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**Inter-American Development Bank**  
Environment, Rural Development and Disaster Risk Management  
Division

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# Shared Mandates, Moral Hazard, and Political (Mis)alignment in a Decentralized Economy

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March 2015

## 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. Relying on difference-in-differences estimations, 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. Our results show that political alignment attenuates such moral hazard effects.

*Keywords:* political alignment; infrastructure provision; water and sanitary services; moral hazard; Brazil.

*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 a poorly studied area of research in political economy as there is little explicit analysis of the importance of political alignment to mitigate coordination problems associated with shared mandates resulting from decentralization (Mookherjee, 2014).

Our evidence is based on the analysis of sanitation policies in the state of São Paulo, Brazil. The Brazilian Constitution divides 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. Agency problems 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 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 in addressing the principal-agent problem that arises from such a lack of regulation. 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. In particular, the (sometimes implicit) hierarchy within a political party allows the governor to provide aligned mayors with tailored incentives. As a result, aligned municipalities should, on average, allocate more resources to sewage treatment.

From the empirical analysis of the poorly designed shared mandates across government levels, we establish a causal relationship between political alignment and higher sewage treatment level for municipalities that are provided by a local sanitation company.<sup>1</sup> We use panel data fixed effect (or diff-in-diff) estimations with a restricted sample of municipalities that experienced close elections. 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. This allows us to address potential endogeneity. Conceptually, our first set of results show that, in an environment with poorly defined contracts and uncertain local commitment, political misalignment leads to an under-provision of public goods. Additionally, we find that political alignment has no effect in municipalities supplied by the state-owned company SABESP and that provision of sewage treatment is higher in the latter (as opposed to municipalities provided by a local company). All together, 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 the state-owned company SABESP because the latter is run by 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

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<sup>1</sup>In the state of São Paulo, 40% of municipalities are provided by public local companies, while 56% are provided by the state-owned regional company SABESP. The remaining 4% are provided by private companies that we exclude from the analysis for their lack of representativity.

(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 alignment 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 a second-best solution and 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. A simple theoretical model of the role of political alignment in sewage treatment provision is provided in section 4. Section 5 defines our identification strategy while section 6 provides details on the data used in the empirical analysis. Section 7 reports the estimation results and section 8 discusses the potential threats to our identification strategy. Section 9 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 of 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 expla-

nations 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 (2012) 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, this literature 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 large number of authors argue that to succeed in multi-party systems, federalism has to be able to address 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 implementation. 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. 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. Similar to our paper, Lipscomb and Mobarak (2014) 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 they address the politics of decentralization, their explanation is anchored in changes in budget allocation resulting from decentralization rather than from purely political concerns.

The economic modeling of the initially apolitical concerns for disagreements on spillover 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 oriented 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 of 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 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, while this empirical research points to the importance of political coordination across government levels, none of these papers addresses the role of political (mis)alignment for the implementation of public policies 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 layer they are accountable to.

### **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 which is the most populated and richest in Brazil.<sup>2</sup> Because of that, it is also the largest and most important electoral college. Due also to its high urban and economic densities, water availability and pollution management is a crucial and as of today, the state is facing the worst drought ever recorded with serious discontinuity of water supply in dwells, factories and farms. 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 for 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 is needed 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 are still another half of municipalities where municipal companies provide services. Such a mix of state and municipal providers is the result of changes in water and sanitation policies in Brazil since the 1970s.

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<sup>2</sup>The population in the state of São Paulo is 43.6 million who generate about 33% of the national GDP and 41% of the national industrial value added (IBGE, 2013)

## **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 state 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 show poor performance.<sup>3</sup> 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.<sup>4</sup> Since then, the regulatory framework of the sector has been both unclear 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 sanitary 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 shared management should take form and, until today, no clear decision has been made. This controversy has created uncertainty, discouraging not only private investments but also service expansion in public companies.

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<sup>3</sup>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).

<sup>4</sup>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.

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).<sup>5</sup> Most importantly, water and sanitary services in Brazil remain largely unregulated with no clear rules or objectives to be complied with 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**

While mayors are the conceding authority for sanitation services, 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 (Seroa da Motta & Moreira, 2005). As a result, sanitation services have been subject to much weaker regulation.

