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and Political (Mis)alignment in a Decentralized Economy

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Abstract

This paper investigates the effects of political (mis)alignment on public service delivery when mandates are shared between state and local governments. We analyze sewage treatment policies in the State of São Paulo, Brazil. Based on a regression discontinuity design, we establish a causal relationship between political alignment and higher sewage treatment provision. Conceptually, we find that, with uncertain local commitment and weakly enforceable local obligations, shared mandates lead to a moral hazard issue implying service under-provision. When political alignment is an option, our results show that it attenuates such moral hazard effects.

Keywords: political alignment; infrastructure provision; moral hazard; regression discontinuity design.

JEL Classification: H40; H54; H72; P48.

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1 Introduction

This paper investigates the effects of political (mis)alignment on the implementation of public policies in decentralized economies. We show that political alignment reconciles conflicting policy priorities resulting from shared mandates across government layers. We contribute to an understudied area of research in political economy. In his recent survey, Mookherjee (2014) shows that there is little explicit analysis of shared mandates and that there is even less research on the importance of political alignment for policy outcomes.

Our evidence is based on the analysis of sanitation policies in the state of São Paulo, Brazil. Brazilian Constitution shares the mandates related to the control of water pollution. It gives the mayors of municipalities the control of local sanitation services. Municipalities are allowed to decide on policy, delegation and all other dimensions related to sanitation. In particular, they determine how much sewage treatment to implement. On the other hand, the governor is responsible for the quality of water bodies (watersheds and rivers) within the state of São Paulo. In fact, the state government has been able to address industry-related pollution issues. In São Paulo, two agencies are responsible for the regulation of industrial effluent discharges in water resources. Although they are very active in the regulation of industrial activities that affect water environmental quality, these agencies have no mandate to enforce rules regarding the quantity of sewage treatment to be provided. How well municipalities treat sewage thus has a direct impact on the effectiveness of state environmental policy.

Conceptually, this is a moral hazard issue as the state government and municipalities have intrinsically conflicting objectives. The former is committed to water environmental protection while the latter do not have incentives to internalize the externalities associated with dumping raw sewage that affect neighboring municipalities. Poor or no water treatment thus raises a challenge for state authorities. As a result, the governor must provide mayors with adequate incentives in order to maintain quality standards through sewage treatment. These incentives are unlikely to be formal. Conflicting objectives between state and municipal government result directly from the Constitution and historical attempts to establish formal clear rules or compelling common objectives have proved unsuccessful. Therefore, sanitation services in Brazil remain largely unregulated

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and, in fact, depend on local political will. In this paper, we argue that informal arrangements between state and local authorities play a key role to address the moral hazard risk. Given that formal contracts or negotiations have failed to set up a regulatory framework, the de facto solution is a more informal type of regulation anchored in the political leverage of the governor.

Informal arrangements to reconcile objectives between different government layers and deliver higher quality of public services are likely to take place within the political party. The political party, as an institution, offers cost-efficient alternatives to formal contracts which can be important in particular when budgets are constraining. A formal or informal hierarchy between governors and mayors of the same party gives some leverage to the governor to provide mayors within the same party with tailored incentives such as promotions within the party or support for electoral campaign in exchange for improvements in local sewage treatment infrastructure. A second reason is that writing formal contracts is a costly activity. It needs to address as many contingencies as possible and tends to do so imperfectly (e.g. contract renegotiations are quite common and costly). Therefore, the governor will prefer an informal arrangement with a trusted political partner. Third, an informal contract gives the governor more control on the rewards and/or punishments that form the incentives to aligned mayors. Enforcing a formal contract might result in very costly and lengthy lawsuits that the governor would like to avoid. Finally, informal contracts can also be implicit, do not have to be transparent and can be part of a broader agenda. Because the governor and aligned mayors are from the same political party, their objective functions are naturally less conflicting.

We derive two main results from the empirical analysis of the consequences of the moral hazard risks due to the poorly designed sharing of responsibilities across government levels. First, political alignment causes a higher level of sewage treatment only for municipalities that are provided by a local sanitation company. Following the approach proposed in Brollo & Nannicini (2012), we use a regression discontinuity design in close election results to establish a causal relationship between political alignment and sewage treatment provision. The victory margin of mayoral candidates aligned with the governor in past elections provides a continuous variable with a cutoff around which the assignment to political alignment is as good as random. Second, provision of sewage treatment is higher in municipalities supplied by the state owned company

SABESP (as opposed to municipalities provided by a local company). Thus, our empirical results show that, in an environment with poorly defined contracts and uncertain local commitment, political misalignment leads to an under-provision of public goods. Also, our findings suggest that sewage treatment level is higher whenever the governor has an influence on local sanitation policy. Sewage treatment infrastructure is better in municipalities provided by state owned company SABESP because the latter is run the governor himself. In municipalities provided by local companies, this influence takes place through informal arrangements between political allies. These results are hard to reconcile with any other interpretation.

Our conceptual analysis and most importantly, our empirical results contribute to the very scarce literature on coordination problems associated with political decentralization processes. The recent papers by Joanis (2009, 2011, 2014), Jametti & Joanis (2010), Brollo & Nannicini (2012) and Solé Ollé (2011) are closely related but focus either on the electoral process rather than on political alignment or on resource allocation (tax revenue or intergovernmental transfers) rather than on policy outcomes. To our knowledge, we provide the first empirical analysis of the relevance of political (mis)alignment for goods provided by publicly-owned firms.

From a strict policy perspective, the evidence we find is a mixed blessing. On the positive side, it implies that political alliances can be seen as a political Coasian solution to mitigate the risks associated with shared mandates across government levels. On the negative side, it confirms that unclear or imperfectly shared mandates can become a source of moral hazard in the implementation of environmental policies (or any other policy). Thus, political alignment can prove to be a short term approach to correct imperfections in shared mandates. However, as political changes occur frequently, alliances are clearly not a sustainable solution to address market failures in decentralized countries. They are at best a second best solution but an unreliable one for the long run.

