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SOCIAL CONTROL OF PUBLIC EXPENDITURE: The effect of social observatories monitoring on brazilian municipal outlays

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INTRODUCTION

Corruption, the "misuse of the public office for personal gain", is a global problem predominantly affecting poor and developing countries (S. Becker et al., 2009). At the subnational level, corruption in Brazil's 5,570 municipalities is of particular concern. In the 1990s, Brazil underwent a broad process of fiscal decentralization that transferred activities, resources, and responsibilities to the municipalities to ensure greater efficiency in provisioning public services and greater control over public spending (Rodden, 2003). In this context, municipal governments became responsible for implementing basic social programs in areas such as: health, education, and local infrastructure (Campos et al., 2018). Because of the insufficiency of municipal resources by the constitutional division of tax powers, sharing mechanisms were devised by which the Union transfers part of its tax collection to the municipalities (Durães & Ribeiro, 2018). However, to the extent that municipal governments have informational advantages (because of knowledge of the local reality) agency relationships and moral hazard problems can be established, where the agent (i.e. municipal government representatives) has incentives to act opportunistically, capturing portions of this income for itself and allies (Rodden, 2003).

Brazilian Local Governments receive, on average, US$ 30 billion per year from the Federal Government cash transfers (Tesouro Nacional, 2022), and despite some portions of the budget being constitutionally tied to certain expenses, mayors and local legislators enjoy broad discretion to decide how to spend the resources, opening up gaps for corruption. Ferraz & Finan (2011) estimate that corruption within municipal governments results in an annual depletion of approximately US$550 million from the funds allocated by the Union to the municipalities.

Serious corruption scandals in the mid-2000s sparked a public demand for greater accountability among public officials (France, 2019). As a response, mechanisms of "social control", involving the monitoring of public activities by civil society, began to be sought to ensure the proper implementation of public programs, policies, and budgets (Siraque, 2009). Against this backdrop, a non-profit institution called "Observatório Social de Maringá" was established in 2006 in the southern region of Brazil, with the aim of mobilizing local citizens to monitor public spending (Chies Schommer & Lima Moraes, 2010). The success of the Maringá initiative served as a catalyst for the emergence of "social observatories" in other cities, leading to the establishment of a national entity known as the "Observatório Social do Brasil" (OSB). Since 2008, OSB has been providing guidance and oversight to a network that now encompasses 136 units across 17 states of the Brazilian Federation (Ribas & Enara, 2018). In addition to the OSB network, our research has also identified 27 other independent observatories operating in Brazil.

Although qualitative approaches have been used to analyze social control, there is still limited econometric research on the causal effect of the social observatories' oversight on municipal public sector spending in Brazil. Our investigation identified (Seixas & Banhos, 2021) as the sole study of this nature published thus far. In their work, the authors examine the impact of observatories within the OSB network on various expenditure categories in municipalities in the state of Paraná. Their aim is to provide evidence that the monitoring efforts of these observatories lead to reductions in municipal public spending, primarily through enhancing efficiency in bidding processes and curbing corruption. The study presents evidence of social observatories' effectiveness; however, its limited scope, focusing solely on

municipalities in Paraná, restricts the external validity of the findings to other instances of Brazilian public administration, such as municipalities in different states. Furthermore, the study's exclusive analysis of the OSB network's monitoring, without considering the role of independent observatories, narrows the breadth of its results.

Therefore, there exist scientific gaps concerning: i) the effectiveness of social control by observatories in Brazilian municipalities, ii) the variations in effectiveness among social observatories in different states and municipalities of various sizes, and iii) the effectiveness disparity between observatories within the OSB network and independent ones. This article aims to build upon the work of Seixas and Banhos (2021) by examining the effects of social control on municipal expenditures across different states where observatories are present. The study encompasses both units within the OSB network and independent observatories. The primary objective is to test the hypothesis that, within the Brazilian context, the monitoring conducted by social observatories over local public administration is effective in reducing municipal public spending. This effectiveness can be achieved through enhancing bidding processes and mitigating local corruption. This hypothesis aligns with the findings of Caldas et al. (2016), which establish a positive association between municipal public spending and corruption levels in Brazilian municipalities, particularly in the health and education sectors.

Additionally, we examined three other hypotheses. The second hypothesis posits that in municipalities with fewer than 50,000 inhabitants, social observatories are particularly effective in social control of public spending. As detailed in Section Two, the institutional challenges stemming from the federal structure outlined in the Brazilian Constitution of 1988 hinder effective oversight of both municipal tax resources and funds transferred from states and the federal government to municipalities. In this context, social control emerges as a mechanism to ensure integrity and transparency in economic management within the local public sector. It is reasonable to assume that experiences of social control may yield more favorable outcomes in smaller municipalities, where formal control mechanisms over public spending are more precarious. However, it is crucial to consider the potential risk of co-optation faced by members of social observatory teams by local economic and political elites, which can compromise their oversight efforts (Bardhan & Mookherjee, 2000; Olken, 2007). This issue, not yet estimated in the Brazilian empirical literature, is of great importance, given that 90% of Brazilian municipalities have populations below 50,000 inhabitants (Klering et al., 2012). Considering the methodological and organizational nuances between OSB network observatories and independent observatories, the third hypothesis states that OSB network observatories achieve better results in terms of average per capita municipal expenditure reduction than the set of Brazilian social observatories as a whole. Lastly, the fourth hypothesis states that there is heterogeneity in the effectiveness of social observatories across different states of the brazilian Federation. This is due to the varying intensities of the culture of corruption in different regions of the country (see Borsky & Kalkschmied, 2019), which variably affect the probability of co-optation of observatory members, thereby impacting the effectiveness of observatories to different degrees. Understanding the heterogeneity of observatory effectiveness across different regions of the country is the first step towards formulating strategic actions that reduce this dispersion, ultimately bringing the group of observatories closer to experiences of greater effectiveness

The article proceeds as follows: Section two provides an exposition of the theoretical foundation, along with the institutional context within which the examined relationships unfold. Section three presents the survey data and delineates the definitions of the dependent variables. In section four, the empirical strategy is introduced, elucidating the three models employed in the conducted studies. Section five tests the formulated hypotheses and analyzes the obtained

results. Our concluding insights are presented in the sixth section, while section seven contains the appendices.

2. Background Theory and the Brazilian context.

Agency theory serves as a conceptual framework dedicated to exploring challenges stemming from the delegation of tasks between a Principal (in our analysis, the federal executive) and an Agent (such as municipal governments) (Eisenhardt, 1989). This theory assumes that actors are rational, opportunistic beings driven by utility maximization. It postulates that despite the Principal's formal authority, the Agent may possess informational advantages that enable them to shirk responsibilities or extract unwarranted benefits (Waterman & Meier, 1998). Consequently, agency theory suggests that the Principal should establish regulatory mechanisms within hierarchical relationships, implementing control systems that mitigate information asymmetry and limit Agent autonomy. Moreover, these control mechanisms should enhance the likelihood of detecting and penalizing opportunistic behavior, thereby reducing the potential gains from engaging in corruption (Eisenhardt, 1989; Leruth & Paul, 2006)

Drawing upon the works of Becker and Stigler (1974), Olken and Pande (2012) present a simplified model (equation 1) wherein the rational public agent faces the decision of engaging in honest or corrupt behavior. This choice hinges on several factors, including the probability and severity of punishment, the agent's system of moral values, and the prevailing cultural environment. The model assumes that the bureaucrat receives a salary (w) from the government and that, in the event of dismissal, they would secure employment in the private sector with a salary (v). If the agent chooses corruption, there exists a probability (p) of being terminated from the public sector, leading to the private sector salary. Conversely, if their corrupt actions go undetected, they would receive a salary (w) augmented by illicit gains (b), while incurring a cost (d) associated with compromising their moral values. Consequently, in an equilibrium scenario, the individual would opt for corruption solely if the burden of corruption (i.e., the wage loss w - v multiplied by the probability p of being exposed) is lower than the potential gain from corruption (i.e., bribery minus the cost of compromising moral values, multiplied by the probability of not being caught, 1-p).

$$(w - v)\, p < 1 - p\, (b - d) \tag{1}$$

The model aids in understanding the array of factors that contribute to reducing corruption. Ceteris paribus, the government can deter corruption by increasing the salary of bureaucrats (w), thereby intensifying the potential loss in the event of dismissal. Additionally, it can impose stricter penalties (such as hefty fines or imprisonment), diminishing the utility and income (v) the agent would gain in the market if they were terminated from the public sector. Initiatives such as educational campaigns and efforts to foster an anti-corruption culture can also play a role by instilling honesty and accountability as fundamental values in the mindset of public servants, thereby amplifying the cost (d) associated with dishonesty and discouraging corruption. The model predicts that implementing more effective controls over public sector activities amplifies the likelihood (p) of detecting and punishing deceit, which helps reverse the inequality outlined in equation 1, thus discouraging corruption.