Given this constitutional setting, mayors have no regulatory incentives to internalize sewage effluent effects on downstream water quality.<sup>6</sup> As a result, they provide a suboptimal level of sewage treatment that conflicts with the objectives of the governor. The governor can hardly circumvent this problem. Any initiatives for water decontamination that would not deal with local

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<sup>5</sup>According to Seroa da Motta & Moreira (2006) municipal companies, particularly private ones may practice lower tariffs with higher efficiency performance.

<sup>6</sup>Furthermore, evidence shows that mayors also lack political incentives to provide sewage treatment. According to a recent poll taken 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.

sanitation policy is potentially jeopardized by a lack of adequate sewage treatment infrastructure.

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 hardly an option since, as just explained, authorities have failed to set up a regulatory framework. As a result, governors are likely to rely on informal arrangements.

Informal arrangements to reconcile objectives between different government layers in order to deliver higher quality of public services are likely to take place within the political party. The political party, as an institution, offers alternatives to formal contracts which can be important in particular when budgets are constraining. The hierarchy between governors and mayors gives some leverage to the governor to provide mayors within the same party with tailored incentives such as promotions or support for electoral campaign in exchange for improvements in local sewage treatment infrastructure. Furthermore, an informal contract gives the governor more control over 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.

Also, 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.<sup>7</sup> 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.

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<sup>7</sup>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.

Thus, given this institutional setting, our predictions are as follows. Sewage treatment level is higher in municipalities that are aligned with a local sanitation company and in municipalities provided by SABESP, that is, wherever the governor has an influence on the local sanitation policy. In the former, the governor's influence is limited unless mayors are politically aligned with the governor. In the latter, sanitation policy is largely influenced by the governor whatever the political party of the mayor in office so that the effect of political alignment should disappear. In other words, the only set of municipalities that the governor cannot (informally) contract are municipalities not aligned with a local sanitation company, and they should provide a lower level of sewage treatment on average.

#### 4 A simple principal-agent model with moral hazard

In this section, we provide a brief theoretical foundation for the role of political alignment in sewage treatment provision. We build a simple principal-agent model with hidden action from Laffont & Martimort (2002).

Let us consider a principal-agent model with two types of agents: contractible  $c$  agents and non-contractible  $nc$  agents. Each agent provides a costly effort  $e$  that can take two values  $e \in \{0, 1\}$  in order to provide a level of production  $q$ . This effort is not observable by the principal and implies a disutility for the agent that is equal to  $\psi$  if  $e = 1$  and 0 otherwise.

We assume that only contractible agents can receive a transfer  $t$  from the principal. As motivated above, the principal cannot propose a contract to non-contractible agents, as the costs of writing the contract are arbitrarily high.

Next, we assume that both principal and agents are risk-neutral. Therefore, the payoff functions of contractible agents are given by

$$U_c = t - \psi \tag{1}$$

As non-contractible agents do not receive transfers from the principal, they do not exert high effort. Therefore, they get the reservation utility, that is,

$$U_{nc} = 0 \tag{2}$$

Sewage treatment production  $q$  is stochastic and only takes two values:  $q \in \{\underline{q}, \bar{q}\}$ . The effort influences production as follows:  $Pr(q = \bar{q}|e = 0) = \pi_0 \leq Pr(q = \bar{q}|e = 1) = \pi_1$ .

It is well known that, when agents are risk-neutral, the principal can offer a contract that induces the high effort without the agent extracting an information rent (Laffont & Martimort, 2002). That is, the principal is able to implement the first-best allocation. Thus, assuming that this contract is offered to all contractible agents, the latter exert a high effort.

As a result, we have that the expected production of a non-contractible agent is lower than the expected production of a contractible agent. Indeed, we have

$$\pi_0 \bar{q} + (1 - \pi_0) \underline{q} < \pi_1 \bar{q} + (1 - \pi_1) \underline{q} \tag{3}$$

since

$$\pi_1 \bar{q} + (1 - \pi_1) \underline{q} = \pi_0 \bar{q} + (1 - \pi_0) \underline{q} + (\pi_1 - \pi_0)(\bar{q} - \underline{q}) \tag{4}$$

with  $(\pi_1 - \pi_0)(\bar{q} - \underline{q}) > 0$  by assumption. Thus, on average, contractible politicians will produce more than non-contractible politicians.

