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Federico Boffa
Francisco Cavalcanti
Amedeo Piolatto

DEPARTAMENTO DE ECONOMIA
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Ignorance is bliss: voter education and alignment in distributive politics

Federico Boffa[a]
Free U. of Bozen/Bolzano & Collegio Carlo Alberto

Francisco Cavalcanti[b]
PUC-Rio

Amedeo Piolatto[c]
Autonomous U. Barcelona & Barcelona School of Economics & IEB

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Abstract

Central-government politicians channel resources to sub-national entities for political gains. We show formally that the central politicians' allocation decision has two drivers: political alignment (between central and local politicians) and the level of local political accountability. However, drivers count one at a time: alignment matters before local elections, while local political accountability matters before central elections. We then perform a test of our model using Brazilian data, which corroborates our results. Furthermore, we show and explain why political accountability becomes a curse: better-educated districts receive fewer transfers in equilibrium.

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[a]Free University of Bozen/Bolzano and Collegio Carlo Alberto. E-mail: fboffa@unibz.it

[b]Postdoctoral researcher, Department of Economics, Pontifícia Universidade Católica do Rio de Janeiro PUC-Rio. E-mail: francisco.lima.cavalcanti@gmail.com

[c]Autonomous U. of Barcelona (UAB), Barcelona School of Economics (BSE) and Barcelona Institute of Economics (IEB). E-mail: amedeo.piolatto@uab.es

1 Introduction

Politicians often channel resources to specific constituencies for political gains.[1] This has sizeable negative welfare consequences (Finan and Mazzocco, In Press). Two characteristics of voting districts may play a central role in the assignment of such resources. One is political affinity, usually measured by the party alignment between the central politician in charge of transfers and the local politicians. The other is the district's level of political accountability, which depends on voters' knowledge of the political process. Hence, it relates to the amount of available information and to voters' ability to process it, which in turn depends on voters' education and economic literacy. We provide a novel explanation of how the two elements interact, through a formal model and an empirical analysis based on Brazilian data.

We show how central politicians can optimally assign resources across districts that are heterogeneous on two levels: alignment and accountability. Consistently with the main findings in economics and political economy, we find that both elements matter in distributive politics. However, they do so one at a time: alignment matters mostly before local elections, while accountability matters mostly before central elections, and in a perhaps counter-intuitive direction. We indeed show and explain why knowledge becomes a curse: more knowledgeable districts receive less transfers in equilibrium.

Political accountability and knowledge play a prominent role not only in political economics, where it is well known that political accountability is crucial to discipline politicians, but in several other fields of economics as well. Political accountability is crucial to discipline politicians. In most cases, knowledge is power and well-educated agents may extract some rent out of it.[2] Yet, there are well-known cases when knowledge may be detrimental.[3] The idea that voters' imperfect knowledge may have an effect on policy goes back at least to Downs (1957) and has received a lot of attention ever since.

The seminal contribution of Lindbeck and Weibull (1987) posit that, when it comes to distributive politics, parties may favour swing districts. Instead, Cox and McCubbins (1986) suggest that a *stronghold* mechanism is at play and that party leaders are more generous with aligned local politicians. The empirical evidence is at least mixed (Section 1.1 develops on

[1] Clemens and Veuger (2021) "estimate that having an additional Senator or Representative per million residents predicts an additional 670 US dollars in combined state and local aid per capita".

[2] Typical examples are when knowledge: provides leverage in negotiations; enhance accountability in delegation processes (e.g. for politicians or managers); reduces inefficiencies by improving the quality of matches; allows customisation of products and services.

[3] A typical example would be when knowledgeable consumers suffer from price discrimination and pay a higher price. When it comes to decision making and politics, Fitts (1990) identifies four possible drawbacks of information: i) it may decrease the rationality of decisions when there's too much of it; ii) it complicates reaching utilitarian goals, inducing collective actions from special interest groups; iii) it makes agreements harder to achieve when agents better understand their interests; iv) losing the veil of ignorance on own interest decreases the chances of reaching agreements that are ex-ante fair for everyone.

this). Our work provides further support to the stronghold approach.

In line with Bracco et al. (2015); Curto-Grau et al. (2018), our model considers a setting with two tiers of government, where the upper tier transfers resources to the lower one. Such transfers are not observable by voters. In our model, central politicians only care about their own re-election. Two major innovations compared to Bracco et al. (2015); Curto-Grau et al. (2018) are that we consider separately the periods preceding mayoral and federal elections and that we account for the heterogeneity in voters' education.

Our formal model and the related empirical analysis contribute to the literature on several accounts. First, we separately consider federal and local elections and show that, in the context of multiple layers of government, distributive politics follows different principles, depending on what level of government is up for reelections next. Second, by distinguishing between knowledgeable and non knowledgeable voting districts, we unveil a new driving force (complementary to those already discussed in the literature). Perhaps surprisingly, we find that, before federal elections, discretionary transfers favour low-educated districts. Furthermore, we rationalise the behaviour of federal politicians. The decision to favour aligned local politicians is endogenously obtained through the maximisation of the chances of re-election. Contrary to us, the literature typically does not analyse the channel through which rational central politicians are incentivised to favour aligned local politicians, but simply models them as altruistic (e.g. Persico et al., 2011; Bracco et al., 2015), or it directly includes the share of aligned districts in their objective function (e.g. Brollo and Nannicini, 2012; Curto-Grau et al., 2018).

Additionally, our empirical analysis confirms some previous results from the literature, possibly providing some new nuances. We show that the impact of transfers on elections depends on the time distance between the two. Indeed, we find a mild direct effect of period 1 transfers on period 2 elections, on top of the indirect effect that goes through the influence of the electoral result in period 1.

Our empirical analysis uses data from Brazil. There, the political mandate lasts four years for both mayors and the president. The two types of election alternate every two years. Intergovernmental transfers represent, on average, 65% of the municipal budget (Brollo and Nannicini, 2012). Part of them is assigned in a discretionary way, including transfers granted after a declaration of local emergency. Municipalities in an emergency situation are eligible to receive various types of financial support that are deregulated and with low transparency. The National Secretariat of Civil Defence (SEDEC), an agency within the federal Ministry of National Integration, formally determines for which municipalities to declare the state of emergency or public calamity. Members of SEDEC are politically nominated by the minister with the endorsement of the president, who can informally influence the agency decision of

which municipalities are granted such emergency status. Once an emergency is declared, SEDEC decides the resources that are assigned to the affected municipalities, which could include transfers of funds, goods (e.g. water) or human resources (e.g. the army). The beneficiaries of those transfers and which resources are assigned remain mostly unobservable to voters.

Inspired by the Brazilian context, in our two-period model the incumbent mayor in each jurisdiction runs for re-election at the end of period 1, while the incumbent national president runs for re-election at the end of period 2. There are two parties, hence mayors may or may not be aligned with the president. In each period, the president may arbitrarily grant transfers to any of the local districts. The president only cares about the own chances of re-election. Transfers are not observable, however, they are used to build some observable local public good. Before each election, citizens receive some signal about the ability of the president and the mayor. Voters differ in their level of education - which may be interpreted as a difference in political accountability or as a difference in the ability to process the available information. More knowledgeable voters receive more signals.

Even if transfers are unobservable, voters are rational and can anticipate the optimal granting strategy of the president. Yet, they remain uncertain about the amount that has been granted. On average such transfers still have a positive impact on the incumbent's re-election. Indeed, transfers influence voters' posterior about the ability of the incumbent, because citizens can only partially account for the transfers impact on public good provision.

We prove that before mayoral elections it is optimal for the president to assign transfers to districts run by aligned mayors (regardless of voters' level of knowledge). We show (both theoretically and empirically) that this is because in period 2 the president benefits from the support of aligned mayors.[4] Even if knowledgeable voters are less influenced (or misled) by transfers than the not knowledgeable ones, it is still a dominant strategy to support all aligned mayors.

Before presidential elections, we find that the best strategy is to assign transfers to districts with low-educated voters, regardless of alignment. Indeed, in period 2 the president only cares about her own re-election and the marginal effect of transfers on votes is larger among voters with no knowledge. Our theory model illustrates the channel leading to this result. The president would like to make voters' signals as noisy as possible, so as to increase citizens' reliance on the incumbency advantage, which benefits her. Voters with little knowledge observe only a signal of the local outcome in terms of public good production. To the contrary, more knowledgeable voters receive (perhaps because they are better able at processing the

[4]This result works in support of the assumption in Brollo and Nannicini (2012); Curto-Grau et al. (2018) that the president cares about the share of aligned mayors.

available information) a signal on the president's ability as well. The transfer reduces the precision of the public good signal. Its impact on the overall inference on the president's ability is larger for voters with little knowledge, who cannot exploit any other signals, than for knowledgeable voters, who can benefit from the additional signal on the president's ability. This result, that the President targets the least knowledgeable voters, is novel and it goes in the opposite direction from the common result in distributive politics (e.g. Stein and Bickers, 1994; Strömberg, 2004), where more knowledgeable voters tend to receive a better treatment. Also, it shows that previous results about how transfers are assigned to aligned districts is robust to the introduction of heterogeneity in knowledge, but only before mayoral elections.

The empirical analysis uses a Regression Discontinuity Design (RDD) approach to estimate the effect of political alignment on elections, by comparing politically aligned and unaligned municipalities. To that end, we focus on municipalities where the 'aligned' candidate mayor won or lost by a small margin of victory in the previous election.[5] By focusing on close elections, we expect that party alignment is randomly distributed around the winning threshold and, therefore, we can safely interpret the impact of party alignment to be causal. We interact political alignment with two indicators: one for municipalities that obtained the state of emergency and the other for municipalities with an above-median level of education (used as a proxy for knowledge and political accountability). Then, we estimate the endogenous probability of transfers being granted by the president to a municipality. As predicted by the model, before mayoral elections alignment matters for the assignment of transfers (the probability increases by 8 to 11 percentage points for not knowledgeable municipalities and by 4 to 5 p.p. for the more knowledgeable ones). Our estimates for the period preceding presidential elections are also in line with the model forecast. Indeed, (lack of) knowledge is crucial in the allocation of transfers: knowledgeable municipalities have 16.8 to 18.3 p.p. less chances of receiving the transfer. Instead, alignment only is of second-order importance.

Our analysis helps at better understanding the mechanism through which distributive politics operates. It is natural to assume that the socially optimal assignment of resources should follow a logic of needs and efficiency, rather than political opportunism. The most obvious solutions to the problem are probably also the hardest to implement: discretional decisions should be limited to very few cases and should be taken by boards that are independent from the political power. If the board's independence is not achievable, then it may be preferable to have its activity monitored by both the incumbent party and the opposition. A second line of intervention should focus on voters knowledge: although we show that less knowledgeable agents benefit from their ignorance, they do so at the expenses of knowledgeable voters

[5]By 'aligned' we refer to candidates that belong to one of the parties that belongs the coalition supporting the incumbent president.

and, even worse, they subtract resources from districts that could benefit more from them. Hence, our model suggests that if all districts were knowledgeable, resources would not be diverted for electoral purposes and would be used where they are needed the most. A directly related policy recommendation is that an increase in transparency as well as in voters' economic literacy would be welcome. Among the less effective but easier to implement policies, one may consider the introduction of restrictions to the assignment of resources in the time preceding elections. An alternative way to mitigate this distributional distortion could consist in designing geographically different districts for voting and for transfer purposes, making it hard for the central government to target any specific voting district.

1.1 Related literature

Our paper belongs to the broad and heterogeneous literature on the consequences of shared governance and, more specifically, on the effects of the presence of multiple layers of governments in federal systems. Accountability under shared governance has played a large effect on the debate on federalism (see Ferraz and Finan, 2011; Boffa et al., 2016, and the literature therein). While a major argument in favour of federalism is the fact that it is easier for voters to monitor politicians that are closer to them, the presence of multiple layers of governments also triggers severe accountability dilutions. These may be due mostly to the difficulty in attributing blame (Joanis, 2014) or to the reduction in salience of low-stake elections (Berry and Gersen, 2009; Bracco and Revelli, 2018). Any reduction in accountability inevitably leads to less transparency, which may hamper efficiency (Gavazza and Lizzeri, 2007, 2009; Glaeser and Ponzetto, 2018; Grossman et al., 2020). Low levels of accountability are also responsible for an increase in corruption and mismanagement of public funds (Fan et al., 2009; Ferraz and Finan, 2011; Bobonis et al., 2016; Repetto, 2018; Lauletta et al., 2020). The accountability dilution is particularly stark under divided governments, that is, when the different layers are governed by different parties (Lowry et al., 1998).[6]

Under multiple layers of government, each tier is responsible for the collection, use and redistribution of resources (across lower tiers of government or directly to citizens). The misallocation of resources is extremely frequent and has significant negative welfare consequences (Finan and Mazzocco, In Press). The seminal works on distributive politics put forward two conjectures: resources are used to target more swing voters (Lindbeck and Weibull, 1987) or to reward and reinforce support in parties' strongholds (Cox and McCubbins, 1986).[7] Testing

[6]Divided government has also consequences on policy outcome. For instance, it leads to more protectionism in trade policy (Lohmann and O'Halloran, 1994).

