On the impacts of territorial fragmentation on voter engagement

Abstract

In recent decades, territorial reforms have shown contrasting trends globally. Developed countries have focused on consolidating local governments into larger units for economies of scale and efficiency, while developing countries have opted for fragmentation to enhance political representation and resource allocation. This paper examines the impact of territorial divisions on local governments in Brazil, focusing on their effects on voter engagement. We build novel data to analyze electoral outcomes from 1988 to 2020 of 621 areas affected by municipal splits. We employ a difference-in-differences, using unsuccessful emancipation attempts to build the control group. Our study shows that there is an increase in electoral participation following the establishment of new municipalities, both in municipal and general elections. This effect is even more pronounced in areas with high fragmentation. Additionally, we found that intrinsic motivations to vote and fewer logistical challenges are likely the main reasons for the increase in voter turnout.

Keywords: Territorial fragmentation, Decentralization, Voter turnout, Difference-in-differences.

JEL: D72, H77, N46.

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1. Introduction

In recent decades, there have been contrasting trends in territorial reforms worldwide. Developed countries have primarily focused on consolidating local governments into larger administrative units to achieve economies of scale and increase efficiency. On the other hand, many developing countries have opted to fragment their territories, creating smaller administrative units to enhance political representation and allocate resources more effectively to address local needs. Although recent quasi-experimental studies have mainly examined the effects of government mergers in developed nations, there is a notable lack of research on the impacts of territorial splits in developing countries (Gendźwiłł et al., 2021). A clearer understanding of fragmentation effects allows us to better comprehend the impact of decentralization on economic development and political dynamics.

This study examines the impact of territorial divisions on local electoral engagement in Brazil. To achieve this, we analyze data from 1988 to 2020, focusing on 621 areas that experienced municipal splits across nineteen states. Brazil presents a unique context for examining territorial reforms. The 1988 Federal Constitution initiated a move towards decentralization by granting municipalities greater autonomy and encouraging the establishment of new ones by means of increased vertical transfers (Tomio, 2002). From 1991 to 2013, the number of municipalities increased from 4,491 to 5,569, with 80% of them having fewer than 10,000 residents. This substantial growth provides a valuable context for assessing the impact of territorial splits.

A key challenge in this literature is the endogeneity, as decentralization is often linked to unobserved factors, such as subnational political power and resources, leading to reverse causality (Rodden, 2019; Besley and Case, 1995). Recent studies have explored territorial reforms as a source of exogenous variation in decentralization, using two-way fixed effects (TWFE) regression to assess their impact on local economies. However, recent developments in difference-in-differences methods show that TWFE can yield biased estimates due to group or time heterogeneity. To overcome this issue, we utilize the difference-in-differences estimator proposed by Callaway and Sant'Anna (2021) to evaluate the effects of municipal fragmentation. This method accommodates treatments across multiple periods while relying on the conditional parallel trends assumption, and we apply it with the inverse probability weighting (IPW) matching approach (Abadie, 2005).

We built a novel dataset on requests for municipal splits from regional electoral courts (TREs) and legislative assemblies from 1988 to the early 2000s. This approach enabled us to assemble a control group of "almost treated" municipalities (those whose split attempts failed), providing a more suitable comparison for the newly formed municipalities. Moreover, we digitized electoral data from the 1988 and 1992 local elections, including from scanned archival documents, and combined it with existing data from the Superior Electoral Court (TSE) for subsequent elections.

Our study highlights two important findings. First, political engagement rose after the administrative division. The voter turnout rate increased by 1.95 percentage points for municipal elections and by 2.19 percentage points for general elections (federal and state positions). The effects on valid votes were similar, while the impact on blank and null votes was weak. Moreover, we also found that highly fragmented areas experience significant

increases in voter turnout, with increases of 3.36 percentage points in municipal elections and 3.42 percentage points in general elections. This indicates that smaller municipalities have a greater impact on voter engagement compared to larger jurisdictions.

Votes for the local election nearly tripled in weight with the establishment of new municipalities. However, the pivotal probability for general elections has remained unchanged, while turnout rates have been similarly affected. Therefore, the increase in voter participation cannot be solely attributed to the increased weight of individual votes. Instead, we found that the rise in turnout is likely due to fewer logistical challenges, stemming from improved access to private vehicles and public transportation after the split. Additionally, the reduction in the electorate's size, along with an increased ratio of officials to residents, likely contributed to a more cohesive community. As a result, this created a greater sense of civic duty, increased social pressure to vote, and enhanced political efficacy among citizens, which are essential drivers of electoral participation.

We contribute to two main areas of economic literature. First, the literature on traditional fiscal decentralization advocates for transferring responsibilities and resources from central to local governments. This approach would better accommodate local preferences, enhance accountability and increase responsiveness, and strengthen democratic practices (Tiebout, 1956; Oates, 1972; Brennan and Buchanan, 1980). To date, few studies have examined the effects of territorial reforms on electoral participation. Most existing research has focused on the amalgamation of subnational governments in developed countries, which has typically resulted in decreased turnout following a merger (Lapointe et al., 2018; Koch and Rochat, 2017; Roesel, 2017).

Our study builds on previous research that examined the effects of Brazilian municipal splitting in the 1990s on financial aspects, public service delivery, and socioeconomic indicators (Dahis and Szerman, 2024; Mattos and Ponczek, 2013; Lima and Silveira Neto, 2018). This paper presents the first empirical estimates of how territorial fragmentation affects turnout in municipal and general elections. Compared to previous studies, we expanded the control group sample by including more states whose municipalities attempted territorial splitting but were unsuccessful. We used a difference-in-differences estimator robust to heterogeneous effects, rather than relying on a TWFE regression as previous studies have.

Our second area of contribution focuses on voting behavior within the context of political economy and political science, based on the rational voter model to analyze voter turnout (Downs, 1957; Riker and Ordeshook, 1968). According to this model, Voters evaluate the costs of voting, the probability that their vote will be pivotal, the comparative advantages of their preferred candidate, and their intrinsic motivations. Territorial reforms can influence these mechanisms by affecting the size of the electorate and potentially strengthening the connection between officials and their constituents. This, in turn, may enhance citizens' engagement in the voting process. Brazil is a notable example of territorial fragmentation that led to the creation of several small municipalities, substantially increasing public spending. We contribute to the existing literature by presenting empirical estimates that suggest logistical improvements and expressive motivations, such as civic duty, social norms, and political efficacy, were likely the primary drivers of increased electoral turnout in the newly established municipalities.

This study is organized as follows. Section 2 details the process of territorial emancipation, offering context for the Brazilian institutional environment in the 1990s. Section 3 presents the Downsian voting model and highlights the mechanisms by means of which territorial reforms can influence electoral participation. Section 4 discusses potential biases in the TWFE regression and introduces the estimator developed by Callaway and Sant'Anna (2021), which was applied in this study. Next, Section 5 details the sample construction, the variables used, and provides descriptive statistics. In Sections 6 and 7, we present our empirical findings and discuss them. Finally, we conclude our study in Section 8.

2. Institutional background

After Brazil's re-democratization, there was a significant movement toward political and administrative decentralization, transferring power from the federal government to the municipalities. As a result, the 1988 Federal Constitution (CF/88) elevated municipalities to the status of entities within the Federation, alongside the federal government and the states. This change ensured greater decision-making autonomy for municipalities, increased resources from intergovernmental transfers, and facilitated territorial reforms. Consequently, the number of municipalities grew from 4,490 in 1991 to 5,569 in 2013.

The Municipal Participation Fund (FPM) is one of the primary revenue sources for municipalities, distributed based solely on population size. It allocates larger per capita amounts to smaller jurisdictions and smaller amounts to larger ones.[1] Therefore, it is not surprising that the establishment of new municipalities significantly increased the share of FPM resources for areas affected by this reform (Mattos and Ponczek, 2013; Lima and Silveira Neto, 2018; Dahis and Szerman, 2024). This fact is often cited as a key reason for the substantial territorial fragmentation observed in the 1990s (Boueri et al., 2013; Tomio, 2002).

This fiscal incentive for creating smaller jurisdictions was supported by the institutional and legal changes enacted in 1988. Prior to this year, the minimum criteria for municipal splits were largely uniform across all states. These requirements included geographic contiguity and minimum levels of population, urban development, and share of state government revenue. With the new Constitution, each state began to establish its own criteria by means of complementary laws. As a result, some states modified their requirements by either relaxing or tightening them, while also introducing new criteria, such as the age of the emancipatory district and its distance from the municipal seat.[2]

According to Tomio (2002), the permissiveness level of state regulations does not fully explain the rise of new jurisdictions. Political factors, such as the governor's ideology and his/her relationship with the legislative assembly, also significantly influenced the establishment of new municipalities. Both Executive and Legislative branches had the authority to stop the emancipation process, which typically followed these steps:

[1] Further information on the distribution criteria at A.1 and A.2, and Figure A.1.

[2] Refer to Table A.3 for further details for municipal splitting.

1. local leaders requested an emancipation plebiscite from the state legislative assembly;
2. state deputies voted on a bill to authorize the plebiscite;
3. governor decided to veto the bill or to sign it into law;
4. plebiscite was conducted by the state electoral court with potentially affected voters;
5. state deputies voted on a bill to create the new municipality;
6. governor decided whether to veto or approve the emancipation; and
7. municipality would be established in the year following the municipal elections.

The governor had two opportunities to stop the process by vetoing the bills related to the plebiscite and the creation of the new entity. However, the legislative assembly could override these vetoes, allowing the bills to become law. Consequently, state deputies held most power in approving and vetoing legislation during the emancipation process. Lawmakers typically supported the preferences of local leaders and voters because opposing these measures could result in negative electoral consequences for them. Therefore, split request rejections occurred only when the Executive opposed creating a new municipality and was supported by a strong political coalition in the Legislative branch (Tomio, 2002).

In 1996, Constitutional Amendment 15 was enacted to reduce the rate of new municipality creation. This was achieved by requiring the establishment of a federal law to regulate the subnational processes of emancipation. As a result, only a limited number of municipalities were established after 2000. Some of these divisions were based on processes that had already been initiated earlier, while others are subjects of legal disputes and have even been deemed unconstitutional by the Brazilian Supreme Court (Acayaba, 2008; Rollsing, 2021).

3. Downsian voting model and jurisdiction size

Understanding voter behavior is a core component of political economy and political science, with its examination guided by two seminal theoretical frameworks. Downs (1957) introduced the rational choice model, which states that, in its purest form, a voter decides to participate in an election if the expected benefits outweigh the costs of casting a ballot (instrumental voting). This reasoning implies that a small number of people would not vote in large electorates, since the impact of each individual vote decreases as the number of voters increases, a dilemma known as the "paradox of voting."

Building on this work, Riker and Ordeshook (1968) introduced an expressive element that captures the intrinsic rewards of voting and is not directly related to the election outcome. It reflects the intrinsic benefits individuals obtain from voting, such as civic duty, partisan affirmation, and social pressure. These motivations are crucial for explaining why voter turnout can remain high, even when strategic incentives are minimal, particularly in large-scale elections where the impact of a single vote is relatively small.

These two frameworks, along with subsequent theories and hypotheses, highlight the factors that drive voter participation in elections and can be expressed as:

$$U = PB - C + D, \tag{1}$$

where U represents the expected utility derived from voting, which is determined by four key factors: the probability that an individual's vote will influence the election outcome (P), the net benefit of electing the preferred candidate compared to an alternative (B), the costs associated with voting (C), and the expressive element (D). Ultimately, a voter will cast a ballot in the current election only if $U > 0$.

In the following subsections, we will explore the theories and hypotheses[3] related to each term in the equation (1) and how territorial reforms may influence them. These reforms can have a significant impact on the political and economic dynamics of the affected areas, primarily by changing the population size.

3.1. Pivotal probability (P)

The probability of a vote being pivotal, P, is influenced by two key factors. First, the *expected closeness of the election* increases the likelihood that a single vote can change the outcome, which encourages a higher voter turnout (Downs, 1957; Riker and Ordeshook, 1968). Second, the *size of the electorate* plays an important role because as the number of voters increases, the impact of each individual vote diminishes.

Territorial fragmentation significantly influences pivotal probability by dividing a larger jurisdiction into at least two smaller ones. Each of these smaller areas has fewer voters than the original, which increases the weight of each individual ballot in local elections. As a result, this change tends to boost voter turnout for local elections. However, it is expected to have no effect on regional or national elections.

On the other hand, fragmentation may reduce the competitiveness of local elections, as smaller jurisdictions tend to foster more homogeneous communities (Tiebout, 1956) and policy agendas, as local politicians could become more responsive to local preferences (Lapointe et al., 2018). This would decrease the need for political participation (Oliver, 2000; Bönisch et al., 2019).

3.2. Net benefit (B)

Larger jurisdictions can achieve economies of scale and increase resources, leading to more efficient delivery of public goods (Oates, 1972; Larsen, 2002; Dollery, 2010). Smaller administrative units may face more policy constraints, leading to candidates with more *similar policy agendas*. This similarity can reduce citizens' motivation to vote for their preferred candidates (Franklin, 2004; Marshall and Fisher, 2015), although this has not been empirically observed at the subnational level (Aaskoven, 2021). Additionally, voter turnout is influenced by citizens' beliefs about how much political leaders and governments respond to their demands, referred to as *external political efficacy* (Balch, 1974; Norris, 2015). This can influence how voters view the benefits of their preferred candidates.