## 5 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),  $\mu_i$  time-invariant unobservable characteristics and  $\delta_t$  a year fixed effect.

The Ordinary Least Square (OLS) model

$$s_{it} = \alpha + \beta A_{it} + \gamma X_{it} + \mu_i + \delta_t + \varepsilon_{it} \quad (5)$$

will provide a biased estimator of  $\beta$  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 (5) would only wipe out time-invariant characteristics yielding a biased estimator due to time-varying characteristics. To circumvent this problem, we restrict the sample of analysis to municipalities with close elections.

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.

We will estimate equation (5) with local panel data fixed effect regressions around  $MV_{it} = 0$  by restricting the sample to municipalities that have experienced close race elections. That is, we will consider only municipalities in the interval  $MV_{it} \in [-h, h]$  where the bandwidth  $h$  is sufficiently small so that observations are not contaminated by unobservable characteristics.

Alternatively, and in the fashion of Brollo & Nannicini (2012), we can estimate the ATE in close elections defined as

$$E[s_{it}(1) - s_{it}(0) | MV_{it} = 0] = E_{\varepsilon \rightarrow 0}[s_{it} | MV_{it} = \varepsilon] - E_{0 \leftarrow \varepsilon}[s_{it} | MV_{it} = \varepsilon] \quad (6)$$



using a spline polynomial in  $MV_{it}$  of order  $p$  that allows for differential slopes on either side of the cutoff:

$$s_{it} = \sum_{k=0}^p (\rho_k MV_{it}^k) + A_{it} \sum_{k=0}^p (\beta_k MV_{it}^k) + \delta_t + \eta_{it} \quad (7)$$

It is important to note that the policy being studied is irreversible. Sewage treatment plants, once built, are not shut down. As a result, if political alignment causes higher sewage treatment, one can only expect increases in rates for municipalities switching from a non-aligned to an aligned status. As diff-in-diff estimations exploit this exact within-municipality time variation in the political alignment and the sewage treatment levels, these are our preferred specifications.

## 6 Timing and data

Since 1994, the Federal Government, through the Modernization Program of Sanitation Sector, has been developing the *Sistema Nacional de Informações sobre Saneamento* (SNIS) as a system of information on the provision of water and sewerage services in Brazil. Data comes from the collection of information from state companies and local water and sewage providers. Data consistency analysis is carried out in two stages. The first one is to fill in an online form on the SNIS website (that should be consistent with previous years data). Once information is received, a technical team performs a second analysis of consistency. Participation in the SNIS survey is voluntary. We are not able to construct a representative sample for the entire country as most of the data regarding sewage treatment are reported missing.<sup>8</sup> Therefore, we have decided to restrict our analysis to the state of São Paulo for 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. From this database, our dependent variable  $s_{it}$  is measured as the following ratio:

$$s_{it} = \frac{\text{Volume of water treated } [m^3]}{\text{Volume of water collected } [m^3]} \quad (8)$$

in municipality  $i$  at time  $t$ .

In Brazil, state and municipal elections take place every four years but they do not coincide.

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<sup>8</sup>Precisely, more than 50% of the data regarding sewage treatment from most states in Brazil are reported missing in SNIS database.

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 a 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.

[Figure 1 about here.]

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 2010. In January 2011, Gerardo Alckmin was elected governor of the state of São Paulo and currently remains in office. These three governors are affiliated with the PSDB and as a result, our political alignment variable  $A_{it}$  is collinear to belonging to the PSDB. In section 8, we discuss at length why our empirical results do not capture the PSDB's potential stronger preferences for sewage treatment but rather the effect of political alignment on reconciling objectives between the governor and the mayors.

In addition to our variable of interest of political alignment, 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. 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 as well as the share of the water discharges generated by the population that is collected by the sewage network. All data regarding the fiscal revenues and expenditures of municipalities come from the *Finbra* dataset of *Tesouro Nacional*. Population and density data come from *Instituto Brasileiro de Geographia e Estadísticas* (IBGE) while sanitation related data come from SNIS database. Finally, 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*.

