Supplemental Appendix
"Decentralizing Development: The Economic Impacts of Government Splits"

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A Conceptual Framework

We sketch a simple framework to illustrate how splitting affects the provision of public services. Our model incorporates several features from our context and highlights the scope for several mechanisms studied in the paper, including neglect from the headquarters and fiscal incentives (Bolton and Roland, 1997; Dur and Staal, 2008).

We work with a one-period model. We assume that a municipality, which we refer to as municipality 1, is composed of two districts, A and B. The municipal population is immobile, and districts A and B have population α_A and α_B. Since there is no income heterogeneity within the district, all residents have income per capita y. Two sources of municipal revenues finance public goods g: income taxes τ and federal transfers $T(\cdot)$. In line with the institutional context described in Section 2, $T(\cdot)$ depends on the population size. We also assume that $T(\cdot)$ is weakly increasing and concave, while federal transfers per capita are weakly decreasing and convex in population size. The utility takes a quasi-linear form, $U_i = \theta_i \ln(g_i) + (1-\tau)y_i$, in which θ_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 regarding the allocation of public goods. When districts A and B form together a single 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. In other words, district A solves the following maximization problem:

$$\max_{g_A, g_B, \tau} \quad (1-\lambda)\alpha_A U_A + \lambda \alpha_B U_B \quad \text{subject to} \quad g_A + g_B \leq \tau y + T(\alpha_A + \alpha_B), \tag{6}$$

in which $y \equiv \alpha_A y_A + \alpha_B y_B$, and λ is the intra-municipality Pareto weight capturing the relative strength of the two districts in deciding over the provision of public goods.

In case of splitting, district B becomes a municipality and obtains decision-making power over its level of public goods, g_B^S. The maximization problem can be written as:

$$\max_{g_B, \tau} \quad \alpha_B U_B \quad \text{subject to} \quad g_B \leq \tau \alpha_B y_B + T(\alpha_B), \tag{7}$$

in which $T(\alpha_B)$ is the total federal transfers the new municipality receives. The parent municipality, now district A, chooses g_A and τ from an analogous maximization problem.

Comparing solutions of the maximization problems, we have:

Proposition 1. *The benefits of splitting for district B are larger if:*

1. ***(Capture and Neglect)*** *Its welfare was captured and neglected by the headquarters (lower λ);*

2. ***(Fiscal Incentives)*** *It is small in population size (lower α_B) and has:*

   (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 Appendix Section B.1. □

To understand the distributional effects, we extend our framework to introduce a second municipality representing the rest of the state, with population α_2. To capture the reallocation of federal transfers after a split, define T_i^U as the transfers that area i receives when municipality 1 does not split; and T_i^S as the transfers that area i receives when municipality 1 splits. Consistent with the Brazilian context, transfers are "zero-sum game", 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 integrated 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 how welfare changes 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) ΔV_A is small, (ii) ΔV_B is positive and large, and (iii) ΔV_2 is negative and small.*

Proof. See Appendix Section B.2. □

The intuition behind Proposition 2 is straightforward. Due to 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 create substantial benefits to the latter. The welfare of district A changes little, either positively or negatively, depending on whether its transfers change or not. We directly test these predictions in Section 5 by separately evaluating the consequences of splitting for headquarters and non-headquarters districts.

B Proofs of Propositions

B.1 Proof of Proposition 1

Proof. 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 integrated policy choice problem (6), assuming there exists an interior optimum, we can solve the first-order condition:

$$\frac{g_B^U}{g_A^U} = \frac{\lambda}{1-\lambda}\frac{\alpha_B}{\alpha_A}\frac{\theta_B}{\theta_A} \tag{8}$$

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 integration:

$$g_A^U = (1-\lambda)\alpha_A\theta_A\frac{y}{\overline{y}} \qquad g_B^U = \lambda\alpha_B\theta_B\frac{y}{\overline{y}} \qquad \tau^U = \frac{\overline{\theta}}{\overline{y}} - \frac{T(\alpha_A+\alpha_B)}{y} \tag{9}$$

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 $\theta \equiv \alpha_A\theta_A + \alpha_B\theta_B$.

Similarly, for Problem (7), we can show that:

$$g_A^S = \alpha_A\theta_A \qquad g_B^S = \alpha_B\theta_B \qquad \tau_A^S = \frac{\theta_A}{y_A} - \frac{T(\alpha_A)}{\alpha_A y_A} \qquad \tau_B^S = \frac{\theta_B}{y_B} - \frac{T(\alpha_B)}{\alpha_B y_B} \tag{10}$$

District B unilaterally chooses to split if $U_B^S \geq U_B^U$. Substituting in Equations (9) and

(10), we can express the surplus condition as:

$$\begin{aligned} G(\lambda, \alpha_A, \alpha_B, \theta_A, \theta_B, y_A, y_B, T) &\equiv U_B^S - U_B^U \\ &= \theta_B[\ln(g_B^S) - \ln(g_B^U)] + (\tau^U - \tau_B^S) y_B \\ &= \theta_B \ln\left(\frac{\overline{y}}{\lambda y}\right) + \left(\frac{\overline{\theta}}{\overline{y}} - \frac{\theta_B}{y_B} + \frac{T(\alpha_B)}{\alpha_B y_B} - \frac{T(\alpha_A + \alpha_B)}{y}\right) y_B \\ &\geq 0 \end{aligned} \tag{11}$$

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 and local taxation change after a split, we derive similar calculations for g_B and τ_B. If district B splits, it increases its provision of public goods ($g_B^S \geq g_B^U$) if, and only if

$$\begin{aligned} H(\lambda, \alpha_A, \alpha_B, \theta_A, \theta_B, y_A, y_B) &\equiv g_B^S - g_B^U \\ &= \alpha_B \theta_B - \frac{\lambda \alpha_B \theta_B y}{\overline{y}} \\ &= \frac{(1-2\lambda)\alpha_A \alpha_B \theta_B y_A}{\overline{y}} \geq 0 \end{aligned} \tag{12}$$

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

District B changes local tax rates from τ^U to τ_B^S after a split. This is equivalent to:

$$\begin{aligned}\tau_B^S - \tau^U &= \frac{\theta_B}{y_B} - \frac{\overline{\theta}}{\overline{y}} + \frac{T(\alpha_A+\alpha_B)}{y} - \frac{T(\alpha_B)}{\alpha_B y_B} \\ &= \frac{(1-\alpha)\alpha_A\alpha_B y[\theta_B y_A - \theta_A y_B] + \overline{y}[\alpha_B y_B T(\alpha_A+\alpha_B) - yT(\alpha_B)]}{\alpha_B y_B y\overline{y}}\end{aligned} \tag{13}$$

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

B.2 Proof of Proposition 2

Proof. If district B is relatively small $\left(\frac{\alpha_B}{\alpha_A} \to 0\right)$ and captured and neglected by its parent district $(\lambda \to 0)$, and municipality 2 is relatively large $\left(\frac{\alpha_2}{\alpha_A+\alpha_B} \to \infty\right)$, we have that:

$$\Delta V_A = \theta_A \ln\left(\frac{\overline{y}}{(1-\lambda)y}\right) + \left(\frac{\overline{\theta}}{\overline{y}} - \frac{\theta_A}{y_A} + \frac{T(\alpha_A)}{\alpha_A y_A} - \frac{T(\alpha_A+\alpha_B)}{y}\right) y_A \tag{14}$$

$$\Delta V_B = \theta_B \ln\left(\frac{\overline{y}}{\lambda y}\right) + \left(\frac{\overline{\theta}}{\overline{y}} - \frac{\theta_B}{y_B} + \frac{T(\alpha_B)}{\alpha_B y_B} - \frac{T(\alpha_A+\alpha_B)}{y}\right) y_B \tag{15}$$

