# Political Accountability and Bureaucratic Selection*

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**Abstract**

The selection of public sector employees is a key determinant of state effectiveness. Given that politicians influence bureaucracies, could increases in political accountability improve bureaucratic selection? This paper investigates this possibility by leveraging randomized anti-corruption audits and individual-level data on the universe of public sector employees in Brazil. Our findings demonstrate that audits enhance the quality of the bureaucracy, particularly for frontline positions that directly impact public service delivery. The results are driven by politicians' heightened incentive to perform well in office.

**Keywords:** Bureaucratic Selection, Accountability, Transparency, State Capacity

**JEL Codes:** H11, O20, P00

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# 1 Introduction

How can we address the scarcity of qualified public sector employees that exists in many parts of the world, particularly in developing countries? This shortage limits state effectiveness, as evidenced by a growing body of literature highlighting the importance of bureaucratic selection in shaping the quality of public service delivery (see Besley et al. (2022) for a recent review). In this paper, we argue that because politicians influence bureaucracies, improving political accountability can enhance the quality of the bureaucracy.

Brazil is an ideal setting for testing this idea for two main reasons. First, we can leverage individual-level official matched employer-employee records (from RAIS) to obtain information about the educational attainment and occupation of every municipal public sector employee, allowing us to construct detailed measures of their qualifications (in a vein similar to Colonnelli et al. (2020)). Second, we can exploit randomized audits conducted in 1,949 municipalities between 2003 and 2015 as exogenous political accountability shocks (as, e.g., Avis et al. (2018)), comparing bureaucratic selection patterns in audited municipalities to those in a large number (3,359) of never-audited municipalities, within a staggered differences-in-differences design.[1]

Our findings reveal that audits lead to a sustained improvement in the quality of the bureaucracy. On average, audits increase the number of qualified employees by 4.4%, without affecting the number of unqualified employees. The increase is primarily driven by frontline occupations which directly affect the quality of public service delivery and require qualifications to be performed effectively – such as teachers, doctors, and nurses. Audits increase the number of qualified individuals hired for these professions by 8.9%, while the number of unqualified professionals remains unchanged. The improvement is particularly pronounced for positions filled through civil service examinations. For these roles, there is a significant increase in the number of qualified hires (9.4%) without any change in the number of unqualified hires. Given the rigidities in firing and the absence of strong incentives in the public sector (as in most countries), these better hires have the potential to permanently improve the provision of public services (Besley et al., 2022).

We posit an explanation of these effects centered on the idea that (i) political accountability incentivizes costly effort to remain in office (Avis et al., 2018) and (ii) politicians hold sway over

[1] Anti-corruption programs and the institutions that implement them have proliferated across the developing world, existing in countries such as India (Central Vigilance Commission), Brazil (Office of the General Comptroller), South Africa (Special Investigating Unit), Mexico (Superior Audit Office of the Federation), Indonesia (Corruption Eradication Commission), and Nigeria (Independent Corrupt Practices and Other Related Offences Commission).

bureaucracies. In the short term, audits incentivize officials to enhance their performance to mitigate the negative electoral impact caused by the exposure of corruption. To achieve this, mayors relinquish corruption rents (Avis et al., 2018). Additionally, since mayors can influence the allocation of municipal public sector jobs (Colonnelli et al., 2020), they invest time and effort in improving the quality of the bureaucracy. They do this by demanding more stringent criteria for positions filled through civil service examinations, which serve as effective screening devices (Dahis et al., 2023). Audits also provide information about the program's actual "bite" (Avis et al., 2018), motivating future mayors to perform better due to the possibility of subsequent audits. This results in sustained improvements in hiring practices. Among all positions in the bureaucracy, those directly affecting public service delivery and requiring specific qualifications see the most significant quality improvements, as better bureaucratic selection for these roles generates the greatest electoral returns.