The rest of the paper proceeds as follows. Section 2 reviews the related literature. Section 3 explains the institutional setting of sanitation services in Brazil and develops the reasons why a moral hazard issue exists between the governor and mayors. Section 4 defines our identification strategy while Section 5 provides details on the data used in the empirical analysis. Section 6 reports the estimation results and Section 7 discusses the potential threats to our identification

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strategy. Section 8 offers concluding remarks.

2 Review of the literature

The first generation of economic research on decentralization initiated by Oates (1972) largely underestimated or ignored political dimensions. The main explanations for failures of shared responsibilities were anchored in a mismatch in expenditure and revenue assignments or poor designs of intergovernmental transfers. Politics appeared with the second generation and the empirical evidence came from various directions. For instance, Solé Ollé (2011) reframed assignment mismatches to include political concerns. Another research line highlighting the role of politics recently reviewed by Faguet (2014) emphasizes limited capacity or governance issues as explanations for underperformance. It is only with a third strand of papers, fueled by both political scientists and economists, that the importance of politics on policies in the context of decentralization started to take shape. In addition to the papers by Joanis (2009, 2011, 2014) and Jametti & Joanis (2010), the few papers related to political alignment concerns include Solé-Ollé & Sorribas-Navarro (2008), Brollo & Nannicini (2011) and Curto-Grau et al. (2012). However, these papers focus on how intergovernmental transfers can be used to ensure alignments of policies and improve electoral outcomes for incumbents.

Political alignment has been significantly more important in the politics literature. Even if it does not include quantitative assessment of specific policy outcomes associated with various political issues, it provides a number of key insights for policy design. This line of research recently reviewed by Weingast (2014) focuses more directly on the importance of multi-party politics in the context of fiscal federalism. In his review, he finds that a substantial share of the literature argues that to succeed in multi-party systems, federalism has to be able to address the risks of coordination failures. He implicitly suggests that political alignment matters since politicians from the same party across government levels need each other to win national and local offices. Refinements of the argument build on the fact that the repeated nature of the political interactions facilitates policy coordination across party lines (self-enforcing federalism as discussed in de Figuereido & Weingast (2005)). But it can also lead to repeated disagreements as discussed in Behar (2009). These disagreements are more likely to be revealed when examining the details of policy implementa-

tion. For this reason, we focus on a specific policy in this paper and we propose to test the core of the underlying intuition in the context of our case study.

The coordination issue identified by Weingast (2014) has in fact also been raised in the context of public services associated with spillover effects, as in the case of water pollution. It was already implicit in Oates (1972) that the optimal degree of decentralization depends on the difficulty of coordinating policies to address inter-jurisdictional externalities. Oates argued that with strong spillovers and disagreements on preferences across subnational actors, decentralization would lead to undesirable outcomes. In the water context, Sigman (2001, 2005, 2014) has provided extensive evidence that decentralization of environmental responsibilities can be associated with differences in the quality of water bodies, even if these differences should not necessarily be interpreted as a race to the bottom but rather as resulting from differences in preferences. Close to our paper, Lipscomb and Mobarak (2007) show that, in Brazil, pollution significantly increases right before a downstream exit point. The negative outcome is however local as they find no effect on the overall water quality across all locations. While their explanation is anchored in changes in budget allocation resulting from decentralization rather than in purely political concerns, they address the politics of decentralization.

The economic modeling of the initially apolitical concerns for disagreements when spillover matter has thus progressively been refined and started to rely on conceptual works that include political dimensions. For instance, Cremer & Palfrey (1996), Besley & Coate (2003) or Lockwood (2008) show that majority rules will fail to address these sorts of concerns. This more politically conscious literature has also generated new empirical evidence on the optimal degree of decentralization based on cross country studies. Arze del Granado et al. (2012) test for the potential superiority of sub-national governance, considering both democratic decentralization and party centralization. Relying on a large dataset on sub-national political institutions, they find that the combination of municipal elections and party centralization improves educational outcomes. Their argument is that democratic decentralization creates the accountability necessary for efficient public good provision, while party centralization increases local governments' incentives to provide public goods with spillover effects. On the other hand, using a 25-year panel of 95 countries, Enikolopov & Zhuravskaya (2007) show that fiscal decentralization works better in a

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strong national party system (considering age and fractionalization of parties). They also find that, in developing countries, administrative subordination of local to higher-level authorities improves decentralization results, contrasting in that conclusion with Arze del Granado et al (2012).

Thus, this empirical research points to the strength of political coordination across government levels as a crucial factor to account for the quality of public service delivery. However, none of these papers addresses the importance of political (mis-)alignment for the implementation of public when responsibilities are shared. Our paper contributes to this latest line of research by investigating how differences in party affiliation influence public service delivery decisions. We also provide evidence on how public operators differentiate public good provision according to which government level they are accountable.

3 Institutional setting of sanitation services in Brazil

Water and sanitation services in Brazil: some stylized facts

In Brazil, water provision services reach almost 95% in urban areas. However, only 38% of water discharges are treated (Ministério das Cidades, 2014). Besides compromising the quality of river water, dumping of raw sewage carries a serious risk of disease spread. This lack of sewage treatment is crucial for the State of São Paulo where 43.6 million people live and generate about 33% of the Brazilian GDP (IBGE, 2013). The Great Metropolitan Area of São Paulo, where 45% of the state population is located, requires importing 32.3 m^3/s from adjacent watershed basins which corresponds to about 45% of total water production in the state (CETESB, 2014).

As water provision is universal and sewage collection covers 90% of the state households, increasing the percentage of sewage treatment is critical for the improvement of water and sanitation management in the state. Therefore, the government of São Paulo, through the Department of Sanitation and Water Resources, set a deadline for the universalization of sewage treatment in the entire state to the year 2020. This is an ambitious goal particularly considering the recent performance. The percentage of treated domestic sewage has only increased from 45% in 2008 to 60% in 2013 (CETESB, 2014). So another 40% increase need to be accomplished in the next seven

years.

Part of this performance is at the hand of the government of the state and its capability to deploy investments in sewage treatment plants. The state-owned company, SABESP, is the main provider of water and sanitation services operating in 364 of the 645 municipalities of the state and covering 68% of the urban population. However, there still exist another half of municipalities where municipal companies provide services. Such mix of state and municipal providers is the result of changes in water and sanitation policies in Brazil since the 1970s.