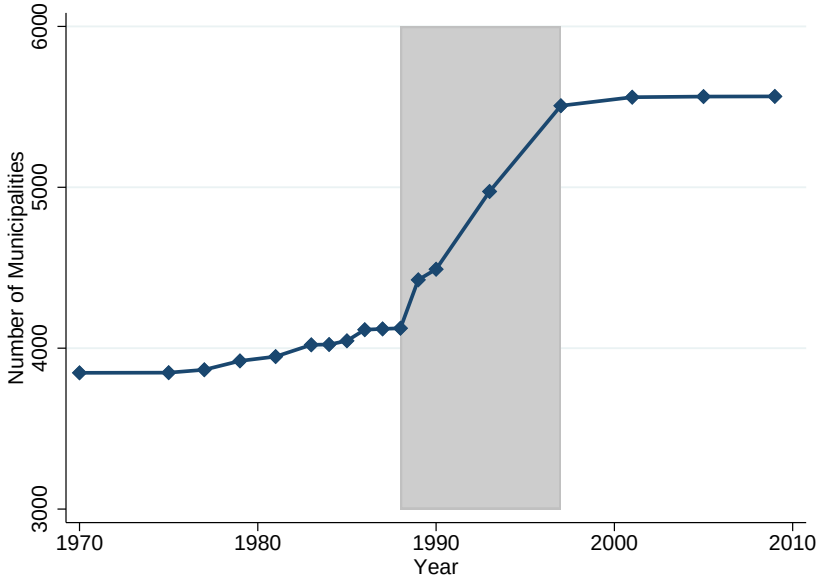
$$\Delta V_2 = \frac{T^S(\alpha_2) - T^U(\alpha_2)}{\alpha_2} \tag{16}$$

Given our assumptions, one can show that $\Delta V_A \to 0$, $\Delta V_B \to \infty$, $\Delta V_2 \to 0$. □

C Data Appendix

C.1 Figures

Figure C.1: Evolution of Total Number of Municipalities



Note: This figure shows the evolution of the number of municipalities between 1970 and 2010. The grey area highlights the period between the 1988 Federal Constitution and the 1996 CA.

C.2 Split Requests

Using historical archives, we have constructed a novel dataset that includes all requests to split initiated by districts between 1989 and 1996. Prior to the 1996 CA, each state assembly had the discretion to set its own regulations on splitting, leading to substantial variation in records on split requests.

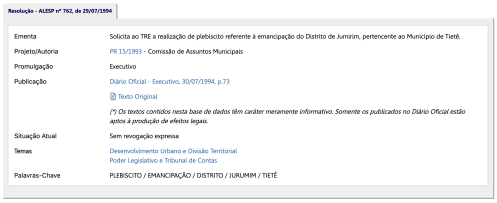
Brazil has 26 state legislative assemblies. For each state assembly, we searched for digitized historical records on split requests from the first half of the 1990s. We found records for twelve states: Amapá, Amazonas, Espírito Santo, Goiás, Mato Grosso, Minas Gerais, Pará, Paraná, Rio Grande do Sul, Rondônia, Santa Catarina, and São Paulo. The availability and quality of the data vary widely across states. Appendix Figure C.2 provides an example of the material available online. Appendix Figure C.3 shows the distributions of

request and split years among applicant districts.

Below, we list the variables we constructed from the records for each state:

Figure C.2: Examples of Raw Material of Split Requests

(a) São Paulo



(b) Rio Grande do Sul

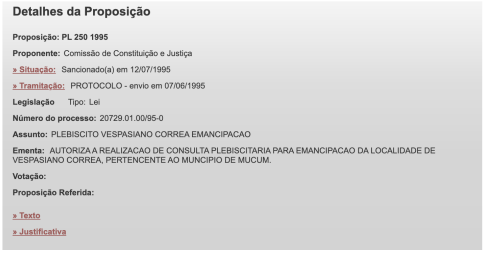
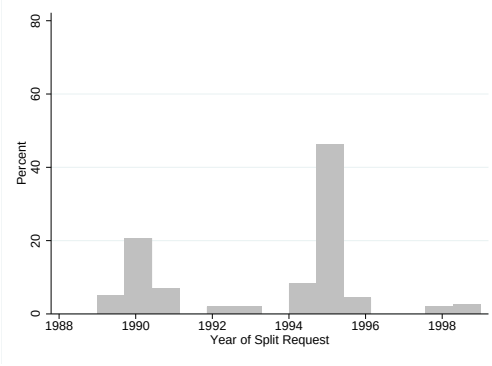
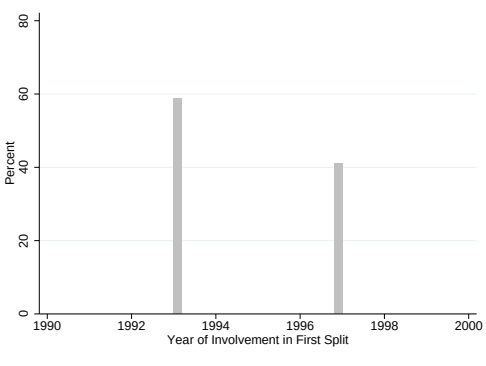


Figure C.3: Histograms of Request and Split Years

(a) Year of *Request* among Almost Split Applicants



(b) Year of *Split* among Applicants



Amapá: Indicator for whether district has requested to split; indicator for whether district has the request approved; identification number of the split process; start date of the process; approval date of the referendum; 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; start date of the process; approval date of the referendum; 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; identification number of the split process; approval date of the referendum; and result of the referendum.

Mato Grosso: Indicator for whether district has requested to split; indicator for whether district has the request approved; identification number of the split process; start date of the process; 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; identification number of the split process; start date of the process; approval date of the referendum; and result of the referendum.

Pará: Indicator for whether district has requested to split; indicator for whether district has the request approved; identification number of the split process; start date of the process; approval date of the referendum; 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; identification number of the split process; start date of the process; 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; identification number of the split process; start date of the process; approval date of the referendum; 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; identification number of the split process; approval date of the referendum; and result of the referendum.

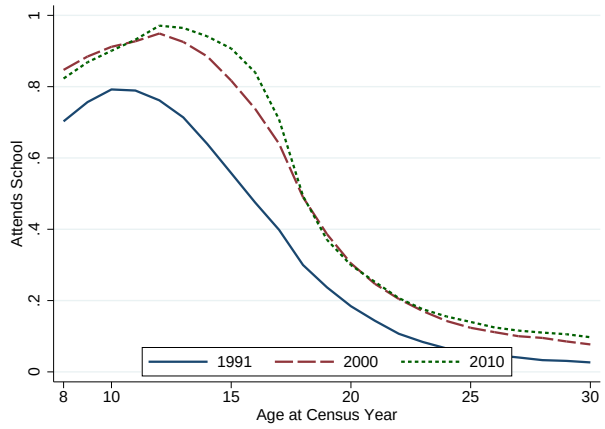
Santa Catarina: Indicator for whether district has requested to split; indicator for whether district has the request approved; indicator for whether the request was archived; date when the request was archived; identification number of the split process; start date of the process; approval date of the referendum; 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; identification number of the split process; start date of the process; approval date of the referendum; and result of the referendum.