Brazil presents an intriguing case, as fragmentation reforms created smaller municipalities, while also increasing the influx of resources to local governments (Dahis and

[3]Most recent empirical studies in this field have primarily focused on amalgamation. Consequently, we adapted the reasoning for the opposite territorial reform (fragmentation).

Szerman, 2024; Lima and Silveira Neto, 2018; Mattos and Ponczek, 2013), a benefit often attributed to territorial consolidations. This additional resource could increase the incentive to vote by enhancing the perceived benefit of a preferred candidate winning an election. Moreover, a higher ratio of representatives to residents in smaller areas likely contributes to stronger external political efficacy (Dagger, 1981; Frandsen, 2002; Carr and Tavares, 2014), as residents often advocate for more direct governance and visibility of government actions (Faguet, 2004; Van Houwelingen, 2017).

3.3. Cost (C)

The cost of voting primarily involves the *time and effort* required to engage in the electoral process. This includes the mental effort needed to decide whom to vote for, particularly when voters lack sufficient information about the candidates and the preferences of other voters (Palfrey and Rosenthal, 1985). Additionally, there are logistical challenges to consider, such as traveling to the polling place, especially when long distances must be covered or public transportation is inadequate (Brady et al., 1995). For example, owning a car positively affects voter turnout (De Benedictis-Kessner and Palmer, 2023).

Smaller municipalities could decrease the overall cost of voting (C) by reducing both the informational and logistical burdens on voters. They could simplify policy agendas, making them more immediate and less abstract, allowing voters to spend less time and cognitive effort evaluating their choices (McDonnell, 2020; Lassen and Serritzlew, 2011). Additionally, smaller geographic areas can reduce logistical challenges and time commitments by improving voter access to polling stations, thereby significantly boosting voter turnout (Cantoni, 2020).

Migration, both inflow and outflow, is another channel by means of which the voting costs can be affected (Highton, 2000; Hansen, 2016; Pardelli and Kustov, 2025). Inmigrants often lack the information on local politics, while out-migrants have increased logistical and time costs to vote back home. Territorial fragmentation can promote "voting with feet" behavior (Tiebout, 1956), as the increasing number of jurisdictions may motivate citizens to migrate to a new location that best meets their needs.

Finally, the cost of participation is also influenced by the electoral system. For instance, mandatory voting contributes to higher levels of voter turnout (León, 2017). In Brazil, citizens face fines and restrictions on accessing public services if they fail to comply with compulsory voting. Although the monetary cost of the fine is relatively low (just a few dollars), there is also a time cost associated with paying the fine, which can considerably increase the overall burden of not voting (and reduce the cost of participating in elections, C). In this context, when citizens vote without a preferred candidate ($B = 0$), casting an invalid vote (blank or null) can be seen as an equivalent option to abstaining. This behavior may reflect voters' dissatisfaction with the political or economic situation (Power and Roberts, 1995).

3.4. Expressive term (D)

Territorial reform can enhance the expressive reward of voting, D, by reshaping the social and psychological motivations that drive voter turnout. Dividing a municipality

into smaller units can foster a stronger sense of community among residents (Koch and Rochat, 2017; Alexander, 2013). This may enhance the perception of voting as a *civic duty*, as individuals recognize their responsibilities to support the local community and uphold democratic values (Blais et al., 2000; Funk, 2010; Knack, 1992), although this perception may diminish if elections occur too frequently (Kostelka, 2025).

Citizens often experience *social pressure* to vote, driven by the desire to conform to societal norms and maintain their standing within the community (Gerber et al., 2008; Dellavigna et al., 2017). In smaller jurisdictions, where neighbors and peers are more likely to observe each other's voting behavior, encouraging individuals to participate at higher rates in order to avoid community disapproval.

Shifts can influence the sense of community in population. Both in-migration and out-migration can disrupt community cohesion and participation norms, which are important factors for voter turnout (Gerber et al., 2008; Pardelli and Kustov, 2025; Alesina and Giuliano, 2011; Fowler, 2005). This disruption may affect voters' sense of civic duty and their motivation to adhere to social norms in their new environments.

Moreover, individuals are more likely to vote when they believe in their ability to understand and engage in politics, a concept known as *internal political efficacy* (Niemi et al., 1991). When local jurisdictions are smaller, residents tend to develop closer relationships with their local officials and face more straightforward policy choices, making political engagement feel more accessible. As a result, these factors enhance citizens' confidence in their own abilities, which strengthens internal political efficacy and increases the personal satisfaction they derive from voting.

Voters may also find satisfaction in expressing their *partisan identity* (Riker and Ordeshook, 1968) by backing a candidate or political party, even one with little chance of winning. In Brazil, the debate about territorial fragmentation was not primarily shaped by ideological divides between left- and right-wing parties. Instead, local communities often sought to create new municipalities to gain administrative autonomy and secure access to fiscal transfers (Tomio, 2002). As a result, it is unlikely that fragmentation affected individuals' loyalty towards any political party.

However, it may have influenced voters' support for individual candidates, particularly in the short term. Local leaders in Brazil played a crucial role in initiating and advocating for the process of territorial emancipation from their original municipalities. These leaders often emerged as strong contenders for mayoral and council positions, which likely influenced voters' decisions to support them, even when they were not the strongest candidates.

Electoral participation can also be influenced by *voting habit*, which refers to the tendency of voters to stick with their previous voting decisions (Gerber et al., 2003; Goldberg and Sciarini, 2023; Meredith, 2009). For example, external factors such as adverse weather conditions can lead to reduced turnout in one election, which in turn may lower the likelihood of voter participation in next one (Fujiwara et al., 2016). The municipal division likely served as an electoral catalyst, as communities sought greater autonomy by means of local plebiscite and voting for the first local officials, expressing their desire to form a new municipality. This may have boosted initial voter participation and contributed to the

establishment of a consistent voting habit over time, alongside other expressive factors.[4]

3.5. Empirical evidence on territorial reforms

Theories and hypotheses suggest that territorial fragmentation can influence voter turnout by means of both instrumental and expressive factors. However, empirical questions remain about the effects of Brazilian territorial fragmentation on voter turnout, including which channels have the most significant impact on electoral participation and how this impact evolves over time.

Recent empirical studies use territorial reforms as an exogenous shock to identify the causal effect of population size on voter engagement. They mainly focus on the mergers of jurisdictions in developed countries (Roesel, 2017; Lapointe et al., 2018; Harjunen et al., 2017; Cobban, 2019; Lyytikäinen and Tukiainen, 2019, and others) and primarily employ difference-in-differences and synthetic control methods. The key conclusion from these studies is that municipal mergers decrease voter turnout.

Some studies have examined the varying effects on voter turnout. Koch and Rochat (2017) found that while turnout significantly decreases in the first election after municipal mergers, this impact decreases over time. Allers et al. (2021) discovered that the effects can persist for at least five elections. Lapointe et al. (2018) noted that the negative impact on turnout is primarily observed in smaller municipalities that have been annexed to larger ones. Furthermore, the decline in turnout was three times greater for local elections compared to general elections in Allers et al.'s (2021) study.

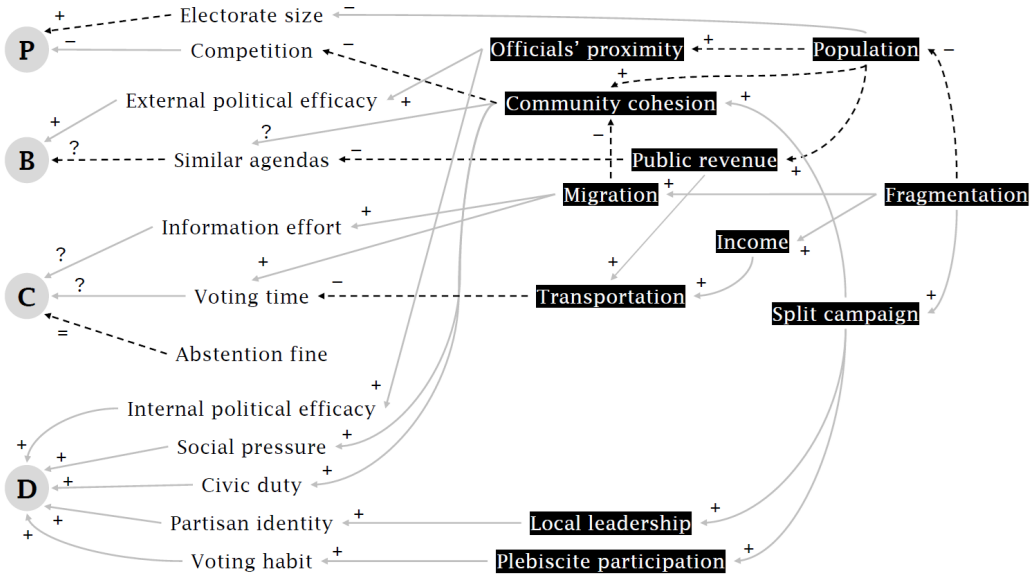
Most existing studies concentrate on amalgamations in developed democracies, while the opposite process (fragmentation) has been largely overlooked. To our knowledge, only three studies in Brazil, one in India, and one in Italy have evaluated the impacts of this reform. In Brazil, there was a significant increase in federal transfers and expenditures in the newly created municipalities (Lima and Silveira Neto, 2018). However, the findings regarding public service provision were mixed. Mattos and Ponczek (2013) found negative impacts on services such as sewage, trash collection, electricity, and literacy rate, while Dahis and Szerman (2024) reported either positive or null effects on these same services. This study identified positive effects on nighttime luminosity (a proxy for economic activity), public sector employment, and private wages. However, Dahis and Szerman (2024) did not observe any significant impact on private establishments and jobs, which ultimately did not influence local tax revenue.

Narasimhan and Weaver (2024) found that the decentralization process in the Indian state of Uttar Pradesh enhanced educational and infrastructure outcomes, increased the number of beneficiaries of assistance and labor programs, and led to higher turnout and more candidates per 1,000 inhabitants. Cerqua and Di Matteo (2025) analyze the estab-

[4]Gerber et al. (2003) and Meredith (2009) found that habit formation consistently increased voter turnout. However, these studies may have mixed effects of voting inertia and lasting changes in voters' perception on civic duties and exposure to media and education (Fujiwara et al., 2016).

lishment of five new municipalities in Italy, finding non-significant effects, particularly in national elections, and some positive increases in municipal elections.

Figure 1: Turnout factors, mechanisms, and expected fragmentation changes



Notes: The four main nodes (P, B, C, and D) represent the factors that influence the voter turnout in model (1). The nodes are interconnected through mechanisms that are influenced by changes resulting from territorial fragmentation (indicated by black rectangles). Solid gray lines represent positive relationships, while dashed black lines indicate negative relationships. The plus, minus, and question mark symbols represent positive, negative, and unknown effects, respectively, that arise from a municipal split, based on theoretical, hypothesized, or evidenced effects.

Figure 1 summarizes this section by showing the four key factors influencing electoral participation: pivotal probability (P), net benefit (B), cost (C), and expressive elements (D). It highlights how territorial fragmentation changes impact these factors by means of voter turnout mechanisms. Brazil presents a unique case of territorial fragmentation primarily due to its compulsory voting system and the rapid establishment of new municipalities, with nearly 88% of them having fewer than 10,000 residents. In this context, the Downsian model is particularly relevant for understanding the factors that drive voter turnout, as both instrumental and expressive motivations are affected.

4. Empirical strategy

In this study, we examine the establishment of new municipalities in Brazil, which primarily took place in the 1990s as a means to promote political and fiscal decentralization to local governments. To assess the impact of territorial splitting on voter engagement, we employed a difference-in-differences approach. This method is commonly used in recent literature concerning territorial reform, particularly for mergers that have occurred in developed countries (Gendźwiłł et al., 2021).

Research in this field has employed two-way fixed effects (TWFE) regression to evaluate the impact of territorial reforms, including those in Brazil (Mattos and Ponczek, 2013; Dahis and Szerman, 2024; Lima and Silveira Neto, 2018), primarily by using its dynamic form:

$$Y_{it} = \mu_i + \lambda_t + \sum_{\substack{\ell=K \\ \ell \neq -1}}^{L} \boldsymbol{\beta}_\ell \, \mathbf{1}\{t - F_i = \ell\} + \boldsymbol{X}'_{it}\boldsymbol{\theta} + \boldsymbol{\varepsilon}_{it}. \tag{2}$$

In our case, Y_{it} represents an electoral outcome for municipality i at year t. The term μ_i denotes the fixed effect for each municipality, while λ_t indicates the fixed effect for time. The β_ℓ represent the event-study effects and $\mathbf{1}\{t - F_i = \ell\}$ are dummies for time relative to territorial fragmentation ℓ, which ranges from $K \leq -2$ to $L \geq 0$, with F_i denoting the first period in which municipality i is split. Finally, $\boldsymbol{X}'_{it}$ denotes covariates along with their coefficients $\boldsymbol{\theta}$, and ε_{it} represents the idiosyncratic error term.

However, recent literature on difference-in-differences (DiD) has raised concerns regarding the validity of earlier findings using this regression approach. This bias arises because, in addition to comparing treated with untreated (or not yet treated) units to calculate the average treatment effect on the treated (ATT), the TWFE regression also compares one treated unit with another treated unit that received the treatment earlier ("forbidden comparisons") (Roth et al., 2023; de Chaisemartin and D'Haultfœuille, 2023; Goodman-Bacon, 2021).

