Voter-Buying, Electoral Reform and Health Outcomes in Brazil

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Abstract

Electoral fraud is often a problem for new democracies. I study the consequences of voter-buying, defined as the act of inducing outsiders to fraudulently transfer their voter registration across jurisdictions in exchange for private benefits. Specifically, I explore the effects of Brazil's 2007 voter re-registration reform which was intended to curb voter-buying. Exploiting a fuzzy regression discontinuity design in the targeting of municipalities assigned to the reform, I examine the response of mayoral elections, public expenditures and socioeconomic outcomes to the imposition of exogenous barriers to voter-buying. The reform led to an increase in political competition and a rise in healthcare expenditures, a programmatic public good salient to poor voters. The increased investments in health are reflected in greater utilization of health services and better health outcomes: a 6.6% increase in prenatal visits, a 15% decrease in the incidence of low birthweight, and 5.3% reduction in the infant mortality rate. Consistent with imported voters being more pivotal in less populous municipalities, I find the impacts are larger in targeted municipalities that are small, and provide additional evidence that restrictions on voter-buying are the main driver of my results. I also provide evidence for more positive selection of politicians, and show that unintended disenfranchisement and incumbent reputation effects are not driving my results.

JEL Codes: P16/P48/D72

Key Words: voter-buying, clientelism, electoral reform, infant mortality, politician selection

1 Introduction

From ballot stuffing and registration irregularities to voter intimidation, electoral fraud is pervasive in new democracies.[1] By eroding confidence in democratic regimes, inducing political unrest, and limiting government responsiveness and accountability, electoral fraud can impinge on the functioning of government.[2]

A common form of electoral fraud is *voter-buying*, the act of inducing outsiders to fraudulently transfer their voter registration across jurisdictions in exchange for private benefits (Ichino and Schundeln 2012; Hidalgo and Nichter 2016). Besides historical accounts of voter-buying in the U.S., contemporary observers have documented instances of voter buying across multiple settings in both developed and developing countries.[3] The high prevalence of voter-buying and electoral fraud more generally raises two inter-related questions. First, can policies that attempt to reduce registration irregularities be effective in addressing these violations of electoral procedures? Second, what consequences do these efforts have on the quality of governance and government policies?

In this paper, I provide answers to both questions in the context of Brazil. I study the consequences of a voter re-registration reform intended to curb the fraudulent registration of voters across a large set of municipalities in the country. Announced and carried out during the year 2007 by Brazil's Federal Electoral Court (Tribunal Superior Eleitoral, or TSE), the reform was motivated by widespread concerns of illegal transfers of voters and represents an effort to clamp down on such practices. Estimates from a subset of municipalities suggest that as much as 15-20% of the locally registered electorate were not legitimate residents, and nearly 200 mayors were charged with the specific allegation of engaging in fraudulent relocation of voters during the period 2000-2008.[4] Following previous work by Hidalgo and Nichter (2016) who study this reform, I exploit the fact that while artificial inflation of the voter rolls was common, the court-ordered reform used a specific criterion to trigger a complete re-registration of voters in a municipality: a ratio of registered voters to total estimated population in 2006 greater than 80%. This allows me to implement a fuzzy

[1] Simpser (2013) documents the widespread manipulation of elections since 2000, particularly in new democracies.

[2] Birch (2008), Elklit and Reynolds (2002), and Rose and Mischler (2009) provide evidence of the link between electoral integrity and political legitimacy. Eisenstadt (2002) document how judicial failures to address electoral irregularities in Mexico led to violent protests. Barro (1973), Ferejohn (1986), and Persson and Tabellini (2006) provide both theoretical and empirical evidence demonstrating the electoral process as a mechanism to shift the officeholder towards a position conducive to the advancement of interest of their constituents. Besley and Coate (2003), and Caselli and Morelli (2004) discuss how electoral competition can lead to more competent candidates getting elected into office.

[3] By some estimates, one in four country-level elections since 2000 were marked by substantial electoral fraud (Simpser, 2000). Contemporary examples include Kenya, Philippines, Bolivia, Botswana, Bulgaria, Jordan, Japan and Ghana.

[4] According to a report by the Federal Prosecutor's Offce in Brazil (Ministerio P'ublico Federal 2008).

regression discontinuity design to identify the effects of the voter re-registration on a broad set of electoral and budgetary outcomes and their socio-economic consequences for the local population.

Using detailed electoral data during the 2008 municipal elections for municipalities around the 80 percent registered voter to population threshold, I provide evidence that the reform led to a decline in voter registrations, increased electoral competition, and reduced the electoral advantage of incumbent mayors. Specifically, the voter registration rates in reformed municipalities in the 2008 municipal election fell 12 percentage points on average, with a corresponding increase in voter registration rates of municipalities that share a border with reformed municipalities. This evidence is consistent with the notion that previously imported voters re-registered in neighboring municipalities where they truly resided. The reform also led to a decline in the re-election probabilities of incumbent mayors of 15-18 percentage points. The reduction in incumbency advantage corroborates the idea that incumbent politicians are better able to buy voters than challengers due to organizational and financial resources. These changes were accompanied by increased political competition in the form of a large drop in the margin of victory at the cut-off (a drop of 5 percentage points, which is equivalent to 50% of the average margin of victory). Moreover, consistent with the idea that the relative value of an additional vote is greater in less populated municipalities, I find that the impacts are more pronounced in small targeted municipalities that are adjacent to larger ones. Finally, using data on the observable characteristics of mayoral candidates, I find suggestive evidence of improvements in elected mayors' prior experience in the public sector.

I then explore how the new political equilibrium induced by the reform shaped subsequent local government policy decisions and the socioeconomic outcomes of residents.. Specifically, using municipality budget data during the 2005-2011 period, I find that, although there are no statistically significant increases in overall expenditure levels, local governments increase public health expenditures by 3 percentage points (10 percent) for the three years following the 2008 election (2009-2011), with no significant changes in other spending categories (e.g., education, transportation). These increases in health expenditures are consistent with the argument that politicians respond to the new political equilibrium by providing programmatic public goods, mainly to poor households, as a substitute for prior practices of clientelism via particularistic and individual transfers in the forms of water, and other basic necessities (Fujiwara 2015, Bobonis et al 2017).[5] Finally, the fuzzy regression discontinuity estimates indicate that increased investments in the public health

[5]Low income households in Brazil rely mostly on a public-funded system for health care services, while wealthier households are more likely to use private services (Alves and Timmins 2003). If the poorer and less educated have relatively stronger preferences for public health services, a shift in spending towards health care can be interpreted as redistribution to the poor, as documented in Fujiwara 2015.

are reflected in greater utilization of health services and improved health outcomes: a 6.6 percent increase in prenatal visits expecting mothers, a 0.5 percentage point (15 percent) decrease in the incidence of low birthweight births, and a 0.1 percentage points (5.3 percent) reduction in infant mortality rates.[6] Finally, consistent with the reform's heterogeneous impact on elections with respect to to municipality size, I find the policy effects to be more pronounced in small targeted municipalities that are adjacent to larger ones.

There are several mechanisms that could help explain why the re-registration reform affects political competition as well as longer-term governance outcomes. First, the reform may have removed external voters and thus erased the electoral advantage derived from voter buying by incumbent politicians. The resulting change in the composition of the electorate could cause politicians to increase the provision of public goods preferred by existing (poor) residents to (re)gain electoral support. Second, the evidence on politician selection is consistent with more competent, honest and/or experienced politicians getting selected into office. Third, since the reform exposed the existence of malfeasance via electoral fraud (because even legitimate residents were forced to re-register), it may have heightened the perception among elected politicians that there would be future crackdowns on electoral fraud, thus increasing their responsiveness to citizens' needs.[7] In ancillary tests, I find evidence consistent with the first two mechanisms playing a role. However, reductions in imported voters and barriers on future voter-buying are the key driver of the results.

I interpret the main findings in the context of a simple political economy model with probabilistic voting to show how the reform may affect incumbency advantage, budget allocation, and voter buying in elections. I explicitly model a pool of external voters who can be imported from outside to vote in an election but otherwise have no ties to a municipality. The model allows the incumbent politicians to transfer voters from outside as well as buy votes from less-educated voters from her own electorate by diverting public funds into private payments. In this context, the 2007 voter re-registration reform in Brazil acts as an exogenous shock to the ability of incumbent politicians to import voters from surrounding municipalities. The model predicts that, as voter-buying becomes less attractive, incumbents try to recover lost votes by funneling resources into public goods. Within the model, the reform essentially increases the marginal cost of vote-buying, leading to a favorable trade-off for funds flowing into public sectors, which is particularly true if the local electorate values public services more than private payments from politicians at the

[6] I focus on neonatal and infant health outcomes for two reasons: due to data availability as well as the fact that newborn health can respond rapidly to health care improvements, which is important for an empirical strategy based on the timing of the reform (Fujiwara 2015). In addition, infant health outcomes are importance for aggregate welfare given its consequences on adult-life health and wellbeing (Almond and Currie 2011, Currie and Vogl 2013).

[7] For evidence regarding the possibility of politicians' learning about the likelihood of future monitoring and anti-corruption audits, see Avis, Ferraz, and Finan (2017).

margin. Thus, the increase in public expenditures due to the reform is further magnified by the presence of higher levels of education among the electorate.

This paper is closely related to various literatures. Firstly, this paper contributes to the literature on electoral technology and electoral fraud (Anderson and Tollison, 1990; Baland and Robinson, 2008, Fafchamps and Pedro Vicente, 2013; Fujiwara, 2015). Fujiwara (2015) report that the introduction of electronic voting technology in Brazilian elections promoted enfranchisement of mainly less educated citizens, leading to a shift in government spending towards health care, which is particularly beneficial to the poor. The key mechanism driving the results in Fujiwara (2015) was the greater political participation of poorer voters. In contrast, I find that exogenous reductions in clientelistic practices mostly benefit municipalities with a higher share of educated citizens. This is consistent with previous findings that educated and informed voters less are likely to be part of clientelistic networks (Fujiwara and Wantchekon, 2013; Banerjee et al, 2011; Brusco et al, 2003). Secondly, this paper is closely related to the literature on factors underlying political clientelism and its consequences for public service provision (Mulligan, Gil, and Sala-i-Martin, 2004; Persson and Tabellini, 2006; Aidt and Jensen, 2013; Frey, 2015). Frey (2015) demonstrated in the Brazilian context that federal transfers shielded from the influence of local clientelistic network led to reductions in incumbency advantage and induced incumbents to increase expenditures on redistributive health and education services. The chief argument in his paper is that federal transfers act as income shocks that reduce the marginal utility of private payments for voters. In contrast, my results on clientelism are driven by a negative supply-shifter on politicians rather than a negative demand shifter for voters, i.e. clientelistic practices became relatively more expensive for incumbent politicians, leading them to shift expenditures towards public health services to maximize their re-election probabilities.

Finally, this paper extends the literature on changes in composition of the electorate and its impacts on public spending decisions (Husted and Kenny, 1997; Miller, 2008; Naidu, 2012; Cascio and Washington, 2014). While these papers focus on the changes brought about by extending enfranchisement to racial minorities and women, I focus on the impact of strictly enforcing residency requirements and removing of voters with no ties to a particular jurisdiction on resource allocation within that jurisdiction.

The rest of the paper is structured as follows. In Section 2, I present an overview of the institutional background, and the features of the electoral reform that I study in this paper. In Section 3, I propose a theoretical model to explain the political and budgetary outcomes. Section 4 describes the identification strategy; Section 5 describes the data sources; Section 6 presents the results and their interpretation; and section 7 concludes.

2 Institutional Background

2.1 Public Healthcare Services in Brazil

Brazil's Unified and Decentralized Health Care System (SUS) was established in 1990 with the goal of providing universal health care for all citizens. Brazil's 1988 constitution required that the administration of primary public healthcare services gradually devolve to municipal governments. Currently, the administration of both basic and complex public health care services in Brazil is fully decentralized in 88% of all Brazilian municipalities. This is consistent with the manner in which many other government services are organized in Brazil. The provision of most public services in Brazil is highly decentralized, with higher levels of government providing transfers to Brazilian municipalities to finance relevant expenses. Besides primary healthcare services, municipal governments are entrusted with the administration and implementation of aspects of education and local infrastructure (Andersson, Gordillo, and van Laerhoven 2009).

Primarily financed by transfers from the state governments, the SUS is highly valued by Brazilian voters as their main source of medical treatment: 93% of all Brazilian citizens receive service from this system (Deloitte Report, 2015). Moreover, non-users benefit from the existence of this service since private insurance may not cover all expenses and economic circumstances of wealthy non-user individuals may change (Leonard and Leonard, 2004). Citizens are able to utilize the public healthcare system without being required to pay health insurance premiums or incur out-of-pocket expenses.

Due to the highly-decentralized nature of the provision of public health services, municipality mayors have significant authority over the allocation of resources to this sector and, thus, the ability to influence the quality of healthcare services provided in their municipality. 5,565 Brazilian municipalities receive on average $35 billion annually from federal government, which amounts to 5% of total federal revenue. These transfers are based on a formula that incorporates annual population estimates of each municipality and the tax revenues of the state that the municipality belongs to. Thus, the pot of money that a municipality government is provided with each year to finance its various operations can be considered to be exogenous to local political considerations. Healthcare accounts for more than 30% of total municipality expenses each year. Each year, an elected municipality mayor decides the allocation of these exogenous resources to different sectors by proposing a detailed budget that outlines expenditures by function and public work projects. This decision is taken in conjunction with a body of elected local councillors and legislators who analyze the budget proposal and then return in to the mayor with suggestions for each line-item. The mayor then authorizes the final approval of the revised budget.

2.2 Clientelism and Vote-Buying in Brazil

Given the substantial influx of resources to the municipality governments and the control over the allocation of budget, the local politicians, and particularly the mayors, are important political figures at the local level. A substantial body of research demonstrate the prevalence of vote-buying and clientelism financed through public funds in the local political context of Brazil (Alston and Mueller, 2006; Fried, 2012, Bobonis, Gertler, Gonzalez-Navarro and Nichter, 2017). A recent survey in Northeastern municipalities of Brazil find that 28% of all respondents who are eligible voters received vote-buying offers and 66% of all respondents were aware of quid pro quo offers for votes (Sugiyama and Hunter, 2013). They also report that government programs are often linked to vote-buying offers. A survey conducted by the Latin American Public Opinion Project (LAPOP 2014) reports that 10.7% of Brazilians were directly offered a private benefit in exchange for their vote in the 2004 federal elections. Vote buying in Brazil typically involves the targeting of the poor, and payments in the form of goods and services (e.g. water, medicine, food, preferential allotment of administrative favors etc.) that are often made in more than one installment [8]

A recent strand of literature focuses on the specific clientelistic practice of fraudulent registration of voters. This involves inducing outsiders to transfer their electoral registration and vote for the relevant political actor. Hidalgo and Nichter (2016) refer to this phenomenon in Brazil as 'voter-buying" and provide extensive qualitative and quantitative evidence of such practices in Brazilian municipal elections. Allegations of mayors importing voters from surrounding municipalities in exchange for private benefits are rife in official documents, prompting the voter re-registration reform of 2007 which is studied this paper. Official records state that recipients are provided with promises of "money, gift and free transportation on election day" in exchange for transferring their voter registration. Vote-buying is an electoral crime in Brazil as per article 41 of the Law 9.504/1997, entailing the loss of political position and political rights for 8 years in the event of a successful indictment. Nearly 700 politicians were ejected from their position by Brazil's electoral courts between 2000 and 2008 (MCCE 2009) on charges of vote-buying. Over 450 municipal mayors were impeached during the same period for allegations of vote-buying. According to a report by the Federal Prosecutor's Office in Brazil (Ministerio P'ublico Federal 2008), almost 200 mayors faced the specific charge of fraudulently importing voters from elsewhere. There are numerous reports of mayors and political operatives being imprisoned for the specific charge of illegally importing voters, e.g. the incumbent mayors of Caracol in Piaui state, Alvorado do Oeste in Rondonia state, and Rio Da Conceicao in Tocantines state after the 2008 municipal elections (Ministerio P'ublico Federal 2008) as well as the prosecution

[8] IBOPE (2005) survey conducted after the 2004 municipal elections finds that vote buying is more prevalent among the poor and involves the offer of public goods and services in 67% of all cases.

of municipal employees in a number of municipalities from the states of Goias, Pernambuco and Amazonas.