The regulatory framework of water and sanitation services in Brazil

In Brazil, municipalities originally provided water and sanitation services under the supervision of FUNASA (National Health Foundation). In the early 1970s, the federal government tried to centralize the sector and established the National Plan of Sanitation (PLANASA). PLANASA defined sectorial planning, pricing, credit policies and supply standards. Most importantly, PLANASA created water and sanitation companies in each states of Brazil (the so-called Companhias Estaduais de Agua e Saneamento - CEAS). This plan provided financial incentives to encourage municipal authorities to make long-term concessions to CEAS. As a result, almost 3,200 of 4,100 municipalities joined PLANASA. This centralization was justified by the need to achieve economies of scale especially in large metropolitan areas. In the late 1980s though, PLANASA began to indicate poor performance.[1] The tariff system was no longer appropriate due to a hyper-inflationary environment and funds for investment were financially debilitated by default.

In 1988, a constitutional reform put an emphasis on decentralization and reaffirmed that municipalities should be the conceding authorities and should have the power to determine sanitation policies at the local level.[2] Since then, the regulatory framework of the sector has been both not clear and heavily dependent on federal financing. Some municipalities terminated their contracts with CEAS and came back to rely on local structures (either public or private) for water and sani-

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[1]PLANASA was at first successful. Urban water coverage in Brazil increased from 60 percent in 1970 to 86 percent in 1990, and coverage of urban sewage rose from 2 percent in 1970 to 48 percent in 1990 (Seroa da Motta and Moreira, 2005).

[2]A notable exception are great metropolitan areas where public services should be shared with states. However, many actors have challenged this clause. See Seroa da Motta and Moreira (2006) for a discussion.

tary services provision.

More recently, the National Sanitation Policy issued in 2007 (Law 11 447) created a new regulatory framework for the sector. Unfortunately, it was not able to get consensual solutions to the jurisdictional management level of water and sanitary services. There was a dispute in the Supreme Court to clarify how a sharing management should take form and, until today, no clear decision was made. This controversy has created uncertainty discouraging not only private investments but also service expansion in public companies.

Thus, as of today, approximately 80% of the country´s urban population is provided by CEAS as opposed to 20% provided through local management (of which 17% are public municipal autarchies and 3% are private providers).[3] Most importantly, water and sanitary services in Brazil remain largely unregulated with no clear rules or objectives to be complied by the authorities. Mayors of municipalities remain the conceding authority and therefore determine the sanitation policy at the local level. As these decisions are decentralized, potential coordination problems are likely to arise.

The case of sewage treatment: a moral hazard issue

On the other hand, environmental management for pollution issues in Brazil is under the jurisdiction of the states. In São Paulo, the *Companhia Ambiental do Estado de São Paulo* (CETESB) has the executive mandate for monitoring water pollution norms and regulatory powers to sanction non-compliers, including water and sanitation companies. Water resource planning is made by the *Departamento de Águas e Energia Elétrica* (DAEE). These agencies are very active in the regulation of industrial activities that affect water environmental quality (Johnsson & Kemper, 2005). However, they are not able to enforce rules regarding sanitation issues. The main reason is that executive and judiciary branches of water and sanitation companies use financing and managerial barriers as justifications for non-compliance. As a result, sanitation services have been subject to a much weaker regulation. In fact, there is no regulatory incentives for sewage treatment.

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[3]According to Seroa da Motta and Moreira (2006) municipal companies, particularly, private ones may practice lower tariffs with higher efficiency performance.

Sewage effluents have their effects mainly on downstream water quality. Therefore, as a centralized authority, the governor would provide the optimal level of sewage treatment that internalizes these externalities. Mayors however take decentralized decisions and have no incentives whatsoever to meet the objectives of the governor. The governor can hardly circumvent this problem. Any initiatives for water decontamination that would not deal with local sanitation policy is potentially jeopardized by a lack of a adequate sewage treatment infrastructure.

Furthermore, evidence shows that mayors also lack political incentives to provide sewage treatment. According to a recent poll realized by independent think tanks, only 2% of the participants declared that they would take sanitation management issues into account when voting for a candidate in the next election (Trata Brasil, 2012). While voters recognize the importance of sanitation services for welfare and the lack of adequate infrastructure, they state that health, education and security are areas with a higher priority for public investments.

These conflicting objectives between the governor and the mayors create a moral hazard issue. The actions of the mayors regarding sanitation services are not observable by the governor - or at least not verifiable by an independent third party since the sector is not regulated. Therefore, in order to improve water pollution through sewage treatment, the governor must provide mayors with adequate incentives. Formal contracts are one option. The State government of São Paulo has taken many initiatives to provide municipal authorities with assistance to build sewage treatment plants. For instance, the program "Agua Limpa" (Water Clean) offers financial and technical support for municipalities with less than 50.000 people that are not provided by the state-owned sanitation company SABESP.

In this paper, we argue that political alignment offers an alternative to formal contracts. We believe that informal arrangements with political allies are likely to play a key role. This is so for several reasons.

First, as mentioned above, municipal authorities justify poor sewage treatment infrastructure by the lack of financial means. Therefore, a formal contract shall include financial support from

the state government. The political party is an institution that offers cost-efficient alternatives. As the governor has a higher position in the hierarchy, he could propose tailored incentives to aligned mayors in exchange for an improvement in local sewage treatment infrastructure. These include promotions within the party, political endorsement or even financial supports for future electoral campaign. As the state government faces a budget constraint, the governor is likely to rely on these cheaper alternatives to meet his objectives.