All regressions are made using a restricted sample to the municipalities in which a candidate affiliated to the party of the governor ran for municipal elections. Table 1 provides summary statistics of the variables used in our regression analysis.

[Table 1 about here.]

## 7 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. In Table 2, we report the results of panel data fixed effect estimations of equation (5) with a restricted sample around  $MV_{it} = 0$ . We consider the following bandwidths:  $h = 0.12$ ,  $h = 0.10$  and,  $h = 0.08$ . The point estimates of political alignment are significantly positive across specifications and suggest that sewage treatment provision is between 30% and 77% higher in municipalities in which the mayor is aligned with the governor. Importantly, all 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.

These results illustrate how a change in alignment provokes a change in sewage treatment level around the cutoff. By using the variation in the stock of sewage treatment, we account for fixed effects including the initial stock of sewage treatment. Furthermore, by restricting our sample to municipalities in which the aligned candidate has lost or won municipal elections by a narrow margin, we get rid of time-varying unobservable characteristics. Therefore, we are confident that these estimates can be interpreted as causal.

[Table 2 about here.]

Additionally, we also provide the results of regression discontinuity (RD) estimations. Using this approach, 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 is about 18% higher in aligned municipalities which correspond roughly to an increase of 31% with respect to the average level. Next, Figure 2 shows a non-parametric fit (local linear regressions of degree 1) of sewage 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 to the left of the cutoff (that is, in non-aligned municipalities). Rather, it is clear that it is an increase in sewage treatment level to 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 the electoral victory of the mayor of an aligned municipality, the lower the sewage treatment level.

[Table 3 about here.]

[Figure 2 about here.]

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 independently of political alignment.

Therefore, we test whether political alignment has a differentiated effect in municipalities provided by SABESP. To do so, we conduct an RD analysis with all municipalities and allow the discontinuity to be different if sanitation services are provided by a local company. That is, using the full sample, we estimate equation (7) with an additional term that is the interaction between the political alignment variable and a dummy variable for local sanitation company.<sup>9</sup> Results in

<sup>9</sup>More concretely, we estimate  $s_{it} = \sum_{k=0}^p (\rho_k MV_{it}^k) + A_{it} \sum_{k=0}^p (\beta_k MV_{it}^k) + L_i + A_{it} * L_i + \delta_t + \eta_{it}$  where  $L_i$  is a dummy variable that indicates whether or not the municipality is provided by a local sanitation company. Note that we cannot

Table 4 show that, for the entire sample, political alignment has no effect as the coefficient of the variable  $A_{it}$  alone is not significant (first row of Table 4). However, political alignment has a positive differentiated effect in municipalities provided with a local sanitation company as the interaction variable  $A_{it} * L_i$  is statistically positive across specifications (second row of Table 4). Finally, results also show that, compared to SABESP, local sanitation companies provide, in average, a lower sewage treatment level as the estimates of the variable  $L_i$  are negative (third row of Table 4). In these municipalities, the effect of political alignment comes to attenuate this service under-provision.

[Table 4 about here.]

Taken altogether, all the results reported in this section point to a very consistent and plausible interpretation. Sewage treatment level is higher whenever the governor has an influence on the local sanitation policy. Sewage treatment infrastructure is better in municipalities provided by state-owned company SABESP because the latter is run by 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.

## 8 Discussion

Over the period of observation 2007-2012, the state of São Paulo has been ruled by governors affiliated to *Partido da Social Democracia Brasileira* (PSDB). 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. Several arguments make that possibility highly implausible.

[Table 5 about here.]

[Table 6 about here.]

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make use of diff-in-diff estimations as  $L_i$  is time-invariant. However, as we estimate the discontinuity around the cutoff determined by close elections, these estimates do not suffer from endogeneity bias.

[Figure 3 about here.]

First, if PSDB mayors had stronger preferences for sewage treatment, these should be associated with stronger environmental preferences as part of a whole pro-environment strategy. As a placebo test, we check whether aligned mayors have higher expenses on municipal environmental management, the latter being a proxy for ecological preferences. Tables 5 and 6 replicate regressions of Tables 2 and 3, with municipal expenses per capita on environmental management as a dependent variable. It is clear from these results that environmental expenditures do not exhibit the same pattern as sewage treatment and are not influenced by political alignment as reported coefficients are insignificant. Figure 3 represents a non-parametric fit (local linear regressions of degree 1) for environmental expenditures. We can see that, unlike sewage treatment in Figure 2, there exists no jump at  $MV = 0$ .