Due to the inverse correlation between controls and corruption, the Brazilian federal constitution of 1988 established a public expenditure control system for the Federal, State, and Municipal levels, categorized into "internal control" and "external control" (Nóbrega, 2011).. Internal control refers to the policies and procedures implemented by an entity to ensure the proper execution of its own matters, preventing misuse, deviations, and wastage (Ejoh & Ejom,

2014). The Comptroller General of the Union (CGU), an entity affiliated with the Presidency of the Republic, oversees internal control within the federal executive bodies and federal public programs, as well as the resources and management transferred from the Union to municipalities (Oliveira Junior & Mendes, 2014). As dictated by Federal Law 13.341/16, the CGU is responsible for assessing the legality and evaluating the effectiveness and efficiency of budgetary and asset management in the bodies and entities of the Federal Public Administration. Despite being a cornerstone of the Brazilian public expenditure control system, internal control suffers from notable shortcomings. Given the vast expanse of Brazil, it becomes impracticable for the Comptroller General of the Union to cater to all demands. Consequently, the CGU resorts to a randomized lottery procedure to select representative samples of municipalities from each region of Brazil for auditing purposes (Campos et al., 2018)

At the state and municipal levels, the situation of internal controls within the local executive is equally concerning. As highlighted by Nóbrega (2011), in numerous states, internal control, which should be an integral part of the government's core functions, often manifests as a mere agency linked to the Secretary of Finance without an independent staff. Similarly, in municipalities, particularly in smaller and economically disadvantaged ones, the subpar quality of the bureaucracy and susceptibility to the influence of local elites present significant barriers to the establishment of effective controls. As Nóbrega (op. cit, p. 61) states, "In small municipalities, control does not appear to be a value, and the mayor demonstrates little to no interest in its implementation

External control encompasses the authority of the legislative branch to oversee the expenditure of the executive branch. Upholding the system of checks and balances essential to democracy, Article 49 of the 1988 Brazilian Federal Constitution confers upon the national congress the power to “inspect and control, directly, or through any of its Houses, the acts of the Executive Branch”. This oversight responsibility, entrusted to the legislators, is commonly executed not by senators, deputies, and councilors, but by the Federal and State audit courts acting on their behalf. At the municipal level, the TCEs (State Audit Courts) scrutinize expenditures financed by local tax resources as well as state transfers, while the TCU (Federal Audit Court) monitors municipal spending of Federal funds allocated by the Union for the administration of federal social programs at the local level.

Regarding the TCEs, however, there is compelling evidence suggesting that these institutions have not fulfilled their role in a comprehensive and transparent manner. An independent evaluation conducted by the "Fundação Getúlio Vargas – RJ" university in collaboration with the Brazilian Ministry of Justice revealed that the TCEs fail to meet the minimum standards set forth by the Law of Access to Information (LAI), both in terms of active disclosure and responsiveness to information requests (Oliveira & Rodrigues, 2017). Furthermore, the appointment of ministers and counselors within both the TCU and the TCEs is often influenced by political considerations from the legislative and executive branches, rather than a meticulous assessment of professional competence and academic merit (France, 2019).The pervasive practice of unethical patronage, as highlighted by Sakai & Paiva (2016), has resulted in the politicization of the audit courts, with approximately 80 percent of ministers having previously held elected or high-ranking positions in public administration, over 20 percent being defendants or having faced convictions, and more than 30 percent having familial ties to politicians (a clear manifestation of nepotism). The lack of transparency and politicization significantly impede the ability of the Audit Courts to effectively carry out their inspection duties (Nóbrega, 2011).

In this particular context, the social control of public spending can serve as a means to alleviate the chronic corruption and inefficiency prevailing within the Brazilian public sector. In

situations where internal and external controls face limitations in their inspection capacity due to resource constraints, legal jurisdiction boundaries of the CGU, or inefficiencies within the audit courts, civil society emerges as a valuable resource to enhance the "accountability" of public administration. In a vast country such as Brazil, comprising 26 states and over 5500 municipalities, civil society groups possess the potential to enforce the proper implementation of local public policies and initiatives by actively monitoring the performance of subnational governments and shedding light on any existing shortcomings(Rich, 2013).

While social control holds the potential to combat local corruption and enhance public management efficiency and accountability, it should not be viewed as a panacea for all challenges. Research conducted by Olken (2007) in the Indonesian context revealed the limited effectiveness of social control, indicating that increased citizen monitoring did not lead to a significant reduction in public spending. This was primarily attributed to the co-optation of responsible citizens by local elites. In a case study on the Social Observatory of Itajaí (SP), Chies Schommer & Lima Moraes (2010) highlighted that despite the institution's claim of technical analyses, the selection and disclosure of information for transparency purposes were subject to power dynamics, determining what, when, how, and by whom information was shared, and for whose benefit. While social control of public spending can serve as a means to mitigate chronic corruption in Brazil, it is important to recognize that its effectiveness may vary. Notably, Brazil has two prominent examples in the realm of public sector control through social observatories, namely the OSB network and the Observatório Social de Maringá. The Observatory of Maringá, as the first of its kind in Brazil, has played a pivotal role in shaping the creation of the OSB network and inspiring numerous independent observatories to adopt its guidelines and adapt them to their specific needs. Both the Maringá Observatory and the OSB network employ similar methodologies for monitoring the municipal public sector, focusing on bid inspections and fostering a culture of transparency and accountability in collaboration with civil society and local public entities (Schommer et al., 2012).

When it comes to bid monitoring, the president of the OSB unit in Brasília, Antônio de Barros, outlines the OSB network's approach as a two-step process. Initially, the OSB unit ensures that the procurement aligns with the municipality's requirements in terms of price, quality, and quantity. Subsequently, the Observatory oversees various aspects such as supplier selection, delivery, payment, and even product distribution (Controladoria Geral da União, 2016, p.3). On the other hand, in an interview with the journal of the brazilian "National Council of Justice", Fábia Sacco, the president of the Social Observatory of Maringá, provides insight into their method of bid monitoring.

> The first phase analyses the bid notice and, when necessary, ask the public authorities to challenge or amend the clauses of the bidding. After concluding the public notice is transparent, it is disclosed to as many companies as possible. The second phase focuses on the bidding process, the prices, quantities, and quality of the products and services purchased. The third phase monitors the delivery of products or services and verifies whether it complies with the bidding specifications. It also evaluates inventory control and effective consumption (Fernandes, 2015, p. 1).

In terms of fostering a culture of transparency and accountability, the OSB places significant emphasis on the value of transparency as a fundamental component of social control. They acknowledge that many municipalities comply with legislation by making fiscal information available on their transparency portals. However, the technical nature of this data often presents challenges for the average citizen to grasp. To address this, the OSB offers citizen qualification courses and undertakes awareness-raising initiatives to highlight the importance of monitoring public spending. They also diligently monitor municipal transparency portals to ensure adherence to legislative requirements. Similarly, in Maringá, there is a strong

commitment to raising public awareness and promoting fiscal education. Recognizing that these topics can be less engaging, they employ creative resources such as plays, informal debates, and writing contests. These interactive activities aim to captivate participants and underscore the social significance of taxes while emphasizing the role of citizen involvement in monitoring public spending (SEDUC- Maringá, 2017).

Although the methodologies employed by the OSB and the independent observatories may differ in certain aspects, the primary distinction lies in their organizational structures. The OSB operates as a well-organized network, employing a standardized methodology that allows for the transfer of accumulated experience through training programs and the sharing of strategic information among its units. Furthermore, the OSB coordinates with other civil society institutions to enhance the effectiveness of local observatories. These advantages are not accessible to independent observatories (Schommer et al., 2012). Given these characteristics, it is reasonable to assume that, on average, the observatories within the OSB network exhibit greater effectiveness in monitoring the activities of the municipal public sector. This assumption forms one of the hypotheses that we will explore further.

Considering that the OSB network adopts a standardized methodology and that the majority of observatories in Brazil are affiliated with the OSB, it is worth exploring whether there are significant variations in the effectiveness of monitoring across different Brazilian states and the underlying factors contributing to these differences. One plausible explanation for the heterogeneity in effectiveness among states could stem from varying levels of corruption. In regions where corruption is more rampant, the incentive for co-opting members of social observatories is likely to be higher. As corruption becomes more deeply ingrained and the number of offenders increases, individuals may experience diminished feelings of guilt for violating rules, face reduced reputational and social consequences for being convicted of corruption, and encounter a lower probability of being detected due to limited investigative capacity (G. S. Becker & Stigler, 1974; Del Monte & Papagni, 2007)

By employing a "spatial dependence model," Bologna (2017) identified clusters of corruption within each Brazilian state, highlighting variations in the intensity of corruption between states and within different regions of each state. If interstate heterogeneity in corruption levels exists, it is reasonable to expect differing degrees of cultural acceptance of corruption at the regional level, which can impact both the co-optation of members and the effectiveness of observatories. Testing the hypothesis of interstate heterogeneity enables the identification of regions where observatories may be more vulnerable, thus facilitating targeted interventions to address the situation.

