseline characteristics.

Our analysis yields five main findings. First, in our preferred specification, we find that after splitting, municipalities experience increases of around 36 percent in federal transfers per capita in comparison to almost split municipalities. Reallocated financial resources are channeled specifically to districts that become new municipalities, while other districts remain mostly unaffected. Second, we show that such increases in local revenues translate into a larger local bureaucracy: consistent with Lima and Silveira Neto (2018), capital and current expenditures grow about 22 and 12 percent, respectively, up to 15 years following splitting.[2] Third, our results show little or no spillover effects of splitting on activity in the private sector and aggregate output, summarized by local tax revenues, the number of establishments, and employment in the private sector. Fourth, the Census data shows that municipalities that split did experience some improvements in the delivery of public services, particularly those for which municipalities are, by law, responsible. In a cohort-level analysis exploiting variation in splitting across cohorts and municipalities, we find increases in school attendance ranging between 4 to 6 percentage points for cohorts up to age 15 by the time of changes in boundaries. We also document positive effects on public services such as household access to piped water, trash collection, electricity, and sewage, ranging from 2.5 to 7 percent. Fifth, using night lights data, we find that luminosity quickly grows in the first five years and stabilizes at around 10 percent afterwards in municipalities that split. The granular and spatial structure of the data also allow us to investigate which districts within a municipality drive the gains. We find that districts that apply to split entirely explain the effects on luminosity, while other parts of the municipality are unaffected.

We probe the robustness of our findings in several ways. First, we show that the conclusions remain the same when we consider alternative definitions of outcomes, samples, and specifications. We also show that our estimates are similar when restricting observations only to requests made right before the Constitutional Amendment 15/1996 halting splits. Second, to address concerns related to unobserved factors affecting our estimates, we perform a complementary approach exploiting an important rule to split before 1996: districts requesting to split to become municipalities were required to conduct local referendums and obtain approval from at least half of voters. Exploiting this discontinuity for a representative state, *Minas Gerais*, where information on referendum results are publicly available, we document that the difference-in-discontinuities estimates on luminosity qualitatively follow the difference-in-differences results.[3]

[2] Capital and current expenses refer to capital purchases and costs to maintain and operate the public sector.

[3] While this exercise has less statistical power given a sample restricted to one state, our results are significant at conventional levels.

In the last part of the paper, we shed light on mechanisms. First, we assess to what extent mechanical increases in local revenues and adjustments to local preferences after municipality splits explain our findings. We find no evidence that federal transfers drive our results. Controlling for revenues in our preferred specifications does not change estimates, and a regression-discontinuity exercise leveraging population cutoffs shows no effects of transfers on our variables of interest. Second, we show that the gains in luminosity are higher in areas experiencing larger reductions in distance from their town halls after splitting. This suggests that the physical distance between areas and their headquarters constitutes an important friction for state capacity, and administrative redistricting can alleviate this constraint. Third, we find that gains in luminosity are higher in areas that voted to split in higher percentages in local referenda. This indicates that new municipalities are able to deliver policies better tailored to the preferences of their electorate.

This paper contributes to three strands of literature. First, an extensive literature studies different aspects of multi-level government and federalism using different expressions: decentralization (Oates, 1972, 1999; Bardhan, 2002; Hooghe and Marks, 2003; Treisman, 2007; Faguet, 2004, 2014; Gadenne and Singhal, 2014; Mookherjee, 2015; Rodden and Wibbels, eds, 2019); the size of nations (Bolton and Roland, 1997; Alesina and Spolaore, 1997, 2003; Lassen and Serritzlew, 2011); administrative unit proliferation (Green, 2010; Pierskalla, 2016; Grossman and Lewis, 2014; Grossman, Pierskalla and Dean, 2017; Pierskalla, 2019); border reforms (Coate and Knight, 2007; Boffa, Piolatto and Ponzetto, 2016; Schoenholzer, 2018; Gendźwiłł, Kurniewicz and Swianiewicz, 2020); amalgamations (Fox and Gurley, 2006; Weese, 2015; Egger, Koethenbuerger and Loumeau, 2017); and municipal cooperation (Ferraresi, Migali and Rizzo, 2018; Tricaud, 2019). Most empirical papers assess the effects of amalgamations on fiscal outcomes, and cannot separately track child and parent administrative units before and after border changes (Reingewertz, 2012; Gendźwiłł, Kurniewicz and Swianiewicz, 2020). We complement this literature by empirically studying the impacts of splitting on local development and public service delivery for new and parent municipalities using a credible empirical design.[4] Closer to our identification strategy, Lima and Silveira Neto (2018) focus on fiscal outcomes, whereas our work incorporates other dimensions to provide a comprehensive picture of the con-

[4] In the particular case of Brazil, our results also contribute to the policy debate on the optimal number and size of municipalities, often deliberated upon in the Brazilian National Congress (Gomes and MacDowell, 2000; Tomio, 2002, 2005; Cachatori and Cigolini, 2012, 2013; Mattos and Ponczek, 2013; Lipscomb and Mobarak, 2017; Lima and Silveira Neto, 2018).

sequences of splitting. We also distinguish the roles of fiscal resources and autonomy in explaining our findings. In particular, we complement Asher, Nagpal and Novosad (2018) by using new variation to directly test the impact of administrative remoteness on local development.

Second, this paper speaks to the literature on promoting regional development in rural periphery areas and decreasing inequality between rich and poor regions within a country, such as increases in public spending (Litschig, 2012; Brollo, Nannicini, Perotti and Tabellini, 2013; Litschig and Morrison, 2013; Gadenne, 2017; Corbi, Papaioannou and Surico, 2019); fiscal decentralization (Martinez-Vazquez et al., 2017); and place-based policies (Kline and Moretti, 2014; Shenoy, 2018). Our empirical contribution is threefold. First, we study changes in small jurisdictions, of about 5,000 inhabitants on average, in which returns to spending are potentially the highest. Second, we exploit administrative redistricting via splitting to understand how autonomy influences spending effectiveness. Finally, we are able to track how policy changes affect different aspects of the local economy over a period of 15 years.

We also contribute to the broad literature on state capacity (Besley and Persson, 2009; Khemani, 2019) and the personnel economics of the state (Evans and Rauch, 1999; Finan, Olken and Pande, 2017; Pepinsky, Pierskalla and Sacks, 2017; Akhtari, Moreira and Trucco, 2020). The literature has shown that the state and a capable bureaucracy matter for local development. This paper confirms theoretical predictions and provides new evidence from a developing country that a growing bureaucracy can ultimately result in improvements in public service delivery. In fact, we find evidence that allowing for new administrative units serves the dual purpose of raising state capacity in the periphery and freeing these areas from captured parent governments (Bardhan and Mookherjee, 2000; Mansuri and Rao, 2013; Alatas, Banerjee, Hanna, Olken, Purnamasari and Wai-Poi, 2019).

The rest of the paper is organized as follows. We describe the institutional background in Section 2, and we outline a simple model to guide our empirical analysis in Section 3. Section 4 delineates our data sources, sample selection, and empirical strategy. Section 5 presents the main results, followed by a discussion on the mechanisms in Section 6. We offer concluding remarks in Section 7.

# 2 Institutional Background

## 2.1 The Role of Municipal Governments

Brazil has three tiers of government that have fiscal, administrative, and political responsibilities: federal, state, and municipality governments. In 1988, the country had 4,124 municipalities, which are also the smallest units of government carrying decision-making power. For organizational purposes, municipalities are divided into districts, which have no political or administrative autonomy. One municipality may consist of one or more districts, although no district belongs to two different municipalities.[5]

The enactment of the Federal Constitution in 1988 represents the country's most important step towards federalism and decentralization of political power and financial resources (Arretche, 2000; Favero, 2004), granting to municipalities additional administrative, fiscal, and political responsibilities.[6] Since 1988, municipalities are responsible for providing a wide range of public goods, including primary education, basic health care, water, sanitation, trash collection, and street lighting services.[7] Fiscal autonomy includes the power to collect and manage local taxes, like property and service taxes, and the discretion to administer their own revenues, including inter-governmental transfers and local revenues. As illustrated in Appendix Figure C.3, the former accounts for 42 percent of total revenue on average, and up to 60 percent for small municipalities, while the latter, which includes both taxation and fees, accounts for 5 percent of total municipality revenues on average.[8]

Municipal elections are held every four years in October to elect the mayor and municipal councillors. In municipalities with less than 200,000 registered voters, mayors are

[5]Following Hooghe and Marks (2003), municipalities in Brazil are *type-1* jurisdictions. They are general-purpose for holding a large range of functions, are durable in the sense that adjusting new jurisdictions is costly and rare, and are characterized by non-intersecting boundaries.

[6]In general, administrative decentralization implies that different government tiers execute various functions and policies. Superior tiers may reverse and overrule decisions made by lower ones. Political decentralization includes *appointment* decentralization, *decision-making* decentralization, or *constitutional* decentralization. Fiscal decentralization involves decision-making decentralization on matters of taxation and expenditure (Ebel and Yilmaz, 2002; Treisman, 2007).

[7]Municipal, state, and federal governments coordinate to provide certain public goods, such as sanitation and health care. Yet, municipalities are exclusively responsible for providing other public goods such as primary education.

[8]While no reliable data exists about local tax rates and how often they change in the 1990s, anecdotal evidence suggests that local tax rates change infrequently and not by large amounts.

elected through a single-round system in which the candidate with the majority of votes wins. Larger municipalities have a two-round system: if no candidate gets at least 50 percent of vote share, there is a second round between the two most voted first-round candidates. The candidate who receives most valid votes wins. Municipal councillors are defined through an open list proportional representation system. In January after elections, elected mayors and councillors take office.

## 2.2 The Creation of New Municipalities

In addition to expanding the role of municipalities, the 1988 Federal Constitution granted to states the authority to establish their own rules and criteria regarding the creation and amalgamation of municipalities (Brandt, 2010). The requirements varied across states and generally involved territorial contiguity, a minimum population, and some level of urban development for new municipalities. The process of creating a new municipality consisted of multiple stages: (1) local leaders or state politicians had to formally request the creation of a new municipality to state assembly; (2) a state legislative committee responsible for evaluating this request approved it; (3) the state legislature authorized a local referendum in the applicant area, though the state governor could veto it; (4) if the majority of voters in the referendum voted for splitting, the request was put forward for voting in the state legislature; (5) thereafter, the state and federal governments had to approve it, although both of them had the discretion to veto it (Tomio, 2002). In practice, these vetoes were rare. The country experienced an unprecedented increase in the number of districts requesting to split and breaking off to become municipalities in the first half of the 1990s.

In 1996, the National Congress curbed the creation of new municipalities by enacting the Constitutional Amendment 15/1996 (henceforth "1996 CA"). It has removed from states and assigned to the federal government the authority to regulate splits and amalgamations. The process to create a new municipality has returned to the pre-1988 system except for two major changes. First, districts requesting to split have to conduct a referendum involving the entire municipality, not only the applicant district (or districts), and obtain approval from the majority of voters. Second, the federal government requires evidence, published officially before referendums happened, that the applicant district (or districts) would be financially viable as municipality (Klering et al., 2012). The 1996 CA stopped the splitting process, inducing a halt in the creation of new municipalities and leading to various districts with unapproved requests.

Once the splitting request is approved, the applicant district (or group of applicant districts) is established as a new municipality after municipal elections, when the elected mayor and municipal councillors take office. Figure 1 displays a 34 percent increase in the number of municipalities between 1988 and 1997, jumping from 4,124 to 5,507. We observe two main waves of splitting approved before the 1996 CA, concentrated in 1993 and 1997, the years immediately after municipal elections. The splitting process leads to an extensive devolution of administrative, fiscal, and political power to new municipalities, which can also be viewed as a form of decentralization.[9]

## 2.3 The Reasons for Splitting

As we consider the most common factors contributing to boundary changes in Brazil, we highlight two of them: neglect from the headquarters and fiscal incentives. Several studies suggest that large disparities in the provision of public goods across districts within a municipality play an important role in the decision to request to split (de Mello, 1992; Cachatori and Cigolini, 2012). In a survey carried out with a representative sample of mayors in 1992, Bremaeker (1993) shows that the majority reported the neglect by local governments and the physical distance to administrative headquarters as the main reasons for splitting.

Because splitting affects the distribution of federal transfers, particularly the *Fundo de Participação dos Municípios* (henceforth "FPM"), fiscal incentives are also relevant in this context. FPM is the main source through which the federal government provides monetary transfers to municipalities, accounting for around 80 percent of all federal transfers and 31 percent of municipal revenues (Corbi, Papaioannou and Surico, 2019). Municipalities must spend 15 percent of FPM transfers on education and health individually, and there is no restriction for the remainder (Brollo, Nannicini, Perotti and Tabellini, 2013).

The 1988 Federal Constitution established the current allocation mechanism of the funds. Every year, 22.5 percent of total revenues from federal income and industrial product taxes are reserved for FPM. Each state receives a block grant to be shared among its municipalities, implying that transfers are zero-sum within state. The final amount of transfers to be allocated to each municipality depends on its population size. Municipalities are grouped into population brackets that assign coefficients determining the share

[9] This is an example of *horizontal* decentralization process. It differs from *vertical* decentralization, which refers to the creation of new tiers of government or to transfer of functions from a higher tier to a lower one.

of transfers they receive. Smaller population brackets correspond to lower coefficients.[10] Municipalities from the same state and population bracket obtain the same amount of transfers.

Consistent with the design of FPM disproportionately benefiting municipalities with lower population sizes, Appendix Figure C.3a, shows that the FPM share grows non-linearly with decreasing municipality population.[11] When splits occur, new municipalities start receiving FPM transfers. Most splits are concentrated in small municipalities, suggesting that gains in FPM transfers may constitute an important driver for splitting requests. Yet, the direction of change in FPM transfers for other areas is unclear, depending on a combination of factors, such as the allocation of funds within municipality prior to splitting, the curvature of the FPM curve and the quantity of splits in the state.[12]

# 3 Conceptual Framework

This section sketches a simple model to illustrate how administrative unit splits affect the provision of public services and to guide our empirical analysis. Our model incorporates several features from our context and highlights the mechanisms, including neglect from the headquarters and federal transfers (Bolton and Roland, 1997; Dur and Staal, 2008). We present further details of the model and formal proofs in Appendix A.

[10] Litschig (2012); Brollo, Nannicini, Perotti and Tabellini (2013); Litschig and Morrison (2013); Gadenne (2017) and Corbi et al. (2019) exploit discontinuities in population brackets to estimate the effects of federal transfers on multiple economic outcomes.

[11] In the aggregate, however, smaller municipalities account for small share of total transfers. For instance, Appendix Figure C.3b indicates that the bottom half of municipalities receive only 26 percent of all FPM transfers.

[12] Consider the following framework. Suppose a municipality is composed of two districts, $A$ and $B$, with population of sizes $\alpha_A$ and $\alpha_B$, respectively. District $B$ considers splitting into a new municipality. Before the split, FPM revenues are $R_A = w_A T(\alpha_A + \alpha_B)$ and $R_B = w_B T(\alpha_A + \alpha_B)$, where $w_A + w_B = 1$. Weights $w_A$ and $w_B$ are shares of total revenue received by each district, which may be proportional to population (i.e. $w_A = \frac{\alpha_A}{\alpha_A + \alpha_B}$) or not. Splitting generates higher revenues for $A$ if $w_A > \frac{T(\alpha_A)}{T(\alpha_A + \alpha_B)}$, and for $B$ if $w_B > \frac{T(\alpha_B)}{T(\alpha_A + \alpha_B)}$. We first conclude that total revenues likely increase (because $T(\alpha_A) + T(\alpha_B) > T(\alpha_A + \alpha_B)$), and that revenues for $B$ also increase (because $w_B$ is small and $T$ is increasing and concave around small $\alpha_B$). Revenues for $A$ may increase if $w_A$ is sufficiently low and if $\frac{T(\alpha_A)}{T(\alpha_A + \alpha_B)}$ is sufficiently high; and vice-versa. Since municipalities receive constant amounts within state and population bracket, the latter comparison depends on whether district $A$ moves to a lower bracket after the split. Lastly, changes in $T$ also depend on the total number of splits within state because one split lowers the total amount available to every other municipality.

We work with a one-period model. We assume there is a municipality composed of two districts, $A$ and $B$. The municipal population is immobile and divided into districts $A$ and $B$, each having population $\alpha_A$ and $\alpha_B$, respectively. There is no income heterogeneity within the district so that all residents have *per capita* income $y$. Two sources of municipal revenues finance public goods $g$: income taxes $\tau$ and federal transfers $T(\cdot)$. To map our model on to the Brazilian context as described in Section 2, $T(\cdot)$ depends on population size. In addition, we assume that federal transfers $T(\cdot)$ are weakly increasing and concave, while *per capita* federal transfers are weakly decreasing and convex in population size. The utility takes a quasi-linear form, $U_i = \theta_i \ln(g_i) + (1-\tau)y_i$, where $\theta_i$ captures local preferences for public goods in district $i$. We normalize the price of public goods to one.

District $A$ contains the municipality headquarters and, for this reason, holds decision-making power, including the responsibility of choosing the allocation of public goods in both districts. When districts $A$ and $B$ are united and form a municipality, district $A$ chooses the levels of public goods in districts $A$ and $B$, $g_A^U$ and $g_B^U$, that maximizes a Pareto weighted sum of utilities subject to a budget constraint. Put differently, district $A$ solves the following maximization problem:

$$\max_{g_A, g_B, \tau} \quad (1-\lambda)\alpha_A U_A + \lambda \alpha_B U_B \quad \text{subject to} \quad g_A + g_B \leq \tau y + T(\alpha_A + \alpha_B), \tag{1}$$

where $y \equiv \alpha_A y_A + \alpha_B y_B$ and $\lambda$ is the intra-municipality Pareto weight capturing the relative welfare strength of the two districts in deciding over the amount of public goods.

In the case of splitting, district $B$ becomes a municipality and is granted decision-making power to decide the level of public goods $g_B^S$. We characterize the maximization problem as follows:

$$\max_{g_B, \tau} \quad \alpha_B U_B \quad \text{subject to} \quad g_B \leq \tau \alpha_B y_B + T(\alpha), \tag{2}$$

where $T(\alpha_B)$ represents the amount of federal transfers that the new municipality receives. The parent municipality, now comprising only district $A$, solves for $g_A$ and $\tau$ through an analogous maximization problem.

Solving the above maximization problems and comparing the solutions, we can state the following proposition:

**Proposition 1.** *District B is more likely to split if:*

1. ***(Neglect)*** *Its welfare was neglected by the headquarters (lower $\lambda$);*

2. ***(Fiscal Incentives)*** *It is small in population size (lower $\alpha_B$) and there are*

   *(A1) a high comparative gain in transfers if split* $\left(\frac{T(\alpha_A+\alpha_B)}{y} \leq \frac{T(\alpha_B)}{\alpha_B y_B}\right)$*; and*

   *(A2) a high comparative tax base* $\left(\frac{\theta_B}{\theta_A} \leq \frac{y_B}{y_A}\right)$.

*Proof.* See Section A.1, Appendix. □

To understand the distributional effects of splitting, we extend our framework to introduce a second municipality with population $\alpha_2$. To illustrate the redistribution of federal transfers after a split, define $T_i^U$ as the amount in transfers area $i$ receives when municipality 1 is united, and let $T_i^S$ be the transfers when municipality 1 splits.