Furthermore, if PSDB mayors had stronger preferences for sewage treatment, these should also appear in municipalities provided by SABESP. However, as Table 4 shows, the effect of political alignment is not significant in such municipalities, meaning that they provide, on average, as much sewage treatment as their non-aligned counterparts. As we concluded from the analysis in the previous section, if the governor has an influence on local sanitation policy through SABESP, the role of political alignment disappears.

For these reasons, we can safely rule out the possibility that PSDB mayors would provide more sewage treatment with no further incentives than the ones created by the political alignment with the governor.

## **9 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 under-provide 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 twofold. 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 when 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. However, these transfers are also not foolproof to political misalignments either, as suggested by Sole-Ollé (2011) and Brollo & Nannicini (2011). Therefore, for future research, we recommend testing the extent to which inter-governmental transfer designs could be used to mitigate the effect of political misalignment in the context of shared mandates in decentralized economies.

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

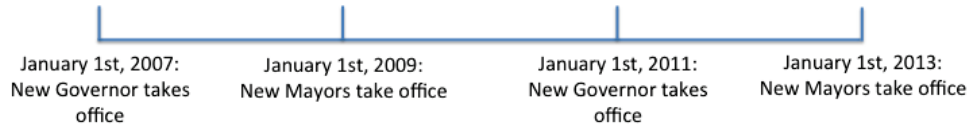


Figure 2: Non-parametric fit (local linear regressions) of sewage treatment.

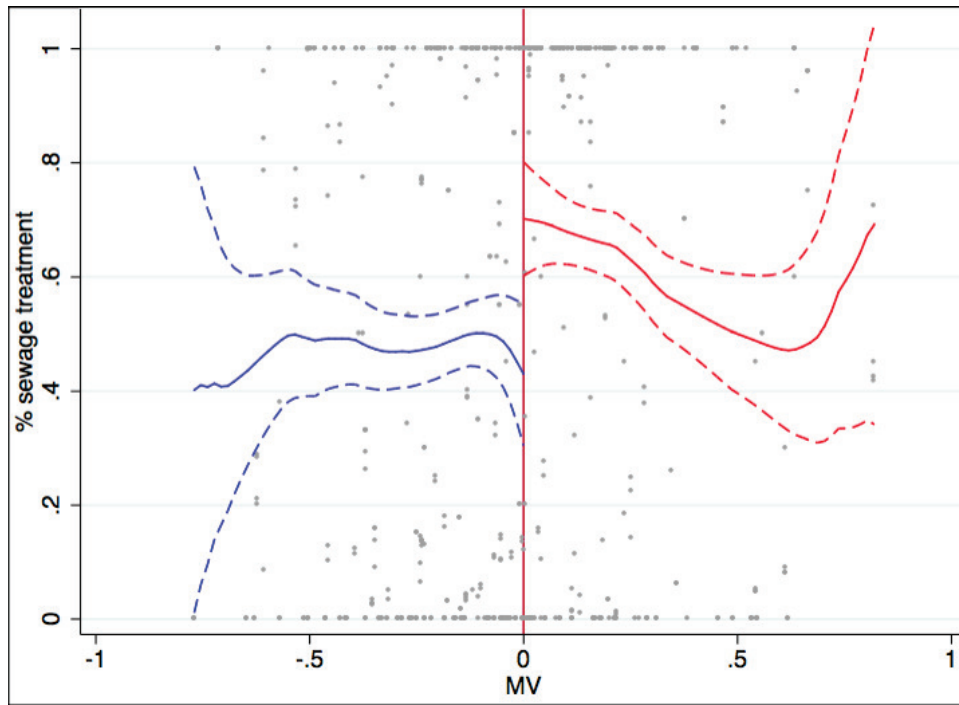
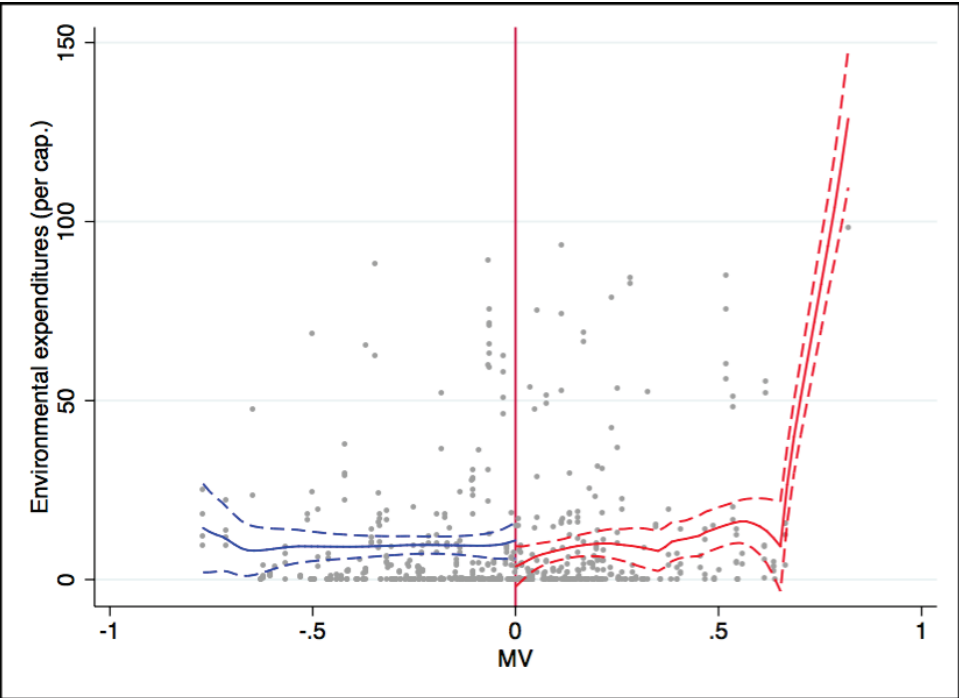