3. Data

To assess the impact of observatories on municipal expenditures, we utilized comprehensive data from the Brazilian National Treasury Secretariat covering the period from 2002 to 2017. This allowed us to construct a panel dataset consisting of 5,532 municipalities and 16 years of observations. However, due to computational challenges arising from the sheer volume of data, we had to adopt a regional geographic division approach. This involved grouping municipalities into "Immediate Regions," which are clusters of interconnected municipalities linked by economic dependencies. Consequently, we focused our analysis solely on municipalities belonging to at least one Immediate Region. This refinement led to a reduced sample size of 1,463 municipalities, ensuring a more manageable and analytically robust dataset for our research.

In order to capture the effects of observatories on specific expenditure categories subject to scrutiny, we disaggregated the overarching category of "Total expenses" into two main components: "Current" and "Capital" expenses, as depicted in Table 1. Within the "Current" expenditure category, we further divided it into several subcategories: "Personnel" expenses, encompassing salaries and labor charges for municipal employees; "Interest" expenses, representing debt payment charges; and "Other current expenses."

The "Other current expenses" subcategory was further segmented into distinct items, including "Consumption of Materials" (e.g., uniforms, hospital supplies, vehicle fuel), "Freely Distributed Materials" (e.g., textbooks, medicines, food provisions for public school lunches), "Services Outsourced to Individuals" (e.g., maintenance services provided by individuals), "Services Outsourced to Legal Entities" (e.g., contracted services from external organizations), and "Per Diem" (which covers reimbursements for accommodation, meals, and transportation expenses incurred by public servants during work-related travel).

The examination of these individual expenditure items, provides insights into the specific areas where observatories may have an impact. This categorization follows the guidelines outlined by the Ministry of Finance (Ministério da Fazenda, 2008).

Table 1 – Municipal expenses

Expense		Group	Subgroup
TOTAL	Current	Personnel	-
		Interest	-
		Other	Consumption of Materials
			Freely Distributed Materials
			Outsourced Services to Individuals
			Outsourced Services for Legal Entities
			Per diems
	Capital	Amortization	-
		Investiment	Equipment and Permanent Material
			Construction and Installations

Source: Seixas and Banhos (2021)

The "Capital" expenses are divided into "Amortization" expenses (i.e., payment or refinancing of the principal and monetary correction of the municipal public debt) and "Investments" (i.e., expenses related to the planning and execution of infrastructure projects). The "Investments" category further breaks down into "Equipment and Permanent Materials" (i.e., acquisition of equipment and materials with a durability of over two years) and "Construction and Installations" (i.e., development of electrical or hydraulic installations and the construction or acquisition of buildings) (Ministério da Fazenda, 2008). All values were adjusted annually for inflation and divided by the estimated population of each municipality for each year, in order to obtain per capita measures. Population data is sourced from the Brazilian Institute of Geography and Statistics (IBGE).

The list of municipalities housing established OSB units, along with their respective dates of establishment, was obtained from the secretariat of the Social Observatory of Brazil. We submitted a formal request via phone and email to obtain this information. To identify independent observatories, we conducted a search on the "Rede Sim" internet portal of the Federal Revenue Service. By utilizing the search function with the term "Social Observatory," we successfully identified all institutions currently operating or previously operating under the name "Social Observatory" in Brazil. The Rede Sim portal also furnished registration data for these institutions, including the issuance date of their CNPJ numbers (the identification

numbers for legal entities in Brazil), which we deemed as the foundation dates for the independent social observatories. In total, we identified 163 observatories, comprising 136 OSB units and 27 independent observatories, scattered across 18 states in the country. To ensure an unbiased analysis, data from all state capitals were excluded, as their behavioral patterns were likely to diverge significantly from those of other municipalities.

Finally, we narrowed down the sample to "Immediate Regions," resulting in a dataset consisting of 122 observatories (106 OSB units and 16 independent observatories) spread across 11 states in Brazil. In addition to these variables, the estimated models also incorporate controls for the mayor's political affiliation during their term in office. The period from 2002 to 2017 encompasses five terms: 2001-2004, 2005-2008, 2009-2012, 2013-2016, and 2017-2020. Information on incumbent mayors and their political affiliation was obtained from the municipal election results available on the websites of the Superior Electoral Court (TSE) and the Regional Electoral Courts (TREs).

4. Empirical strategy

Estimating the causal impact of social observatories on municipal expenditures requires special attention due to the non-random nature of their implementation in municipalities. Both the OSB network units and independent observatories are established based on the interest and initiative of citizens in promoting social control of public spending. As a result, unobservable characteristics of municipalities can influence both the decision to establish an observatory and the quality of fiscal management. In a municipality, if the population exhibits political and economic preferences that favor stricter public administration, it can drive the emergence of a collective of citizens with a vested interest in establishing a social observatory, as well as in electing more upright and capable politicians. Therefore, this unobservable cultural characteristic can introduce a downward bias in average expenditures, as the greater fiscal management efficiency observed in municipalities with social observatories may not be solely attributed to oversight activities, but also to a tendency for greater fiscal austerity by elected representatives. Furthermore, various local cultural elements and specific temporal factors can introduce confounding effects, including unit and time-specific fixed effects, which, if not adequately considered, can bias the estimates. Therefore, it is imperative to employ a rigorous methodology that effectively neutralizes these effects (Angrist & Pischke, 2015; Imbens & Wooldridge, 2009). In this study, we adopt the difference-in-differences (DD) approach to isolate the intervention's effect by eliminating time-fixed effects and temporal trends (Cunningham, 2021).

In its standard formulation, the difference-in-differences approach involves two groups, two time periods, and two treatment states. The treatment group, denoted as G = 1, is compared to the control group, denoted as G = 0. The post-intervention period is represented by T = 1, while the pre-intervention period is represented by T = 0. The states where the treatment is applied are labeled as (1), while the untreated states are labeled as (0). In this framework, the intervention effect, known as the "Average Treatment on the Treated" (ATT), is captured by equation 2, which compares the average outcome of the treatment group in the treated state during the post-intervention period (the first term of the subtraction) with its counterfactual (i.e., the average outcome that the treatment group would have had in the absence of treatment).

$$EMTT = E\left[Y_{i,1}(1)\middle|G_i = 1\right] - E\left[Y_{i,1}(0)\middle|G_i = 1\right] \quad (2)$$

As it does not belong to the realm of empirical reality, the counterfactual is naturally unknown and not calculable. However, assuming the hypothesis of parallel trends, which, as

shown in equation 3, presumes that in the absence of treatment, the temporal evolution of the results of the treatment and control groups would be the same, it becomes possible to estimate the ATT.

$$E[Y_1(0) - Y_0(0) \,|G = 1] = E[Y_1(0) - Y_0(0) \,|G = 0] \quad (3)$$

When the pre-intervention trends of the treatment and control groups are very similar, as they result from the same set of influences, it is possible to assume that the averages would evolve in a parallel way in the intervention's absence (Cunningham, 2021). Thus, when the hypothesis of parallel trends is verified, the double subtraction strategy of the difference-in-differences approach (see equation 4) allows the identification of the intervention effect, isolating it from time and unit fixed effects. The treatment effect is identified in a two-step process. The first calculates the difference between the pre-and post-intervention periods of the empirical mean of the outcome variable $E_n[Y_1 - Y_0]$, both for the treatment group $G_i = 1$ and the control group $G_i = 0$. This first pair of subtractions eliminates any effects that remain fixed in time. The second step calculates the difference between the differences, isolating the treatment from its counterfactual. That is, isolating the treated group results evolution from what would happen, had the treatment have not occurred, identifying the average effect of the treatment on the treated (Callaway & Sant'Anna, 2020).

$$\widehat{EMTT} = E_n[Y_1 - Y_0|G_i = 1] - E_n[Y_1 - Y_0|G_i = 0] \quad (4)$$

Equation 4, where the ATT is calculated by hand, is algebraically convertible into the DD regression equation (equation 5), in which y_{it} represents the expected value of the per capita municipal outlays over time, ϵ_{it} is the stochastic error term, $POST_t$ and $TREAT_i$ are dummies for treatment period and status, and the coefficient δ represents the ATT, i.e., the average difference between treated and untreated, in the post-intervention period (Sant`Anna & Callaway, 2020)

$$y_{it} = \gamma_t POST_t + \gamma_i TREAT_i + \delta\, POST_t \,.\, TREAT_i + \epsilon_{it} \quad (5)$$

However, as the observatories of the different municipalities are implemented at different moments in time, being subject to differential treatment time, we are forced to move away from the 2x2 approach, with two groups (treatment and control) and two periods (pre and post), adopting the difference-in-differences Two Way Fixed Effects approach, which uses dummies for individuals (γ_i) and time periods (λ_t) as fixed effects, in addition to the treatment dummies (D_{it}) (Goodman-Bacon, 2021).

$$y_{it} = \alpha + \gamma_i + \lambda_t + \delta^{DD} D_{it} + u_{it} \quad (6)$$

In addition to the traditional structure of the TWFE model, our models incorporate a specific linear trend for each municipality, along with a vector of control variables (X_{it}), as indicated in equation 7.

$$y_{it} = \alpha + \gamma_i + \lambda_t + \delta OS_{it} + \theta X_{it} + \sum_{i=1}^{n} \beta_i (Municipality_i \times t) + u_{it} \quad (7)$$

In our models, the coefficient δ serves as a measure of the effect of the observatory (OS_{it}) on the dependent variable (municipal expenditure). Including fixed effects and linear trends makes it possible to better control for the effects of unobservable variables, correlated with the Observatory's presence and to the dependent variables, avoiding the omitted variables bias. In

the X_{it}vector, we include control variables that shift the demand for public services and that may be correlated to observatories presence, such as: per capita municipal GDP and the added value of the agricultural, industrial, and service sectors. We further incorporate a dummy variable for the mayor's party, to control for any effects emerging from the ideological-party orientation.