To match the Brazilian context, we assume that transfers are zero-sum, always summing to a constant $\overline{T}$. We also assume that $T_A^S + T_B^S \geq T_{A+B}^U$ and $T_2^U \geq T_2^S$. We define the indirect utility of transfers for each area $i$ when united as $V_i^U$ and when split as $V_i^S$. We can express the changes in indirect utility for area $i$ after a split as $\Delta V_i \equiv V_i^S - V_i^U$. Our next proposition details what determines changes in total welfare after a split.

**Proposition 2.** *If district $B$ is relatively small* $\left(\frac{\alpha_B}{\alpha_A} \to 0\right)$ *and neglected by its parent district* $(\lambda \to 0)$, *and if municipality 2 is relatively large* $\left(\frac{\alpha_2}{\alpha_A+\alpha_B} \to \infty\right)$, *then (i) $\Delta V_A$ is small, (ii) $\Delta V_B$ is positive and large, and (iii) $\Delta V_2$ is negative and small.*

*Proof.* See Section A.2, Appendix. □

The intuition behind Proposition 2 is straightforward. Because of decreasing returns to spending, for a given configuration of population sizes and neglect by the headquarters district, the transfers moved from municipality 2 to district $B$ may do little harm to the former and substantially benefit the latter. District $A$'s welfare changes little, either positively or negatively, depending on whether its transfers change or not.[13] We directly test these predictions in Section 5 by separately evaluating the consequences of splitting for headquarter and non-headquarter districts.

We highlight that, despite being outside the scope of this paper, the model can be extended to incorporate specific features from other contexts. For example, it is possible to

[13]In a setting allowing for agglomeration effects, this result could be further exacerbated (Kline and Moretti, 2014).

allow for individuals ”voting with their feet” (Tiebout, 1956) with adjustments in population shares after policy choices. Ethnic divisions between areas (Alesina, Baqir and Hoxby, 2004; Pierskalla, 2016; Bazzi and Gudgeon, 2020) or municipality mergers (Weese, 2015; Blom-Hansen, Houlberg, Serritzlew and Treisman, 2016) are also potential extensions of the model.

# 4 Data and Empirical Strategy

## 4.1 Data

### 4.1.1 Splitting Requests

We catalog all splitting requests from two sources. First, we gather information from the Brazilian Institute of Geography and Statistics (IBGE) on the dates municipalities were created, and officially established and their parent municipalities before their creation. Second, we manually collect and classify historical archives on splitting requests. Prior to the 1996 CA, state assemblies set their own rules for evaluating splitting requests, implying that the availability and quality of these archives vary across states.[14] The final data contain splitting requests initiated by districts from 11 states (42 percent of all states, covering 58 percent of the country's population in 1991) between 1989 and 1996, regardless of whether requests were approved.[15] Section B of the Appendix describes the final data in detail.

We manually scrape legislative reports about referendum results for the states of Minas Gerais and São Paulo, the only ones for which reliable records are available, including information on turnout and percentage of valid votes and voters in favor of splitting. We validate information from reports by cross-checking them with our data on split requests.

[14]The level of detail of these requests, including information on submission and vote dates and whether they were vetoed, also differs by state.

[15]Information on splitting requests are available for the following states: Amapá, Espírito Santo, Goiás, Mato Grosso, Minas Gerais, Pará, Paraná, Rio Grande do Sul, Rondônia, Santa Catarina, and São Paulo. The remaining states do not provide public records on requests.

#### 4.1.2 Outcome Data

We combine different sources of spatial and administrative data to examine whether and how splitting affects public revenues and expenses, local development, and public service delivery. We describe these sources in detail below.

**Public Finance.** We collect information on revenues and expenditures at the municipality level from the Brazilian National Treasury (Finbra). Available since 1989, the data contain details on revenue sources (e.g., local taxation and intergovernmental transfers) and expenditure categories (e.g., capital and current expenses).

**Formal Labor Market.** We draw labor market information from the annual matched employer-employee data, the *Relação Anual de Informações Sociais* (RAIS), carried out by the Brazilian Ministry of Economy. The data cover the formal sector (Dix-Carneiro, 2014; Alvarez, Benguria, Engbom and Moser, 2018) between 1995 and 2018 and include a rich set of worker, job, and establishment characteristics. We use individual-level data to generate information on the total number of employees and establishments in the public and private sectors at the municipality level. We also generate these variables by economic sector (agriculture, mining, manufacturing, construction, retail, and services) and areas (e.g., education and health).

**Demographic Census.** We use decennial census data in 1991, 2000, and 2010 sourced from IBGE and the Atlas of Human Development in Brazil (United Nations Development Programme, 2013) to recover demographic and socioeconomic characteristics, including population size, urbanization rate, education, health, access to public services, and income. For our baseline specification, we aggregate data at the municipality level because district identifiers are not available. We also use individual-level microdata on literacy and school attendance when exploiting variation across cohorts.

**Night Lights.** We use satellite imagery of night-time lights organized by the U.S. National Oceanographic and Atmospheric Administration (NOAA) and the National Geophysical Data Center (NGDC). The data consist of grids with integer values spanning from 0 (no light) to 63 that record the intensity of lights for every year between 1992 and 2013.[16] We construct district-level data containing annual information on both the intensive and extensive margins of luminosity, measured by the weighted average of lights across grids

[16] A grid cell captures a 30 arc-second output pixel, equivalent to about 0.86 square kilometers at the Equator.

within a district and whether this average is above zero. To capture regional inequality, we calculate a luminosity Gini index from variation across pixels within each district.[17]

**Elections.** We collect data on municipalities' electoral outcomes from the Superior Electoral Court (TSE). Available every four years since 1988, the information richness grows over time. Between 1988 and 1996, we observe only the elected mayor's name and party. The list of candidates and vote shares of municipal elections, along with other information, are reported since 2000.

Our analysis also includes the following minor sources of data: (1) soil suitability from FAO-GAEZ; and (2) terrain ruggedness from Carter (2018).

### 4.1.3 Sample Selection

We take several steps to build our estimation sample. Starting from an initial universe of 4,298 municipalities from the 1991 census,[18] we keep municipalities that meet the following criteria: (1) municipalities that belong to one of eleven states with records on split requests; (2) municipalities with a single split event or with districts having split requests between 1989 and 1996; and (3) municipalities that do not belong to state capitals. The restrictions yield a final sample of 448 municipalities.

While we perform our analysis mostly at the municipality level due to data availability, several data are also available at the district level, allowing us to gain insights on differences within and across municipalities. Therefore, we apply similar restrictions to districts to construct a secondary sample. Starting from a sample of 8,855 districts from the 1991 census, we first restrict it to districts meeting the following criteria: (1) districts from 11 states with records on split requests; (2) districts that do not belong to state capitals; (3) districts in municipalities where split requests are started by districts[19]; and (4)

[17] Intensity of night lights measures both outdoor and some indoor use of lights. Henderson, Storeygard and Weil (2012) and Henderson, Squires, Storeygard and Weil (2018) show that night lights are a good proxy for long-term GDP growth. This is useful in our context because information on economic activity is not collected at the district level and data on electricity consumption are only available for more recent years.

[18] Changes in municipality boundaries are generally not nested. To account for them, we adopt the standard procedure of harmonizing boundaries between 1991 and 2010 into *minimum comparable areas*, as done in Lipscomb and Mobarak (2017) and Lima and Silveira Neto (2018). This approach yields a sample of 4,298 minimum comparable areas, which we refer to as municipalities throughout this paper, instead of using the list of 5,565 original municipalities in 2010. We use the material publicly provided by Ehrl (2017).

[19] Several split requests are initiated by areas smaller than districts, such as neighborhoods or parks, so we exclude these cases from the estimation sample.

districts in municipalities with a single split event or split requests between 1989 and 1996. Combined, these restrictions leave us with a sample of 1,281 districts. We then classify them into three groups: (1) *applicants*, corresponding to periphery districts that requested to split; (2) *remaining*, containing periphery districts that did not request to split themselves, but were located in municipalities where some district did so; and (3) *headquarters*, including headquarter districts in municipalities with a district requesting to split. This division leads to 560 applicants, 331 remaining, and 390 headquarter districts.

## 4.2 Who Applies to Split?

Before outlining our empirical strategy, we discuss how municipalities select into splitting and how districts select into applying to split. Table 1 presents summary statistics for baseline municipality characteristics in 1991 levels. Overall, municipalities in our final estimation sample in Column (1) that contain an applicant district are comparable to municipalities without split requests in Column (3) in various dimensions, except for population size, area, and amount of federal transfers as share of total revenues, consistent with fiscal incentives from splitting. Municipalities in both groups display similar population composition and measures of education, health, public services, and income prior to splitting. In addition, unlike other countries, such as Indonesia (Pierskalla, 2016; Bazzi and Gudgeon, 2020) or India (Dunning, 2019), racial and religious composition are balanced across both groups. This allows us to shut down one of the most common drivers of splitting in the literature.

Our institutional context suggests that districts requesting to split are more likely to be less developed than other parts of the country. Our data generally corroborate this prediction. In Appendix Table C.1, we compare the average mean district characteristics in the baseline period, before the waves of splitting, between applicants in Column (1) and headquarters in Column (5). On average, applicant districts display worse economic and demographic conditions. For instance, they are smaller in total population and area, are less urban, and exhibit lower levels of public service delivery. As expected, they are also located farther from their parent town halls. Yet, applicant districts are larger and more developed than remaining districts in Column (3).[20]

[20] For completeness, Columns (7)–(10) display summary statistics for districts outside our estimation sample. They document that districts not involved in splits are similar to those that are across most dimensions with the exception of population, area, urbanization and terrain ruggedness.

## 4.3 Empirical Strategy

### 4.3.1 Identification

In order to identify the causal effects of splitting, we classify our final sample of 448 municipalities into two groups: *split* (324) and *almost split* (124). As the name suggests, almost split municipalities contain a district that applied and failed to split into a new municipality. They form a credible counterfactual to split municipalities because they attempted to split, mitigating concerns related to selection into application that can affect our estimates, and had a good chance of having their requests accepted. Several of them ultimately failed to become new municipalities due to exogenous political reasons, such as legislative commissions denying the request, the referendum not returning a majority, or the state governor vetoing the request. In addition, the enactment of the 1996 CA left a substantial number of splitting requests open, some of them initiated in 1995, which had reasonable chances of approval had the new regulation not been implemented.[21]

Considering these new classifications, Figure 2[22] plots split and almost split municipalities using the Brazilian map. Two relevant patterns emerge: split requests are geographically scattered and, despite some clustering due to the state's rules for splitting, there is a large geographical variation in split and almost split events.

### 4.3.2 Regression Specifications

To understand how splitting affects municipalities, we estimate the following difference-in-differences model:

$$y_{mt} = \alpha_m + \alpha_{s(m)t} + X_m^{1991}\alpha_t + \sum_{\tau=-\underline{\tau}}^{\overline{\tau}} \beta_\tau Split_m \mathbf{1}[t - E_{w(m)} = \tau] + \gamma Post_{w_m} + \varepsilon_{mt} \quad (3)$$

in which $y_{mt}$ represents outcomes for municipality $m$ in year $t$; $\alpha_m$ are municipality fixed effects; $\alpha_{s(m)t}$ controls for any state-by-time fixed effects; and $X_m^{1991}$ are baseline variables extracted from Appendix Table 1 interacted with time fixed effects. $Split_m$ is an indi-

[21] We extend similar arguments to districts. The new division leads yields samples of 560 applicants (441 split and 119 almost split); 331 remaining (261 split and 70 almost split); and 390 headquarter districts (292 split and 98 almost split).

[22] Figure 2 also presents a diagram illustrating the simple comparison between split (in blue areas) and almost split (in orange) municipalities. Each municipality is divided into districts classified as applicant, remaining, and headquarter districts.

cator variable for whether the municipality $m$ split; and $\mathbf{1}[t - E_{w(m)} = \tau]$ are dummies indicating year relative to the wave-year $w$ of splitting request for municipality $m$. Because our data contain two waves of splitting (1993 and 1997) when categorizing splitting requests into one of these years, we consider the earliest year after their initial submission. The choices of start time $\underline{\tau}$ and end time $\overline{\tau}$ are a function of the data and depend on the outcome of interest $y_{mt}$. $Post_{w(m)}$ is a dummy indicating years after the wave year the municipality belongs to (1993 or 1997) to capture potential differences across waves. Standard errors are clustered at the microregion level.

In Equation (3), we normalize $\beta_{-1} = 0$ so that our estimates are relative to the year before splitting, 1992 or 1996. The post-event coefficients of interest, $\beta_\tau$, capture the dynamics effects of splitting relative to that year. The main identification assumption relies on the timing of splitting being uncorrelated with the outcomes of interest, conditional on our set of fixed effects and controls. In particular, outcomes for treated and control municipalities would have followed parallel trends in $\tau \geq 0$ if no splitting had occurred. We test this assumption by assessing whether the pre-event coefficients of interest are statistically indistinguishable from zero.[23]

Our empirical strategy contrasts municipalities that split to those that applied for splitting but did not receive an approval. Having some sense of what predicts approval is an useful exercise. In Table 2, we display least squares estimates of the probability of splitting as a function of baseline characteristics at the municipality level in 1991. Columns (1) and (2) show estimates without and with state fixed effects to account for state-specific splitting policies and geographic clustering of splitting decisions. In both specifications, we document that most baseline covariates do not predict splitting in standard levels of statistical significance. The exceptions are log distance to state capital, years of education, share of preschool attendance, and shares of households with access to piped water and trash collection. We notice that the point estimates are predominantly small in magnitude and the statistical significance is sensitive to the inclusion of state fixed effects. To be conservative, we proceed by flexibly saturating Equation (3) with interactions of these baseline characteristics interacted with time dummies to capture differential trends in these dimensions. We also emphasize that our identification strategy does not require balance on pre-splitting covariates in levels. It relies only on parallel trends between split

[23] To further validate our findings, we complement our difference-in-differences results with an RD approach embedded in local referendums — districts with at least half of voters in favor of splitting are more likely to split — and find that the RD estimates qualitatively follow the difference-in-differences results. We describe this strategy in Section 5.5.

and almost split municipalities before splitting.

# 5 Main Results

This section presents the main results in parts. First, we show that splitting generates a reallocation of federal transfers. Second, we find that both the size of bureaucracy required to run a municipality and the public service delivery increase after splitting. Third, we document that the local economy is unaffected. We also offer explanations for our main findings and probe the robustness of our results.

## 5.1 Impacts on Reallocation of Federal Transfers

Our institutional context, described in Section 2, suggests that gains in federal transfers are larger for municipalities with small populations, constituting relevant incentives for districts to request to split. Using public finance data, we estimate Equation (3) for log federal transfers per capita. Figure 3 presents the annual point estimates along with 95 percent confidence intervals. Pre-event coefficients are statistically close to zero, lending support to the parallel trends assumption from our identification strategy. Immediately after splitting, federal transfers increase sharply and significantly. On average, municipalities that split experience a 35.9 percent increase in federal transfers per capita. Considering municipal revenues per capita as the outcome variable, Column (1) of Appendix Table C.3 indicates an 11 percent increase. These coefficients suggest that splitting also generates reallocation of local revenues.

## 5.2 Impacts on Public Expenditures and Personnel

Having shown that splitting induces larger revenues, we next examine whether these extra revenues are converted into growth of the size of the public sector. Panel (a) of Figure 4 shows annual coefficients for capital expenditures per capita, which refer to purchases of machinery, vehicles, buildings, and the like (Lima and Silveira Neto, 2018), and account for 16 percent of municipal expenditures. There is a spike at around 50 percent in the year of splitting, followed by an increase of 22 percent over the next 15 years.

Panel (b) of Figure 4 reports the results for current expenditures, equivalent to maintenance and operation costs of public services, such as payrolls and administrative costs. These costs represent 84 percent of municipal expenditures. We find that, after splitting, municipalities experience an increase of 12 percent in current expenditures. Lima and Silveira Neto (2018) argue that capital expenditure tends to be initially higher than current expenditures due to installation and entrance costs. Current expenditures, however, are mostly payrolls with fixed contracts. Regulation also inhibits hiring in the public sector, which explains the stable trends.

We also validate the above results using the matched employer-employee RAIS data. The key idea is to gauge the effects on the size of the public sector considering the number of municipal public employees and total payroll as our outcome variables. Panels (c) and (d) of Figure 4 and Appendix Table C.3 document that splitting is associated with an average increase of around 18 percent in both outcomes. We do not find impacts on federal or state public employment, reassuring us that the growth in bureaucracy comes from municipal governments.

### 5.3 Impacts on the Private Sector

The previous findings point to large investments in local bureaucracy. A fundamental question is whether splitting increases economic activity in the private sector, yielding a lasting boost in aggregate income beyond the public sector. To answer it, we use information from data on revenues from local taxes and on formal employment in the private sector. Panel (a) of Figure 5 and Appendix Table C.3 indicate that, after splitting, municipalities experience a small and imprecise raise of 5 percent in revenues from local taxes.[24] Because changes in tax rates are unusual, the lack of effects on tax revenues indirectly suggests that tax base does not alter after splitting.[25]

Panels (b)-(d) of Figure 5 display annual estimates for capital and labor activities in the private sector, summarized by a log of the total number of establishments and employment. The number of establishments grow around 5 percent up to 15 years later, although the coefficient is only marginally significant at the 10 percent level. Turning to

[24]Local revenues from local taxes include ISS (tax on services); IPTU (property tax); IBTI (property transfer tax); and fees, like public lighting fees.

[25]Other indirect evidence that the size of tax base does not change is the lack of changes in total population or population composition after splitting.

employment, we do not find significant impacts on the number of private jobs and total payroll. Combined, these findings suggest that large investments in public infrastructure through higher administrative, fiscal and political autonomy, and revenues do not spill over to the private sector.

## 5.4 Impacts on Public Service Delivery

We next investigate whether and how splitting affects public service delivery using three complementary approaches. First, we leverage individual-level information from the census data to conduct a cohort-level analysis that exploits exposure to splitting across cohorts. Second, we take advantage of the census data at the municipality level with additional outcomes to provide a comprehensive picture of the consequences of splitting on educational attainment, public infrastructure, and poverty. Third, we use granular spatial data on luminosity to understand which districts drive the gains within municipalities.

### 5.4.1 Cohort-Level Analysis

Ideally, we would like to have data on the total amount of public goods, like public schools and hospitals, to capture responses along this margin. But such data from the years before splitting, the early 1990s, are unavailable in Brazil. To overcome this limitation, we propose an indirect test in the spirit of Duflo (2001), exploiting the variation in splitting across cohorts and municipalities. Intuitively, if additional schools generated an increase in educational attainment, younger cohorts more exposed to splitting should experience higher educational attainment than older and less exposed cohorts.