In recent years, new DiD estimators have been proposed to address potential heterogeneity bias in staggered treatment designs (Borusyak et al., 2024; de Chaisemartin and d'Haultfoeuille, 2020; Sun and Abraham, 2021). In this type of design, a unit becomes treated once and remains treated for the duration of the analysis period. In this study, we employed the estimator developed by Callaway and Sant'Anna (2021), an alternative to equation (2)[5] that addresses the potential bias caused by heterogeneity by estimating multiple disaggregated effects, denoted as $\text{ATT}(g, t)$. These represent the average treatment effects on the treated at time t for groups who were first treated at time g, where $g \leq t$. By doing this, We can carefully select appropriate comparisons and aggregate them into a single average treatment effect on the treated (ATT). We can also aggregate by group, time, or event study to enable further analysis.

[5]We also calculated estimates using equation (2) and other alternative staggered difference-in-differences estimators (Borusyak et al., 2024; Sun and Abraham, 2021) as robustness checks in subsection 6.4.

This framework relies on parallel trends to identify the average treatment effect on the treated (ATT). However, this assumption may not be valid if the pre-treatment characteristics that influence outcome dynamics are not balanced between the treatment and control groups, leading to potential selection bias. Therefore, to strengthen the credibility of the parallel trends, one may apply a parametric or semi-parametric approach to adjust for potential differences between these groups using time-invariant covariates.

Callaway and Sant'Anna (2021) suggests three approaches. The first one is the outcome regression (OR) (Heckman et al., 1997), which models the control group's outcomes based on their covariates, allowing us to estimate an adjustment on the treated unit's counterfactual based on their baseline characteristics. The second method is the inverse probability weights (IPW) (Abadie, 2005), a matching method that reweights the control units to make their characteristics similar to those of the treatment group. The doubly robust (DR) (Sant'Anna and Zhao, 2020) approach combines both previous methods, providing increased robustness since the estimate is unbiased if either the propensity score model or the outcome regression model is correctly specified.

To strengthen the parallel trends assumption and minimize potential selection bias, we also considered municipalities that requested a territorial split but were unsuccessful as control units. This could either be due to their requests being rejected during the emancipation process or being suspended after the implementation of the Constitutional Amendment 15/1996. We refer to these jurisdictions as "almost treated" (Lima and Silveira Neto, 2018; Dahis and Szerman, 2024). These units are arguably more suitable as control groups since they "selected themselves" for a territorial division. Additional information about these units is discussed further in the next section.

5. Data

5.1. Split requests

Data on the establishment year of new municipalities was obtained from the Brazilian Institute of Geography and Statistics (IBGE). Between 1990 and 2013, the number of municipalities in Brazil increased by 1,078, representing a 24% growth. No additional municipalities were established afterward.

This increase was unevenly distributed among the states (Table 1). There are notable differences as some states experienced significant relative increases in the number of municipalities despite belonging to the same region and having similar socioeconomic conditions. In the Northeast, the number of municipalities in Bahia increased by 0.5%, while in Piaui, it surged by 90%. This substantial growth in Piaui led to a significant reallocation of the FPM transfers among municipalities due to the larger relative increase in new jurisdictions. As a result, this may violate the stable unit treatment value assumption (SUTVA), because the municipalities used as control groups might experience reduced transfers due to the establishment of new municipalities within the same state.

Since the emancipation process was carried out by subnational governments, there is no single source that compiles all territorial reform attempts. Consequently, the lists

of unsuccessful emancipation attempts were gathered from the websites or by direct requests to state public entities. Unlike Dahis and Szerman (2024) and Lima and Silveira Neto (2018), we did not exclusively obtain this data from legislative assemblies. We also sourced it from regional electoral courts, as they play a role in the emancipation process by organizing plebiscites. This paper examines nearly twice the number of states compared to similar studies (Table 1).

Table 1: Successful and failed split requests by state

	Municipalities			Split requests		Failures collected		
State	**1990**	**2013**	**Δ%**	**succeeded**	**failed**	**NHS**	**DS**	**LSN**
Brazil (all states)	4,491	5,569	24%	1,079	605	19	11	10
North								
Acre	12	22	83%	10	–			
Amapa	9	16	78%	7	6	✓	✓	
Amazonas	62	62	0%	0	–			
Para	105	144	37%	39	9	✓	✓	
Rondonia	23	52	126%	29	10	✓	✓	
Roraima	8	15	88%	7	0	✓		
Tocantins	79	139	76%	60	15	✓		
Northeast								
Alagoas	97	102	5%	5	–			
Bahia	415	417	0.5%	2	113	✓		✓
Ceara	178	184	3%	6	–			
Maranhao	136	217	60%	81	17	✓		
Paraiba	171	223	30%	52	–			✓
Pernambuco	168	185	10%	17	54	✓		✓
Piaui	118	224	90%	106	4	✓		
Rio Grande do Norte	152	167	10%	15	–			
Sergipe	74	75	1%	1	–			
Southeast								
Espirito Santo	67	78	16%	11	6	✓	✓	✓
Minas Gerais	723	853	18%	130	65	✓	✓	✓
Rio de Janeiro	70	92	31%	22	10	✓		✓
Sao Paulo	572	645	13%	73	53	✓	✓	✓
South								
Parana	323	399	24%	76	29	✓	✓	✓
Rio Grande do Sul	333	497	49%	164	101	✓	✓	✓
Santa Catarina	217	295	36%	78	22	✓	✓	✓
Central-West								
Goias	211	246	17%	35	34	✓	✓	
Mato Grosso	95	141	48%	46	53	✓	✓	
Mato Grosso do Sul	72	79	10%	7	4	✓		

Sources: IBGE, TREs, State Legislative Assemblies, and Tomio (2002). Notes: There was no territorial division after 2013. The last three columns indicate whether we (NHS), Dahis and Szerman (2024) (DS), and Lima and Silveira Neto (2018) (LSN) collected the failed split requests in the corresponding state.

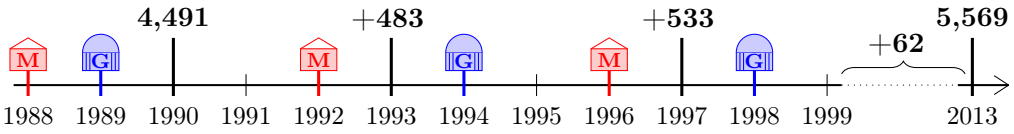
We identified 605 almost-split municipalities across 19 out of 26 states, which ac-

counted for 86.8% of the Brazilian population in 2013. This data was collected from all the states in the South, Southeast, and Central West regions. However, there are gaps in the North and Northeast regions, where neither the legislative assemblies nor the regional electoral courts kept records of requests for territorial emancipation. Refer to the Table A.5 for further details.

5.2. Elections and political parties

Elections in Brazil occur every two years, alternating between local and federal/state polls. Municipal elections are held every four years, beginning in 1988. General elections for federal and state governments take place every four years, starting in 1994, with the exception of the 1989 election (Figure 2). Until 1996, the country used paper ballots for voting, and local election information was not centralized in the Supreme Electoral Court (TSE). As a result, we build a novel municipal dataset from 21 out of the 26 Regional Electoral Courts (TREs) for the 1988 and 1992 elections.[6] Most of this data was digitized by transcribing scanned archival documents, including handwritten and typewritten materials, into a structured database. For the general elections and for municipal elections held after 1996, voting information was sourced from the TSE.

Figure 2: Elections and number of municipalities in Brazil (1990–2013)



Notes: The colored markers denote election types: red for municipal elections (1992, 1996, 2000) and blue for general elections (1989, 1994, 1998), which occur every four years, except for 1989. Bolded numbers show the municipality count at milestones: 4,491 in 1990, with increases of +483, +533, and +62, reaching 5,569 by 2013.

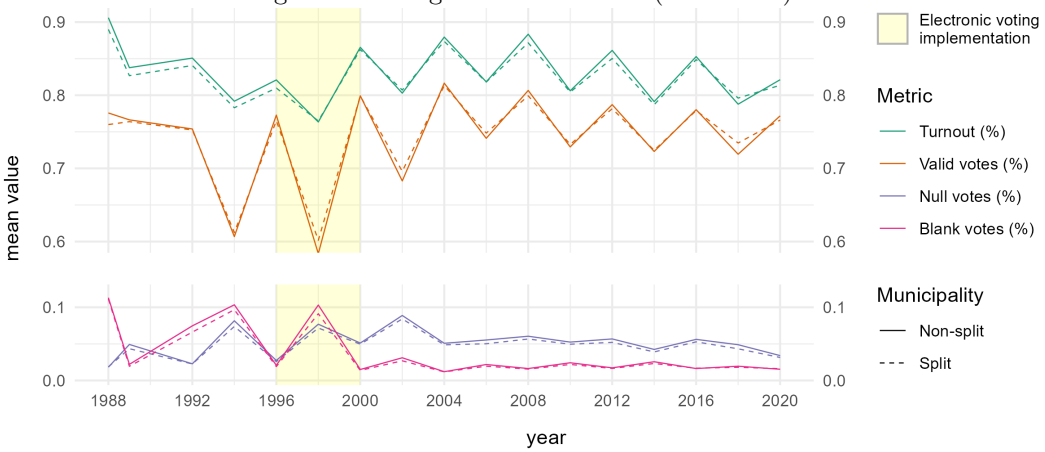
Brazilian municipal elections have consistently shown higher voter turnout rates compared to federal and state elections (Figure 3), reflecting a greater interest in local politics among voters. Before 1996, the proportion of null (spoiled) and blank votes fluctuated considerably. The implementation of electronic voting machines from 1996 to 2000 resulted in lower and more stable invalid vote rates, likely due to enhanced ballot accuracy, which reduced the number of discarded votes (Fujiwara, 2015). Moreover, trends in areas affected by territorial changes were similar to those in municipalities that were not affected throughout the entire period.

To assess voter engagement in local politics, we used the turnout rate (calculated as the number of votes divided by the electorate), a commonly employed metric in this field. In Brazil, voting is mandatory for citizens over 17 years old, and failing to vote

[6]Refer to Table A.4 for further information on data collection.

without justification can lead to a fine and certain civil restrictions. Therefore, we used the *valid vote rate*, which excludes null and blank votes,[7] often seen as protest votes, indecision, or input error. Additionally, the voter base may expand due to increased political engagement, which could negatively impact both voter turnout and the rate of valid votes. Therefore, we also examine the split effect on the *electorate*.

Figure 3: Voting metrics in Brazil (1988–2020)



Notes: The y-axis is truncated to highlight differences between the split (dashed) and non-split (solid) lines. The x-axis labels show only municipal election years, omitting general election markers for clarity. Colors represent voting metrics: turnout, valid votes, null votes, and blank votes. The yellow shaded area indicates the rollout of electronic voting machines: 30% in 1996, 60% in 1998, and 100% in 2000.

To assess potential turnout mechanisms, we also used electoral data on the size of the electorate, the elected mayor's share of votes, and the ratio of officials to inhabitants. These factors influence the pivotal probability of voting, local electoral competition, and political efficacy, respectively.

In our analysis, we considered the important roles of governors and state legislators in the process of territorial division by including two covariates: a dummy variable indicating whether the mayor is in the governor's coalition and the coalition percentage in the legislative assembly. The power of the governor's political coalition within the legislative assembly was relevant, as state deputies tended to support the creation of new municipalities and could override the governor's veto against such divisions.

[7] A blank vote occurs when a voter does not vote for any candidate. In the past, this was done by leaving the ballot unmarked. Voters now have the option to choose a 'blank' option in the electronic voting machine. On the other hand, a null vote happens when a voter enters a candidate number that does not exist.

5.3. Socioeconomic and fiscal variables

Alongside the political variables, we included a set of socioeconomic indicators widely used in the literature as controls: the log of total population size, population density (inhabitants per square kilometer), household income, the Gini coefficient (income inequality), the literacy rate among residents aged fifteen and over, the share of the working-age population (ages fifteen to sixty-four), and average age. These variables capture key dimensions of local development (welfare, inequality, and human capital) that may affect voter behavior. We obtained all socioeconomic data from the Brazilian Institute of Geography and Statistics (IBGE). Moreover, we also used data on local migration and car ownership, as these factors affect community cohesion and the cost of voting.

Since municipal-level GDP data in Brazil were unavailable until 1997, we utilized satellite-captured nighttime lights as a proxy for economic activity levels (Henderson et al., 2011).[8] The 1992–2020 dataset from Li et al. (2020) measures nighttime lights on a scale from 0 (no detectable light) to 100 (maximum intensity). It has a limitation due to the blooming effect, which causes spillovers from illuminated areas to adjacent non-illuminated ones (see Figure A.2). Therefore, we considered only nighttime lights with values greater than 7 to reduce measurement errors (Omar and Ismal, 2019; Coetzee and Kleynhans, 2021).

Finally, we analyze the effects on total expenditures and public transportation spending using financial data from 1991 to 2020, provided by the National Treasury Secretariat (STN). To ensure consistency, monetary values were adjusted to reflect the price levels of the year 2020.