Besides this first analysis, we performed another three, totaling four studies. The second analysis imposes a cut on the data, analyzing only municipalities with a population of fewer than 50,000 inhabitants, to assess whether the observatories are especially effective in small towns. The third one, changes the specification, of the basic model (for the specification of equation 8), interacting the dummy OS_{it} (with 1 denoting the presence of social observatory and 0 otherwise) with the dummy $\mathrm{OSB_{it}}$ (where 1 denotes the presence of observatory of the OSB network and zero otherwise), to assess whether the observatories of the OSB network achieve, on average, better results in terms of per capita municipal outlay reduction, than those promoted by the Brazilian social observatories in general.

$$y_{it} = \alpha + \gamma_i + \lambda_t + \delta OS_{it} \times OSB_{it} + \theta X_{it} + \sum_{i=1}^{n} \beta_i (Municipality_i \times t) + u_{it} \quad (8)$$

Finally, the fourth study modifies the basic model again, interacting OS_{it} with the categorical variable "State" (see equation 9), seeking to assess the presence of heterogeneity in the social observatories monitoring effectiveness in different states of Brazil.

$$y_{it} = \alpha + \gamma_i + \lambda_t + \delta OS_{it} \times State_{it} + \theta X_{it} + \sum_{i=1}^{n} \beta_i (Municipality_i \times t) + u_{it} \quad (9)$$

While the parallel trends hypothesis cannot be directly tested, evidence of its validity can be found through event studies. An event study is a graphical representation of the point estimates and confidence intervals of the coefficients in the TWFE model during the pre- and post-treatment periods (Cunningham, 2021). Event studies are particularly relevant in difference-in-differences analyses, as the estimated values (the point estimates) represent the average differences between the treatment and control groups at each time point. When the pre-intervention point estimates are statistically null, with their confidence intervals crossing zero, it suggests that the difference between the treatment and control group outcomes over time is not significant, indicating parallel trends. Conversely, statistically significant point estimates provide evidence of non-parallel trends (Huntington-Klein & McDermott, 2021). Out of the fifteen per capita expenses analyzed in our models, the parallel trends hypothesis is refuted for only two variables: 'Outsourced services to individuals' (shown in Figure 2, in the appendix) and 'Amortization' (in Figure 3). Therefore, the estimates for these expenses become suspicious of bias and are not considered in subsequent analyses[i]

5. Analysis of results by stated hypothesis:

5.1. The effectiveness of social observatories

The first hypothesis posits that social observatories play an effective role in reducing per capita expenses in the Brazilian context. This implies that the estimated coefficients of the difference-in-differences analysis will be negative and statistically significant. Tables 2a, 2b, and 2c present the results of our model (equation 7) for fifteen different expense items. As anticipated, nine of these items exhibit negative and statistically significant coefficients at a 5% significance level, providing strong support for the effectiveness of the observatories. Conversely, one item, "Outsourced Services for Individuals," shows a positive and statistically significant coefficient, challenging the hypothesis. However, as shown in Figure 2 of the

appendix, there is suspicion of non-parallelism of trends in this specific expense. Thus, the evidence overwhelmingly supports the hypothesis that Brazilian social observatories are effective in controlling municipal public spending.

Table 2a - Impact of observatories on Per Capita Expenses (R$/Inhabitants)

	Total Expense	Current Expense	Interest	Personnel	Other Current Exp.
Observatório	-96,208**	-59,625*	-0,939	-78,882***	20,196
	(38,682)	(32,257)	(1,122)	(19,930)	(21,315)
N	23.011	23.011	23.011	23.011	23.011
R^2	0,137	0,152	0,053	0,176	0,110

Notas *p < ,1; **p < ,05; ***p < ,01

Table 2b - Impact of observatories on Per Capita Expenses (R$/Inhabitants)

	Consumption of Materials	Freely Distributed Materials	Outsorced Serv. Individuals	Outsorced Serv. Entities	Per Diems
Observatório	-13,096**	-4,688**	15,086***	9,113	-2,038***
	(6,631)	(1,989)	(2,676)	(17,347)	(0,729)
N	23.011	23.011	23.011	23.011	23.011
R^2	0,052	0,114	0,074	0,083	0,050

Notas *p < ,1; **p < ,05; ***p < ,01

Table 2c - Impact of observatories on Per Capita Expenses (R$/Inhabitants)

	Capital Expenses	Amortization	Investiment	Equipament and Permanent Material	Construction and Instalations
Observatório	-36,721**	2,606	-40,049***	-22,380***	-45,962***
	(16,273)	(2,837)	(14,511)	(3,402)	(9,875)
N	23.011	23.011	23.011	23.011	23.011
R^2	0,049	0,037	0,050	0,037	0,033

Notas *p < ,1; **p < ,05; ***p < ,01

5.2 Social observatories small town greater effectiveness hypothesis.

This second study focuses on municipalities with populations of less than 50,000 inhabitants, which, as argued earlier, lack institutional controls to a greater extent. These towns face significant deficiencies in both internal control (by the Federal and Municipal Executive Branches) and external control (conducted by the Legislature, TCU, and TCEs). The context of small municipalities presents a dilemma. On one hand, it is reasonable to assume that the implementation of a new control unit, such as a new observatory, would have a considerable marginal effect, potentially even higher than in larger municipalities. However, on the other hand, due to the close proximity of observatory team members to local elites within the small town's social network, there is a greater risk of co-optation by bureaucrats and local politicians, which could potentially diminish the effectiveness of the observatory (Olken, 2007)

Table 3a - Impact of observatories on Per Capita Expenses (R$/Inhabitants)

	Total Expense	Current Expense	Interest	Personnel	Other Current Exp.
Observatório	-140,742	-132,986**	1,817	-112,492***	-22,311
	(91,633)	(64,326)	(2,243)	(38,710)	(41,300)
N	19.029	19.029	19.029	19.029	19.029
R^2	0,141	0,164	0,049	0,180	0,119

Notas *p < ,1; **p < ,05; ***p < ,01

Table 3b - Impact of observatories on Per Capita Expenses (R$/Inhabitants)

	Consumption of Materials	Freely Distributed Materials	Outsorced Serv. Individuals	Outsorced Serv. Entities	Per Diems
Observatório	-5,504	-3,011	18,127***	-16,871	0,651
	(14,329)	(4,600)	(6,392)	(33,582)	(2,486)
N	19.029	19.029	19.029	19.029	19.029
R^2	0,057	0,126	0,080	0,091	0,066

Notas *p < ,1; **p < ,05; ***p < ,01

The study aims to empirically unravel this puzzle. However, the evidence presented in tables 3a, 3b, and 3c initially appears to be ambiguous. These tables reveal that only three out of the fifteen per capita expenditure items showed a significant reduction in averages after treatment: "Current Expenses," "Personnel Expenses," and investments in "Equipment and Permanent Material." For the remaining eleven expenses, including categories such as "Investments" and "Construction and Installations," which are prime targets for observatory

inspections, the effects were statistically null. However, despite the small number of expenses with negative and significant coefficients, a comparison of these coefficients with the estimated ones for Brazil as a whole (refer to Tables 2a, 2b, and 2c) reveals that the reduction in expenses in small municipalities was significantly more pronounced.

The decline in average expenditures, following the treatment, in municipalities with populations below 50,000, is significantly more pronounced for the categories of "Current Expenditure" (R$ -132.98), "Personnel" (R$ -112.49), and "Equipment and Permanent Material" (R$ -25.02) compared to the national level reductions for the same expenses. Specifically, these declines are 123%, 42.6%, and 11.8% more intense, respectively. These findings provide partial support for the hypothesis at hand, suggesting that the effectiveness of social observatories is particularly significant in small municipalities compared to the broader sample encompassing municipalities of all sizes.