The literature argues that incumbents are better-positioned to engage in clientelistic practices as they have greater access to municipal resources, social programs and control over public employment (Nichter, 2016; Gallego and Wantchekon, 2012; Stokes 2009). Wantchekon (2003) provides experimental evidence that clientelistic practices are more effective for incumbent political candidates, possibly because their promises to deliver private benefits carry more credibility. The comparative advantage that incumbents enjoy in this regard also extends to the specific practice of importing voters from outside to inflate one's voter rolls, given that municipal mayors in Brazil can often exert influence over municipal employees to carry out fraudulent registration of voters, as has been documented in the case of Caracol in Piaui state and Nova Ipixuna in the state of Para. Voter registration transfers are carried out in electoral offices, which are often staffed by workers appointed by the mayor's office.

2.3 Voter Re-Registration Reform

The voter re-registration reform studied in this paper was announced near the end of the year 2007 by Brazil's Superior Electoral Court (TSE), which is the highest body of Brazilian electoral justice and is composed of members from the Justices of the Brazilian Supreme Federal Court. As described in the previous section, the reform was prompted by widespread concerns of illegal transfer of voter registrations. The explicit purpose of the reform was to eliminate fraudulent voter registrations that existed in the 2007 electoral rolls and ensure that only the true residents of a municipality participate in the municipal elections. In the words of a senior member of the TSE: *"What justifies a revision is the existence, in the electoral rolls, of voters who don't have links with a municipality."* This sentiment was echoed by a state deputy in Mato Grosso who states that the reform ensures *"only people who actually live in the municipality will vote"* (V'arzea Grande 2008).

The first municipal elections to be affected by the reform took place in 2008. Figure 1 plots the timeline of all the relevant events. Brazil holds municipal elections every four years in each of its 5,596 municipalities spread across 27 states to elect a mayor and a local council of legislators. Mayors have a two-term limit, but can decide to run for re-election after a hiatus of 8 years (approximately 21.8% of all two-term mayors decide to run for re-election). Voting is mandatory for all registered voters between the ages of 18 and 70, and abstentions involve punitive fines. Citizens who do not register as voters cannot take advantage of a wide array of public services, including utilizing public health services, being hired for a public-sector job or study at a public university.

The voter re-registration reform of 2007 led to existing voter rolls in selected municipali-

ties to be completely expunged and required all citizens in these municipalities to re-register as voters. The requirement of re-registration was advertised through TV and radio advertising. To re-register, voters had to provide the electoral office in their municipality with an identification document and proof of residency at least five months prior to the 2008 municipality elections (held in October of that year) in order to be eligible to vote in the 2008 election. Figure 2 provides a map of all municipalities that were selected for reform and shows that municipalities from all across Brazil were selected for the reform. Statistical tests do not find any particular region of Brazil being over or under-represented by the reform (Table A1).

The key criteria outlined by the TSE for a municipality to be selected for the reform is: the ratio of registered voters in the 2006 federal elections to total estimated population in 2006 in a given municipality was greater than 80 percent. Exceeding the 80 percent threshold was considered to be a sign of artificial inflation of voter rolls, given the national demographics of Brazil at the time and that citizens aged below 16 cannot be registered as voters. There were two other criteria that had to be met for the reform to take place. These were: (1) Electorate was double the summed population of citizens aged 10-15 and over 70 years in 2006; and (2) Voter transfers increased at least 10 percent over the previous year. However, the 80 percent trigger was the key determinant of the reform taking place. This is because 27% of Brazil's municipalities fulfilled the 80% criterion, while over 99% fulfilled (1) and over 60% fulfilled (2). Moreover, 90% municipalities over the 80 percent threshold met both the other criteria. Figure 3 plots the probability of undergoing the reform below and above the 80 percent threshold, demonstrating a significant jump in the exogenous probability of being reformed once a municipality crosses this threshold. I employ the 80 percent trigger to exploit the variation in the exogenous *probability* of being selected for reform as the basis for carrying out a fuzzy regression discontinuity design for identification. A total of 1186 Brazilian municipalities underwent the reform, which is roughly above a fifth of all municipalities in Brazil.

3 Theoretical Framework

In this section, I propose a political economy model in order to show how the voter re-registration reform affects incumbency advantage, and budget allocation by importing an exogenous barrier on importing voters from outside, and how these effects vary with the level of education of the electorate.

3.1 Set-up

Consider a two-period model, where there is an incumbent and challenger, indexed by P=$\{I, C\}$. There are two groups of voters, indexed by J=$\{H, L\}$, where H denotes high-educated voters and L denotes low-educated voters. α^J is the share of each group of voters from the entire population of legitimate voters in a municipality, denoted by N. High-educated voters have income w_H, and low-educated voters have income w_L, with $w_L < w_H$.

The parameter $\sigma_P^{J_i}$ denotes political preference of voter i in group J for politician P. The relative preference for the challenger, $\sigma_C^{J_i} - \sigma_I^{J_i}$, has a group-specific uniform distribution on $(-\frac{1}{2\phi^J}, \frac{1}{2\phi^J})$. This parameter represents any dimension of political preferences than actual policy, and could be based on observable characteristics of the politician. This individual political preference parameter, $\sigma_P^{J_i}$, is redrawn every electoral cycle. A politician observes exogenous group preference parameters, but not individual political preferences.

3.2 Voters

I assume that the utility of voters is log-separable on public and private consumption, where g denotes public consumption and c denotes private consumption. The utlity of an individual voter under politician P is given by:

$$U(g_P, c_P) = \delta log(g_P) + (1 - \delta) log(c_P) + \sigma_P^{J_i}$$

An individual i residing within a municipality will vote for highest utility taking into account political preferences and relative popularity of challenger. So, an individual i from group Jvotes for incumbent if:

$$U(g_I, c_I) - U(g_C, c_C) + \sigma_I^{J_i} - \sigma_C^{J_i} > 0$$

Besides groups H and L, there is a pool of external voters, denoted by E, and their relative share is denoted by α^E. These are voters who do not belong to a particular municipality, but who can be imported only by an incumbent politician in order to inflate her vote-bank [9]. The income for voters of this group is equal to the income of low-educated voters in a given municipality, w_L. This group of voters obtains utilityfrom only their own private consumption. The ability of an incumbent to draw voters from this pool of external voters is denoted by the parameter θ. This parameter captures physical constraints related to importing voters from neighboring municipalities, e.g. distance from surrounding municipalities, size of surrounding municipalities etc, and represents an upper bound on the

[9] Given the institutional features of the Brazilian electoral system, the incumbent enjoys a competitive advantage in engaging in this type of practice

number of voters that can be imported from elsewhere in a given election. The relative share of voters that are imported, α^E, is prportional to θ and the amount of vote-buying resources dedidated to external voters. Thus, $\alpha^E \propto \theta(1-s)v$.

Given the distributional assumptions of various parameters, the incumbent vote-share is given by:

$$\pi_I = \sum \alpha^J \phi^J [U^J(g_I, c_I) - U^J(g_C, c_C) + \frac{1}{2\phi^J}] + \alpha^E [U^E(c_I) - U^E(c_C)] \tag{1}$$

I assume that politicians extract no rents from office, other than ego rents, thus an incumbent only cares about the probability of re-election.

3.3 Budget Allocation

Budget b is fixed and exogenously determined, in accordance with the manner in which municipal governments in Brazil are structured. The budget is allocated to public goods and vote-buying resources. A portion of this budget, denoted by v, is allocated to vote/voter buying purposes. A share s of v is allocated to buying votes from low-educated voters, while the rest is used for importing external voters.

The utilities of different groups under the incumbent are:

$$H : U(g_I^H, c_I^H) = \delta log(\frac{b-v}{N}) + (1-\delta) log(w_H)$$

$$L : U(g_I^L, c_I^L) = \delta log(\frac{b-v}{N}) + (1-\delta) log(w_L + \frac{sv}{\alpha^L N})$$

$$E : U(g_I^E, c_I^E) = log(w_L + \frac{(1-s)v}{\alpha^E N})$$

Voters will face a competing utility given by the challenger. Challengers are not able to make credible promises without access to budget resources. Because the composition of groups in period 2 is not yet known, all high-educated voters expect from the challenger the private consumption of $(w_H + \frac{v}{(\alpha^H + \alpha^L)N})$, and all low-educated voters expect from the challenger the private consumption of $(w_L + \frac{v}{(\alpha^H + \alpha^L)N})$ In this context, incumbency advantage exists because (i) only the incumbent can target low-educated voters better, and (ii) only the incumbent can import external voters [10].

[10] In this version of the model, the incumbent has an informational advantage over the challenger even in the absence of voter-buying from surrounding municipalities. An alternate way of modelling this would be to provide the incumbent with access to higher resources for the purposes of vote-buying, i.e. $v_I > v_C$. This formulation does not change the model predictions.

Combining the utility of private consumption under each candidate with equation 1,

$$\pi_I = \alpha^H \phi^H (1-\delta) log(\frac{N w_H}{N w_H + v}) + \alpha^L \phi^L (1-\delta) log(\frac{N\alpha^L w_L + sv}{N\alpha^L w_L + \alpha^L v}) \\ + \alpha^E log(w_L + \frac{(1-s)v}{\alpha^E N}) \tag{2}$$

Where $\alpha^E = k\theta(1-s)v$ and k is a constant.

The incumbent's choice variables are s and v, and her objective is to maximize her share of votes, π_I.

3.4 Model Analysis

This paper examines the effect of an exogenous reduction on the ability of the incumbent to induce external voters to fraudulently register in a municipality to inflate the incumbent's vote-banks. This corresponds with an exogenous reduction in the parameter θ within the model.

Proposition 1: The voter re-registration program reduces the vote-share of the incumbent: $\frac{d\pi_I}{d\theta} > 0$, only if voter-buying exists prior to the reform taking place.

Proposition 2: The voter re-registration program reduces the amount of resources allocated to vote buying: $\frac{dv}{d\theta} > 0$. The reduction in θ leads to freeing up the portion $1-s$ of funds tied to vote-buying. This portion will now be distributed to both the provision of public goods and making vote-buying offers to low-educated resident voters of the municipality.

Proposition 3: The decline in the vote-share of the incumbent is greater if a higher proportion of the electorate is high-educated: $\frac{d\pi_I}{d\theta d\alpha^L} > 0$. Moreover, the decline in the amount of resources allocated to vote buying is greater if a higher proportion of the electorate is high-educated: $\frac{dv}{d\theta d\alpha^L} > 0$. This is because high-educated voters prefer the public good relatively more compared to low-educated voters in the municipality. Thus, channelling more funds into the public sector increases incumbent's vote-share.

4 Empirical Methodology

Estimating the effects of ability to engage in clientelism on political outcomes and responses of the relevant political actors can be frustrated by classic endogeniety concerns. For example, selection bias can overpower estimates, or even change the direction of the effect. Omitted variable bias is also a concern in these types of studies. However, the unique policy

aspects of the 2007 electoral revision facilitate the identification of these effects by bypassing these concerns. I am able to circumvent endogenity concerns and separately identify the effects of the reform by using a regression discontinuity design. This design allows me to quantify the effects of the reform in a transparent manner. The assumptions for identification can also be tested. I first quantify the effects of the reform on relevant political outcomes. Next, I focus on the effects of the reform on allocation of the municipality budget to health expenditures. After establishing a response in these two areas, I then explore the effect of this reform on relevant health outcomes at the municipality level. Finally, I use a triple differences design to explore the heterogeneity of the impact of the reform based on the level of education of the electorate.

4.1 Regression Discontinuity

The identification of local average treatment effects through regression discontinuity analysis is now well established in the literature (Angrist and Lavy, 1999; Lee et al., 2004). I use local linear regressions, dropping observations outside a set bandwidth of the cut-off (Lee and Lemieux, 2010) in order to reduce bias from including observations far away from the cut-off where the assumptions underlying the identification is likely to not hold. The forcing variable is the ratio of registered voters in 2006 to the estimated population of the municipality in 2006. As mentioned in the previous section, exceeding the threshold of 80 percent acts as an exogenous trigger for the reform to take place.

The formal equation describing the RD design is as follows, using only observations that satisfy the requirement that the electorate to population ratio in 2006 $\in (0.8-h, 0.8+h)$, where h is the choice bandwidth around the 80 percent threshold:

$$\begin{aligned} Y_i = \alpha + \beta_1 D_i + \beta_2[Electorate\ \ to\ \ Population\ \ Ratio - 0.8] \\ +\beta_3 D_i X[Electorate\ \ to\ \ Population\ \ Ratio - 0.8] + \epsilon_i \end{aligned} \tag{3}$$

Here, Y_i is the relevant outcome variable (e.g. political outcomes, health expenditure shares, health outcomes) in municipality i, D_i is a dummy variable that takes on the value of 1 if the municipality crosses the threshold of 80 percent that triggers the reform. This specification allows for a linear relationship between the outcome and the forcing variable to be estimated separately on each side of the discontinuity within the bandwidth window. The regressor of interest is D_i, which provides the reduced form estimate for the existence of any discontinuity at the threshold.

The 80-percent trigger leads to an exogenous increase in the *probability* of undergoing reform, as mentioned in the previous section. Undergoing the reform is not a deterministic function of the ratio of registered voters to population, rather it is the probability of being

treated that varies discontinuously at the threshold. As such, along with the reduced form estimates, I report the fuzzy regression discontinuity results using the Calonico, Cattaneo and Titiunik's "rdrobust" package with a triangular kernel.

A key decision is h, the kernel bandwidth, and the trade-off between precision and bias. I report estimates based on Imbens and Kalyanaraman's (2012) optimal bandwidth choice (IKBW), which is itself a function of the data and hence different for each outcome variable. To check the robustness of results, I also provide estimates using observations within the bandwidth of 0.78 to 0.82, and 0.76 to 0.84. There are 750 municipalities around the cut-off in the sample with a bandwidth from 0.78 to 0.82 and 1,474 municipalities in the sample with a bandwidth from 0.76 to 0.84.

For RD strategy to be valid, agents cannot have precise control over the forcing variable (Lee, 2008). There are a couple of reasons why this condition should hold in the setting of this particular reform. Firstly, TSE calculates electorate statistics, and census bureau releases population estimates, both of which are beyond the scope of a municipality mayor to influence. The 80 percent threshold underlying the reform was also calculated based on past realizations in 2006, while the reform itself was announced in 2007. Secondly, electorate size changes for reasons outside of mayors' precise control including deaths, cancellations, new registrations and outflows. Moreover, the setting passes the McCrary Density test. Figure 21 shows that there is no precise sorting around the cut-off.

To check if municipalities above and below the cut-off are comparable, I present estimates of the effects of the reform on a wide array of predetermined covariates in table A1. These are municipality population, municipal budget, poverty rates, size of electorate, rural population, income inequality, infant mortality, live births and geographical location. All effects are close to zero in magnitude and statistically insignificant.

5 Data

The electoral data related to the municipal elections of 2004 and 2008 are obtained from the Superior Electoral Court (TSE). These include data on number of registered voters, turnout, votes for different candidates, measures of candidate quality, number of voter transfers and other voting statistics for locations within each municipality. I use this data to construct measures of margin of victory and number of candidates in each election I also obtain data on voter education, age and gender reported by the TSE. These voter characteristics are gleaned from voter registration forms and are aggregated at the location level within each municipality. I obtain annual budget allocation data at the municipality level from the National Treasury database (FINBRA) from 2000-2011, which provides total municipality budget as well as expenses by function.

I construct measures of health care utilization and outcomes at birth by using data from the National System of Information on Live Births (SINASC), which contains birth records collected from medical and official registries, such as birth certificates. This database is known to have near universal coverage of Brazilian births. I supplement this database with mortality records (SIM) made available by the Brazilian Health Informatics Department to construct annual infant mortality rates from 2000-2014 in all Brazilian municipalities. Finally, a wide variety of demographic data, including population and geographical locations, are obtained from the Institute of Applied Economic Research (IPEA) and the Brazilian Institute of Geography and Statistics (IBGE).

6 Results

6.1 Political Outcomes

Before reporting the main results, I provide some graphical evidence. Figure 9 plots the re-election probabilities of incumbent mayors in municipality elections against the forcing variable (the ratio of registered voters to estimated population in 2006 in each municipality) for two different municipal elections within a threshold of 2% around the cut-off of 80%. Each marker represents a local average: the mean of the outcome in a bin of 20 municipalities. A straight line is fitted on the original (i.e., "unbinned") data at each side of the vertical threshold, so that the point where the lines are not connected is where the discontinuity in outcomes could be visible.