5.4. Minimum comparable areas (MCA)

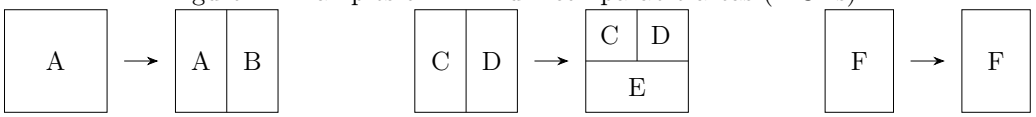
In our empirical analysis, we use the minimum comparable area (MCA) as the unit of observation to maintain spatial and temporal consistency despite changes in municipal boundaries. An MCA is the smallest contiguous territory whose border remains unchanged between years (see Figure 4). This approach aggregates all splits, mergers, and territorial transfers into stable analytical units. This ensures that any demographic and electoral changes accurately reflect real shifts in demographic indicators or voting behavior, rather than being the result of misleading data discontinuities caused by boundary changes (e.g., halving the population size after territorial division). To aggregate municipalities and their indicators, we utilized 1991-2010 MCA dataset from Ehrl (2017).[9]

Table 2 shows the composition of MCAs and their categorization based on treatment status. The "treated" group includes areas where pre-existing municipalities underwent a fragmentation process, resulting in the creation of new ones. The "almost treated" group consists of municipalities that formally requested a split but were ultimately denied. The "untreated" group refers to all jurisdictions that were not affected by the territorial reform.

[8]The correlation between night light and GDP is stronger in urban areas (Keola et al., 2015; Chen and Nordhaus, 2019), it is weaker in rural areas (Gibson et al., 2019).

[9]MCAs for municipalities established in 2013 were manually included by the authors.

Figure 4: Examples of minimum comparable areas (MCAs)



Notes: When municipality A is divided to create municipality B, the MCA includes both A and B. Similarly, when municipalities C and D give up territory to form Municipality E, the MCA consists of C, D, and E. Finally, a municipality without any boundary changes, such as F, constitutes its own MCA.

In our sample of 3,557 MCAs, 2,523 (71%) did not attempt to split and remained as single-municipality units without any boundary change, while 413 (11.6%) requested a split but did not succeed (almost treated). The remaining 621 MCAs (17.4%) underwent fragmentation. Most commonly, 408 MCAs (65.7% of treated) produced one new municipality, while 151 (24.3% of treated) divided into three or four municipalities. Less frequently, 62 MCAs (10% of treated) experienced larger reorganizations involving five to twenty municipalities. Territorial reforms mostly established an additional municipality, yet one-third of them led to more complex fragmentations.

Table 2: MCAs by their territorial composition and treatment status

MCAs	**MCA composition**			**treatment**
(obs.)	**total munic.**	**new munic.**	**pre-existing**	**status**
2,523	1	0	1	untreated
413	1	0	1*	almost
408	2	1	1	treated
70	3	2	1	treated
28	3	1	2	treated
25	4	3	1	treated
23	4	2	2	treated
5	4	1	3	treated
62	5–20	1–13	1–8	treated

Notes: Column 1 reports the number of minimum comparable areas (MCAs) by composition type. Columns 2–4 indicate the total number of municipalities in each MCA, distinguishing between new and pre-existing ones. The final column categorizes MCAs by treatment status: untreated (no boundary change), almost treated (*attempted but failed division), and treated (affected by fragmentation). The last row combines MCAs with five to twenty units, including varying quantities of new and pre-existing municipalities.

5.5. Descriptive Statistics

In Table 3, we present baseline descriptive statistics for electoral and socioeconomic variables across three groups of minimum comparable areas (MCAs). The differences

between the treated groups and the other two groups are mostly statistically significant at conventional levels, particularly the socioeconomic variables. This was expected as the process of territorial reform was not implemented randomly but rather driven by the self-selection of emancipatory areas.

Table 3: MCA baseline descriptive statistics

Variables	**treated**	**almost**	**diff.**	**untreated**	**diff.**
Municipal election (1988)					
Electorate size	25,572	38,658	13,085	13,735	-11,837***
Turnout (% electorate)	89.0	89.5	0.5	91.4	2.4***
Valid (% electorate)	76.3	75.9	-0.4	78.4	2.1***
Blank + Null (% electorate)	12.7	13.6	0.9***	13.0	0.3
Elected mayor's votes (% valid)	43.1	42.3	-0.8	46.5	3.4***
Elected officials$^{\times}$ ($\times$1000)	0.7	0.8	0.1*	1.7	0.9***
General election (1989)					
Electorate size	27,759	41,703	13,944	14,879	-12,880***
Turnout (% electorate)	83.0	83.2	0.3	85.2	2.2***
Valid (% electorate)	77.0	75.4	-1.6**	78.4	1.4***
Blank + Null (% electorate)	6.0	7.8	1.8***	6.8	0.8***
Governor's legislative coalition (%)	45.2	49.8	4.6***	50.8	5.5***
Mayor in governor's coalition (%)	34.7	40.4	5.7*	39.5	4.8**
Financial variables (1991)					
Total expenditures$^{\times}$	283.6	281.4	-2.2	388.9	105.4***
Transportation (%)	11.5	9.5	-2.0***	11.3	-0.2
Socioeconomic variables (1991)					
Population	51,600	74,406	22,805	25,341	-26,259**
Rural households (%)	46.3	45.5	-0.9	43.6	-2.8***
Income$^{\times}$	738.2	684.3	-53.9***	724.7	-13.6
Vehicle ownership (%)	17.0	14.5	-2.5***	18.0	-1.0*
Gini Index ($\times$100)	54.6	53.5	-1.1***	52.9	-1.7***
Literacy (%)	76.0	71.0	-5.0***	76.4	0.4
Working age population (%)	58.6	57.5	-1.0***	59.2	0.6***
Age	25.2	25.1	-0.1	26.0	0.8***
In-migrants† (% population)	25.2	25.1	-0.1	26.0	0.8***
Out-migrants† (% population)	21.5	18.6	-2.9***	20.5	-1.0*
Nighttime luminosity$^{\times}$ ($\times$1000)	24.0	25.4	1.5	24.3	0.3
Municipalities per MCA in 2013	2.9	1		1	
Observations	621	413		2,523	

Notes: $^{\times}$per capita. †cumulative migration in the last five years. The table presents average statistics for treated, almost treated, and untreated groups. The "diff." columns show differences between the treated group and the corresponding group, along with the significance levels: $^{*}p < 10\%$, $^{**}p < 5\%$, $^{***}p < 1\%$.

Before the split, the treated and almost treated groups showed slightly more similar statistics compared to the untreated group, although most differences were statistically significant. The untreated municipalities had smaller electorate sizes and higher turnout rates in both local and general elections. Additionally, this group had twice as many local officials (mayor, vice-mayor, and councilors) per 1,000 citizens, and the elected mayor received a larger share of the vote in the first term of municipal elections. The propor-

tion of the governor's legislative coalition is lower in the treated group, suggesting a less favorable political environment for vetoing territorial fragmentation laws in those states. Interestingly, stronger alignment of mayors with the governor's political coalition does not seem to influence the success of the fragmentation request.

Regarding government size, the treated and almost treated groups have similar expenditures per capita, while the untreated group spends, on average, about one-third more. In contrast, the share of spending on public transportation in the treated areas is closer to that of non-affected municipalities, whereas the almost treated group has slightly lower expenditures in this area. A similar behavior is observed in the percentage of households that own at least one vehicle for private use.

As treated municipalities split into 2.9 new jurisdictions, the population and electorate sizes per municipality decreased to about one-third by 2013, resulting in smaller jurisdictions comparable to untreated municipalities. In terms of cumulative migration over the last five years, the treated groups experienced a lower inflow compared to the untreated group and a higher outflow compared to almost affected municipalities. Fragmented areas exhibited higher per capita incomes and greater inequality, along with improved literacy rates and a slightly larger proportion of working-age residents. The analysis shows that night light intensities are statistically similar across all groups, indicating comparable levels of economic activity per capita.

These notable differences raise concerns about potential selection bias, as economic and demographic factors likely affected both the feasibility and desirability of fragmentation. To address this issue, our empirical strategy incorporates a comprehensive set of control variables to isolate the effects of fragmentation from any confounding socioeconomic factors. To strengthen the validity of the conditional parallel trends assumption, we also perform our analysis using the almost treated group as the control group. This is because their characteristics closely resemble those areas that successfully underwent territorial division, and also helps to account for unobservable factors that influenced the decision to pursue fragmentation.

6. Results

For our analysis, we applied Callaway and Sant'Anna's (2021) difference-in-differences estimator with the IPW[10] matching method (Abadie, 2005) to assess the impact of territorial splits on local voter engagement and its mechanisms. We used two model specifications regarding the control groups. In Model I, we included all minimum comparable areas (MCAs) that did not undergo any administrative divisions between 1990 and 2020. Model II, our preferred specification, focuses on MCAs that requested a territorial split but were unsuccessful. It includes only states from which we acquired this information,

[10]Using the DR approach for estimation on our unbalanced panel resulted in numerical instability, leading to convergence failures. We implemented the IPW to account for the incomplete municipal election data, particularly from 1988 and 1992.

accounting for 82.8% of the total MCAs.[11]

We estimated the effects on electoral outcomes separately for general and municipal elections, as these involve different political positions (governor/president and mayor, respectively) and have distinct historical levels of turnout, valid votes, blank votes, and null votes (see Figure 3). Elections for a new municipality are held three months before its official establishment. Therefore, for municipal elections, we set the voting baseline at four years before the first local election, while for general elections, it is set at two years before.[12]

Moreover, we clustered standard errors by microregion to account for the shared social, economic, and spatial connections among contiguous municipalities.[13] This adjustment ensures consistent variance estimates and minimizes the risk of overstating statistical significance due to intra-cluster correlation.

6.1. Voter turnout

The results presented in Table 4 show an increase in voter turnout after the administrative division, suggesting that smaller municipalities with lower populations and electorates enhance electoral engagement. In both election types, our preferred specification (Model II) indicates statistically significant increases in voter turnout: 1.95 percentage points (pp) for municipal elections and 2.19 pp for general ones.

Table 4: Municipal split effects on electoral variables

	Municipal		**General**	
Outcomes	**(I)**	**(II)**	**(I)**	**(II)**
Turnout (%)	1.47**	1.95***	1.84**	2.19***
	(0.65)	(0.61)	(0.78)	(0.79)
Valid votes (%)	1.73**	1.86**	1.99***	2.62***
	(0.75)	(0.79)	(0.75)	(0.80)
Blank + Null votes (%)	-0.28	0.07	-0.15	-0.43*
	(0.48)	(0.51)	(0.23)	(0.23)
log(Electorate) × 100	-2.50	2.03	-3.62	2.56
	(3.99)	(4.84)	(3.78)	(4.86)
Specifications				
Only almost treated as controls	–	✓	–	✓
Observations	3,557	1,034	3,557	1,034

Notes: $^{*}p < 10\%$, $^{**}p < 5\%$, $^{***}p < 1\%$. Standard errors clustered at the microregion level in parentheses. Model I includes all minimum comparable areas (MCAs) that never underwent a split as controls; Model II (preferred) only uses MCAs that attempted to split but failed.

[11] Refer to Tables 1 and A.5 for further information.

[12] Except for 1989 general elections, held three years before the first municipal election.

[13] As of 2017, Brazil had 558 microregions, which are similar to US commuting zones.

The impact on valid vote rates was similar, indicating that the increase in citizen engagement was primarily due to votes cast for candidates rather than blank or null votes, which had a negligible effect.

The event study estimates for municipal and general turnouts indicate similar trends over time following the fragmentation (see Figure B.4). The impact peaks at 8-10 years post-division, then slightly decreases but remains significant at the 5% or 10% levels of significance. Moreover, the estimates for all pre-split periods are consistently non-significant, which strengthens the credibility of the conditional parallel trends assumption.

For valid votes, we observe distinct patterns when compared to turnout. The dynamic effects on blank and null votes in general elections are negative, although significant only in the first general election, whereas they are non-significant and close to zero for all local elections. Despite the positive effects on the valid votes in municipal elections (mostly non-significant after 10 years), voter engagement in general elections showed even greater effects, as evidenced by a decrease in spoiled ballots.

Finally, there was no increase in the electorate. While voting is mandatory in Brazil, it is optional for individuals aged 16 and 17, as well as for those who are illiterate. The findings indicate that these groups did not become more engaged, as there was no significant increase in the number of eligible voters.

6.2. Heterogeneity by level of fragmentation

To assess the impact of fragmentation on electoral outcomes, we classified each MCA using the Herfindahl-Hirschman Index (HHI). This index effectively captures both the number of municipalities within an MCA and their relative "weight." The HHI is calculated by summing the squares of the population shares, $\sum_i \text{pop}_i^2$, where pop_i represents the share of the population of municipality i relative to the MCA total population. This index is close to zero in areas with many municipalities and evenly distributed populations. Conversely, HHI is higher in areas with fewer municipalities, especially if one municipality holds a large portion of the population.[14]

The literature on territorial amalgamations classifies reforms into mergers and annexations based on population shares. While we could also assess fragmentation by examining population shares, this approach may overlook the fundamental differences between MCAs. For example, two MCAs with 50% of their population from new municipalities can have different levels of fragmentation if one has a population concentrated in a single new municipality, while the other is spread across ten smaller ones. The HHI addresses this issue by weighting each subunit based on its population share and penalizing uneven distributions.