Second, writing formal contracts might be very costly as they should include as many contingencies as possible. Obviously, writing down all the contingencies is too costly and both parties (principal and agent) might find it preferable to end up with an incomplete contract (Tirole, 1999; Battigalli & Maggi, 2002). Within this perspective, the governor might prefer to make an informal arrangement with a trusted political partner. Third, the governor has more control on the rewards and/or punishments that define the incentives to aligned mayors. Promotions or financial supports for electoral campaign can be easily applied or withdrawn as a function of the final output delivered by the mayor. On the contrary, enforcing a formal contract might result in very costly and lengthy lawsuits that the governor would like to avoid. Last but not least, informal contracts can also be implicit. Because the governor and aligned mayors are from the same party, their objective functions are naturally less conflicting. Therefore, aligned mayors might be more willing (or less reluctant) to help the governor in his mission of internalizing externalities due to sanitation issues. This provides self-enforcing incentives to aligned mayors that might result in a higher level of sewage treatment.

As mentioned above, in the state of São Paulo, 56% of municipalities are provided by the state-owned regional company SABESP and 40% are provided by public local companies.[4] The regional company SABESP is owned and run by the state government. The state government owns 50% of the shares and can veto any decision regarding the management of the company. Moreover, the administrative staff is on the state government payroll. As a result, the regional company SABESP has an objective function in line with the governor. Therefore, sanitation policy in municipalities that are provided by SABESP is largely influenced by the governor and should result

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[4]Private companies also operate in 4% of municipalities in São Paulo. We discard these from the analysis as they represent an insignificant part of the sample of observations.

in high sewage treatment level. This is so whatever the political party of the mayor in office. Conversely, the governor's influence is limited in municipalities with a local sanitation company unless mayors are politically aligned with the governor.

Thus, our predictions are the following. First, political alignment should cause a higher level of sewage treatment only in municipalities with a local sanitation company as opposed to municipalities provided by SABESP. Second, non-aligned municipalities with a local sanitation company should have, in average, a lower level of sewage treatment.

4   Identification strategy

In our analysis, the estimand of interest is the Average Treatment Effect (ATE) of the political alignment between mayors and the governor on the municipal sewage treatment level. Let s_{it} be the level of sewage treatment in municipality i at time t, X_{it} a set of covariates that are likely to explain sewage treatment infrastructure, A_{it} a dummy variable that indicates whether the mayor is politically aligned with the governor (that is, the mayor belongs to the same political party as the governor), μ_i time-invariant unobservable characteristics and δ_t a year fixed effect.

The Ordinary Least Square (OLS) model

$$s_{it} = \alpha + \beta A_{it} + \gamma X_{it} + \mu_i + \delta_t + \varepsilon_{it} \tag{1}$$

will provide a biased estimator of β if political alignment is correlated with unobservable characteristics (both time-invariant and time-varying). The use of panel data fixed effect (within estimator) to estimate equation (1) would only wipe out time-invariant characteristics yielding a biased estimator due to time varying characteristics. We then use a regression discontinuity (RD) design following Brollo & Nannicini (2012) which rests on a methodology proposed by Lee (2008).

Let MV_{it} be the past elections margin of victory of the mayoral *candidate* aligned with the governor in municipality i at time t. This continuous variable is deterministic in political alignment: if $MV_{it} > 0$ ($MV_{it} < 0$), the mayor of municipality i at time t is politically aligned (unaligned)

with the governor. We assume that the municipalities in which the aligned candidates barely lost or barely won provide two homogenous samples that are comparable in all dimensions except the political alignment of the mayor. This assumption rests on the idea that only random events on the election day were decisive for the electoral outcome, namely the victory or loss of the aligned candidate. In other words, we assume that around the cutoff $MV_{it} = 0$, political alignment is as good as randomly assigned.

Thus, the ATE in close election is defined as

$$E[s_{it}(1) - s_{it}(0)|MV_{it} = 0] = E_{\varepsilon \to 0}[s_{it}|MV_{it} = \varepsilon] - E_{0 \leftarrow \varepsilon}[s_{it}|MV_{it} = \varepsilon] \tag{2}$$

We can locally estimate equation (2) using a polynomial approximations of order p in MV_{it}:

$$s_{it} = \sum_{k=0}^{p} (\rho_k MV_{it}^k) + \beta A_{it} + \delta_t + \eta_{it} \tag{3}$$

Equation (3) can be extended to a spline polynomial in order to allow for differential slopes on either side of the cutoff:

$$s_{it} = \sum_{k=0}^{p} (\rho_k MV_{it}^k) + A_{it} \sum_{k=0}^{p} (\beta_k MV_{it}^k) + \delta_t + \eta_{it} \tag{4}$$

Alternatively, as recommended in Imbens & Lemieux (2008), we can estimate a local linear regression using only the municipalities in the interval $MV_{it} \in [-h, h]$:

$$s_{it} = \rho_0 + \rho_1 MV_{it} + \beta_0 A_{it} + \beta_1 A_{it} MV_{it} + \delta_t + \eta_{it} \tag{5}$$

The optimal bandwidth h can be computed following a methodology proposed in Imbens & Kalyanaraman (2009).

January 1st, 2007:
New Governor takes
office

January 1st, 2009:
New Mayors take office

January 1st, 2011:
New Governor takes
office

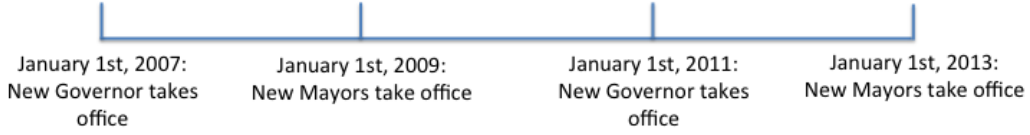January 1st, 2013:
New Mayors take office

Figure 1: Timing of state and municipal elections over the period of analysis.

5 Timing and data

Our dependent variable s_{it} is measured as the following ratio:

$$s_{it} = \frac{\text{Volume of water treated } [m^3]}{\text{Volume of water collected } [m^3]} \tag{6}$$

in municipality i at time t. These data come from *Sistema Nacional de Informações sobre Saneamento* (SNIS). Although these data are available since 1995, we are not able to construct a representative sample in early years as most of the data regarding sewage treatment are reported missing.[5] Therefore, we decide to restrict our analysis to the period 2007-2012. In 2007, 75% of the data is available for the State of São Paulo. The latest available year is 2012 and encompasses approximately 92% of the data.