Results from several empirical exercises support our proposed interpretation. First, consistent with the idea that audits improve bureaucratic selection by incentivizing mayors' effort, there are no effects on the quality of public sector employees hired by the state or federal government – whose hiring mayors cannot easily influence. Second, consistent with the idea that mayors maximize the electoral returns to their efforts, the results are driven by positions which directly affect public service delivery and require qualifications to be performed effectively. Third, the short- and long-term effects are entirely driven by audits that reveal above-median levels of corruption or affect a mayor that is not term-limited – i.e. those which, by reducing the incumbent's re-election chances (Ferraz and Finan, 2008), induce the strongest (i) incentive for the incumbent to improve their performance and (ii) updating of the "bite" of the program upwards. Fourth, consistent with the idea that the long-term effects of audits stem from an increased perceived cost of being audited again in the future, our baseline results hold when comparing municipalities that learned about the audit's impact through an audited neighbor to those that neither experienced an audit nor had an audited neighbor.[2]

Our results lend little empirical support to alternative explanations. First, the fact that our baseline result holds when evaluating the effects of indirect exposure to the audits is inconsistent with the idea that direct effects of the audits, such as the dismissal of corrupt state employees, drive the improvement in bureaucratic selection.[3] Since neighboring audits do not reveal

[2] Colonnelli and Prem (2022), among others, exploit the fact that the results of the audits were disseminated via radio to neighboring municipalities to investigate the effects of indirect exposure to them.

[3] This notion also conflicts with the program's remit, which did not aim to enhance the qualification of

information about the local incumbent and therefore do not affect their re-election chances, these results are also inconsistent with the idea that the long-term effects arise from changes in the type of politician in power (e.g. voters ousting corrupt mayors (Ferraz and Finan, 2008)) or from bureaucratic turnover induced by political turnover (Akhtari et al., 2022). Second, the absence of effects on bureaucratic selection when the audited mayor is term-limited, and the lack of improvement for employees hired by the state or federal government, are inconsistent with the idea that audits create a generalized fear leading public officials to raise public standards independently of the mayor. Third, the fact that we do not see effects on patronage (i.e. the hiring of campaign donors of the incumbent mayor, as in Colonnelli et al. (2020)) is inconsistent with the idea that the improvement in bureaucratic selection is mediated by a reduction in corrupt hiring practices.[4] This is also inconsistent with the idea that the effects on bureaucratic selection are driven by a perception that all forms of misbehavior, such as corrupt hiring practices, are now under stronger scrutiny (Montenegro, 2020). Lastly, the lack of change in the average age of public sector employees is inconsistent with the idea that the improvement in bureaucratic selection is a mechanical consequence of new hires being disproportionately drawn from younger cohorts, which are generally more educated.

The key takeaway from this paper is that that, since politicians influence bureaucracies, the quality of the bureaucracy can increase if political accountability increases. Our work primarily contributes to the literature on how transparency and accountability affect key determinants of state capacity.[5] A large literature has focused on studying how transparency and accountability affect corruption, finding negative results overall (Avis et al., 2018; Zamboni and Litschig, 2018; Bobonis et al., 2016; Olken, 2007; Di Tella and Schargrodsky, 2003). Relative to this literature, our main contribution consists in studying how political accountability affects bureaucratic selection, a different determinant of state capacity which has received increasing attention.[6]

bureaucrats.

[4]Hiring unqualified individuals is not a crime. In parts of Brazil, like many other countries, the scarcity of qualified professionals means that, without significant hiring effort, a less-than-ideal candidate might secure a public sector job.

[5]An influential body of literature examines the effects of accountability interventions on the effectiveness of public service delivery per se, finding positive results overall (Dupas and Jain, 2023; Ramos et al., 2022; Muralidharan et al., 2021; Banerjee et al., 2020; Varjao, 2019; Banerjee et al., 2018; Björkman Nyqvist et al., 2017; Reinikka and Svensson, 2011; Björkman and Svensson, 2009; Reinikka and Svensson, 2005).

[6]It has been shown that attracting better bureaucrats via financial and career incentives (Deserranno and León-Ciliotta, 2021; Leaver et al., 2021; Alva et al., 2020; Brown and Andrabi, 2020; Deserranno, 2019) and selecting them via rules-based competitive civil service examinations (Dahis et al., 2023; Aneja and Xu, 2023; Muñoz and Prem, 2022; Otero and Munoz, 2022; Mocanu, 2022; Moreira and Pérez, 2021; Estrada, 2019; Bostashvili and Ujhelyi, 2019; Ornaghi, 2016) or discretion (Weaver, 2021; Toral, 2022; Brassiolo et al., 2021; Riaño, 2021; Colonnelli et al., 2020; Voth and Xu, 2020; Xu, 2018; Lewis, 2007) affects state effectiveness.