In our sample, the fragmented MCAs' HHI range from 0.086 (very highly fragmented) to 0.979 (near unity), with a median of 0.568. We classify MCAs with an HHI of 0.568 or

[14]For example, a MCA divided equally into two identical municipalities results in a Herfindahl-Hirschman Index (HHI) of $2 \times (0.5)^2 = 0.5$. In contrast, an MCA with one large municipality and one very small one could produce an HHI close to one.

lower as "high fragmented" and those with an HHI greater than 0.568 as "low fragmented." This cut-off divides the treated MCAs into two groups for comparison with the almost treated MCAs (HHI = 1).

Results presented in Table 5 indicates that highly fragmented jurisdictions experience significant increases in voter turnout and valid vote rates of 3.36 and 3.11 pp in municipal elections, and 3.42 and 3.98 pp in general elections, all of which are statistically significant at the 1% level. Low-fragmentation areas demonstrate a similar but reduced impact, roughly half that of highly fragmented areas during general elections. In municipal elections, their effect is about one-third and slightly significant for the turnout rate. The impact of invalid votes and the variation in the electorate is not significant across low- and high-fragmentation areas.

Table 5: Municipal split effects on electoral variables by level of fragmentation

	Municipal		**General**	
Outcomes	**Low**	**High**	**Low**	**High**
Turnout (%)	1.02*	3.36***	1.56**	3.42***
	(0.59)	(0.70)	(0.67)	(0.90)
Valid votes (%)	1.11	3.11***	2.04***	3.98***
	(0.85)	(1.02)	(0.73)	(0.80)
Blank + Null votes (%)	-0.09	0.22	-0.48*	-0.57*
	(0.52)	(0.64)	(0.25)	(0.27)
log(Electorate) × 100	1.87	5.03	2.80	4.87
	(5.45)	(3.78)	(5.37)	(5.19)
Specifications				
AMCs with HHI > 0.568	✓	–	✓	–
AMCs with HHI ≤ 0.568	–	✓	–	✓
Only almost treated as controls	✓	✓	✓	✓
Observations	724	723	724	723

Notes: $^{*}p < 10\%$, $^{**}p < 5\%$, $^{***}p < 1\%$. Standard errors clustered at the microregion level in parentheses. Both models use only MCAs that attempted to split but failed as controls.

The event study estimates by fragmentation level (see Figures B.5 and B.6) mirror the pattern observed in Model II, but with stronger effects in areas of higher territorial fragmentation and weaker effects in areas of lower fragmentation. These findings emphasize that the establishment of new municipalities also influences national and state elections, particularly in areas with highly fragmented AMCs.

6.3. Turnout mechanisms

Results presented in Table 6 examines how municipal splits influence the four core turnout factors within our Downsian framework: pivotal probability (P), net benefit (B), cost (C), and expressive term (D). It evaluates the effects of territorial fragmentation on

eight variables that directly or indirectly impact these factors, as indicated in the "Factor linkage" columns.

Territorial split had mixed effects on pivotal probability (P). Following Model II, on the one hand, the electorate per municipality decreased by 65.12%, suggesting that one's vote share for local elections nearly tripled after the split. On the other hand, this reform also increased the vote share of elected mayors by 2.80 percentage points in the first term of municipal elections. As a result, it likely reduced competition, which, in turn, negatively affected pivotality by means of this mechanism.

Table 6: Municipal split effects on turnout mechanisms

	Factor linkage				**Estimates**	
Outcomes	**P**	**B**	**C**	**D**	**(I)**	**(II)**
Electoral variables						
log(Electorate per municipality) × 100	−				-72.40***	-65.12***
					(5.32)	(4.84)
Elected mayor's votes (%)	−				4.15***	2.80***
					(0.79)	(0.90)
log(Officials per citizen) × 100		+		+	76.12***	67.10***
					(5.31)	(4.84)
Financial variables						
Public expenditure$^{\times}$		+			87.12	228.43***
					(35.73)	(43.63)
Transportation share (%)			−		0.36	-0.21
					(0.63)	(0.58)
Socioeconomic variables						
Vehicle ownership (%)			−		1.69**	2.49**
					(0.80)	(1.00)
Out-migration (%)		−	+	−	0.07	-1.56**
					(0.72)	(0.64)
In-migration (%)		−	+	−	1.11	0.96
					(1.42)	(1.03)
Specifications						
Only almost treated as controls					–	✓
Observations					3,557	1,034

Notes: $^{*}p < 10\%$, $^{**}p < 5\%$, $^{***}p < 1\%$. Standard errors clustered at the microregion level in parentheses. Model I includes all minimum comparable areas (MCAs) that never split as controls; Model II (preferred) uses only MCAs that attempted to split but failed. The "Factor Linkage" columns map each outcome to one of the four Downsian turnout factors: P (pivotal probability), B (net benefit), C (cost of voting), and D (expressive utility), with "+" or "−" indicating the expected relationship direction.

The results also suggest that expressive utility (D) has increased due to enhanced internal political efficacy and by means of a rise in community pride. Still according to Model II, the number of officials per capita has increased by 67.10%, fostering a closer

relationship between citizens and politicians. As a result, the intrinsic value of voting was likely enhanced, with voters feeling more confident in their political understanding and in their participation in elections.

Moreover, the community appears to have become more cohesive. This is shown not only by the decrease in population and electorate sizes but also by a reduction in outward migration. While the impact of fragmentation on in-migration was statistically insignificant, there was a significant decrease of 1.56 percentage points in citizen outflow, suggesting a greater attachment to the community compared to areas unaffected by territorial splits. This likely heightened voters' sense of civic duty and increased social pressure to cast a ballot, thereby enhancing the intrinsic value of voting.

The effect of fragmentation on net benefit (B) is uncertain. Increasing the number of elected officials per thousand inhabitants may have reinforced voters' belief in their ability to influence local policies (external political efficacy), potentially increasing the net benefit of their preferred candidate. However, it is unclear whether the candidates' policy agendas became more or less similar after the split. On the one hand, public expenditure increased significantly by R$ 228.43 per capita, which is expected to reduce the similarity between the candidates' agendas. On the other hand, community cohesion has also grown, suggesting that the closer relationship between the community and the candidates could have led to more homogeneous policy proposals.

The costs of voting (C) likely decreased due to improved voter mobility to polling stations. Vehicle ownership increased by 2.49 percentage points, facilitating personal transportation to cast ballots. Additionally, it seems that public transportation services were also enhanced, as local expenditures rose significantly while the share of transportation spending remained unaffected by the split.

These findings indicate that territorial fragmentation affects voter turnout in several ways. A reduced electorate size positively affected voters' pivotality, although it was simultaneously hindered by decreased competition for the mayoral position. Furthermore, having more officials per capita and stronger community ties seems to enhance voters' expressive motivations. Increased public transportation funding and higher vehicle ownership likely reduced barriers to voting as well.

6.4. Robustness checks

For our robustness check, we assessed the stable unit treatment value assumption (SUTVA) and applied other recent difference-in-differences estimators for both binary and staggered treatment designs.

6.4.1. Stable Unit Treatment Value Assumption (SUTVA)

In our first robustness check, we limited our sample to states that had only a small increase in the number of new municipalities (up to 25%, more specifically), since a fixed amount of FPM transfer is distributed within all municipalities of the same state. This approach was intended to consider only states whose controls were only marginally impacted by the decrease in FPM transfers.

Table 7: Municipal split effects on electoral variables

	Municipal	**General**
Turnout (%)	2.68***	1.62***
	(0.52)	(0.53)
Valid votes (%)	2.67**	2.38***
	(1.04)	(0.74)
Blank + Null votes (%)	0.00	-0.76***
	(0.83)	(0.28)
log(Electorate) × 100	1.83	1.12
	(6.72)	(6.67)
Specifications		
Only almost treated as controls	✓	✓
Only low affected states	✓	✓
Observations	577	577

Notes: $^{*}p < 10\%$, $^{**}p < 5\%$, $^{***}p < 1\%$. Standard errors clustered at the microregion level in parentheses. Both models use only MCAs that attempted to split but failed as controls. Model III includes only those states that increased at most 25% of their municipalities to limit the potential effects of FPM redistribution within the state.

The results from this analysis were presented in Table 7 and are similar to Model II (Table 4). While we cannot completely rule out the possibility of violating SUTVA, if it exists, its influence seems to be minimal.

6.4.2. Other staggered difference-in-differences estimators

The results using the estimators from Sun and Abraham (2021) and Borusyak et al. (2024) are presented along with the event study effects in Appendix B. For comparison, we included the two-way fixed effects (TWFE) estimates, as they were used in previous studies.

Both Borusyak et al. (2024) and Sun and Abraham (2021) rely on the parallel trends assumption and make linear adjustments for covariates. However, Borusyak et al. (2024) applies this assumption to all pre-treatment periods, which can enhance efficiency but may also lead to larger biases if the parallel trends assumption is only approximately valid (Roth et al., 2023). In contrast, Callaway and Sant'Anna (2021) uses a weaker assumption of conditional parallel trends and considers more flexible adjustments for time-invariant covariates, including outcome regression, inverse probability weights, and doubly robust approaches. If the estimates from these three methods differ significantly, de Chaisemartin and D'Haultfœuille (2023) suggests that the parallel trends assumption used by Borusyak et al. (2024) and Sun and Abraham (2021) may be violated.

The point estimates obtained from all these methods are similar, demonstrating the robustness of the results. However, the confidence intervals from Callaway and Sant'Anna's (2021) estimator tend to be larger than those from the other methods. As a result, some estimates that are significant at the 5% level using these estimators may not be significant when using our chosen method.

7. Discussion

In general terms, the results presented in Section 6 indicate that municipal divisions have increased electoral participation by 1.95 and 2.19 percentage points (pp) for municipal and general elections, respectively. These effects are comparable in magnitude to those in previous studies with an increase of 1.93 pp on fragmentation (Narasimhan and Weaver, 2024) and, with the opposite sign, effects ranging from -2.2 to -4.1 pp in local elections of merged jurisdictions (Koch and Rochat, 2017; Allers et al., 2021; Lapointe et al., 2018). Moreover, they also found significantly greater effects (up to three times) on turnout when smaller jurisdictions are annexed to larger ones, which aligns with our heterogeneity analysis regarding the level of fragmentation.

Although it is difficult to clearly differentiate between instrumental and expressive motivations for voting (Fischer, 1996), we identify key mechanisms that may explain this effect in the Brazilian context, none of which is mutually exclusive.

First, territorial fragmentation had mixed effects on the pivotality of local votes. On one hand, it roughly tripled the weight of each vote in affected areas. On the other hand, it decreased competition in the mayoral election, thereby lowering the chance that any single vote would determine the outcome. Although reducing the size of the electorate might have a greater impact on pivotality than decreasing competition, this explanation alone does not fully account for the similar increases in voter turnout observed in subsequent general elections, where pivotality remained unchanged. Therefore, this factor does not appear to be the main reason for the rise in voter participation.

Second, territorial fragmentation probably reduced the logistical and time constraints of voting by improving mobility. In newly established jurisdictions, the ownership of private vehicles increased, and local governments also raised their per capita budget allocations for public transportation services. These enhancements likely lowered the cost of participation in both municipal and general elections.

Third, the establishment of municipal divisions enhanced community cohesion by creating smaller populations and electorates. This change likely contributed to a decrease in out-migration in the affected areas, fostering a stronger sense of civic duty and increasing social pressure to vote. Furthermore, the growing number of local elected officials has likely empowered citizens to cast their ballots, reflecting an increase in internal political efficacy.

Although not explored in our econometric framework, Tomio (2002) indicates that Brazilian splits were initiated by means of a local campaign to promote a plebiscite in favor of emancipation, which started the fragmentation process. These efforts likely encouraged citizens to vote for local leaders and helped solidify voting as a habit, particularly given persistence estimates in the 0.5–0.9 range (Gerber et al., 2003; Fujiwara et al., 2016).

Territorial fragmentation can enhance the instrumental value of each vote by increasing its likelihood of being pivotal. However, our findings indicate that the primary factors behind increased voter turnout are expressive motivations and improved mobility. When new municipalities are established, communities undergo a significant institutional moment that fosters civic pride, boosts internal political efficacy, and creates strong social expectations surrounding voting. Additionally, the concurrent rise in vehicle ownership

and investments in local public transport can significantly reduce the time and effort required to cast a ballot.

8. Conclusion

This study offers an in-depth analysis of how territorial fragmentation affected voter engagement in Brazil. By examining data from 1988 to 2020, including 621 areas affected by municipal splits across nineteen Brazilian states, we highlighted the broader implications of decentralization for constituents' electoral participation.

By using the difference-in-differences estimator from Callaway and Sant'Anna (2021) and considering areas that failed to create new municipalities as control units, we found a positive and statistically significant impact on voter turnout in both municipal and state/federal elections. Additionally, we found evidence suggesting that greater fragmentation further enhances the effect on electoral participation.

This study offers valuable insights into the impacts of territorial fragmentation; however, it has some limitations that policymakers should consider when interpreting the results. First, the number of registered voters may be overestimated because it includes individuals who have passed away or duplicates of those who have acquired a new electoral ID in a different municipality. Consequently, the actual voter base might be smaller, leading to an underestimation of the impact on voter turnout rates.