[7]Within the empirical literature that evaluates standard models of distributive politics, Larcinese et al. (2006); Solé-Ollé and Sorribas-Navarro (2008); Persico et al. (2011); Larcinese et al. (2013) provide, among other things, excellent reviews of the previous literature.

the hypothesis of public spending being used to favour swing districts provided mixed results.[8] In many contexts, including ours, there is evidence that spending favours party strongholds.[9] Transfers of resources are not always motivated by politicians' willingness to directly improve their chances of being reelected. In Persico et al. (2011), politicians are trying to reinforce their position within the party, by favouring party members that belong to their same faction. Carozzi and Repetto (2016) show that Italian politicians disproportionally redirect resources to their birthplace without apparent electoral motive. Curto-Grau and Zudenkova (2018) show that resources are used by party leaders to reward local politicians that follow the party line against the will of their local constituency. Instead, in Bonilla-Mejía and Morales (2020), transfers are used by the government to build legislative consensus within the parliament.

The political budget cycle literature, pioneered by Nordhaus (1975) and which gained prominence after Alesina and Perotti (1995), looks at how the strategic political mismanagement varies in the proximity of elections.[10] Our focus is on discretionary transfers in a federal setting and how these are used for electoral purposes, however, we don't study the timing of transfers within electoral terms. We distinguish local from federal elections and aligned from misaligned districts and we account for districts' average level of education (which is used as a proxy for accountability).

Before us, Brollo and Nannicini (2012) already showed, using Brazilian data, that municipalities where the mayor is politically aligned with the president receive approximately one-third larger discretionary transfers for infrastructures. Compared to their work, we microfound the theoretical setting for the mayoral election, we add a second period describing the presidential election and we distinguish municipalities by level of education. Similarly, in our empirical analysis we look at the assignment of transfers also in the period preceding presidential elections. While Brollo and Nannicini (2012) look at transfers for infrastructures, we use data on transfers related to the declaration of the state of emergency.

Bracco et al. (2015) provide a fully fledged principal–agent model of discretionary grants across tiers of government, distinguishing between aligned and misaligned districts. They find empirical evidence that the size of the grant matters and that before local elections alignment becomes a better predictor of how grants are attributed. Similar to them, in our model grants translate into signals, rather than bribes, by raising local public good provision which

[8] Case (2001); Johansson (2003); Strömberg (2008); Arulampalam et al. (2009); Firpo et al. (2015) may be among the most well-known contributions that support the claim.

[9] Khemani (2007); Arulampalam et al. (2009) find support for political alignment favouritism in India in the 70's to 90's. Larcinese et al. (2006); Persico et al. (2011); Brollo and Nannicini (2012); Bracco et al. (2015); Curto-Grau et al. (2018); Catalinac et al. (2020) find analogous results, respectively, in the US, Mexico, Brazil, Italy, Spain and Japan.

[10] Typical examples would be an increase in public loans (Cole, 2009), a decrease in traffic tickets (Bracco, 2018) or an increase in local investments (Repetto, 2018) when elections approach.

the electorate interprets as signal of higher incumbent ability.

Curto-Grau et al. (2018) is possibly the first at looking at distributive politics through the lens of the election of the upper tier layer of government. One main difference from the previous literature is that, for the upper tier, they consider regional instead of presidential elections. This allows them to have many more data points for their empirical analysis. Their scope is to understand the mechanism behind the assignment to municipalities of regional transfers before local elections, distinguishing cases in which competition at the previous regional election has been high or low. In line with the previous literature, they find that aligned municipalities receive more transfers but they also find that the degree of electoral competition at the regional level matters. Indeed, per-capita transfers are much larger for aligned municipalities when the regional incumbent enjoyed a large margin of victory, while the difference between aligned and misaligned municipalities almost disappears when the last regional elections had been close. They interpret their results, helped by a stylised model, suggesting that the regional legislator has diverging short and long run interests. In the long run, it is beneficial to support aligned mayors but in the short run it may not be the case. When regional incumbents feel safer, they focus on the long run benefits and support aligned mayors more than if they expect their reelection to be at risk. Compared to Curto-Grau et al. (2018), we don't have enough statistical power to distinguish between close and non-close elections at the upper level.

In Brollo and Nannicini (2012); Bracco et al. (2015); Curto-Grau et al. (2018) the interest of the central government to help the local incumbents is taken for granted. Indeed, they assume that the central government cares about the electoral fortunes of politically aligned local incumbents, which provides the incentive for the centre to donate to districts with aligned incumbents. Our model rationalises such behaviour, showing that such altruism is not needed to explain transfers, for the central government may already have ulterior (selfish) motives to divert grants towards aligned municipalities before local elections.

Brollo and Nannicini (2012); Bracco et al. (2015); Curto-Grau et al. (2018) disregard the elections of the upper-tier level of government and, therefore, how transfers are again strategically used to improve the chances of reelection. Instead, our model is able to explain the pattern of transfers before presidential elections, where we show that alignment is not relevant anymore.

An additional novelty of our approach is that we distinguish between municipalities with high and low level of education. Education is our preferred proxy for voters' knowledge, as it significantly affects the ability to understand and process the available information (which is the source of political accountability). Consistently with the prediction of our theoretical model, we find that education is not relevant for the attribution of resources before mayoral

elections, while it matters before the presidential ones, when uninformed districts receive more resources. Our results on the benefits from low prior to national elections echo Hodler and Raschky (2014), who find that regional favouritism is most prevalent in uneducated regions, whose voters are less able to hold their politicians accountable.

2 The model

Consider a country organised with two tiers of government, central and local, and m jurisdictions. Both the central president and the local mayor are directly elected.

In each district i, the representative individual derives utility $u_t^i = \tilde{u}_t^i + g_t^i$ in period $t = \{1, 2\}$, where $\tilde{u}_t^i$ and g_t^i are the utility respectively from private consumption and the provision of local public good. We treat $\tilde{u}_t^i$ as an exogenous mean-zero shock and focus exclusively on public goods.

Politicians are of type θ^j, with $j = \{\ell, c\}$ referring to the local (ℓ) and central (c) tier of governance. $\theta_t^c = c_t + c_{t-1}$ and $\theta^{\ell,i} = \ell_t^i + \ell_{t-1}^i$ are first order moving average processes, where shocks c_t and ℓ_t are i.i.d. over time and across politicians and normally distributed so that $\theta^c \sim N(\mu_c, \sigma_c^2)$ and $\theta^{\ell,i} \sim N(\mu_\ell, \sigma_\ell^2)$. The (exogenous and unobservable) politicians' type translates into their ability to provide public goods.

The public good is produced then with technology $g_t^i = \theta_t^c + \theta_t^{\ell,i} + T_t^i$, where T_t^i is a money transfer that the central politician may award in a discretionary way. If granted, its amount is stochastic: $T_t^i \sim N(\mu_T, \sigma_T^2)$. Therefore, politicians have an impact on the amount of public good produced through their exogenous type. Local politicians cannot take actions that will affect production, while central politicians may do so by granting transfers T_t^i.

Following Bracco et al. (2015), agents cannot observe the grant. However, in our setting they are rational and understand which districts will receive it by anticipating the equilibrium behaviour of the president. This implies that, in equilibrium, voters know if their district received a transfer, but they won't know its amount.

When an election is held, citizens in each jurisdiction want to select the best politician by confirming the incumbent or electing the opponent. The incumbent politician enjoys an incumbency advantage (ϕ_j). Such advantage is amplified when the incumbent at one layer of jurisdiction (central/local) is aligned with the incumbent at the other layer. In particular,

$$v_t^j = \begin{cases} v^a \sim U[0, 2\phi_j + 2\psi_j] & \text{if aligned} \\ v^u \sim U[0, 2\phi_j] & \text{if unaligned} \end{cases} \tag{1}$$

We will refer to ψ_j as the alignment advantage and it's specific to each level of governance. Therefore, ψ_ℓ represents the positive spillover enjoyed by mayors running for reelection if the

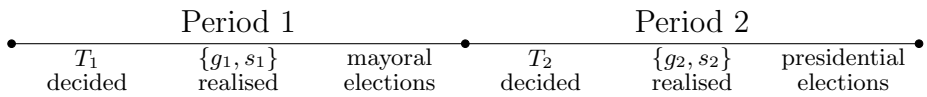
president is aligned with them; instead, ψ_c represents the positive spillover enjoyed by the president running for reelection in districts where the local mayor is aligned with them.

All citizens observe the amount of public good g_t^i produced in their jurisdiction and can use that as a signal of the politicians' type. Furthermore, the representative agent in a jurisdiction may be knowledgeable or not knowledgeable, where knowledgeable voters differ in that they also receive a second (imperfect) signal s of the ability of the president, with $s = \theta_t^c + \epsilon$ and $\epsilon \sim N(\mu_s, \sigma_s^2)$.

Notice that g_t^i is simultaneously providing a signal of the ability of the mayor and of the president. Therefore, when knowledgeable agents use signal s_t to update their beliefs about the president, they are also able to better disentangle the role of the president in the production of g_t^i. Hence, signal s_t is also used by knowledgeable citizens to indirectly improve upon their prediction of the ability of the mayor.

We consider a two-period game, where each period starts with the decision (by the president) to grant or not the transfer. Then g_t, s_t are observed. Finally, citizens vote to reappoint (or not) the incumbent politician: mayoral elections take place at the end of the first period, while presidential elections are held at the end of the second period.

Figure 1: Timing



In each district, representative agents form their believes about the incumbent's ability based on the prior and the available signals. The representative agent supports the incumbent politician as long as their expected ability, adjusted for the incumbency shock, is larger than the one of the opponent. Hence, the incumbent expects to win a district if

$$\begin{cases} E(\theta^j|g_t, s_t) + E(v_t) > E(\theta^j) & \text{in knowledgeable districts} \\ E(\theta^j|g_t) + E(v_t) > E(\theta^j) & \text{in not knowledgeable districts} \end{cases} \tag{2}$$

Using Eq. (1), the previous condition translates into

$$\begin{cases} E(\theta^j|g_t, s_t) + (\psi_j + \phi_j) > \mu_j & \text{if aligned \& knowledgeable} \\ E(\theta^j|g_t) + (\psi_j + \phi_j) > \mu_j & \text{if aligned \& not knowledgeable} \\ E(\theta^j|g_t, s_t) + \phi_j > \mu_j & \text{if unaligned \& knowledgeable} \\ E(\theta^j|g_t) + \phi_j > \mu_j & \text{if unaligned \& not knowledgeable} \end{cases} \tag{3}$$

We solve the model backward, starting with period 2.

Presidential elections. Representative voters update their priors about the ability of the central politician, by using signals g_2 and s_2 if knowledgeable, or just g_2 if not knowledgeable.

By the standard process of signal extraction, we have that

$$E(\theta^c|s_2,g_2) = \frac{(\sigma_\ell^2+\sigma_T^2)\sigma_s^2\mu_c + \sigma_c^2(\sigma_\ell^2+\sigma_T^2)\,(s_2-\mu_s) + \sigma_c^2\sigma_s^2\,(g_2-\mu_\ell-\mu_T)}{\sigma_c^2\left(\sigma_\ell^2+\sigma_T^2+\sigma_s^2\right)+(\sigma_\ell^2+\sigma_T^2)\sigma_s^2} \tag{4}$$

$$E(\theta^c|g_2) = \frac{(\sigma_\ell^2+\sigma_T^2)}{\sigma_c^2+(\sigma_\ell^2+\sigma_T^2)}\mu_c + \frac{\sigma_c^2}{\sigma_c^2+(\sigma_\ell^2+\sigma_T^2)}(g_2-\mu_\ell-\mu_T). \tag{5}$$

Eqs. (4) and (5), as customary, are basically weighing the prior and signals based on their variance.

Lemma 1. *For each type of district, Eq.* (6) *defines the condition on the average ability of a candidate (μ_c) for the representative agent to vote for the incumbent president.*

Proof. See appendix A. □

$$\mu_c < \begin{cases} \frac{(\sigma_\ell^2+\sigma_T^2)(s_2-\mu_s)+\sigma_s^2\hat{g}_2}{\left(\sigma_\ell^2+\sigma_T^2+\sigma_s^2\right)} + (\psi_c+\phi_c)\left(1+\frac{(\sigma_\ell^2+\sigma_T^2)\sigma_s^2)}{\sigma_c^2\left(\sigma_\ell^2+\sigma_T^2+\sigma_s^2\right)}\right) & \text{if aligned \& knowledgeable} \\ \hat{g}_2+(\psi_c+\phi_c)\left(\frac{\sigma_c^2+\sigma_\ell^2+\sigma_T^2}{\sigma_c^2}\right) & \text{if aligned \& not knowledgeable} \\ \frac{(\sigma_\ell^2+\sigma_T^2)(s_2-\mu_s)+\sigma_s^2\hat{g}_2}{\left(\sigma_\ell^2+\sigma_T^2+\sigma_s^2\right)} + \phi_c\left(1+\frac{(\sigma_\ell^2+\sigma_T^2)\sigma_s^2)}{\sigma_c^2\left(\sigma_\ell^2+\sigma_T^2+\sigma_s^2\right)}\right) & \text{if unaligned \& knowledgeable} \\ \hat{g}_2+\phi_c\left(\frac{\sigma_c^2+\sigma_\ell^2+\sigma_T^2}{\sigma_c^2}\right) & \text{if unaligned \& not knowledgeable} \end{cases} \tag{6}$$

where $\hat{g}_2 \equiv g_2-\mu_\ell-\mu_T$ is the realisation of g_2, net of the average ability of the mayor and the average transfer.

