How social accountability fosters public integrity: the role of public policy councils in curbing corruption

Revista de Sociologia e Política

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ABSTRACT **Introduction:** This article assesses the impact of social accountability, implemented through municipal public policy councils in the fields of health, education, and social assistance, on corruption. **Materials and methods:** The study adopts a quasi-experimental research design within a robust causal inference framework. A set of estimation techniques, such as regression, propensity score matching, and instrumental variables, is employed to establish a counterfactual for analyzing a random sample of 1,223 municipalities independently audited between 2006 and 2015 as part of the Municipal Oversight Program of the Brazilian Office of the Comptroller General. **Findings:** Statistically significant effects of social accountability, carried out through public policy councils, on corruption in Brazilian municipalities are observed. When these councils are operational and active, and effectively exercising their legally mandated roles, a statistically significant reduction in the occurrence of corruption cases is evident. **Discussion:** Findings align with the international literature, emphasizing the positive impact of social accountability in the fight against corruption. The proposed theoretical model elucidates how operational public policy councils, through monitoring, regulation, consultation, and decision-making on local programs, play a key role in promoting social accountability while overcoming the 'social fence dilemma,' bolstering the necessary collective action for public integrity. However, corruption is a complex problem that demands a multifaceted approach, and further research is required to delve into strategies for optimizing the performance of public policy councils. The study contributes to a more evidence-based design of democratic anticorruption policies.

I. Introduction[1]

Are social accountability mechanisms, such as policy councils, effective tools for curbing corruption? Empirical evidence of tangible impacts of these initiatives is mixed and context-dependent (Fox, 2015; O'Meally, 2013). The public integrity is both a valuable common good to be achieved and a complex social problem to be solved. This public integrity-oriented approach implies that deterring corruption is not only a matter of changing the behavior of public officials, but an outcome of civil society attitudes in fostering public integrity and contributing to its co-production through social accountability (Olken, 2007; Bjorkman & Svensson, 2009).

Social accountability is an approach to building responsibility that relies on civic engagement, whose mechanisms can be initiated and supported by the state, citizens or both, but are often demand-driven and operate from the bottom-up (Malena et al., 2004). They refer to the broad range of actions and mechanisms (beyond voting) that citizens, communities, civil society organizations (CSOs) and independent media can use to hold public officials accountable. It relates to the empowering environment for residents, those responsible for public service and program receivers to demand better accessibility and responsiveness from policy makers, program implementers, and public service benefactors (Wagle, 2022). Thus, if civil society is empowered, social accountability makes local public officials and service providers directly

accountable to the communities they serve, and this mechanism can play a critical role in fighting corruption and increasing overall public management performance (Larsson & Grimes, 2022; Brinkerhoff & Wetterberg, 2016; Nyqvist et al., 2017)[2].

To achieve these goals, many social accountability mechanisms can be implemented. The literature has emphasized consultation, participatory budget, and citizens report more than policy councils (Golubovic, 2010; Camargo & Stahl, 2016; Posner et al., 2019). This article contributes to overcoming these pitfalls by providing a re-analysis of the phenomenon of corruption as a social dilemma, describing the policy councils as a critical social accountability tool to curb corruption, presenting the results of robust tests to infer the effect of this social governance mechanism on wrongdoing, and addressing limitations and recommendations.

[2] I share the understanding of Carmen Malena et al. (2004, p. 9) that social accountability is an approach toward building accountability that relies on civic engagement, in which it is ordinary citizens and/or civil society organizations who participate directly or indirectly in exacting accountability. For a critical perspective on participation in the fight against corruption, see Bonifácio & Ribeiro (2016).

II. Theoretical framework

II.1 Corruption as a social dilemma

Controlling governmental corruption is an unquestionable goal for policy-makers. To protect public integrity, members of civil society need to contribute by refraining from paying bribes to trusted public officials who wish to favor their own personal interests and to hold the government accountable, in order to prevent others from doing the same. In this scenario, all individuals would be better off if they cooperated, but each person alone gets a higher return for a socially harmful choice - a dominant strategy that leads to a non-optimum equilibrium. Therefore, corruption is a policy problem similar to other social dilemmas - a situation in which there is a conflict between individual and collective interest, and individual rationality leads to collective irrationality. Thus, corruption is a case of multiple-person dilemma properly modeled as a social trap or as a social fence. As a trap, there is immediate private gain and long-term collective loss. As a fence, there is immediate individual loss and long-term societal gain (Kollock, 1998; Van Lange et al., 2014).

As a social trap, corruption is an uncooperative result of individuals (corrupt public officials) who are tempted with immediate individual benefits that cause collective losses (Chen et al., 2016). Consequently, anti-corruption policies are concerned with the misuse of common good (entrusted power). The traditional approach to curbing governmental corruption is concerned with how to prevent the abuse of these joint goods under the control of the public agent (Della Porta & Vanucci, 2005; Lambsdorff & Teksöz, 2005). From the social trap perspective, full attention is directed to the protection of public resources by improving government institutions against misconduct, including a strong emphasis on controls over public office holders who may misuse the power entrusted to them (Rothstein, 2005).

The widespread definitions of corruption as the abuse of entrusted power for private gains, and its conceptual variations have reinforced a social trap perspective (Transparency International, 2020; UNODC, 2020a). Public bodies' corporate governance mechanisms (such as Governance, Risks, and Compliance - GRC), designed to curb corruption according to the OECD recommendations, are also inspired by this conventional framework (OECD, 2020a). The Brazilian State-Owned Enterprises Act (Law n° 13.303/2016), and the Public Governance Decree (Decree n° 9.203/2017), are both rooted in

these recommendations that institutions must be designed to reduce "trust in corruption", the colluding practices between corrupt and corrupting, inside public organizations.

From a different point of view, as a social fence, corruption is perceived as a uncooperative outcome caused by a failure to support collective action for public integrity due to individuals that avoid contributing to the production of this common good. Accordingly, the emphasis of anti-corruption policy is shifted from government to civil society (Mungiu-Pippidi, 2013; Persson et al., 2013; Bauhr, 2017). In this case, corruption is understood as policy problem about the production of a common good through collective action: public integrity. From a game-theoretic perspective, corruption can be explained as a failure to solve a collective-action problem of reaching the socially optimum equilibrium for the provision of public integrity.

Theoretically, public integrity is a common good, responsible for protecting the social power entrusted to the government. However, to produce public integrity represents an institutional challenge like any other common goods (Olson, 1965). We can graphically represent, as an n-person prisoners' dilemma, how the payoff of an individual continuously varies according to the distribution of cooperative and non-cooperative choices for collective action.

In this model, each person can choose between cooperating with others for the common good or defecting, following their short-term selfish interest (Colman, 2001). The individual tradeoff is specifically in assuming the costs of cooperative behavior (engaging in collective action) while others can simply defect (free ride of the common good) (Szilagyi, 2003; Kollock, 1998). According to Szilagyi (2003, p. 157), the dilemma can be formulated by the following statements: "a) regardless of what others do, each one receives a higher payoff for defecting behavior than for cooperating behavior; b) all agents receive lower payoff if all defect than if all cooperate". At this point, encouragement on providing common goods will typically be inadequate, dominant strategy for individuals is defecting collective action, and succumb to the temptation of free riding; notwithstanding, the outcome stands certainly as collective disaster (Kollock, 1998). In this scenario, both curves equally rise as N increases (because individuals are always better off if others participate), but defecting remains the dominant strategy (Figure 1).