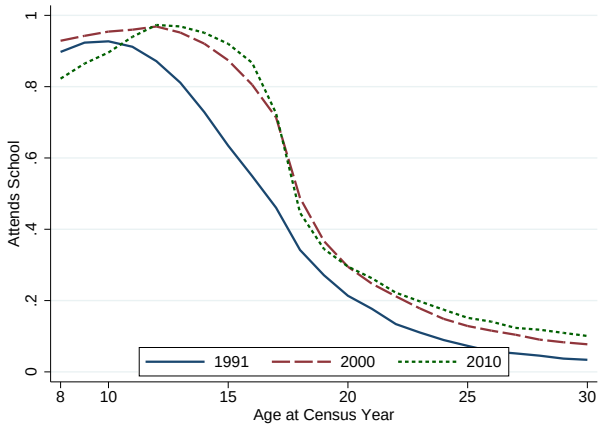
D Additional Results

Figure D.1: Heterogeneous Effects of Splitting on Education Outcomes: Raw Data

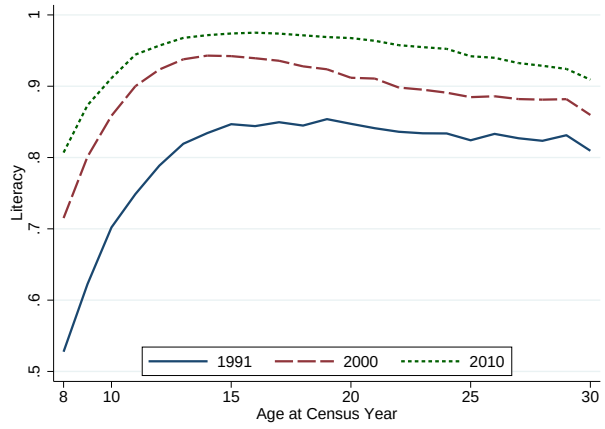
(a) School Attendance, Split Municipalities



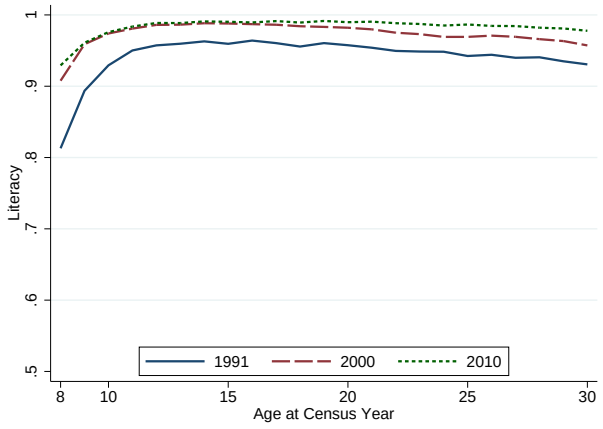
(b) School Attendance, Almost Split Municipalities



(c) Literacy Rates, Split Municipalities



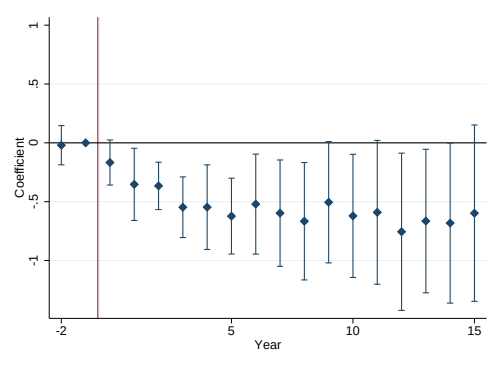
(d) Literacy Rates, Almost Split Municipalities



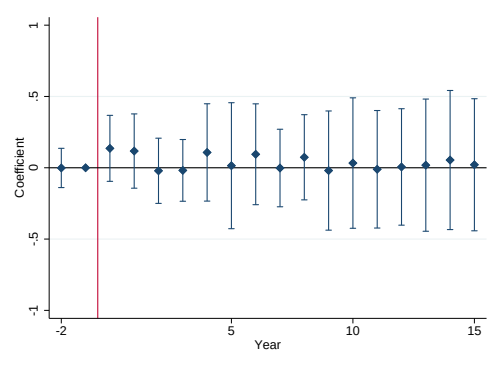
Note: This figure displays the raw data for school attendance and literacy rates from the sample described in Figure 4 for split and almost split municipalities, by census wave and age. The main data sources are the individual-level microdata from decennial Demographic Census from 1991, 2000, and 2010.