Taking Eq. (6) into account, the president must decide which districts to assign the transfers to, before knowing the realisation of each of the random variables.

Lemma 2. *The decision of the president to grant a transfer is independent of the (prior) expected value of the transfer μ_T.*

Proof. See appendix A. □

Lemma 2 implies that the decision to grant a transfer may affect the electoral outcome only through the variance σ_T^2. This result plays an important role in the model. Indeed, in equilibrium one would expect that the average amount μ_T that is transferred is decreasing in the number of municipalities receiving the transfer (because of the public budget constraint). Lemma 2 guarantees that the voting equilibrium doesn't depend on the average amount that is transferred and, therefore, that we can safely disregard possible (and plausible) changes in μ_T that would follow from a change in the cardinality of who obtains the transfer.

In our model, the president is only motivated by the desire to be reelected. Therefore, the assignment of transfers will directly reflect such reelection concerns. For the president, it is ex-ante beneficial to grant a transfer to a municipality of a given type, if this leads to an increase in the right hand side of Eq. (6). Proposition 1 summarises the optimal behaviour of the president in period 2.

Lemma 3. *In aligned municipalities, transfers have a larger positive impact on the reelection of the incumbent president than in the unaligned ones.*

Proposition 1. *Before presidential elections (i.e. in period 2), the president uses voters' knowledge as the main criteria to assign resources. In particular, it is in the best interest of the president to grants the transfer to all the not knowledgeable municipalities, regardless of alignment.*

Only if the incumbency advantage is 'large' ($\phi_c > \hat{\phi}$), the president would like to grant the transfer also to municipalities that are simultaneously knowledgeable and aligned.[11]

Only if the incumbency advantage is 'very large' ($\phi_c > \hat{\phi} + 1$), the president would like to grant the transfer to all municipalities.

Corollary 1. *The threshold $\hat{\phi}$ for the incumbency advantage to be large enough to justify transfers to knowledgeable districts is increasing in the variance in the ability of politicians: $\frac{\partial \hat{\phi}}{\partial \sigma_c^2} > 0$ and $\frac{\partial \hat{\phi}}{\partial \sigma_\ell^2} > 0$.*

Proof. See appendix A. □

Following Proposition 1, (lack of) knowledge is the main criteria that the president should use to assign transfers to maximise their chances of reelection. Whether or not it pays off to also send transfers to knowledgeable municipalities, depends on the magnitude of the incumbency effect and, as such, it will be an empirical question (that we will answer through our empirical analysis) whether the incumbent president grants transfers to knowledgeable districts too. The corollary shows that the greater the uncertainty on the ability of politician (larger σ_j^2) the less likely it is to observe transfers to knowledgeable districts. Our theoretical model suggests that it is rewarding to grant the transfers to knowledgeable municipalities only when the incumbency advantage is large enough, with the threshold being larger for knowledgeable municipalities that are unaligned.

To better understand this result, notice that the immediate effect of granting the transfer is that signal g becomes more noisy and, hence, voters will put less weight on it. In the case of not knowledgeable municipalities, reducing the weight of g corresponds to increase the weight of the incumbency advantage. Since the latter plays in favour of the incumbent, it is

[11] The value of threshold $\hat{\phi}$ is derived in appendix A, within the proof of Proposition 1.

in the president's interest to increase its prominence. However, in the case of knowledgeable municipalities, a reduction in the weight of g implies an increase in the prominence of both s and the incumbency advantage. Therefore, it is less obvious that such change will benefit the incumbent. Only when the incumbency advantage is 'sufficiently large', it becomes profitable to grant the transfer to the knowledgeable municipalities

When looking at the marginal benefit of granting the transfer (Eq. 13 in Appendix A), it is immediate to notice that, within not knowledgeable districts, the returns on transfers are larger for aligned municipalities. Similarly, within knowledgeable districts, the returns are also larger for aligned municipalities.

Lemma 4. *It is in the best interest of the president to have, by the time of the election, as many aligned municipalities as possible.*
The benefit from alignment is increasing in the variance of the ability of the mayor (σ_ℓ) and decreasing in the variance of the ability of the president (σ_c).

Proof. See appendix A. □

Similarly to what occurs in period 2, when we analyse period 1 we need to start by looking at the election at the end of the period. In this case, voters need to choose between the incumbent mayor and their opponent.

Mayoral elections It is crucial to notice that signal s is about the ability of the president, not of the mayor. Yet, such signal helps knowledgeable voters again to be more accurate in their posterior about the incumbent. Indeed, knowledgeable voters use s to better disentangle what in g depends on the ability of the president and the mayor.

Following the standard signal extraction procedure,

$$E(\theta^\ell|g_1,s_1)=\frac{\left(\sigma_c^2\sigma_s^2+\left(\sigma_c^2+\sigma_s^2\right)\sigma_T^2\right)\mu_\ell+\sigma_\ell^2\left(\left(\sigma_c^2+\sigma_s^2\right)(g_1-\mu_T)-\sigma_s^2\mu_c-\sigma_c^2(s_1-\mu_s)\right)}{\sigma_c^2\sigma_s^2+\left(\sigma_c^2+\sigma_s^2\right)\left(\sigma_\ell^2+\sigma_T^2\right)} \tag{7}$$

$$E(\theta^\ell|g_1)=\frac{\sigma_c^2+\sigma_T^2}{\sigma_\ell^2+\sigma_c^2+\sigma_T^2}\mu_\ell+\frac{\sigma_\ell^2}{\sigma_\ell^2+\sigma_c^2+\sigma_T^2}(g_1-\mu_c-\mu_T) \tag{8}$$

Lemma 5. *For each type of district, Eq.* (9) *defines the condition on the average ability of a candidate (μ_ℓ) for the representative agent to vote for the incumbent mayor.*

Proof. See appendix A. □

$$\mu_\ell < \begin{cases} \frac{\sigma_c^2((g_1-\mu_T)-(s_1-\mu_s))+\sigma_s^2\hat{g}_1}{(\sigma_c^2+\sigma_s^2)} + (\psi_\ell+\phi_\ell)\left(1+\frac{\sigma_c^2\sigma_s^2}{(\sigma_c^2+\sigma_s^2)\sigma_\ell^2}+\frac{\sigma_T^2}{\sigma_\ell^2}\right) & \text{if aligned \& knowledgeable} \\ \hat{g}_1 + (\psi_\ell+\phi_\ell)\left(1+\frac{\sigma_T^2+\sigma_c^2}{\sigma_\ell^2}\right) & \text{if aligned \& not knowledgeable} \\ \frac{\sigma_c^2((g_1-\mu_T)-(s_1-\mu_s))+\sigma_s^2\hat{g}_1}{(\sigma_c^2+\sigma_s^2)} + \phi_\ell\left(1+\frac{\sigma_c^2\sigma_s^2}{(\sigma_c^2+\sigma_s^2)\sigma_\ell^2}+\frac{\sigma_T^2}{\sigma_\ell^2}\right) & \text{if unaligned \& knowledgeable} \\ \hat{g}_1 + \phi_\ell\left(1+\frac{\sigma_T^2+\sigma_c^2}{\sigma_\ell^2}\right) & \text{if unaligned \& not knowledgeable} \end{cases} \tag{9}$$

where $\hat{g}_1 \equiv g_1 - \mu_c - \mu_T$ is the realisation of g_1, net of the average ability of the president and the average transfer.

Moving backward, the president should now decide who to assign the transfers to. This is decided ex-ante (before knowing the realisation of each of the random variables). From Lemma 4, the president finds it optimal to maximise the number of aligned municipalities, for that will increase their chance of being re-appointed at period 2 elections.

Therefore, the president's objective is reached by favouring the re-election of the incumbent mayor in aligned municipalities and to favour the election of the opponent in unaligned municipalities. Consequently, it is ex-ante optimal for the president to grant a transfer to an aligned municipality if, by doing so, the right hand side in Eq. (9) increases. On the contrary, it would be optimal to grant a transfer to unaligned districts if, by doing so, the right hand side in Eq. (9) decreases.

Lemma 6. *For all types of municipalities, the reelection chances of the incumbent mayor increase when a transfer is granted. The effect is larger for aligned municipalities.*

Proposition 2. *In the period before municipal elections, the president will grant the transfer to aligned municipalities only. The decision will not be based on the degree of knowledge (i.e. accountability) of voters in the district.*

Proof. See Appendix A. □

Looking together at Propositions 1 and 2, we obtain the main predictions of the model. When the president is purely office-motivated, they should use two different criteria to assign resources in a discretionary way.

Before mayoral elections, transfers should be sent only to districts where the incumbent mayor is aligned. This is done to maximise the reelection chances of aligned mayors and to minimise those of the unaligned ones.

Before presidential elections, instead, the relevant criterion is the level of knowledge (or political accountability) of voters. Transfers sent to not knowledgeable districts are unequivocally beneficial for the incumbent reelection. While the model could predict transfers to knowledgeable municipalities, that would only occur if the incumbency advantage is large

enough, in which case not knowledgeable districts remain the primary target of transfers but it wouldn't hurt the president to also grant transfers to knowledgeable municipalities.

Our result suggests a curse of the knowledgeable, who are less likely to be recipient of transfers (before presidential elections only). One should notice that our analysis assumes that mayors are honest and never appropriate part of the transfer. Suppose that instead mayors are able to extract some rent out of the transfer (maintaining the assumption that the president doesn't observe the behaviour of mayors before granting the transfer). In more accountable districts, mayors would behave more and the mechanism described in our model would be stronger. This implies that mayors in accountable districts would have more chances of being reelected.

3 Empirical Analysis

The theoretical model endows us with at least two testable predictions. Related to mayoral elections, it suggests that transfers should be channelled towards aligned districts irrespective of their degree of knowledge (see Proposition 2). Instead, when it comes to presidential elections, it suggests that transfers should always reach districts with no knowledge, irrespective of alignment (see Proposition 1). The model is less firm about the destiny of knowledgeable districts. They may also receive discretionary transfers, should the incumbent advantage be sufficiently large.

In what follows, we start by introducing the institutional framework and the source of data (Section 3.1). The subsequent sections will present the econometric strategies that we use to test predictions of the model.

3.1 Institutions and Data

Brazil has three layers of government: local, state, and federal. The way the budget is financed varies at each tier. States and the federal government mostly rely on own taxes and fees. The budget of local governments, instead, is mainly composed of a combination of intergovernmental transfers. About 65% of the municipal budget is represented by transfers from the central government, while local taxes typically represent about 5.5% of it (Brollo and Nannicini, 2012). According to data from the 2000 Brazilian Census, Brazil has about 5,500 municipalities with an average population of about 30,000 inhabitants. The average income of cities is R\$170 per month per-capita (around \$100 at 2021 prices), and the average schooling is 3 years of school attendance. These numbers show, on average, the high percentage of people below the poverty line (less than 1 dollar a day), 14 percent. The Brazilian political landscape is quite fragmented, with more than 40 parties active in 2020. Presidential

coalitions have traditionally been very large. In the years covered by our analysis, they came to include up to 15 parties (in the period 2007-2012), see B. The four most recent Brazilian presidents have belonged to the Workers' Party PT (Luiz Inácio Lula da Silva "Lula" and Dilma Rousseff), to the Brazilian Democratic Movement Party MDB (Michel Temer), and to the social liberal party PSL (Jair Bolsonaro). According to Feierherd (2020), Brazilian parties differ in their cohesion, ranging from strong parties sharing a common platform of ideas and policies, including PT as well as the Popular Socialist Party (PPS) and the Green Party (PV), to weak parties without a common set of policy proposals, including the Brazilian Party for Social Democracy PSDB.

State of emergency and transfers. Transfers to local governments may be assigned following objective criteria or in a discretionary way (*Transferências voluntárias da União*). The group of discretionary transfers mostly includes transfers for infrastructure and those assigned following the declaration of the state of emergency.

Indeed, since the 1960s the Brazilian government has been extensively using the emergency aid against drought as a distributive measure in favour of municipalities. The procedure to allocate them requires a preliminary declaration, by the President, of the state of emergency for the municipality. Then, the National Secretariat of Civil Defence (SEDEC), within the federal Ministry of National Integration, decides on the composition of the aid-relief package for each municipality for which the state of emergency has been declared. The package may include monetary transfers, reduction of red tape related to public spending, investments in infrastructure, distribution of water and food, deployment of the army to affected areas to help with basic needs, renegotiation of agricultural debts and special access to labour insurance funds (FGTS). Estimating the economic value of an aid-relief package would be extremely challenging.

Transfers related to the declaration of emergency are a perfect fit with the model. First of all, they are assigned in a discretionary way and the president has a strong influence on which municipalities obtain the state of emergency. However, it has significantly less chances of determining the type and amount of resources that are assigned. Secondly, citizens are likely to figure out if the state of emergency has been declared, but they are unlikely to get a reliable estimate of the amount of resources that is directed to the municipality.