In Brazil, state and municipal elections take place every four years but they do not coincide. Therefore, in the middle of the governor's mandate, new mayors take office. During the 2007-2012 period of analysis, state and municipal elections took place. Therefore, we are able to observe different governors and different set of mayors. This provides us with a time variation in the political alignment variable of interest as in some municipalities, some non-aligned mayors have been replaced by aligned ones and vice-versa after elections. Figure 1 illustrates this timing.

It is important to note that, during the sample period, the *Partido da Social Democracia Brasileira* (PSDB) was ruling the state of São Paulo. In January 2007, governor José Serra took office and ruled the state until April 2010 when he stepped down in order to run for presidential elections. He was replaced by vice-governor Alberto Goldman who was in office until December

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[5]This is also the reason why our analysis is restricted to the State of São Paulo. More than 50% of the data regarding sewage treatment from most States in Brazil are reported missing in SNIS database.

2010. In January 2011, Gerardo Alckmin was elected governor of the state of São Paulo and remains currently in office. These three governors are affiliated to PSDB and as a result, our political alignment variable A_{it} is collinear to belonging to PSBD. We are aware of this issue and we will discuss it at length in section 8.

In addition to our variable of interest of political alignment, we control for some electoral characteristics, namely the margin of victory of the mayor in the past municipal elections and whether the mayor is in office for the first or second time. All data regarding electoral results come from *Tribunal Superior Eleitoral*. We also control for some variables that characterize the population of municipalities: population size, population density, the percentage of urban population, the share of the population that is connected to the water distribution network and to the sewage network as well as the share of the water discharges generated by the population that is collected by the sewage network. Next, we control for some fiscal variables that are likely to play a role in sanitation policy. These are municipal revenues per capita, sanitation expenditures per capita, the share of the municipal budget spent on sanitation infrastructure, the amount of discretionary state transfers for sanitation projects per capita, the amount of discretionary federal transfers for sanitation projects per capita and the amount of total discretionary state transfers per capita. Population and density data come from *Instituto Brasileiro de Geographia e Estadisticas* (IBGE) while all data regarding the fiscal revenues and expenditures of municipalities come from *Finbra* dataset of *Tesouro Nacional*.

We also use variables that are specific to sanitation companies. We proxy for the solvability of these companies by creating a ratio of the operation income over operation expenditures. We account for investments per capita in sewage issues (including sewage treatment) and total investments per capita made by these companies. Finally, among local companies, there exist several judicial status for which we control.[6] All these data were found in SNIS database.

We provide summary statistics for the restricted sample that we use for our regression dis-

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[6]More precisely, these are: *administração pública direita, autarquía, empresa pública, sociedade de economía mista com gestão pública*. It is important to note that all these companies have more than 50% of their shares held by the municipal government which therefore control these companies.

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continuity design.[7] Table 1 reports the means of the main observable characteristics for aligned and non-aligned municipalities. We see that there exist differences in mean characteristics regarding the population. Population, population density and shares of urban population, population connected to water and sewage network are lower in aligned municipalities. At this point of the analysis, we just note that aligned and non-aligned municipalities present differences in terms of population size and we will discuss this in Section 8.

Next, municipal revenues per capita and total discretionary state transfers per capita are slightly higher in aligned municipalities. However, these two last differences are clearly driven by the fact that population is lower in aligned municipalities. Conditional on population, means of municipal revenues and discretionary state transfers do not exhibit differences.[8] Therefore, these differences do not represent a threat to our identification strategy. Moreover, Brollo & Nannicini (2012) have shown that political alignment causes higher funds from centralized authorities. Consequently, no omitted variables are likely to explain both alignment and higher discretionary transfers. As we control for the later in all our regressions, we are able to discard a potential income effect that could result in a better sewage treatment infrastructure.

6 Estimation results

We start the analysis with the effect of political alignment on the level of sewage treatment when sanitation services are provided by a *local* company. Most of the following regressions are run with a set of control variables as defined in the previous section. Electoral characteristics include victory margin of the mayor in the past elections and whether she is in a second mandate. Population characteristics include population, population density, the percentage of urban population, the share of the population that is connected to the water distribution network and to the sewage network and the rate of water discharges that is collected by the sewage network. Fiscal characteristics are defined by municipal revenues per capita, sanitation expenditures per capita, the

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[7]In the regression discontinuity design, our original sample is restricted to the municipalities in which a candidate affiliated to the party of the governor ran for municipal elections.

[8]Differences are respectively of 6793615 (8915703) and 542313.8 (394806.6) with robust standard errors in parentheses.

Table 1: Summary statistics: aligned versus non-aligned municipalities

Variable	Non-Aligned	Aligned	Difference
Dependent variable			
% sewage treatment	0.486	0.638	0.152**
			(0.060)
Population characteristics			
Population	123891	58111	-65 780**
			(30 357)
Population density	552	151	-401*
			(219)
Share of urban population	0.92	0.87	-0.05***
			(0.02)
Share of population connected to water network	0.94	0.91	-0.04**
			(0.01)
Share of population connected to sewage network	0.907	0.861	-0.046**
			(0.018)
Share of water discharges collected by sewage system	0.838	0.822	-0.016
			(0.018)
Fiscal characteristics			
Municipal revenues per capita	2016.064	2208.978	192.914*
			(108.297)
Municipal sanitation expenditures per capita	119.532	106.123	-13.409
			(10.827)
Share of municipal budget spent on sanitation	0.058	0.051	-0.007
			(0.004)
State transfers for sanitation projects per capita	6.854	4.387	-2.467
			(5.084)
Federal transfers for sanitation projects per capita	1.678	1.227	-0.451
			(0.783)
Total transfers for sanitation projects per capita	8.532	5.614	-2.918
			(5.200)
Total discretionary State transfers per capita	39.559	59.69	20.131*
			(10.952)
Sanitation company characteristics			
Solvability index	1.018	0.992	-0.026
			(0.051)
Sewage investments per capita	14.174	12.652	-1.522
			(4.046)
Total investments per capita	28.812	25.637	-3.175
			(5.867)

Robust standard errors clustered at the municipality level in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

share of the municipal budget spent on sanitation infrastructure, the amount of discretionary state transfers for sanitation projects per capita, the amount of discretionary federal transfers for sanitation projects per capita and the amount of total discretionary state transfers per capita. Sanitation company characteristics include the solvability index, sewage investments per capita and total investments per capita made by sanitation companies.