Table 3c - Impact of observatories on Per Capita Expenses (R$/Inhabitants)

	Capital Expenses	Amortization	Investiment	Equipament and Permanent Material	Construction and Instalations
Observatório	-8,837	-2,512	-10,396	-25,027***	-17,954
	(39,946)	(5,460)	(32,707)	(7,788)	(15,324)
N	19.029	19.029	19.029	19.029	19.029
R^2	0,049	0,049	0,049	0,031	0,035

Notas $^{*}p < ,1$; $^{**}p < ,05$; $^{***}p < ,01$

5.3 Hypothesis of the greater effectiveness of OSB network observatories

The objective of the third study is to evaluate the differential effectiveness between observatories within the OSB network and the broader landscape of Brazilian observatories, with the aim of determining whether the OSB observatories can be considered the "gold standard" for social observatories. As mentioned earlier, there are only minor distinctions between the standardized approach adopted by the OSB network units and the methodologies employed by independent observatories such as the "Observatório de Maringá." However, beyond the potential variations in outcomes due to methodological heterogeneity, the collaborative nature of the OSB observatories and their knowledge-sharing network may provide competitive advantages that result in superior outcomes in terms of reducing municipal expenses (Van Laere & Heene, 2003).

Hence, utilizing the model of equation 8, where we interact the dummy variable OS_{it} with the OSB_{it} dummy variable, we test the hypothesis that, on average, the social control of public expenditures conducted by OSB observatories is more effective than that carried out by Brazilian observatories in general. The results, presented in Tables 4a, 4b, and 4c, lead to a counterintuitive finding. The standardized methodology and network organization do not appear to guarantee superiority for OSB observatories. In fact, out of the fifteen expenditure items analyzed, thirteen (86% of cases) exhibit statistically insignificant coefficients for the interaction between the OS_{it} and OSB_{it} dummy variables, indicating a lack of significant differences between the effects of OSB observatories and the overall set of brazilian observatories. At a significance level of 5%, only the coefficients associated with "Services

Outsourced for Legal Entities" and investments in "Construction and Installations" were found to be significant. However, the analysis of these two expenses presents ambiguous evidence.

Table 4a - Impact of observatories on Per Capita Expenses (R$/Inhabitants)

	Total Expense	Current Expense	Interest	Personnel	Other Current Exp.
Observatório	-202,351**	-174,711***	-2,389	-142,649***	-29,673
	(80,026)	(67,306)	(1,945)	(45,926)	(37,501)
Obs x OSB	126,773	137,454*	1,732	76,161	59,561
	(89,784)	(75,497)	(2,294)	(50,436)	(43,918)
N	23.011	23.011	23.011	23.011	23.011
R^2	0,137	0,152	0,053	0,176	0,111

Notas *p < ,1; **p < ,05; ***p < ,01

Table 4b - Impact of observatories on Per Capita Expenses (R$/Inhabitants)

	Consumption of Materials	Freely Distributed Materials	Outsorced Serv. Individuals	Outsorced Serv. Entities	Per Diems
Observatório	1,842	-4,863	18,454**	-49,492**	-1,957
	(16,168)	(4,094)	(8,216)	(24,670)	(1,623)
Obs x OSB	-17,842	0,208	-4,024	69,995**	-0,096
	(17,421)	(4,579)	(8,586)	(31,143)	(1,751)
N	23.011	23.011	23.011	23.011	23.011
R^2	0,052	0,114	0,074	0,084	0,050

Notas *p < ,1; **p < ,05; ***p < ,01

For the category "Services outsourced to legal entities," Table 4b reveals that the brazilian set of observatories reduces this expense (on average) by R$-49.49 compared to the control group. In contrast, the "OSB network" increases it by R$69.99 relative to the set of brazilian observatories, resulting in an increase of R$20.50 compared to the control group. Conversely, regarding per capita expenses in "Construction and Installations," Table 4c demonstrates that the brazilian set of observatories achieves an average reduction of approximately R$8.98 compared to the control group. However, OSB's observatories further deepen this reduction by R$44.17, leading to a significant reduction of R$53.15 relative to the control group. The findings indicate that the effects of the OSB observatories on municipal expenses are

comparable to those of the broader set of brazilian observatories, thereby refuting the hypothesis of greater effectiveness of the OSB network.

Table 4c - Impact of observatories on Per Capita Expenses (R$/Inhabitants)

	Capital Expenses	Amortization	Investiment	Equipament and Permanent Material	Construction and Instalations
Observatório	-28,482	-1,668	-24,552	-27,989***	-8,982
	(25,300)	(6,113)	(21,850)	(6,462)	(17,321)
Obs x OSB	-9,840	5,104	-18,508	6,700	-44,168**
	(31,121)	(6,804)	(27,182)	(7,354)	(20,157)
N	23.011	23.011	23.011	23.011	23.011
R^2	0,049	0,037	0,050	0,037	0,033

Notas *p < ,1; **p < ,05; ***p < ,01

5.4 The hypothesis of interstate heterogeneity of the observatories' effectiveness.

Based on equation 9, where we introduced the interaction term between the dummy variable "OS" (representing the effect of observatories) and the variable "State," we tested the hypothesis of interstate heterogeneity in observatory effectiveness, specifically examining the differential effectiveness among social observatories in different states. The results obtained provide compelling evidence in support of this hypothesis. Table 5 and Figure 1 illustrate a wide range of possibilities across states, spanning from nearly complete observatory ineffectiveness to high levels of effectiveness. Figure 1 presents a state-wise distribution of coefficients, with red bars indicating positive and significant coefficients at a 5% level (suggesting that the observatories' actions lead to an increase in municipal per capita expenses) and green bars representing negative and significant coefficients. States consistently exhibiting positive and significant coefficients may indicate the presence of pockets of significant local corruption and co-optation of observatory team members.

The Northeast region of Brazil is characterized by the presence of the least effective cases. One such case is the State of Piauí (PI), which has had an OSB network unit in the municipality of Picos since 2014. In Piauí, 60% of the analyzed expenditures (nine out of fifteen) exhibit positive and significant coefficients in the difference-in-differences analysis. Notably, Piauí is the only state in the Federation where the item "Total Expenditure" shows a positive and significant coefficient (at a 5% level), indicating that the average total expenses, after accounting for the control group average, increase following the implementation of the observatory. Additionally, as shown in Table 5, Piauí displays positive and significant coefficients for items such as "Investment," investments in "Equipment and Permanent Material," and investments in "Construction and Installations" (which are priority areas for observation by the observatories).

Table 5 – Observatories Impact on Percapita Expenses (Expenditure/Inhabitants)

State	Total	p-value	Current	p-value	Interest	p-value	Personnel	p-value
BA	21,181	0,762	-46,655	0,179	1,451	0,033	2,506	0,906
MG	-110,372	0,334	-73,541	0,428	-5,627	0,377	-138,655	0,028
MS	88,714	0,366	119,225	0,203	-7,903	0,003	4,66	0,948
MT	14,38	0,921	-34,561	0,786	2,371	0,65	-141,937	0,081
PI	144,551	0	18,862	0,622	8,190	0	88,741	0
PR	-84,338	0,27	-63,586	0,205	-2,076	0,293	-85,239	0,001
RJ	-64,476	0,738	-147,728	0,321	3,066	0,501	-109,418	0,235
RO	-121,998	0,275	-129,776	0,195	4,360	0	-117,317	0,085
RS	-142,971	0,167	-122,863	0,196	2,298	0,504	-141,401	0,024
SC	-265,896	0,001	-140,662	0,067	-1,034	0,534	-102,042	0,039
SP	74,557	0,402	140,325	0,196	-1,809	0,674	37,49	0,604

UF	Other.	p-value	Consumption Material	p-value	Freely Distributed	p-value	Outsorced individuals	p-value
BA	-50,611	0,051	21,167	0,224	5,499	0,099	46,34	0
MG	70,741	0,296	21,524	0,125	-5,233	0,412	11,021	0,51
MS	122,468	0,005	-41,955	0,196	3,195	0,355	-19,442	0,065
MT	105,005	0,178	75,363	0,075	1,535	0,465	34,033	0,164
PI	-78,07	0,002	-92,244	0	8,833	0	-18,325	0,304
PR	23,729	0,499	-8,6	0,435	-1,581	0,649	17,098	0
RJ	-41,375	0,695	-8,193	0,484	-10,058	0,022	-5,89	0,688
RO	-16,819	0,648	-35,118	0,041	-5,889	0,015	11,204	0,029
RS	16,241	0,774	-33,177	0,004	-7,988	0,031	8,883	0,012
SC	-37,585	0,359	-25,546	0,019	-10,866	0,018	14,019	0,001
SP	104,644	0,254	-28,75	0,305	-6,426	0,419	13,691	0,063