We focus on the emergency declarations for drought in Brazil for the following reasons. First, the rules and protocols for drought-motivated declarations of emergency are looser than those for other natural disasters.[12] Second, droughts in Brazil are known to be a source

[12]This is because, compared to other events like floods or storms, it is usually harder to define the boundary of the affected area as well as its actual length.

of clientelism and to lead to strategic behaviours for political gains (Bobonis et al., 2017; Nelson and Finan, 2009). Moreover, drought is the most frequent natural disaster in Brazil as droughts-motivated declarations represent about 50% of the total and the affected area usually includes several municipalities.

We obtained the full list of municipalities included in any draught-motivated declaration of the state of emergency for the period 2002 - 2016 from *Sistema Integrado de Informações sobre Desastres Naturais* (S2ID). Figure 2 shows the total number of declarations by each municipality over such period. Notice that, while the Northeast and South of Brazil are characterised by the largest concentration of declarations, most of the populated areas of the country had a declaration of state of emergency at least once. We use this information to construct a dummy variable at the election-municipality level that takes value 1 if the state of emergency has been granted within the two years preceding an election.

Election, political alignment Brazil is a federal presidential democracy with three tiers of government: municipalities, states and the federal level, ruled respectively by the mayor, the governor and the president. All three officials are directly elected through runoff majority rule. Elections take place every four years, with mayoral and presidential elections alternating every two years.

In our analysis, we consider mayoral elections held in 2004, 2008, 2012 and 2016, and presidential elections held in 2002, 2006, 2010 and 2014. We obtained electoral data from *Tribunal Superior Eleitoral*. Table 9 in Appendix B shows the coalition of parties supporting the president for each biennium.[13]

We use electoral data to construct two variables that are crucial for our analysis: the incumbent's vote share and the margin of victory.

Due to the two-mandate limit, for each municipality and election we use the vote share obtained by the candidate representing the party currently in power to compute the incumbent's vote share.[14] The vote share is used as dependent variable.

The margin of victory (MV_{t-x}) is computed as the difference between the share of votes cast for the first and second-ranked candidate in a mayoral election. We always take the perspective of the candidate from the party supporting the incumbent president. Hence, a positive MV_{t-x} implies that the winning mayor is aligned with the incumbent president, while

[13] In 2016, following the impeachment of President Dilma Rousseff (member of the PT party), vice-president Michel Temer (member of a MDB) has served as ad-interim president until the end of Rousseff term. This would have consequences on the definition of aligned municipalities. Hence, we stop our analysis in 2016.

[14] Since 1997 (*Emenda Constitucional* n. 16, 4^{th} June) a two-term limit is imposed on candidates, which implies that some incumbents cannot run for reelection. For this reason, we look at the performance of the candidate from the incumbent party. That is, if an incumbent does not run for reelection, we define the incumbent as the candidate from the same party.

a negative value implies unalignment. MV_{t-x} is used as a forcing variable. We always use MV_{t-x} computed at the last municipal elections: if a mayoral election takes place at time t, we compute MV_{t-x} based on the results of the municipal election that took place 4 years earlier; however, if a federal election takes place at time t, we use the municipal election that took place two years earlier to compute MV_{t-x}. In other words, $x = \begin{cases} 4 \text{ if municipal elections at } t \\ 2 \text{ if presidential elections at } t \end{cases}$. Fig. 4 in Appendix B shows the McCrary density test, which confirms that there is no discontinuity in the forcing variable, both for municipal and federal elections.

Table 1 provides some summary statistics.

Table 1: Summary statistics

Variables in presidential elections	**Mean**	**Std. Dev.**	**Min.**	**Max.**	**N**
Vote share of president's party	0.506	0.165	0.094	0.950	16,392
Aid relief for drought	0.197	0.398	0	1	21,904
Mayor in the same president's coalition	0.628	0.483	0	1	16,379
Margin of victory of aligned candidate	-0.008	0.230	-0.995	1.000	8,850
Variables in mayoral elections	**Mean**	**Std. Dev.**	**Min.**	**Max.**	**N**
Vote share of mayor's party	0.186	0.272	0.000	1.000	21,904
Aid relief for drought	0.201	0.401	0	1	21,904
Mayor in the same president's coalition	0.471	0.499	0	1	21,813
Margin of victory of aligned candidate	0.006	0.230	-1.000	1.000	10,771

Voters knowledge Municipalities are divided into two groups (above and below the median) based on the average level of education of citizens. As previously discussed, we interpret knowledge as the ability to understand and process the available information (which is the source of political accountability), and we believe education is the most appropriate proxy for this concept. Data are extracted from the 2010 IBGE demographic census.

3.2 Determinants of the allocation of transfers

We want to estimate the advantage that aligned municipalities allegedly enjoy in the allocation of transfers, distinguishing between knowledgeable and not knowledgeable districts.

Political alignment, however, could be correlated with unobservable factors that may influence the dependent variables and bias the estimation. To face this empirical challenge, we use a Regression Discontinuity Design (RDD) to simulate partisan alignment between governments in a quasi-experiment way. The maintained assumption is that municipalities with a nearly-zero margin of victory have statistically-similar unobservable characteristics, except for their alignment status.

Eq. (10) represents the baseline RDD specification to study the impact of alignment on

the probability for a municipality m of receiving a discretionary transfer.

$$Tra_{m,b} = \beta_0 + \beta_1 Alg_{m,b} + \sum_{p=1}^{\iota} \gamma_p (MV_{m,t-x})^p + Alg_{m,b} \sum_{p=1}^{\iota} \theta_p (MV_{m,t-x})^p + \epsilon_{m,b}, \tag{10}$$

where $Tra_{m,b}$ indicates whether municipality m received transfers during the last biennium (two years preceding the elections).[15] The forcing variable $MV_{m,t-x}$ represents the margin of victory of the candidate mayor from the president's coalition at the previous mayoral election, hence, $t-x = \{2000, 2004, 2008, 2012\}$. The treatment effect $Alg_{m,b}$ indicates if the incumbent president and the incumbent mayor are aligned; notice that it takes value one if and only if $MV_{m,t-x} > 0$.[16] Our specification allows for local or global polynomial order (p) in the forcing variable on both sides of the zero-threshold.

We extend the baseline specification in Eq. (11) to account for the heterogeneity in the level of knowledge:

$$\begin{aligned} Tra_{m,b} = \beta_0 + \beta_1 Alg_{m,b} + \beta_2 Edu_m + \beta_3 (Edu_m * Alg_{m,b}) + \\ \sum_{p=1}^{\iota} \gamma_p (MV_{m,t-x})^p + (Alg_{m,b} + Edu_m) \sum_{p=1}^{\iota} \theta_p (MV_{m,t-x})^p + \epsilon_{m,b}, \end{aligned} \tag{11}$$

where Edu_m indicates municipalities that are ranked above the median in terms of citizens education, our proxy for knowledge and political accountability. This specification allows great flexibility. The forcing variable (MV) is interacted with both the knowledge (Edu) and the alignment (Alg) indicators. This allows the forcing variable to take different shapes for every type of municipality, although it makes the specification saturated.

Coefficient β_1 and the linear combination of coefficients β_1 and β_2 are the most relevant elements of Eq. (11) for our analysis. From β_1, we obtain the local average treatment effect (LATE) of alignment on transfers for non knowledgeable municipalities, $\beta_1 + \beta_2$ gives it for the knowledgeable ones.

To deal with the traditional trade-off between the size of bandwidth around the threshold and the polynomial order of the forcing variable when executing the RDD, we analyse whether results are consistent with the following criteria. In the first regression, we arbitrarily select elections in which the margin of victory is between -50% and 50% and introduce variables

[15] For instance, if considering the 2016 mayoral election, $Tra_{m,b}$ considers transfers granted over biennium $b = 2015 - 16$. Similarly, if considering the 2014 presidential election, $Tra_{m,b}$ considers transfers granted over biennium $b = 2013 - 14$.

[16] Note that we might use candidates with different parties' affiliations when calculating the margin of victory ($MV_{m,t-x}$) for each type of election: mayoral and presidential. For instance, for the biennium 2003-04, we take into account the margin victory of the candidate for mayor in the 2000 election affiliated to the presidential coalition at the period (PT, PSB, PDT, PL, PTB, PPS, PV, PC do B, and PL). As for the 2001-02 biennium, we also considered the margin of victory in the 2000 election, but for the candidate for mayor affiliated to the presidential coalition of the corresponding period (PMDB, PSDB, PFL, and PP). The same logic applies to all other biennia.

up to the polynomial order 3 of the forcing variables. In the following two regressions, we use the bandwidth selectors proposed respectively by Calonico et al. (2014) and Imbens and Kalyanaraman (2012) and use the local polynomial with a rectangular kernel. Finally, in the last two regressions, we further restrict the optimal bandwidths by dividing them by 2.

Proposition 2 predicts that, during the period preceding municipal elections, transfers will be channelled as much as possible towards aligned municipalities. We test such result in Table 2. Indeed, municipalities in which the mayor is aligned with the president are more likely to obtain discretionary transfers in the two years that lead to local elections. The probability of receiving transfers increases between 8.3 and 11 p.p. for aligned municipalities that are not knowledgeable and between 4.2 and 5.2 p.p. for those that are knowledgeable.

Table 2: [mayoral elections] impact of alignment on the assignment of aid relief

Dependent variable: Aid relief before mayoral elections					
	(1)	(2)	(3)	(4)	(5)
(β_1) Mayor in the same president's coalition	0.110***	0.100***	0.108***	0.084***	0.083***
	(0.016)	(0.018)	(0.017)	(0.023)	(0.021)
(β_2) Educated	-0.212***	-0.217***	-0.214***	-0.219***	-0.220***
	(0.010)	(0.011)	(0.010)	(0.014)	(0.013)
(β_3) Aligned * Educated	-0.063***	-0.050**	-0.062***	-0.042	-0.030
	(0.016)	(0.020)	(0.019)	(0.026)	(0.024)
Linear combination: educated municipalities	0.047***	0.050***	0.046***	0.042***	0.052***
	(0.010)	(0.011)	(0.010)	(0.014)	(0.013)
Linear combination: uneducated municipalities	0.110***	0.100***	0.108***	0.084***	0.083***
	(0.016)	(0.018)	(0.017)	(0.023)	(0.021)
Observations	10,218	6,819	7,607	4,060	4,754
R-squared	0.099	0.091	0.095	0.089	0.086
Polynomial order	3	1	1	1	1
Bandwidth	0.500	0.165	0.199	0.082	0.099
Procedure	Arbitrary	CCT	IK	CCT/2	IK/2

Note: Regression Discontinuity Design (RDD). The forcing variable is the margin of victory in the previous mayoral election of the candidate from the party of the incumbent president. Optimal bandwidth: CTT refers to Calonico et al. (2014) while IK to Imbens and Kalyanaraman (2012). Robust standard errors in parentheses. *** p-value < 0.01, ** p-value < 0.05, * p-value < 0.10.

Proposition 1 predicts that the president channels transfers to non knowledgeable municipalities. It has less sharp predictions regarding the knowledgeable: it suggests that the president may transfer resources to them too, if the incumbency advantage is large enough. It clearly states, though, that the condition to send transfers to knowledgeable, unaligned municipalities is stricter than for the knowledgeable, aligned ones. Hence, we expect transfers to be skewed towards non knowledgeable municipalities. Under some conditions they could possibly reach the knowledgeable, aligned ones too, while the knowledgeable, unaligned municipalities are the least likely to receive transfers.

Table 3 tests Proposition 1 predictions. It shows, in line with the theoretical model,

that knowledge decreases the probability of receiving a transfer before presidential elections between -16.8 and -18.3 p.p. Alignment plays a positive but smaller role in the assignment of transfers, which was also predicted by the model. Among non knowledgeable municipalities, the aligned ones have between 3.8 and 6.4 p.p. more chances of receiving a transfer. Among the knowledgeable ones, the impact of alignment is statistically indistinguishable from zero.

Table 3: [presidential elections] impact of education on the assignment of aid relief

Dependent variable: Aid relief before presidential elections					
	(1)	(2)	(3)	(4)	(5)
(β_1) Mayor in the same president's coalition	0.045***	0.064***	0.061***	0.038	0.052**
	(0.017)	(0.021)	(0.019)	(0.029)	(0.025)
(β_2) Educated	-0.182***	-0.183***	-0.183***	-0.168***	-0.172***
	(0.016)	(0.020)	(0.017)	(0.027)	(0.023)
(β_3) Aligned * Educated	-0.063***	-0.069***	-0.067***	-0.064*	-0.072**
	(0.020)	(0.027)	(0.024)	(0.036)	(0.030)
Linear combination: educated municipalities	-0.018	-0.006	-0.006	-0.026	-0.021
	(0.013)	(0.016)	(0.014)	(0.022)	(0.018)
Linear combination: uneducated municipalities	0.045***	0.064***	0.061***	0.038	0.052**
	(0.017)	(0.021)	(0.019)	(0.029)	(0.025)
Observations	8,409	4,702	5,882	2,623	3,510
R-squared	0.077	0.070	0.070	0.060	0.067
Polynomial order	3	1	1	1	1
Bandwidth	0.500	0.126	0.175	0.063	0.087
Procedure	Arbitrary	CCT	IK	CCT/2	IK/2

Note: Regression Discontinuity Design (RDD). The forcing variable is the margin of victory in the previous mayoral election of the candidate from the party of the incumbent president. Optimal bandwidth: CTT refers to Calonico et al. (2014) while IK to Imbens and Kalyanaraman (2012). Robust standard errors in parentheses. *** p-value < 0.01, ** p-value < 0.05, * p-value < 0.10.