Figure 3: Non-parametric fit (local linear regressions) of per capita environmental expenditures.



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Table 1: Summary statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
% Sewage treatment	891	0.67	0.43	0.00	1.00
Alignment	891	0.49	0.50	0.00	1.00
Fiscal characteristics					
Municipal revenues per capita	710	2,108.99	872.34	887.77	8,360.91
Municipal sanitation expenditures per capita	710	113.07	84.87	0.00	707.96
Share of municipal budget spent on sanitation	884	0.05	0.04	0.00	0.26
State transfers for sanitation projects per capita	701	5.67	69.21	0.00	1,803.69
Federal transfers for sanitation projects per capita	701	1.46	9.86	0.00	159.50
Total transfers for sanitation projects per capita	701	7.13	69.92	0.00	1,803.69
Total discretionary state transfers per capita	701	49.21	113.26	0.00	1,953.28
Population characteristics					
Population	714	92,290.98	184,323.50	1,125.00	1,299,283.00
Density	714	360.20	1,289.52	5.58	1,2913.57
Share of urban population	714	0.89	0.12	0.30	1.00
Share of population connected to water network	891	0.91	0.13	0.00	1.00
Share of water discharges collected by sewage system	625	0.81	0.12	0.00	1.00
Electoral characteristics					
Second mandate	881	0.36	0.48	0.00	1.00
Victory margin	891	0.19	0.17	0.00	0.87

Table 2: Panel data regressions limited to close elections.

Dependent variable	% Sewage treatment								
	h=0.12			h=0.10			h=0.08		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Alignment	0.215*	0.199**	0.192**	0.296**	0.247***	0.231**	0.477**	0.416***	0.448***
	(0.116)	(0.089)	(0.096)	(0.135)	(0.087)	(0.105)	(0.198)	(0.139)	(0.105)
Fiscal charact.	YES	YES	YES	YES	YES	YES	YES	YES	YES
Population charact.	NO	YES	YES	NO	YES	YES	NO	YES	YES
Electoral charact.	NO	NO	YES	NO	NO	YES	NO	YES	YES
Time dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES
Mean DV	0.63	0.63	0.63	0.61	0.61	0.61	0.58	0.58	0.58
Observations	253	234	232	215	197	195	177	161	159
R-squared	0.151	0.202	0.208	0.163	0.264	0.285	0.221	0.344	0.379

Robust standard errors clustered at the municipal level in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1



Table 3: Regression discontinuity estimates.