Figure 1 - Common goods as an n-person prisoners' dilemma
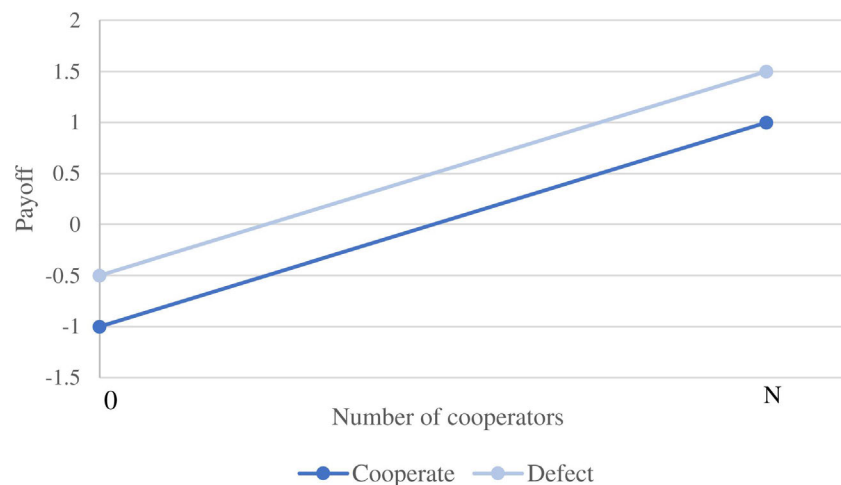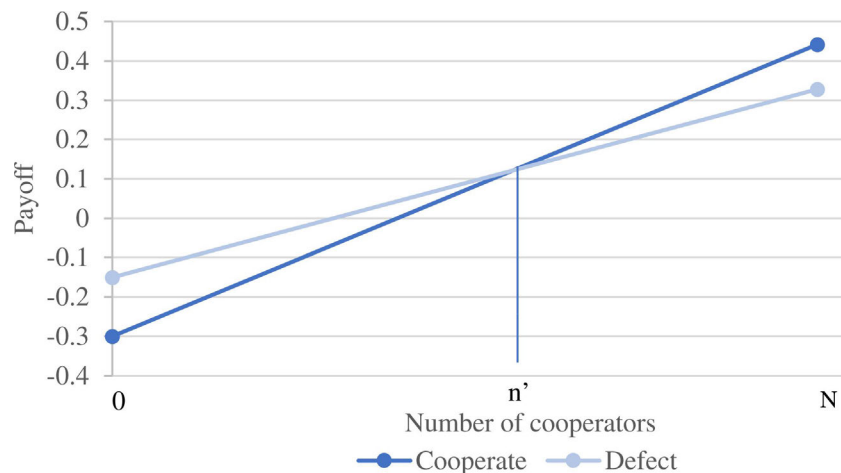

Source: author (2023).

In the public integrity game, individuals are encouraged to make a decision similar to others. In societies where public integrity prevails, individuals tend to cooperate (positive feedback), while the opposite is also true (Bauhr, 2017; Della Porta & Vanucci, 1999; Persson et al., 2013). Individuals act like "conditional cooperators", willing to engage as long as everyone else does (Fehr & Fischbacher, 2005). Then, only when a certain threshold of cooperation is achieved does it provide the right incentive for everyone else to cooperate too (Figure 2). This feedback mechanism can be a closed society in a cooperative or non-cooperative equilibrium (Pierson, 2004).

This game has a mixed strategy Nash equilibrium at the exact point of the intersection of the dashed lines (n = n') and two pure Nash equilibria in the bottom left (n = 0) and top right (n = N) corners (Dixit et al., 2014). Nevertheless, the mixed equilibrium is Pareto dominated by either of the pure Nash equilibria. Thus, public integrity keeps evolving in a sort of continuously stable strategy (CSS) when a selective advantage emerges to individual strategies which are closer to the cooperative (n = N) or uncooperative (n = 0) equilibrium (Eshel & Motro, 1981; Smith & Price, 1973). In short, from this game-theoretic perspective, corruption can be explained as a failure to solve a collective-action problem of reaching the socially optimum equilibrium to provide public integrity as a common good.

II.2 Collective action mechanisms for supplying public integrity

Corruption is part of a broad social governance challenge. It is about people finding ways of being able to act collectively in their own best interests (Booth, 2012). Governance refers to the way in which people with power exercise that power, formally and informally, and describes how institutions work and how government relate to societies more broadly, rather than just through standard formal governmental agencies (Grindle, 2017; Rose-Ackerman, 2016). Good governance brings together principles like integrity, transparency, and accountability to promote partnerships between government and civil society. It promotes legitimate, accountable, and effective ways of obtaining and using public resources in pursuit of widely accepted social goals

Figure 2 - Public integrity as an n-person assurance game

Source: author (2023).

(Mungiu-Pippidi, 2015; Rothstein, 2011; UNESCAP, 2013). Corruption is therefore an expression of the failure of the state governance.

According to Johnston (2005), improving governance requires strengthening participation and institutions, which encompass an integrated, long-term strategy based on cooperation between government and civil society. Corruption thrives where civil society is unable to engage in collective action to nurture integrity and expand social accountability on politicians, bureaucrats or even among private organizations themselves. This approach is not centered on public officials, but on the production of a common good, strengthening ties between public and private sectors to promote the cooperative behavior (necessary to increase public integrity), and mitigate the risks of uncooperative behavior (engaging in corrupt practices). The emphasis is not on the public office holder, but on the civil society actors.

The institutional design plays a major role in promoting a good governance cooperative equilibrium (Chong, 1991; North, 1990; Ostrom, 1990; 2000). Since corruption was reinterpreted as a collective action problem (social fence), a growing number of innovative anti-corruption policies, built on public-private collaboration practices, have been designed and many of them have been specifically designed to focus on democratic underpinnings (Broadley & Dixon, 2022; Blomkamp, 2018; Vesnic-Alujevic & Scapolo, 2019; UNODC, 2014; 2020b).

One institutional path drives collective action against corruption by bringing together private companies, like the "Wolfsberg Group", formed in the 1990s to mobilize financial institutions (Pieth, 2012). The first actions took different forms, such as anti-corruption statements, integrity pacts or standard-setting initiatives (World Bank, 2008; 2012; Marquette & Peiffer, 2015). However, a neutral third party is usually needed to monitor and enforce these agreements. Then, rapidly, new governance models to promote collective action have evolved to include both civil society representatives and public authorities (OECD, 2020b; Ethos, 2023; ASEAN, 2020).

Another institutional path originates from the civil society itself. As it comprises, by definition, all voluntary organizations engaged in the promotion of collective action and the production of collective goods, it is expected that some of these organizations gradually evolved to curb corruption through social accountability and civic participation (Edwards, 2004; Grimes, 2012; Mungiu-Pippidi, 2013). Civil society's capacity for collective action is based on people's efforts of solving social problems. Naturally, civic engagement is expected to evolve for curbing corruption (Rothstein & Uslaner, 2005; Jenkins, 2007; Griesshaber & Geys. 2012).

To solve complex policy problems such as corruption, many common goods obtained through civic engagement need to be provided in the form of social accountability, political participation, protests, petitions, etc. Civil society can deploy diverse democratic mechanisms to hold the government accountable (Maravall & Sánchez-Cuenca, 2007). Nevertheless, it lies with the social accountability mechanisms the ability to enrich the traditional democratic procedures and thus empower citizens, increase service delivery, and improve public governance in general (Brinkerhoff & Wetterberg, 2016).