Figure D.2: Crowd-Out Effects of Splitting on Jobs

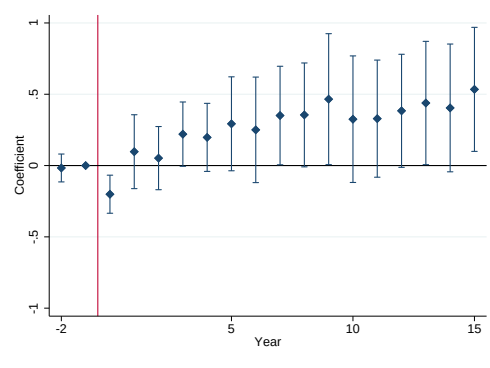
(a) Log Nonprofit Jobs in Education



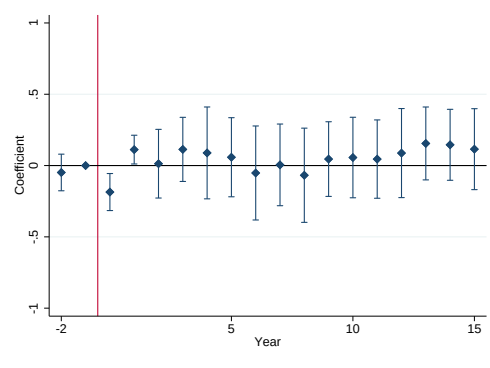
(b) Log Nonprofit Jobs in Health



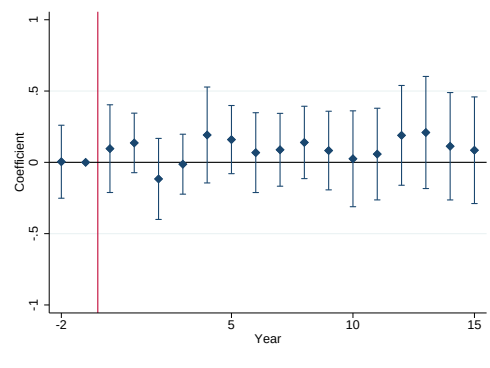
(c) Log Private Jobs in Education



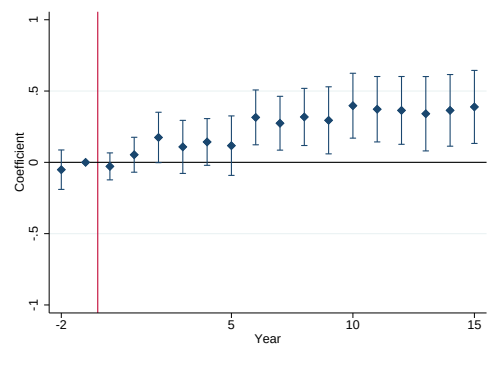
(d) Log Private Jobs in Health



(e) Log Public Jobs in Education

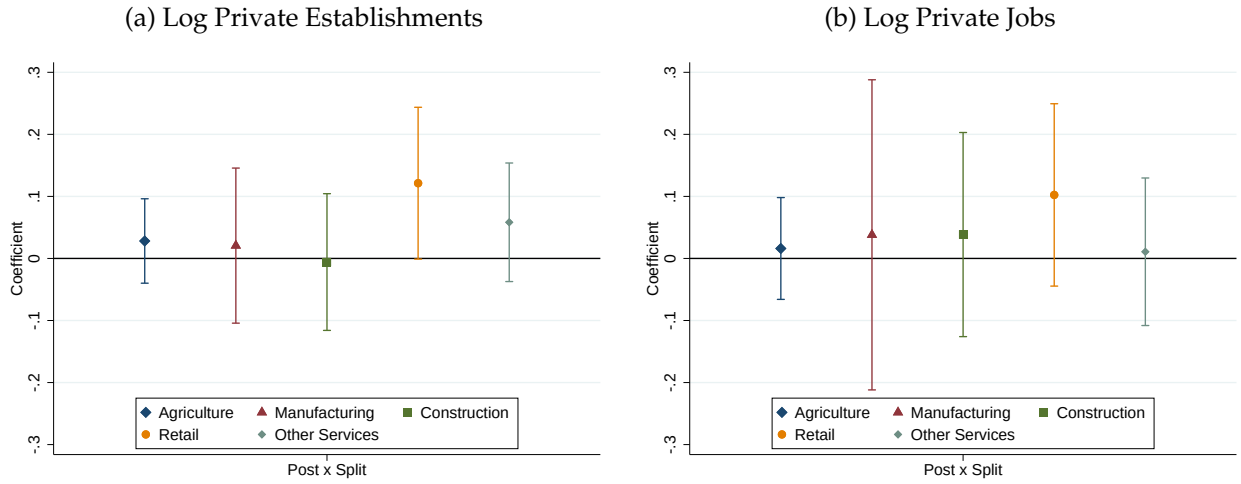


(f) Log Public Jobs in Health



Note: This figure reports annual crowd-out effects of splitting on log number of jobs in nonprofit, private, and public sectors in education and health areas after estimating Equation (1). The omitted category is the year before splitting. Standard errors are two-way clustered at the state and split wave levels.

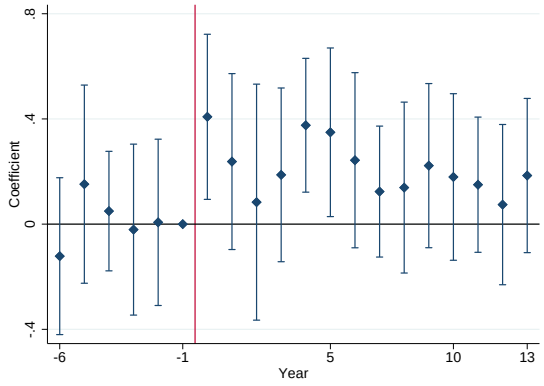
Figure D.3: Heterogeneous Effects of Splitting on the Private Sector



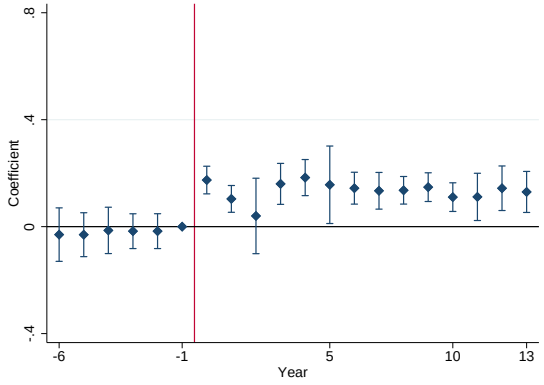
Note: This figure decomposes the aggregate effects of splitting on log private establishments and log private jobs from Columns (1) and (2) of Appendix Table D.5 across economic sectors.

Figure D.4: Effects of 1997 Splitting on Selected Outcomes

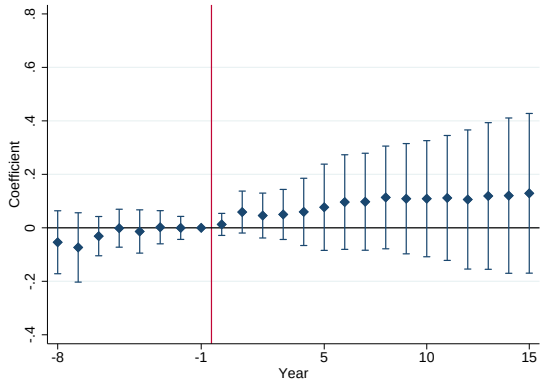
(a) Log Capital Expenditures



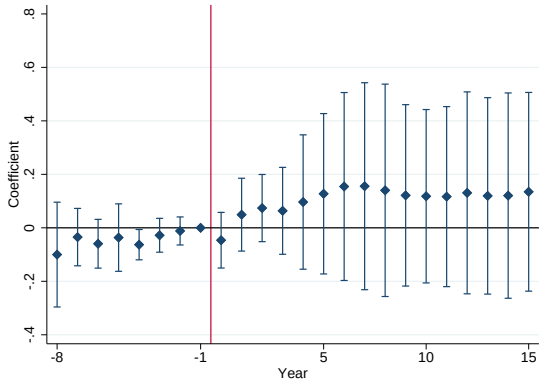
(b) Log Current Expenditures



(c) Log Establishments

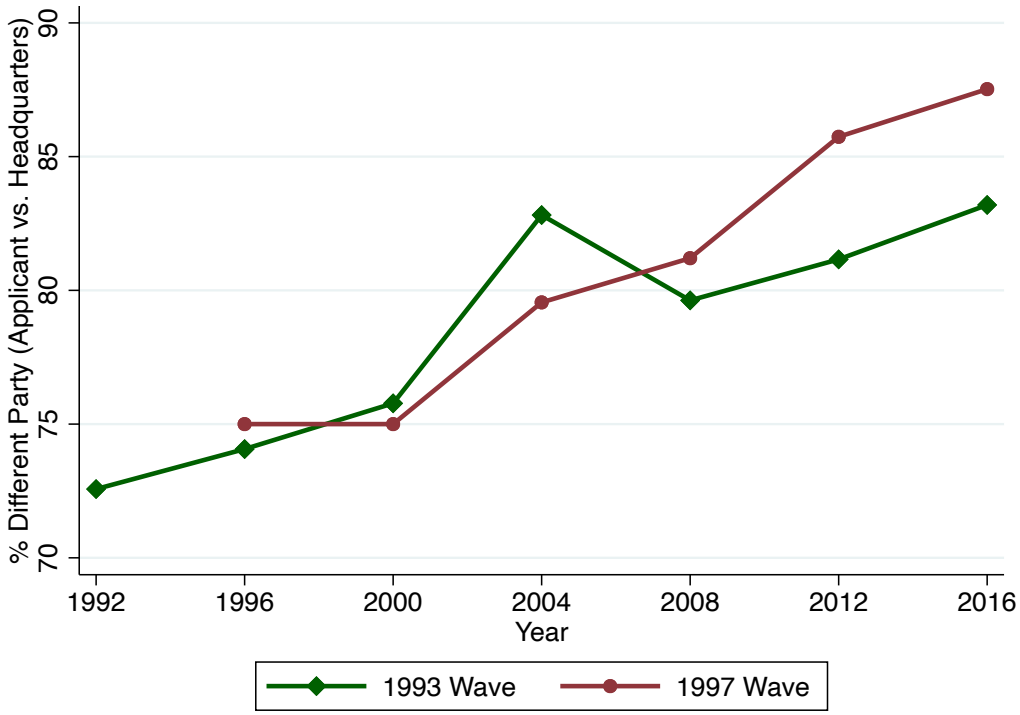


(d) Log Jobs



Note: This figure reports the annual effects of 1997 splitting after estimating Equation (1). We consider the following dependent variables: log municipal capital expenditures, log municipal current expenditures, log total number of establishments, and log total number of jobs. The omitted category is the year before splitting. Standard errors are two-way clustered at the state and split wave levels.