3.3 Effectiveness of transfers in vote shifting

Section 3.2 confirms the model predictions and shows that transfers are allocated by the central politician in a strategic way.

It is natural to wonder how voters react to transfers and, therefore, whether it is rational for the president to allocate them in the way that the model (Propositions 1 and 2) and data (Tables 2 and 3) suggest.

Eq. (12) provides a specification that allows us to estimate how the interaction between political alignment and transfers impacts the incumbent's chances of reelections. It distinguishes between knowledgeable and non knowledgeable municipalities.

$$\begin{aligned} VS_{m,t} = \alpha_0 + \alpha_1 Alg_{m,b} + \alpha_2 Edu_m + \alpha_3 Tra_{m,b} + \alpha_4(Edu_m * Alg_{m,b}) + \\ \alpha_5(Edu_m * Tra_{m,b}) + \alpha_6(Alg_{m,b} * Tra_{m,b}) + \alpha_7(Edu_m * Alg_{m,b} * Tra_{m,b}) + \\ \sum_{p=1}^{\iota} \gamma_p (MV_{m,t-x})^p + [Alg_{m,b} + Edu_m + Tra_{m,b}] * \sum_{p=1}^{\iota} \theta_p (MV_{m,t-x})^p + \epsilon_{m,t}. \end{aligned} \tag{12}$$

The dependent variable $VS_{m,t}$ represents the vote share of the incumbent party. We include three indicators ($Alg_{m,b}$, Edu_m, and $Tra_{m,b}$) together with their pairwise and triple interactions. This specification also allows the forcing variables to take different forms for every type of municipality considered by interacting each indicator variable with the forcing variables.

Focusing first on aligned municipalities, Eq. (12) provides us with the estimate of the effect of transfers on the chances of reelection for knowledgeable and non knowledgeable municipalities. The former consists of the linear combination of α_3, α_5, α_6 and α_7, while the latter is the linear combination of α_3 and α_6. Similarly for misaligned municipalities, the linear combination of α_3 and α_5 corresponds to the case of knowledgeable municipalities, while α_3 estimates it for the non knowledgeable ones.

Multicollinearity is a possible threat. As a preliminary step, we test it in Table 4 with Variance Inflation Factors (VIFs) for our variables Transfer, Alignment and Education, which is our proxy for knowledge. Results suggest an extremely moderate level of multicollinearity that should not warrant corrective measures.

Table 4: Variance Inflation Factors (VIFs)

Education:	1.06
Transfer:	1.06
Alignment:	1.00

According to the model (Lemma 6) receiving transfers increases the chances of reelection for the incumbent mayor and this is true for all types of municipalities. This result leads to the theoretical prediction (Proposition 2) that the president will favour aligned municipalities in the assignment of transfers. Such prediction is empirically confirmed by Table 2.

Table 5 uses the specification in Eq. (12) to test if transfers increase the chances of reelection for the incumbent mayor. We control for alignment and knowledge and find, indeed, that the impact of transfers is always (weakly) positive.

In particular, among the aligned municipalities, depending on the specification, the benefit ranges between 3.4 and 7.3 p.p. for knowledgeable municipalities and slightly positive (0 to 2 p.p.) but not statistically significant for the non knowledgeable ones. Among the unaligned municipalities, instead, it ranges between 5.3 and 8.1 p.p. for knowledgeable municipalities and between 2.2 and 3.2 p.p for the non knowledgeable.

Table 2 confirms our model predictions for period 1. In particular, the president has a strong incentive not to grant transfers to unaligned municipalities because this would lead to a substantial increase in the chances of their incumbent (unaligned) mayor to be reelected. As long as the objective of the president is to favour the reelection of aligned mayors, this can be achieved by skewing transfers.

Table 5: [mayoral elections] impact of aid relief on vote share

Dependent variable: Vote share of mayor's party					
	(1)	(2)	(3)	(4)	(5)
(α_1) Aligned mayor and president	0.082***	0.084***	0.086***	0.096***	0.099***
	(0.010)	(0.012)	(0.012)	(0.015)	(0.015)
(α_2) Educated district	0.013	0.020**	0.018*	0.025**	0.025*
	(0.009)	(0.010)	(0.010)	(0.013)	(0.013)
(α_3) Aid relief before mayoral elections	0.028**	0.022*	0.022*	0.031**	0.032**
	(0.011)	(0.012)	(0.012)	(0.016)	(0.016)
(α_4) Aligned * Educated	0.028**	0.018	0.019	-0.007	-0.012
	(0.013)	(0.016)	(0.016)	(0.021)	(0.021)
(α_5) Educated * Transfer	0.053***	0.047**	0.049**	0.023	0.021
	(0.019)	(0.022)	(0.022)	(0.028)	(0.029)
(α_6) Aligned * Transfer	-0.016	-0.001	-0.004	-0.031	-0.034
	(0.017)	(0.020)	(0.021)	(0.026)	(0.026)
(α_7) Aligned * Educated * Transfer	-0.022	-0.033	-0.032	0.046	0.054
	(0.031)	(0.036)	(0.036)	(0.047)	(0.047)
Linear combination: aligned municipalities					
- Educated	0.043***	0.034	0.035	0.070***	0.073**
	(0.021)	(0.023)	(0.024)	(0.032)	(0.033)
- Uneducated	0.012	0.021	0.018	0.000	-0.002
	(0.014)	(0.016)	(0.016)	(0.020)	(0.020)
Linear combination: unaligned municipalities					
- Educated	0.081***	0.068***	0.071***	0.054**	0.053**
	(0.016)	(0.019)	(0.019)	(0.024)	(0.024)
- Uneducated	0.028***	0.022*	0.022*	0.031***	0.032**
	(0.011)	(0.012)	(0.012)	(0.016)	(0.016)
Observations	10,124	6,261	6,134	3,628	3,531
R-squared	0.036	0.036	0.037	0.038	0.038
Polynomial order	3	1	1	1	1
Bandwidth	0.500	.147	.143	0.073	0.071
Procedure	Arbitrary	CTT	IK	CCT/2	IK/2

Note: Regression Discontinuity Design (RDD). The forcing variable is the margin of victory in the previous mayoral election of the candidate from the party of the incumbent president. Optimal bandwidth: CTT refers to Calonico et al. (2014) while IK to Imbens and Kalyanaraman (2012). Robust standard errors in parentheses. *** p-value < 0.01, ** p-value < 0.05, * p-value < 0.10.

We replicate the same approach to check how transfers affect the vote share for the president. Once more, we first test for multicollinearity in Table 6 with Variance Inflation Factors (VIFs), this time however, we compute it for the two years before presidential elections. Results suggest again an extremely moderate level of multicollinearity that should not warrant corrective measures.

Table 6: Variance Inflation Factors (VIFs)

Education:	1.09
Transfer:	1.09
Alignment:	1.00

Tables 7 and 8 look at the impact of transfers to a municipality on the votes for the incumbent president. We distinguish between 'lagged' transfers, that were granted between two and four years before presidential elections, in Table 7, and transfers granted in the two years preceding presidential elections, in Table 8.

Table 7 provides information beyond the predictions of the model and in support of the idea that transfers have a positive impact on the appreciation both of the mayor and the president. Indeed, it shows a small but positive and statistically significant effect in all municipalities. Lagged transfers granted to knowledgeable municipalities have a positive impact on the vote share for the president in the subsequent elections (between 2.5 and 3 p.p. if aligned, between 1.9 and 2.9 p.p. if unaligned). The effect is similar for the case of non knowledgeable municipalities (between 0.8 and 1.2 p.p. if aligned, between 4.7 and 6 p.p. if unaligned).

From the estimates in Table 8, and depending on the specification, the benefit among the knowledgeable municipalities ranges between statistically-indistinguishable-from-zero and 2.5 p.p. for aligned municipalities while it is always slightly negative (-0.8 to -1.5 p.p.) but not statistically significant for the unaligned. Moving to the non knowledgeable municipalities, instead, it ranges between 8 and 9.9 p.p. for knowledgeable municipalities and between 3.8 and 5.6 p.p for the non knowledgeable. Those estimates are fully in line with the model predictions. We notice that, indeed, given knowledge the impact is larger for aligned municipalities, as suggested by Lemma 3 and, given alignment, the impact of transfers on vote is larger for the non knowledgeable, as implied by Proposition 1.

Looking at Tables 3 and 8 together, they fully support the predictions of the model. Indeed, we learn from Table 8 that it is in the best interest of the president to skew the allocation of transfers in favour of non knowledgeable municipalities and that, among them, the president should prefer the aligned ones. There are, instead, few to no reasons to send transfers to knowledgeable municipalities.

Table 7: [presidential elections] impact of lagged aid relief on vote share

Dependent variable: Vote share of president's party					
	(1)	(2)	(3)	(4)	(5)
(α_1) Mayor in the same president's coalition	-0.033***	-0.027**	-0.024**	-0.042***	-0.040***
	(0.012)	(0.011)	(0.011)	(0.014)	(0.014)
(α_2) Educated district	-0.189***	-0.189***	-0.189***	-0.197***	-0.195***
	(0.008)	(0.008)	(0.008)	(0.010)	(0.010)
(α_3) Aid relief before mayoral elections	0.059***	0.058***	0.060***	0.047***	0.050***
	(0.008)	(0.009)	(0.009)	(0.011)	(0.011)
(α_4) Aligned * Educated	0.017	0.018	0.017	0.033*	0.033**
	(0.013)	(0.013)	(0.013)	(0.017)	(0.017)
(α_5) Educated * Transfer	-0.034***	-0.031***	-0.031***	-0.027**	-0.031**
	(0.010)	(0.011)	(0.011)	(0.013)	(0.013)
(α_6) Aligned * Transfer	0.006	0.012	0.009	0.026	0.025
	(0.014)	(0.015)	(0.014)	(0.019)	(0.018)
(α_7) Aligned * Educated * Transfer	-0.006	-0.014	-0.012	-0.016	-0.016
	(0.013)	(0.015)	(0.015)	(0.018)	(0.018)
Linear combination: Educated municipalities					
- aligned	0.025***	0.026***	0.026***	0.030***	0.028**
	(0.009)	(0.009)	(0.009)	(0.012)	(0.012)
- unaligned	0.025***	0.027***	0.029***	0.019***	0.019***
	(0.008)	(0.009)	(0.009)	(0.011)	(0.011)
Linear combination: Uneducated municipalities					
- aligned	0.008***	0.009***	0.009***	0.012***	0.012**
	(0.008)	(0.009)	(0.009)	(0.011)	(0.011)
- unaligned	0.059***	0.058***	0.060***	0.047***	0.050***
	(0.008)	(0.009)	(0.009)	(0.011)	(0.011)
Observations	7,745	5,887	6,017	3,764	3,876
R-squared	0.405	0.390	0.391	0.392	0.389
Polynomial order	3	1	1	1	1
Bandwidth	0.500	.201	.210	.100	.105
Procedure	Arbitrary	CTT	IK	CCT/2	IK/2

Note: Regression Discontinuity Design (RDD). The forcing variable is the margin of victory in the previous mayoral election of the candidate from the party of the incumbent president. Optimal bandwidth: CTT refers to Calonico et al. (2014) while IK to Imbens and Kalyanaraman (2012). Robust standard errors in parentheses. *** p-value < 0.01, ** p-value < 0.05, * p-value < 0.10.