UF	Outsorced entities	p-value	Per diem	p-value	Capital Expenses	p-value	Amortiz.	p-value
BA	-93,81	0	-0,835	0,339	67,401	0,12	-8,116	0,34
MG	16,201	0,476	-6,615	0,122	-37,109	0,444	-2,556	0,803
MS	106,023	0	-10,326	0	-29,69	0,082	14,361	0,021
MT	-11,59	0,757	5,862	0,262	49,737	0,5	32,544	0,001
PI	27,973	0,178	-7,829	0	124,393	0	10,75	0
PR	-6,697	0,808	-1,63	0,257	-20,949	0,539	-1,469	0,78
RJ	-100,498	0,085	-1,548	0,161	82,898	0,152	-19,654	0,116
RO	-66,583	0	-13,397	0	8,142	0,813	11,506	0,007
RS	87,713	0,145	-2,06	0,017	-20,316	0,572	6,8	0,413
SC	-9,503	0,759	-3,249	0,001	-125,487	0	5,058	0,335
SP	80,853	0,275	0,28	0,875	-65,558	0,156	5,248	0,558

UF	Investiment	p-value	Equipament and Permanent Material	p-value	Construction and Instalations	p-value
BA	72,046	0,066	30,896	0	51,371	0,097
MG	-34,734	0,41	7,018	0,57	-54,571	0,126
MS	-46,12	0,004	-24,516	0,002	-38,988	0,003
MT	15,976	0,816	-28,848	0	-59,484	0,314
PI	109,191	0	10,452	0,003	52,373	0
PR	-23,061	0,423	-39,255	0	-35,624	0,005
RJ	104,626	0,032	7,772	0,265	37,642	0,337
RO	-4,285	0,901	-67,225	0	-68,514	0,019
RS	-29,872	0,421	-21,565	0,068	-47,586	0,175
SC	-126,939	0	-27,955	0	-87,777	0
SP	-68,429	0,088	-0,108	0,983	-63,055	0,044

Source: Self elaborated.

Note: The values highlighted in green and red indicate statistically significant coefficients at the 5% level. Green represents negative coefficients, while red represents positive ones.

Apart from capital expenditures, Piauí also presents positive and significant coefficients for other expenses including: "Interests," "Freely Distributed Materials," and "Personnel". In this state, only three municipal expenditure items exhibit negative and significant coefficients: "Other current expenses", "Consumption of Materials", and "Per diem". Therefore, in the state of Piauí, the downsides outweigh the benefits, and it appears that the social observatory does not benefit the local society.

The State of Bahia (BA) follows a similar, albeit more subtle, pattern, exhibiting positive and statistically significant coefficients at a 5% significance level for the categories of "Equipment and Permanent Material" and "Interest." Additionally, positive coefficients (significant at a 10% level) were observed for investments in "Construction and Installations" and "Freely Distributed Materials." Bahia is home to six municipal observatories, all part of the OSB network. However, negative and statistically significant coefficients (associated with expense reduction) were identified for only two categories: "Other Current Expenses" and "Outsourced Services for Legal Entities".

In turn, the State of Rondônia (RO), the sole representative from the North region in the sample, presents a more encouraging scenario. Rondônia has a single observatory, which is part of the OSB network. While it displays positive and statistically significant coefficients for the categories of "Interest," "Outsourced Services for Individuals," and "Amortization," the latter two are suspected of exhibiting non-parallel trends bias and are therefore disregarded. In line with expectations, the state exhibits negative and statistically significant coefficients for six expenditure items, including "Consumption of Materials," "Freely Distributed Materials," "Outsourced Services for Legal Entities," "Per diem," "Equipment and Permanent Material," and "Construction and Installations.

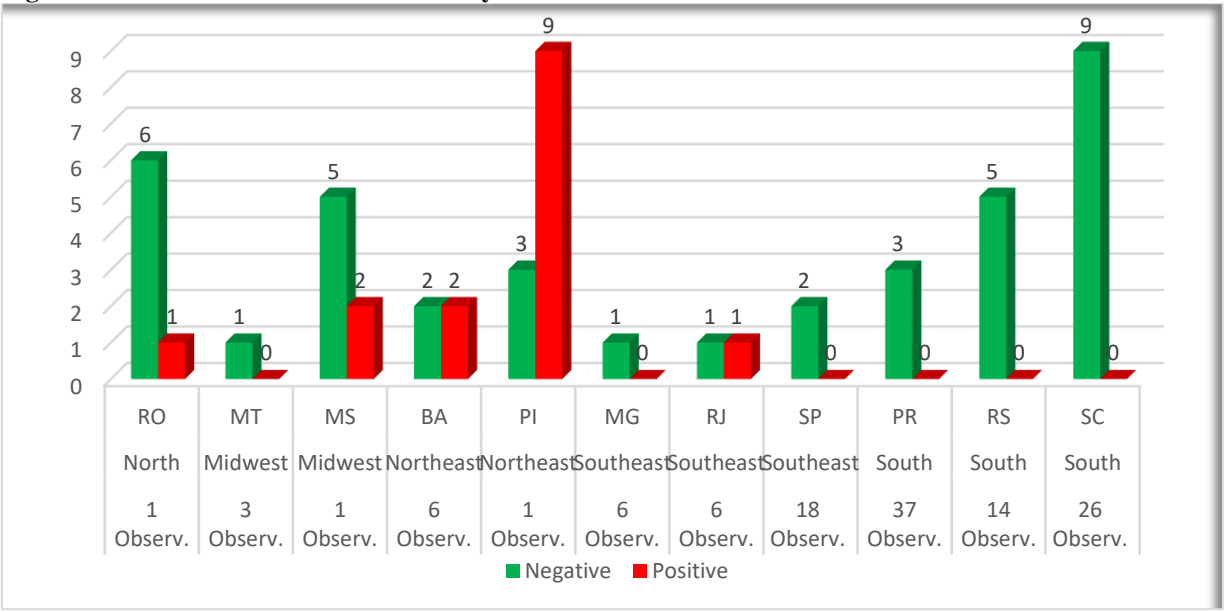
The states of Mato Grosso and Mato Grosso do Sul represent the Midwest region in the sample. In Mato Grosso (MT), the estimated coefficients are not statistically significant, except for two cases: i) the positive and significant coefficient of "Amortization" (which is suspected of exhibiting "non-parallelism bias"), and ii) the negative and significant coefficient of investments in "Equipment and Permanent Material". The latter provides favorable evidence for the hypothesis of the effectiveness of the observatories in the municipalities of Cáceres and Sorriso (OSB network) and Rondonópolis (independent), which operate in this state. In the state of Mato Grosso do Sul (MS), in turn, the coefficients for the overall category of "Investments," as well as investments in "Equipment and Permanent Material" and "Construction and Installations," are negative and significant. This suggests the effectiveness of the independent observatory in Dourados, the only one operating in the state, in monitoring capital expenditures. However, when it comes to current expenses, the evidence is less conclusive. Positive and significant coefficients are observed for categories such as "Other Current Expenses" and "Outsourced Services to Legal Entities," while negative and significant coefficients are observed for categories like "Per diem" and "Interest." Table 5 indicates the effectiveness of the observatories in these two states in the Midwest region, while also highlighting the need for improvements in their monitoring practices and strategies.

In the three states of the southeastern region of Brazil, Rio de Janeiro (RJ), Minas Gerais (MG), and São Paulo (SP), the coefficients of difference-in-differences are, with rare exceptions, not significant. The scarcity of significant and negative coefficients suggests that the effectiveness of the social observatories strategy for public expenditure control has been relatively low in these states. What may be associated with inefficiencies in the observatories management, or with team members co-optation by local elites. Rio de Janeiro, for example, which has six observatories (all from the OSB network) have only two significant coefficients. One negative, for "Outsourced Services to Legal Entities" and one positive, for the heading "Investment". Minas Gerais, served by six OSB network observatories and an independent one, has a single significant and negative coefficient associated with "Personnel" expenses. And São Paulo (which has eighteen observatories of the OSB network and an

independent one) performs only a little better than its Southeast counterparts, presenting two negative and significant coefficients associated with the headings: “Investment” and “Construction and Installations”.

Finally, in the south region, the observatories demonstrate a higher level of effectiveness compared to the rest of the country. Among the three states included in the sample—Paraná (PR), Rio Grande do Sul (RS), and Santa Catarina (SC)—a significant number of expense categories show negative coefficients that are statistically significant, aligning with our expectations. However, there is one exception: the expense category of "Outsourced Services to Individuals," which, as discussed earlier, exhibits a potential bias related to non-parallel trends.

Figure 1 – Effectiveness of observatories by State



Source: Self elaborated.
Note: The coefficients in the figure are significant at the 5% significance level.