As can be seen, there is no visible discontinuity in the re-election probabilities of incumbent mayors in the 2004 municipality elections, which took place prior to the implementation of the reform. However, a clear decline is visible in the 2008 municipal election. The re-election probability of the mayor plummets by 15 percentage points after the reform takes hold. The fact that no discontinuity is visible for the municipal elections held in 2004 provides a falsification test indicating that municipalities "just above" and "just below" the cut-off are indeed valid treatment and control groups.

Table 1 presents the local linear regression estimates of the treatment effects on several relevant political outcomes. I report both the sharp RD estimates (which is analogous to an intent to treat estimate) and the fuzzy discontinuity estimates. I include state fixed effects, since municipality budget is decided by pre-determined formulas at the state-level. I cluster the errors at the state level as well. Confirming the graphical analysis, the table shows that, irrespective of the bandwidth used, the estimated effect of the reform on incumbent re-election probability is in the magnitude of 15-20 percentage points decline in the 2008 municipal elections and is statistically significant at the 1% level. Moreover, the proportion of the population in a municipality that are registered voters in the 2008 municipal elec-

tion drop by 12 percentage points, indicating the reform had substantial impact on voter registration rates. Columns 3 and 4 show that these changes were accompanied by closer elections increased political competition in the form of a large drop in the margin of victory at the cut-off (a drop of 5 percentage points, which is equivalent to 50% of the average margin of victory). This drop in the margin of victory is not an artifact of higher number of candidates in these elections, as column 5 reports that the reform's effect on number of candidates is numerically small and statistically insignificant.

Table 7 presents the potential spillover effects of the reform in the 2008 municipal elections on adjacent municipalities, i.e. municipalities that share a border with a reformed municipality but did not undergo the reform themselves. As can be seen, the reform did not have any discernible effect on incumbent re-election probabilities, margin of victory and number of mayoral candidates in adjacent municipalities. However, crucially, the voter registration rates of these municipalities in the 2008 municipal elections increased by 2.5 percentage points. This is supporting evidence that voters who were previously registered as a voter in a reformed municipality without being a legitimate resident of said municipality transferred their voter registration to a neighboring municipality. Given that slightly below a fifth of all municipalities underwent the voter registration reform, each reformed municipality are on average neighbors to four other municipalities that did not undergo the reform. Moreover, the reformed municipalities have lower population sizes on average. Thus, the decline in voter registration rates in reformed municipalities are equivalent to the rise in voter registration rates in surrounding municipalities that were not treated. Section 5.4 provides additional evidence that the observed changes in reformed municipalities are indeed being driven by lower rates of fraudulent voter registrations. Section 5.6 investigates whether the reform induced unintentional disenfranchisement of voters.

6.2 Effects on Health Expenditures

I now investigate the effects of reform on the allocation of municipality budget to different sectors, with emphasis on the share of health expenditures. As argued, in section 2, mayors have considerable authority to influence the administration and quality of primary health services in a given municipality.

Figure ?? plots the share of municipality budget allocated to health expenditures against the forcing variable, both in the years before and after the reform. As before, each marker represents a local average in a bin of 20 municipalities. There is no visible discontinuity in health expenditures in the years leading up to the reform (2005-2007). However, following the decline in incumbency advantage and decline in the margin of victory in the 2008 municipal elections, there is a significant jump in the share of health expenses in the years 2009-2011 on the right side of the threshold. This is in accordance with the expectation

in the literature that increased political competition leads to politicians becoming more responsiveness to the needs of their electorate.

Table 2 reports the discontinuity estimates in a formal regression framework. I include state fixed effects in each of these regressions, since the municipality budget is determined by the relevant state governments based on a pre-defined formula. As can be seen, the pre-reform differences in health expenses are both statistically and economically insignificant, confirming the graphical analysis. In contrast, shares allocated to health expenses increased by an average of 3 percentage points per year in the three years following the reform, which is significant at the 1% level, irrespective of the bandwidth and specification employed. Moreover, this increase can be observed in each of these three years individually, as reported in columns 3-5. Given that the average health share of expenses is 30% of the municipality budget, an increase of 3 percentage points is equivalent to a 10% increase in overall health expenses, which translates into an average increase of 640 Reais (215 USD) per capita per year.

Table A4 shows that the reform was not accompanied by an increase in total municipality budget, which is in accordance with the method by which municipality budget is determined each year. Since the budget relies on state revenues and estimated population of a municipality each year (which is continuous at the cut-off), there is no reason to expect any discontinuity before or after the reform. Moreover, there is no discontinuity in the recorded total expenses of each municipality. Table A5 breaks down total expenses by function in the years following the reform. Although the point estimate for share of educations expenditures is positive, it is statistically insignificant. I find statistically insignificant effects of the reform on other sectors. This finding, coupled with no increase in total expenditures, imply that mayors are not systematically transferring funds from a particular sector into the provision of public health services across municipalities. Finally, table 33 reports that health expenditure shares in neighboring municipalities were unaffected by the reform.

6.3 Effects on Health Outcomes

In this section, I explore whether the rise in health expenditures translated to better health outcomes at the municipality level. I focus on both the utilization of pre-natal health services (number of pre-natal visits by mother) and pre-natal health outcomes (birthweight and infant mortality) at the municipality level.

Table 3 shows the effect of the reform on a variety of primary health outcomes in the years following the reform, while Tables A2 and A3 reports the effects of the reform at the threshold for several measures both before and after the reform. As can be seen, there is virtually no distinction between treated and untreated units in the years leading up to the

reform for all of these measures. However, there is evidence of significant improvements in each of these measures in the years following the reform. The average number of pre-natal visits made by expecting mothers rise by a statistically significant magnitude of 0.3 times, which is a 5 % increase over the overall average of 7 visits per mother. The proportion of mothers with at least four pre-natal visits, a measure commonly used in the relevant literature indicating whether expecting mothers meet the lower limit of sufficient pre-natal care, also goes up by one and a half percentage points. Given that almost 95% of all mothers meet this threshold, a further increase of 1.5 percentage points is a substantial improvement. The increased utilization of prenatal health services is accompanied by better outcomes at birth, as evidenced by a drop in incidences of low birth weight babies by a magnitude of approximately 10% of the overall average.

With regards to infant mortality (defined as the number of deaths per thousand live births), the point estimate suggests that there is a decline, albeit statistically insignificant. However, table A2 breaks down the effects on infant mortality by each year beginning from 2009 and going up to the year 2014. As can be seen, the drop in infant mortality is persistent and statistically significant for at least four years beginning from the year 2011. The point estimate of roughly 2.5 fewer death per thousand live births indicate an improvement of 12.5% over the average infant mortality rates for all municipalities in Brazil. It appears that the gains in lower infant mortality appears in the data with a lag of two years since the increase in health expenses in 2009. A possible reason is that there may be a lag between the provision of higher public health services and utilization by the intended beneficiaries. I explore this by breaking down the utilization of health services by individual years from 2009 to 2012 in tables 16 and 17. It does appear that there is a lag of one year before municipality residents begin to take advantage of higher healthcare resources in treated municipalities. The rise in average prenatal visits and proportion of expecting mothers with at least four prenatal visits become statistically significant from 2010 and persists till 2012, which is in contrast with the finding reported previously that share of health expenses rise in 2009 immediately following the 2008 municipal elections. Section 5.4 provides further evidence that the gains in improved health outcomes were concentrated in municipalities where fraudulent transfer of voter registration is more likely to be prevalent before the reform took place.

6.4 Voter-Buying as a Mechanism

The argument of this paper is that the voter-registration reform imposed exogenous barriers on the ability of incumbent mayors to import voters from surrounding municipalities. This led to a decline in incumbency advantage, and an increase in the share of public resources devoted to the provision of public healthcare services. In this section, I examine whether

the heterogenous effects of the reform demonstrate that the findings are consistent with the voter-buying story.

6.4.1 Small Municipalities

I first investigate whether the effects on political outcomes, health expenditures and health outcomes are large in magnitude in smaller municipalities. This idea builds on Fukumoto and Horiuchi (2011), who report that fraudulent registration of voters is more likely to take place in small districts where an imported voter has a greater probability of being pivotal. The literature also reports that that the electoral returns from non-clientelistic (programmatic) strategies are greater as the size of electorate increases (Stokes et al, 2013), due to the economies of scale of advertising and higher costs of accurately monitoring whether citizens who receive private benefits renege on their side of the bargain. These reasons render voter-buying to be a more cost-effective strategy in smaller municipalities. Therefore, if reduction in voter-buying is driving the main results reported in this paper, one would expect the effects to be larger in magnitude in smaller municipalities.

I split the sample of all municipalities into two categories: municipalities with below-median population and above-median population. I construct these two categories based on the respective municipality population estimates in the pre-reform year of 2007. I carry out the regression discontinuity design separately for each of these two groups of municipalities. Table 4 report that the effects of the reform on political outcomes for each group. Both set of municipalities are characterized by declining incumbency disadvantage, but the drop in the magnitude of re-election probabilities is greater and more precisely estimated for municipalities that were on average smaller in the year before the reform took place. These municipalities also witnessed a larger drop in registered voters as a proportion of their population, and a larger decline in the margin of victory in the 2008 municipal elections. Thus, the political outcomes ensuing from the reform were more pronounced in smaller municipalities. Table **??** shows share of healthcare expenses increased by approximately 6 percentage points in smaller municipalities in the years after the 2008 municipal elections, as opposed to an imprecisely estimated 1.5 percentage points for larger municipalities. Finally, smaller municipalities show larger improvements in all four measures of health outcomes, as seen in tables **??** - **??**. These results are consistent with voter-buying being more prevalent in small municipalities.

6.4.2 Voter Transfer Patterns with Neighboring Municipalities

I now explore whether the reform had heterogenous effects based on the voter registration transfer patterns in pre-reform years. This builds on the Ichino and Schundeln (2012)

and Hidalgo and Nichter (2016), who argue that fraudulent relocation of voters happens from geographically proximal cities due to "time and resource constraints." The voter re-registration reform can be expected to lead to a sharper decline in incumbency advantage if the incumbent recently imported many voters from surrounding municipalities. Thus, I explore if the effects of the reform are larger in municipalities that have undergone larger numbers of additions to their voter rolls prior to the reform, while simultaneously a large number of voters have left the voter rolls in surrounding municipalities.

I observe the number of voter transfers into a municipality, and the number of voter transfers out of a municipality in each year from the TSE data. I split the sample of all municipalities into two categories based on whether they were above or below the national median in terms of 1) voter transfers out of their neighboring municipalities in the pre-reform years of 2005 and 2006, and 2) voter transfers into their own electoral rolls during these two years. The median number of voter transfers into a municipality in 2005 and 2006 was 180, while the median number of voter transfers out of neighboring municipalities during the same time period was 1,446. I categorize municipalities that are above the national median for both conditions as high net transfer municipalities.

I implement the regression discontinuity design separately for each of these two groups of municipalities. Panel A of table 5 reports the effects of the reform on political outcomes for each group. I find that high net transfer municipalities were marked by higher levels of incumbency disadvantage, higher electoral competition and a larger drop in registered voters as a proportion of their population due to the reform, as opposed to municipalities that were not above the national median in either one or both of the two conditions. These high net transfer municipalities also witnessed higher health expenditures in subsequent years (panel B of table 5) and greater improvements in health outcomes (panel C of table 5). Thus, the results are driven by municipalities marked by potentially suspicious patterns of voter transfers before the reform took place, which is consistent with the reform increasing the costs of importing voters from elsewhere.

6.5 Heterogeneity by Education of Electorate

In this section, I test the third key prediction of the model. The model suggests that the reform will hurt the incumbent mayor's electoral prospects more if the level of education of the electorate is higher, followed by a greater increase in funds flowing to sectors with public utility subsequent to the reform. The argument behind this is that higher-educated voters have less propensity to engage in clientelistic practices and value public services relatively more. Thus, as the costs of engaging in clientelistic practices increase due to the reform, the trade-off for funds flowing into sectors with public utility becomes more favorable in the presence of more educated voters.

I begin by providing suggestive evidence that people with more education are less prone to selling their votes in exchange for private benefits. Figure 22 plots supply curves for the willingness to sell votes at given prices for two different groups - voters with less than high-school education, and voters with at least a high-school education. The figure has been constructed using data from the working paper by Bobonis, G., Gertler, P., Gonzalez-Navarro, M. and Nichter, S. (2016). The survey was conducted in 40 municipalities in the northeastern region of Brazil. Respondents were asked whether they are willing to exchange their vote under different hypothetical offers made by any mayoral candidate. The figure shows that at any given price, a much higher proportion of voters with less than high-school education are willing to sell their votes relative to their more educated counterparts. The difference is statistically and economically significant at all prices, suggesting that buying votes of more educated voters is relatively more expensive for a mayoral candidate. This is consistent with the theoretical framework proposed in this paper.

I observe the proportion of all registered voters that belong to various categories of educational attainment in each voting location in each municipality, which allows me to determine what proportion of a municipality's electorate have completed high-school education. I construct these proportions using all voters who are 25 years or older in each municipality, since younger voters may be in the process of completing their education. I then partition the sample of all municipalities into two categories: municipalities with below-median education and above-median education, based on the proportion of registered voters who have completed high school in a given municipality. The median high-school education completion rate in 2008 was 12.1%. Table **??** provides the results for the above-median and below-median education samples, respectively. Both sets of municipalities are marked by an increase in political competition and incumbency disadvantage, but the magnitudes of the estimates on re-election probabilities and margin of victory are far greater for municipalities with more education.

I then employ a triple-differences regression design to isolate the heterogenous effects of the reform based on the level of education of the electorate. Table A6 shows that the reform led to an additional 2.5 percentage points of increased expenditure in public health provision for reformed municipalities with above median levels of education. I include flexible dummies for population deciles in these regressions, to control for possible economies of scale involved in the provision of healthcare services. Table A7 shows that that the health outcomes followed a similar pattern. The higher expenditure corresponds with a greater drop in infant mortality, fewer low birth-weight incidences at birth and greater number of prenatal visits by expecting mothers in reformed municipalities with higher levels of education. These results are consistent with the model's prediction that municipalities with more educated voters will have larger effects due to the reform.

6.6 Alternative Explanations

Thus far, the findings of this paper provide evidence that the voter re-registration reform harmed the electoral prospects of incumbent mayors and increased political competition by imposing exogenous barriers on the ability of the mayor to engage in importing voters from surrounding municipalities. These political outcomes were followed by a shift of public resources towards public healthcare services, which in turn led to better health outcomes in these municipalities. The mechanisms discussed in this paper point towards reductions in voter-buying as the key driver of the results. In this section, I conduct additional analyses to explore potentially alternative explanations.

6.6.1 Unintended Disenfranchisement

I first explore whether there were heterogenous effects of the reform due to unintended disenfranchisement of voters. Given that voting is mandatory in Brazil, and citizens who do not register as voters cannot avail of a wide array of public services and that failure to vote without good cause incurs a financial penalty, I expect unintended disenfranchisement to be a negligible driver in the results of this paper. When the reform was announced in 2007, every single voter was required to re-register at their local electoral office. The requirements were broadcast via TV and radio advertising. All municipalities were accorded a period of at least five months from the announcement to the last date by which voters had to re-register to be eligible to vote in the 2008 municipal elections. I explore three possible channels through which unintended and selective disenfranchisement of voters may have taken place.

Voters with Less Political Engagement

In this section I consider whether voters who are less politically engaged and thus might be less likely to re-register as voters despite the penalties incurred. This would only be a concern if this group of voters are also more likely to vote for the incumbent. I test for this possibility by comparing the share of blank and invalid votes out of total votes cast in the 2008 municipal elections (and the 2004 municipal elections as a placebo check) between treated and control municipalities at the 80 percent threshold. Ames et al (2013) presented sample characteristics and summary statistics from the 2010 Brazilian Electoral Panel Study, where they provide evidence that disinterested voters are substantially more likely to cast blank or invalid votes in mayoral elections (53% of respondents who "do not care at all about politics" are likely to cast a blank or null vote, as opposed to only 4.08% of respondents who care "much" about politics). One would expect the share of blank and null votes to drop if disinterested voters were disproportionately disenfranchised by the voter

re-registration reform of 2007[11].