Table 8: [presidential elections] impact of aid relief on vote share

Dependent variable: Vote share of president's party					
	(1)	(2)	(3)	(4)	(5)
(α_1) Mayor in the same president's coalition	-0.043***	-0.036***	-0.033***	-0.057***	-0.056***
	(0.012)	(0.011)	(0.011)	(0.014)	(0.014)
(α_2) Educated district	-0.183***	-0.183***	-0.183***	-0.195***	-0.194***
	(0.008)	(0.008)	(0.008)	(0.010)	(0.010)
(α_3) Aid relief before presidential elections	0.056***	0.053***	0.055***	0.038***	0.039***
	(0.009)	(0.009)	(0.009)	(0.011)	(0.011)
(α_4) Aligned * Educated	0.022*	0.022	0.021	0.043**	0.043**
	(0.013)	(0.013)	(0.013)	(0.017)	(0.017)
(α_5) Educated * Transfer	-0.069***	-0.062***	-0.063***	-0.053***	-0.053***
	(0.010)	(0.011)	(0.011)	(0.013)	(0.013)
(α_6) Aligned * Transfer	0.033**	0.037**	0.036**	0.060***	0.060***
	(0.014)	(0.015)	(0.014)	(0.019)	(0.019)
(α_7) Aligned * Educated * Transfer	-0.007	-0.014	-0.013	-0.020	-0.021
	(0.014)	(0.015)	(0.015)	(0.019)	(0.018)
Linear combination: Educated municipalities					
- aligned	0.013	0.014	0.015	0.025**	0.025**
	(0.009)	(0.010)	(0.010)	(0.012)	(0.012)
- unaligned	-0.013	-0.009	-0.008	-0.015	-0.014
	(0.009)	(0.010)	(0.010)	(0.012)	(0.012)
Linear combination: Uneducated municipalities					
- aligned	0.080***	0.091***	0.091***	0.098***	0.099***
	(0.008)	(0.009)	(0.009)	(0.011)	(0.011)
- unaligned	0.056***	0.053***	0.055***	0.038***	0.039***
	(0.009)	(0.009)	(0.009)	(0.011)	(0.011)
Observations	7,745	5,887	6,017	3,764	3,876
R-squared	0.407	0.394	0.395	0.396	0.393
Polynomial order	3	1	1	1	1
Bandwidth	0.500	0.201	0.210	0.100	0.105
Procedure	Arbitrary	CTT	IK	CCT/2	IK/2

Note: Regression Discontinuity Design (RDD). The forcing variable is the margin of victory in the previous mayoral election of the candidate from the party of the incumbent president. Optimal bandwidth: CTT refers to Calonico et al. (2014) while IK to Imbens and Kalyanaraman (2012). Robust standard errors in parentheses. *** p-value < 0.01, ** p-value < 0.05, * p-value < 0.10.

Based on the results in Tables 7 and 8 we conclude that the presidential strategy described in Table 3 is fully rational, favouring aligned districts is beneficial.

Income is likely to be highly positively correlated with education. On top of that, it could be regarded as a good predictor of political accountability and knowledge by itself. In Appendix C, we provide a set of robustness tests involving income. We first repeat the entire analysis controlling for income (Tables 11 to 14). Our main results remain unaltered, confirming that education, and in particular political accountability and knowledge, is indeed a driver of the president's allocation, beyond any possible effect due to income. We then replace education with income as our main regressor (Tables 15 to 18). Not surprisingly, given the high correlation between the two variables, results do not change in this case either.

4 Final remarks

We built a fully fledged two-period formal model in which a federal politician distorts the assignment of public resources to enhance their chances of reelection. Funds go to municipalities that differ in the level of accountability of citizens and in the political colour of their mayor, who may or not be aligned with the central politician.

We unveil the mechanisms behind the strategic behaviour of the central politician, who will use two different criteria to assign funds. Before mayoral elections, resources are channelled towards aligned municipalities (Proposition 2). This increases the chances of the incumbent aligned mayors to be reelected, while it is neutral on the chances of the incumbent mayor in unaligned districts (Lemma 6). This way, the president maximises the number of aligned municipalities (Lemma 4). Before presidential elections, instead, the most effective strategy is to favour low-accountability districts, that are more likely to mistakenly interpret the increase in welfare as a signal of the president's ability (Proposition 1).

Using Brazilian data from the last two decades, we causally test and confirm the predictions of the model. Using an RDD approach for close elections, we show that transfers increase the chances of reelection of the incumbent mayor (Table 5) and indeed the president distorts the share of resources in favour of aligned municipalities (Table 2). Indeed, depending on the specification, aligned municipalities have between 8 and 11 p.p. more chances of receiving a transfer, if non knowledgeable, or between 4 and 5 p.p. if knowledgeable.

We also prove that only non knowledgeable municipalities electorally reward the president for the transfers preceding presidential elections (Table 8) and that transfers indeed are disproportionally assigned to non knowledgeable municipalities. Indeed, being knowledgeable reduces the chances of being awarded a transfer by between 16.8 and 18.3 p.p. Amongst the non knowledgeable municipalities, the aligned ones receive a favourable treatment, having

between 3.8 and 6.4 larger chances of receiving a transfer. (Table 3).

Our results extend the literature in several directions. Possibly, the recent works closest to us are Brollo and Nannicini (2012); Bracco et al. (2015); Curto-Grau et al. (2018); Curto-Grau and Zudenkova (2018). The main novelty of our approach is that we distinguish municipalities by their level of accountability and include also presidential elections, as a second period in the analysis. This allows to rationalise the president's interest for supporting aligned mayors and to explain why alignment alone is not sufficient to explain the distortions in the assignment of transfers.

The analysis of this paper isolates the core determinants of distributive politics. The efficient use of transferred resources is undoubtedly also important. Our result that transfers before presidential elections are directed primarily to non knowledgeable districts, i.e. those with the lowest level of accountability, has detrimental consequences on welfare.[17] Indeed, resources end up being managed by the local politicians with the greatest opportunity to mismanage them.

Several policy reforms may palliate the negative impact of the misallocation of resources. Increasing voters knowledgeable may play a crucial role, with the caveats discussed in Gavazza and Lizzeri (2007, 2009); Grossman et al. (2020). A possibly easier to implement policy, albeit not as effective, is to break the link between voting districts and the assignment of resources. This can obviously be implemented by having resources assigned through a strict, non-arbitrary protocol, or by delegating decisions to a politically independent agency. In countries where corruption and hidden political influence are strong, possibly the only safe option is to have the country organised into non-overlapping districts when it comes to local and national elections and to the assignment of resources.[18] Indeed, having 'resource-assignment' districts that don't coincide with voting districts, it would be harder for the president to target aligned municipalities. Meanwhile, if local and federal voting districts are different, it also becomes harder to identify which regions the president would like to target.

[17] See Ferraz and Finan (2011) for an estimate of the impact of accountability on corruption. Also related to it, de Janvry et al. (2012) provide evidence that re-election incentives improve the efficiency in the management of public funds.

[18] Having non-overlapping voting districts would also have other advantages. Daniele et al. (2020) indeed shows how this would reduce the strategic incentive for voters of electing extreme politicians.

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Appendix A Proofs

Proof of Lemma 1. Using Eqs. (4) to (5) in Eq. (3), the condition follows immediately. □

Proof of Lemma 2. Looking at Eq. (6), μ_T is always subtracted from g_2. Notice that $E(g_2) = \mu_\ell + \mu_c + \mu_T$. Suppose that, following some action, the expected value of the transfer changes from μ_T to μ'_T. Then, the expected value of g_2 would also change by the same amount. Therefore, ex-ante, $E(g_2 - \mu_T)$ is equal to $E(g'_2 - \mu'_T)$. □

Proof of Lemma 3 and Proposition 1. The variation in the right hand side of Eq. (6) when a transfer is granted, denoted by $\Delta\overline{\mu}_c$, is equal to

$$\Delta\overline{\mu}_c = \begin{cases} \frac{\sigma_s^2\left((\sigma_T^2-\sigma_\ell^2)\sigma_c^2(s-\mu_s)-\sigma_c^2\sigma_T^2(g-\mu_y)+(\psi_c+\phi_c)\sigma_T^2\sigma_s^2\right)}{\sigma_c^2(\sigma_T^2+\sigma_\ell^2+\sigma_s^2)(\sigma_\ell^2+\sigma_s^2)} & \text{if aligned \& knowledgeable} \\ \frac{\sigma_s^2\left((\sigma_T^2-\sigma_\ell^2)\sigma_c^2(s-\mu_s)-\sigma_c^2\sigma_T^2(g-\mu_y)+\phi_c\sigma_T^2\sigma_s^2\right)}{\sigma_c^2(\sigma_T^2+\sigma_\ell^2+\sigma_s^2)(\sigma_\ell^2+\sigma_s^2)} & \text{if unaligned \& knowledgeable} \\ \frac{\sigma_T^2(\psi_c+\phi_c)}{\sigma_c^2} & \text{if aligned \& non knowledgeable} \\ \frac{\sigma_T^2\phi_c}{\sigma_c^2} & \text{if unaligned \& non knowledgeable} \end{cases} \tag{13}$$

Define $\hat{\phi} \equiv \frac{\sigma_c^2}{\sigma_s^2\sigma_T^2}\left(\sigma_T^2\left(g-\mu_y\right) - \left(\sigma_T^2-\sigma_\ell^2\right)\left(s-\mu_s\right)\right) - \psi_c$.

The president benefits from granting the transfer if $\Delta\overline{\mu}_c > 0$, hence,

$$\begin{cases} \text{if } \phi_c > \hat{\phi} & \text{if aligned \& knowledgeable} \\ \text{if } \phi_c > \hat{\phi}+1 & \text{if unaligned \& knowledgeable} \\ \text{always} & \text{if aligned \& non knowledgeable} \\ \text{always} & \text{if unaligned \& non knowledgeable} \end{cases} \tag{14}$$

Notice that $\frac{\partial\hat{\phi}}{\partial\sigma_c^2} > 0$ and $\frac{\partial\hat{\phi}}{\partial\sigma_\ell^2} > 0$. □

Proof of Lemma 4. Taking the level of knowledge in a district as given, we can compare the threshold for the president to be re-elected.

From Eq. (6), it is immediate to notice that, in any knowledgeable district, the condition is weaker when the district is aligned than when it is not. Similarly, conditional on being non knowledgeable, the condition is weaker when the district is aligned.

In particular, the difference in the threshold between aligned and unaligned is:

$$\Delta\overline{\mu}^A = \begin{cases} \psi_c\left(1+\frac{(\sigma_\ell^2+\sigma_T^2)\sigma_s^2)}{\sigma_c^2\left(\sigma_\ell^2+\sigma_T^2+\sigma_s^2\right)}\right) & \text{if knowledgeable} \\ \psi_c\left(\frac{\sigma_c^2+\sigma_\ell^2+\sigma_T^2}{\sigma_c^2}\right) & \text{if non knowledgeable} \end{cases} \tag{15}$$

Notice that $\frac{\partial\Delta\overline{\mu}^A}{\partial\sigma_c^2} < 0$ and $\frac{\partial\Delta\overline{\mu}^A}{\partial\sigma_\ell^2} > 0$. □

Proof of Lemma 5. Using Eqs. (7) to (8) in Eq. (3), the condition follows immediately. □

Proof of Lemma 6 and Proposition 2. When granting a transfer, the threshold in Eq. (9) variation is:

$$\Delta\overline{\mu}_c = \begin{cases} \frac{\sigma_T^2(\psi_\ell+\phi\ell)}{\sigma_c^2} & \text{if aligned} \\ \frac{\sigma_T^2\phi\ell}{\sigma_c^2} & \text{if unaligned} \end{cases} \tag{16}$$

The variation is positive both for aligned and unaligned districts. This means that transfers always increase the chances of the incumbent mayor to be re-elected.

The president wants to maximise the chances of incumbent aligned mayors and minimise the ones of the incumbent unaligned mayors. Therefore, transfers are always granted to aligned districts and never granted to the unaligned ones.

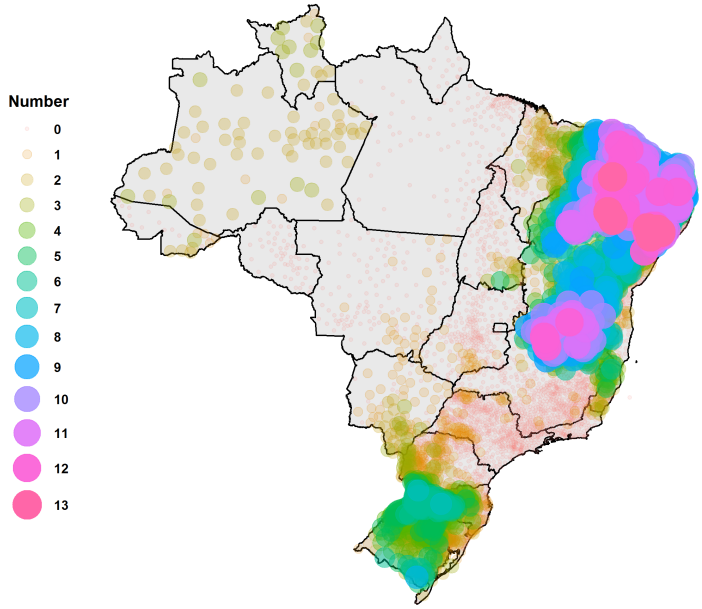
□

Appendix B Additional Tables and Figures

Table 9: Presidential coalition parties

Biennium	Party coalition
2016/2015	PT, PMDB, PP, PR, PSB ,PDT ,PSC ,PC do B ,PRB , PTC
2014/2013	PT, PMDB, PP, PR, PSB ,PDT ,PSC ,PC do B ,PRB , PTC
2012/2011	PT, PMDB, PRB, PC do B, PSB, PP, PR, PTB, PV, PDT, PAN, PSC, PT do B, PMN, PHS
2010/2009	PT, PMDB, PRB, PC do B, PSB, PP, PR, PTB, PV, PDT, PAN, PSC, PT do B, PMN, PHS
2008/2007	PT, PMDB, PRB, PC do B, PSB, PP, PR, PTB, PV, PDT, PAN, PSC, PT do B, PMN, PHS
2006/2005	PT, PMDB, PSB, PDT, PL, PTB, PPS, PV, PC do B, PL
2004/2003	PT, PSB, PDT, PL, PTB, PPS, PV, PC do B, PL
2002/2001	PMDB, PSDB, PFL, PP

Figure 2: Total number of state of emergency declaration because of drought.