Dependent variable	% Sewage treatment					
	(1) Linear	(2) Quadratic	(3) Cubic	(4) Spline-lin	(5) Spline-qua	(6) Spline-cub
Alignment	0.172** (0.087)	0.177** (0.087)	0.185* (0.104)	0.177** (0.087)	0.182 (0.116)	0.160 (0.152)
Fiscal charact.	YES	YES	YES	YES	YES	YES
Population charact.	YES	YES	YES	YES	YES	YES
Electoral charact.	YES	YES	YES	YES	YES	YES
Time dummies	YES	YES	YES	YES	YES	YES
Mean DV	0.58	0.58	0.58	0.58	0.58	0.58
Observations	605	605	605	605	605	605
R-squared	0.145	0.149	0.149	0.149	0.149	0.150

Robust standard errors clustered at the municipal level in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 4: Estimates of sewage treatment level: regional vs local companies.

Dependent variable	% Sewage treatment					
	(1) Linear	(2) Quadratic	(3) Cubic	(4) Spline-lin	(5) Spline-qua	(6) Spline-cub
Alignment	-0.064 (0.044)	-0.064 (0.045)	-0.056 (0.053)	-0.064 (0.044)	-0.058 (0.058)	-0.095 (0.073)
Alignment * Public local	0.205*** (0.067)	0.205*** (0.067)	0.205*** (0.067)	0.205*** (0.067)	0.205*** (0.066)	0.206*** (0.067)
Public local	-0.304*** (0.060)	-0.304*** (0.060)	-0.304*** (0.060)	-0.304*** (0.060)	-0.304*** (0.060)	-0.307*** (0.061)
Fiscal charact.	YES	YES	YES	YES	YES	YES
Population charact.	YES	YES	YES	YES	YES	YES
Electoral charact.	YES	YES	YES	YES	YES	YES
Time dummies	YES	YES	YES	YES	YES	YES
Mean DV	0.72	0.72	0.72	0.72	0.72	0.72
Observations	1,856	1,856	1,856	1,856	1,856	1,856
R-squared	0.194	0.194	0.194	0.194	0.194	0.195

Robust standard errors clustered at the municipal level in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 5: Difference-in-differences estimates with environmental preferences.

Dependent variable	Environmental expenditures								
	h=0.12			h=0.10			h=0.08		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Alignment	5.813 (3.851)	6.151 (3.872)	5.516 (3.934)	7.948 (5.123)	6.895 (4.685)	5.624 (5.692)	7.106 (10.206)	6.466 (10.179)	7.960 (8.492)
Fiscal charact.	YES	YES	YES	YES	YES	YES	YES	YES	YES
Population charact.	NO	YES	YES	NO	YES	YES	NO	YES	YES
Electoral charact.	NO	NO	YES	NO	NO	YES	NO	YES	YES
Time dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES
Mean DV	8.59	8.72	8.80	7.50	7.51	7.59	8.69	8.73	8.84
Observations	253	234	232	215	197	195	177	161	159
R-squared	0.170	0.197	0.201	0.155	0.190	0.193	0.228	0.239	0.248

Robust standard errors clustered at the municipal level in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 6: Regression discontinuity estimates with environmental preferences.

Dependent variable	Environmental expenditures					
	(1)	(2)	(3)	(4)	(5)	(6)
	Linear	Quadratic	Cubic	Spline-lin	Spline-qua	Spline-cub
Alignment	-4.885 (4.413)	-5.568 (4.388)	2.205 (5.412)	-5.313 (4.422)	3.026 (5.961)	-5.745 (6.143)
Fiscal charact.	YES	YES	YES	YES	YES	YES
Population charact.	YES	YES	YES	YES	YES	YES
Electoral charact.	YES	YES	YES	YES	YES	YES
Time dummies	YES	YES	YES	YES	YES	YES
Mean DV	10.00	10.00	10.00	10.00	10.00	10.00
Observations	605	605	605	605	605	605
R-squared	0.150	0.174	0.198	0.163	0.201	0.254

Robust standard errors clustered at the municipal level in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1