These mechanisms can combine decision-making and/or monitoring procedures, in addition to voting, which citizens can use to hold the government to account, as well as actions on the part of government, civil society, media, and others. In general, social accountability comprises a wide range of mechanisms, as delineated in Table 1, such as rights petition, social audits,

Table 1 - Mapping citizen participation in the exercise of public authority

		Decision-making	
		strong	**weak**
Monitoring	strong	Policy councils	Social audits
	weak	Participatory budgeting	Right to information

Source: adapted from Anuradha Joshi (2008, p.14).

participatory budgeting, policy councils, and other channels of autonomous democratic expressions of civil society (Brinkerhoff & Wetterberg, 2016).

Policy councils are a governance mechanism that reconciles the principles of participatory and representative democracy (Sipioni & Silva, 2013; Lüchmann, 2008; Azevedo, 2004). They are designed to enhance civic engagement to both leverage public participation and increase the quality of the representative democracy. Policy councils are built upon a long-term cooperation strategy between government and civil society that illustrates well the most advanced recommendations of the public governance paradigm (Klijn & Koppenjan, 2016; Torfing et al., 2012). If properly implemented, these councils are accurate examples of bodies foreseen by the good governance principles (IFAC, 2001; ANAO, 2014; TCU, 2014). However, the body of literature on policy councils has usually emphasized participatory decision-making and notes a lack of evaluations of their impact on public sector outputs and outcomes (Azevedo et al., 2020; Cunha et al., 2011; Almeida et al., 2016; Carlos et al., 2019).

Public integrity, as a collective action good, is produced by policy councils because their social accountability activities, such as monitoring service providers and independent reporting to civil society, are implemented as "by-products" of the participation of social organizations in public policy decision-making. As these stakeholders have great power to decide on a policy through deliberation and regulation, they are expected to mobilize and spend their own resources to inform, monitor, and enforce their decisions on public service providers and their related public agencies.

This privileged position in local public administration has the potential to create an incentive for civic engagement and, in places where there is a high density of social organizations, virtuous competition between these civic entities is also expected occur (Harrell, 2018; Colomer, 1995). By independently nominating a representative on a policy board, social organizations are empowered to promote their policy agenda and take an active role in local policy decision-making. Public integrity emerges through the policy council mechanism not just because of its normative goodness, but also as a result of a civic engagement oriented primarily towards influencing the policymaking and ensuring the achievement of its own expected outcomes.

Entrepreneurial civic leaders can mobilize interest groups that contribute to collective action in its early stages, even before reaching a critical threshold of cooperation (Van Vugt & De Cremer, 1999; Humphreys et al., 2006). Civic leaders have much to contribute to increasing the performance and compliance of public policies once they join together in a policy council where interaction is recurring over time. Repeated decisions in a council can provide a mechanism to stimulate policy learning and avoid uncooperative behavior (Figure 3).

Policy councils benefit from this civic engagement originated in the civil society (engagement) and combine it with a legal mandate that came from the government (support) to deliver social accountability as monitoring (super-

Figure 3 - Policy councils as a social accountability mechanism
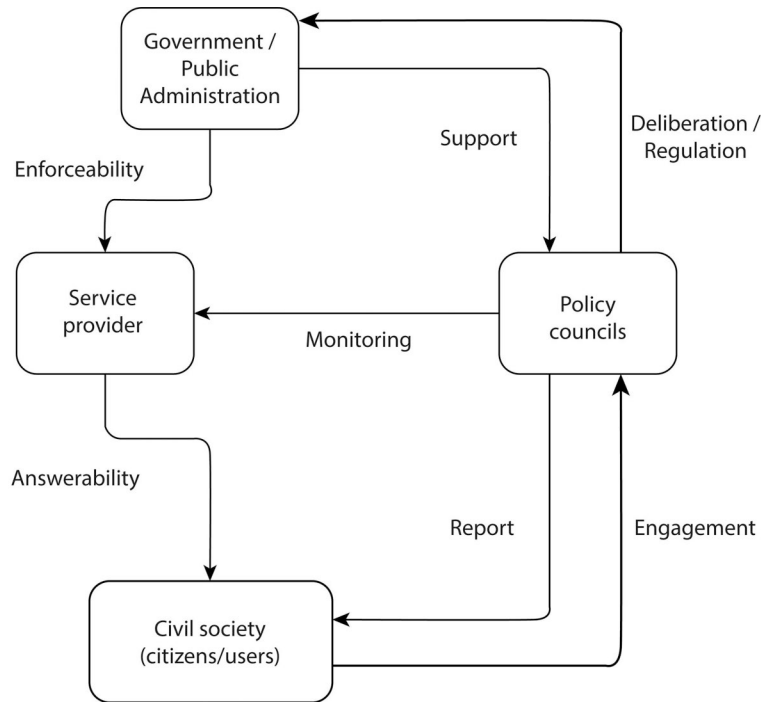
Source: author (2023).

vision), reporting to civil society (report), and participatory decision-making (deliberation/regulation). The council's decision is enforced by the public administration over the service providers, and this procedure helps them to provide better responses to the needs of the society. Through this mechanism, policy councils function as a bottom-up social accountability tool, which is expected to be effective at both improving integrity and sector-specific outcomes (Beath et. al., 2013; Mansuri & Rao, 2013).

II.3 Policy councils: designing a causal path to public integrity

After the 1980s, within the third wave of democratization, a decentralization movement gained momentum around the world and many central governments started to transfer power to their lower levels (Bache & Flinders, 2004). These initiatives attempted to shorten the distance between citizens, decision-makers, and service providers in order to make governance more responsive and increase local input to policy-making (TI, 2019). Nevertheless, decentralization has not had uniform effects in terms of governance.

> While many local governments saw a rebirth of local politics and renewed synergy between local governments and their constituents, other areas saw a rise of corruption in the form of clientelism, state capture, and illicit rent-seeking. In response to the failure of decentralization in many countries, civil society organizations, governments, and international development organizations promoted social accountability mechanisms to allow citizens to hold local governments responsible for their actions (Transparency International, 2019, p. 2).

In this global context, the Brazilian local policy councils were conceived to play a central role in promoting social accountability (Almeida & Tatagiba, 2012; Almeida et al., 2015). The evolution of these councils had a major boost during the process of democratization inaugurated with the 1988 Brazilian Constitution, when civil society put pressure on the governmental apparatus to

promote decentralization, universalize citizenship rights, and increase democratic management of public policies (Brasil, 2014; Rocha, 2009; Lüchmann, 2008; Avritzer, 2007). After the military dictatorship regime, Brazilian civil society claimed for new democratic venues, enabling them to promote a direct participation in public management and potentially approach the old bureaucratic and authoritarian institutions to support accountability (Arato, 2002; Diniz, 2015). Henceforth, world-famous democratic innovations, such as the participatory budgeting, began to emerge across the country and gained political and academic attention. However, none of them shows the same legal and managerial importance for the Brazilian public administration as the policy councils.

In 2018, while a dozen governmental entities had some kind of participatory budget, 99% of the 5,570 Brazilian municipalities had the Health Council (CMS), the FUNDEB Council, the School Feeding Council (CAE), and the Municipal Social Assistance Council (CMAS) (IBGE, 2018). These councils are responsible for formulating policy guidelines, monitoring activities, and supervising the use of public funds. Although, the policy implementation remains under the responsibility of the city government, these councils are key players in deciding, monitoring, and evaluating policies at local level. They are legally bound to promote local social accountability and participatory decision-making in critical policy fields such as health, education, and social assistance. According to the Brazilian Constitution, municipalities must invest at least 25% of their budget in education and 15% in health policies, and many federal transfers to municipalities are conditional on the direct deliberation and supervision of these councils.