In the state of Paraná, which boasts thirty-seven observatories (thirty-one OSBs and six independent ones), three expenses exhibit significant and negative coefficients: "Personnel", "Equipment and Permanent Material", and "Construction and Installations". Moving on to Rio Grande do Sul, with fourteen observatories, all from the OSB network, five expenses show negative and significant coefficients: "Personnel", "Consumption of Materials", "Freely Distributed Materials", "Per diem" and "Equipment and Permanent Material". Lastly, in Santa Catarina, which has twenty-six observatories (twenty-four OSBs and two independent ones), nine expenses display negative and significant coefficients: "Total Expenses", "Personnel", "Consumption of Materials", "Freely Distributed Materials", "Per diem", "Investment", "Equipment and Permanent Materials" and "Construction and Installations".

The stark variation observed among states in terms of observatory effectiveness highlights a complex landscape. Surprisingly, states like Minas Gerais and Rio de Janeiro, despite having a considerable number of observatories, exhibit effectiveness equal to or even lower than states with fewer observatories such as Mato Grosso, Mato Grosso do Sul, and Rondônia. Similarly, when comparing states with similar numbers of observatories, the discrepancies in effectiveness are striking—São Paulo contrasting with Rio Grande do Sul, and Santa Catarina standing in almost diametric opposition to Piauí. These disparities suggest that certain regions may still harbor a deeply ingrained culture of corruption, entrenched within the values, habits, and traditions of their populations (Hodgson, 2007). This resistance hampers the

establishment of a culture of transparency and accountability championed by the social observatories, ultimately limiting the practical impact of their endeavors.

6. Final remarks

Despite receiving limited attention from the Brazilian press, municipal corruption poses significant harm, particularly affecting the most vulnerable segments residing in cities with low levels of economic and social development. Constraints on the legal authority and material resources of the General Comptroller of the Union, inefficiencies within audit courts, and a lack of interest among council members in overseeing city hall contribute to the flourishing of corruption. In this context, social observatories emerge as an invaluable tool with the transformative potential to create transparent environments governed by accountability. However, the effectiveness of social observatories faces practical challenges, including the ability to engage dedicated volunteers capable of monitoring bidding processes and public expenditures, effectively disseminating financial education, and, most importantly, resisting pressures, threats, and attempts at co-optation by corrupt politicians and local elites.

In our initial study, we aimed to address the effectiveness of social observatories in controlling municipal public spending within the Brazilian context. Through an analysis of the difference-in-differences coefficients of fifteen per capita expenses, using equation 7 as our model, we discovered compelling evidence regarding the effectiveness of these observatories. The results revealed significant declines (at a 5% level of significance) in approximately 60% of municipal expenses during the post-intervention period. A percentage that rises to 67% when considering a 10% level of significance.

Regarding the greater effectiveness of social observatories in small and sparsely populated municipalities, a dilemma arises. On one hand, the weakness of the institutional control system tends to yield significant results with any increase in oversight, such as that provided by the social observatories. On the other hand, the proximity to local bureaucrats and politicians increases the risk of co-opting representatives of the observatories. The research findings shed light on which side of this scale weighs more in the Brazilian context. The monitoring conducted by the social observatories leads to a substantial reduction (at a 5% level of significance) in 20% of the analyzed per capita expenses. Notably, these reductions are considerably greater within the sample of small municipalities. Therefore, when considering categories such as “Current Expenditure”, “Personnel”, and investments in “Permanent Material and Equipment”, the evidence demonstrates that social observatories are more effective in small municipalities. As for other categories, two of them likely exhibit biased coefficients due to non-parallel trends, while the remaining categories, although not statistically significant, generally display negative coefficients, reinforcing the evidence of the effectiveness of social observatories in small municipalities. The presented results create room for further investigation into why the greater effectiveness of observatories in small cities is significantly observed in certain expenses but not in others.

As for the hypothesis of the greater effectiveness of the OSB observatories relative to the set of Brazilian observatories, the research did not find evidence that validates it. The results seem to suggest that the methodological and operational differences of the OSB network do not provide differentials of effectiveness. This is a counterintuitive result because even though there are few methodological differences between the OSB and the independent observatories, the operational differences are remarkable. The literature in the fields of Industrial Organization and Strategy in Organizations predicts competitive advantages for organizations that operate in a network (Van Laere & Heene, 2003). According to Granovetter (1985), network operation facilitates access to resources that expand the organization’s competencies. Besides ensuring access to strategic actors, information holders, and resources that can prove to be of great value

at opportune times (Burt, 1992). For these reasons and because our base of independent observatories is small (containing only 16 units), we recommend caution in accepting this result and we suggest that future research delve deeper into this topic.

Finally, the results presented in Table 5 and Figure 1 provide compelling evidence supporting the hypothesis of interstate effectiveness heterogeneity among observatories. This phenomenon can be reasonably attributed to varying levels of corruption institutionalization across different states. When corruption becomes deeply rooted within a society, embedded in its social norms and daily practices, it becomes pervasive and enduring (Sandholtz & Taagepera, 2005). This is because the individual's expected gains from corruption "depend on their perception of the prevalence of corruption within the organization or society" (Del Monte & Papagni, 2007; p. 383). Bologna (2017) has mapped corruption hotspots across different states in Brazil, revealing a higher concentration and intensity in the Northeast region and the state of Rio de Janeiro. These cues indicate significant challenges to the dissemination of a culture of transparency and accountability in these localities, thus hindering the effectiveness of social observatories as our results show. Also, it calls attention to the need for strategies and tactics of social control, specially designed for the different regions of Brazil.

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Apendix:

Event studies present cues of parallelism of trends for the treatment and control groups when the difference-in-differences placebo point estimates in the pre-intervention are statistically insignificant, having their confidence interval crossed by zero (CUNNINGHAM, 2021). Among the fifteen per capita expenses studied, only two categories, "Outsourced

Services to Individuals" and "Amortization" (Figures 2 and 3), deviate from this pattern, exhibiting a parabolic trajectory that causes several placebo coefficients to have their confidence interval unbounded by zero in the pre-intervention period. Figures 2 to 7 in this appendix present event studies of some independent variables of this research. Due to space constraints, we cannot present event studies for all fifteen expense categories analysed.

Figure 2 - Event Study - Outsourced Services to Individuals outlays

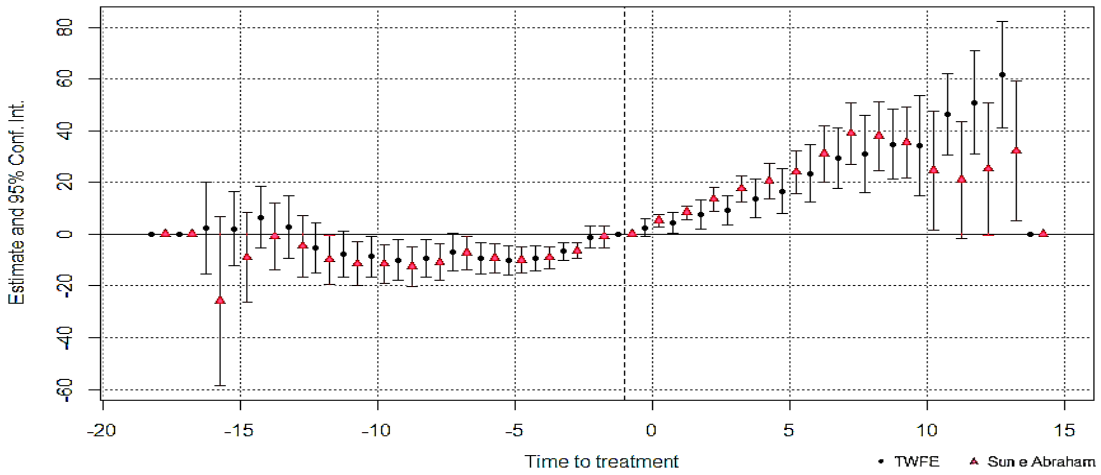


Figure 3 – Event Study – Amortization outlays

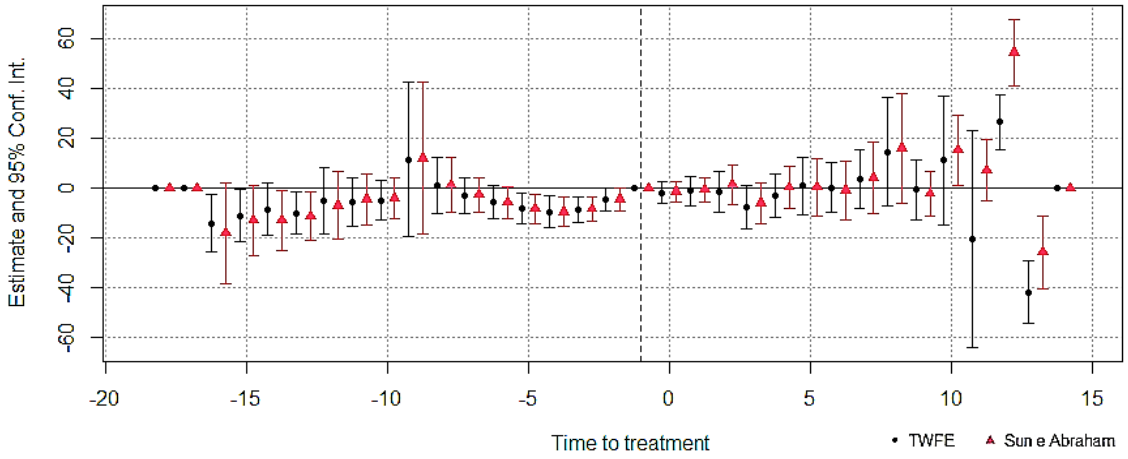


Figure 4 – Event study – Total outlays.