Using the census data, we exploit three sources of variation: (1) municipalities that split versus almost split; (2) periods before and after splitting; and (3) age of individuals when they are surveyed. We then estimate the following triple-differences model:

$$y_i = \alpha_{m(i)k(i)} + \alpha_{m(i)t(i)} + \alpha_{s(i)k(i)t(i)} + \sum_{\tau=5}^{31} \beta_\tau Split_{m(i)t(i)} \mathbf{1}[t(i) - k(i) = \tau] + X_i\lambda + \varepsilon_i, \quad (4)$$

in which $y_i$ represents outcomes for person $i$ in municipality $m$, birth cohort $k$ and year $t$; $\alpha_{m(i)k(i)}$, $\alpha_{m(i)t(i)}$, and $\alpha_{s(i)k(i)t(i)}$ are municipality-by-cohort, municipality-by-year and state-by-cohort-by-year fixed effects; $Split_{m(i)t(i)}$ is an indicator variable for whether the municipality $m$ split, and takes values equal to zero for $t = 1991$ and equal to one for years $t \in \{2000, 2010\}$ in municipalities that split; and $\mathbf{1}[t(i) - k(i) = \tau]$ are dummies indicating years relative to the year of splitting request for municipality $m$, similar to Equation (3). The term $X_i$ refers to a vector of individual controls such as gender, race, religion, and nationality. We cluster standard errors $\varepsilon_i$ at the microregion level. We normalize $\beta_{31} = 0$ so that our estimates are relative to individuals age 31, the oldest age in our sample. The identification assumption for this exercise is that, absent splitting, birth cohorts would have followed the same educational trends in split and almost split municipalities.

Figure 6 presents our results for school attendance and literacy rates. Gray areas represent 95 percent confidence intervals. We display the raw data in Appendix Figure C.4. Panel (a) documents increases ranging between 4 and 6 percentage points in school attendance for cohorts up to age 15 relative to those aged 31 when splitting occurred. The gains in school attendance concentrated among younger cohorts are consistent with the division of roles in education: municipalities are responsible for providing preschool and primary education, whereas state governments are in charge of high schools. Panel (b) shows imprecise, albeit positive, effects on literacy rates.[26] We notice that in the 2000s Brazil achieved universal enrollment of primary and lower secondary education, particularly after the introduction of conditional cash transfers. While attendance rates increased, the quality of public schools remains low, which potentially explain only modest impacts on literacy.

#### 5.4.2 Municipality-Level Analysis

We further shed light on how splitting affects public service delivery using additional measures available at the municipality level from the census data. Although the data inform us about various outcomes we can use to study the margins of response to splitting, it does not allow us to report pre-event coefficients, because 1991 is the first wave we use. Figure 7 and Appendix Table C.4 report coefficients after estimating Equation (3) for main outcomes related to education, access to public services, and poverty.

In Panel (a) we observe that the average impacts on preschool and middle school attendance rates are 3.9 and 2.3 percentage points, equivalent to 30 and 2.5 percent increases.

[26] To put the numbers into perspective, the average school attendance and literacy rates for the omitted group, formed by individuals aged 31 in 1991 are 2.6 and 85 percent, respectively. For individuals age 15 or younger, these numbers are 61.6 and 62 percent, respectively.

In line with Section 5.4.1, high school attendance does not change, consistent with municipalities providing education up to middle school. In addition, literacy rates for both children ages 11-14 and for adults increase by 1.8 and 1.3 percent, and the small magnitudes corroborate our cohort-level results.[27]

In Panel (b) we show estimates for public goods. We document positive impacts on household access to piped water, trash collection, electricity, and sewage, ranging from 2.5 to 7 percent. Only the coefficients associated with trash collection and sewage are statistically significant at the 10 percent level. Interestingly, the effects are weaker for services for which other levels of government share responsibility and there is uncertainty about the role of each level, like water and sanitation (Kresch, 2017). Lastly, we find negative and imprecise estimates for poverty and extreme poverty rates, which fall by around 1.7 and 4.2 percent.

### 5.4.3 District-Level Analysis

We leverage satellite data on luminosity to examine the impacts of splitting. Aggregating the grid cells at the municipality level, we first validate our previous findings with a different source of data. Panel (a) of Figure 8 displays the annual estimates. In municipalities that split, luminosity grows in the first 5 years after splitting and stabilizes at around 10 percent afterwards.

The municipality-level analysis, however, masks substantial heterogeneity across districts. The granularity of the data allows us to look into districts to distinguish between applicant, remaining, and headquarter districts to understand which drive the gains in luminosity. To that end, we run the following difference-in-differences regression separately for each of the three district samples using the district-level data:

$$y_{dt} = \alpha_d + \alpha_{s(d)t} + X_d^{1991}\alpha_t + \sum_{\tau=-\underline{\tau}}^{\overline{\tau}} \beta_\tau Split_{m(d)}\mathbf{1}[t - E_{w(d)} = \tau] + \gamma Post_{w(d)} + \varepsilon_{dt}, \quad (5)$$

in which subscripts $d$, $m$, $s$, $t$ and $w$ stand for district, municipality, state, and wave of splitting; $\alpha_d$ are district fixed effects; $\alpha_{s(d)t}$ control for state-by-time fixed effects. We add a vector of baseline controls $X_d^{1991}$ consisting of all baseline variables from Appendix Table

[27] In Appendix Figure C.5, we show other pieces of evidence of increasing local public provision of education through higher investments: after splitting, there is a crowd-out of employment from non-profits to government organizations in the education sector.

C.2 interacted with time fixed effects. The remaining variables are similar to Equation (3) with subscripts representing districts. Standard errors $\varepsilon_{dt}$ are clustered at the microregion level.

Panel (b) of Figure 8 panel reports the estimates from Equation (5) for applicant (blue), remaining (red), and headquarters (green) districts. We notice three striking patterns. First, all pre-event coefficients are statistically close to zero. Second, for applicant districts, there is rapid growth immediately after splitting, peaking 5–8 years later at about 40 log points. The coefficients remain stable, suggesting a 29 log points, or 32 percent, increase 15 years after splitting. Third, for remaining and headquarter districts, we observe no effect on luminosity 15 years after a split.[28] Taken together, the results indicate that the effects on luminosity are exclusively driven by applicant districts, and not by other parts of the municipality. These cases illustrate how non-voluntary and voluntary splits set lower and upper bounds of the expected impacts of splitting, ranging from zero to 32 percent.

We are also interested in understanding to what extent the impacts on luminosity are driven by extensive or intensive margins and decline in inequality. We use two measures described in Section 4.1 as outcome variables: the share of lit pixels and luminosity Gini index. Panels (c) and (d) of Figure 8 plot the coefficients. We document a 6 percent increase in lit pixels, which captures pixels with average of lights above zero, and a 4 percent decline in luminosity Gini index for applicant districts. While spatial inequality decreases slightly in these areas, consistent with our previous results, we do not find any impact for remaining districts and only smaller effects for headquarter districts.

## 5.5 Robustness Checks

We probe whether our results are robust to alternative definitions of outcomes, samples, and specifications in Appendix Table C.7. For brevity, we choose to report the results on log luminosity for applicant districts.[29] Column (1) reproduces our benchmark result from Column (1) of Appendix Table C.5. In Column (2) we do not add 0.1 to the

[28] Appendix Table C.5 reports the aggregate estimates for log of average luminosity considering different specifications. In addition, we follow Oster (2019) to assess potential bias due to unobservable factors using the sensitivity of the treatment to additional controls. Under the assumption of proportional selection, Appendix Table C.6 reports that selection in unobservables would need to be about 11 percent of selection in observables to explain our baseline estimate for applicant districts.

[29] Results for remaining and headquarter districts as well as other outcomes are available upon request.

average luminosity so that its log is not defined for all districts. To investigate if the results differ when we restrict attention to the wave of splits affected by the 1996 CA, we present estimates only for the 1997 wave in Column (3). Because the process to split is lengthy, sometimes taking years, the timing of the 1996 CA is likely to be exogenous to our outcomes for the 1997 wave, whose sample consists of requests initiated between 1994 and 1996. We find that the coefficient is large and similar in magnitude as compared to Column (1). To control for geographic shocks to economic activity, Column (4) includes microregion-by-year fixed effects, which yields similar conclusions.

The event studies show no sign of pre-trends, reassuring the causal interpretation of the difference-in-differences estimates. Confounding shocks threatening our results would need to exactly coincide with splitting and to affect our estimation sample. While we are not aware of these shocks, one may still worry that unobservable factors, such as better organizational capacity and connections with the state legislature that would influence the set of districts getting approval to split and correlate with potential gains from splitting, generating biased estimates. To alleviate this concern, we develop a complementary empirical strategy focusing on luminosity as the main outcome, as it requires district-level data.

To become a municipality before 1996, the district applying to break off needed to conduct a local referendum and obtain approval from at least half of voters. We exploit the 50 percent cutoff in local referendums to perform a difference-in-discontinuities (RD-DD) exercise in the spirit of Grembi, Nannicini and Troiano (2016). We restrict our analysis to a large and representative state, Minas Gerais, for which data on referendum results are available, and estimate the following RD-DD specification in two stages:

$$Split_{m(d)} = \psi + \phi \mathbf{1}[V_d \geq 50\%] + \kappa g(V_d) + X_d \omega + \eta_d \tag{6}$$

$$y_{dt} = \alpha_d + \alpha_t + \beta Split_d Post_{w(d)} + \gamma g(V_d) Post_{w(d)} + X_{dt} \lambda + \varepsilon_{dt} \tag{7}$$

in which, from the first-stage Equation (6), $Split_{m(d)}$ is an indicator variable for whether the municipality $m$ with district $d$ split after the referendum; $V_d$ represents the referendum vote share in favor of splitting in district $d$; and $\mathbf{1}[V_d \geq 50\%]$ is an indicator for whether district $d$ had at least half of votes. Following Gelman and Imbens (2019), we define $g(V_d)$ as a linear distance from the cutoff. In our second-stage Equation (7), we include district and year fixed effects, $\alpha_d$ and $\alpha_t$. We control for $Post_{w(d)}$, which is an indicator variable for the years after the wave-year $w$ of splitting request for municipality $m(d)$, and the vector of time-varying controls $X_{dt}$ is the same as in Equation (5). Our coefficient of interest $\beta$ captures the effect of splitting for a sample of districts with referendum results. To keep our estimation comparable and account for few observations on the left side of the cutoff, our preferred specification considers a 15 percent bandwidth.

We validate our strategy by showing no significant discontinuities in pre-referendum observable district characteristics around the cutoff in Appendix Table E.10.[30] Turning to the main results, we provide a visual evidence of the first-stage in Appendix Figure E.8a, from which we notice that splitting is an almost deterministic function of reaching a majority vote.[31] Figure E.9 displays the reduced-form estimates for log luminosity and documents a clear jump around the cutoff. In Column (2), we find that districts above the cutoff experience an increase of 50 percent in luminosity relative to those below it. Column (3) refers to the second-stage estimate. For a more meaningful interpretation, the Wald estimate points to a coefficient of log luminosity of 0.23 (0.22/0.96). It is larger than our benchmark difference-in-differences estimate in Column (4) for a sample restricted to Minas Gerais. We notice that any comparison in magnitude between these coefficients should be taken with a grain of salt due to sample differences and size. We interpret them as qualitatively similar results.

# 6 Mechanisms

Taken together, our main results suggest that the redistribution of autonomy and fiscal resources after splits led to growth of the public sector and improvements in public service delivery. We next investigate to what extent these findings can be attributed to increasing federal transfers to new municipalities, or to more effective policy making due to higher autonomy. We also assess the roles of administrative remoteness and local preferences in explaining our results.

[30] We measure baseline covariates in 1991. Appendix Figure E.8b depicts the distribution of vote shares around the 50 percent cutoff and confirms that very few districts had less than half of voters agreeing to split.

[31] The difference in the likelihood of splitting between both sides of the cutoff reaches 96 percent (Column (1) of Table E.11).

## 6.1 Are Effects Mechanically Driven by Federal Transfers?

We propose two empirical exercises to test the relationship between increases in federal transfers and our main outcomes. In the first we control for total revenues in our main difference-in-difference Equation (3). This "horse-race" approach holds federal transfers constant when comparing split and almost split municipalities, and the coefficient associated with $Post_{w(m)} \times Split_m$ would approach zero if federal transfers entirely explain our outcomes. Table 3 reports the coefficients for selected outcomes without and with controls for federal transfers in odd and even columns, respectively. The estimates are similar in both specifications.

Second, following Litschig (2012), Brollo, Nannicini, Perotti and Tabellini (2013), and Corbi, Papaioannou and Surico (2019), we take advantage of the allocation mechanism of federal transfers. The design of the revenue-share mechanism generates interesting discontinuities in the amount of federal transfers for identification: municipalities in the same bracket obtain the same quantity regardless of their exact population. Appendix D describes the rules and empirical strategy in detail. Using municipalities from our estimation sample, we exploit these cutoffs to isolate the impacts of regional transfers on selected outcomes. Appendix Table D.9 reports the reduced form estimates. Column (1) indicates that municipalities above the population bracket receive, on average, 13 percent more federal transfers. Yet, when considering public and private jobs, number of establishments, and average luminosity as outcome variables, we do not find significant impacts.[32] We interpret these results as providing no evidence that increases in revenue drive our results.

## 6.2 Remoteness

Our model predicts gains from splitting when applicant districts are neglected by their headquarters. While neglect is difficult to measure, the literature has shown that physical distance between places constitutes an important friction for the flow of activities over space (Atkin and Donaldson, 2015), including public services (Asher, Nagpal and Novosad, 2018). The physical distance between areas and their headquarters may un-

[32] These results differ from others in the literature (Litschig, 2012; Brollo, Nannicini, Perotti and Tabellini, 2013; Corbi, Papaioannou and Surico, 2019). Nonetheless, we use a distinct sample, which may explain these differences.

dermine state capacity and development by distancing citizens from their administrators (Bardhan, 2002; Mansuri and Rao, 2013; Krishna and Schober, 2014; Asher, Nagpal and Novosad, 2018; Brinkerhoff, Erik and Wibbels, 2018).[33] Administrative redistricting via splitting can reduce such physical distance.

We then ask whether the gains in luminosity are higher in areas experiencing larger reductions in distance from their town halls after splitting. Once new municipalities are established, they are required to build a new town hall, automatically reducing the physical distance from their headquarters. Figure 9a presents binned scatter plots of luminosity growth between averages pre- and post-split versus reduction in distance to town hall after splitting.[34] We find that districts having larger reductions in distance grow more in luminosity, suggesting administrative remoteness constitutes a relevant friction for applicant districts.

We complement this analysis by assessing heterogeneous effects. Using a sample of applicant districts, we add to Equation (5) an interaction term between splitting coefficient and proxies for remoteness, such as distance to parent town halls, distance to state capital, and fraction of rural population. Column (4) of Table C.8 shows that the impact of splitting on log luminosity is around 30 percent larger for every percentage point increase in distance to parent town halls.

### 6.3 Local Preferences

We also assess the role of differences in local preferences across applicant and headquarters districts in explaining our results. From the decentralization theorem (Oates, 1972), we expect policies tailored to the local median voter to be more efficient than a centralized decision if there is preference heterogeneity. Such heterogeneity between districts may be explained by local economic conditions or by historical factors, and would be represented in politics by forward-looking politicians (Persson and Tabellini, 2000). Given that it is difficult to directly measure preferences for public goods provision in our context, we proxy

[33]For instance, on the supply side, transportation costs may explain why bureaucrats do not travel to remote areas. On the demand side, citizens from remote areas may not be able to convey their demands to politicians located in the town hall.

[34]We control for state fixed effects, all baseline characteristics shown in Table C.1, and changes in federal transfers at the municipality level. We also notice that our effect may be spurious if areas where distance to town hall decreases more are also municipalities with higher increases in federal transfers. In Appendix Figure C.6 we show the opposite happens: on average, federal transfers grow less where distance to town hall decreases more.

it with manually collected data on vote shares in favor of splitting in referenda held at applicant districts. We predict that gains in public service delivery are largest in areas where differences in local preferences, as proxied by vote shares in favor of splitting, are larger.

We test this prediction empirically with the following exercise. Restricting attention to applicant districts who successfully split in the Minas Gerais and São Paulo states, we estimate the following regression:

$$y_{dt} = \alpha_d + \alpha_{s(d)t} + X_d^{1991}\alpha_t + \sum_{q=1}^{5} \beta_q Post_{w(d)} V_d^q + \gamma Post_{w(d)} + \lambda \ln(T)_{m(d)t} + \varepsilon_{dt}, \quad (8)$$

in which subscripts $d$, $s$, $t$, and $w$ stand for district, state, year, and wave; $\alpha_d$ are district fixed effects; and $\alpha_{s(d)t}$ control for state-by-time fixed effects. We add a vector of baseline controls $X_d^{1991}$ consisting of all baseline variables from Table C.2 interacted with time fixed effects. We categorize referendum vote shares $V$ into quintiles $q$ and estimate coefficients separately. We control for $Post_{w(d)}$, which is an indicator variable for years after the wave event a district $d$ is a part of, and $\ln(T)_{m(d)t}$ as the log of federal transfers per capita in municipality $m$ and year $t$. Standard errors $\varepsilon_{dt}$ are clustered at the microregion level. $\beta_q$ are our coefficients of interest.

We present results visually in Panel (b) of Figure 9. We report the point estimates in Table 5. Among districts that split, we find that the effects splitting on log luminosity are monotonically larger in areas with higher referendum vote shares. In particular, while the average effect of splitting is 18 log points in Column (1), we show that districts in the $3^{rd}$, $4^{th}$, and $5^{th}$ quintiles of vote shares grow luminosity in 17, 28, and 31 log points, respectively. This indicates that areas with clearer preferences for splitting benefit from it more substantially, even conditional on changes in revenues.

Lastly, in a separate descriptive exercise, we further illustrate this point. In Appendix Figure C.7 we leverage the limited data on elections available for the 1990s to show that applicant and headquarter districts elect mayors from different parties in large shares of the time after splits. The pattern starts at about 75 percent immediately after a split, and grows to about 85 percent over two decades. Assuming that the politicians and parties who are elected after splitting reflect local preferences for public goods, (Persson and Tabellini, 2000), we conclude that differences in preferences across districts may constitute an important driver of results discussed in this section.[35]

# 7 Conclusion

This paper provides an empirical account of the economic effects of a large administrative redistricting event in Brazil. Exploiting a window of time of exceptionally low requirements for municipality splits, during which Brazil experienced a 23 percent growth in number of units, we estimate the impacts of the creation of new municipalities. We manually collect data on the universe of split requests and assemble a rich panel of municipalities and districts over time. New municipalities gain new autonomy and substantial inflows of federal transfers. Our estimates suggest that municipalities convert the new resources to physical investments and in growing their public sector. However, despite improving public service delivery along some margins, these changes do not spill over into the broader local economy and labor market.

Our findings have important policy implications for countries weighing the equity-efficiency trade-off when they are choosing how much autonomy and fiscal resources to decentralize to poor periphery areas. Despite a statement about aggregate effects of splits being beyond the scope of this paper, reducing inequality and poverty may come at a high price for urban centers that may lose in revenues and total economic activity. And, while we show that new municipalities benefit at no cost to their remaining and headquarter districts, with effects driven by reductions in physical remoteness to government and adjustments to local preferences, the reallocated transfers are spent on duplicated fixed costs to sustain new governments. Our results, therefore, suggest a cautionary tale of decentralization (Kremer, Moulin and Namunyu, 2003).