The Health Municipal Councils (CMS) are responsible for overseeing the use of the National Health Fund (FNS) transferred to the municipalities for supporting the local activities of the Brazilian Unified Health System (SUS). In education, two local councils have a central role in educational policies. First, the School Feeding Councils (CAE) are responsible for overseeing the use of the National Education Development Fund (FNDE) transferred to the municipalities for supporting the National School Feeding Program (PNAE). Moreover, the Monitoring and Social Control Council of the Fund for Maintenance and Development of Elementary Education and Improvement of Education Professionals (FUNDEB), known as FUNDEB councils, are responsible for overseeing the distribution, transfer, and the use of this educational fund and other federal resources transferred from national programs to municipal administration, such as the school transportation support program (PNATE), youth and adult education (*Recomeço Program*), the annual education census, etc. In some municipalities, it is possible that the CAE and the FUNDEB councils were merged with an Education Council. Finally, the Municipal Social Assistance Councils (CMAS) are responsible for overseeing the use of this National Social Assistance Fund (FNAS), which is transferred to the municipalities to support the local activities of the Brazilian Unified Social Assistance System (SUAS).

Policy councils are designed to be legally and administratively independent from the government, and their members come mostly from the civil society (appointed directly by their own entities). The main activities of these councils can be summarized as regulating, deliberating, advising, and inspecting (Table 2). Each council approves its own internal regulation and members are not paid by their civic engagement. Municipal Health Councils are made up of 50% of representatives from user groups (appointed by NGOs, social movements, etc.), 25% of representatives from healthcare professionals, and 25% of representatives from governmental and private service providers. On average,

Table 2 - Council's legal basis and attribution

Legal basis	Attributions
Health Councils (CMS) Complementary Law nº 141/12 Law nº 8.890/90 Resolution CNS nº 453/2012 Resolution CNS nº 333/2003	1. participate in the formulation and oversight of the health policy, including its economic aspects, and propose strategies for its implementation; 2. establish criteria for financial and budgetary planning and execution of the Health Funds, besides monitoring its destination; 3. approve the annual health budget planning, considering the prior goals established in the law; 4. supervise all the expenditure and deliberate on criteria for the use of resources to health policy, including those transferred from other federative entities; 5. periodically review health policy plans; 6. analyze and decide on management reports; 7. supervise and monitor the activities on health services, receive complaints about them and send it to accountability bodies, in accordance with legislation.
FUNDEB Councils Law nº 11.494/2007	1. prepare the FUNDEB annual budget plan; 2. obtain information about all financial transactions carried out with FUNDEB funds; 3. demand that the Teachers' Career Plan be drawn up and faithfully complied with; 4. meet regularly to evaluate the reports and statements prepared by the City Council on FUNDEB; 5. issue an opinion on the statements, which contain information relating to the use of FUNDEB, to be forwarded to the Court of Auditors; 6. request school managers and the Education Department to fully comply with the actions and deadlines planned by FUNDEB.
School Feeding Councils (CAE) Law n° 11.947/2009	1. monitor and supervise the use of resources destined to school meals and compliance with guidelines and objective of the PNAE; 2. ensure the quality of the food and the acceptability of the menus; 3. report any irregularities observed in the implementation of the program to the control bodies; 4. hold meetings, including specific ones, to assess the PNAE actives and results; 5. Develop an Annual Action Plan.
Municipal Social Assistance Councils (CMAS) Law nº 8.742/1993 Resolution CNAS nº 237/2006	1. decide on the municipal social assistance plan and reviews; 2. decide on the use of the municipal social assistance fund and monitor the annual budget and financial execution; 3. evaluate and monitor the results of the social assistance plan to ensure its effectiveness; 4. establish the criteria for providing benefits to citizens; 5. deliberate on the social assistance budget and the annual management report; 6. regulate the provision of public and private social assistance services; enroll and inspect social assistance entities; 7. receive complaints about the policy and forward them to accountability bodies, in accordance with legislation.

Source: author (2023).

these councils made up of 22.54 members (IBGE, 2018). The FUNDEB councils are made up of, at a minimum, of 2 representatives from the City Hall, of which at least 1 must belong to the Department of Education; 1 representative from the elementary school teachers; 1 representative from the elementary school principals; 1 representative from the elementary school administrative staff; 2 representatives from parents of students enrolled in public elementary schools; and 2 representatives from students of public elementary schools, one of whom is appointed by a high school student entity. On average, these councils have 19.73 participants (IBGE, 2018). School Feeding Councils are composed, at a minimum, of 1 representative from the City Hall; 2 representatives

from teachers and students; 2 representatives from parents of students; and 2 representatives from civil society. On average, these councils have of 13.91 members (IBGE, 2018). Municipal Social Assistance Councils are made up of 50% of representatives from the government sector and 50% of representatives from civil society, including users, NGOs, and service providers. On average, these councils have 17.23 members (IBGE, 2018).

The existence and approval of these councils is a necessary condition for municipalities to receive national funds. These independent councils have the power to enforce their decisions through budgeting, policy planning, and auditing. In the event of misuse of public funds, councilors are expected to inform local managers (City Hall or City Council), the national managers of the public funds for education, health, and social assistance (FNDE, FNS, FNAS), regional or federal courts of accounts (TCE/TCU), the General Comptroller Office (CGU) or the regional or federal prosecution services (MPE/MPF). Thus, except by the City Council or the City Hall itself, no other local institution has such powers in hand to enforce their will and prevent corruption in local administration as these.

As noted above, the causal path by which the policy councils can lead to impact is further detailed in the following theory of change (Figure 4). This framework summarizes several causal chains that link the activities to improved policy performance as inputs that lead to outputs and then to intermediate outcomes to impact overall policy performance.

The inputs are provided by the civil society (volunteers, information, and societal partners) and the government (legal mandate, professional staff, budget, information, and governmental partners). They are critical to perform the council's activities (deliberation and regulation, advising, and monitoring). If there is no legal mandate, councilors will have no political autonomy for deliberation and regulation. If there is no professional staff or budget, the council will not have adequate support in its advisory and regulatory functions.

Moreover, if there are no volunteers and partners from the society, councils will not be accurately constituted or engage in independent inspections (Borges et al., 2017; Abranches & Azevedo, 2004). The council's outputs are derived from their activities. Deliberation and regulation integrate the civil society into the decision-making process and allow a periodic review of policy planning. Monitoring is useful for overseeing implementation and allows policy evaluation. Advising keeps the stakeholders informed and helps communicate policy results to society as a whole. In addition, council's monitoring, evaluation, and reporting provide outcomes that go beyond an increase on governmental knowledge about the policies; they also expand social knowledge about policies and the involvement of well-informed stakeholders. This process is boosted within policy councils because councilors have real decision-making power, such as periodic policy review and veto power in policy planning. Strengthened civic engagement is expected when individuals and social organizations are kept informed and empowered to influence the policy process. Then, through repeated interactions, a civic partnership is strengthened. Finally, the trust resulting from this process allows for sustainable collaboration, to improve public management (creating public value) and for assuring social accountability (preserving public value) which improves the overall performance of the policy (impact).