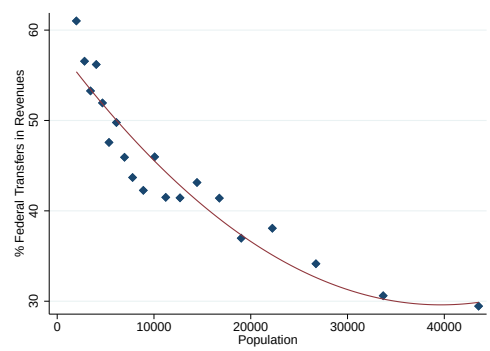
Figure D.5: Divergence in Political Preferences After Redistricting



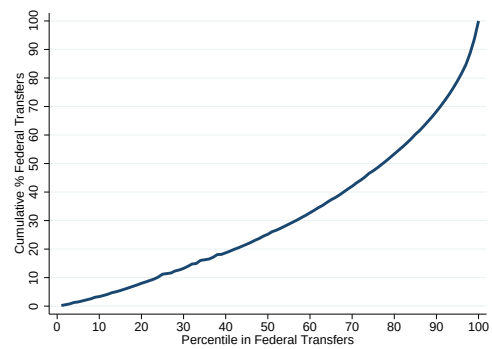
Note: This figure plots the percentage of municipalities in which the applicant and headquarters districts elected mayors from different parties after splitting. Because data on elections are only available at the municipality level, we only plot trends for municipalities that ultimately split.

Figure D.6: Distribution of Federal Transfers

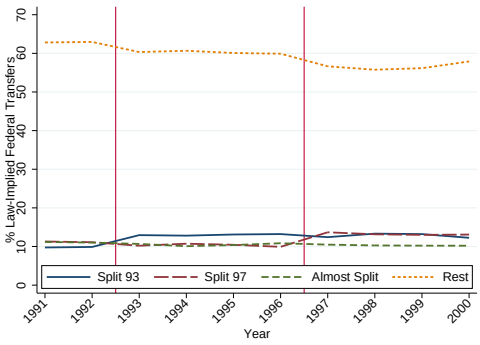
(a) Share of Federal Transfers Relative to Municipal Revenues in 1991



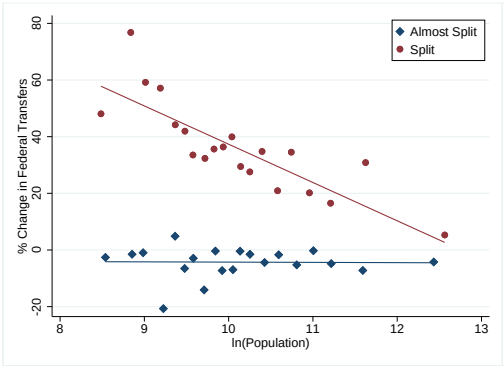
(b) Cumulative Distribution of Federal Transfers in 1991 (Bottom 50% Get ≈ 26%)



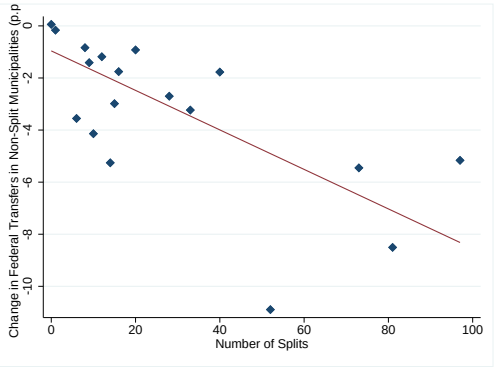
(c) Group Shares After Split Waves



(d) Change in Federal Transfers Across Groups



(e) Number of Splits and Losses in Federal Transfers



Note: This figure reports the patterns of revenues from federal transfers (FPM) over time, as described in Section 2. Panel (a) describes the share of municipal revenues from federal transfers across population bins in 1991. Panel (b) plots the distribution of federal transfers in 1991. Panel (c) plots the reallocation of federal transfers after the 1993 and 1997 split waves implied by the transfer allocation mechanism. Panel (d) illustrates how the gains in revenues from federal transfers accrue particularly to new municipalities with smaller population. Panel (e) shows the relationship between the number of splits and the losses in federal transfers in non-split municipalities.

Table D.1: Baseline Descriptive Statistics at the District Level

	In Sample						Rest				*Differences*			
	Applicant		Remaining		Headquarters		Periphery		Headquarters		(1)-(3)		(1)-(5)	
	Mean (1)	SD (2)	Mean (3)	SD (4)	Mean (5)	SD (6)	Mean (7)	SD (8)	Mean (9)	SD (10)	Diff. (11)	p-value (12)	Diff. (13)	p-value (14)
Population (000's)	5.4	12.4	3.1	5.4	31.7	63.8	3.6	13.3	17.8	48.8	2.7	<0.01	-25.8	<0.01
% Urban Population	38.5	26.5	27.7	24.6	67.8	22.4	32.2	24.9	61.9	22.6	11.4	<0.01	-29.2	<0.01
% Male	51.8	1.3	52.3	1.8	50.3	1.2	52.3	1.9	51	1.3	-.5	<0.01	1.5	<0.01
% Literacy	65.8	11.6	65.1	12.2	70.3	9.5	64.3	11.2	68.9	8.6	.9	.26	-4.4	<0.01
% Piped Water	62.9	27	58.9	29	77.5	21.1	61.5	26.5	76	21	4.4	.02	-14.3	<0.01
% Sewage	19.9	25.5	16.2	22.9	40.5	30.5	17.3	22.5	38.4	30	4	.02	-20.2	<0.01
% Trash Collection	21.5	27.1	13.1	22.9	54.1	26.7	13.5	23.2	47.6	27.2	8.9	<0.01	-32.3	<0.01
Avg. Luminosity	1.8	5.8	1.4	5.2	3.1	6.5	1.7	7.2	2.4	6.7	.5	.18	-1.2	<0.01
Area (000's km2)	.5	1.5	.3	.5	.9	2.5	.3	.9	.6	1.5	.3	<0.01	-.4	<0.01
Log Distance to Parent Townhall	3	.6	2.8	.6	1.5	1	2.7	.6	1.4	.9	.1	<0.01	1.4	<0.01
Log Distance to State Capital	5.5	.8	5.4	.7	5.4	.8	5.2	.8	5.3	.8	.1	.13	.1	.3
Log Maize Suitability	8.7	.3	8.7	.3	8.6	.3	8.5	.3	8.5	.2	0	.99	0	.06
Log Wet Rice Suitability	8.6	.8	8.6	.5	8.7	.5	8.6	.9	8.6	.8	0	.57	0	.42
Log Soybean Suitability	7.7	.4	7.7	.2	7.7	.2	7.6	.8	7.7	.7	0	.44	0	.73
Log Wheat Suitability	6.5	2.9	6.8	2.8	6.6	2.8	6.5	3	6.5	2.9	-.2	.37	0	.9
Terrain Ruggedness	83.2	78.2	72.7	68.6	76.1	72.7	68.5	71.8	68.7	71.4	9.9	.06	6.9	.16
	N = 552		N = 324		N = 384		N = 912		N = 1777					

Notes: This table reports baseline descriptive statistics in 1991 at the district level. We use information from the 1991 Demographic Census, and the 1992 night lights, MapBiomas, FAO-GAEZ soil suitability, and terrain ruggedness data. See Section 3 for further details on data and construction of the district-level sample.