Table 8 presents the results on the share of blank and null votes separately and together for both the 2004 and 208 municipal elections. As can be seen, the patterns are identical across both the mayoral elections, providing evidence that is not supportive of this alternative explanation.

Voters Residing in Remote Locations

One might be concerned that the campaign to inform voters about the need to re-register in the treated municipalities might not have reached voters residing in remote locations. I begin by examining whether municipalities with higher levels of rural population underwent differential effects of the reform. The idea is to test whether the voters living in rural parts in potential isolation may have been expunged from the electoral rolls despite being legitimate residents of a municipality. I divide municipalities into two categories: municipalities with below median and above median rural population. Table **??** shows that the political outcomes in both groups of municipalities have the same magnitude and the differences are statistically insignificant, while table **??** shows that the same holds true for share of health expenses before and after the reform. If disenfranchisement of rural voters were a concern, one would expect the reform to have divergent effects in this two sets of municipalities.

Low-Educated Resident Voters

Finally, I test whether there was heterogenous effects of the reform based on selective disenfranchisement of low-educated voters. As explained in the previous section, I observe the proportion of registered voters in each municipality to have completed high-school education in the year 2008. I compare this proportion with the proportion of the total population to have completed high-school education in each municipality as reported in the 2010 national census. I compute the difference between these two proportions, and divide the sample of all municipalities in terms of above median and below median differences in the two numbers. The idea is to explore whether municipalities with many low-educated citizens but fewer low-educated voters were affected differentially by the reform. As seen in table XXX, I find that both sets of municipalities witnessed statistically identical political outcomes due to the reform, providing evidence that do not corroborate this hypothesis.

[11] Fujiwara (2011) employed a similar test to explore whether the introduction of electronic voting machines in the 1990s led to greater enfranchisement of low-educated voters in municipal and state elections. Given that the electronic voting machine became ubiquitous from the 2000s, this test can no longer capture that dimension

6.6.2 Politician Selection

I now explore whether the reform could have led to positive selection of politicians being elected into office, i.e. whether more competent and honest politicians got elected into office and replaced dishonest incumbent politicians, which would also result in improvements of the quality of public service provision. I test for whether voters rewarded good politicians and punished bad incumbents in the 2008 municipal elections by testing for selection on observables on both the intensive and extensive margins. It would also be harder to reconcile bad politicians getting elected leading to good outcomes after the 2008 municipal elections.

Table 10 provides suggestive evidence of positive politician selection, although none of the coefficients are statistically significant. As can be seen, younger politicians, politicians who have at least completed high-school education and politicians with more experience in public service (excluding incumbent mayors) have a slightly higher probability of winning the election. At the intensive margin, these characteristics also lead to a candidate receiving a higher share of the votes in the treated municipalities compared to the control municipalities. An overall index that standardizes and adds these three components for both the extensive and intensive margins as in Kling, Liebman and Katz (2007) corroborates these findings, but fails to add to the precision of the estimates. Of course, these variables are used as proxies for selection on unobservables, e.g. honesty and competence. Although I cannot rule out politician selection as a channel that may explain the reduced-form results, the evidence does not appear to be strong for positive selection.

6.6.3 Perception of the Incumbent

I now explore whether the reform harmed the electoral prospects of the incumbent by negatively affecting the voters' perception of the incumbent. The argument is that the reform, which required voters to renew their registration, will lead to voters perceiving their mayors to have engaged in fraudulent activities, thus inducing them to punish the incumbent by voting for the challenging candidates. To investigate this possibility, I build on the Ferraz and Finan (2008), who demonstrated that the presence of local media in municipalities magnified the effects of publicizing the audits of federal funds. I divide municipalities by the presence of a local AM radio station and implement the regression discontinuity design on each group of municipalities. Table 11 shows that the political outcomes and reallocation of health expenses were not heterogenous by the presence of local media, or the proportion of the municipality population with access to radio. Thus the evidence is inconsistent with this alternative explanation.

7 Conclusion

This paper explores how local politicians respond to exogenous barriers to engaging in clientelistic behaviors by taking into account the characteristics of their electorate, and how these responses shape allocation of public resources and relevant economic outcomes. I investigate this question in the context of the highly decentralized political climate of Brazil where municipality mayors have a large degree of autonomy over the allocation of the municipality budget into different sectors. I explore an electoral reform in Brazil that was intended to curb fraudulent registration of voters and was primarily based on a threshold rule which led to exogenous variation in the abilities of mayors to buy votes from their surrounding municipalities. This regression discontinuity design generates assignment of electoral rules that is as good as random and allows causal inference of its effects.

I provide evidence that exogenous barriers on the ability of incumbent politicians to engage in importing voters from outside in exchange for monetary benefits increases electoral competition and reduces incumbency advantage for mayors. The reform increases costs of engaging in clientelistic practices, leading to a favourable trade-off for funds flowing into sectors with public utility, particularly the provision of public healthcare services. Thus, the reform led to higher shares of public funds allocated to health, which in turn led to improved health outcomes in these municipalities, including lower rates of infant mortality and low birth-weight incidences, and higher number of prenatal visits by expecting mothers. I find that these effects are the largest for municipalities where registered voters have relatively higher levels of education, indicating that more educated voters are less prone to entering clientelistic relationships. I test for exact mechanisms that are driving the results, and find evidence that reform-induced barriers on voter-buying is the central mechanism. The heterogenous effects of the reform show that effects are bigger in smaller municipalities, where imported voters are more likely to be pivotal. Effects are also larger in municipalities which had undergone suspicious patterns of voter migration in the years leading up to the reform.

The findings of this study are relevant for policy, especially because they can inform efforts to curb conditions under which clientelism may flourish. I find that exogenous reductions in clientelism benefits municipalities with higher numbers of more educated citizens, which is consistent with previous findings that educated and informed voters less are likely to be part of clientelistic network. The paper also underscores the cost of clientelism by demonstrating that, as clientelistic practices become relatively more expensive for incumbent politicians, more public expenditures are diverted toward health services leading to better health outcomes.

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8 Tables and Figures

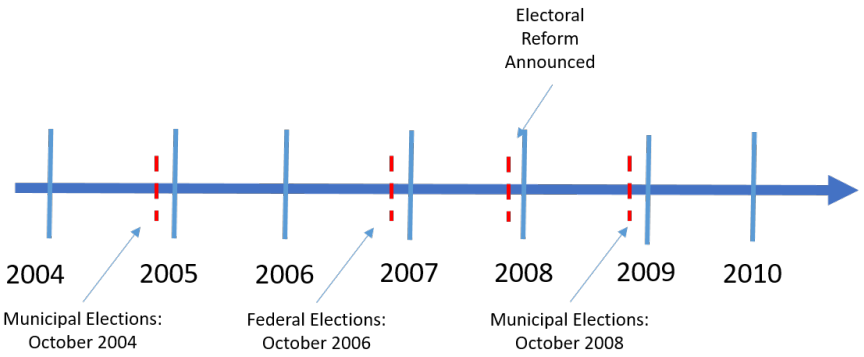

Figure 1: Timeline of Events

Notes: Brazil is divided into 5,596 municipalities across 27 states. The darker regions indicate the 1,186 municipalities that underwent the Voter Re-Registration Reform in 2007.

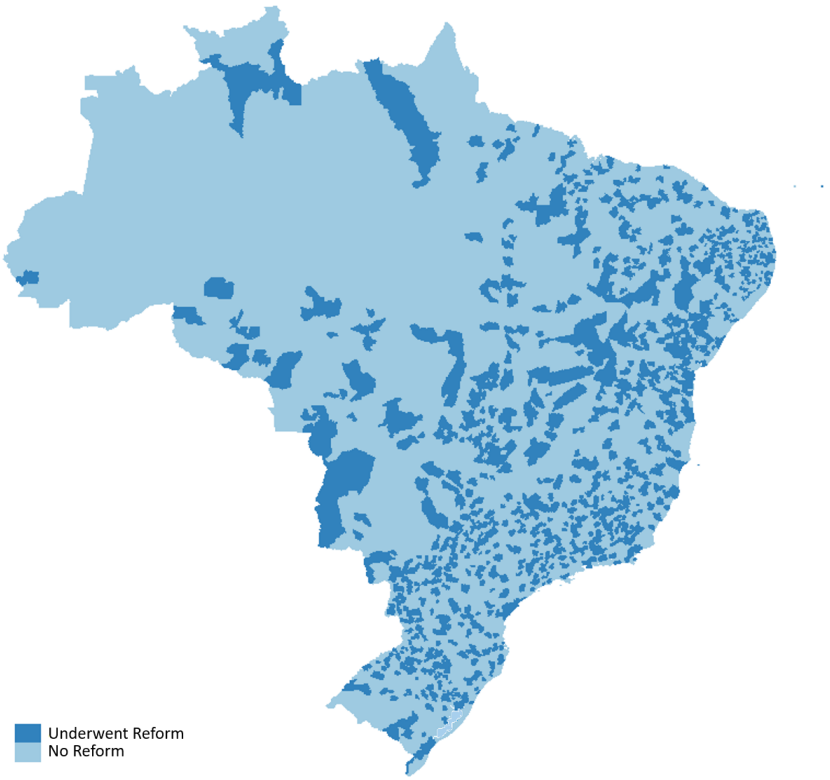

Figure 2: Map of Reformed Municipalities

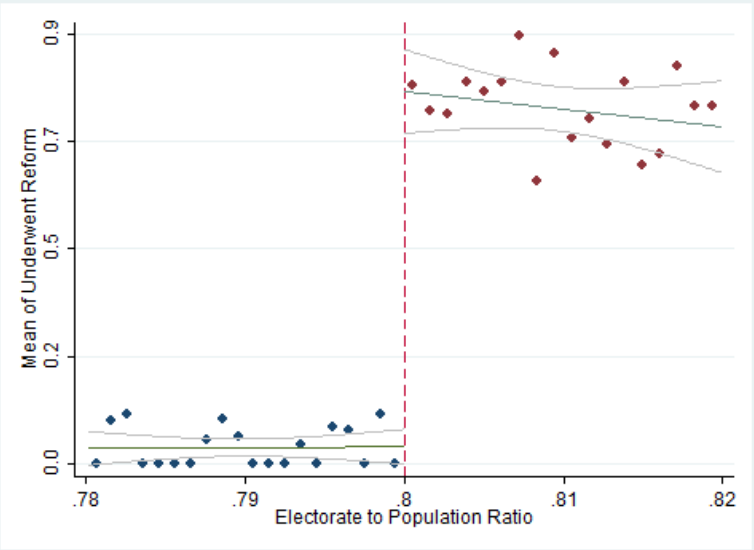

Figure 3: Threshold on Probability of Reform

Notes: This figure plots the probability of being selected for undergoing the Voter Re-Registration Reform in 2007 against the forcing variable, which is the ratio of total registered voters in 2006 to the estimated population in 2006 for a given municipality. Each point represents the average value of the outcome in a bin containing 20 municipalities. The solid line plots predicted values on the unbinned raw data, with separate linear trends estimated on either side of the 80% threshold. The dashed lines show 95% confidence intervals.

Incumbent Re-Election Probability

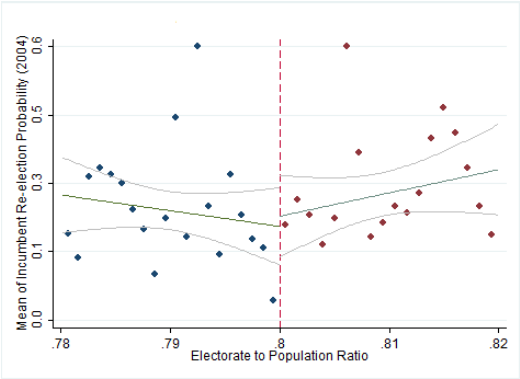

Figure 4: 2004 Municipal Elections

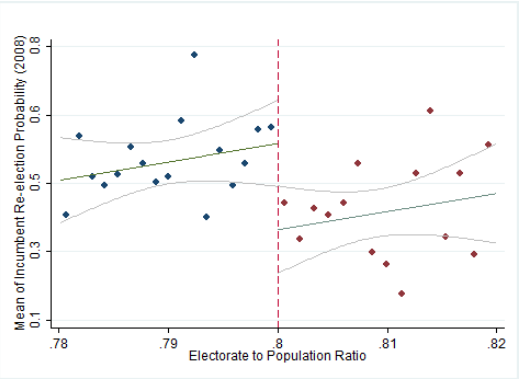

Figure 5: 2008 Municipal Elections

Notes: These figures plot incumbent re-election probabilities against the forcing variable, which is the ratio of total registered voters in 2006 to the estimated population in 2006 for a given municipality. Each point represents the average value of the outcome in a bin containing 20 municipalities. The solid line plots predicted values on the unbinned raw data, with separate linear trends estimated on either side of the 80% threshold. The dashed lines show 95% confidence intervals.

Health Share of Expenditures

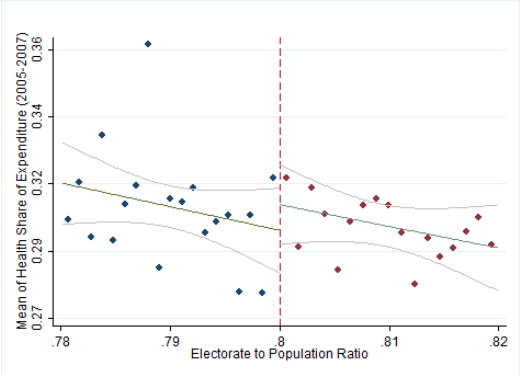

Figure 6: Before Reform: 2005 - 2007

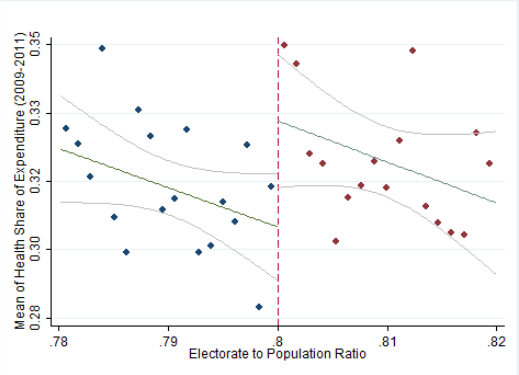

Figure 7: After Reform: 2009 - 2011

Notes: These figures plot share of municipality budget allocated to healthcare expenditures before and after the reform against the forcing variable, which is the ratio of total registered voters in 2006 to the estimated population in 2006 for a given municipality. Annual municipality budget and total expenditures in healthcare and sanitation at the municipality level is obtained from the National Treasury Database (FINBRA) of Brazil from 2000-2011, which provides total municipality budget as well as expenses by function. The dependent variable in each column is the total healthcare expenditures in the specified time period divided by the total municipality budget for the same time period. Each point represents the average value of the outcome in a bin containing 20 municipalities. The solid line plots predicted values on the unbinned raw data, with separate linear trends estimated on either side of the 80% threshold. The dashed lines show 95% confidence intervals.

Average Number of Prenatal Visits

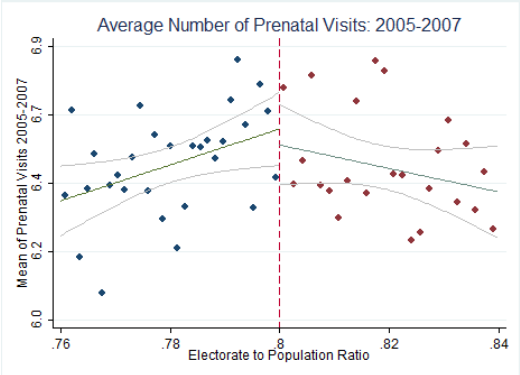

Figure 8: Before Reform: 2005 - 2007

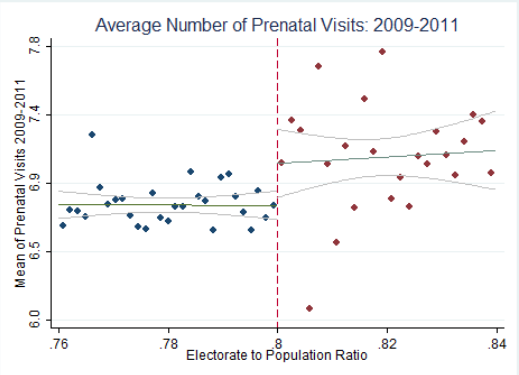

Figure 9: After Reform: 2009 - 2011

Notes: These figures plot the average number of prenatal visits by expecting mothers at the municipality level (before and after the reform) against the forcing variable, which is the ratio of total registered voters in 2006 to the estimated population in 2006 for a given municipality. Measures of health care utilization and outcomes at birth are constructed by using data from the National System of Information on Live Births (SINASC), which contains birth records collected from medical and official registries, such as birth certificates. The dependent variable plotted along the y-axis is constructed using a categorical variable specifying the range within which the number of prenatal visits made by a mother fall into. Each point represents the average value of the outcome in a bin containing 20 municipalities. The solid line plots predicted values on the unbinned raw data, with separate linear trends estimated on either side of the 80% threshold. The dashed lines show 95% confidence intervals.