Despite having made significant progress in answering our primary question, this paper leaves various interesting paths open for future research. A next natural step is to formally study distributional impacts and address the equity-efficiency trade-off in a general equilibrium framework (Kline and Moretti, 2014; Fajgelbaum and Gaubert, 2020; Gaubert,

[35] A strand of literature has examined how decentralization impacts and is caused by political processes and outcomes. For instance, Myerson (2006) argues that decentralization may increase yardstick competition between jurisdictions, thus increasing the talent pool for national leadership and improving the chances of selecting capable administrators. Boffa, Piolatto and Ponzetto (2016) argue that centralization has an important advantage: by combining regions with diverse numbers of informed voters, the average level of information increases, which limits rent-seeking. For a review of the literature, see Grossman, Pierskalla and Dean (2017) and Pierskalla (2019).

Kline and Yagan, 2020). Relating our estimates to structural parameters would allow for more conclusions on optimal redistricting policy. Second, when higher-quality political data are made available, future research could study whether a political resource curse impacts our estimates (Brollo, Nannicini, Perotti and Tabellini, 2013). As has been shown in the literature, windfall of government revenue exacerbates the political monitoring problem and deteriorates the quality of political candidates. Understanding whether this also happens in our context of administrative splits would shed light on the efficiency of the observed changes in public policy. Lastly, fleshing out exactly how governments are formed in new municipalities, what specific promises and investments they make, and how splits affect political yardstick competition and representation (Grossman, Pierskalla and Dean, 2017) would give this story a new level of detail.

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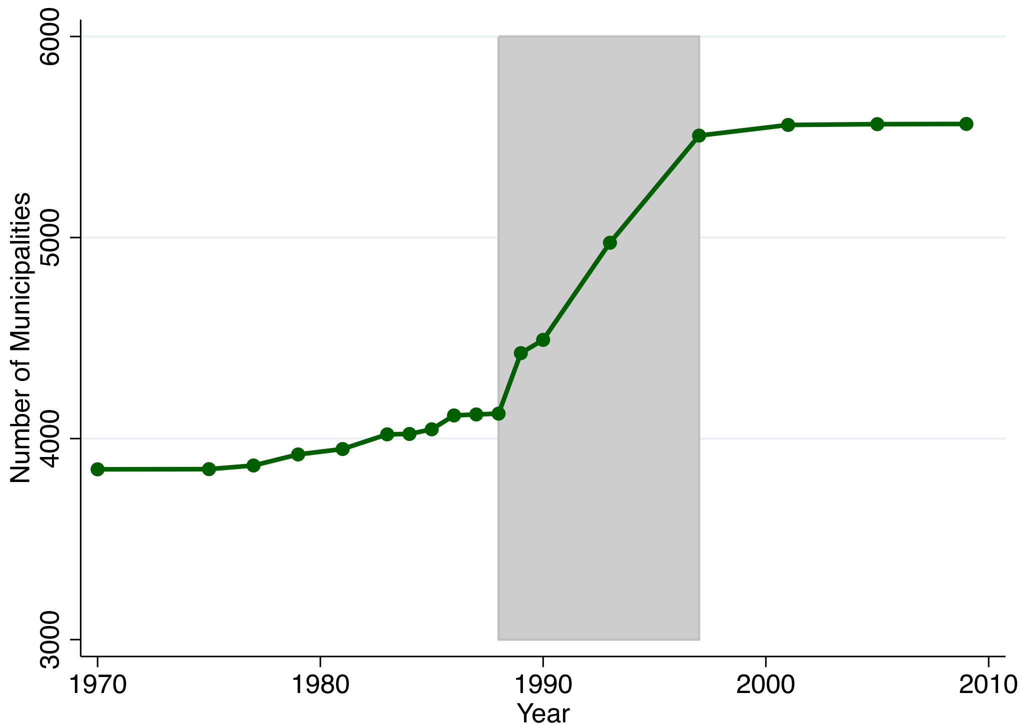
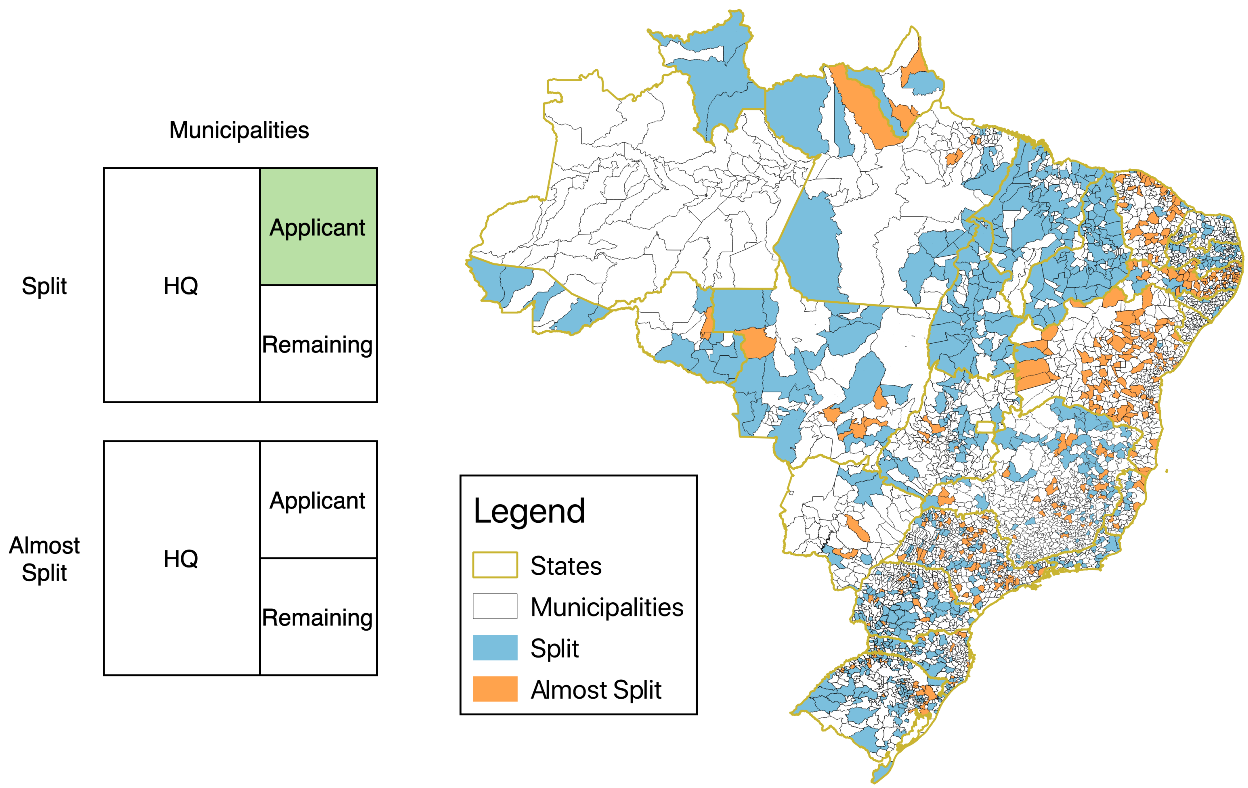
# 8 Figures

Figure 1: Evolution of Total Number of Municipalities



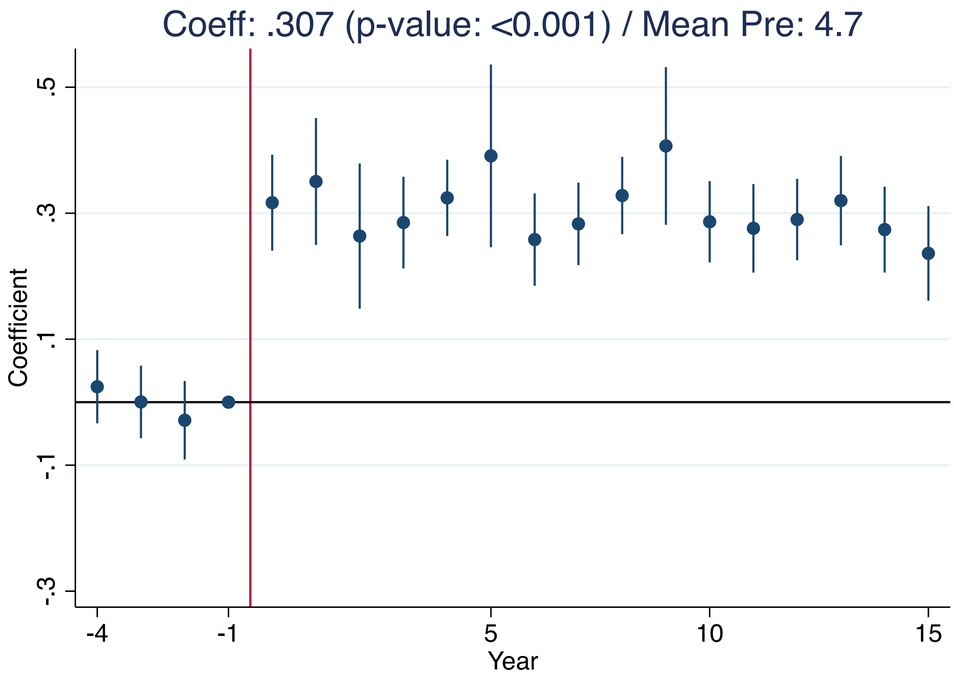

**Notes**: Graph shows how the total number of municipalities evolved in Brazil between 1970 and 2010. New municipalities are established in the beginning of election terms after obtaining approval to split. The gray area highlights our period of study, between the enactments of the 1988 Federal Constitution and the 1996 Constitutional Amendment. Information is obtained from the Brazilian Institute of Geography and Statistics (IBGE).

Figure 2: Split Diagram and Map of Brazil




**Notes**: The diagram on the left illustrates the structure of split requests in our sample. Municipalities are divided into applicant, remaining and headquarters district. We color green applicant districts that succeed at splitting. More details can be found in Section 4.2. The map on the right represents Brazil in 1991. Municipalities that split are colored blue, while municipalities that almost split are colored orange. Our samples are defined in Section 4.1.3.

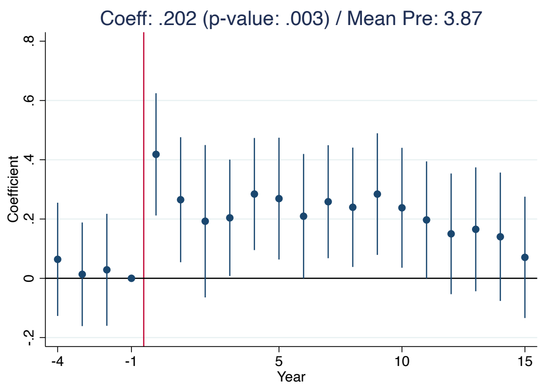
Figure 3: Reallocation of Federal Transfers



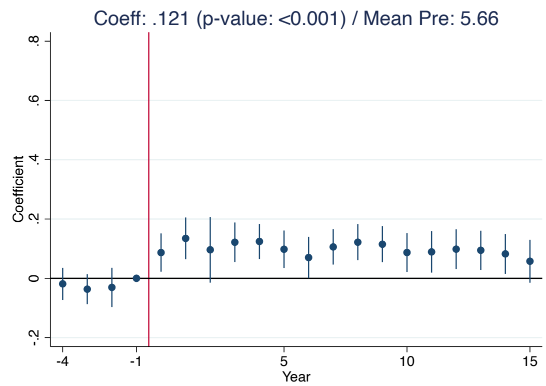

**Notes**: This figure reports point estimates of the annual effects of splitting on log federal transfers per capita after estimating Equation (3). We use information from the *Finanças Brasileiras* (Finbra) data between 1989 and 2018. The omitted category is the year before splitting. Bars represent the 95%-confidence intervals.

Figure 4: Public Expenditures and Personnel

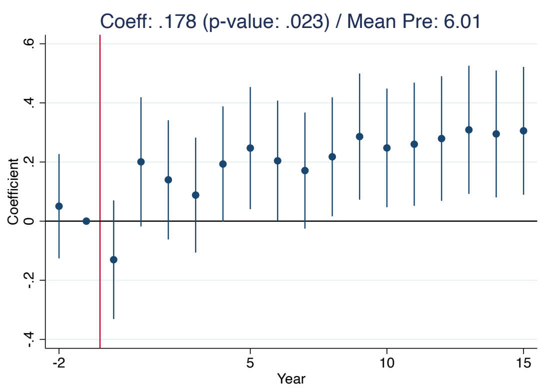
(a) ln(Capital Expenditures p.c.)



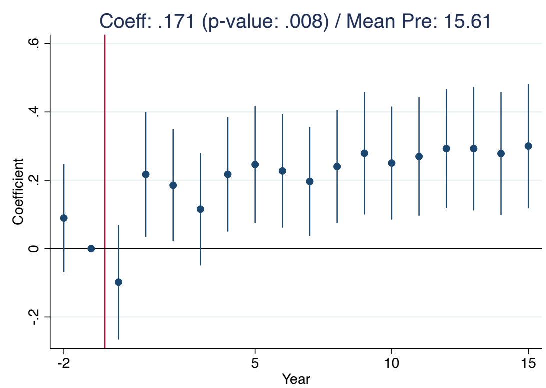

(b) ln(Current Expenditures p.c.)




(c) ln(Public Municipal Jobs)

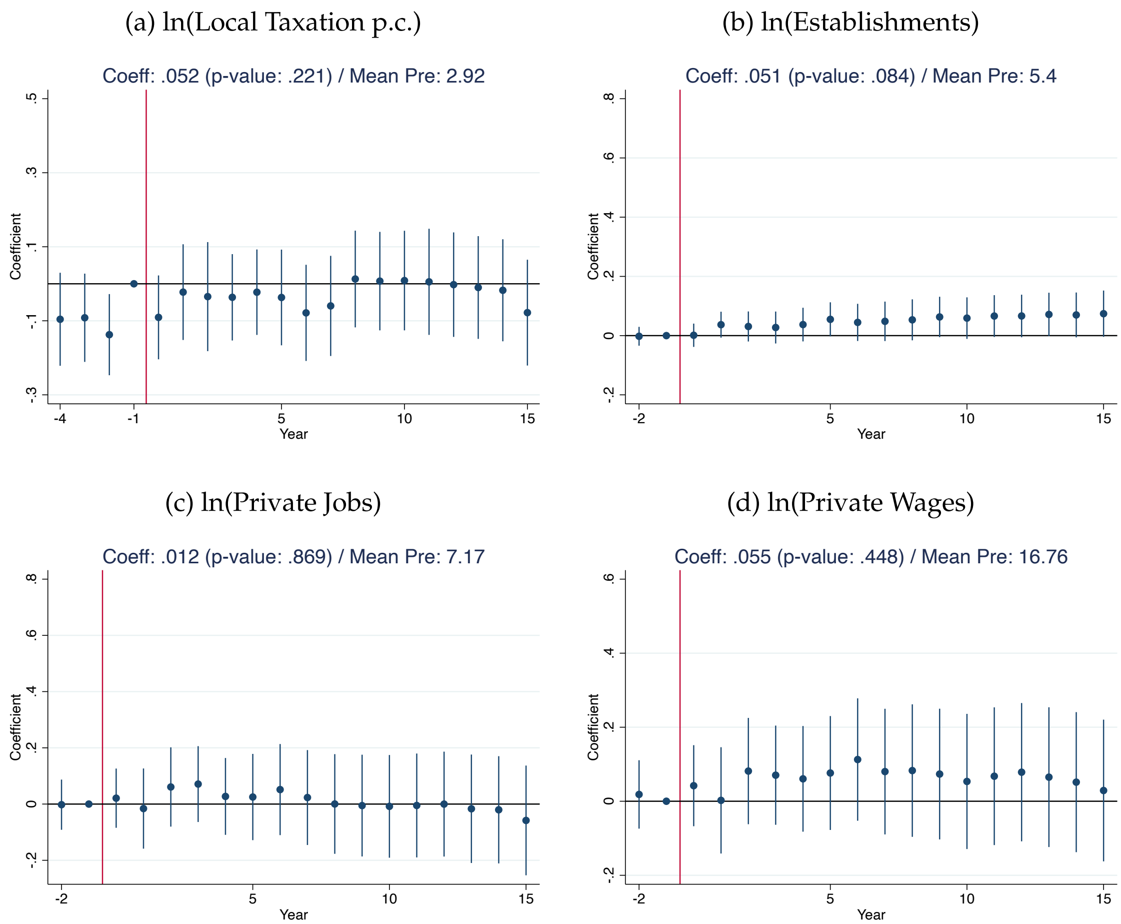



(d) ln(Public Municipal Wages)



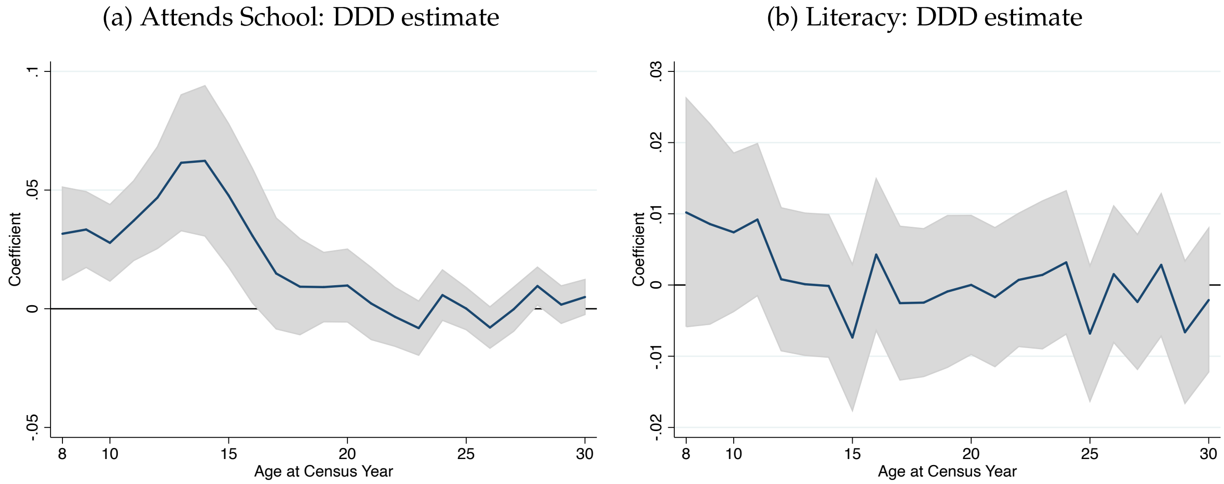

**Notes**: This figure reports point estimates of the annual effects of splitting on log capital expenditures per capita, log current expenditures per capita, log total number of public municipal jobs, and log public municipal wages after estimating Equation (3). We use information from Finbra (1989 – 2018) and RAIS (1995 – 2018) data. The omitted category is the year before splitting. Bars represent the 95%-confidence intervals.