Table D.2: Baseline Descriptive Statistics at the District Level by Split Wave

	Applicants		Split		Almost Split		(2)-(1)		(4)-(3)		(5)-(3)		(6)-(4)	
	1993	1997	1993	1997	1993	1997								
	Mean (1)	Mean (2)	Mean (3)	Mean (4)	Mean (5)	Mean (6)	Dif. (7)	p (8)	Dif. (9)	p (10)	Dif. (11)	p (12)	Dif. (13)	p (14)
Population (000's)	5.73	4.95	4.94	4.32	9.8	6.88	-.78	.46	-.62	.27	-4.86	.03	-2.56	.05
% Urban Population	42.2	33.85	39.84	32.59	54.26	37.66	-8.35	0	-7.25	0	-14.42	0	-5.07	.17
% Male	51.79	51.76	51.78	51.74	51.87	51.8	-.04	.73	-.04	.77	-.09	.64	-.06	.78
% Literacy	68.54	62.41	68.23	61.28	70.12	65.84	-6.13	0	-6.96	0	-1.88	.2	-4.56	.02
% Piped Water	68.56	55.9	66.33	52.7	79.96	65.6	-12.66	0	-13.63	0	-13.63	0	-12.9	0
% Sewage	22.34	16.79	20.34	15.03	32.58	22.1	-5.55	.01	-5.31	.02	-12.24	0	-7.07	.04
% Trash Removal	25.44	16.7	21.41	14.74	46.06	22.66	-8.74	0	-6.67	.01	-24.65	0	-7.93	.03
Avg. Luminosity	1.97	1.51	1.23	.73	5.74	3.87	-.45	.36	-.49	.17	-4.52	0	-3.14	0
Area (000's km2)	.5	.61	.57	.69	.14	.35	.11	.4	.12	.43	.43	.03	.34	.19
Log Distance to Parent Townhall	2.97	2.96	3.05	3.05	2.56	2.69	-.01	.89	0	.95	.48	0	.36	0
Log Distance to State Capital	5.49	5.45	5.5	5.59	5.42	5.02	-.04	.57	.09	.18	.09	.46	.58	0
Log Maize Suitability	8.64	8.69	8.68	8.69	8.45	8.67	.04	.05	.01	.58	.23	0	.03	.46
Log Wet Rice Suitability	8.57	8.68	8.56	8.68	8.64	8.71	.11	.08	.12	.14	-.09	.58	-.03	.23
Log Soybean Suitability	7.7	7.74	7.7	7.73	7.71	7.76	.04	.27	.03	.46	-.01	.83	-.03	.69
Log Wheat Suitability	6.56	6.52	6.45	6.66	7.13	6.12	-.04	.88	.2	.48	-.67	.14	.54	.21
Terrain Ruggedness	86.16	79.44	95.21	83.22	39.84	67.99	-6.72	.32	-11.99	.12	55.37	0	15.23	.18
	N = 306	N = 246	N = 256	N = 185	N = 50	N = 61								

Note: This table reports baseline descriptive statistics at the district level by the split wave (1993 and 1997). We use information from the 1991 Demographic Census, the 1992 night lights, MapBiomas, FAO-GAEZ soil suitability, and terrain ruggedness data. See Section 3 for further details on data and construction of the district-level sample.

Table D.3: Effects of Splitting on the Public Sector

	Log Capital Expenditures	Log Current Expenditures	Log Municipal Jobs	Log Average Municipal Wages
	(1)	(2)	(3)	(4)
Post x Split	0.24***	0.16***	0.15	0.01
	(0.07)	(0.02)	(0.14)	(0.03)
Observations	8,803	8,807	7,063	7,063
R-squared	0.87	0.98	0.83	0.94
State-Year FE	✓	✓	✓	✓
Mean Pre-Split	13.67	15.33	5.80	8.19
SD Pre-Split	1.43	1.13	1.31	0.43

Note: *** p<0.01, ** p<0.05, * p<0.1. This table reports the aggregate effects of splitting on the public sector. We consider the following dependent variables: log municipal capital expenditures, log municipal current expenditures, log total number of municipal jobs, and log average municipal wages. Standard errors are two-way clustered at the state and split wave levels.

Table D.4: Effects of Splitting on Public Services, Poverty, and Child Mortality

	% Piped Water	% Trash Collection	% Electricity	% Sewage	% Extreme Poverty	% Poverty	Child Mortality 1-	Child Mortality 5-
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post x Split	1.77	4.42*	2.50	1.00**	-1.33	-1.77*	-0.51	-0.78
	(1.89)	(2.31)	(2.87)	(0.40)	(1.11)	(0.96)	(0.39)	(0.55)
Observations	1,344	1,344	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	0.95	0.96
State-Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Mean Pre-Split	71.18	63.51	81.33	96.10	19.62	42.81	32.33	38.64
SD Pre-Split	24.17	27.35	20.03	7.660	14.86	20.60	9.700	12.85

Note: *** p<0.01, ** p<0.05, * p<0.1. This table reports the aggregate effects of splitting on public services, poverty, and child mortality. We consider the following dependent variables: household access to piped water, trash collection, electricity, sewage, extreme poverty, poverty, and child mortality (up to 1 and 5 years old) rates. Standard errors are two-way clustered at the state and split wave levels.

Table D.5: The Economic Effects of Splitting

	(1) Log Private Establishments	(2) Log Private Jobs	(3) Log Private Wages	(4) Log Luminosity	(5) Log Municipal Revenues	(6) Log Municipal Transfers	(7) Log Municipal Taxation
Post x Split	0.10	0.06	0.15**	0.08***	0.14***	0.16***	0.11
	(0.08)	(0.07)	(0.06)	(0.02)	(0.03)	(0.03)	(0.07)
Observations	7,152	7,152	8,925	8,276	8,809	8,808	8,808
R-squared	0.99	0.97	0.99	0.99	0.98	0.97	0.96
State-Year FE	✓	✓	✓	✓	✓	✓	✓
Mean Pre-Split	4.65	6.95	10.57	-0.04	15.50	15.49	12.77
SD Pre-Split	1.57	1.94	5.02	1.31	1.11	1.26	1.97

Note: *** p<0.01, ** p<0.05, * p<0.1. This table reports the aggregate effects of splitting on the private sector, economic activity, and public finance. We consider the following dependent variables: log total number of private establishments, log total number of private jobs, log private wages, log average luminosity, log municipal revenues, log municipal transfers, and log municipal taxes. Standard errors are two-way clustered both at the state and split wave levels.

Table D.6: Distributional Effects of Splitting on Economic Activity

	Panel A: Log Luminosity		
	Applicants	Remaining	Headquarters
	(1)	(2)	(3)
Post x Split	0.34***	-0.07	0.06***
	(0.03)	(0.10)	(0.02)
Observations	10,122	5,964	6,987
R-squared	0.96	0.95	0.98
Mean Pre-Split	-0.724	-0.848	0.221
SD Pre-Split	1.527	1.425	1.415
	Panel B: % Pixels Lit		
	Applicants	Remaining	Headquarters
	(1)	(2)	(3)
Post x Split	0.04***	-0.04*	0.00
	(0.01)	(0.02)	(0.01)
Observations	10,122	5,964	6,987
R-squared	0.96	0.94	0.97
Mean Pre-Split	0.176	0.152	0.246
SD Pre-Split	0.289	0.256	0.290
	Panel C: Log Luminosity Outside 5km Town Hall Radius		
	Applicants	Remaining	Headquarters
	(1)	(2)	(3)
Post x Split	0.34***	-0.07	0.07***
	(0.03)	(0.10)	(0.02)
Observations	10,122	5,964	6,987
R-squared	0.96	0.95	0.98
Mean Pre-Split	-0.729	-0.848	0.196
SD Pre-Split	1.531	1.425	1.409

Note: *** $p<0.01$, ** $p<0.05$, * $p<0.1$. This table reports the aggregate effects of splitting on economic activity separately for three groups of districts: applicant, remaining, and headquarters. Dependent variables for log average luminosity (Panel A), the percentage of pixels with luminosity above zero (Panel B), and log average luminosity outside a radius of 5km around the town hall (Panel C). Standard errors are two-way clustered at the state and split wave levels.