Four or More Prenatal Visits

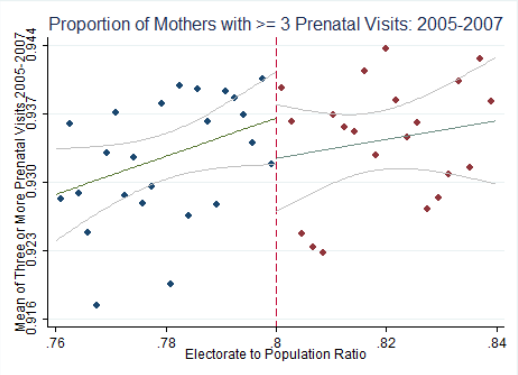

Figure 10: Before Reform: 2005 - 2007

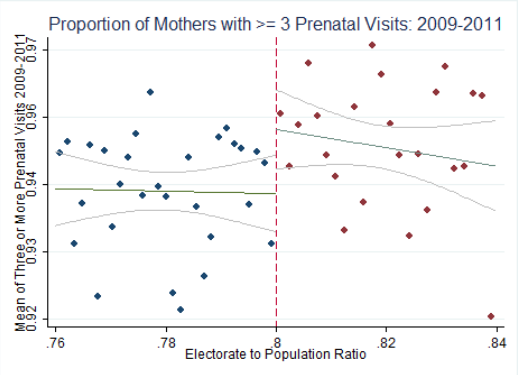

Figure 11: After Reform: 2009 - 2011

Notes: These figures plot the proportion of expecting mothers who undertook at least four prenatal visits at the municipality level (before and after the reform) against the forcing variable, which is the ratio of total registered voters in 2006 to the estimated population in 2006 for a given municipality. Measures of health care utilization and outcomes at birth are constructed by using data from the National System of Information on Live Births (SINASC), which contains birth records collected from medical and official registries, such as birth certificates. Each point represents the average value of the outcome in a bin containing 20 municipalities. The solid line plots predicted values on the unbinned raw data, with separate linear trends estimated on either side of the 80% threshold. The dashed lines show 95% confidence intervals.

Low Birth-Weight Incidences

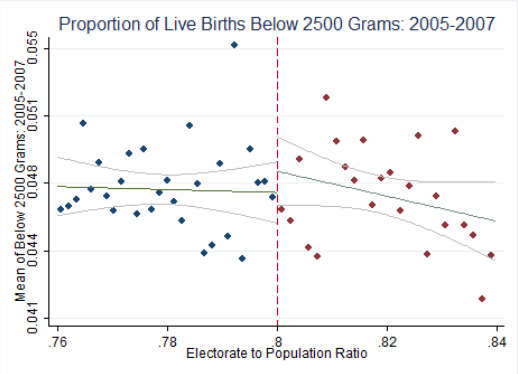

Figure 12: Before Reform: 2005 - 2007

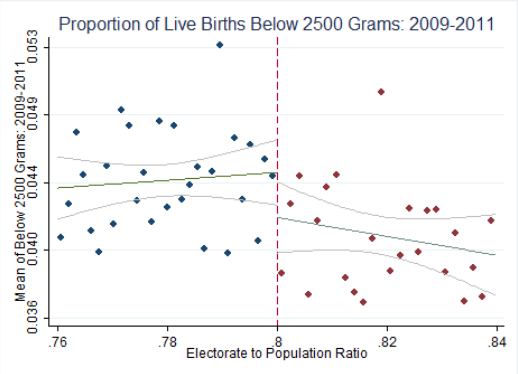

Figure 13: After Reform: 2009 - 2011

Notes: These figures plot the proportion of total live births involving weight at birth of below 2500 grams at the municipality level (before and after the reform) against the forcing variable, which is the ratio of total registered voters in 2006 to the estimated population in 2006 for a given municipality. Measures of health care utilization and outcomes at birth are constructed by using data from the National System of Information on Live Births (SINASC), which contains birth records collected from medical and official registries, such as birth certificates. The dependent variable plotted along the y-axis is the proportion of total live births involving weight at birth of below 2500 grams. Each point represents the average value of the outcome in a bin containing 20 municipalities. The solid line plots predicted values on the unbinned raw data, with separate linear trends estimated on either side of the 80% threshold. The dashed lines show 95% confidence intervals.

Infant Mortality

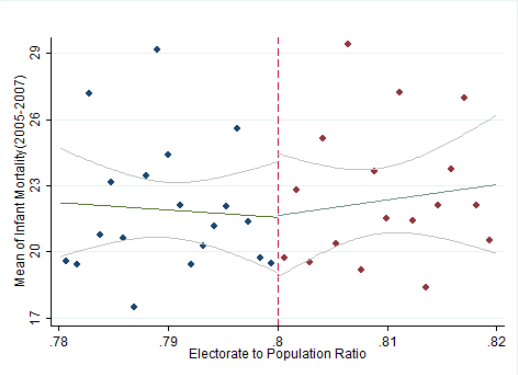

Figure 14: Before Reform: 2005 - 2007

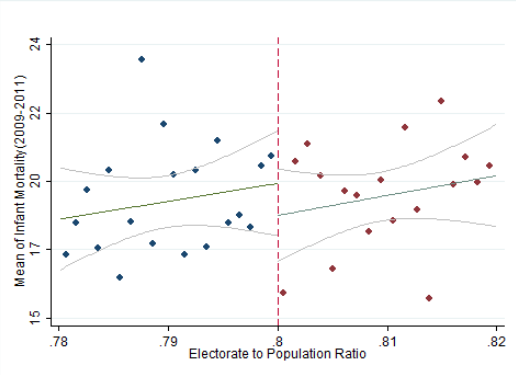

Figure 15: After Reform: 2009 - 2011

Notes: These figures plot the rates of infant mortality at the municipality level (before and after the reform) against the forcing variable, which is the ratio of total registered voters in 2006 to the estimated population in 2006 for a given municipality. Measures of health care utilization and outcomes at birth are constructed by using data from the National System of Information on Live Births (SINASC), which contains birth records collected from medical and official registries, such as birth certificates. This database with mortality records (SIM) made available by the Brazilian Health Informatics Department to construct annual infant mortality rates in all Brazilian municipalities. The dependent variable plotted along the y-axis is the number of deaths of infant aged 1 or less per 1000 live births, and is constructed by dividing total number of infant deaths in a year by the total number of live births in a year, and multiplying the resulting fraction by 1000. Each point represents the average value of the outcome in a bin containing 20 municipalities. The solid line plots predicted values on the unbinned raw data, with separate linear trends estimated on either side of the 80% threshold. The dashed lines show 95% confidence intervals.

Regression Discontinuity Estimates for Each Individual Year

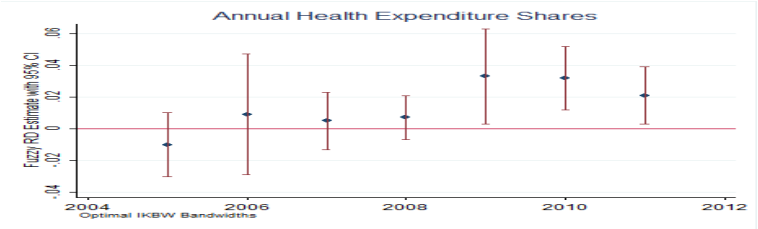

Figure 16: Share of Healthcare Expenditures

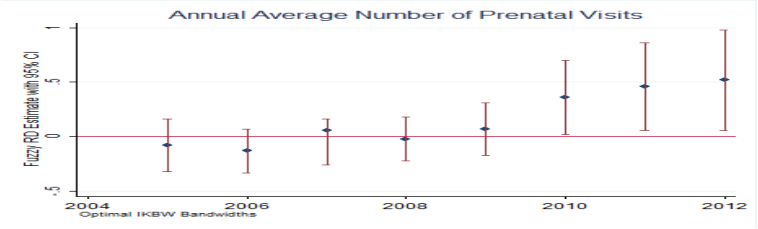

Figure 17: Average Number of Prenatal Visits

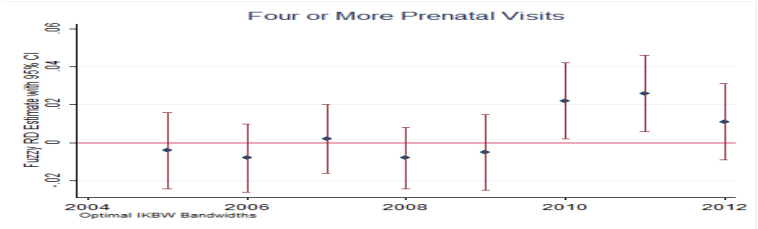

Figure 18: Proportion With Four or More Prenatal Visits

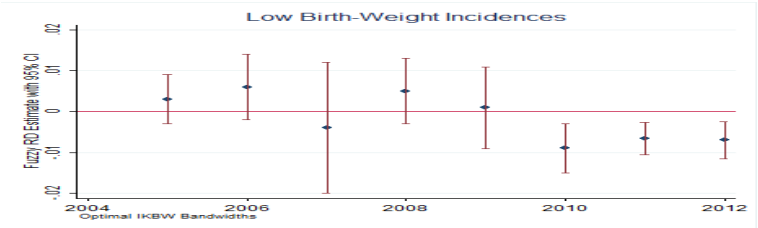

Figure 19: Low Birth-Weight Incidences

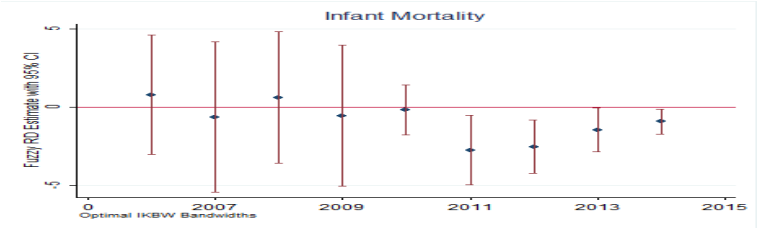

Figure 20: Infant Mortality

Notes: These figures plot different health outcomes at the municipality level (before and after the reform) against the forcing variable, which is the ratio of total registered voters in 2006 to the estimated population in 2006 for a given municipality. Measures of

health care utilization and outcomes at birth are constructed by using data from the National System of Information on Live Births (SINASC), which contains birth records collected from medical and official registries, such as birth certificates. This database with mortality records (SIM) made available by the Brazilian Health Informatics Department to construct annual infant mortality rates in all Brazilian municipalities. The dependent variable plotted along the y-axis is the number of deaths of infant aged 1 or less per 1000 live births, and is constructed by dividing total number of infant deaths in a year by the total number of live births in a year, and multiplying the resulting fraction by 1000. Each point represents the average value of the outcome in a bin containing 20 municipalities. The solid line plots predicted values on the unbinned raw data, with separate linear trends estimated on either side of the 80% threshold. The dashed lines show 95% confidence intervals.

Table 1: Reform on Electoral Competition in 2008

	Incumbent Re-election Probability	Registered Voters Over Population in 2008	Margin of Victory Over Population in 2008	Margin of Victory Over Turnout in 2008	Number of Candidates in 2008
	(1)	(2)	(3)	(4)	(5)
Panel A: IKBW Bandwidth					
Sharp RD Estimate	-0.161***	-0.093***	-0.042***	-0.052***	0.021
	(0.047)	(0.009)	(0.009)	(0.016)	(0.077)
Fuzzy RD Estimate	-0.172***	-0.126***	-0.0566***	-0.0603***	0.0293
	(0.057)	(0.00106)	(0.0136)	(0.0198)	(0.107)
State Fixed Effects	Yes	Yes	Yes	Yes	
Observations	809	1708	1814	1416	2176
Mean of Dep Variable	0.501	0.760	0.105	0.161	2.670
Panel B: Bandwidth 0.78 to 0.82					
Sharp RD Estimate	-0.154***	-0.083***	-0.047***	-0.058***	0.036
	(0.053)	(0.009)	(0.012)	(0.019)	(0.136)
Fuzzy RD Estimate	-0.167***	-0.123***	-0.063***	-0.079***	0.049
	(0.068)	(0.010)	(0.017)	(0.027)	(0.177)
State Fixed Effects	Yes	Yes	Yes	Yes	
Observations	576	699	699	699	747
Mean of Dep Variable	0.496	0.742	0.108	0.155	2.386
Panel C: Bandwidth 0.76 to 0.84					
Sharp RD Estimate	-0.184***	-0.0912***	-0.034***	-0.046***	0.026
	(0.043)	(0.007)	(0.009)	(0.013)	(0.112)
Fuzzy RD Estimate	-0.246***	-0.0812***	-0.0324**	-0.045***	0.162
	(0.068)	(0.010)	(0.015)	(0.017)	(0.177)
State Fixed Effects	Yes	Yes	Yes	Yes	
Observations	1118	1455	1396	1396	1471
Mean of Dep Variable	0.496	0.791	0.106	0.152	2.409

*The unit of observation is a municipality. Each regression discontinuity estimate is from a separate local linear regression on either side of the 80% threshold with the specified bandwidth. The electoral data related to the municipal elections of 2004 and2008 are obtained from the Superior Electoral Court (TSE) of Brazil. The dependent variable in column 1 is an indicator equal to 1 if the incumbent won re-election. The sample in column 1 is limited to municipalities where the incumbent mayor chose to run for re-election. The dependent variable in column 2 is calculated by dividing the total number of registered voters in a municipality in 2008 by the estimated population of that municipality in 2008. The dependent variables I columns 3 and 4 are calculated by dividing the difference in the total votes received by the winner and the closest candidate in the 2008 municipal elections by the population and turnout in 2008 of those municipalities respectively. Robust standard errors clustered at the state level in parentheses. All columns include state fixed effects. * 10%, ** 5%, *** 1% significance levels.*

Table 2: Reform on Share of Health Expenditures

	2005-2007	2009-2011	2009	2010	2011
	(1)	(2)	(3)	(4)	(5)
Panel A: IKBW Bandwidth					
Sharp RD Estimate	0.000243	0.0204***	0.0243**	0.023**	0.0152**
	(0.00684)	(0.007)	(0.0115)	(0.010)	(0.006)
Fuzzy RD Estimate	0.0003	0.0246***	0.0328**	0.0319***	0.0207**
	(0.009)	(0.0778)	(0.0154)	(0.011)	(0.0101)
State Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	1714	2643	1232	2122	1562
Mean of Dep Variable	0.315	0.328	0.322	0.323	0.325
Panel B: Bandwidth 0.78 to 0.82					
Sharp RD Estimate	0.008	0.029***	0.032***	0.029**	0.017**
	(0.008)	(0.093)	(0.011)	(0.013)	(0.086)
Fuzzy RD Estimate	0.011	0.040**	0.039***	0.039**	0.024**
	(0.011)	(0.017)	(0.013)	(0.017)	(0.012)
State Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	695	649	738	712	666
Mean of Dep Variable	0.305	0.313	0.322	0.309	0.314
Panel C: Bandwidth 0.76 to 0.84					
Sharp RD Estimate	-0.00104	0.0252***	0.0258**	0.0226**	0.0149**
	(0.00575)	(0.0716)	(0.0128)	(0.0109)	(0.00640)
Fuzzy RD Estimate	0.00171	0.0260***	0.0465**	0.0628**	0.0514**
	(0.0122)	(0.0089)	(0.0206)	(0.0240)	(0.0213)
State Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	1354	1448	1393	1302	1265
Mean of Dep Variable	0.306	0.320	0.312	0.316	0.315

*The unit of observation is a municipality. Each regression discontinuity estimate is from a separate local linear regression on either side of the 80% threshold with the specified bandwidth. Annual municipality budget and total expenditures in healthcare and sanitation at the municipality level is obtained from the National Treasury Database (FINBRA) of Brazil from 2000-2011, which provides total municipality budget as well as expenses by function. The dependent variable in each column is the total healthcare expenditures in the specified time period divided by the total municipality budget for the same time period. Robust standard errors clustered at the state level in parentheses. All columns include state fixed effects. * 10%, ** 5%, *** 1% significance levels.*