Figure 5: The Local Economy



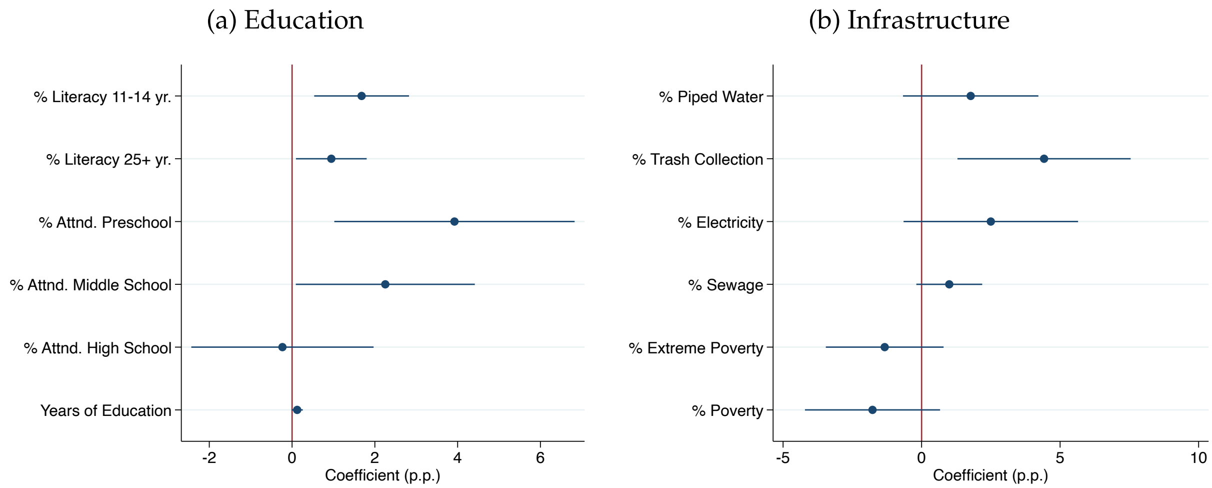

**Notes**: This figure reports point estimates of the annual effects of splitting on log local tax revenue per capita, log total number of establishments, log total number of private jobs, and log private wages after estimating Equation (3). We use information from Finbra (1989 – 2018) and RAIS (1995 – 2018) data. The omitted category is the year before splitting. Bars represent the 95%-confidence intervals.

Figure 6: Education Outcomes from Triple-Differences




**Notes**: This figure reports results after estimating the triple-differences (DDD) Equation (4). We normalize $\beta_{31} = 0$ so that the estimates are relative to individuals aged 31. We use information from the 1991, 2000, and 2010 Demographic Census data. Gray areas represent the 95%-confidence intervals. We display raw data in Appendix Figure C.4.

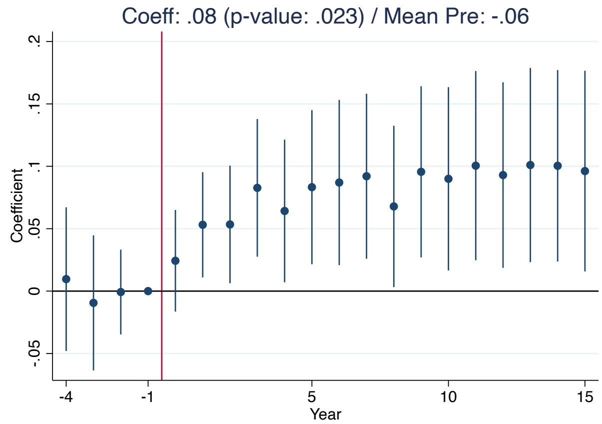
Figure 7: Public Service Delivery



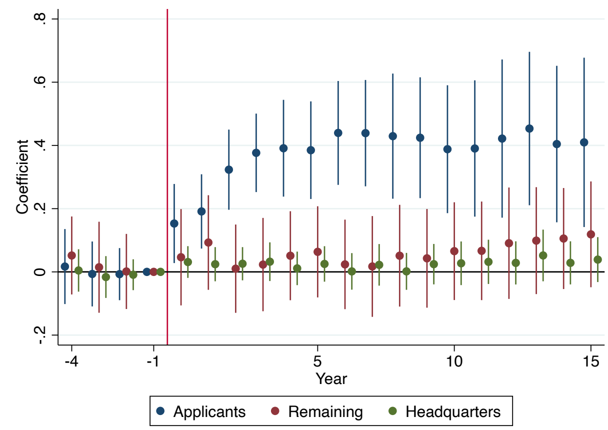

**Notes**: This figure reports the aggregate effects of splitting on public service delivery using different educational, infrastructure and poverty measures after estimating a modified version of Equation (3). In Panel A, the educational variables are literacy rates for individuals aged between 11 and 14 and above 25; preschool, middle school and high school attendance rates; and total years of education. In Panel B, we report both the infrastructure and poverty outcomes. The infrastructure variables are shares of households with piped water, trash collection services, electricity, and sewage. Poverty outcomes are shares of household living in extreme poverty and poverty conditions. We use information from the 1991, 2000, and 2010 Demographic Census data. Bars represent the 95%-confidence intervals. Further details can be found in Appendix Table C.4.

Figure 8: Nighttime Luminosity

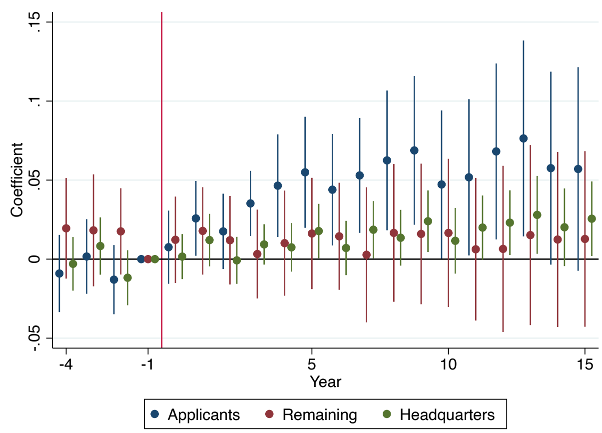
(a) ln(Luminosity) - Municipality level



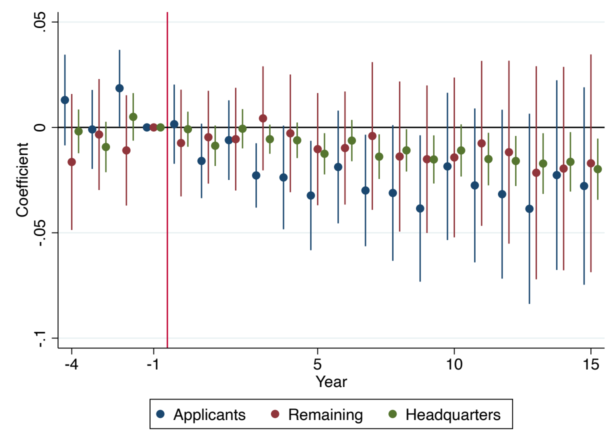

(b) ln(Luminosity) - District level




(c) % Pixels Lit - District level



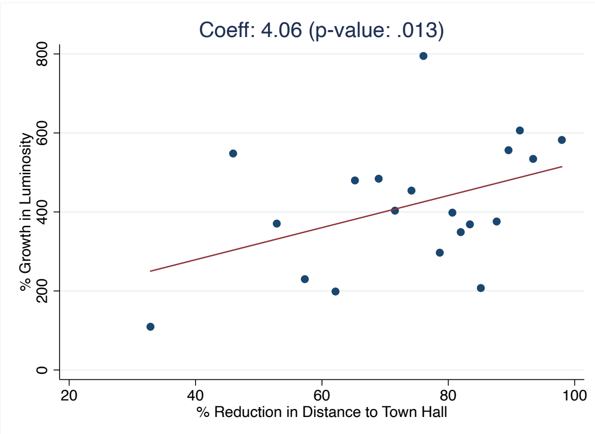

(d) Luminosity Gini - District level



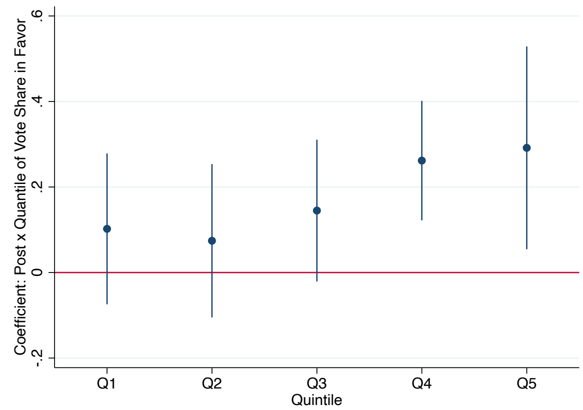

**Notes**: This figure reports point estimates of the annual effects of splitting on luminosity. We use information from the night lights data (1992 – 2013). Figure 8a reports results for ln(0.1 + luminosity) at the municipality level after estimating Equation (3). Figures 8b – 8d report results for ln(0.1 + average luminosity), share of pixels lit, and luminosity Gini at the district level after estimating Equation (5). We display coefficients separately for three sets of groups: applicant (blue), remaining (red), and headquarters (green) districts. Bars represent the 95%-confidence intervals. Further details can be found in Appendix Table C.5

Figure 9: Mechanisms

(a) Remoteness




(b) Local Preferences




**Notes**: Figure 9a plots a binned scatter across (i) % growth in luminosity between periods before and after the split and (ii) % reduction in distance to town hall after split. We control for state fixed effects, ln(area), ln(distance to state capital), soil suitability for maize, wet rice, soybean, and wheat, terrain ruggedness, ln(baseline luminosity in 1992), and growth in federal transfers at the municipality level. Panel (b) reports coefficients after estimating Equation (8). The sample is restricted to districts with information on referendum vote shares. See Section 4.1 for details on data.

# 9 Tables

Table 1: Baseline Descriptive Statistics in Levels - Municipalities

| | Contains Applicant | | Rest | |
|---|---|---|---|---|
| | Mean | SD | Mean | SD |
| | (1) | (2) | (3) | (4) |
| Number of Districts | 3 | 1.8 | 1.6 | 1 |
| Population (000's) | 40.5 | 71.8 | 21.7 | 75.3 |
| Area (000's km2) | 2.5 | 10.3 | 0.9 | 2.7 |
| % Urban Population | 58.5 | 23.8 | 59.2 | 22.8 |
| % Population 14- | 22.9 | 3.1 | 22.2 | 2.9 |
| % Population 15-24 | 19.4 | 1.4 | 19.3 | 1.4 |
| % Population 25-34 | 15.8 | 1.9 | 15.9 | 1.8 |
| % Population 65+ | 4.9 | 1.4 | 5.4 | 1.5 |
| Years of Education | 8.8 | 1.4 | 8.8 | 1.4 |
| % Literacy 11-14 | 91.6 | 8.9 | 92.3 | 8 |
| % Literacy 25+ | 74.7 | 12.9 | 74.2 | 10.6 |
| Preschool Attnd. | 13.1 | 9.7 | 17.4 | 14 |
| Middleschool Attnd. | 88.1 | 10.7 | 89.7 | 11.5 |
| High School Attnd. | 28.1 | 14.4 | 28.3 | 14.1 |
| Life Expectancy | 66.8 | 2.7 | 66.8 | 2.6 |
| Child Mortality 1- | 32.3 | 9.7 | 32.3 | 9 |
| Child Mortality 5- | 38.6 | 12.8 | 39 | 11.8 |
| % Piped Water | 71.2 | 24.2 | 74.9 | 21.8 |
| % Trash Collection | 63.5 | 27.3 | 67.3 | 29.4 |
| % Electricity | 81.3 | 20 | 83.8 | 18.9 |
| % Sewage | 96.1 | 7.7 | 96.8 | 8 |
| HHI Race | 64.3 | 13.9 | 62.2 | 14.9 |
| HHI Religion | 75.8 | 12.2 | 79.3 | 12 |
| ln(Dist. State Capital) | 5.4 | 0.8 | 5.3 | 0.8 |
| ln(Income p.c.) | 5.7 | 0.5 | 5.6 | 0.4 |
| % Extreme Poverty | 19.6 | 14.9 | 17.6 | 13.6 |
| % Poverty | 42.8 | 20.6 | 42.3 | 19.2 |
| % Federal Transfers in Revenues | 37.2 | 17 | 43.6 | 18.5 |
| | N = 448 | | N = 1925 | |

**Notes**: Table reports characteristics from various data sources at municipality level (1991 Demographic Census, and *Finanças Brasileiras*). Samples are defined in Sections 2 and 4.1.

Table 2: Predicting Splitting at Baseline - Municipalities

| | Split | |
|---|---|---|
| | (1) | (2) |
| Number of Districts | 0.009 | 0.011 |
| | (0.012) | (0.011) |
| Population (000's) | -0.000 | -0.000 |
| | (0.000) | (0.000) |
| Area (000's km2) | 0.001 | 0.001 |
| | (0.001) | (0.001) |
| % Urban Population | -0.002 | -0.002 |
| | (0.002) | (0.002) |
| ln(Dist. State Capital, km2) | 0.072* | 0.077** |
| | (0.036) | (0.035) |
| Years of Education | -0.087** | -0.071* |
| | (0.040) | (0.041) |
| % Literacy 11-14 | -0.007 | -0.005 |
| | (0.007) | (0.006) |
| % Literacy 25+ | -0.000 | 0.003 |
| | (0.005) | (0.004) |
| % Preschool Attendance | -0.004 | -0.006** |
| | (0.003) | (0.003) |
| % Middleschool Attendance | 0.004 | 0.002 |
| | (0.003) | (0.003) |
| % High School Attendance | 0.004 | 0.004 |
| | (0.003) | (0.003) |
| % Piped Water | 0.005 | 0.004* |
| | (0.003) | (0.003) |
| % Trash Collection | -0.002* | -0.004*** |
| | (0.001) | (0.001) |
| % Electricity | -0.000 | -0.002 |
| | (0.003) | (0.003) |
| % Sewage | -0.004 | 0.000 |
| | (0.004) | (0.003) |
| HHI Race | 0.003 | 0.004* |
| | (0.002) | (0.002) |
| HHI Religion | -0.001 | -0.002 |
| | (0.002) | (0.002) |
| % Extreme Poverty | -0.005 | -0.008 |
| | (0.005) | (0.005) |
| % Poverty | 0.002 | 0.005 |
| | (0.005) | (0.004) |
| % Federal Transfers in Revenues | 0.001 | 0.001 |
| | (0.002) | (0.002) |
| Observations | 431 | 431 |
| R-squared | 0.173 | 0.122 |
| State FE | - | ✓ |
| Controls | ✓ | ✓ |
| Mean | 0.72 | 0.72 |
| SD | 0.45 | 0.45 |

**Notes**: This table reports results from an OLS regression at the municipality level estimating the relationship between there being a split in the municipality and observable characteristics from the baseline period. Standard errors clustered at the microregion level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 3: Horse-Race Between Splitting and Federal Transfers

| | ln(Public Jobs) | | ln(Establishments) | | ln(Private Jobs) | | ln(Luminosity) | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Post x Split | 0.25*** | 0.23*** | 0.05** | 0.04* | -0.03 | -0.03 | 0.06** | 0.06** |
| | (0.08) | (0.08) | (0.02) | (0.02) | (0.06) | (0.06) | (0.03) | (0.03) |
| ln(Revenues p.c.) | | 0.15*** | | 0.03 | | 0.04 | | 0.03* |
| | | (0.04) | | (0.02) | | (0.04) | | (0.02) |
| Observations | 7,033 | 6,922 | 7,086 | 6,970 | 7,086 | 6,970 | 7,583 | 7,464 |
| R-squared | 0.87 | 0.87 | 0.99 | 0.99 | 0.98 | 0.98 | 0.99 | 0.99 |
| State-Year FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Controls-Time FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Mean Pre-Split | 5.98 | 5.99 | 5.40 | 5.40 | 7.17 | 7.16 | -0.08 | -0.08 |
| SD Pre-Split | 1.35 | 1.35 | 1.5 | 1.5 | 2.02 | 2.04 | 1.65 | 1.65 |

**Notes**: Results from estimation of Equation (3) in Section 6. Controls interacted with time fixed effects include number of districts in 1991, ln(Population) in 1991, % Urban in 1991, ln(Area), ln(Distance to State Capital), ln(Income p.c.) in 1991, and HHI for race and religion in 1991. Standard errors clustered at the microregion level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 4: Mechanism: Remoteness

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Post x Split | 0.29*** | 1.49*** | 0.55 | 0.85 |
| | (0.06) | (0.42) | (0.68) | (1.01) |
| Post x Split x ln(Pop. 1991) | | -0.07 | -0.02 | -0.07 |
| | | (0.05) | (0.06) | (0.06) |
| Post x Split x ln(Area) | | -0.09** | -0.21*** | -0.19*** |
| | | (0.04) | (0.06) | (0.06) |
| Post x Split x % Urban 1991 | | -0.00* | -0.00 | -0.00 |
| | | (0.00) | (0.00) | (0.00) |
| Post x Split x ln(Dist. Parent Townhall) | | | 0.21* | 0.27** |
| | | | (0.11) | (0.10) |
| Post x Split x ln(Dist. State Capital) | | | 0.10 | -0.01 |
| | | | (0.07) | (0.07) |
| Post x Split x % Literacy 1991 | | | | -0.01 |
| | | | | (0.01) |
| Post x Split x % Piped Water 1991 | | | | 0.01*** |
| | | | | (0.00) |
| Post x Split x % Sanitation 1991 | | | | 0.01 |
| | | | | (0.01) |
| Post x Split x % Trash Collection 1991 | | | | -0.01** |
| | | | | (0.00) |
| Observations | 10,276 | 10,276 | 10,276 | 10,276 |
| R-squared | 0.97 | 0.97 | 0.97 | 0.97 |
| District FE | ✓ | ✓ | ✓ | ✓ |
| State-Year FE | ✓ | ✓ | ✓ | ✓ |
| Controls-Time FE | ✓ | ✓ | ✓ | ✓ |
| Mean Pre-Split | -0.737 | -0.737 | -0.737 | -0.737 |
| SD Pre-Split | 1.549 | 1.549 | 1.549 | 1.549 |

**Notes**: Table reports point estimate results from Equation (5). All Columns include district and state-year fixed effects. Columns (1) to (3) restrict observations to applicant districts, while columns (4) to (6) restrict it to remaining districts, defined in Sections 2 and 4.1. Controls interacted with time fixed effects include ln(Area), ln(Distance to Parent Townhall), ln(Distance to State Capital), soil suitability for maize, wet rice, soybean, and wheat, terrain ruggedness, ln(Luminosity) in 1992, land use shares in 1991 for urban, agriculture, pasture and forest. Standard errors clustered at the microregion level in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 5: Mechanism: Local Preferences

| VARIABLES | (1) | (2) | (3) |
|---|---|---|---|
| Post | 0.18*** | -0.41 | |
| | (0.06) | (0.53) | |
| Post x % In Favor | | 0.01 | |
| | | (0.01) | |
| Post x % In Favor Q1 | | | 0.11 |
| | | | (0.09) |
| Post x % In Favor Q2 | | | 0.09 |
| | | | (0.09) |
| Post x % In Favor Q3 | | | 0.17** |
| | | | (0.08) |
| Post x % In Favor Q4 | | | 0.28*** |
| | | | (0.07) |
| Post x % In Favor Q5 | | | 0.31** |
| | | | (0.12) |
| Observations | 3,073 | 3,073 | 3,073 |
| R-squared | 0.98 | 0.98 | 0.98 |
| District FE | ✓ | ✓ | ✓ |
| State-Time FE | ✓ | ✓ | ✓ |
| Baseline Chars. x Time FE | ✓ | ✓ | ✓ |

**Notes**: Coefficients from Equation (8). Observations are restricted to districts with data available for referendum vote shares, as described in Section 4.1. Controls contain the list above, plus fixed effects for district, state-year and controls interacted with time. Standard errors clustered at the microregion level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

# Appendices

# A Proofs of Propositions

## A.1 Proof of Proposition 1

*Proof.* In order to approximate the Brazilian context, we assume throughout that $\lambda \leq 0.5$, $\alpha_B < \alpha_A$, and $y_B < y_A$. We also highlight two conditions which come up in the proofs below:

(A1) a high comparative gain in transfers if split $\left(\frac{T(\alpha_A+\alpha_B)}{y} \leq \frac{T(\alpha_B)}{\alpha_B y_B}\right)$; and

(A2) a high comparative tax base $\left(\frac{\theta_B}{\theta_A} \leq \frac{y_B}{y_A}\right)$.