According to this causal model, collective action is obtained from repeated interaction, within a small group of councilors (they can easily identify
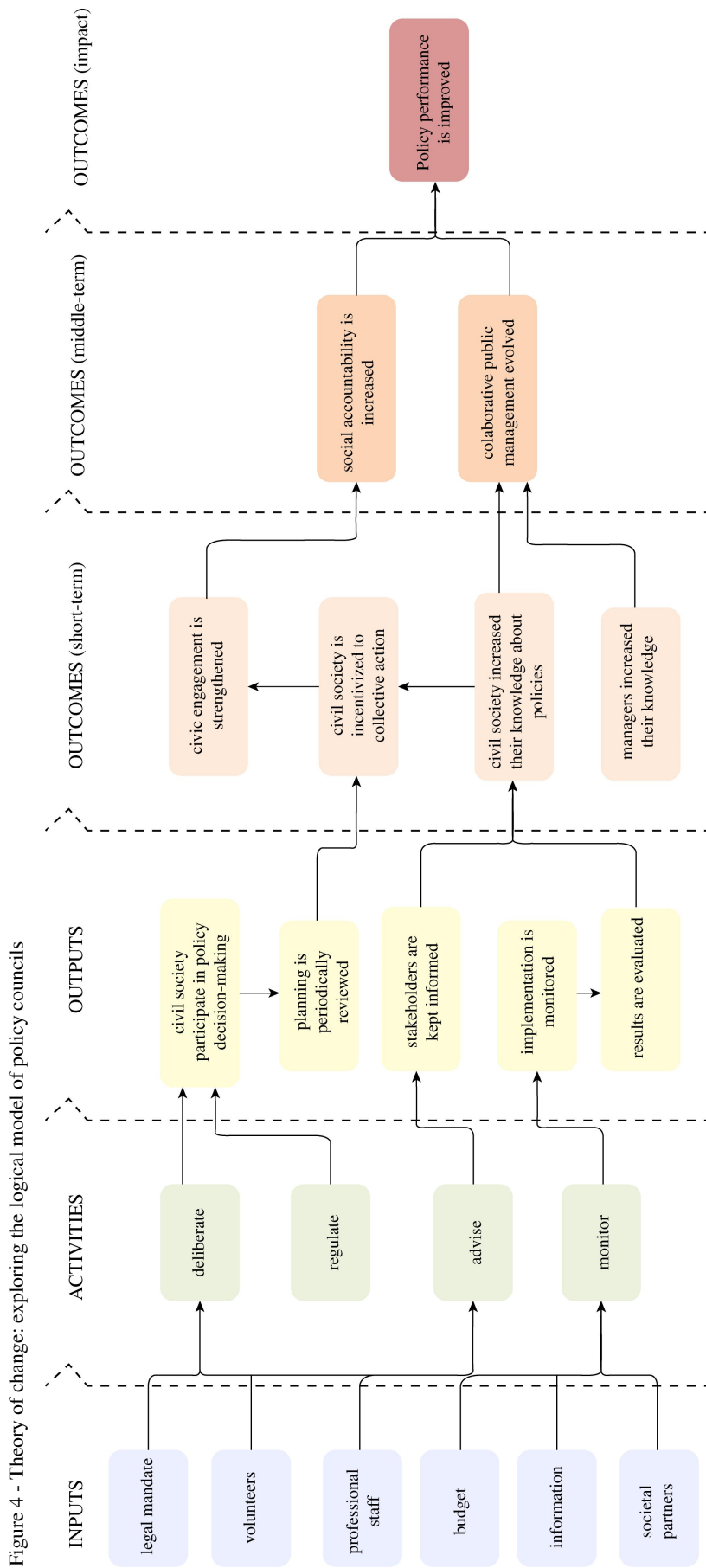
Figure 4 - Theory of change: exploring the logical model of policy councils

Source: author (2023).

opportunism) and selective incentives such as reputation and a tangible decision-making power. The councilors' motivation for cooperation is expected to be a by-product of the collaborative management derived from civic participation in policy decision-making. It is because civil society is engaged in local policy decision-making that it would invest scarce resources to hold public managers and public service providers to account, and not the other way around.

Civil society would not be expected to put its reputation at risk by being part of a voluntary policy council, or even by sharing decision-making power, if it could not guarantee a certain level of public integrity. In this process, from inputs to outputs, it is assumed that: i) the volunteer councilors are capable of carrying out their duties, ii) councilors have autonomy from governmental bodies to carry out their duties; and iii) there is a balanced composition between government and civil society representatives (Tonella 2006). However, these results can only be obtained if the councils are operational (and not all councils are). For this reason, we will test whether operational councils contribute to reducing corruption.

III. Methodology

III.1 Research design

This article tests the hypothesis that social accountability (treatment), through the policy councils, has a significant effect on reducing governmental corruption (effect) in Brazilian municipalities. The research question assumes the classic policy impact evaluation design (Equation 1). Although we can observe and measure the outcome (Y) with the intervention ($Y \mid I = 1$), there are no data to establish what the outcome would have been in the absence of it ($Y \mid I = 0$) (Gertler et al., 2016).

$$\Delta = (\ Y \mid I = 1)\ -\ (\ Y \mid I = 0) \tag{1}$$

Notwithstanding, in this initiative, this crucial counterfactual cannot be outlined by a Randomized Controlled Trial (RCT) design, because treatment and control groups were not randomly assigned (Glennerster & Takavarasha, 2013). Consequently, to construct valid comparison groups that will allow us to estimate the counterfactual, I deploy OLS and GLM regression analysis, non-parametric matching (as a strategy for estimating causal effects by conditioning on observed variables to block back-door paths) and instrumental variable (as a strategy that uses exogenous variation to isolate covariation in the causal and outcome variables) (Morgan & Winship, 2015). To analyze the plausible attribution of this treatment, a dataset formed of a sample of 1,223 randomly selected Brazilian municipalities, around 22% of the population, from years 2006 to 2015, were gathered.

III.2 Data source and measurement

In 2003, the Brazilian federal internal control body, known as *Controladoria-Geral da União* (CGU), which is the Comptroller General´s office in the country, introduced a national program based on random audits of municipalities to oversee the use of federal funds and widely publicized its reports

(CGU, 2020; Santos, 2013). This program, under the name of *Programa de Fiscalização por Sorteios Públicos*, a public lottery inspection program, selected municipalities with up to 500,000 inhabitants by means of a lottery carried out by the official lottery system. This sample covers approximately 22% of the municipalities under the population thresholds, and these cases are geographically well distributed throughout the territory.

The CGU is fully independent from the local government and, for each municipality sampled, a set of work orders, which must be observed impersonally during the inspection process, is opened in advance. For the education and health programs, all federal transfers are audited in each sampled municipality. During this process, a series of pre-planned meetings were held with members of the local community, as well as with the policy councils.

Once the audit is complete, a detailed report is made and sent to the central CGU body in Brasília, where information is compiled and submitted to the National Congress, the Federal Court of Auditor's (TCU), the Federal Prosecution Service (MPF), the local City Council, the City Hall. All reports are officially released and made available to the public at the CGU website (CGU, 2020). Similar data has been analyzed in other studies, such as that by Ferraz & Finan (2011). A descriptive table summarized the research variables (Appendix A).

III.3 Respondent variable

From 2006 to 2015, the auditors alone counted the irregularities audited. Altogether, 94,492 records were classified during this period by the CGU auditors among information and comments, formal failures, administrative failures, or serious failures. According to this independent classification, serious failures are the undesirable situations that significantly compromise the performance of the program or unit, in which there is the characterization of one of the following occurs: i) the practice of an illegal, illegitimate, uneconomical management act or violation of the legal or regulatory standard of an accounting, financial, budgetary, operational or patrimonial nature, which has the potential to cause damage to the treasury or constitute a serious deviation from the principles to which it is submitted to the administration; ii) damage to the treasury resulting from illegitimate or uneconomical management acts; and; iii) misappropriation of public money, assets or values.