A first set of results show that there exists a correlation between the level of sewage treatment and the political alignment of a municipality. Table 2 displays the estimation results of OLS and difference-in-differences (panel data fixed effect) estimators. The point estimates of political alignment are significantly positive across specifications meaning that sewage treatment provision is higher in municipalities in which the mayor is politically aligned with the governor. OLS estimates suggest that the level of sewage treatment in aligned municipalities is higher by about 10%. With respect to the average level, this corresponds to an increase of approximately 17%. Diff-in-diff estimates are slightly lower (columns (5) to (8)) and point to an increase of about 14% of the average sewage treatment level. Importantly, most of these regressions include fiscal characteristics and therefore control for discretionary state transfers (both general and targeted at sanitation infrastructure). Thus, these results indicate that, conditional on receiving the same amount of discretionary transfers, politically aligned municipalities provide in average more sewage treatment. For both approaches of estimation, estimates remain stable across specifications and therefore, do not seem to be influenced by other variables potentially correlated with sewage treatment. However, diff-in-diff estimates can still suffer from a time-varying omitted variable bias.

We turn now to the regressions discontinuity (RD) estimates. This time, the effect of political alignment is captured by the estimation of the jump at the cutoff $MV_{it} = 0$. Table 3 reports estimates for first to third-order polynomials and spline polynomials. According to these estimates, sewage treatment level is about 20% higher in aligned municipalities which corresponds roughly to an increase of 36% with respect to the average level. Table 4 exhibits the estimates of local linear regressions (non parametric estimates) as in equation (5). We calculated the optimal bandwidth to be used according to the methodology proposed by Imbens & Kalyanaraman (2009). We found it to be $h^* = 0.38$. For the sake of clarity, we also provide OLS estimations of equation (1) in close intervals around $MV_{it} = 0$, namely for $h = 0.15$ and $h = 0.20$. These last point estimates

Table 2: OLS and difference-in-differences estimates.

Dependent variable	% Sewage treatment							
	OLS				Panel Data Fixed Effect			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Alignment	0.107**	0.108*	0.110**	0.127**	0.071*	0.086*	0.087*	0.079*
	(0.053)	(0.055)	(0.054)	(0.062)	(0.043)	(0.047)	(0.047)	(0.040)
Electoral charact.	YES	YES	YES	YES	YES	YES	YES	YES
Population charact.	NO	YES	YES	YES	NO	YES	YES	YES
Fiscal charact.	NO	NO	YES	YES	NO	NO	YES	YES
Companies charact.	NO	NO	NO	YES	NO	NO	NO	YES
Time dummies	YES	YES	YES	YES	YES	YES	YES	YES
Mean DP	0.57	0.58	0.58	0.55	0.57	0.58	0.58	0.55
Observations	985	877	857	615	985	877	857	615
R-squared	0.063	0.093	0.139	0.200	0.135	0.151	0.172	0.282

Robust standard errors clustered at the municipality level in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

measure the difference in means of sewage treatment in municipalities that experienced very close elections. These estimates suggest that political alignment provokes an increase of 36% to 46% in sewage treatment level with respect to the average.

Figure 2 shows a non-parametric fit (local linear regressions of degree 1) of sewage treatment level with 95% confidence intervals. There exists a clear jump at $MV = 0$. It is important to note that this jump does not seem to be driven by a sharp decrease in sewage treatment level on the left of the cutoff (that is, in non-aligned municipalities). Rather, it is clear that it is an increase in sewage treatment level on the right of the cutoff (that is, in aligned municipalities) that drives this difference. Interestingly, while the slope of the margin of victory MV is rather flat on the left-hand side of the cutoff, we can observe that it is negative on the right hand-side. This suggests that, while the electoral results of the mayors in non-aligned municipalities do not matter, the greater is the electoral victory of the mayor of an aligned municipality, the lower the sewage treatment level.

To test this hypothesis formally, we run linear regressions that allow for the slope of the forcing variable MV to be different on either side of the cutoff. Table 5 reports the estimates of a first-order spline polynomial. The coefficient of the variable MV alone captures the slope of the forcing variable on the left-hand side of the cutoff. It is highly insignificant across specifications. The coefficient of the interaction variable $Alignment * MV$ captures the slope of the forcing vari-

Table 3: Regression discontinuity estimates.

Dependent variable	% Sewage treatment					
	(1)	(2)	(3)	(4)	(5)	(6)
	Linear	Quadratic	Cubic	Spline-lin	Spline-qua	Spline-cub
Alignment	0.193**	0.200**	0.232**	0.205**	0.250**	0.197
	(0.089)	(0.090)	(0.107)	(0.090)	(0.115)	(0.149)
Electoral charact.	YES	YES	YES	YES	YES	YES
Population charact.	YES	YES	YES	YES	YES	YES
Fiscal charact.	YES	YES	YES	YES	YES	YES
Companies charact.	YES	YES	YES	YES	YES	YES
Time dummies	YES	YES	YES	YES	YES	YES
Mean DP	0.55	0.55	0.55	0.55	0.55	0.55
Observations	458	458	458	458	458	458
R-squared	0.213	0.220	0.221	0.224	0.228	0.229

Robust standard errors clustered at the municipality level in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

able on the right-hand side of the cutoff. We then see that this slope is negative and statistically significant at the 15 % level for aligned municipalities.[9] This result is particularly relevant for our interpretation in terms of a moral hazard issue. The higher the electoral score of a mayor affiliated to the party of the governor, the more legitimate. Within the political party, successful mayors are therefore in a much better position to negotiate an (informal) contract with the governor than a mayor that won the elections by a narrow margin. Thus, as it raises the bargaining costs between mayors and the governor, a higher legitimacy results in a lower sewage treatment provision.