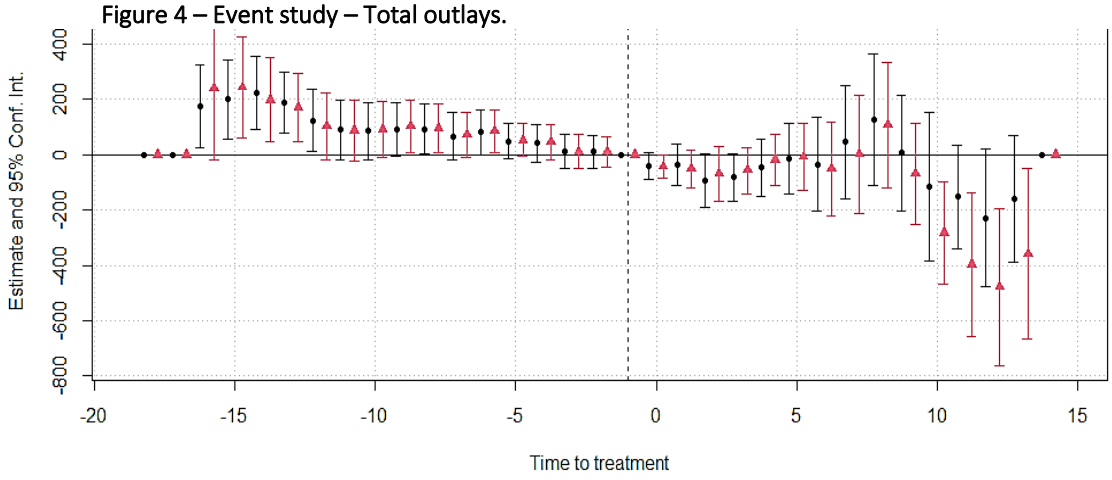


Figure 5 – Event study – Current Outlays

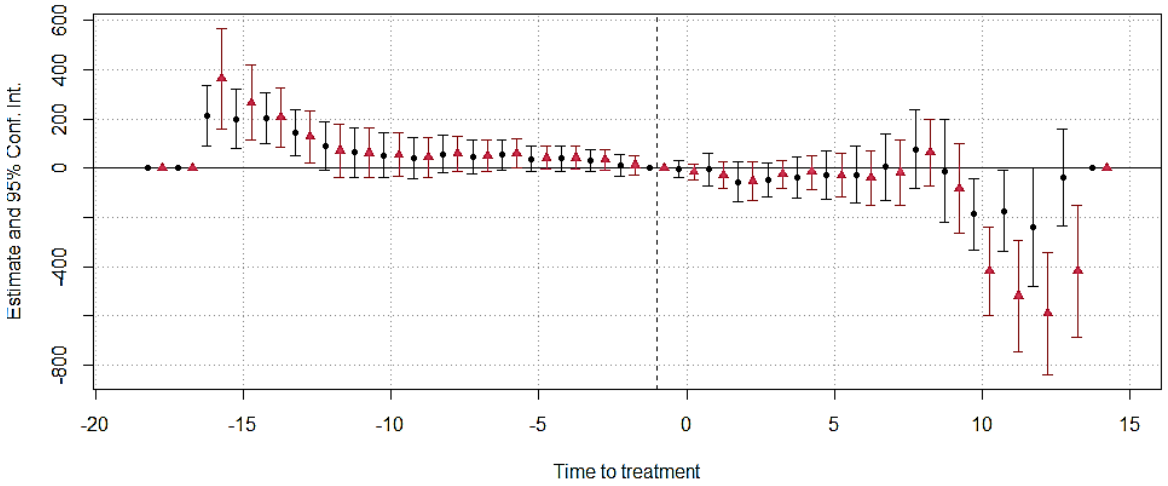


Figure 6 – Event study – Interest outlays

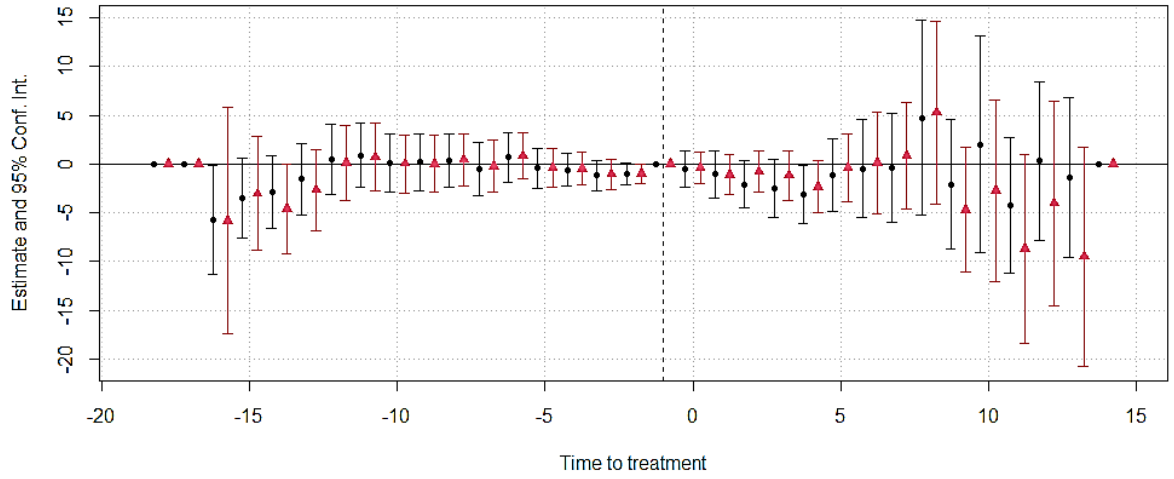
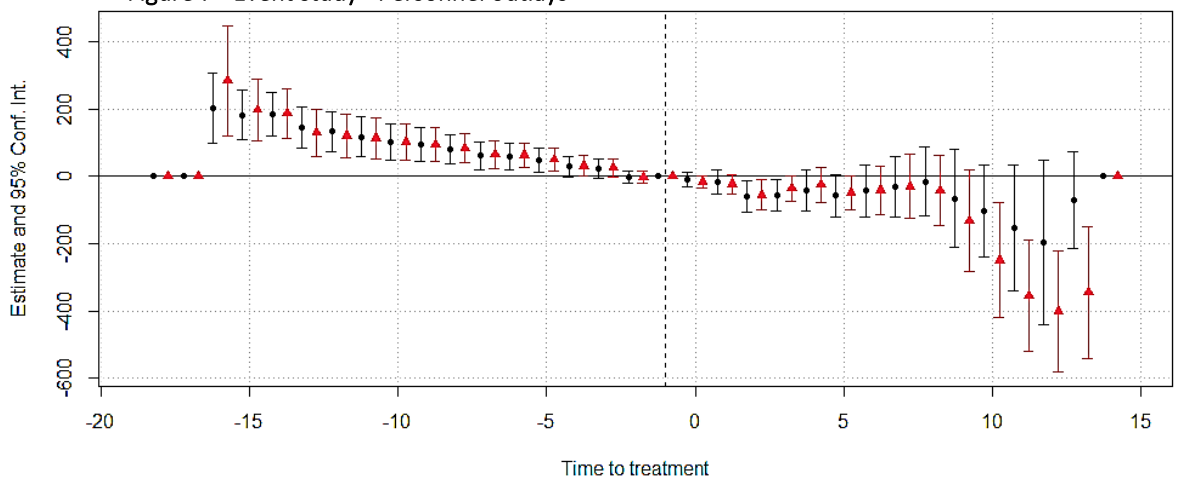


Figure 7– Event study –Personnel outlays



[i] Sun and Abraham (2021) demonstrated that in contexts where there is a difference in treatment timing between units, the use of the TWFE/event study specification may cause contamination of the estimated coefficients for one or more "leads" and " lags" by the treatment effects of other periods. Thus, they propose a new estimator, free from contamination. The event studies we report in the appendix show (superimposed on the same graph) the TWFE/event study version (in black colour), and the Sun and Abraham event study estimator (in red).