Serious failures comprise precisely corrupt practices, such as fraud in the procurement of goods and services, the adoption of an uncompetitive procurement process that allows diversion of funds, overpricing of goods and services, as well as other forms of private appropriation of public funds. As many studies have demonstrated, the count of serious failures in audited municipalities provides a reliable indicator of corruption in Brazilian municipalities (Ferraz & Finan, 2011; Campos et al., 2018).

III.4 Explanatory and control variables

The model's explanatory variable is also calculated from the analysis of these same reports when it specifies both malpractices in the policy council's composition or functioning. The first criteria checks whether the councils are truly civic - respecting the legal minimum requirements composition of civil society. The second criterion verifies whether the councils are truly engaged in

social accountability - observing the legal requirements of civil society participation in meetings and other oversight activities. Each municipality had the composition and functioning of its four main municipal public policy councils (CMS, CAE, FUNDEB, and CMAS) independently audited by the CGU.

By analysis these auditing reports, it is possible to observe whether any of these policy councils have flaws with composition or functioning. When they do not have these problems (composition of function), they are classified as active. If these four councils are operative (engaged in social accountability), the social accountability indicator was assigned a value of four (one point for each operative policy council).

The variable was recoded into the treatment and control groups. As there is no statistically significant difference between municipalities with 2, 3 or 4 active councils, cases that score 0 or 1 were assigned to control group (0), and others which scored 2, 3 or 4 were assigned to treatment group (1).

These types of irregularities with councils are independent from the serious failures, audited by different work orders, and eventually counted as administrative failures. The most frequent failures identified by the auditors are the lack of social representation in the composition of the board, the appointment of politically oriented councilors, the lack of supporting documentation for social accountability activities (meetings minutes, inspections reports, approved regulations, etc.). Some of these practices were also identified by earlier studies that conclude that there is not just a lack of administrative maturity, but also a wicked effect of political patronage on the performance of policy councils (Dombrowski, 2008; Lavalle et al., 2016; Almeida & Tatagiba, 2012).

An exploratory analysis was performed to identify potential cofounders. The results showed that there is an association between corruption, political-administrative regions (south, southeast, central-west, north, northeast) and the size of the municipalities (small and medium). Brazilian regional cleavages (north / south) are widely known, as well as their correlation with the quality of local and regional public management (more fragile in the north and more robust in the south). The regional means are as follows: South (M = 3.7; SD = 6.5), Southeast (M = 4.2; SD = 5.6), Midwest (M = 6.3; SD = 7.7), North (M = 10; SD = 9.2), and Northeast (M = 15.4; SD = 14.5). The results of the Kruskal-Wallis test (Monte Carlo method) points out that there is a significant difference (H (4) = 312.83; p < 0.001) between corruption in the Brazilian political-administrative regions.

A similar effect is also expected when comparing small (M = 8.54; SD = 10.8) and medium-sized (M = 11.6; SD = 13.7) municipalities. The results of the Mann-Whitney test (Monte Carlo method) show that there is a significant difference between corruption in small and medium-sized municipalities (U = 139939; z = -3.956; p < 0.001).

The number of audit service orders issued for each municipality were also incorporated into the analyzes because of its theoretical relevance (more SO increase the sensibility/probability to found corruption cases). For that reason, region, size, and service orders were taken as control variables in the following estimations. Official data about municipalities were released by the Brazilian Institute of Geography and Statistics, popularly known as *Instituto Brasileiro de Geografia e Estatística* (IBGE, 2010a; 2018). The statistical analysis was carried out by RStudio desktop®. The database and the R script were made public at GitHub for public access (Vieira, 2023).

III.5 Data analysis

To estimate the effect of social accountability through policy councils on reducing corruption, we deploy two strategies for causal inference and different statistical techniques for observational studies, such as regression, matching and instrumental variable. The first strategy for estimating causal effect is the condition on variables to eliminate the noncausal portion of an association between treatment and effect, and the second strategy uses an exogenous variation in an appropriate instrumental variable to isolate covariation in the causal and outcome variable (Morgan & Winship, 2015). Initially, the naïve Ordinary Least Squares (OLS) regression model and the logistic regression model were run for getting a first glance at the statistical coefficients (Equation 2).

$$y_i = B_0 + B_1(\text{social\_accountability\_dic}) + B_2(\text{service\_orders}) + B_3(\text{south})$$

$$+ B_4(\text{southeast}) + B_5(\text{midwest}) + B_6(\text{north}) + B_7(\text{size}) + \varepsilon_i \qquad (2)$$

However, in the OLS regression model, the statistical assumptions such as normality and heteroscedasticity are violated. In addition, the use of logistic regression implies a significant loss of information when the response variable is transformed into a binary variable. Actually, corruption is a count variable, and a Generalized Linear Model (GLM) would fit better to correct for the normality assumption from the Gauss-Markov theorem (Cameron & Trivedi 2005).

The Poisson regression model is considered the standard GLM model for count-dependent variables such as corruption. However, as long as there is also a problem of over-dispersion and excess zero counts, a zero-inflated negative binomial regression is expected to fit even better into a regression analysis approach (Zeileis et al., 2020). A Vuong closeness test was made to compare the ordinary Poisson model with the zero-inflated model (Vuong, 1989).

The matching and instrumental variable methods were performed to produce a more accurate and reliable assessment of the social accountability effect on reducing corruption through a valid estimate of the counterfactual. Matching uses statistical techniques to construct an artificial comparison group. Thus, for every possible case under treatment, it attempts to find a nontreatment unit (or a set of nontreatment units) that has the most similar characteristics possible. Two variants of matching algorithms were tested: exact and the nearest neighbor. The exact algorithm constructed the counterfactual for each treatment case using the control cases with identical values on all the control variables. The nearest-neighbor algorithm constructed the counterfactual for each treatment case using the control cases that are closest to the treatment case on a unidimensional distance measure constructed from the control variables, most commonly an estimated propensity score. Despite literature states that matching can allow for consistent and unbiased estimations, selection on unobservable remains an unsolved problem (Morgan & Winship, 2015).

The instrumental variable was applied to overcome this methodological challenge and allow an unbiased estimation. As the randomized approach is not feasible, an encouragement design to select an instrumental variable was adopted as an external source of variation that affects the probability of receiving the treatment (but is otherwise unrelated to the participants' characteristics). A binary measure of civic density was chosen as instrumental

variable to the model. It is assumed that the policy councils are exist in any Brazilian municipality (there is universal coverage), so the design of incentive for civic density can serve as a promotion of genuine involvement of civil society in policy councils with no direct empirical or theoretical relationship with corruption, except through a mechanism of social accountability like the one previously described.

The instrumental variable was coded considering the municipality density of civil society organizations. In 2010, the municipalities in the sample had on average 39.79 civil society organizations officially registered in their territory (IBGE, 2010). Taking this threshold into consideration, all municipalities below this value were ranked (0) and all those above were ranked (1).

IV. Findings

This section provides empirical evidence that social accountability through policy councils is associated with lower levels of corruption in Brazilian municipalities. As predicted in the model, municipalities with policy councils that achieved better results in social accountability (more operative councils) have also improved their public integrity (less cases of corruption). These findings are robust to various specifications and estimation techniques, including two different strategies for causal reasoning (Appendix B).

Through an initial exploratory analysis, it is possible to see that there is a decrease in the average cases of corruption as more social accountability through policy councils is observed (Graph 1).

The results of the Kruskal-Wallis test (Monte Carlo method) show that there is a significant difference (H (4) = 87.5; p < 0.001) between municipalities that do not have any social control through policy councils and those that do. The Jonckheere-Terpstra test confirms the existence of a statistically significant trend in the data, because the greater the indicator of social

Graph 1 - Corruption by social accountability through policy councils

Source: author (2023).

accountability through policy councils, the lower the observed mean for the corruption indicator (JT = 223069; p < 0.001).