We turn now to the analysis of municipalities that are provided by the *regional* sanitation company, SABESP. As mentioned previously, this company is owned by the state of São Paulo and in fact, controlled by the governor. Given the unregulated framework of sanitation services in Brazil, local sanitation policy should respond to the interests of the governor in municipalities supplied by SABESP. Table 6 reports the results of regressions that estimate the difference between municipalities provided by SABESP and by local companies. We see that municipalities with local companies have, in average, a lower sewage treatment level (column (1)). However, this effect disappears in aligned municipalities: point estimate in column (2) for the restricted sample of aligned municipalities is not significant while point estimate in column (3) for the restricted sample of

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[9] A replication of Table 5 with non-robust standard errors shows the slope to be negatively significant at the 1% level on the right-hand side of the cutoff. Results are available upon request.

Table 4: Non parametric RD and OLS estimates in close elections.

Dependent variable	% Sewage treatment			
	(1)	(2)	(3)	(4)
	h*=0.38	h*=0.38	h=0.15	h=0.20
Alignment	0.192*	0.170	0.283***	0.206**
	(0.110)	(0.110)	(0.094)	(0.088)
Electoral charact.	NO	NO	YES	YES
Population charact.	NO	NO	YES	YES
Fiscal charact.	NO	NO	YES	YES
Companies charact.	NO	NO	YES	YES
Time dummies	NO	YES	YES	YES
Mean DP	0.57	0.57	0.60	0.60
Observations	536	536	143	208
R-squared	0.045	0.069	0.399	0.294

Robust standard errors clustered at the municipality level in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

non-aligned municipalities is even lower than point estimate in column (1). Thus, the difference between SABESP and local companies is driven by non-aligned municipalities only. More formally, we can infer that the effect of switching from SABESP to a local company is negative in average but significantly attenuated in aligned municipalities. Columns (4) to (6) show that while the coefficient of the dummy variable *Local company* is statistically negative, the interaction variable *Alignment ∗ Local company* is statistically positive across specifications.

Table 7 reports the RD estimates of the impact of political alignment on sewage treatment level for the sub-sample of municipalities provided by SABESP. Most of these point estimates are not statistically significant and are negative across specifications. While the interpretation of the negative sign of these coefficients is out of the scope of this paper, we clearly see that the effect of political alignment is radically different in municipalities provided by SABESP. In the latter, the governor has a sufficiently high discretionary power over sanitation services to adjust local sanitation policy according to his objectives. This is so whatever the political affiliation of the mayor in office. Consequently, political alignment or informal contracts play a minor role.

Thus, while the estimates of the two last tables are correlations, they point to a very coherent and plausible interpretation. Sewage treatment level is higher whenever the governor has an in-

Figure 2: Non-parametric fit (local linear regressions) of sewage treatment.
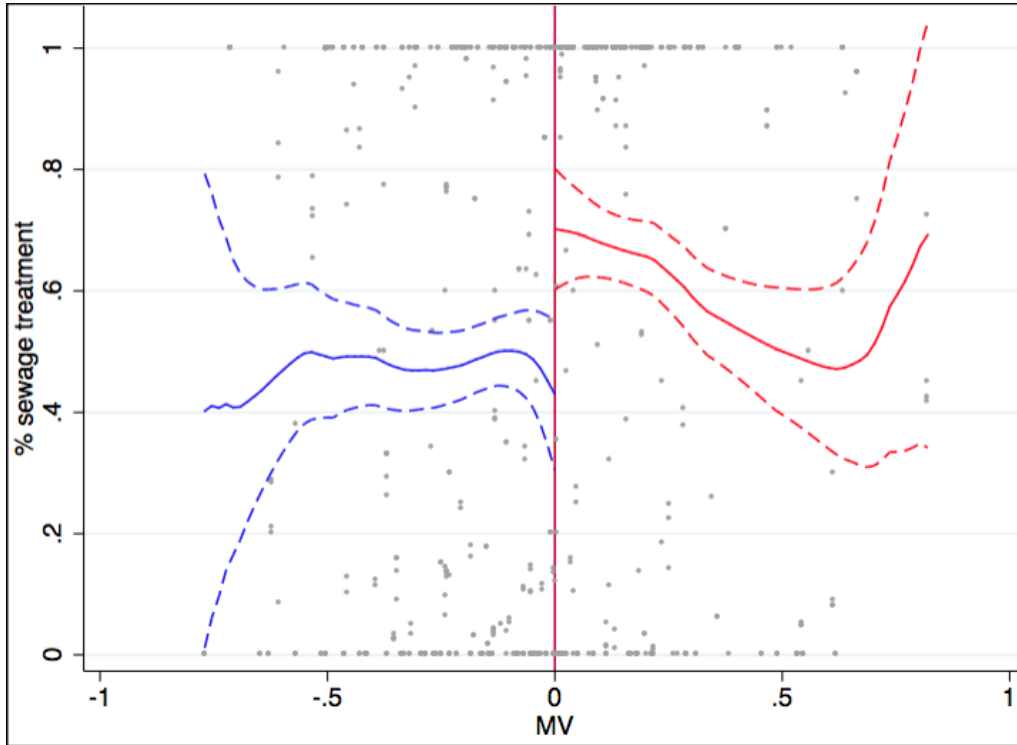
fluence on the local sanitation policy. Sewage treatment infrastructure are better in municipalities provided by state owned company SABESP because the latter is run the governor himself. In municipalities provided by local companies, this influence takes place through informal arrangements between political allies. These results are hard to reconcile with any other explanation.

7   Discussion

In this section, we address several concerns regarding the identification strategy. We discuss them in details and show that they are not likely to invalidate the results of the previous section.

The state of São Paulo has been ruled by governors affiliated to *Partido da Social Democracia Brasileira* (PSDB) over the period 2007-2012. Therefore, our political alignment variable is collinear with belonging to PSDB and the previous results might capture the fact that PSDB mayors have stronger preferences for sewage treatment. Two arguments make that possibility highly

Table 5: Estimates of first degree spline-polynomials.