Notes: Period between 2002-2016. Map of Brazil divided by states.

Table 10: Descriptive statistics: municipalities

	Education = 0			Education = 1			
	n	mean	sd	n	mean	sd	Diff
Total population of the municipality	19103	14944.84	15156.75	19096	46368.58	263332.31	31423.73***
Education							
High-school degree (%)	19103	0.76	0.60	19096	3.50	2.19	2.73***
Graduated (%)	19103	0.40	0.37	19096	1.94	1.43	1.54***
Economic Conditions							
Average income	19103	98.36	44.43	19096	242.42	89.20	144.06***
Poor (%)	19103	18.83	8.16	19096	9.80	7.88	-9.03***
Very poor (%)	19103	13.28	7.66	19096	6.37	6.97	-6.90***
Amenities							
Rural Households (%)	19103	50.49	18.72	19096	29.17	21.35	-21.32***
Households with general water supply (%)	19103	46.32	21.25	19096	68.33	20.71	22.00***
Households with television (%)	19103	60.35	17.34	19096	87.02	7.69	26.67***
Households with radio (%)	19103	72.59	12.81	19096	88.00	7.32	15.41***
Households with energy (%)	19103	75.59	17.89	19096	95.32	5.00	19.73***
Occupation							
Active population (%)	19103	33.98	7.20	19096	42.47	7.54	8.49***
Occupied in the agricultural sector (%)	19103	18.84	8.02	19096	14.89	11.34	-3.95***
Occupied in industry (%)	19103	2.33	2.31	19096	5.97	4.75	3.64***
Occupied in the commerce sector (%)	19103	5.30	2.38	19096	9.59	3.42	4.28***
Occupied in the transportation sector (%)	19103	0.83	0.48	19096	1.51	0.70	0.68***
Occupied in the service sector (%)	19103	5.14	1.77	19096	8.28	2.58	3.14***
Occupied in the public administration (%)	19103	1.92	1.16	19096	2.35	1.27	0.43***
Demographics							
People under 21 y.o. (%)	19103	51.03	4.83	19096	41.38	3.94	-9.65***
People over 65 y.o. (%)	19103	6.10	1.91	19096	6.85	1.93	0.74***
Black people (%)	19103	63.23	17.16	19096	28.95	19.38	-34.27***
Women (%)	19103	49.03	1.53	19096	49.45	1.30	0.41***
Evangelical people (%)	19103	9.89	7.35	19096	14.73	8.82	4.84***
Politics							
HH index political competition	10881	0.50	0.13	10892	0.49	0.14	-0.01***
Age of the mayor	10854	46.88	10.24	10877	49.30	9.72	2.41***
Aridity index (historical mean)	18970	1.33	0.64	18970	0.72	0.29	-0.61***
Km from a river	18802	31.76	27.60	18879	22.98	18.67	-8.78***

Figure 3: Municipalities with declaration of state of emergency (%)

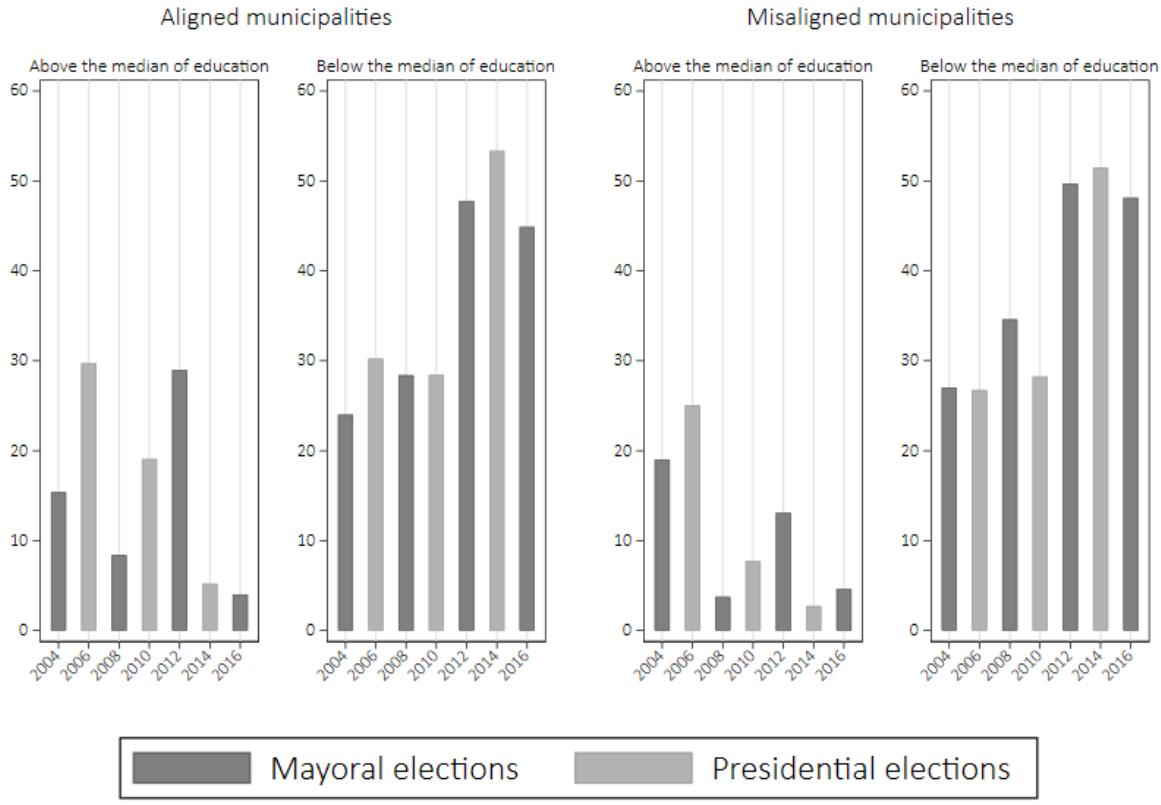
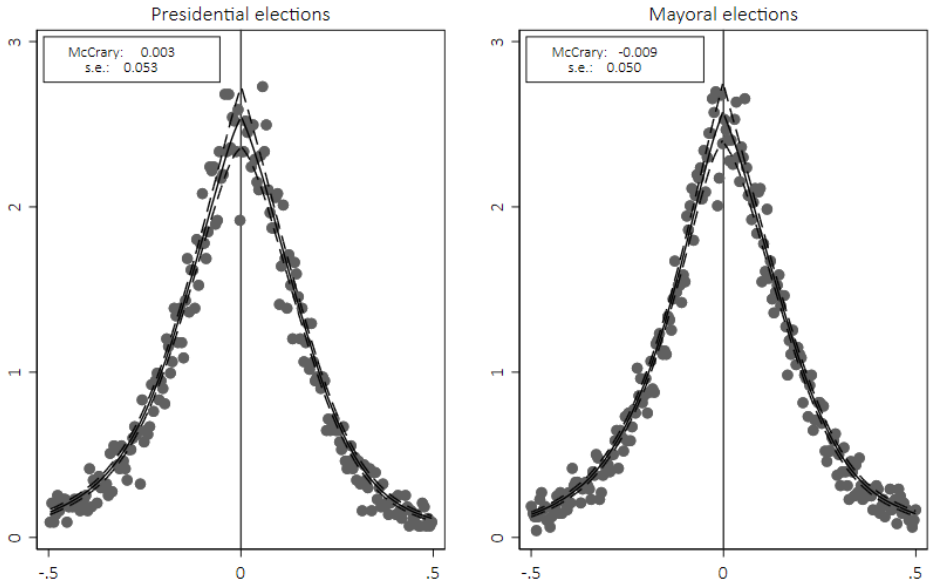


Figure 4: McCrary Density Test.



Notes: Margin of victory (at previous elections) for the candidate mayor running for the same coalition as the (current) president.

Appendix C The role of income

Not surprisingly, our measure of education is correlated with income, as one can already suspect from Table 10. In here, we replicate our main regressions twice. Tables 11 to 14 still use education as a regressor, but they control for income. Strikingly, our results remain essentially unchanged in this case. Instead, Tables 15 to 18 replace education with income.Even in this case, results remain basically unaltered, which is perhaps not that surprising given the already discussed high correlation between education and income.

Results are substantially unchanged. While this is pe

Table 11: [mayoral elections] impact of alignment on the assignment of aid relief, controlling for income

Dependent variable: Aid relief before mayoral elections					
	(1)	(2)	(3)	(4)	(5)
(β_1) Mayor in the same president's coalition	0.115***	0.105***	0.118***	0.090***	0.107***
	(0.015)	(0.018)	(0.016)	(0.022)	(0.020)
(β_2) Educated	-0.109***	-0.111***	-0.103***	-0.112***	-0.106***
	(0.013)	(0.014)	(0.013)	(0.020)	(0.017)
(β_3) Aligned * Educated	-0.064***	-0.049**	-0.070***	-0.039	-0.046**
	(0.016)	(0.020)	(0.018)	(0.026)	(0.022)
Linear combination: Educated municipalities	0.051***	0.056***	0.048***	0.050***	0.061***
	(0.010)	(0.011)	(0.009)	(0.014)	(0.012)
Linear combination: Uneducated municipalities	0.115***	0.105***	0.118***	0.090***	0.107***
	(0.015)	(0.018)	(0.016)	(0.022)	(0.020)
Observations	10,218	6,803	8,345	4,060	5,463
R-squared	0.116	0.107	0.110	0.106	0.107
Polynomial order	3	1	1	1	1
Bandwidth	0.500	0.164	0.239	0.082	0.119
Procedure	Arbitrary	CCT	IK	CCT/2	IK/2

Note: Regression Discontinuity Design (RDD). The forcing variable is the margin of victory in the previous mayoral election of the candidate from the party of the incumbent president. Optimal bandwidth: CTT refers to Calonico et al. (2014) while IK to Imbens and Kalyanaraman (2012). Robust standard errors in parentheses. *** p-value < 0.01, ** p-value < 0.05, * p-value < 0.10.

Table 12: [presidential elections] impact of education on the assignment of aid relief, controlling for income

Dependent variable: Aid relief before presidential elections					
	(1)	(2)	(3)	(4)	(5)
(β_1) Mayor in the same president's coalition	0.045***	0.065***	0.051***	0.043	0.060***
	(0.017)	(0.021)	(0.016)	(0.029)	(0.019)
(β_2) Educated	-0.085***	-0.085***	-0.086***	-0.075**	-0.086***
	(0.018)	(0.022)	(0.017)	(0.030)	(0.020)
(β_3) Aligned * Educated	-0.058***	-0.061**	-0.058***	-0.058	-0.060**
	(0.019)	(0.026)	(0.020)	(0.036)	(0.024)
Linear combination: Educated municipalities	-0.013	0.004	-0.007	-0.016	0
	(0.014)	(0.016)	(0.012)	(0.022)	(0.014)
Linear combination: Uneducated municipalities	0.045***	0.065***	0.051***	0.043	0.060***
	(0.017)	(0.021)	(0.016)	(0.029)	(0.019)
Observations	8,409	4,765	7,826	2,663	5,771
R-squared	0.090	0.082	0.086	0.069	0.083
Polynomial order	3	1	1	1	1
Bandwidth	0.500	0.128	0.339	0.064	0.170
Procedure	Arbitrary	CCT	IK	CCT/2	IK/2

Note: Regression Discontinuity Design (RDD). The forcing variable is the margin of victory in the previous mayoral election of the candidate from the party of the incumbent president. Optimal bandwidth: CTT refers to Calonico et al. (2014) while IK to Imbens and Kalyanaraman (2012). Robust standard errors in parentheses. *** p-value < 0.01, ** p-value < 0.05, * p-value < 0.10.