Second, this excess of registered voters has been identified as a source of fraudulent voting, as incumbent politicians may buy irregular votes to gain an advantage over their opponents in elections (Karim, 2025). It can be argued that with increased transfers, incumbents could more easily purchase these irregular votes, thus influencing voter turnout. However, this potential mechanism does not appear to have greatly influenced our results. In preparation for the 2008 election, a national re-registration reform was implemented to address irregular registrations. However, we do not see any distinct effects in voter turnout 12 or 16 years[15] after the initial elections (Figure B.4).

Third, since the emancipation processes mostly began more than 30 years ago, there is a lack of electoral data to further investigate the fragmentation effects. For instance, only a few state electoral courts could provide information about the emancipation plebiscites for us to analyze the community engagement. Of the few plebiscites we examined, the vast majority produced overwhelming support for territorial division, many recording over 90 percent "yes" votes. Additionally, older data did not differentiate votes by polling stations, so we could not verify if there had been a redesign of electoral zones and sections that might have alleviated logistical burdens for voters.

These limitations indicate that more research is necessary to fill these gaps and understand the wider implications of decentralization in various contexts. Future studies could examine how the creation of new municipalities has influenced electoral mapping

[15]These time spans represent the distance from the 2008 "reformed" election to the 1996 and 1992 elections, which account for over 90% of the newly created municipalities.

and voter access in Brazil. Investigating whether the relocation of polling stations has enhanced voting convenience could provide insight into how logistical factors affect voter turnout.

Appendix A. Supplementary information

Table A.1: FPM Interior: Share of each state in the total distribution

State	Share of FPM Interior
North	
Acre	0.3%
Amapa	0.1%
Amazonas	1.3%
Para	3.3%
Rondonia	0.8%
Roraima	0.1%
Tocantins	1.3%
Northeast	
Alagoas	2.1%
Bahia	9.3%
Ceara	4.6%
Maranhao	4.0%
Paraiba	3.2%
Pernambuco	4.8%
Piaui	2.4%
Rio Grande do Norte	2.4%
Sergipe	1.3%
Southeast	
Espirito Santo	1.8%
Minas Gerais	14.2%
Rio de Janeiro	2.7%
Sao Paulo	14.3%
South	
Parana	7.3%
Rio Grande do Sul	7.3%
Santa Catarina	4.2%
Central-West	
Goias	3.7%
Mato Grosso	1.9%
Mato Grosso do Sul	1.5%

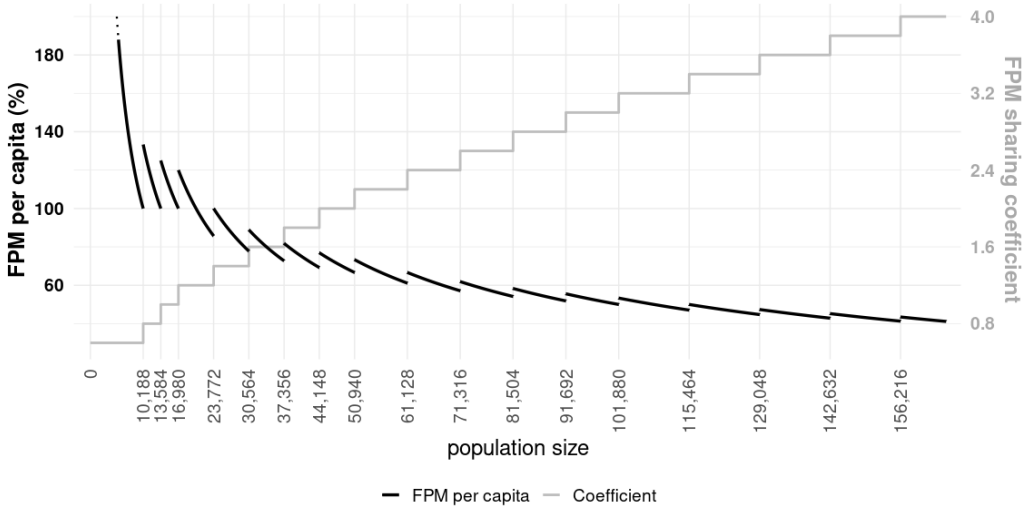
Source: Complementary Law 62/1989 and TCU Resolution 242/1990. Notes: These percentages represent fixed shares of the FPM Interior allocated to the states before distribution among municipalities within each state. These values have remained unchanged since their establishment.

Table A.2: FPM Interior: Municipal coefficients by population size

Population size	Coefficient	Population size	Coefficient
up to 10,188	0.6	50,941 – 61,128	2.2
10,189 – 13,584	0.8	61,129 – 71,316	2.4
13,585 – 16,980	1.0	71,317 – 81,504	2.6
16,981 – 23,772	1.2	81,505 – 91,692	2.8
23,773 – 30,564	1.4	91,693 – 101,880	3.0
30,565 – 37,356	1.6	101,881 – 115,464	3.2
37,357 – 44,148	1.8	115,465 – 129,048	3.4
44,149 – 50,940	2.0	129,049 – 142,632	3.6

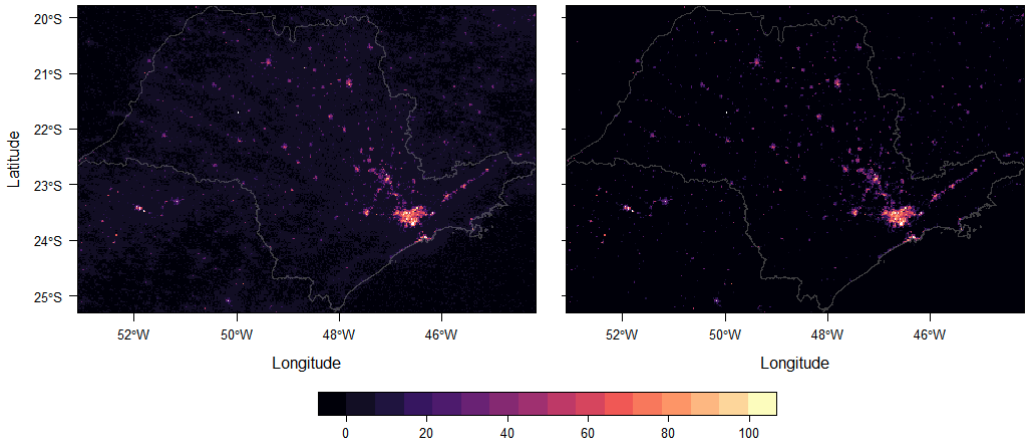
Source: Decree-Law 1881/1981.

Figure A.1: FPM Interior per capita and sharing coefficients by population size



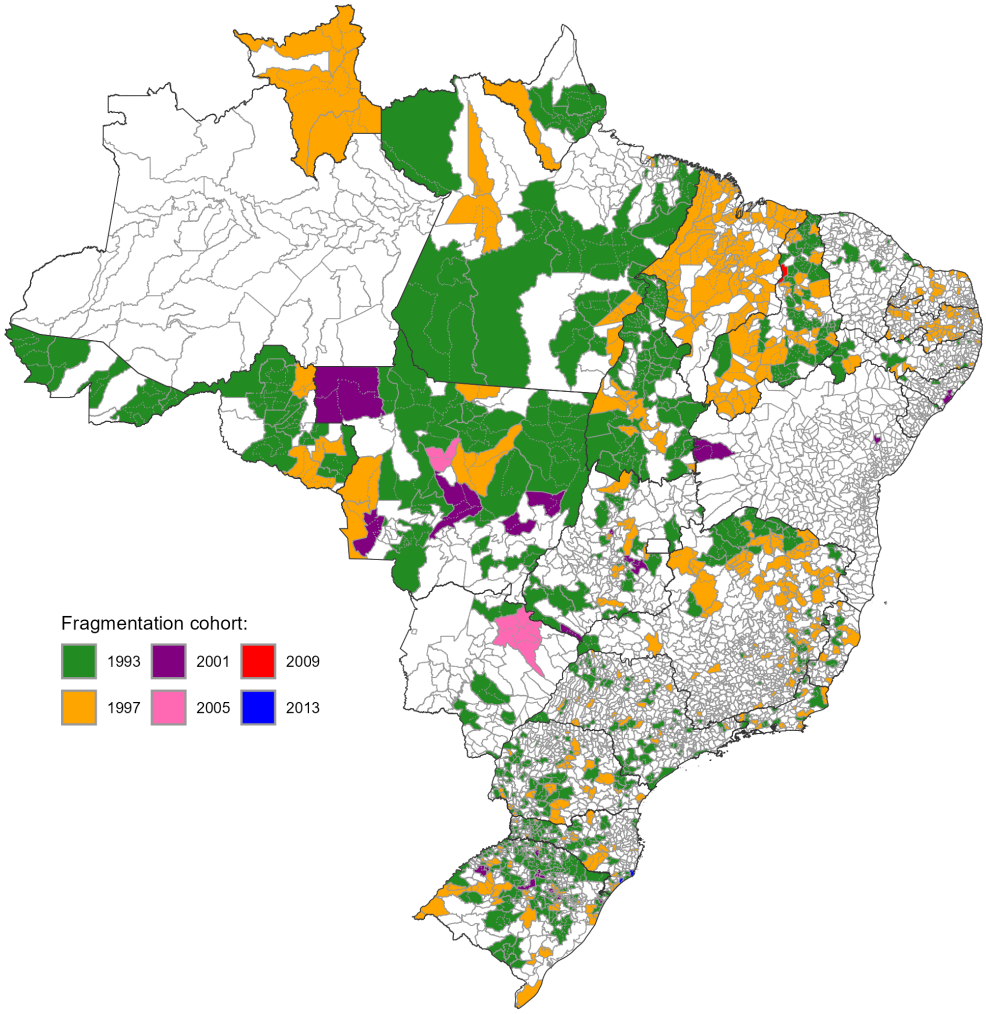
Sources: Boueri et al. (2013) and Decree-Law 1,881/1981. Notes: The black lines represent the per capita transfers from the FPM received by municipalities based on their population size. The per capita value for a municipality with 10,188 residents is established at 100%. The gray line indicates the sharing coefficient used for distributing FPM resources among the municipalities within a state. To illustrate the rapid increase in the number of municipalities, consider the following scenario: if a municipality of 10,000 residents with the lowest FPM coefficient of 0.6 splits into two jurisdictions of 5,000 residents each, the new combined coefficient for the area becomes 1.2. This change nearly doubles the amount of transfers received. While this adjustment enhances the per capita FPM transfers for the affected area, it slightly reduces the resources available to other municipalities within the same state (zero-sum game).

Figure A.2: Comparison between the original nighttime lights and considering only DN > 7



Note: To the left, we have plotted the original night lights over Sao Paulo, which range from 0 (black) to 100 (light yellow). A blurring effect is noticeable in areas of high light intensity (purple), including beyond the southeastern boundary, which is adjacent to the Atlantic Ocean. On the right, we have plotted only the night lights with a digital number (DN) greater than 7.

Figure A.3: MCAs affected by territorial fragmentation by year



Notes: MCA = Minimum Comparable Area: the smallest geographic unit maintaining consistent boundaries over two periods, encompassing all municipalities before and after any split. Only the first fragmentation event within each MCA is explicitly identified in the map.

Table A.3: Minimum necessary criteria for territorial emancipation by state

State	Population/ Electorate*	District age	Share of revenue	Distance from seat	Urban buildings
Brazil (before 1988)	10,000 or 0.5% of state	–	5/1,000	–	200
North					
Acre	1,500	–	2/1,000	–	50
Amapa	948	–	–	–	–
Amazonas	965	–	–	–	–
Para	5,000	–	–	–	200
Rondonia	6,155	–	–	–	150
Roraima	2,471	–	–	–	100
Tocantins	1,200	–	0.3/1,000	–	50
Northeast					
Alagoas	5,500	–	1/1,000	–	–
Bahia	8,000	–	–	–	–
Ceara	10,213	5 years	10/1,000	–	400
Maranhao	1,000*	–	–	–	200
Paraiba	2,000	–	–	–	120
Pernambuco	10,000	–	–	–	300
Piaui	4,000	–	–	–	100
Rio Grande do Norte	2,558	–	–	–	–
Sergipe	6,000	–	3/1,000	–	300
Southeast					
Espirito Santo	8,600	–	2.5/1,000	–	200
Minas Gerais	2,000*	–	1.5/1,000	–	400
Rio de Janeiro	6,393	–	5/1,000	–	400
Sao Paulo	1,000*	2 years	–	3 km	–
South					
Parana	5,000	–	–	–	100
Rio Grande do Sul	1,800*	–	–	–	150
Santa Catarina	5,000	5 years	–	5 km	200
Central-West					
Goias	2,000	–	0.7/1,000	6 km	133
Mato Grosso	4,000	–	–	–	200
Mato Grosso do Sul	5,781	–	3/1,000	–	–

Sources: Tomio (2002), Complementary Law 1/1967, and states' complementary laws. Notes: Until 1988, the minimum population size required for a new municipality was either 10,000 residents or 0.5% of its state population, whichever was lower. In some states, the number of eligible voters was used instead of the total population as the primary criterion for dividing municipalities. These cases are marked with an asterisk (*). The horizontal lines (–) indicate that the corresponding criterion was not applied in the state.