From the unified policy choice problem (1), assuming there exists an interior optimum, we can solve the First Order Condition (FOC) for

$$\frac{g_B^U}{g_A^U} = \frac{\lambda}{1-\lambda}\frac{\alpha_B}{\alpha_A}\frac{\theta_B}{\theta_A} \tag{9}$$

The agent's private spending is $c_i = (1-\tau)y_i$. We can solve for a closed-form levels of public good provision and taxation under unification:

$$g_A^U = (1-\lambda)\alpha_A\theta_A\frac{y}{\overline{y}} \qquad g_B^U = \lambda\alpha_B\theta_B\frac{y}{\overline{y}} \qquad \tau^U = \frac{\overline{\theta}}{\overline{y}} - \frac{T(\alpha_A+\alpha_B)}{y} \tag{10}$$

where $\overline{y} \equiv (1-\lambda)\alpha_A y_A + \lambda\alpha_B y_B$, $y \equiv \alpha_A y_A + \alpha_B y_B$, $\overline{\theta} \equiv (1-\lambda)\alpha_A\theta_A + \lambda\alpha_B\theta_B$, and $\theta \equiv \alpha_A\theta_A + \alpha_B\theta_B$.

Under the same functional-form assumptions, from problem (2), it is straightforward to show that

$$g_A^S = \alpha_A\theta_A \qquad g_B^S = \alpha_B\theta_B \qquad \tau_A^S = \frac{\theta_A}{y_A} - \frac{T(\alpha_A)}{\alpha_A y_A} \qquad \tau_B^S = \frac{\theta_B}{y_B} - \frac{T(\alpha_B)}{\alpha_B y_B} \tag{11}$$

Thus, district B unilaterally chooses to split if $U_B^S \geq U_B^U$. Substituting in Equations (10) and (11), we express the surplus condition as:

$$\begin{aligned}
G(\lambda,\alpha_A,\alpha_B,\theta_A,\theta_B,y_A,y_B,T) &\equiv U_B^S - U_B^U \\
&= \theta_B[\ln(g_B^S) - \ln(g_B^U)] + (\tau^U - \tau_B^S)y_B \\
&= \theta_B \ln\left(\frac{\overline{y}}{\lambda y}\right) + \left(\frac{\overline{\theta}}{\overline{y}} - \frac{\theta_B}{y_B} + \frac{T(\alpha_B)}{\alpha_B y_B} - \frac{T(\alpha_A+\alpha_B)}{y}\right) y_B \\
&\geq 0
\end{aligned} \tag{12}$$

With simple algebra we can show that

1. $\frac{\partial G}{\partial \lambda} = -\frac{\alpha_A}{\lambda \overline{y}^2}[(1-\lambda)\alpha_A\theta_B y_A^2 + \lambda\alpha_B\theta_A y_B^2] \leq 0.$
2. $\frac{\partial G}{\partial \alpha_B} = -y_B\left[\frac{(1-2\lambda)\alpha_A\theta_B y_A}{\lambda y\overline{y}} + \frac{(1-\lambda)\lambda\alpha_A(\theta_A y_B - \theta_B y_A)}{\overline{y}^2} + \frac{T'(\alpha_A+\alpha_B)y - T(\alpha_A+\alpha_B)y_B}{y^2}\right] + \frac{\alpha_B T'(\alpha_B) - T(\alpha_B)}{\alpha_B}$

   After more algebra we conclude that $\frac{\partial G}{\partial \alpha_B} \leq 0$ if conditions (A1) and (A2) hold.
3. $\frac{\partial G}{\partial \theta_A} = \frac{(1-\lambda)\alpha_A y_A}{\overline{y}} \geq 0$
4. $\frac{\partial G}{\partial \theta_B} = \ln\left(\frac{\overline{y}}{\lambda y}\right) - \frac{(1-\lambda)\alpha_A y_A}{\overline{y}} \lesseqgtr 0.$
5. $\frac{\partial G}{\partial y_A} = -\frac{\alpha_A y_B}{y^2\overline{y}^2}[\overline{\theta} y[(1-\lambda)y - (1-2\lambda)\alpha_B\theta_B] - T(\alpha_A+\alpha_B)\overline{y}^2] \lesseqgtr 0$
6. $\frac{\partial G}{\partial y_B} = \frac{\alpha_A y_A}{y^2\overline{y}^2}[y((1-\lambda)\overline{\theta} y + (1-2\lambda)\alpha_B\theta_B) - T(\alpha_A+\alpha_B)\overline{y}^2] \lesseqgtr 0$

To further understand how choices of public goods provision and local taxation change with a split, we derive similar calculations for $g_B$ and $\tau_B$. If district $B$ splits, it increases its provision of public goods ($g_B^S \geq g_B^U$) if, and only if

$$\begin{aligned}
H(\lambda,\alpha_A,\alpha_B,\theta_A,\theta_B,y_A,y_B) &\equiv g_B^S - g_B^U \\
&= \alpha_B\theta_B - \frac{\lambda\alpha_B\theta_B y}{\overline{y}} \\
&= \frac{(1-2\lambda)\alpha_A\alpha_B\theta_B y_A}{\overline{y}} \geq 0
\end{aligned} \tag{13}$$

With simple algebra we can show that

1. $\frac{\partial H}{\partial \lambda} = -\frac{\alpha_A\alpha_B\theta_B y_A y}{\overline{y}^2} \leq 0$

2. $\frac{\partial H}{\partial \alpha_B} = -\frac{(1-2\lambda)\theta_B y_A[\lambda\alpha_B^2 y_B - (1-\lambda)\alpha_A^2 y_A]}{\overline{y}^2} \geq 0.$

3. $\frac{\partial H}{\partial \theta_A} = 0$

4. $\frac{\partial H}{\partial \theta_B} = \frac{(1-2\lambda)\alpha_A\alpha_B y_A}{\overline{y}} \geq 0.$

5. $\frac{\partial H}{\partial y_A} = \frac{(1-2\lambda)\lambda\alpha_A\alpha_B^2\theta_B y_B}{\overline{y}^2} \geq 0.$

6. $\frac{\partial H}{\partial y_B} = -\frac{(1-2\lambda)\lambda\alpha_A\alpha_B^2\theta_B y_A}{\overline{y}^2} \leq 0.$

Moreover, district $B$ changes local tax rates from $\tau^U$ to $\tau_B^S$ after a split. Substituting in all terms and rearranging, this is equivalent to

$$\begin{aligned}\tau_B^S - \tau^U &= \frac{\theta_B}{y_B} - \frac{\overline{\theta}}{\overline{y}} + \frac{T(\alpha_A+\alpha_B)}{y} - \frac{T(\alpha_B)}{\alpha_B y_B} \\ &= \frac{(1-\alpha)\alpha_A\alpha_B y[\theta_B y_A - \theta_A y_B] + \overline{y}[\alpha_B y_B T(\alpha_A+\alpha_B) - yT(\alpha_B)]}{\alpha_B y_B y \overline{y}}\end{aligned} \tag{14}$$

We conclude that local tax rates after a split are lower than when districts are united, i.e. $\tau_B^S \leq \tau^U$, if conditions (A1) and (A2) hold.

□

## A.2 Proof of Proposition 2

*Proof.* Assume that district $B$ is relatively small $\left(\frac{\alpha_B}{\alpha_A} \to 0\right)$ and neglected by its parent district ($\lambda \to 0$), and if municipality 2 is relatively large $\left(\frac{\alpha_2}{\alpha_A+\alpha_B} \to \infty\right)$. Moreover, simplifying notation from Section A.2 gives us

$$\Delta V_A = \theta_A \ln\left(\frac{\overline{y}}{(1-\lambda)y}\right) + \left(\frac{\overline{\theta}}{\overline{y}} - \frac{\theta_A}{y_A} + \frac{T(\alpha_A)}{\alpha_A y_A} - \frac{T(\alpha_A+\alpha_B)}{y}\right) y_A \tag{15}$$

$$\Delta V_B = \theta_B \ln\left(\frac{\overline{y}}{\lambda y}\right) + \left(\frac{\overline{\theta}}{\overline{y}} - \frac{\theta_B}{y_B} + \frac{T(\alpha_B)}{\alpha_B y_B} - \frac{T(\alpha_A+\alpha_B)}{y}\right) y_B \tag{16}$$

$$\Delta V_2 = \frac{T^S(\alpha_2) - T^U(\alpha_2)}{\alpha_2} \tag{17}$$

Given our assumptions, it is straightforward to show that $\Delta V_A \rightarrow 0$, $\Delta V_B \rightarrow \infty$, $\Delta V_C \rightarrow 0$.

$\square$

# B Data Construction

## B.1 Splitting Requests

This appendix contains a detailed description of the data on split requests used in this paper. As previously explained, we construct a novel data set containing all requests to split made by districts during the years between 1989 and 1996 from historical archives. Prior to the enactment of the 1996 Constitutional Amendment (CA), each state assembly had discretion to set its own rules to regulate over splitting, leading to substantial variation in local legislation and records on split requests.

Brazil has 26 state legislative assemblies.[36]. For each state assembly, we search for digitized historical records on split requests from the first half of the 1990s. We find records for twelve states: Amapá, Amazonas, Espírito Santo, Goiás, Mato Grosso, Minas Gerais, Pará, Paraná, Rio Grande do Sul, Rondônia, Santa Catarina, and São Paulo. The availability and quality of the data widely vary across states. We exemplify the online material we have access to in Figure B.2 below.

In what follows, we list the variables we construct from the records for each state:

**Amapá.** indicator for whether district has requested to split; indicator for whether district has the request approved; id of the split process; date when the process began; date when the referendum was approved; and result of the referendum.

**Amazonas.** indicator for whether district has requested to split; indicator for whether district has the request approved; and result of the referendum.

**Espírito Santo.** indicator for whether district has requested to split; indicator for whether district has the request approved; date when the process began; date when the referendum was approved; and result of the referendum.

**Goiás.** indicator for whether district has requested to split; indicator for whether district has the request approved; indicator for whether the request was archived; id of the split process; date when the referendum was approved; and result of the referendum.

**Mato Grosso.** indicator for whether district has requested to split; indicator for whether district has the request approved; id of the split process; date when the process began;

[36]The country has 27 federal units, encompassing 26 states and the Federal District. The Federal District does not have a state assembly. Instead, it has a legislative chamber.

and result of the referendum.

**Minas Gerais.** indicator for whether district has requested to split; indicator for whether district has the request approved; indicator for whether the request was archived; date when the request was archived; id of the split process; date when the process began; date when the referendum was approved; and result of the referendum.

**Pará.** indicator for whether district has requested to split; indicator for whether district has the request approved; id of the split process; date when the process began; date when the referendum was approved; and result of the referendum.

**Paraná.** indicator for whether district has requested to split; indicator for whether district has the request approved; indicator for whether the request was archived; id of the split process; date when the process began; and result of the referendum.

**Rio Grande do Sul.** indicator for whether district has requested to split; indicator for whether district has the request approved; indicator for whether the request was archived; id of the split process; date when the process began; date when the referendum was approved; and result of the referendum.

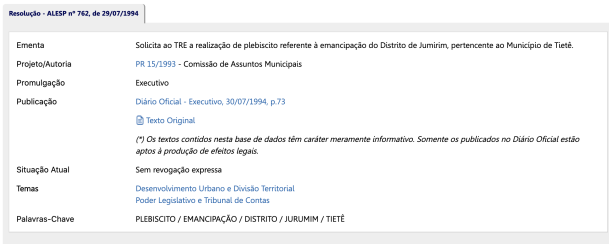
**Rondônia.** indicator for whether district has requested to split; indicator for whether district has the request approved; indicator for whether the request was archived; date when the request was archived; id of the split process; date when the referendum was approved; and result of the referendum.

**Santa Catarina.** indicator for whether district has requested to split; indicator for whether district has the request approved; indicator for whether the request was archived; date when the request was archived; id of the split process; date when the process began; date when the referendum was approved; and result of the referendum.

**São Paulo.** indicator for whether district has requested to split; indicator for whether district has the request approved; indicator for whether the request was archived; id of the split process; date when the process began; date when the referendum was approved; and result of the referendum.

Figure B.1: Examples of Raw Material for Split Request Data Collection

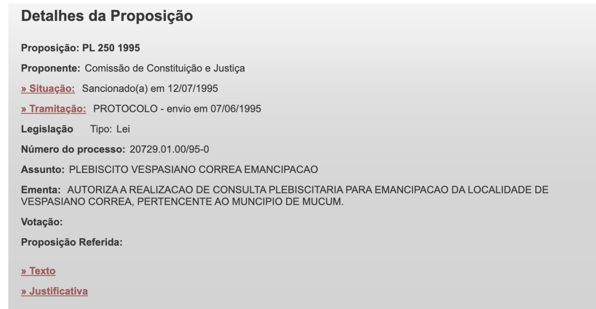
(a) São Paulo



Resolução - ALESP nº 762, de 29/07/1994

| | |
|---|---|
| Ementa | Solicita ao TRE a realização de plebiscito referente à emancipação do Distrito de Jumirim, pertencente ao Município de Tietê. |
| Projeto/Autoria | PR 15/1993 - Comissão de Assuntos Municipais |
| Promulgação | Executivo |
| Publicação | Diário Oficial - Executivo, 30/07/1994, p.73<br>Texto Original<br>*(*) Os textos contidos nesta base de dados têm caráter meramente informativo. Somente os publicados no Diário Oficial estão aptos à produção de efeitos legais.* |
| Situação Atual | Sem revogação expressa |
| Temas | Desenvolvimento Urbano e Divisão Territorial<br>Poder Legislativo e Tribunal de Contas |
| Palavras-Chave | PLEBISCITO / EMANCIPAÇÃO / DISTRITO / JURUMIM / TIETÊ |

(b) Rio Grande do Sul



**Detalhes da Proposição**

**Proposição:** PL 250 1995

**Proponente:** Comissão de Constituição e Justiça

**» Situação:** Sancionado(a) em 12/07/1995

**» Tramitação:** PROTOCOLO - envio em 07/06/1995

**Legislação** Tipo: Lei

**Número do processo:** 20729.01.00/95-0

**Assunto:** PLEBISCITO VESPASIANO CORREA EMANCIPACAO

**Ementa:** AUTORIZA A REALIZACAO DE CONSULTA PLEBISCITARIA PARA EMANCIPACAO DA LOCALIDADE DE VESPASIANO CORREA, PERTENCENTE AO MUNCIPIO DE MUCUM.