Table 13: [mayoral elections] impact of aid relief on vote share, controlling for income

Dependent variable: Vote share of mayor's party					
	(1)	(2)	(3)	(4)	(5)
(α_1) Aligned mayor and president	0.083***	0.084***	0.085***	0.096***	0.097***
	(0.010)	(0.012)	(0.012)	(0.015)	(0.016)
(α_2) Educated district	0.026**	0.028**	0.026**	0.028*	0.028*
	(0.010)	(0.012)	(0.012)	(0.015)	(0.015)
(α_3) Aid relief before mayoral elections	0.026**	0.020*	0.019	0.031**	0.030*
	(0.011)	(0.012)	(0.012)	(0.016)	(0.016)
(α_4) Aligned * Educated	0.028**	0.017	0.021	-0.007	-0.007
	(0.013)	(0.016)	(0.016)	(0.021)	(0.022)
(α_5) Educated * Transfer	0.053***	0.047**	0.046**	0.022	0.017
	(0.019)	(0.022)	(0.022)	(0.028)	(0.029)
(α_6) Aligned * Transfer	-0.016	-0.002	-0.004	-0.031	-0.032
	(0.017)	(0.020)	(0.021)	(0.026)	(0.027)
(α_7) Aligned * Educated * Transfer	-0.022	-0.031	-0.026	0.046	0.056
	(0.030)	(0.036)	(0.036)	(0.047)	(0.048)
Linear combination: aligned municipalities					
- Educated	0.040*	0.034	0.035	0.069**	0.071**
	(0.021)	(0.023)	(0.024)	(0.032)	(0.033)
- Uneducated	0.010	0.018	0.015	0	-0.003
	(0.014)	(0.016)	(0.016)	(0.020)	(0.021)
Linear combination: unaligned municipalities					
- Educated	0.079***	0.067***	0.065***	0.054**	0.047**
	(0.016)	(0.019)	(0.019)	(0.024)	(0.024)
- Uneducated	0.026**	0.020*	0.019	0.031**	0.030*
	(0.011)	(0.012)	(0.012)	(0.016)	(0.016)
Observations	10,124	6,252	5,954	3,622	3,394
R-squared	0.036	0.037	0.037	0.038	0.039
Polynomial order	3	1	1	1	1
Bandwidth	0.500	.147	.137	.073	.068
Procedure	Arbitrary	CCT	IK	CCT/2	IK/2

Note: Regression Discontinuity Design (RDD). The forcing variable is the margin of victory in the previous mayoral election of the candidate from the party of the incumbent president. Optimal bandwidth: CTT refers to Calonico et al. (2014) while IK to Imbens and Kalyanaraman (2012). Robust standard errors in parentheses. *** p-value < 0.01, ** p-value < 0.05, * p-value < 0.10.

Table 14: [presidential elections] impact of aid relief on vote share, controlling for income

Dependent variable: Vote share of president's party					
	(1)	(2)	(3)	(4)	(5)
(α_1) Aligned mayor and president	-0.038***	-0.032***	-0.029***	-0.052***	-0.054***
	(0.011)	(0.010)	(0.010)	(0.013)	(0.013)
(α_2) Educated district	-0.084***	-0.079***	-0.080***	-0.097***	-0.095***
	(0.011)	(0.012)	(0.012)	(0.016)	(0.017)
(α_3) Aid relief before mayoral elections	0.040***	0.037***	0.040***	0.027**	0.024**
	(0.008)	(0.008)	(0.008)	(0.011)	(0.011)
(α_4) Aligned * Educated	0.021*	0.020	0.018	0.044***	0.042**
	(0.011)	(0.012)	(0.013)	(0.016)	(0.017)
(α_5) Educated * Transfer	-0.056***	-0.048***	-0.048***	-0.042***	-0.039***
	(0.009)	(0.010)	(0.010)	(0.012)	(0.012)
(α_6) Aligned * Transfer	0.033***	0.035***	0.030**	0.054***	0.063***
	(0.013)	(0.013)	(0.014)	(0.017)	(0.018)
(α_7) Aligned * Educated * Transfer	-0.008	-0.013	-0.012	-0.018	-0.027
	(0.012)	(0.014)	(0.014)	(0.017)	(0.018)
Linear combination: Educated municipalities					
- aligned	0.009	0.011	0.010	0.021*	0.021*
	(0.009)	(0.009)	(0.009)	(0.012)	(0.012)
- unaligned	-0.016*	-0.011	-0.007	-0.015	-0.015
	(0.008)	(0.009)	(0.009)	(0.011)	(0.012)
Linear combination: Uneducated municipalities					
- aligned	0.073***	0.072***	0.070***	0.081***	0.086***
	(0.008)	(0.008)	(0.008)	(0.011)	(0.011)
- unaligned	0.040***	0.037***	0.040***	0.027***	0.024**
	(0.008)	(0.008)	(0.008)	(0.011)	(0.011)
Observations	7,745	5,884	5,578	3,759	3,468
R-squared	0.505	0.499	0.499	0.492	0.489
Polynomial order	3	1	1	1	1
Bandwidth	0.500	0.200	0.183	0.100	0.091
Procedure	Arbitrary	CCT	IK	CCT/2	IK/2

Note: Regression Discontinuity Design (RDD). The forcing variable is the margin of victory in the previous mayoral election of the candidate from the party of the incumbent president. Optimal bandwidth: CTT refers to Calonico et al. (2014) while IK to Imbens and Kalyanaraman (2012). Robust standard errors in parentheses. *** p-value < 0.01, ** p-value < 0.05, * p-value < 0.10.

Table 15: [mayoral elections] impact of alignment on the assignment of aid relief - Income as a regressor

Dependent variable: Aid relief before mayoral elections					
	(1)	(2)	(3)	(4)	(5)
(β_1) Mayor in the same president's coalition	0.126***	0.121***	0.127***	0.113***	0.108***
	(0.016)	(0.018)	(0.017)	(0.023)	(0.022)
(β_2) Income	-0.227***	-0.228***	-0.227***	-0.229***	-0.230***
	(0.010)	(0.010)	(0.010)	(0.014)	(0.013)
(β_3) Aligned * Income	-0.089***	-0.085***	-0.096***	-0.086***	-0.071***
	(0.016)	(0.020)	(0.019)	(0.026)	(0.024)
Linear combination: high-income municipalities	0.037***	0.036***	0.032***	0.027**	0.037***
	(0.009)	(0.010)	(0.009)	(0.013)	(0.012)
Linear combination: low-income municipalities	0.126***	0.121***	0.127***	0.113***	0.108***
	(0.016)	(0.018)	(0.017)	(0.023)	(0.022)
Observations	10,218	6,819	7,607	4,060	4,754
R-squared	0.119	0.111	0.116	0.110	0.105
Polynomial order	3	1	1	1	1
Bandwidth	0.500	0.165	0.199	0.082	0.099
Procedure	Arbitrary	CCT	IK	CCT/2	IK/2

Note: Regression Discontinuity Design (RDD). The forcing variable is the margin of victory in the previous mayoral election of the candidate from the party of the incumbent president. Optimal bandwidth: CTT refers to Calonico et al. (2014) while IK to Imbens and Kalyanaraman (2012). Robust standard errors in parentheses. *** p-value < 0.01, ** p-value < 0.05, * p-value < 0.10.

Table 16: [presidential elections] impact of Income on the assignment of aid relief - Income as a regressor

Dependent variable: Aid relief before presidential elections					
	(1)	(2)	(3)	(4)	(5)
(β_1) Mayor in the same president's coalition	0.052***	0.069***	0.066***	0.033	0.050**
	(0.017)	(0.021)	(0.019)	(0.029)	(0.025)
(β_2) Income	-0.193***	-0.193***	-0.194***	-0.195***	-0.193***
	(0.016)	(0.019)	(0.017)	(0.026)	(0.022)
(β_3) Aligned * Income	-0.075***	-0.080***	-0.075***	-0.048	-0.068**
	(0.019)	(0.026)	(0.023)	(0.036)	(0.030)
Linear combination: high-income municipalities	-0.023*	-0.011	-0.010	-0.015	-0.017
	(0.013)	(0.015)	(0.014)	(0.021)	(0.017)
Linear combination: low-income municipalities	0.052***	0.069***	0.066***	0.033	0.050**
	(0.017)	(0.021)	(0.019)	(0.029)	(0.025)
Observations	8,409	4,702	5,882	2,623	3,510
R-squared	0.089	0.080	0.080	0.068	0.076
Polynomial order	3	1	1	1	1
Bandwidth	0.500	0.126	0.175	0.063	0.087
Procedure	Arbitrary	CCT	IK	CCT/2	IK/2

Note: Regression Discontinuity Design (RDD). The forcing variable is the margin of victory in the previous mayoral election of the candidate from the party of the incumbent president. Optimal bandwidth: CTT refers to Calonico et al. (2014) while IK to Imbens and Kalyanaraman (2012). Robust standard errors in parentheses. *** p-value < 0.01, ** p-value < 0.05, * p-value < 0.10.

Table 17: [mayoral elections] impact of aid relief on vote share - Income as a regressor

Dependent variable: Vote share of mayor's party					
	(1)	(2)	(3)	(4)	(5)
(α_1) Aligned mayor and president	0.086***	0.088***	0.090***	0.087***	0.088***
	(0.011)	(0.012)	(0.012)	(0.016)	(0.016)
(α_2) High-income municipality	0.011	0.014	0.013	0.005	0.006
	(0.009)	(0.010)	(0.010)	(0.013)	(0.013)
(α_3) Aid relief before mayoral elections	0.031***	0.023*	0.023*	0.023	0.025
	(0.011)	(0.012)	(0.012)	(0.016)	(0.016)
(α_4) Aligned * Income	0.022*	0.010	0.010	0.009	0.008
	(0.013)	(0.016)	(0.016)	(0.021)	(0.021)
(α_5) Income * Transfer	0.044**	0.041*	0.044*	0.035	0.033
	(0.019)	(0.023)	(0.023)	(0.030)	(0.030)
(α_6) Aligned * Transfer	-0.018	-0.009	-0.011	-0.018	-0.019
	(0.017)	(0.020)	(0.020)	(0.026)	(0.027)
(α_7) Aligned * Income * Transfer	-0.013	-0.008	-0.010	0.025	0.027
	(0.032)	(0.038)	(0.038)	(0.049)	(0.049)
Linear combination: aligned municipalities					
- High-income	0.044**	0.047*	0.046*	0.065*	0.065*
	(0.022)	(0.025)	(0.026)	(0.034)	(0.034)
- Low-income	0.013	0.014	0.012	0.005	0.006
	(0.014)	(0.016)	(0.016)	(0.020)	(0.021)
Linear combination: unaligned municipalities					
- High-income	0.075***	0.064***	0.067***	0.058**	0.058**
	(0.017)	(0.020)	(0.020)	(0.026)	(0.026)
- Low-income	0.031***	0.023*	0.023*	0.023	0.025
	(0.011)	(0.012)	(0.012)	(0.016)	(0.016)
Observations	10,124	6,261	6,134	3,628	3,531
R-squared	0.034	0.035	0.035	0.035	0.035
Polynomial order	3	1	1	1	1
Bandwidth	0.500	.147	.143	.073	.071
Procedure	Arbitrary	CCT	IK	CCT/2	IK/2

Note: Regression Discontinuity Design (RDD). The forcing variable is the margin of victory in the previous mayoral election of the candidate from the party of the incumbent president. Optimal bandwidth: CTT refers to Calonico et al. (2014) while IK to Imbens and Kalyanaraman (2012). Robust standard errors in parentheses. *** p-value < 0.01, ** p-value < 0.05, * p-value < 0.10.

Table 18: [presidential elections] impact of aid relief on vote share - Income as a regressor

Dependent variable: Vote share of president's party					
	(1)	(2)	(3)	(4)	(5)
(α_1) Aligned mayor and president	-0.034***	-0.031***	-0.029***	-0.039***	-0.040***
	(0.011)	(0.011)	(0.011)	(0.014)	(0.014)
(α_2) Income	-0.197***	-0.196***	-0.197***	-0.204***	-0.205***
	(0.007)	(0.008)	(0.008)	(0.010)	(0.010)
(α_3) Aid relief before mayoral elections	0.049***	0.045***	0.046***	0.029***	0.029***
	(0.008)	(0.009)	(0.008)	(0.011)	(0.011)
(α_4) Aligned * Income	0.019	0.015	0.016	0.027	0.029*
	(0.012)	(0.013)	(0.013)	(0.017)	(0.016)
(α_5) Income * Transfer	-0.070***	-0.062***	-0.063***	-0.053***	-0.052***
	(0.010)	(0.011)	(0.011)	(0.013)	(0.013)
(α_6) Aligned * Transfer	0.028**	0.034**	0.034**	0.061***	0.063***
	(0.013)	(0.014)	(0.014)	(0.018)	(0.018)
(α_7) Aligned * Income * Transfer	-0.004	-0.010	-0.008	-0.021	-0.023
	(0.013)	(0.015)	(0.015)	(0.018)	(0.017)
Linear combination: High-income municipalities					
- aligned	0.003	0.007	0.008	0.016	0.017
	(0.009)	(0.009)	(0.009)	(0.012)	(0.012)
- unaligned	-0.020**	-0.018*	-0.017*	-0.024**	-0.023*
	(0.009)	(0.010)	(0.010)	(0.012)	(0.012)
Linear combination: Uneducated municipalities					
- aligned	0.077***	0.079***	0.079***	0.090***	0.092***
	(0.008)	(0.008)	(0.008)	(0.010)	(0.010)
- unaligned	0.049***	0.045***	0.046***	0.029***	0.029***
	(0.008)	(0.009)	(0.008)	(0.011)	(0.011)
Observations	7,745	5,887	6,017	3,764	3,876
R-squared	0.453	0.445	0.446	0.455	0.455
Polynomial order	3	1	1	1	1
Bandwidth	0.500	0.200	0.210	0.100	0.105
Procedure	Arbitrary	CCT	IK	CCT/2	IK/2

Note: Regression Discontinuity Design (RDD). The forcing variable is the margin of victory in the previous mayoral election of the candidate from the party of the incumbent president. Optimal bandwidth: CTT refers to Calonico et al. (2014) while IK to Imbens and Kalyanaraman (2012). Robust standard errors in parentheses. *** p-value < 0.01, ** p-value < 0.05, * p-value < 0.10.