Table A.4: Availability of the electorate and turnout data for 1988 and 1992 municipal elections

State	1988	1992	Sources
Brazil (all states)	19	21	
North			
Acre			
Amapa	×	×	Provided by TRE-AP upon request.
Amazonas	×	×	Provided by TRE-AM upon request.
Para	×	×	Provided by TRE-PA upon request.
Rondonia	•	•	Provided by TRE-RO upon request.
Roraima			
Tocantins			
Northeast			
Alagoas	•		Found at TRE-AL website (tre-al.jus.br).
Bahia		×	Provided by TRE-BA upon request.
Ceara	×	×	Provided by TRE-CE upon request.
Maranhao	×	×	Found at TRE-MA website (tre-ma.jus.br).
Paraiba	×	×	Found at TRE-PB website (tre-pb.jus.br).
Pernambuco	×	×	Provided by TRE-PE upon request.
Piaui	×	×	Provided by TRE-PI upon request.
Rio Grande do Norte	×	×	Provided by TRE-RN upon request.
Sergipe			
Southeast			
Espirito Santo	×	×	Found at 15th Electoral Museums Spring (tre-rn.jus.br).
Minas Gerais	×	×	Provided by TRE-MG upon request.
Rio de Janeiro		×	Found at TRE-RJ website (tre-rj.jus.br).
São Paulo	×	×	Found at SEADE website (produtos.seade.gov.br).
South			
Paraná	×	×	Provided by TRE-PR upon request.
Rio Grande do Sul	×	×	Provided by TRE-RS upon request.
Santa Catarina	×	×	Found at TRE-RS website (tre-sc.jus.br).
Central-West			
Goias		×	Found at TRE-GO website (apps.tre-go.jus.br).
Mato Grosso	×	×	Found at 15th Electoral Museums Spring (tre-rn.jus.br).
Mato Grosso do Sul	×	×	Found at TRE-MS website (tre-ms.jus.br).

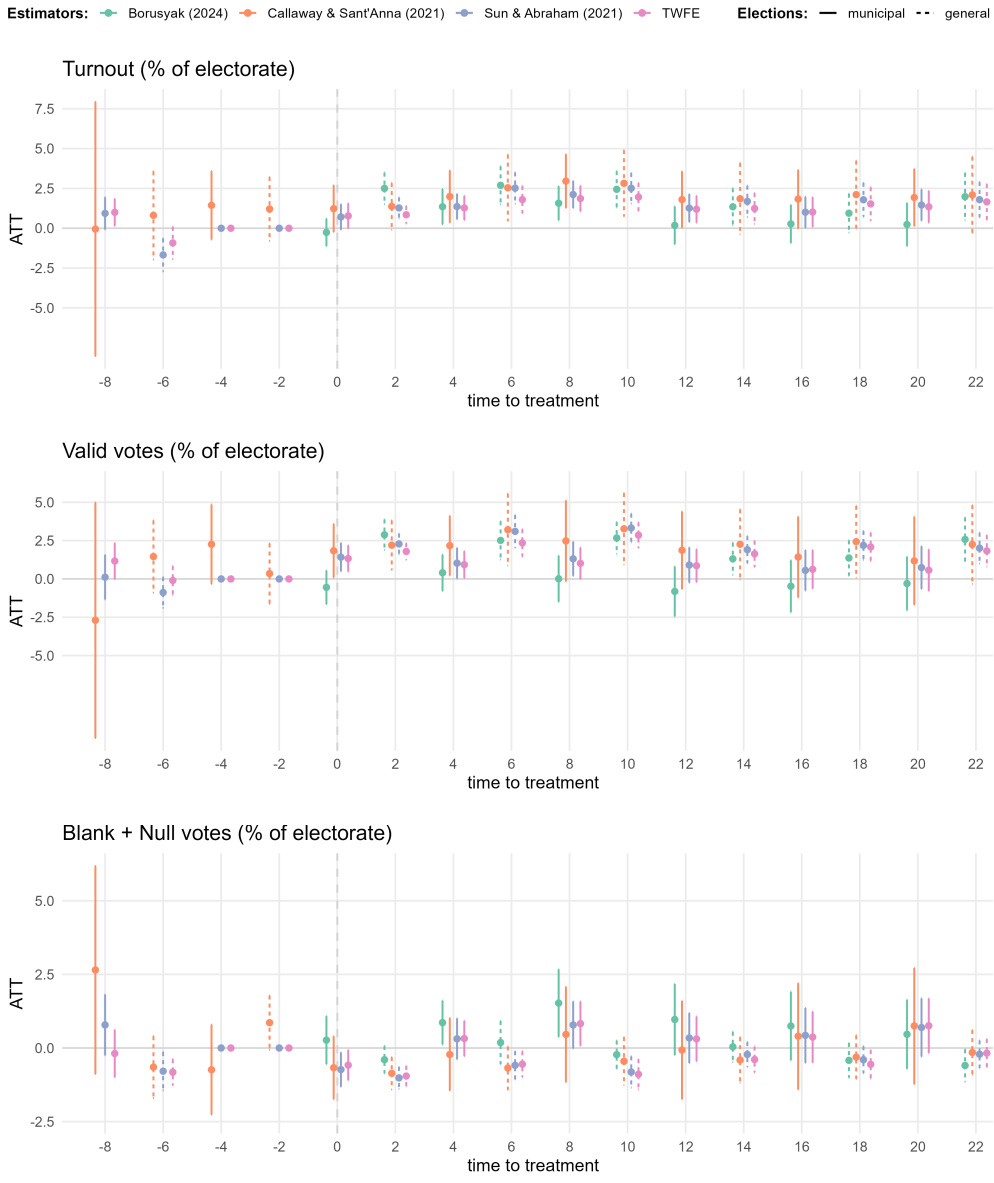
Notes: × both electorate and turnout data available. • missing only the electorate data. In this case, we assumed that the number of total voters in 1988 (1992) was 5% (2%) lower than in the 1989 (1994) general election, respectively. This assumption was based on the average increase in the electorate for municipalities with complete data between the years 1988/1989 and 1992/1994.

Table A.5: Availability of failed split requests data

State	Sources
North	
Amapa	Decrees of the Legislative Assembly of Amapa (ALEAP) found at Leis Municipais website (leismunicipais.com.br).
Para	Plebiscite results found at Regional Electoral Court of Para's (TRE-PA) archives (atom.tre-pa.jus.br).
Rondonia	List of districts/areas that tried to emancipate received from the Regional Electoral Court of Rondonia (TRE-RO) upon request.
Roraima	List of districts/areas that tried to emancipate received from the Regional Electoral Court of Roraima (TRE-RR) upon request.
Tocantins	List of districts/areas that tried to emancipate received from the Legislative Assembly of Tocantins (ALETO) upon request.
Northeast	
Bahia	List of plebiscites suspended by the Regional Electoral Court of Bahia (TRE-BA), provided by Tomio (2002).
Maranhao	List of districts/areas that tried to emancipate received from the Regional Electoral Court of Maranhao (TRE-MA) upon request.
Pernambuco	List of emancipation requests in the Legislative Assembly of Pernambuco (ALEPE), provided by Tomio (2002).
Piaui	List of districts/areas that tried to emancipate received from the Regional Electoral Court of Piaui (TRE-PI) upon request.
Southeast	
Espírito Santo	Bills authorizing plebiscites found at Legislative Assembly of Espirito Santo (ALES) website (al.es.gov.br).
Minas Gerais	Requests for emancipation found at Legislative Assembly of Minas Gerais (ALMG) website (almg.gov.br).
Rio de Janeiro	List of plebiscites found at Regional Electoral Court of Rio de Janeiro (TRE-RJ) website (tre-rj.jus.br).
São Paulo	Resolutions authorizing plebiscites found at Legislative Assembly of São Paulo website (al.sp.gov.br).
South	
Paraná	Resolutions authorizing emancipation plebiscites at Legislative Assembly of Parana (ALEP) website (assembleia.pr.leg.br).
Rio Grande do Sul	List of rejected emancipation requests in the Legislative Assembly of Rio Grande do Sul (ALRS), provided by Tomio (2002).
Santa Catarina	List of rejected emancipation requests in the Legislative Assembly Santa Catarina (ALESC), provided by Tomio (2002).
Central-West	
Goias	Plebiscite resolutions found at Regional Electoral Court of Goias (TRE-GO) archives (acervo.tre-go.jus.br) and list of districts/areas that tried to emancipate received from the Legislative Assembly of Goias (ALEGO) upon request.
Mato Grosso	List of districts/areas that tried to emancipate received from the Legislative Assembly of Mato Grosso (ALMT) upon request.
Mato Grosso do Sul	Plebiscite resolutions found at Regional Electoral Court of Mato Grosso do Sul's (TRE-MS) archives (atom.tre-ms.jus.br) and list of districts/areas that tried to emancipate received from the Legislative Assembly of Mato Grosso do Sul (ALEMS) upon request.

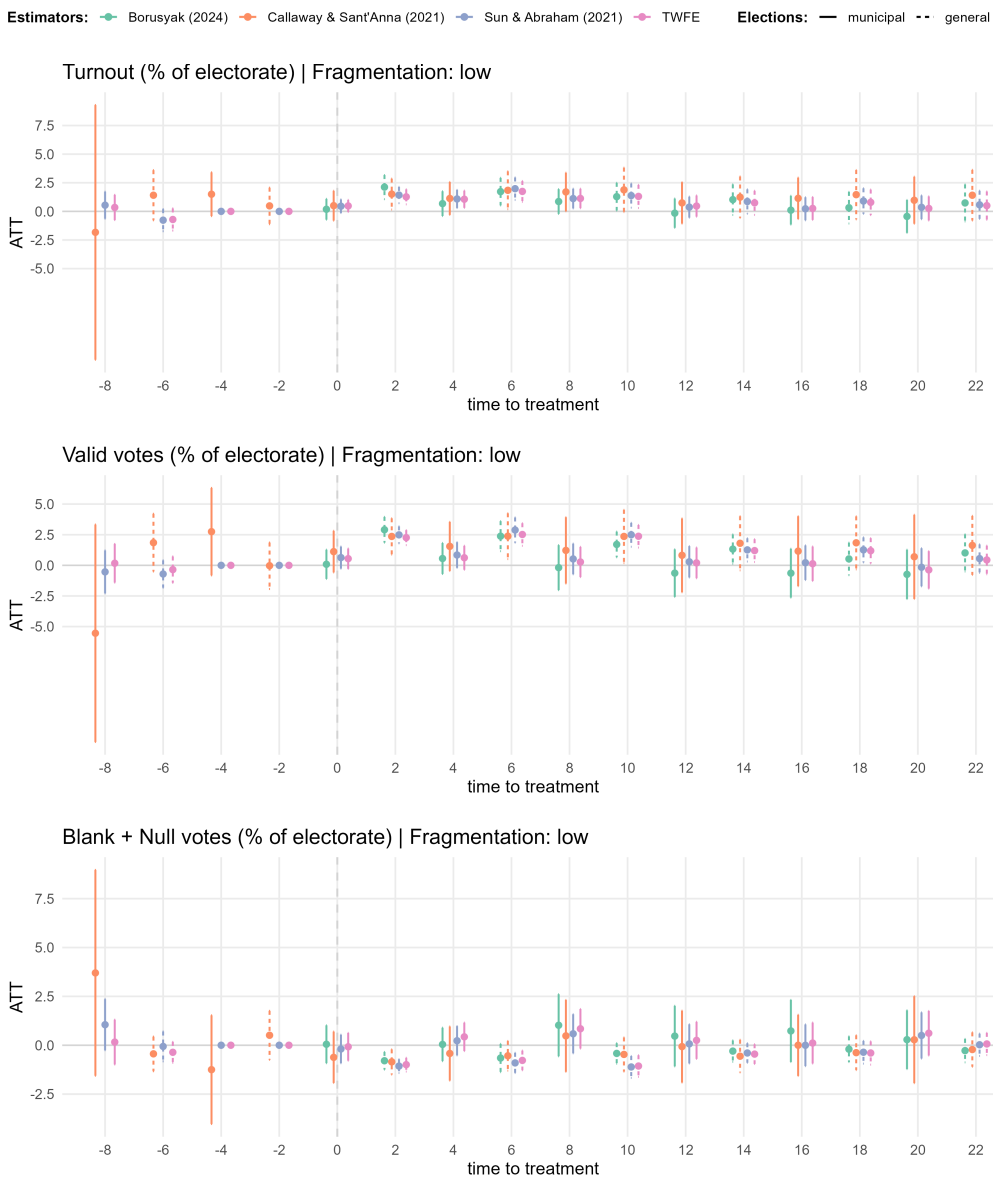
Appendix B. Event study estimates

Figure B.4: Fragmentation effect on electoral outcomes (Model II)