Table 3: Reform on Health Outcomes: 2009 - 2011

	Average Number of Prenatal Visits	Proportion of Mothers with At Least 4 Prenatal Visits	Incidences of Low Birth-Weight at Birth	Infant Mortality
	(1)	(2)	(3)	(4)
Panel A: IKBW Bandwidth				
Sharp RD Estimate	0.341**	0.0179**	-0.00522***	-0.838
	(0.143)	(0.00800)	(0.0019)	(0.869)
Fuzzy RD Estimate	0.463**	0.0244**	-0.000714	-0.962
	(0.191)	(0.0108)	(0.00264)	(1.188)
State Fixed Effects	Yes	Yes	Yes	Yes
Observations	1197	1474	1732	1603
Mean of Dep Variable	6.614	0.922	0.0422	26.69
Panel B: Bandwidth 0.78 to 0.82				
Sharp RD Estimate	0.297**	0.0160*	-0.00575***	-0.981
	(0.130)	(0.00802)	(0.00161)	(0.801)
Fuzzy RD Estimate	0.468***	0.0389***	-0.0151**	-1.026*
	(0.151)	(0.0129)	(0.00739)	(0.619)
State Fixed Effects	Yes	Yes	Yes	Yes
Observations	750	750	750	751
Mean of Dep Variable	7.040	0.954	0.0410	19.01
Panel C: Bandwidth 0.76 to 0.84				
Sharp RD Estimate	0.277**	0.0153*	-0.00359**	-0.917
	(0.119)	(0.00757)	(0.00166)	(0.806)
Fuzzy RD Estimate	0.629***	0.0871***	-0.00816**	-5.634***
	(0.201)	(0.0170)	(0.00384)	(2.040)
State Fixed Effects	Yes	Yes	Yes	Yes
Observations	1474	1474	1474	1477
Mean of Dep Variable	7.015	0.952	0.0407	19.06

*The unit of observation is a municipality. Each regression discontinuity estimate is from a separate local linear regression on either side of the 80% threshold with the specified bandwidth. Measures of health care utilization and outcomes at birth are constructed by using data from the National System of Information on Live Births (SINASC), which contains birth records collected from medical and offcial registries, such as birth certificates. This database with mortality records (SIM) made available by the Brazilian Health Informatics Department to construct annual infant mortality rates in all Brazilian municipalities. The dependent variable in column 1 is constructed using a categorical variable specifying the range within which the number of prenatal visits made by a mother fall into. The dependent variable in column 2 is the proportion of expecting mothers who made at least four prenatal visits before birth at the municipality level. The dependent variable in column 3 is the proportion of total live births involving weight at birth of below 2500 grams. The dependent variable in column 4 is the number of deaths of infant aged 1 or less per 1000 live births, and is constructed by dividing total number of infant deaths in a year by the total number of live births in a year, and multiplying the resulting fraction by 1000. Robust standard errors clustered at the state level in parentheses. All columns include state fixed effects. * 10%, ** 5%, *** 1% significance levels.*

Table 4: Heterogeneity of Reform Based on Size of Municipality

	Municipalities with Below Median Population	Municipalities with Above Median Population	P-Value of Test of Equality
	(1)	(2)	(3)
Panel A: Electoral Competition			
Incumbent Re-election probability	-0.182**	-0.143*	0.1
	(0.0834)	(0.0751)	
Total Registered Voters by Population	-0.118***	-0.0714***	0.07
	(0.0143)	(0.0102)	
Margin of Victory/Population in 2008	-0.0581***	-0.0193	0.28
	(0.0223)	(0.0154)	
Margin of Victory/Turnout in 2008	-0.0743***	-0.0217	0.24
	(0.0352)	(0.0238)	
Number of Candidates	-0.169*	0.205	0.1
	(0.315)	(0.0975)	
Panel B: Share of Health Expenditures			
Pre-Reform: 2005 - 2007	0.0111	-0.00531	0.29
	(0.0104)	(0.0244)	
Post-Reform: 2009 - 2011	0.0617***	0.0141	0.03
	(0.0129)	(0.0236)	
Panel C: Health Outcomes : 2009 - 2011			
Infant Mortality	-2.244**	0.821	0.06
	(1.184)	(0.733)	
Average Number of Prenatal Visits	0.588**	-0.0644	0.03
	(0.266)	(0.107)	
Proportion of Mothers with	0.0352**	-0.00632	0.02
At Least Four Pre-Natal Visits	(0.0140)	(0.00709)	
Incidences of Low Birth-Weight	-0.00562**	-0.00716*	0.30
	(0.00229)	(0.00354)	
Observations	473	421	

*The unit of observation is a municipality. Column 1 provides the regression discontinuity estimate for each outcome for municipalities with population less than the median for the entire sample of municipalities in 2007. Column 2 provides the estimates for municipalities that were above the median. Each fuzzy regression discontinuity estimate is from a separate local linear regression on either side of the 80% threshold. The electoral data related to the municipal elections of 2004 and2008 are obtained from the Superior Electoral Court (TSE) of Brazil. Total registered voters by population is calculated by dividing the total number of registered voters in a municipality in 2008 by the estimated population of that municipality in 2008. The two measures of margin of victory are calculated by dividing the difference in the total votes received by the winner and the closest candidate in the 2008 municipal elections by the population and turnout in 2008 of those municipalities respectively. Annual municipality budget and total expenditures in healthcare and sanitation at the municipality level is obtained from the National Treasury Database (FINBRA) of Brazil from 2000-2011. The dependent variable in panel B is the total healthcare expenditures in the specified time period divided by the total municipality budget for the same time period. Measures of health care utilization and outcomes at birth are constructed by using data from the National System of Information on Live Births (SINASC), which contains birth records collected from medical and official registries, such as birth certificates. This database with mortality records (SIM) made available by the Brazilian Health Informatics Department to construct annual infant mortality rates in all Brazilian municipalities. Average number of prenatal visits is constructed using a categorical variable specifying the range within which the number of prenatal visits made by a mother fall into. Low birth-weight incidences refer to the proportion of total live births involving weight at birth of below 2500 grams. Infant mortality refers to the number of deaths of infant aged 1 or less per 1000 live births, and is constructed by dividing total number of infant deaths in a year by the total number of live births in a year, and multiplying the resulting fraction by 1000. Robust standard errors clustered at the state level in parentheses. All columns include state fixed effects. * 10%, ** 5%, *** 1% significance levels.*

Table 5: Heterogeneity of Reform Based on Patterns of Voter Transfers from Neighbor Municipalities

	Municipalities with High Net Transfers	Municipalities with Low Net Transfers	P-Value of Test of Equality
	(1)	(2)	(3)
Panel A: Electoral Competition			
Incumbent Re-election probability	-0.445***	-0.0765	0.01
	(0.102)	(0.0707)	
Total Registered Voters by Population	-0.126***	-0.0778***	0.04
	(0.0188)	(0.00861)	
Margin of Victory/Population in 2008	-0.0419***	-0.0518	0.2
	(0.0443)	(0.0123)	
Margin of Victory/Turnout in 2008	-0.0507**	-0.0701	0.16
	(0.0688)	(0.0191)	
Number of Candidates	-0.0472	0.185	0.61
	(0.449)	(0.0954)	
Panel B: Share of Health Expenditures			
Pre-Reform: 2005 - 2007	0.00783	0.0149	0.53
	(0.00642)	(0.0234)	
Post-Reform: 2009 - 2011	0.0509***	0.0377	0.09
	(0.0110)	(0.0248)	
Panel C: Health Outcomes : 2009 - 2011			
Infant Mortality	-2.034**	0.140	0.02
	(1.219)	(1.057)	
Average Number of Prenatal Visits	0.380**	0.0210*	0.32
	(0.186)	(0.0108)	
Proportion of Mothers with At Least Four Pre-Natal Visits	0.0201*	0.334	0.28
	(0.0102)	(0.214)	
Incidences of Low Birth-Weight	-0.0105***	-0.00394*	0.06
	(0.00352)	(0.00216)	
Observations	467	423	

The unit of observation is a municipality. Column 1 provides the regression discontinuity estimate for each outcome for municipalities that were above the national median in terms of 1) voter transfers out of their neighboring municipalities in the pre-reform years of 2005 and 2006, and 2) voter transfers into their own electoral rolls during these two years. Column 2 provides the estimates for municipalities that were below the median for both conditions. Each fuzzy regression discontinuity estimate is from a separate local linear regression on either side of the 80% threshold. The electoral data related to the municipal elections of 2004 and 2008 are obtained from the Superior Electoral Court (TSE) of Brazil. Annual municipality budget and total expenditures in healthcare and sanitation at the municipality level is obtained from the National Treasury Database (FINBRA) of Brazil from 2000-2011. The dependent variable in panel B is the total healthcare expenditures in the specified time period divided by the total municipality budget for the same time period. Measures of health care utilization and outcomes at birth are constructed by using data from the National System of Information on Live Births (SINASC), which contains birth records collected from medical and official registries, such as birth certificates. Average number of prenatal visits is constructed using a categorical variable specifying the range within which the number of prenatal visits made by a mother fall into. Low birth-weight incidences refer to the proportion of total live births involving weight at birth of below 2500 grams. Infant mortality refers to the number of deaths of infant aged 1 or less per 1000 live births, and is constructed by dividing total number of infant deaths in a year by the total number of live births in a year, and multiplying the resulting fraction by 1000. Robust standard errors clustered at the state level in parentheses. All columns include state fixed effects.

Table 6: Heterogeneity of Reform by Education of Electorate

	Municipalities with Above Median Educated Electorate	Municipalities with Below Median Educated Electorate	P-Value of Test of Equality
	(1)	(2)	(3)
Panel A: Electoral Competition			
Incumbent Re-election probability	-0.193***	-0.109**	0.09
	(0.070)	(0.050)	
Total Registered Voters by Population	-0.127***	-0.105***	0.44
	(0.014)	(0.018)	
Margin of Victory/Population in 2008	-0.074***	-0.031*	0.23
	(0.019)	(0.017)	
Margin of Victory/Turnout in 2008	-0.091***	-0.470	0.03
	(0.031)	(0.019)	
Number of Candidates	0.296*	-0.470	0.02
	(0.167)	(0.362)	
Panel B: Share of Health Expenditures			
Pre-Reform: 2005 - 2007	0.0193	-0.00192	0.25
	(0.01960)	(0.0153)	
Post-Reform: 2009 - 2011	0.0531***	0.0119	0.04
	(0.0180)	(0.0111)	
Panel C: Health Outcomes : 2009 - 2011			
Infant Mortality	-2.562	0.831	0.23
	(0.249)	(1.539)	
Average Number of Prenatal Visits	0.384***	0.205	0.08
	(0.134)	(0.200)	
Proportion of Mothers with	0.0184*	0.0138	0.30
At Least Four Pre-Natal Visits	(0.010)	(0.0110)	
Incidences of Low Birth-Weight	-0.00534**	-0.00326	0.10
	(0.00161)	(0.00347)	
Observations	376	286	

*The unit of observation is a municipality. Column 1 provides the regression discontinuity estimate for each outcome for municipalities where the proportion of total registered voters with at least a high-school education in 2008 was above the median for the sample of all municipalities. Column 2 provides the estimates for municipalities that were below the median. Each fuzzy regression discontinuity estimate is from a separate local linear regression on either side of the 80% threshold. The electoral data related to the municipal elections of 2004 and2008 are obtained from the Superior Electoral Court (TSE) of Brazil. Total registered voters by population is calculated by dividing the total number of registered voters in a municipality in 2008 by the estimated population of that municipality in 2008. The two measures of margin of victory are calculated by dividing the difference in the total votes received by the winner and the closest candidate in the 2008 municipal elections by the population and turnout in 2008 of those municipalities respectively. Annual municipality budget and total expenditures in healthcare and sanitation at the municipality level is obtained from the National Treasury Database (FINBRA) of Brazil from 2000-2011. The dependent variable in panel B is the total healthcare expenditures in the specified time period divided by the total municipality budget for the same time period. Measures of health care utilization and outcomes at birth are constructed by using data from the National System of Information on Live Births (SINASC), which contains birth records collected from medical and official registries, such as birth certificates. This database with mortality records (SIM) made available by the Brazilian Health Informatics Department to construct annual infant mortality rates in all Brazilian municipalities. Average number of prenatal visits is constructed using a categorical variable specifying the range within which the number of prenatal visits made by a mother fall into. Low birth-weight incidences refer to the proportion of total live births involving weight at birth of below 2500 grams. Infant mortality refers to the number of deaths of infant aged 1 or less per 1000 live births, and is constructed by dividing total number of infant deaths in a year by the total number of live births in a year, and multiplying the resulting fraction by 1000. Robust standard errors clustered at the state level in parentheses. All columns include state fixed effects. * 10%, ** 5%, *** 1% significance levels.*

Table 7: Electoral Outcomes and Health Expenses in Bordering Municipalities

	Change in Voter Registration Rate 2006-2008	Incumbent Re-election probability	Margin of Victory /Population in 2008	Margin of Victory /Turnout in 2008	Number of Candidates in 2008
	(1)	(2)	(3)	(4)	(5)
Panel A: Electoral Competition					
Neigbor to Reformed Municipality	0.024***	0.0247	-0.000310	-0.00436	-0.190**
	(0.003)	(0.0211)	(0.00256)	(0.00439)	(0.0749)
State Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	4250	3331	4129	4129	4282
Mean of Dep Variable	0.723	0.507	0.104	0.161	2.743
Mean of Non-adjacent Municipalities	0.701	0.495	0.102	0.163	2.901
	2009	2010	2011	Post Pooled (2009 - 2011)	Pre Pooled (2005-2007)
	(1)	(2)	(3)	(4)	(5)
Panel B: Share of Health Expenses					
Neigbor to Reformed Municipality	0.00792*	0.00293	0.00641	0.00576	0.0110**
	(0.00394)	(0.00453)	(0.00474)	(0.00410)	(0.00436)
State Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	4196	4025	3708	3598	3841
Mean of Dep Variable	0.332	0.326	0.326	0.329	0.319
Mean of Non-adjacent Municipalities	0.325	0.322	0.321	0.324	0.310

*The unit of observation is a municipality. "Neighbor to Reformed Municipality" is an indicator equal to 1 if a municipality shares borders with another municipality that underwent the Voter Re-Registration Reform of 2007, but the municipality itself did not undergo the same reform. The electoral data related to the municipal elections of 2004 and2008 are obtained from the Superior Electoral Court (TSE) of Brazil. Total registered voters by population is calculated by dividing the total number of registered voters in a municipality in 2008 by the estimated population of that municipality in 2008. The two measures of margin of victory are calculated by dividing the difference in the total votes received by the winner and the closest candidate in the 2008 municipal elections by the population and turnout in 2008 of those municipalities respectively. Annual municipality budget and total expenditures in healthcare and sanitation at the municipality level is obtained from the National Treasury Database (FINBRA) of Brazil from 2000-2011. The dependent variable in panel B is the total healthcare expenditures in the specified time period divided by the total municipality budget for the same time period. Robust standard errors clustered at the state level in parentheses. All columns include state fixed effects. * 10%, ** 5%, *** 1% significance levels.*

Table 8: Share of Blank and Null Votes in Total Eligible Votes

	Blank Over Eligible in 2004	Blank Over Eligible in 2008	Null Over Eligible in 2004	Null Over Eligible in 2008	Blank and Null Over Eligible in 2004	Blank and Null Over Eligible in 2008
	(1)	(2)	(3)	(4)	(5)	(6)
Sharp RD Estimate	0.00156	-0.000204	0.000940	0.000296	0.00250	0.0000917
	(0.00189)	(0.00194)	(0.00661)	(0.00932)	(0.00640)	(0.0101)
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1472	1471	1472	1471	1472	1471
Mean of Dep Variable	0.0117	0.0162	0.0454	0.0542	0.0571	0.0704
Mean of Below Threshold Municipalities	0.0110	0.0162	0.0452	0.0532	0.0563	0.0694