**Votação:**

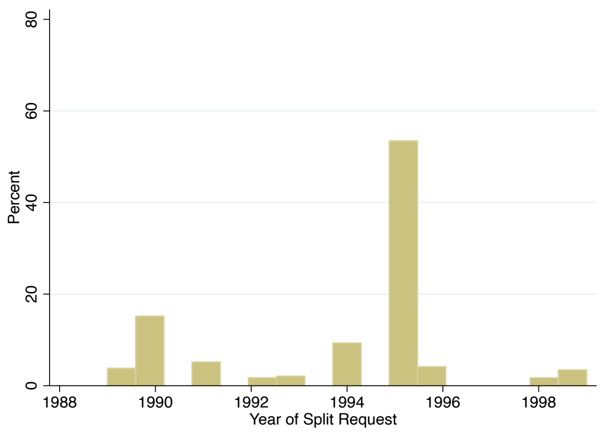
**Proposição Referida:**

**» Texto**

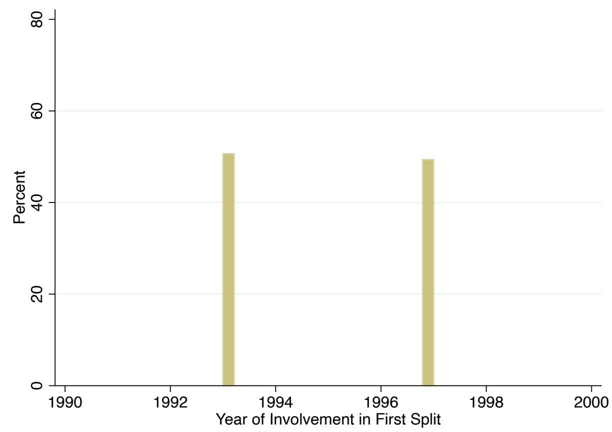
**» Justificativa**

Figure B.2: Examples of Raw Material for Split Request Data Collection

(a) Year of *Request* for Almost Split-Applicants

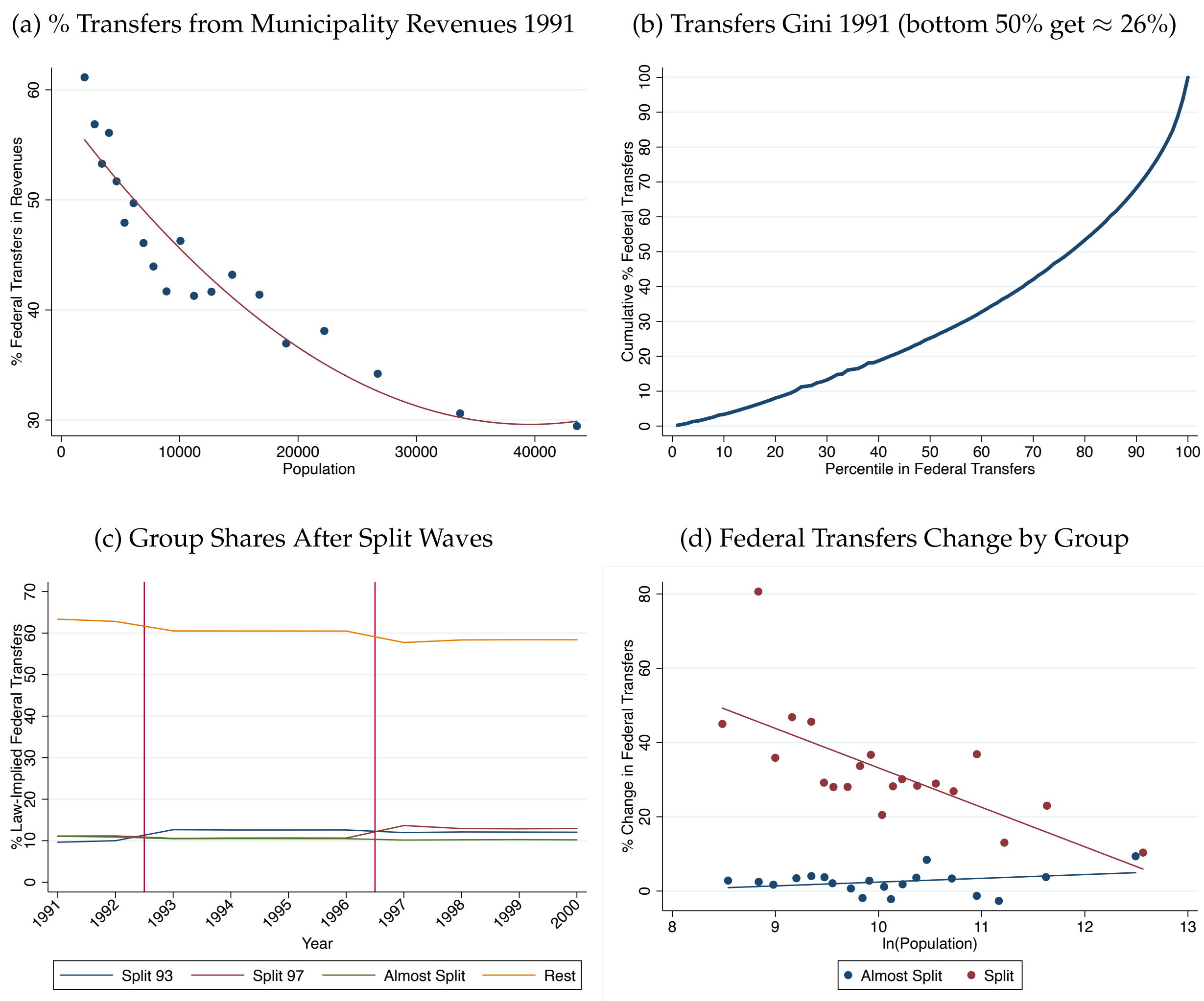



(b) Year of *Split* for Split-Applicants



# C Additional Results

Figure C.3: Distribution of Federal Transfers




(a) % Transfers from Municipality Revenues 1991

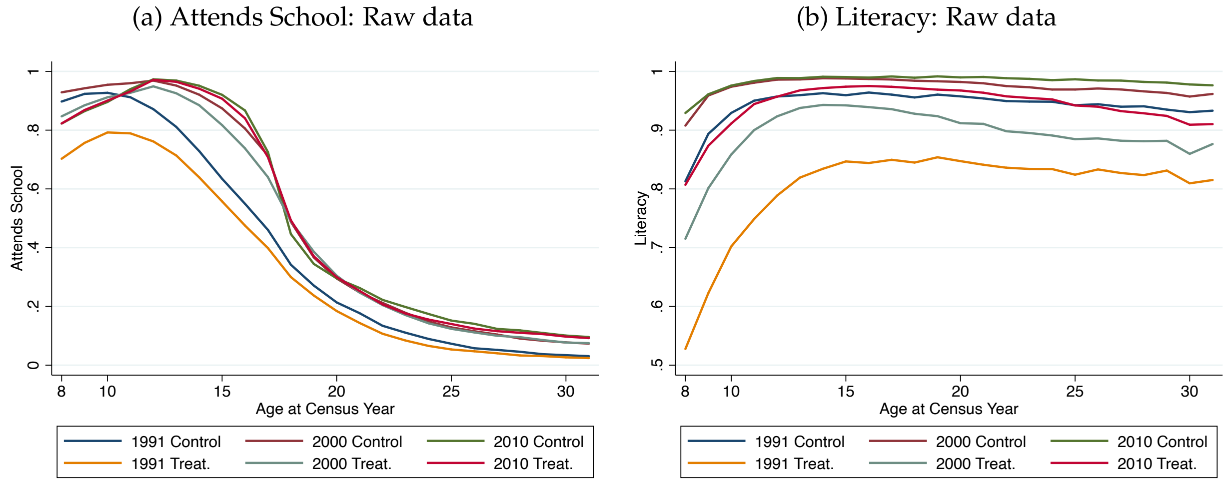
(b) Transfers Gini 1991 (bottom 50% get ≈ 26%)

(c) Group Shares After Split Waves

(d) Federal Transfers Change by Group

**Notes**: Figures describing patterns of revenues from federal transfers (*Fundo de Participação dos Municípios*) over time, as described in Section 2. Panel (a) describes the disproportionate share of municipal revenues from federal transfers for small municipalities in 1991. Panel (b) plots the distribution of federal transfers in 1991. Panel (c) plots the reallocation of law-implied federal transfers after the 1993 and 1997 split waves. Panel (d) shows how the gains in revenues from federal transfers accrue particularly to small new municipalities.

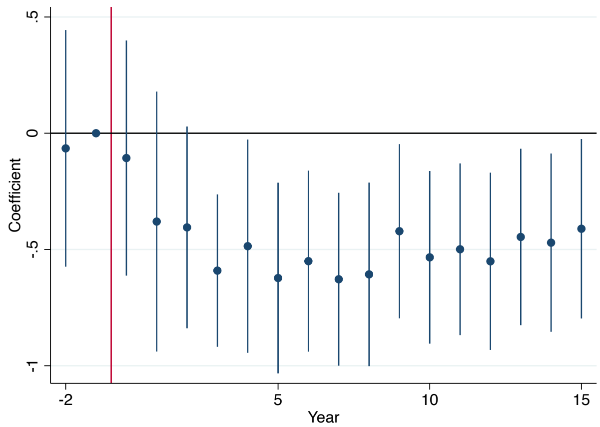
Figure C.4: Education Outcomes - Raw Data



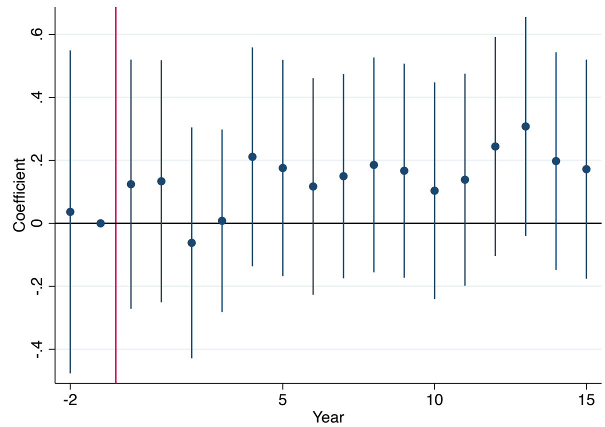

**Notes**: Panels (a) and (b) display the raw data, relative to Figure 6, by treatment (split) vs. control (almost split), year and age group. Main data sources are the Demographic Census microdata from of 1991, 2000 and 2010. Questions about educational attainment are only asked for individuals age 5 or older.

Figure C.5: Crowd-out of Nonprofit Jobs in Education

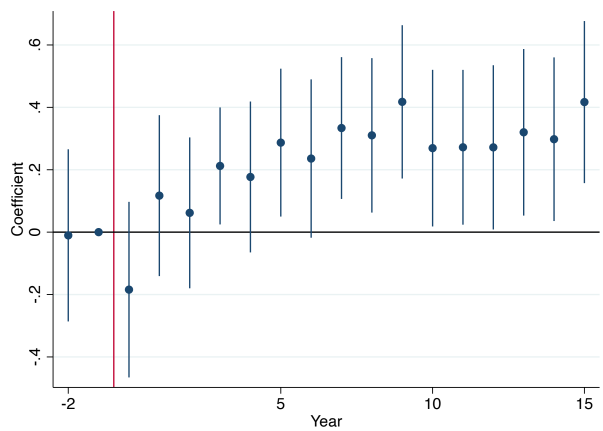
(a) ln(Nonprofit Jobs)




(b) ln(Private Sector Jobs)

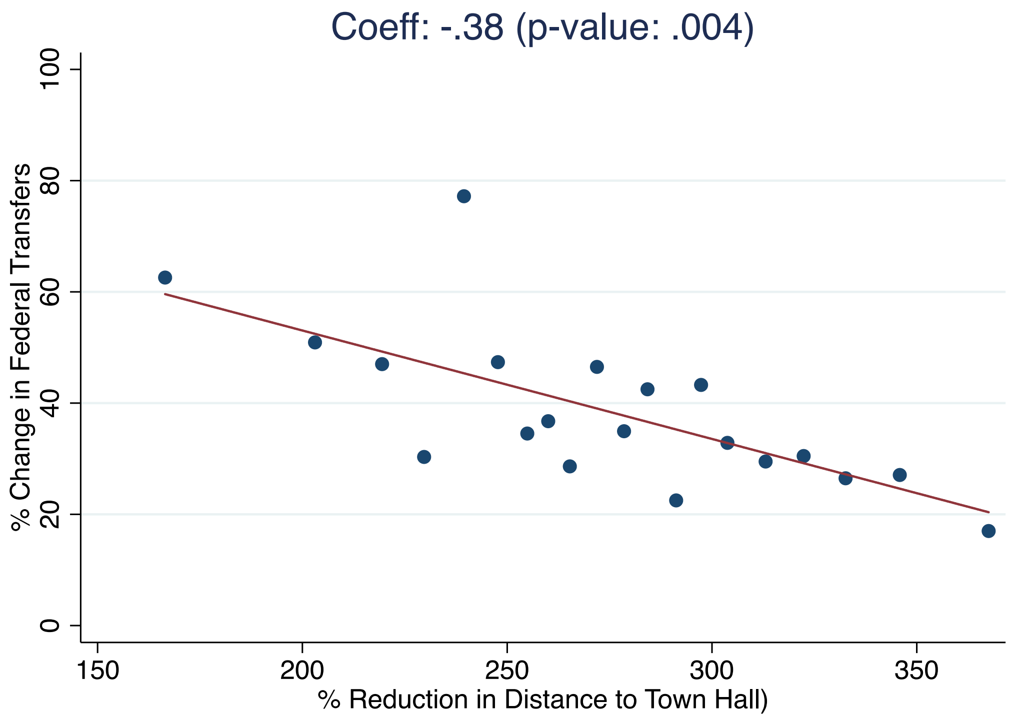



(c) ln(Public Jobs)



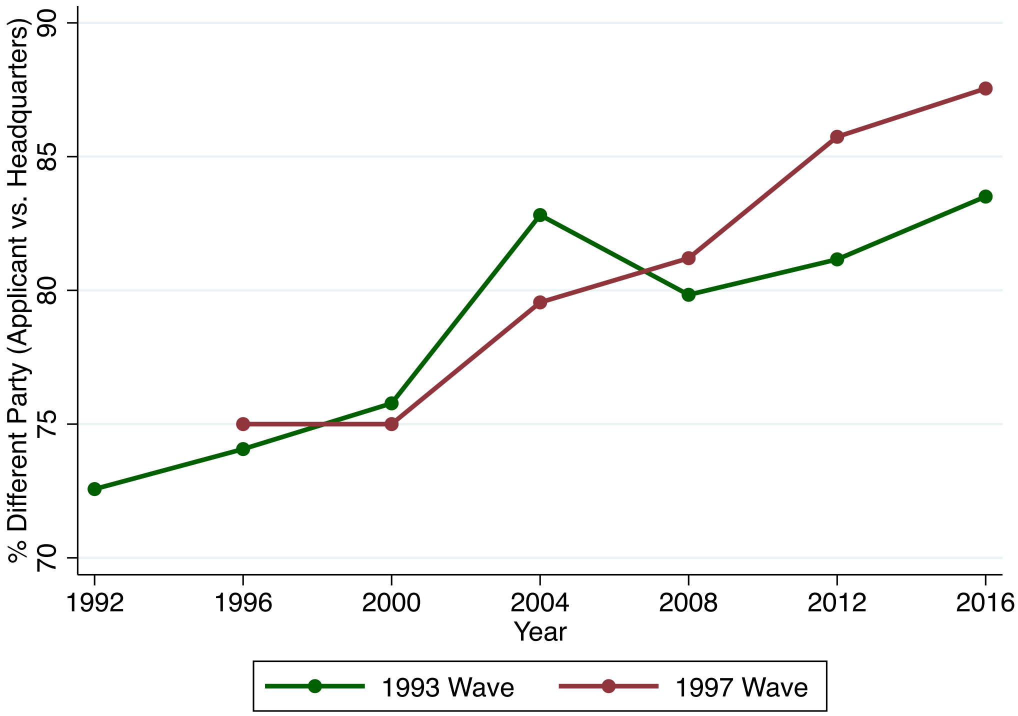

**Notes**: Results from estimation of Equation (3) in Section 5. Main data source is the *Relação Anual de Informações Sociais* (RAIS) data set for 1995 to 2018. We classify jobs and establishments according to sector with information from the *Classificação Nacional de Atividades Econômicas* (CNAE) and *Classificação Brasileira de Ocupações* (CBO). Controls interacted with time fixed effects include number of districts in 1991, ln(Population) in 1991, % Urban in 1991, ln(Area), ln(Distance to State Capital), ln(Income p.c.) in 1991, and HHI for race and religion in 1991. Bars represent the 95%-confidence intervals.

Figure C.6: Change in Federal Transfers x Distance to Town Hall




**Notes**: Figure plots a binned scatter across (i) % growth in luminosity over 15 years and (ii) % reduction in distance to town hall after split. Controls include state fixed effects, ln(Area, km2), ln(Distance to State Capital, km), soil suitability for maize, wet rice, soybean, and wheat, terrain ruggedness, ln(Luminosity) in 1992.

Figure C.7: Divergent Political Preferences




**Notes**: Figure plots the percentage of municipalities where applicant and headquarters districts elected mayors from different parties after the split. Data on elections is only available at the municipality level. Therefore, we only plot trends for municipalities that split.

Table C.1: Baseline Descriptive Statistics in Levels - Districts

| | Estimation Sample | | | | | | Rest | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Applicant | | Remaining | | Headquarters | | Periphery | | Headquarters | |
| | Mean (1) | SD (2) | Mean (3) | SD (4) | Mean (5) | SD (6) | Mean (7) | SD (8) | Mean (9) | SD (10) |
| Population (000's) | 5.8 | 14.1 | 3.1 | 5.4 | 31.6 | 63.5 | 3.6 | 13.1 | 17.9 | 48.9 |
| % Urban Population | 38.9 | 26.6 | 27.7 | 24.6 | 67.9 | 22.4 | 32.4 | 24.8 | 61.9 | 22.6 |
| % Male | 51.8 | 1.3 | 52.3 | 1.8 | 50.3 | 1.2 | 52.3 | 1.9 | 51 | 1.3 |
| % Literacy | 65.8 | 11.6 | 64.9 | 12.3 | 70.2 | 9.6 | 64.3 | 11.2 | 68.9 | 8.6 |
| % Piped Water | 44.9 | 33 | 46.3 | 32 | 54.1 | 35.8 | 47.8 | 31.7 | 53 | 35.6 |
| % Sanitation | 60.2 | 35.1 | 64.8 | 31.7 | 62 | 36.5 | 63.2 | 32.7 | 60.6 | 36.5 |
| % Trash Removal | 9.9 | 18.4 | 7.3 | 16.3 | 34.4 | 28.6 | 7.1 | 16.2 | 29 | 26.7 |
| Avg. Luminosity | 1.9 | 6.2 | 1.3 | 5.2 | 3.1 | 6.5 | 1.9 | 8.1 | 2.5 | 7.3 |
| Area (000's, km2) | 0.6 | 1.8 | 0.3 | 0.6 | 1 | 3.3 | 0.3 | 0.9 | 0.6 | 1.5 |
| ln(Distance to Town Hall, km) | 3 | 0.7 | 2.8 | 0.6 | 1.5 | 1 | 2.7 | 0.6 | 1.4 | 0.9 |
| ln(Distance to State Capital, km) | 5.5 | 0.8 | 5.4 | 0.7 | 5.4 | 0.8 | 5.2 | 0.9 | 5.3 | 0.8 |
| ln(Maize Suitability) | 8.7 | 0.3 | 8.7 | 0.3 | 8.6 | 0.3 | 8.5 | 0.3 | 8.5 | 0.2 |
| ln(Wet Rice Suitability) | 8.6 | 0.8 | 8.6 | 0.5 | 8.7 | 0.5 | 8.6 | 0.9 | 8.6 | 0.8 |
| ln(Soybean Suitability) | 7.7 | 0.4 | 7.7 | 0.2 | 7.7 | 0.2 | 7.6 | 0.8 | 7.7 | 0.7 |
| ln(Wheat Suitability) | 6.5 | 3 | 6.7 | 2.9 | 6.5 | 2.9 | 6.5 | 3 | 6.5 | 2.9 |
| Terrain Ruggedness | 82.6 | 78 | 72.9 | 68.3 | 75.7 | 72.4 | 68.6 | 71.7 | 68.7 | 71.4 |
| | N = 560 | | N = 331 | | N = 390 | | N = 916 | | N = 1783 | |

**Notes**: This table reports descriptive statistics for districts using information from 1991 Demographic Census, 1992 night lights, MapBiomas, FAO-GAEZ soil suitability, and Carter (2018)'s terrain ruggedness data. The variables are: total population (in thousands), shares of urban and male population, literacy rate, share of households with access to piped water, sanitation and trash removal, average luminosity, total area (in thousands km$^2$), log distance to town hall, log distance to state capital, log soil suitability for different crops (maize, wet rice, soybean and wheat), and log terrain ruggedness. See Sections 2 and 4.1 for further details on sample construction.