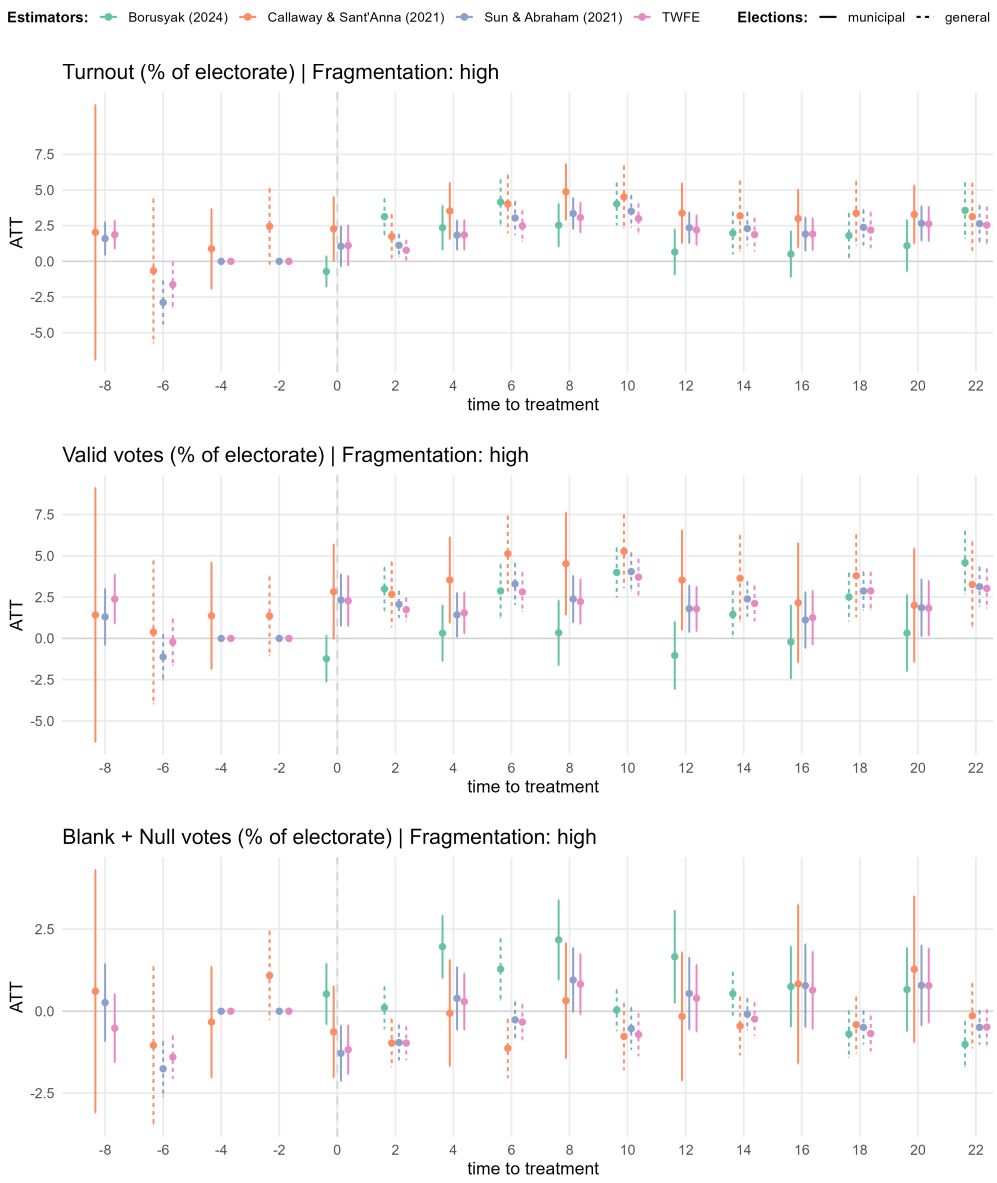
Notes: Figure presents event-study effects of municipal splits on electoral outcomes, using the preferred difference-in-differences specification with only almost treated as controls (Model II). Vertical lines represent 95% confidence intervals and estimates for municipal (solid) and general (dashed) elections were conducted separately, but plotted together.

Figure B.5: Fragmentation effect on electoral outcomes (low fragmentation)



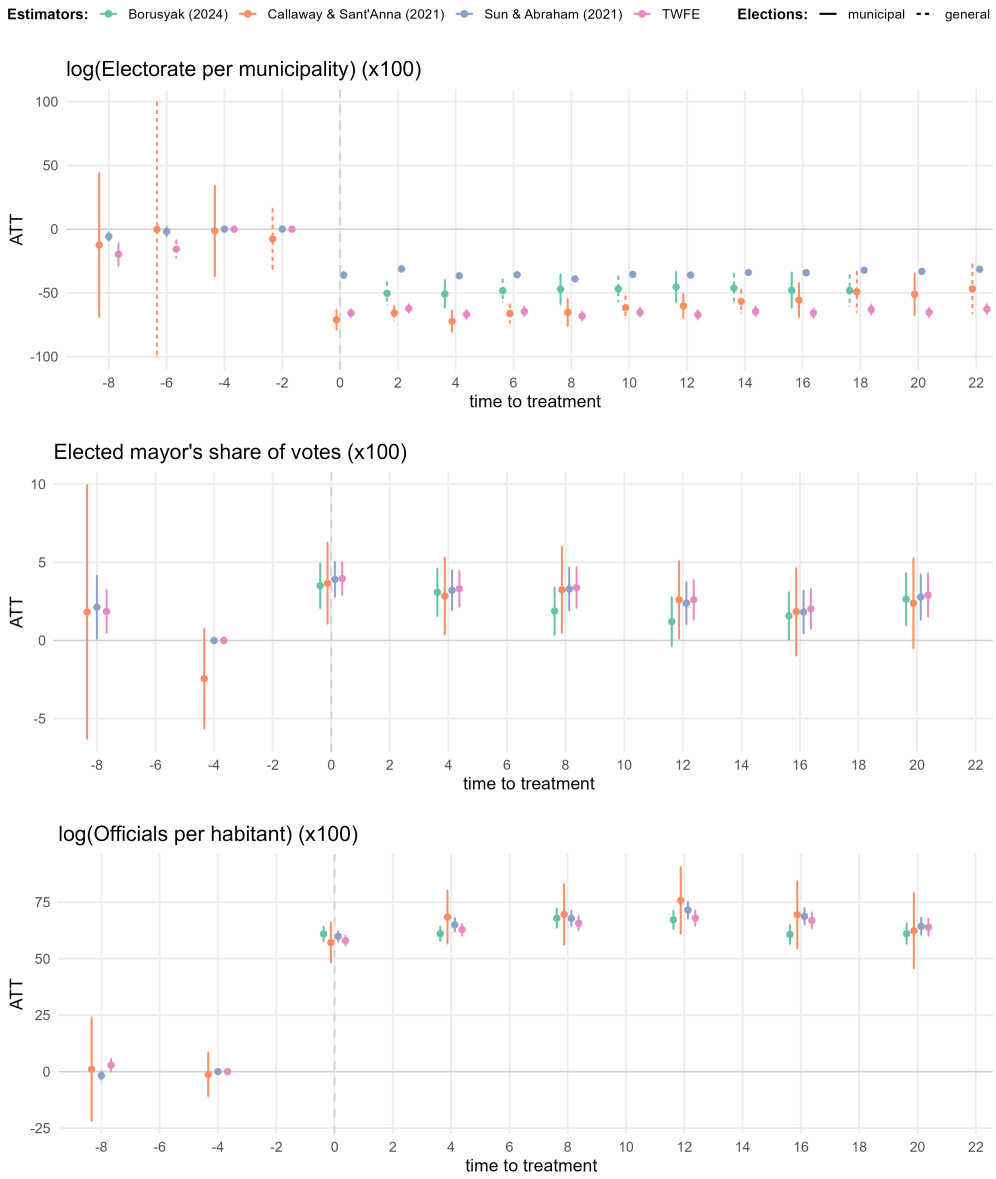
Notes: Figure presents event-study effects of municipal splits on electoral outcomes, using the preferred difference-in-differences specification using only almost treated as controls (Model II) with low level of fragmentation (HHI $>$ 0.568). Vertical lines represent 95% confidence intervals and estimates for municipal (solid) and general (dashed) elections were conducted separately, but plotted together.

Figure B.6: Fragmentation effect on electoral outcomes (high fragmentation)



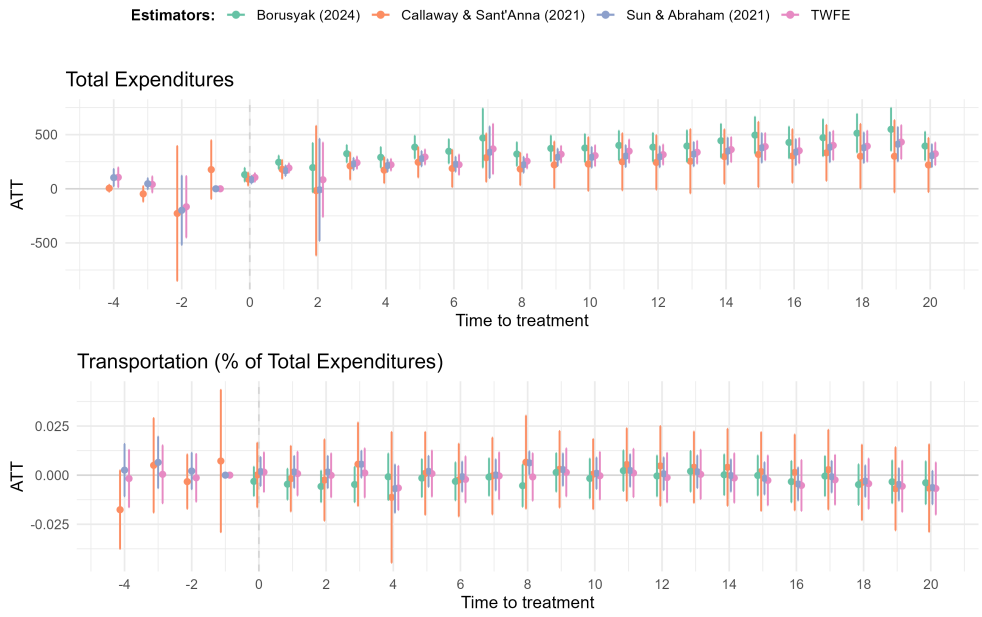
Notes: Figure presents event-study effects of municipal splits on electoral outcomes, using the preferred difference-in-differences specification using only almost treated as controls (Model II) with high level of fragmentation (HHI ≤ 0.568). Vertical lines represent 95% confidence intervals; dashed lines indicate municipal elections, while solid lines denote general elections.

Figure B.7: Fragmentation effect on other electoral variables



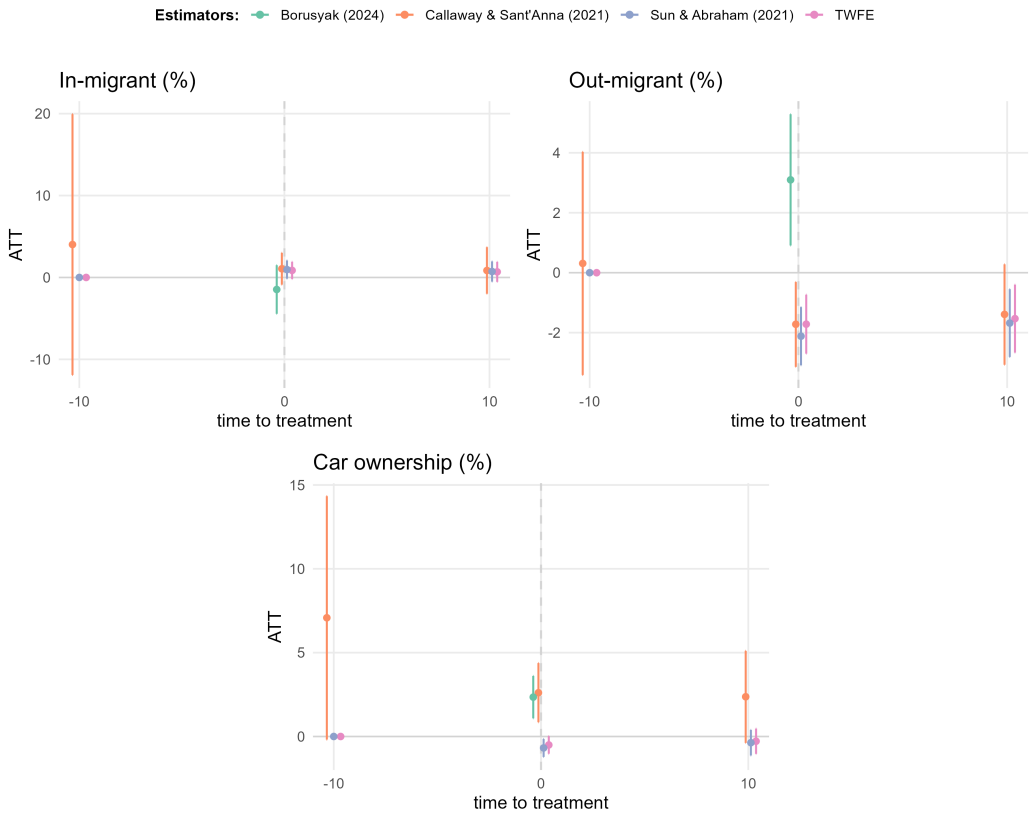
Notes: Figure presents event-study effects of municipal splits on electoral outcomes, using the preferred difference-in-differences specification with only almost treated as controls (Model II). Vertical lines represent 95% confidence intervals and estimates for municipal (solid) and general (dashed) elections were conducted separately, but plotted together.

Figure B.8: Fragmentation effect on fiscal variables



Notes: Figure presents event-study effects of municipal splits on fiscal outcomes, using the preferred difference-in-differences specification with only almost treated as controls (Model II). Vertical lines represent 95% confidence intervals.

Figure B.9: Fragmentation effect on socioeconomic variables



Notes: Figure presents event-study effects of municipal splits on socioeconomic outcomes, using the preferred difference-in-differences specification with only almost treated as controls (Model II). Vertical lines represent 95% confidence intervals.

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