*The unit of observation is a municipality. Each regression discontinuity estimate is from a separate local linear regression on either side of the 80% threshold. The electoral data related to the municipal elections of 2004 and2008 are obtained from the Superior Electoral Court (TSE) of Brazil. The dependent variable in columns A and B are constructed by dividing the total number of blank votes cast by the total number of registered voters in a municipality for municipal elections in 2004 and 2008 respectively. All other measures are constructed using an analogous process. Robust standard errors clustered at the state level in parentheses. All columns include state fixed effects. * 10%, ** 5%, *** 1% significance levels.*

Table 9: Heterogeneity of Reform Based on Share of Rural Population of Municipality

	Municipalities with Above Median Rural Population	Municipalities with Below Median Rural Population	P-Value of Test of Equality
	(1)	(2)	(3)
Panel A: Electoral Competition			
Incumbent Re-election probability	-0.108***	-0.247***	
	(0.036)	(0.088)	
Total Registered Voters by Population	-7.753***	-9.945***	
	(1.161)	(1.107)	
Margin of Victory/Population in 2008	-0.0452**	-0.0521***	
	(0.0195)	(0.0172)	
Margin of Victory/Turnout in 2008	-0.0565*	-0.0662**	
	(0.0294)	(0.0279)	
Number of Candidates	-0.191	0.174	
	(0.132)	(0.150)	
Panel B: Share of Health Expenditures			
Pre-Reform: 2005 - 2007	0.0430	0.0174	
	(0.0297)	(0.0227)	
Post-Reform: 2009 - 2011	0.0282**	0.0333	
	(0.0119)	(0.0269)	
Observations			

*The unit of observation is a municipality. Column 1 provides the regression discontinuity estimate for each outcome for municipalities where the proportion of rural population out of total population was above the median for the entire sample of municipalities in 2007. Column 2 provides the estimates for municipalities that were below the median. Each fuzzy regression discontinuity estimate is from a separate local linear regression on either side of the 80% threshold. The electoral data related to the municipal elections of 2004 and2008 are obtained from the Superior Electoral Court (TSE) of Brazil. Total registered voters by population is calculated by dividing the total number of registered voters in a municipality in 2008 by the estimated population of that municipality in 2008. The two measures of margin of victory are calculated by dividing the difference in the total votes received by the winner and the closest candidate in the 2008 municipal elections by the population and turnout in 2008 of those municipalities respectively. Annual municipality budget and total expenditures in healthcare and sanitation at the municipality level is obtained from the National Treasury Database (FINBRA) of Brazil from 2000-2011. The dependent variable in panel B is the total healthcare expenditures in the specified time period divided by the total municipality budget for the same time period. Measures of health care utilization and outcomes at birth are constructed by using data from the National System of Information on Live Births (SINASC), which contains birth records collected from medical and official registries, such as birth certificates. This database with mortality records (SIM) made available by the Brazilian Health Informatics Department to construct annual infant mortality rates in all Brazilian municipalities. Average number of prenatal visits is constructed using a categorical variable specifying the range within which the number of prenatal visits made by a mother fall into. Low birth-weight incidences refer to the proportion of total live births involving weight at birth of below 2500 grams. Infant mortality refers to the number of deaths of infant aged 1 or less per 1000 live births, and is constructed by dividing total number of infant deaths in a year by the total number of live births in a year, and multiplying the resulting fraction by 1000. Robust standard errors clustered at the state level in parentheses. All columns include state fixed effects. * 10%, ** 5%, *** 1% significance levels.*

Table 10: Politician Selection Due to Reform: 2008 Municipal Elections

	Winner Age	Winner Completed High School	Winner had Public Experience	Standardized Index
	(1)	(2)	(3)	(4)
Panel A: Extensive Margin				
Sharp RD Estimate	-0.149	0.000272	0.141***	0.123
	(1.130)	(0.0620)	(0.0509)	(0.0845)
State Fixed Effects	Yes	Yes	Yes	
Observations	1284	1284	1284	1284
Mean of Dep Variable	47.91	0.780	0.156	0.00880
	Share of Votes for Young Candidate	Share of Votes for High School Educated Candidate	Share of Votes for Experienced Candidate	Standardized Index
	(1)	(2)	(3)	(4)
Panel B: Intensive Margin				
Sharp RD Estimate	0.00604	-0.0269	0.0743	0.401
	(0.00998)	(0.0415)	(0.0731)	(0.255)
State Fixed Effects	Yes	Yes	Yes	
Observations	529	1213	484	228
Mean of Dep Variable	0.996	0.803	0.446	0.0177

In Panel A: the dependent variable in column 1 is the age of the winning candidate in the 2008 municipal elections. The dependent variable in column 2 is an indicator equal to 1 if the winning candidate completed at least high-school education. The dependent variable in column 3 is an indicator equal to 1 if the winning candidate had prior experience working in the public sector, except for being the incumbent municipality mayor. The dependent variable in column 4 is an overall index that standardizes and adds these three components as in Kling, Liebman and Katz (2007). **In Panel B:** the dependent variable in column 1 is the share of votes received by a candidate below the median age of all winning candidates for the entire sample of municipalities, and is constructed by dividing total votes received by the candidate by the total number of votes cast in the 2008 municipal elections. The dependent variable in column 2 is the share of votes received by a candidate with at least high-school education. The dependent variable in column 3 is the share of votes received by a candidate with prior experience working in the public sector, except for being the incumbent municipality mayor. The dependent variable in column 4 is an overall index that standardizes and adds these three components as in Kling, Liebman and Katz (2007).

Table 11: Heterogeneity of Reform Based on Presence of Local Media

	Municipalities with Local AM Radio Station	Municipalities with Local AM Radio Station	P-Value of Test of Equality
	(1)	(2)	(3)
Panel A: Electoral Competition			
Incumbent Re-election probability	-0.161**	-0.168**	
	(0.072)	(0.086)	
Total Registered Voters by Population	-0.0629***	-0.106***	
	(0.024)	(0.007)	
Margin of Victory/Population in 2008	-0.060*	-0.0577***	
	(0.0416)	(0.0184)	
Margin of Victory/Turnout in 2008	-0.072	-0.0697**	
	(0.0643)	(0.0184)	
Number of Candidates	-0.293	0.0443	
	(0.514)	(0.166)	
Panel B: Share of Health Expenditures			
Pre-Reform: 2005 - 2007			
Post-Reform: 2009 - 2011			
Observations			

*The unit of observation is a municipality. Column 1 provides the regression discontinuity estimate for each outcome for municipalities which had a local AM radio station in 2007. Column 2 provides the estimates for municipalities that did not have a local AM radio station in 2007. Each fuzzy regression discontinuity estimate is from a separate local linear regression on either side of the 80% threshold. The electoral data related to the municipal elections of 2004 and2008 are obtained from the Superior Electoral Court (TSE) of Brazil. Total registered voters by population is calculated by dividing the total number of registered voters in a municipality in 2008 by the estimated population of that municipality in 2008. The two measures of margin of victory are calculated by dividing the difference in the total votes received by the winner and the closest candidate in the 2008 municipal elections by the population and turnout in 2008 of those municipalities respectively. Annual municipality budget and total expenditures in healthcare and sanitation at the municipality level is obtained from the National Treasury Database (FINBRA) of Brazil from 2000-2011. The dependent variable in panel B is the total healthcare expenditures in the specified time period divided by the total municipality budget for the same time period. Measures of health care utilization and outcomes at birth are constructed by using data from the National System of Information on Live Births (SINASC), which contains birth records collected from medical and official registries, such as birth certificates. This database with mortality records (SIM) made available by the Brazilian Health Informatics Department to construct annual infant mortality rates in all Brazilian municipalities. Average number of prenatal visits is constructed using a categorical variable specifying the range within which the number of prenatal visits made by a mother fall into. Low birth-weight incidences refer to the proportion of total live births involving weight at birth of below 2500 grams. Infant mortality refers to the number of deaths of infant aged 1 or less per 1000 live births, and is constructed by dividing total number of infant deaths in a year by the total number of live births in a year, and multiplying the resulting fraction by 1000. Robust standard errors clustered at the state level in parentheses. All columns include state fixed effects. * 10%, ** 5%, *** 1% significance levels.*

9 Appendix Tables and Figures

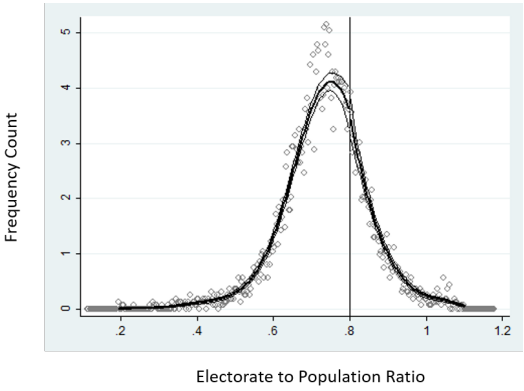

Figure 21: McCrary Test

Discontinuity estimate: -.031
Standard Error: (.079)
P value: 0.69

Table A1: Balance of Covariates: Bandwidth 0.78 to 0.82

	Population 2005-2008	Budget 2005-2008	Northwest	Southeast	Rural Population in 2007	Local AM Radio	Poverty 2000	Electorate in 2004	Electorate in 2006
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Sharp RD Estimate	1743.2	-1342.6	-1.21e-16	-7.87e-16	59.1	0.0333	0.153	655.3	631.6
	(1224.2)	(1417000.2)	(4.60e-16)	(10.02e-16)	(555.6)	(0.0644)	(2.043)	(946.6)	(973.5)
Fuzzy RD Estimate	2089.8	1260.0	0.0103	-0.017	83.6	0.0560	0.087	201.5	213.8
	(1697.4)	(1190118.0)	(0.0500)	(0.0635)	(696.1)	(0.0804)	(2.527)	(1305.7)	(1335.4)
State Fixed Effects	Yes	Yes	Yes	Yes					
Observations	751	667	751	751	749	751	741	751	743
Mean of Dep Variable	10914.6	9987673.0	0.254	0.345	3686.2	0.150	46.468	8282.9	8495.8

	Turnout in 2004	Turnout in 2006	Win Margin in 2004	Win Margin by Eligible in 2004	Win Margin by Turnout in 2004	Prop Electorate High School Educated	Infant Mortality 2005-2007	Live Births 2005-2007	Theil 2000
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Sharp RD Estimate	510.7	507.8	146.7	0.0129	0.0171	0.00336	0.370	30.72	0.018
	(792.0)	(792.9)	(230.8)	(0.0196)	(0.0227)	(0.00439)	(1.093)	(21.19)	(0.215)
Fuzzy RD Estimate	658.1	660.1	396.1	0.0225	0.0293	-0.00258	-0.162	34.50	0.0437
	(1085.9)	(1091.7)	(307.9)	(0.0248)	(0.0287)	(0.00513)	(1.411)	(29.94)	(0.220)
State Fixed Effects	Yes	Yes	Yes	Yes					
Observations	751	751	722	722	722	712	680	751	741
Mean of Dep Variable	7032.1	7065.3	895.1	0.116	0.130	0.0830	22.93	161.7	0.529

*The unit of observation is a municipality. Each regression discontinuity estimate is from a separate local linear regression on either side of the 80% threshold. The demographic data, including population and geographical locations, are obtained from the Institute of Applied Economic Research (IPEA) and the Brazilian Institute of Geography and Statistics (IBGE). The electoral data related to the municipal elections of 2004 and2008 are obtained from the Superior Electoral Court (TSE) of Brazil. Robust standard errors clustered at the state level in parentheses. All columns include state fixed effects. * 10%, ** 5%, *** 1% significance levels.*

Table A2: Infant Mortality: Bandwidth 0.78 to 0.82

	2005-2007	2009-2011	2009	2010	2011	2012	2013	2014
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sharp RD Estimate	0.370	-0.981	-0.578	-0.185	-2.747**	-2.545***	-1.457**	-0.934**
	(1.093)	(0.801)	(2.249)	(0.294)	(1.119)	(0.847)	(0.712)	(0.391)
Fuzzy RD Estimate	0.493	-1.026*	-0.727	-0.253	-3.350**	-3.304**	-1.897**	-0.919**
	(1.396)	(0.619)	(2.693)	(0.385)	(1.610)	(1.657)	(0.816)	(0.402)
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	438	445	504	576	445	446	441	486
Mean of Dep Variable	22.93	18.91	21.22	18.05	18.15	18.78	18.19	18.04

*The unit of observation is a municipality. Each regression discontinuity estimate is from a separate local linear regression on either side of the 80% threshold with the specified bandwidth. Measures of health care utilization and outcomes at birth are constructed by using data from the National System of Information on Live Births (SINASC), which contains birth records collected from medical and offcial registries, such as birth certificates. This database with mortality records (SIM) made available by the Brazilian Health Informatics Department to construct annual infant mortality rates in all Brazilian municipalities. The dependent variable in each column is the number of deaths of infant aged 1 or less per 1000 live births, and is constructed by dividing total number of infant deaths in a year by the total number of live births in a year, and multiplying the resulting fraction by 1000. Robust standard errors clustered at the state level in parentheses. All columns include state fixed effects. * 10%, ** 5%, *** 1% significance levels.*

Table A3: Yearly Breakdown of Other Health Outcomes: Bandwidth 0.78 to 0.82

	2005-2007	2009-2011	2009	2010	2011	2012
	(1)	(2)	(3)	(4)	(5)	(6)
Average Number of Pre-Natal Visits	-0.111	0.297**	0.0680	0.363**	0.461**	0.516**
	(0.0784)	(0.130)	(0.126)	(0.171)	(0.215)	(0.231)
Proportion of Mothers with At Least Four Pre-Natal Visits	-0.00761	0.0160*	-0.005	0.0217**	0.0263**	0.0108
	(0.00462)	(0.00802)	(0.00511)	(0.0102)	(0.0111)	(0.0124)
Incidences of Low Birth Weight (Below 2500 grams)	0.00310	-0.00575***	0.000922	-0.0086***	-0.00657**	-0.00797***
	(0.00229)	(0.00161)	(0.00385)	(0.00199)	(0.00292)	(0.00261)
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	750	750	750	749	750	750
Mean of Dep Variable	6.560	7.040	6.848	7.094	7.183	7.230
Mean of Below Threshold Municipalities	6.560	6.813	6.743	6.848	6.856	6.855

*The unit of observation is a municipality. Each regression discontinuity estimate is from a separate local linear regression on either side of the 80% threshold with the specified bandwidth. Measures of health care utilization and outcomes at birth are constructed by using data from the National System of Information on Live Births (SINASC), which contains birth records collected from medical and offcial registries, such as birth certificates. This database with mortality records (SIM) made available by the Brazilian Health Informatics Department to construct annual infant mortality rates in all Brazilian municipalities. Average number of prenatal visits is constructed using a categorical variable specifying the range within which the number of prenatal visits made by a mother fall into. Low birth-weight incidences refer to the proportion of total live births involving weight at birth of below 2500 grams. Robust standard errors clustered at the state level in parentheses. All columns include state fixed effects. * 10%, ** 5%, *** 1% significance levels.*

Table A4: Municipality Budget and Expenses: Bandwidth 0.78 to 0.82

	Log Municipality Budget 2005-07	Log Municipality Budget 2009-11	Log Municipality Expenses 2005-07	Log Municipality Expenses 2009-11
	(1)	(2)	(3)	(4)
Sharp RD Estimate	0.042	0.046	0.047	0.0730
	(0.072)	(0.065)	(0.076)	(0.067)
Fuzzy RD Estimate	0.058	0.064	0.065	0.099
	(0.095)	(0.085)	(0.101)	(0.087)
State Fixed Effects	Yes	Yes	Yes	Yes
Observations	696	651	688	651
Mean of Dep Variable	15.33	15.52	15.66	15.82

*The unit of observation is a municipality. Each regression discontinuity estimate is from a separate local linear regression on either side of the 80% threshold with the specified bandwidth. Annual municipality budget and total expenditures segregated by function at the municipality level is obtained from the National Treasury Database (FINBRA) of Brazil from 2000-2011. Robust standard errors clustered at the state level in parentheses. All columns include state fixed effects. * 10%, ** 5%, *** 1% significance levels.*