Table D.7: Distributional Effects of Splitting on Public Services

	% Piped Water	% Trash Removal	% Sewage	% Urban Population
	(1)	(2)	(3)	(4)
Panel A: Applicants				
Post x Split	9.93**	5.27***	0.53	2.88**
	(4.15)	(1.29)	(1.08)	(1.12)
Observations	1,656	1,656	1,656	1,656
R-squared	0.76	0.91	0.84	0.93
Mean Pre-Split	62.92	21.55	19.86	38.47
SD Pre-Split	26.97	27.14	25.48	26.50
Panel B: Remaining				
Post x Split	-1.51	-8.31*	-3.04	-0.97
	(4.91)	(4.01)	(3.76)	(3.49)
Observations	972	972	972	947
R-squared	0.78	0.85	0.77	0.94
Mean Pre-Split	58.86	13.06	16.20	27.68
SD Pre-Split	28.98	22.87	22.90	24.55
Panel C: Headquarters				
Post x Split	2.37	2.87***	1.49	1.77**
	(2.33)	(0.89)	(1.44)	(0.74)
Observations	1,149	1,149	1,149	1,149
R-squared	0.80	0.92	0.90	0.95
Mean Pre-Split	77.48	54.14	40.52	67.84
SD Pre-Split	21.10	26.73	30.51	22.45

Note: *** $p<0.01$, ** $p<0.05$, * $p<0.1$. This table reports the aggregate effects of splitting on public services separately for three groups of districts: applicant (Panel A), remaining (Panel B), and headquarters (Panel C). We consider the following dependent variables: household access to piped water, trash collection and sewage, and share of urban population. Standard errors are two-way clustered at the state and split wave levels.

Table D.8: Robustness Checks: Effects of Splitting on Luminosity for Applicant Districts

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Specifications						
Post x Split	0.34***	0.45***	0.10***	0.32***	0.27***	0.36***
	(0.03)	(0.04)	(0.03)	(0.04)	(0.06)	(0.03)
Observations	10,122	9,530	10,122	4,920	10,122	10,122
R-squared	0.96	0.95	0.97	0.96	0.98	0.96
Choice	Benchmark	Log	IHS	1997 Wave	Microregion FE	Controls
Mean Pre-Split	-0.724	-0.929	0.707	-0.638	-0.724	-0.724
SD Pre-Split	1.527	2.052	0.999	1.507	1.527	1.527
Panel B: Standard errors						
Post x Split	0.34***	0.34***	0.34***	0.34***		
	(0.03)	(0.05)	(0.05)	(0.03)		
Observations	10,122	10,122	10,122	10,122		
R-squared	0.96	0.96	0.96	0.96		
Std Error Clustering	State-Split Wave	Municipality	Microregion	State		
Wild Bootstrap p-value	<0.01			<0.01		
Mean Pre-Split	-0.724	-0.724	-0.724	-0.724		
SD Pre-Split	1.527	1.527	1.527	1.527		
Number of Clusters	20	422	194	11		

Note: *** p<0.01, ** p<0.05, * p<0.1. This table reports several robustness checks for the aggregate estimates of splitting on economic activity, measured by log average luminosity, for applicant districts. Panel A shows that the results are robust to different choices of specifications, dependent variables, and samples. Column (1) repeats the benchmark specification from Equation (3). Column (2) does not add 0.1 to the average luminosity, while Column (3) applies inverse hyperbolic sine transformation to the average luminosity. Column (4) restricts the sample to districts involved in the 1997 wave. Column (5) adds micro region-by-year fixed effects to the set of controls. Column (6) controls for baseline characteristics from Appendix Table D.1 interacted with year fixed effects. Panel B shows that the results are robust to choices of clustering the standard errors. Column (1) refers to the standard choice of two-way clustering at the state and split wave levels. Columns (2), (3) and (4) consider clustering at the municipality, micro region and state levels, respectively. To account for the small number of clusters, Columns (1) and (4) additionally report wild bootstrap p-values.

Table D.9: The Politics of Splitting

	Some Applicant	Some Split	Some Applicant	Some Split
	(1)	(2)	(3)	(4)
Mayor and Governor from the Same Party	-0.00	0.04		
	(0.01)	(0.05)		
Left-Wing Mayor			0.05*	0.09
			(0.03)	(0.07)
Observations	3,144	338	3,148	340
R-squared	0.16	0.21	0.17	0.22
State and Election Year FE	✓	✓	✓	✓
Controls	✓	✓	✓	✓
Mean Pre-Split	0.118	0.743	0.101	0.763
SD Pre-Split	0.323	0.438	0.301	0.426

Note: *** p<0.01, ** p<0.05, * p<0.1. This table reports political correlates of splitting decisions for the two waves of splitting in our data, 1993 and 1997. In Columns (1) and (3), the dependent variable is an indicator for having a split request in the municipality. In Columns (2) and (4), the dependent variable is an indicator variable for having split, and we restrict the sample to municipalities with some split request. We classify parties as left-wing following Zucco and Power (2023). Controls are log population, log area, log distance to the state capital, urbanization rate, Gini index, and the percentage of households with access to piped water and trash collection in 1991. We report robust standard errors.

Table D.10: Migration Effects of Splitting

	(1)	(2)	(3)
Split	0.16	0.19	-0.23
	(0.69)	(0.68)	(0.69)
Observations	220	220	220
R-squared	0.00	0.05	0.22
Controls	-	✓	✓
State FE	-	-	✓
Mean	9.8	9.8	9.8
SD	4.4	4.4	4.4

Note: *** p<0.01, ** p<0.05, * p<0.1. This table reports the aggregate effects of splitting on migration after estimating Equation (4). Column (1) considers a regression without state fixed effects and baseline characteristics from Table 1 in the set of controls. Column (2) controls for baseline characteristics, while Column (3) further adds state fixed effects to the set of controls. We consider the fraction of residents who declare having lived in another municipality five years before as the dependent variable. The main data source is the decennial Demographic Census from 2000. We report robust standard errors.

E Difference-in-Discontinuities in Luminosity

Econometric Specification. Using the nighttime luminosity data at the district level, we estimate the following difference-in-discontinuities model in two stages:

$$Split_{m(d)} = \psi + \phi \mathbf{1}[RV_d \geq 50\%] + \kappa g(RV_d) + \eta_d \tag{17}$$

$$y_{dt} = \alpha_d + \alpha_t + \beta Split_d Post_{w(d)} + \gamma g(RV_d) Post_{w(d)} + X_{dt}\lambda + \varepsilon_{dt}. \tag{18}$$

From the first-stage Equation (17), we have that $Split_{m(d)}$ is an indicator variable for whether the municipality m with district d split after the referendum; RV_d represents the referendum vote share in favor of splitting in district d; $g(RV_d)$ is defined as a linear distance from the cutoff; and $\mathbf{1}[RV_d \geq 50\%]$ is an indicator for whether district d obtained at least half of votes in the referendum. The second-stage Equation (18) includes district and year fixed effects, α_d and α_t; and $Post_{w(d)}$, which is an indicator variable for the years after the wave-year w of splitting request. To account for fewer observations on the left side of the cutoff, our preferred specification considers a 15 percent bandwidth. The coefficient of interest, β, captures the effect of splitting. To support the validity of the research design, Appendix Table E.1 shows that most pre-referendum characteristics at the district level around the cutoff are continuous, except for population. To attenuate any bias in our estimates, we include interactions of 1991 population and year fixed effects as controls in the results below to allow for differential trends across levels of population.[30]

Panel (a) of Appendix Figure E.1 provides visual evidence of the first stage, confirming that having a simple majority determines splitting. Comparing applicant districts that barely obtained the majority of necessary votes to split to those that did not, Panel (a) of Appendix Figure E.2 displays a clear jump on the growth of log luminosity around the cutoff. Columns (1) and (3) of Appendix E.2 point to the Wald estimate of 28 percent ($= 0.27/0.96$). This effect is close to the difference-in-differences estimate restricted to the state of *Minas Gerais* (Column (4)). Concerning heterogeneity across districts, Panel (b) of Appendix Figure E.2 shows that the gains are driven by applicant districts.