Moreover, by documenting zero effects on patronage, our paper also shows that substitution effects of the form described in Olken (2007) – whereby politicians substitute towards untargeted forms of corruption in response to transparency shocks –, which have received attention in the literature (see, e.g., Fisman and Golden (2017); Lichand and Fernandes (2019); Gagliarducci and Manacorda (2020); Gerardino et al. (2022)), may not always materialize. In fact, our results echo those in Barbosa and Ferreira (2023), who, in the same context, find that the audits reduced the effect of a particular political group rising to power on the share of jobs allocated to individuals belonging to that group.

By focusing on how political accountability affects bureaucratic selection, our paper is most closely related to the recent literature studying how transparency and accountability affect the bureaucracy.[7] Jävervall (2022) studies the effects of a different transparency policy (a law requiring wealth disclosure by candidates) on the extent of skill-task mismatch in the IAS – the topmost layer of the government bureaucracy in India. We differ from this paper by studying the effects of a policy that directly informs voters about politicians' performance on the quality of hires across all bureaucratic layers. Studying the same audits program in Brazil, Gonzales (2021) and Lauletta et al. (2021a) show that the audits increase the hires of the local bureaucracy without improving public service delivery.[8] Based on these results, these papers conclude that the audits led to inefficient hiring by the public sector. However, assessing the quality of these hires based on how the audits affected public service delivery is challenging since the audits also affected other determinants of public service delivery besides public sector hires, such as the amount of federal transfers to municipalities (Brollo et al., 2008), corruption (Avis et al., 2018), tax compliance (Montenegro, 2020), and economic activity (Colonnelli and Prem, 2022). To address this challenge, we examine the *direct* effects of audits on the quality of bureaucrats. Our approach aims to cleanly identify how audits impact the quality of hires, and is motivated by recent research emphasizing the importance of the match quality between bureaucrats and their tasks for state performance (Xu, 2023; Bergeron et al., 2022; Balan et al., 2022; Spenkuch et al., 2023; Limodio, 2021; Xu et al., 2023; Bhavnani and Lee, 2018).

The remainder of this paper proceeds as follows. Section 2 describes Brazil's randomized

[7] By drawing a link between transparency, political incentives and bureaucratic outcomes, this body of work is closely related to the growing literature on the organizational economics of the state (recently discussed by Besley et al. (2022)).

[8] When looking only at the period between 2001 and 2004, Lauletta et al. (2021b) find that the audits led to a decrease in the number of local bureaucrats required to provide a given level of public services. In this paper, we use a more general sample, encompassing the entirety of the program (2003-2015).

audits program, municipal civil service, and municipal elections. Section 3 details our data, presents descriptive statistics, and delineates our empirical strategy. Section 4 presents our results on the dynamic effects of audits on bureaucratic selection and explores the mechanisms underlying those effects. Finally, Section 5 concludes.

# 2 Background

## 2.1 Federal Audits

In May 2003, the Brazilian central government announced the Monitoring Program via Public Lotteries (*Programa de Fiscalização por Sorteios Públicos*), a large-scale program aimed at detecting and preventing corruption and mismanagement in the allocation of federal resources. The program, operational from 2003 to 2015, encompassed 40 rounds of random selection of municipalities. The audits were carried out by the Office of the Comptroller General, known as the Controladoria Geral da União (CGU), a federal agency entrusted with the mission of preventing corruption at the federal level and overseeing activities involving the utilization of public resources. The random draws were conducted by a large public bank in Brazil, *Caixa Econômica Federal*, and were televised and monitored by the press, political parties, and civil society members.

The lotteries were drawn with replacement, but municipalities audited in recent rounds were ineligible. At first, municipalities audited in any of the previous three rounds were ineligible. However, this rule changed over time, going from 3 to 12 rounds. The randomization was stratified by state and round. State capitals or municipalities with populations exceeding a specified threshold were ineligible. The population threshold was initially set at 100,000 at the beginning of the program, but it was eventually raised to 500,000. Some draws also had a minimum population threshold of 10,000 inhabitants. As of 2014, 5,476 municipalities were eligible, representing more than 99% of Brazil's 5,570 municipalities and about 70% of the country's population. The annual median number of audit rounds was 3. During each audit round, approximately 60 municipalities were chosen randomly. However, due to fluctuations in the federal budget, the frequency of lotteries (audits) conducted each year also experienced variations, ranging from 7 (400) in 2004 to 3 (180) in 2007, eventually reduced to just 1 (60) in 2013. Figure 1 depicts this pattern. While the implied audit probabilities in any given lottery round and year were quite small (an average of approximately 1 and 3 percent, respectively),

the probability of being audited in a 4-year political term could be quite high depending on the state, ranging from 8.6% to 26.4%. By the end of the program, over R$22 billion worth of federal funds had been audited, and 1,881 municipalities had been audited at least once. Figure 2 shows the spatial distribution of ever-treated municipalities.