The results of the Kruskal-Wallis test (Monte Carlo method) show that there is a significant difference between municipalities that do not have any social accountability through policy councils and those that do, even when controlling by regions: south (χ^2_4 = 11.753, p < 0.019), southeast (χ^2_4 = 21.045; p < 0.001), midwest (χ^2_4 = 9.26; p < 0.001), north (χ^2_4 = 10.551; p < 0.032), and northeast (χ^2_4 = 67.01; p < 0.001).

The same trend is observed when comparing the results by municipality size. The results of the Kruskal-Wallis test (Monte Carlo method) show that the same pattern also persists when controlled by small-size (χ^2_4 = 68.438; p < 0.001) and medium-sized (χ^2_4 = 29.168; p < 0.001).

IV.1. 1st strategy: conditioning to eliminate the noncausal portion of an association

The first strategy for estimating causal effect is condition on variables to eliminate the noncausal portion of an association between treatment and effect (Morgan & Winship 2015). Initially, an ordinary last square (OLS) regression was used as a technique to estimate the best-fitting linear approximation to a conditional expectation function in the population. It would be inappropriate to give a causal interpretation to any of the estimated coefficients in β in the naïve model, it is better interpreted as an attempt to estimate the best linear approximation to the conditional expectation. This descriptive result displays a negative association between corruption and social accountability (β = -4.604; p < 0.001), when controlling by size, region, and service orders. However, assumptions such as normality and heteroscedasticity were violated, indicating bias and inefficiency on the coefficient values[3].

Therefore, a series of generalized linear models was employed to better estimate these coefficients. Firstly, a standard count model was run through a Poison link function. Then, a negative binomial regression to correct for overdispersion. Finally, a zero-inflated negative binomial regression for modeling count variables with excessive zeros (Cameron & Trivedi, 2005). The results evidence that all the coefficients are statistically significant (p < 0.001) and reinforce the hypothesis of a negative relationship between corruption and social accountability in different estimation models: Poisson (β = -0.433; p < 0.001), negative binomial (β = -0.435; p < 0.001) and zero-inflated (β = -0.396; p < 0.001)[4]. We could interpret this as meaning that, with social accountability, corruption decreases by just over 40% on average, all other predictors remaining equal.

Subsequently, a logistic regression was run to estimate a logit model. From the sample, 191 (15.6%) municipalities had no cases of corruption and 1,032 (84.4%) had at least one case. The research hypothesis posed to the data is that "the probability of a municipality having at least one case of corruption is related to its social accountability, size, region, and service orders". According to logit estimate, the logarithm of the probability of a municipality having had at least one case of corruption was negatively related to social accountability (p < 0.001), small size (p < 0.05), south (p < 0.001), southeast (p < 0.001), midwest (p < 0.001), and north (p < 0.1) and positively related with the number of audit service orders issued (p < 0.05). In other words, in the presence of social accountability through policy councils, it is less likely that a municipality would have cases of corruption. In fact, the odds of a municipality with

[3] According to the Jarque-Bera test we reject the null hypothesis and conclude that the residuals are not normally distributed (χ^2_2 = 4076.3; p < 0.001) and to the Breusch-Pagan test (χ^2_6 = 403.98; p < 0.001) we reject the null hypothesis and conclude that the residuals are not homoscedastic.

[4] According to the Vuong test we reject the null hypothesis and conclude that the zero-inflated negative binomial model is superior to the Poisson model (p < 0.001).

social accountability having a case of corruption were 0.4956 (= $e^{0.702}$) times lower than the odds of a municipality without social accountability[5].

Finally, matching was applied to the condition on variables to eliminate the non-causal portion of an association between social accountability and corruption. In the absence of experimental data, matching serves to isolate how the treatment variable affects responses (Rubin, 2006; Imai & Van Dyk, 2004). The treatment estimates support the previous hypothesis, and the difference between the treatment and control group was statistically significant in matching algorithms (Table 3).

The matching estimators support that corruption is negatively related with social accountability when controlling for the size, region, and service orders. However, this model also keeps the assumption that there is no selection by unobservable, so a different causal strategy was also applied to increase our confidence on the estimation.

IV.2. 2nd strategy: exogenous variation in an instrumental variable to isolate covariation

The second strategy applied an instrumental variable (exogenous variation) to isolate covariation in the causal and the outcome variable (Morgan & Winship, 2015; Gertler et al., 2016). This model is expected to overcome the omitted-variable bias and estimate the true effect of social accountability in corruption, taking into consideration the previous control variables - size, region, and service orders (Abadie, 2003). This instrumental variable offers a more credible identification strategy because municipalities count with different levels of civic density.

The analysis shows that civic density is a strong instrument. First, it is significantly associated with social accountability ($\beta = 0.1514$, p < 0.001). Second, social accountability and corruption are an independent of civic density. Third, there is no association between civic density and corruption ($\beta = -0.027$, p < 0.37587) apart from the association generated by a direct path that begins at the instrument (civic density) and ends in the outcome (corruption) via the treatment (social accountability) (Sovey & Green, 2010). Likewise, first-stage F-statistic shows the relevance of the instrument (F = 23.54, p < 0.001) (Stock & Yogo 2004).

According to Angrist et al. (1996), this sample can be distinguished by four groups of respondents (compliers, defiers, always-takers, never-takers). The average treatment effect on compliers supports the research hypothesis that a decrease in corruption on municipalities is observed with an increase in social accountability, when controlling by size, region, and service orders ($\beta = -15.046$, p < 0.005). As the instrument (civic density) predicts the causal variable (social accountability) but is linearly unrelated to the outcome (corruption), it is possible to infer that the estimation is more accurate than previous OLS and GLM estimators.

Table 3 - Welch test for matching algorithms (corruption by social accountability through policy councils)

Algorithm	Corruption (mean)		t	df	p-value
	control	treatment			
Exact	13.8787	8.2584	6.264	578.64	0.001
Nearest	13.5843	4.7848	10.90	587.04	0.001

In common, all these estimates provide significant evidence for the causal reasoning that, when civil society is engaged in policy council activities, social accountability thrives, and corruption languishes. When policy councils properly perform their activities (councils are operative), increasing social accountability (outcome), corruption is expected to decrease (Table 4).

This study is in line with those who provide evidence that societal accountability mechanisms, such as the Brazilian policy councils, are effective tool for curbing corruption. It supports the argument that corruption, understood as social fence problem, can also be properly explained as a civil society failure to cooperate for generating public integrity (as common good).

V. Conclusion

This paper contributes to the contemporary literature on democratic institutional design by explaining how policy councils can generate incentives for collective actions that contributes to increasing public integrity, and presents evidence that, when operating properly, social accountability (through policy councils) is important to reducing corruption in Brazilian local government. These results sum with a growing literature that seeks to investigate the impact of specific institutional arrangements to better design anti-corruption policies and to understand how participatory mechanisms can increase the performance and legitimacy of public management in general.

However, this is not a definitive story. Alternatively, further analysis is required to evaluate each chain of the policy council's theory of change (from inputs to impact). More in-deep analysis about how the civil society dynamics influence the council's activities, for instance, would help to enlighten the crucial assumption that councils create more incentives for civil society to engage in collective action for public integrity. Thus, not all policy councils would be operative. To promote public integrity policies, more in deep studies are necessary to explain: why are some policy councils active and others not? When is this cooperation threshold achieved? While civic density remains a critical factor for achieving the cooperative threshold needed for civil society engagement in policy council activities, which other institutional incentives can be designed to reach out this point? To this end, the presented theoretical framework brings a new testable hypothesis for future studies: more policy decision-making powers assigned to policy councils will increase their social accountability by boosting their by-product incentives to cooperate with the production of public integrity (understood here as a common good).