[30] We use baseline characteristics from 1991. Panel (b) of Appendix Figure E.1 depicts the distribution of vote shares around the 50 percent cutoff. We note there are fewer districts with less than half of the voters.

Table E.1: Discontinuity Test on Pre-Referendum Characteristics

	Log Population	Log Area	Log Luminosity	Log Distance to Townhall
	(1)	(2)	(3)	(4)
Referendum Vote $\geq$ 50%	0.81***	0.18	0.58	-0.05
	(0.28)	(0.34)	(0.37)	(0.30)
Observations	50	50	50	50
R-squared	0.38	0.23	0.40	0.13
Mean Control	9.577	5.147	0.354	2.849

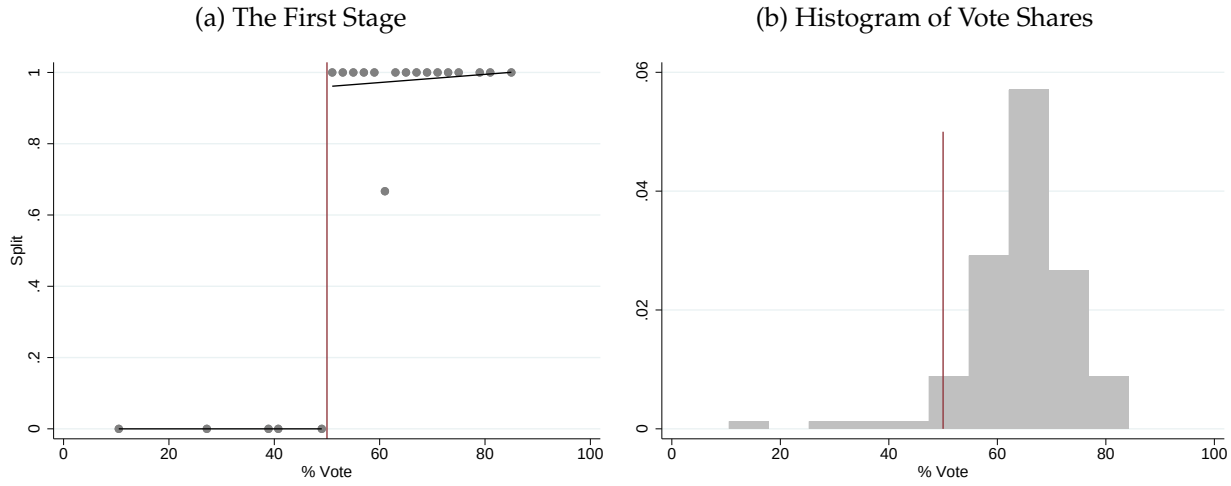
Note: *** p<0.01, ** p<0.05, * p<0.1. This table reports point estimates from modified versions of Equation (17) to test for discontinuities in district-level characteristics prior to the referendum. We use these pre-referendum characteristics: log total population, log total area, log average luminosity, and log distance to the parent town hall.

Table E.2: Effects of Splitting on Economic Acitivity

	First Stage	Reduced Form	Second Stage	DD
	(1)	(2)	(3)	(4)
Referendum Vote $\geq$ 50%	0.96***			
	(0.03)			
Post x Referendum Vote $\geq$ 50%		0.16***		
		(0.06)		
Post x Split			0.27***	0.26***
			(0.06)	(0.03)
Observations	50	985	985	2,422
R-squared	0.64	0.97	0.97	0.98
Mean Control	0	-1.001	-1.001	-0.802

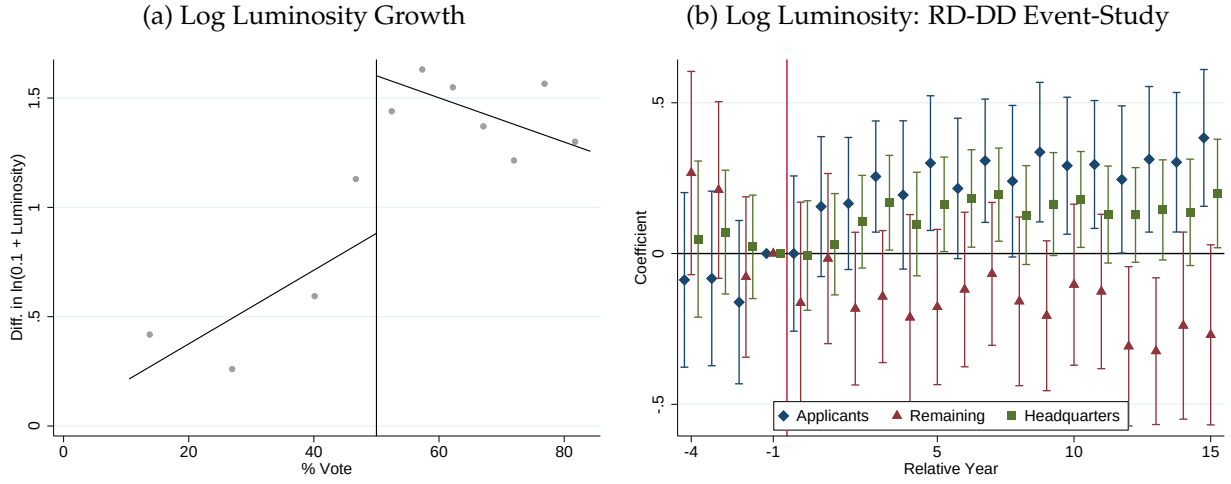
Note: *** p<0.01, ** p<0.05, * p<0.1. This table reports point estimates from the difference-in-discontinuities specification. Column (1) refers to the first stage from Equation (17), while Column (2) reports the reduced-form estimates. Column (3) refers to Equation (18). Column (4) speaks to the difference-in-differences estimates from Equation (3) restricted to the state of *Minas Gerais*. Except for Column (1), whose dependent variable is an indicator variable for splitting, the remaining dependent variables are log average luminosity.

Figure E.1: Referenda in *Minas Gerais*



Note: This figure describes the referendum data from Minas Gerais. Panel (a) plots the first stage of referendum votes on the likelihood of splitting. Panel (b) plots the distribution of vote shares. As described in Section 2, districts are required to obtain at least 50 percent turnout and votes in favor of splitting in the unilateral referendum as one of the steps to become a municipality.

Figure E.2: Effects of Splitting on Log Luminosity: Difference-in-Discontinuities



Note: This figure reports results from specifications in Appendix Section E. Panel (a) plots the growth in log luminosity for applicant districts with share of votes from local referendum in favor of splitting below and above the approval cutoff of 50 percent. Panel (b) plots point estimates of the difference-in-discontinuities from Equation (18) for the applicant, headquarters, and remaining districts separately. The omitted category is the year before splitting.