Table C.2: Predicting Splitting at Baseline - Districts

| | Applicants | Remaining | Headquarters |
|---|---|---|---|
| | (1) | (2) | (3) |
| ln(Population) | 0.068* | -0.030 | -0.014 |
| | (0.038) | (0.040) | (0.039) |
| % Urban Population | 0.001 | 0.001 | -0.002 |
| | (0.001) | (0.002) | (0.002) |
| % Male | -0.026* | -0.013 | -0.045 |
| | (0.015) | (0.016) | (0.031) |
| % Literacy | -0.003 | 0.002 | -0.004 |
| | (0.003) | (0.004) | (0.006) |
| % Piped Water | 0.002 | 0.001 | 0.006* |
| | (0.001) | (0.002) | (0.003) |
| % Sanitation | 0.004*** | 0.000 | -0.002 |
| | (0.002) | (0.002) | (0.004) |
| % Trash Removal | -0.001 | -0.002 | 0.000 |
| | (0.001) | (0.002) | (0.002) |
| ln(Avg. Luminosity) | -0.014** | -0.011 | -0.015 |
| | (0.007) | (0.011) | (0.018) |
| ln(Area) | 0.097*** | 0.026 | 0.042 |
| | (0.029) | (0.042) | (0.042) |
| ln(Distance to Parent Townhall) | 0.072* | 0.071 | -0.023 |
| | (0.043) | (0.068) | (0.030) |
| ln(Distance to State Capital) | 0.043 | 0.101 | 0.005 |
| | (0.036) | (0.070) | (0.049) |
| Observations | 560 | 326 | 389 |
| R-squared | 0.245 | 0.228 | 0.179 |
| State FE | ✓ | ✓ | ✓ |
| Controls | ✓ | ✓ | ✓ |
| Mean | 0.79 | 0.79 | 0.75 |
| SD | 0.41 | 0.41 | 0.43 |

**Notes**: This table reports results from an OLS regression at the municipality level estimating the relationship between splitting and observable characteristics from the baseline period. of there being a split in the municipality on baseline characteristics from various data sources at the district level. Controls include measures of soil suitability and terrain ruggedness. Standard errors clustered at the microregion level in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table C.3: Difference-in-Differences Results for Public Finance and the Local Economy

| | ln(Rev. p.c.) (1) | ln(Exp. p.c.) (2) | ln(Federal Transfers p.c.) (3) | ln(Capital Exp. p.c.) (4) | ln(Current Exp. p.c.) (5) | ln(Public Municipal Jobs) (6) |
|---|---|---|---|---|---|---|
| Post x Split | 0.11*** | 0.13*** | 0.31*** | 0.20*** | 0.12*** | 0.18** |
| | (0.02) | (0.03) | (0.03) | (0.07) | (0.02) | (0.08) |
| Observations | 7,819 | 7,819 | 7,795 | 7,814 | 7,818 | 7,010 |
| R-squared | 0.94 | 0.94 | 0.90 | 0.75 | 0.94 | 0.87 |
| State-Year FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Controls-Time FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

| | ln(Public Municipal Wages) (7) | ln(Local Taxation Revenues p.c.) (8) | ln(Establishments) (9) | ln(Private Jobs) (10) | ln(Private Wages) (11) |
|---|---|---|---|---|---|
| Post x Split | 0.17*** | 0.05 | 0.05* | 0.01 | 0.06 |
| | (0.06) | (0.04) | (0.03) | (0.07) | (0.07) |
| Observations | 7,010 | 7,818 | 7,086 | 7,086 | 7,086 |
| R-squared | 0.91 | 0.92 | 0.99 | 0.98 | 0.98 |
| State-Year FE | ✓ | ✓ | ✓ | ✓ | ✓ |
| Controls-Time FE | ✓ | ✓ | ✓ | ✓ | ✓ |

**Notes**: Point estimates for Figure 5. Results from estimation of Equation (3) in Section 5. Main data sources are the *Finanças Brasileiras* (Finbra) data set for 1989 to 2018 and RAIS for 1995 to 2018. We classify jobs and establishments according to sector with information from the *Classificação Nacional de Atividades Econômicas* (CNAE) and *Classificação Brasileira de Ocupações* (CBO). Controls interacted with time fixed effects include number of districts in 1991, ln(Population) in 1991, % Urban in 1991, ln(Area), ln(Distance to State Capital), ln(Income p.c.) in 1991, and HHI for race and religion in 1991. Standard errors clustered at the micro-region level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table C.4: Difference-in-Differences Results for Education and Public Services Delivery

| | Attnd. Preschool<br>(1) | Attnd. Middle School<br>(2) | Attnd. High School<br>(3) | % Literacy 11-14 yr.<br>(4) | % Literacy 25+ yr.<br>(5) | Years of Educ.<br>(6) |
|---|---|---|---|---|---|---|
| Post x Split | 3.92*** | 2.25** | -0.23 | 1.68*** | 0.95** | 0.12* |
| | (1.47) | (1.10) | (1.12) | (0.58) | (0.43) | (0.07) |
| Observations | 1,344 | 1,344 | 1,344 | 1,344 | 1,344 | 1,344 |
| R-squared | 0.91 | 0.80 | 0.91 | 0.85 | 0.97 | 0.89 |
| Mean | 13.11 | 88.07 | 28.13 | 91.64 | 74.65 | 8.83 |
| SD | 9.68 | 10.73 | 14.44 | 8.94 | 12.86 | 1.44 |
| | % Piped Water<br>(7) | % Trash Collection<br>(8) | % Electricity<br>(9) | % Sewage<br>(10) | % Extreme Poverty<br>(11) | % Poverty<br>(12) |
| Post x Split | 1.77 | 4.42*** | 2.50 | 1.00* | -1.33 | -1.77 |
| | (1.24) | (1.59) | (1.60) | (0.60) | (1.08) | (1.24) |
| Observations | 1,344 | 1,344 | 1,344 | 1,344 | 1,344 | 1,344 |
| R-squared | 0.89 | 0.87 | 0.83 | 0.89 | 0.89 | 0.94 |
| Mean | 71.18 | 63.51 | 81.33 | 96.10 | 19.62 | 42.81 |
| SD | 24.17 | 27.35 | 20.03 | 7.66 | 14.86 | 20.6 |

**Notes**: Point estimates for Figure 7. Results from estimation of a simplified version of Equation (3) in Section 5. Each coefficient is calculated from a regression with 1344 observations on the given standardized outcome. Main data sources are the Demographic Census of 1991, 2000 and 2010. Standard errors clustered at the microregion level in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table C.5: Difference-in-Difference Estimates for Districts

| | ln(0.1 + Luminosity) | | |
|---|---|---|---|
| | Applicants (1) | Remaining (2) | Headquarters (3) |
| Post x Split | 0.29*** | 0.04 | 0.03 |
| | (0.06) | (0.07) | (0.03) |
| Observations | 10,276 | 6,010 | 7,101 |
| R-squared | 0.97 | 0.97 | 0.99 |
| Mean Pre-Split | -0.737 | -0.826 | 0.203 |
| SD Pre-Split | 1.549 | 1.463 | 1.447 |

| | % Pixels Lit | | |
|---|---|---|---|
| | Applicants (1) | Remaining (2) | Headquarters (3) |
| Post x Split | 0.06*** | -0.00 | 0.02** |
| | (0.02) | (0.02) | (0.01) |
| Observations | 10,276 | 6,010 | 7,101 |
| R-squared | 0.97 | 0.95 | 0.98 |
| Mean Pre-Split | 0.180 | 0.163 | 0.249 |
| SD Pre-Split | 0.294 | 0.267 | 0.295 |

| | Luminosity Gini | | |
|---|---|---|---|
| | Applicants (1) | Remaining (2) | Headquarters (3) |
| Post x Split | -0.04*** | -0.01 | -0.01** |
| | (0.01) | (0.02) | (0.01) |
| Observations | 9,760 | 5,078 | 7,072 |
| R-squared | 0.97 | 0.95 | 0.98 |
| Mean Pre-Split | 0.832 | 0.835 | 0.839 |
| SD Pre-Split | 0.240 | 0.215 | 0.186 |

**Notes**: Table reports point estimate results from Equation (5) in Section 5 plotted in Figure 8. All Columns include district and state-time fixed effects. Controls interacted with time fixed effects include ln(Area), ln(Distance to Parent Town Hall), ln(Distance to State Capital), soil suitability for maize, wet rice, soybean, and wheat, terrain ruggedness, and ln(Luminosity) in 1992. Standard errors clustered at the microregion level in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table C.6: Oster (2019) Correction

| | Baseline | $\beta$ | | | $\delta$ |
|---|---|---|---|---|---|
| Applicant: Post $\times$ Split | .29 | .19 | .19 | .2 | .11 |
| Remaining: Post $\times$ Split | .04 | -.16 | -.14 | -.13 | -.07 |
| Headquarters: Post $\times$ Split | .03 | 0.04 | .03 | .03 | .37 |
| $\delta$ | | 1 | 2 | 5 | |
| $\beta$ | | | | | 0 |
| $R_{max}$ | | 1 | 1 | 1 | 1 |

**Notes**: Results from the procedure proposed by Oster (2019) for estimates from Equation (5).

Table C.7: Robustness for Applicant Districts

| | Baseline (1) | ln(Luminosity) (2) | Only 97 Wave (3) | More FEs (4) |
|---|---|---|---|---|
| Post x Split | 0.29*** | 0.28*** | 0.35*** | 0.20*** |
| | (0.06) | (0.09) | (0.13) | (0.08) |
| Observations | 10,276 | 9,760 | 5,040 | 10,276 |
| R-squared | 0.97 | 0.96 | 0.97 | 0.98 |
| State-Year FE | ✓ | ✓ | ✓ | - |
| Controls-Time FE | ✓ | ✓ | ✓ | ✓ |
| Microregion-Year FE | - | - | - | ✓ |
| Mean Pre-Split | -0.74 | -0.99 | -0.66 | -0.74 |
| SD Pre-Split | 1.55 | 2.11 | 1.54 | 1.55 |

**Notes**: Table reports point estimate results from Equation (5). All Columns include district fixed effects. Controls interacted with time fixed effects include ln(Area), ln(Distance to Parent Town Hall), ln(Distance to State Capital), soil suitability for maize, wet rice, soybean, and wheat, terrain ruggedness, and ln(Luminosity) in 1992. Standard errors clustered at the microregion level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table C.8: Difference-in-Difference Heterogeneity Estimates for Districts

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Post x Split | 0.29*** | 1.49*** | 0.55 | 0.85 |
| | (0.06) | (0.42) | (0.68) | (1.01) |
| Post x Split x ln(Pop. 1991) | | -0.07 | -0.02 | -0.07 |
| | | (0.05) | (0.06) | (0.06) |
| Post x Split x ln(Area) | | -0.09** | -0.21*** | -0.19*** |
| | | (0.04) | (0.06) | (0.06) |
| Post x Split x % Urban 1991 | | -0.00* | -0.00 | -0.00 |
| | | (0.00) | (0.00) | (0.00) |
| Post x Split x ln(Dist. Parent Townhall) | | | 0.21* | 0.27** |
| | | | (0.11) | (0.10) |
| Post x Split x ln(Dist. State Capital) | | | 0.10 | -0.01 |
| | | | (0.07) | (0.07) |
| Post x Split x % Literacy 1991 | | | | -0.01 |
| | | | | (0.01) |
| Post x Split x % Piped Water 1991 | | | | 0.01*** |
| | | | | (0.00) |
| Post x Split x % Sanitation 1991 | | | | 0.01 |
| | | | | (0.01) |
| Post x Split x % Trash Collection 1991 | | | | -0.01** |
| | | | | (0.00) |
| Observations | 10,276 | 10,276 | 10,276 | 10,276 |
| R-squared | 0.97 | 0.97 | 0.97 | 0.97 |
| District FE | ✓ | ✓ | ✓ | ✓ |
| State-Year FE | ✓ | ✓ | ✓ | ✓ |
| Controls-Time FE | ✓ | ✓ | ✓ | ✓ |
| Mean Pre-Split | -0.737 | -0.737 | -0.737 | -0.737 |
| SD Pre-Split | 1.549 | 1.549 | 1.549 | 1.549 |

**Notes**: Table reports point estimate results from Equation (5) in Section 6. All Columns include district and state-time fixed effects. Controls interacted with time fixed effects include ln(Area), ln(Distance to Parent Town Hall), ln(Distance to State Capital), soil suitability for maize, wet rice, soybean, and wheat, terrain ruggedness, and ln(Luminosity) in 1992. Standard errors clustered at the microregion level in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

# D Details for Regression-Discontinuity in Federal Transfers

As we described in Section 2, the FPM revenues are first given in fixed blocks to states and, second, allocated to municipalities within state through a coefficient rule based on population size. More precisely, define $FPM_m^s$ as the amount of federal transfers received by municipality $m$ in state $s$ in a given year. The allocation mechanism formula is the following:

$$FPM_m^s = FPM^s \frac{\lambda_m}{\sum_{m \in s} \lambda_m},$$

in which $FPM^s$ is the amount of federal transfers allocated to state $s$. $\lambda_m$ is the FPM coefficient of municipality $m$ based on its population. The fraction $\frac{\lambda_m}{\sum_{m \in s} \lambda_m}$ is the share of state FPM transfers ($FPM^s$) allocated to municipality $m$ in state $s$ in a given year.

The coefficients $\lambda_m$ mark a series of population cutoffs. For simplicity, we restrict our attention the first discontinuity (10,189 inhabitants) since it closely approximates the bracket in which the majority of our sample of new municipalities are located. Using a sample of municipalities described in Section 4.1.3, we estimate a regression discontinuity for selected outcomes expressed in log: total number of public jobs, establishments, total number of private jobs, and average luminosity. We compare municipalities barely located to the left (receive less federal transfers) and barely to the right (more transfers) of the population threshold. In particular, we consider the following specification:

$$y_{mt} = \alpha_m + \alpha_t + g(P_{m,t-1}) + \beta T_{mt} + \varepsilon_{mt} \tag{18}$$

in which $y_{mt}$ represents outcomes for municipality $m$ in year $t$. We include municipality and year fixed effects $\alpha_m$ and $\alpha_t$. The function $g(\cdot)$ controls for linear polynomials of lagged population $P_{m,t-1}$, and $T_{mt}$ indicates whether a municipality is treated for being located to the right of the population cutoff. Standard errors $\varepsilon_{mt}$ are clustered at the microregion level.

Table D.9: Effects of Federal Transfers - Regression Discontinuity

| | ln(Transfers) (millions) (1) | ln(Public Jobs) (2) | ln(Estab.) (3) | ln(Private Jobs) (4) | ln(Luminosity) (5) |
|---|---|---|---|---|---|
| RD Estimate | 0.13*** | 0.06 | -0.04 | -0.15 | -0.00 |
| | (0.05) | (0.10) | (0.11) | (0.15) | (0.16) |
| Observations | 1,741 | 1,964 | 2,044 | 2,042 | 2,357 |
| State-Year FE | ✓ | ✓ | ✓ | ✓ | ✓ |
| Optimal Bandwidth (%) | 4 | 4.9 | 6.2 | 3.5 | 3.8 |

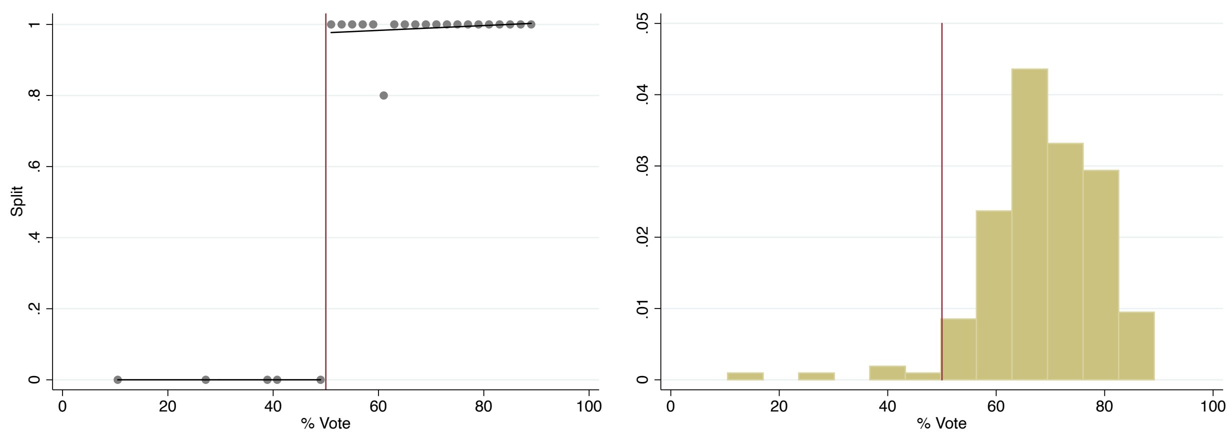
**Notes**: Results from estimation of Equation (18) in Section 6. Standard errors clustered at the microregion level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

# E Details for Difference-in-Discontinuities in Luminosity

Figure E.8: Referendums in *Minas Gerais*

(a) First Stage

(b) Histogram of Vote Shares



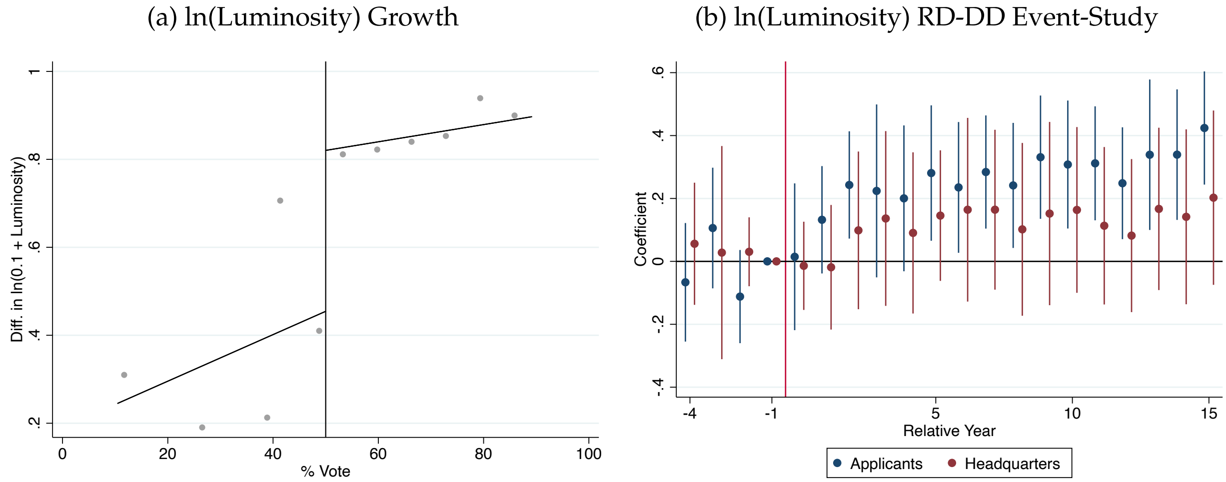

**Notes**: Panel (a) plots the binned first stage of referendum votes on likelihood of splitting at district level. Panel (b) plots the frequency of referendum vote shares. As described in Section 2, districts required a unilateral referendum with at least 50% turnout and votes in favor as one of necessary steps for splitting.

Table E.10: Discontinuity Test on Covariates

| VARIABLES | (1) ln(Population) | (2) ln(Area) | (3) ln(Luminosity) | (4) ln(Dist. Parent TH) |
|---|---|---|---|---|
| Referendum Vote $\geq$ 50% | 0.57 | 0.18 | 1.87 | -0.05 |
| | (0.44) | (0.75) | (2.57) | (0.53) |
| Observations | 50 | 50 | 50 | 50 |
| R-squared | 0.48 | 0.23 | 0.26 | 0.13 |
| Mean | 3.120 | 5.706 | -4.102 | 3.120 |
| SD | 0.631 | 0.947 | 3.311 | 0.631 |

**Notes**: Estimates from Equation (6) in Section 5.5. Standard errors clustered at the microregion level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Figure E.9: Difference-in-Discontinuities




**Notes**: Results from estimation described in Section 5.5. Panel (a) plots the growth in ln(0.1 + Luminosity) for districts below and above the plebiscite approval cutoff of 50%. Panel (b) plots the Differences-in-Discontinuities results. Each set of coefficients is from one differences-in-differences equation, one for applicant and another for remaining districts. Controls interacted with time fixed effects include ln(Area), ln(Distance to Parent Town Hall), ln(Distance to State Capital), soil suitability for maize, wet rice, soybean, and wheat, terrain ruggedness, and ln(Luminosity) in 1992. Bars represent the 95%-confidence intervals clustered at the microregion level.

Table E.11: Fuzzy Difference-in-Discontinuities on ln(0.1 + Luminosity)

| | First Stage (1) | Reduced Form (2) | Second Stage (3) | DD (4) |
|---|---|---|---|---|
| Referendum Vote $\geq$ 50% | 0.96*** | | | |
| | (0.18) | | | |
| Post x Referendum Vote $\geq$ 50% | | 0.16*** | | |
| | | (0.05) | | |
| Post x Split | | | 0.22*** | 0.17*** |
| | | | (0.05) | (0.02) |
| Observations | 50 | 985 | 985 | 2,422 |
| R-squared | 0.64 | 0.98 | 0.98 | 0.98 |
| District FE | - | ✓ | ✓ | ✓ |
| Controls-Year FE | - | ✓ | ✓ | ✓ |
| Mean | 0.88 | -0.82 | -0.82 | -0.6 |
| SD | 0.39 | 1.83 | 1.83 | 1.94 |

**Notes**: Estimates from Equations (6) and (7) in Section 5.5. Standard errors clustered at the microregion level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.