Table 4 - Finding's summary

Model	B coefficient	P-value
OLS	-4.604	0.01
Poisson	-0.433	0.01
Negative-binomial	-0.435	0.01
Zero-inflated	-0.396	0.01
Logistic	-5.007	0.01
Matching (exact)	-1.652	0.10
Matching (nearest)	-5.007	0.01
Instrumental variable	-15.046	0.05

Source: author (2023).

The right-fit way to achieve public integrity remains an important question. Integrity is and will continue to be a notable issue of public governance (Roman, 2012). To estimate the general effect of social accountability (through policy councils) on corruption is just one step into better policy governance design, because corruption can be tackled by different approaches and more evidence is needed about how to make these policy councils operational. Following this enduring path, evidence-based recommendations for social accountability can be seen as an undeniable contribution to strengthening public integrity.

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Como o controle social promove a integridade pública: o papel dos conselhos de política pública para conter a corrupção

Palavras-chave: corrupção, conselhos de políticas públicas, controle social, integridade pública, governança pública.

RESUMO **Introdução:** O artigo estima o impacto do controle social realizado por meio dos conselhos municipais de políticas públicas nas áreas de saúde, educação e assistência social sobre a corrupção. **Materiais e métodos:** O estudo adota um desenho de pesquisa quase-experimental dentro de um modelo formal para inferência causal. Um conjunto de técnicas de estimativa, como regressão, pareamento e variáveis instrumentais, é empregado para estabelecer um contrafactual a partir de uma amostra aleatória de 1.223 municípios, auditados de forma independente entre 2006 e 2015, como parte do Programa de Fiscalização de Municípios da Controladoria-Geral da União. **Resultados:** Observa-se o efeito estatisticamente significativo do controle social, realizado por meio dos conselhos de políticas públicas, sobre a corrupção nos municípios brasileiros. Quando esses conselhos estão operacionais e atuantes, exercendo adequadamente o controle social que lhes é atribuído por lei, evidencia-se uma redução estatisticamente significativa na ocorrência dos casos de corrupção. **Discussão:** Os resultados estão alinhados com a literatura internacional que aponta os efeitos positivos do controle social no combate à corrupção. O modelo teórico proposto permite explicar como os conselhos de políticas públicas operativos são capazes, por meio de ações de monitoramento, regulação, consulta e decisão sobre os programas locais, de promover o controle social pela superação do "dilema da cerca social", apoiando a ação coletiva necessária a integridade pública. Entretanto, a corrupção é um problema complexo que demanda uma abordagem multifacetada e pesquisas adicionais são necessárias para aprofundar as estratégias de otimização do desempenho dos conselhos de políticas públicas. O estudo contribui para um melhor desenho de políticas anticorrupção democráticas e baseadas em evidências.

Appendix

A - Variables' description

Variables		Metric	Operationalization
Dependent	corruption	Counting of corruption	Total amount of serious failures (CGU, 2020)
	corruption_dic	Dichotomous counting of corruption	Dummy which 1 represents 1 or more serious failure; 0 otherwise (CGU, 2020)
Independent	social_accountability	Social accountability	Categorial variable in which 4 represents fully social accountability (no failures in composition or functioning at policy councils). One point was subtracted, up to the limit of 0, for each nonoperational policy council (CGU, 2020).
	social_accountability_dic	Dichotomous social accountability	Dummy in which 1 represents more than 2 operational policy councils (2, 3 or 4); 0 otherwise (CGU, 2020)
	k_social	Civic density	Count of civil society organizations formally registered in the municipality (IBGE, 2010b)
Controls	region	IBGE region	IBGE political administrative region (IBGE, 2018)
	size	IBGE size	Dummy in which 1 represents more than 20.000 inhabitants; 0 otherwise (IBGE, 2010a)
	south	South region	Dummy in which 1 represents south; 0 otherwise

- Continuation

Variables		Metric	Operationalization
	southeast	Southeast region	Dummy in which 1 represents southeast; 0 otherwise
	midwest	Midwest region	Dummy in which 1 represents midwest; 0 otherwise
	north	North region	Dummy in which 1 represents north; 0 otherwise
	northeast	Northeast region	Dummy in which 1 represents northeast; 0 otherwise
	SO	Service Orders	Number of audit service orders issued (CGU, 2020)
Others	IBGE	IBGE code	Municipality code (IBGE, 2018)

Source: author (2023).

B - Statistical report

	Dependent variable							
	OLS (1)	Logistic (2)	Poisson (3)	Negative binomial (4)	Zero-inflated Count (5)	Matching (exact) (6)	Matching (nearest) (7)	Instrumental variable (8)
social_accountability_dic	-4.605*** (0.644)	-0.702*** (0.204)	-0.433*** (0.019)	-0.435*** (0.066)	-0.396*** (0.066)	-5.007*** (0.759)	-1.652* (0.965)	-15.046** (6.498)
SO	-0.007 (0.032)	0.025** (0.010)	-0.001 (0.003)	0.001 (0.003)	-0.002 (0.003)	0.052 (0.057)	0.006 (0.038)	0.004 (0.036)
south	-10.422*** (0.902)	-1.954*** (0.261)	-1.288*** (0.039)	-1.308*** (0.096)	-1.157*** (0.103)	-9.846*** (1.192)	-14.526*** (1.296	-8.176*** (1.709)
southeast	-10.507*** (0.0777)	-1.807*** (0.244)	-1.221*** (0.031)	-1.223*** (0.082)	-1.102*** (0.086)	-10.677*** (0.942)	-14.330*** (1.168)	-8.967*** (1.282)
midwest	-8.212*** (1.144)	-1.283*** (0.333)	-0.800*** (0.041)	-0.796*** (0.119)	-0.718*** (0.120)	-8.746*** (1.598)	-11.425*** (1.685)	-6.874*** (1.509)
north	-5.269*** (1.014)	-0.723** (0.359)	-0.416*** (0.029)	-0.421*** (0.103)	-0.383*** (0.100)	-6.223*** (1.346)	-7.965*** (1.400)	-4.382*** (1.246)
northeast								
size	-2.774*** (0.660)	-0.434** (0.200)	-0.261*** (0.019)	-0.322*** (0.068)	-0.288*** (0.068)	-2.670*** (0.895)	-2.081** (0.827)	-3.473*** (0.847)
Constant	20.106*** (1.108)	3.116*** (0.374)	3.151*** (0.032)	3.150*** (0.114)	3.181*** (0.114)	19.083*** (1.671)	21.013*** (1.331)	26.527*** (4.156)
Observations	1,223	1,223	1,223	1,223	1,223	924	818	1,223
R^2	0,233					0,217	0,298	0,067
Adjusted R^2	0,228					0,211	0,292	0,061
Log Likelihood		0466.280	-7,095.359	-3,819.104	-3,804.403			
Theta				0.970*** (0.047)				
Akaike Inf. Crit.		948.560	14,206.720	7,654.209				
Residual Std. Error	10.448 (df = 1215)					11.199 (df = 916)	10.386 (df = 810)	11.523 (df = 1215)
F Statistic	52.605*** (df = 7,1215)					36.288*** (df = 7,916)	49.226*** (df = 7,810)	

Source: Vieira (2023).

Note:
* $p < 0.1$;
** $p < 0.05$;
*** $p < 0.01$.