Dependent variable	% Sewage treatment			
	(1)	(2)	(3)	(4)
Alignment	0.215**	0.186**	0.171*	0.205**
	(0.090)	(0.092)	(0.089)	(0.090)
MV	0.030	0.090	0.129	0.106
	(0.226)	(0.230)	(0.211)	(0.203)
Alignment*MV	-0.378	-0.436	-0.452	-0.550
	(0.334)	(0.348)	(0.331)	(0.342)
Electoral charact.	YES	YES	YES	YES
Population charact.	NO	YES	YES	YES
Fiscal charact.	NO	NO	NO	YES
Companies charact.	NO	NO	NO	YES
Time dummies	YES	YES	YES	YES
Mean DP	0.56	0.56	0.57	0.55
Observations	648	620	607	458
R-squared	0.073	0.098	0.150	0.224

Robust standard errors clustered at the municipality level in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

implausible.

First, if PSDB mayors had stronger preferences for sewage treatment, these should also appear in municipalities provided by SABESP. However, as Table 7 shows, the effect of political alignment is not significant in such municipalities, meaning that they provide, in average, as much sewage treatment as their non-aligned counterparts. As we concluded from the analysis in the previous section, as the governor has an influence on local sanitation policy through SABESP, the role of political alignment disappears. Second, expenditures on water and sewage collection projects are complementary to sewage treatment provision. We can hardly imagine mayors that would invest uniquely in sewage treatment infrastructures while not improving sewage collection or water distribution. Therefore, had PSDB mayors have stronger preferences for sewage treatment, should they also spend proportionally more on sanitation services as a whole. Nevertheless, Table 1 shows that, both, expenditures per capita on sanitation services and the share of the municipal budget spent on sanitation infrastructure are lower in aligned municipalities as opposed to non-aligned municipalities. For these reasons, we can safely discard the possibility that PSDB mayors have stronger preferences for sanitation services and in particular, sewage treatment.

Table 6: Estimates of sewage treatment level: regional vs local companies.

Dependent variable	% Sewage treatment					
	(1)	(2)	(3)	(4)	(5)	(6)
	Full sample	Aligned munic.	Non-aligned munic.	Full sample	Full sample	Full sample
Local company	-0.228***	-0.082	-0.301***	-0.363***	-0.299***	-0.283***
	(0.050)	(0.076)	(0.059)	(0.039)	(0.047)	(0.054)
Alignment * Local company				0.160**	0.160***	0.173**
				(0.063)	(0.062)	(0.067)
Electoral charact.	YES	YES	YES	YES	YES	YES
Population charact.	YES	YES	YES	YES	YES	YES
Fiscal charact.	YES	YES	YES	NO	YES	YES
Companies charact.	YES	YES	YES	NO	NO	YES
Time dummies	YES	YES	YES	YES	YES	YES
Mean DP	0.75	0.74	0.76	0.74	0.74	0.75
Observations	2,560	762	1,798	2,909	2,819	2,560
R-squared	0.224	0.232	0.271	0.183	0.201	0.232

Robust standard errors clustered at the municipality level in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Table 7: Regression discontinuity estimates for the regional company (SABESP).

Dependent variable	% Sewage treatment					
	(1)	(2)	(3)	(4)	(5)	(6)
	Linear	Quadratic	Cubic	Spline-lin	Spline-qua	Spline-cub
Alignment	-0.079*	-0.080*	-0.059	-0.079*	-0.049	-0.104
	(0.048)	(0.048)	(0.057)	(0.047)	(0.061)	(0.073)
Covariates	YES	YES	YES	YES	YES	YES
Time dummies	YES	YES	YES	YES	YES	YES
Mean DP	0.79	0.79	0.79	0.79	0.79	0.79
Observations	1,243	1,243	1,243	1,243	1,243	1,243
R-squared	0.202	0.203	0.203	0.204	0.205	0.207

Robust standard errors clustered at the municipality level in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Finally, a possible concern with our identification strategy is that it seems to have a negative jump in the population around the cutoff. In other words, aligned municipalities are, in average, less populated. Therefore, an unobservable characteristic might explain the political alignment of municipalities, their population size and the sewage treatment level. We must acknowledge that we cannot fully discard the possibility of confounding with such an unobservable characteristic. However, we cannot think of another interpretation that would be easy to reconcile with the results presented in the previous section. On the contrary, smaller municipalities tend to have lower sewage treatment as water discharges are less of an issue with a low population.[10]

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[10]In all our regressions, the estimates of population have always a positive coefficient which is sometimes significant.

8 Policy recommendations and concluding remarks

The main empirical conclusion of our paper is that political (mis)alignment matters for public good provision when responsibilities are shared across government levels. As argued by Oates (1972) long ago, when local administrations are not pressured to internalize externalities, they will be tempted to free ride and underprovide services. For any service that requires shared responsibilities, the same concern should apply. The risk is serious in the context of environmental policies. Accounting for spillovers is clearly not on the agenda of local politicians as revealed by the low commitment to sewage treatment in our study. The main positive spin to be put on our results is that we find that free riding can be reduced or eliminated when there is political alignment between local and state governments.

The policy implications of these results are of two types. The first set of implications is relevant to the assignment of mandates for activities with spillovers in the design of fiscal federalism. Our results imply that the higher the risks of free riding in the presence of spillovers, the higher the government level that should be in charge. This is not a new result but our case study adds to the collective evidence on this issue. Our contribution is to show that this general result also holds for shared mandates, thereby contributing to filling in what Mookherjee (2014) identified as a gap in the literature.

The second set of implications is more pragmatic in that it addresses what to do when mandates are shared and there is political misalignment across government levels. This paper shows that relying on political alignment can offer a solution to imperfect service delivery resulting from poor coordination across government levels. This solution is however quite unstable and is unlikely to be as effective as relying on the design of inter-governmental transfers to minimize political interferences with the allocation of resources across government levels. These transfers are however not full proof to political misalignments either as suggested by Sole-Olle (2011) and Brollo & Nannicini (2011). Therefore, for future research, we suggest to test the extent to which inter-governmental transfers designs could be used to mitigate the effect of political misalignment in the context of shared mandates in decentralized economies.

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