Table A5: Expenses by Function in 2009-2011: Bandwidth 0.78 to 0.82

	Education	Administration	Transport	Industry & Commerce	Social Security	Agriculture	Capital Investment (Others)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Sharp RD Estimate	0.013	0.006	-0.008	0.001	0.004	-0.004	-0.009
	(0.008)	(0.009)	(0.007)	(0.002)	(0.006)	(0.005)	(0.006)
Fuzzy RD Estimate	0.018	0.009	-0.011	0.002	0.005	-0.005	-0.012
	(0.011)	(0.013)	(0.011)	(0.003)	(0.008)	(0.007)	(0.008)
State Fixed Effects	Yes	Yes	Yes	Yes	Yes		
Observations	649	649	649	649	649	649	649
Mean of Dep Variable	0.181	0.221	0.065	0.008	0.085	0.042	0.156

*The unit of observation is a municipality. Each regression discontinuity estimate is from a separate local linear regression on either side of the 80% threshold with the specified bandwidth. Annual municipality budget and total expenditures segregated by function at the municipality level is obtained from the National Treasury Database (FINBRA) of Brazil from 2000-2011. The dependent variable in each column is the expenditures in a given function in the specified time period divided by the total municipality budget for the same time period. Robust standard errors clustered at the state level in parentheses. All columns include state fixed effects. * 10%, ** 5%, *** 1% significance levels.*

Table A6: Reform on Health Share of Expenditures by Education

	(1)	(2)
Post Period (2009-2011)	0.002	0.001
	(0.004)	(0.005)
Reform	-0.003	-0.006
	(0.009)	(0.005)
Post Period X Reform	-0.002	-0.004
	(0.004)	(0.005)
Above Median High school educated electorate in 2008	-0.003	-0.000
	(0.007)	(0.005)
Post X Above Median High school educated electorate	0.022***	0.023***
	(0.003)	(0.004)
Reform X Above Median High school educated electorate	0.013	0.012*
	(0.008)	(0.006)
Reform X Post X Above Median High school educated electorate	0.025**	0.026**
	(0.015)	(0.016)
State Fixed Effects	No	Yes
Controls	Yes	Yes
Observations	9130	9130
Mean of Dep Variable		0.321

*The unit of observation is a municipality-period, where pre-periods pool the values for the years 2005-2007 and post-periods pool the values for 2009-2011. Each column reports the coefficient estimates from a triple differences-in-differences specification. Annual municipality budget and total expenditures segregated by function at the municipality level is obtained from the National Treasury Database (FINBRA) of Brazil from 2000-2011. The dependent variable in each column is the total healthcare expenditures in the specified time period divided by the total municipality budget for the same time period. Robust standard errors clustered at the state level in parentheses. All columns include state fixed effects. * 10%, ** 5%, *** 1% significance levels.*

Table A7: Reform on Health Outcomes by Education

	Average Number of Pre-Natal Visits		At Least Four Pre-Natal Visits		Incidences of Low Birth Weight at Birth		Infant Mortality	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post Period (2009-2011)	0.398***	0.398***	0.0349***	0.0349***	-0.000436	-0.000442	-1.339*	-1.294*
	(0.0415)	(0.0415)	(0.00513)	(0.00514)	(0.000645)	(0.000645)	(0.688)	(0.675)
Reform	0.00976	0.0181	0.00692	0.00247	0.000214	0.0000147	0.13	-0.027
	(0.118)	(0.0457)	(0.0127)	(0.00543)	(0.00136)	(0.00124)	(0.589)	(0.682)
Post Period X Reform	0.193***	0.193***	0.00843*	0.00843*	0.0000656	0.0000845	-1.124	-1.076
	(0.0423)	(0.0424)	(0.00474)	(0.00475)	(0.00134)	(0.00135)	(0.819)	(0.817)
Above Median High school educated electorate in 2008	1.047***	0.399***	0.0808***	0.0347***	-0.00194*	-0.00199*	-2.278***	0.176
	(0.160)	(0.0702)	(0.0171)	(0.00706)	(0.00107)	(0.000991)	(0.524)	(0.495)
Post X Above Median High school educated electorate	-0.241***	-0.241***	-0.0284***	-0.0284***	0.000364	0.000370	-2.550***	-2.618***
	(0.0319)	(0.0320)	(0.00461)	(0.00462)	(0.000627)	(0.000627)	(0.575)	(0.574)
Reform X Above Median High school educated electorate	-0.158	-0.00596	-0.0150	-0.00118	-0.00255	-0.00158	0.370	0.324
	(0.102)	(0.0596)	(0.0110)	(0.00593)	(0.00156)	(0.00157)	(0.957)	(0.900)
Reform X Post X Above Median High school educated electorate	0.574***	0.563***	0.0390***	0.0371***	-0.0116***	-0.0117***	-4.451***	-4.453**
	(0.0693)	(0.0694)	(0.00634)	(0.00635)	(0.00242)	(0.00243)	(0.800)	(0.818)
State Fixed Effects	No	Yes	No	Yes	No	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10506	10506	10506	10506	10497	10497	10234	10234
Mean of Dep Variable		6.454		0.911		0.0416		20.63

*The unit of observation is a municipality-period, where pre-periods pool the values for the years 2005-2007 and post-periods pool the values for 2009-2011. Each column reports the coefficient estimates from a triple differences-in-differences specification. Measures of health care utilization and outcomes at birth are constructed by using data from the National System of Information on Live Births (SINASC), which contains birth records collected from medical and official registries, such as birth certificates. This database with mortality records (SIM) made available by the Brazilian Health Informatics Department to construct annual infant mortality rates in all Brazilian municipalities. Average number of prenatal visits is constructed using a categorical variable specifying the range within which the number of prenatal visits made by a mother fall into. Low birth-weight incidences refer to the proportion of total live births involving weight at birth of below 2500 grams. Infant mortality refers to the number of deaths of infant aged 1 or less per 1000 live births, and is constructed by dividing total number of infant deaths in a year by the total number of live births in a year, and multiplying the resulting fraction by 1000. Robust standard errors clustered at the state level in parentheses. All columns include state fixed effects. * 10%, ** 5%, *** 1% significance levels.*

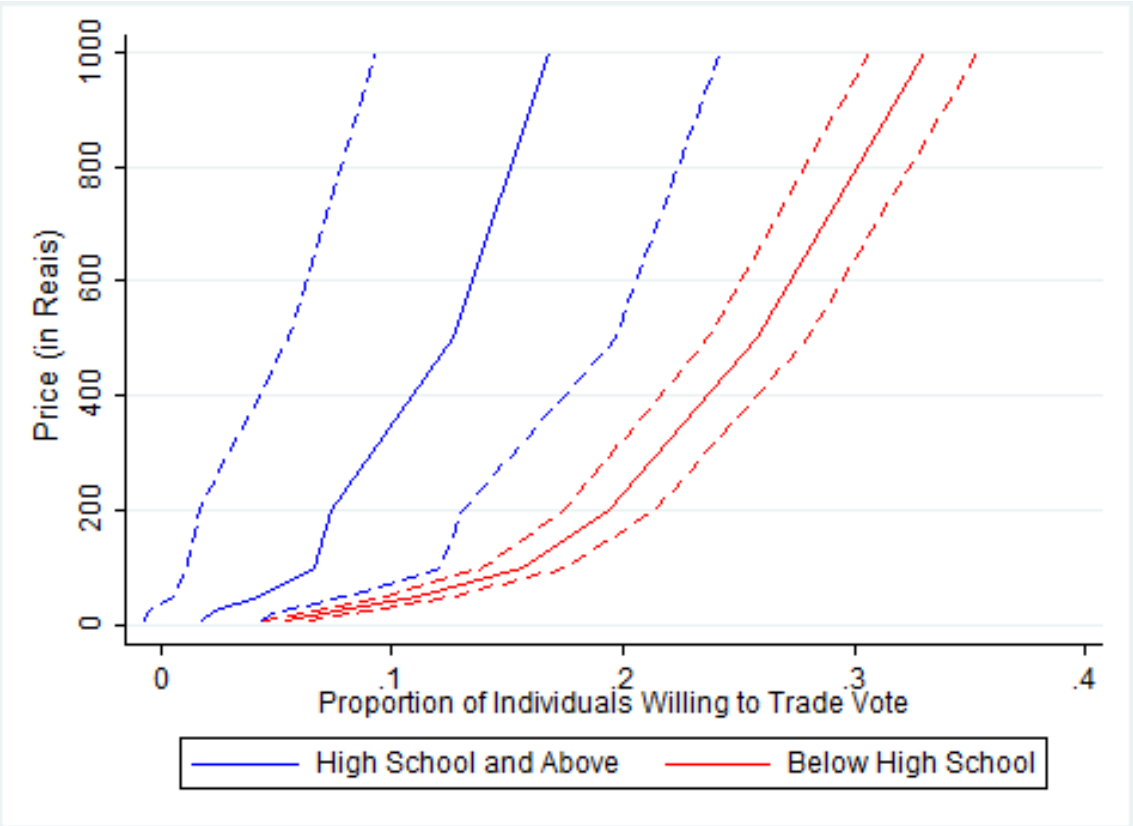

Figure 22: Supply Curve for Votes

Constructed using survey data from Bobonis, G., Gertler, P., Gonzalez-Navarro, M. and Nichter, S., 2016. Vulnerability and Clientelism. Working paper. At a given price, the average proportion of respondents with or without a high-school who are willing to exchange their votes have been plotted to construct the two supply curves. The dotted lines represent 95% confidence intervals which were constructed using robust standard errors from a linear regression with municipality fixed effects.

Average Number of Prenatal Visits

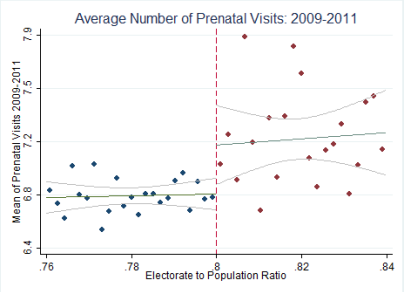

Figure 23: Small Municipalities

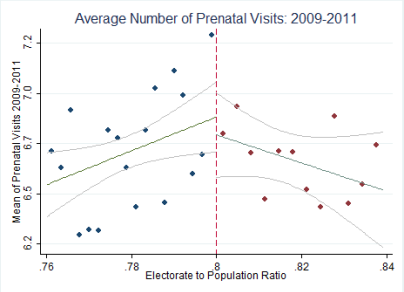

Figure 24: Big Municipalities

Proportion with 4 or More Prenatal Visits

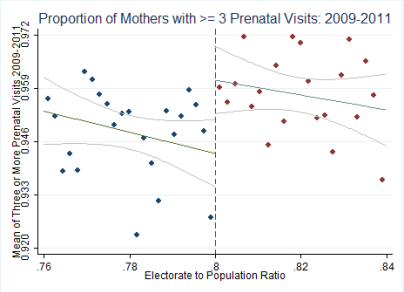

Figure 25: Small Municipalities

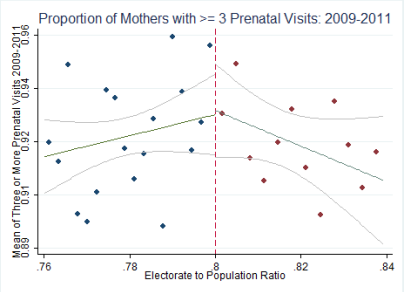

Figure 26: Big Municipalities

Low Birth-Weight Incidences

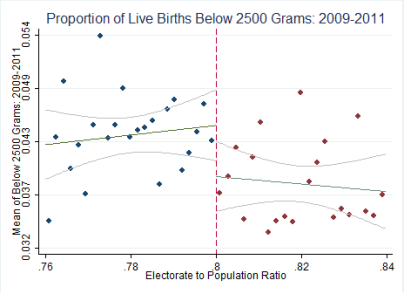

Figure 27: Small Municipalities

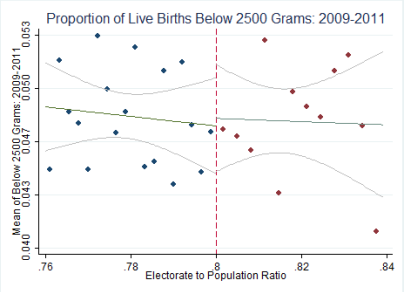

Figure 28: Big Municipalities

Notes: These figures plot health outcomes at the municipality level (before and after the reform) against the forcing variable for municipalities with above and below median population in 2007. Measures of health care utilization and outcomes at birth are constructed by using data from the National System of Information on Live Births (SINASC), which contains birth records collected from medical and official registries, such as birth certificates. Average number of prenatal visits is constructed using a categorical variable specifying the range within which the number of prenatal visits made by a mother fall into. Low birth-weight incidences refer to the proportion of total live births involving weight at birth of below 2500 grams. Each point represents the average value of the outcome in a bin containing 20 municipalities. The solid line plots predicted values on the unbinned raw data, with separate linear trends estimated on either side of the 80% threshold. The dashed lines show 95% confidence intervals.

Average Number of Prenatal Visits

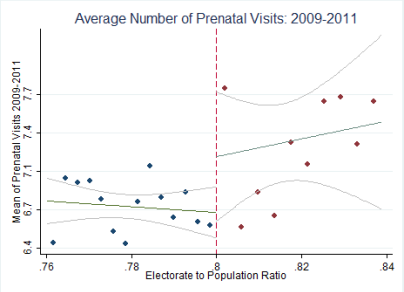

Figure 29: Municipalities with High Net Transfers

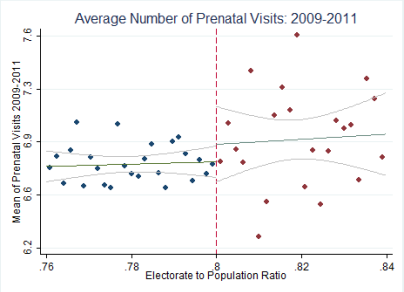

Figure 30: Municipalities with Low Net Transfers

Proportion with 4 or More Prenatal Visits

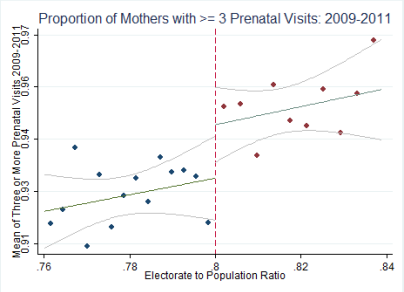

Figure 31: Municipalities with High Net Transfers

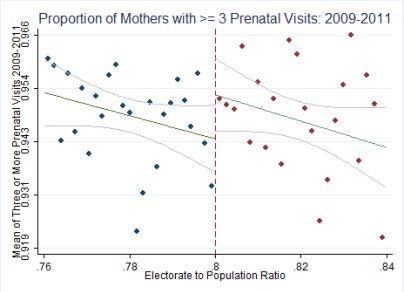

Figure 32: Municipalities with Low Net Transfers

Low Birth-Weight Incidences

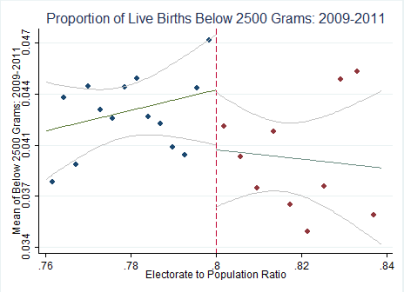

Figure 33: Municipalities with High Net Transfers

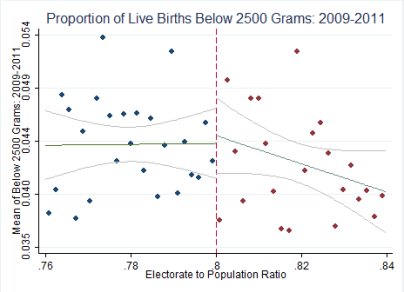

Figure 34: Municipalities with Low Net Transfers

Notes: These figures plot health outcomes at the municipality level (before and after the reform) against the forcing variable for municipalities with high and low net transfers. High net transfer municipalities are those that were above the national median in terms of 1) voter transfers out of their neighboring municipalities in the pre-reform years of 2005 and 2006, and 2) voter transfers into their own electoral rolls during these two years. Low net transfers municipalities were those that were below the median for both conditions. Measures of health care utilization and outcomes at birth are constructed by using data from the National System of Information on Live Births (SINASC), which contains birth records collected from medical and official registries, such as birth

certificates. Average number of prenatal visits is constructed using a categorical variable specifying the range within which the number of prenatal visits made by a mother fall into. Low birth-weight incidences refer to the proportion of total live births involving weight at birth of below 2500 grams. Each point represents the average value of the outcome in a bin containing 20 municipalities. The solid line plots predicted values on the unbinned raw data, with separate linear trends estimated on either side of the 80% threshold. The dashed lines show 95% confidence intervals.