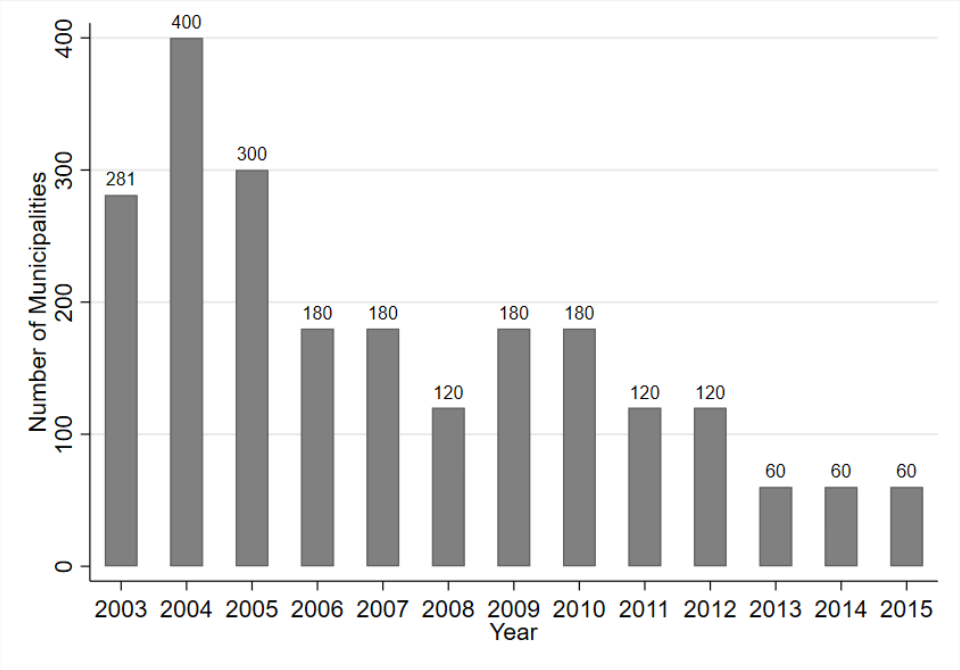



Figure 1: Number of Audits Over Time

Notes: This figure reports the yearly total number of audits using administrative data from CGU for 2003–2015.

Once a municipality was selected, the audit process began shortly after the lottery draw. Ten to fifteen competitively hired and paid auditors were dispatched to the municipality for one to two weeks. They aimed to determine whether earmarked federal transfers had been utilized under the prescribed guidelines. The auditors searched for signs of mismanagement and corruption, such as diversion of funds, noncompetitive bidding in the procurement contracts, incompleteness, or non-utilization in specific federally-funded projects and public works. The audits mainly uncovered irregularities related to procurement processes. Avis et al. (2018) find that the three most common forms of corruption that this program detected were (1) embezzlement (diversion of funds), (2) frauds in procurement processes and (3) over-invoicing, while Lichand and Fernandes (2019) find that the audits detected 11 types of irregularities, 9 of which are directly related to procurement procedures: (i) irregular receipts, in procurement processes; (ii) evidence for ghost firms, in procurement processes; (iii) contracts not signed or falsified signatures, in procurement processes; (iv) favored vendors, in procurement processes; (v) lack of publicity,

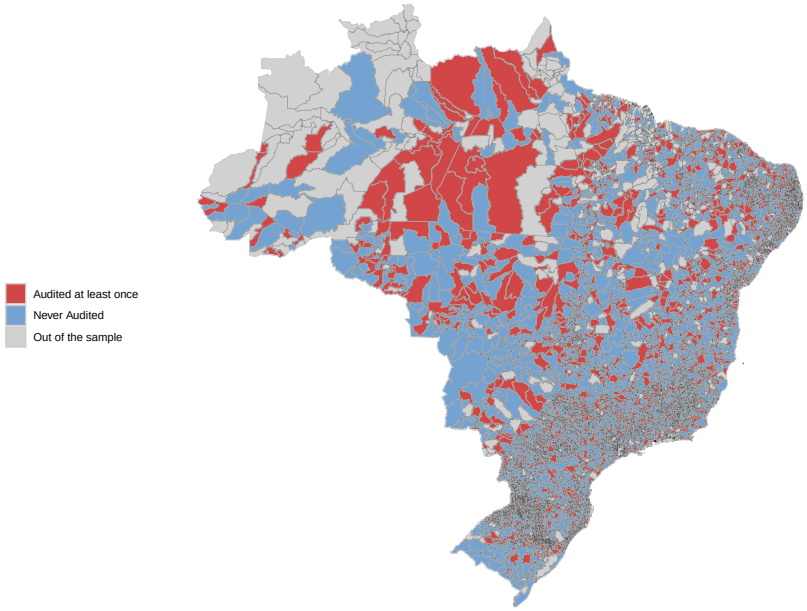



Figure 2: Ever-Audited Municipalities

Notes: This figure depicts the treatment status of Brazilian municipalities based on administrative data from CGU for 2003–2015. Audited municipalities are highlighted in red, eligible but never-audited municipalities are marked in blue, and always-ineligible municipalities are shaded in gray.

in procurement processes; (vi) documents set with different dates, in procurement processes; (vii) other procurement-related problems; (viii) irregular class of procurement processes; (ix) lack of a procurement process; (x) resource diversion via over-invoicing; (xi) resource diversion via off-the-record payments. Importantly, Brazil's randomized audits program did not target improving the quality of hires by the municipal public sector.

Upon the completion of their inspections, the auditors meticulously compiled a comprehensive report documenting all irregularities related to the utilization of federal resources. These reports, a testament to the transparency of the audit process, were then submitted to the central CGU office. The central unit, in turn, consolidated this information into publicly accessible reports, which were disseminated through various media channels, including the Internet, newspapers, television, and radio. The local radio stations even reported on the audit results of neighboring municipalities, further enhancing public awareness. The information in these reports was also used in political campaigns. Ultimately, the CGU forwarded the reports to the relevant administrative and judicial government bodies, initiating the process of prosecuting any corruption cases and pursuing administrative or legal penalties and fines. The most common legal outcomes resulting

from these audits included the suspension or removal of public officials from their positions, or the forfeiture of a mayor's mandate.

## 2.2 Municipal Civil Service

Municipal bureaucracies employ over half of all public sector employees in Brazil and play key roles in providing public services such as health and education. The Brazilian constitution establishes that municipalities have to rely on transparent rules and requirements for selecting civil servants. More specifically, most civil servants must undertake a formal, competitive, open entrance examination (*concurso público*), whose requirements are job-specific and can include written and oral tests and the submission of academic and professional credentials. Competitive civil service examinations are the standard mechanism through which states try to hire competent employees, and have been shown to be an effective screening device (Dahis et al., 2023). Although an educational level satisfying the suggested educational level of the position is desirable (e.g. a full tertiary degree for a public school teacher), hiring workers without the recommended qualifications is not illegal and often occurs due to a lack of qualified candidates. Hiring committees comprise top and middle bureaucrats who respond directly or indirectly to mayors. Therefore, mayors can demand higher stringency from the hiring committees, to increase the quality of hires.

In addition to the positions filled through competitive exams, there are discretionary positions appointed by mayors. These positions fall into the following categories: commissioned positions (*cargo em comissão*), positions of trust (*função de confiança*), temporary jobs (*emprego temporário*), and political appointees (*cargo de natureza política*). Hiring in the first two categories is limited to high-level public officials' positions (directors, managers, supervisors, advisors, and administrative assistants). Temporary jobs are defined by politicians or high-level public officials and intended to give municipalities flexibility to meet temporary hiring needs. Finally, political appointees, the smallest share of municipal public sector workers, are mostly municipal managers, supervisors, and advisors.

## 2.3 Municipal Politics

Municipalities in Brazil are governed by an executive branch led by the mayor and a legislative branch represented by the city council. The mayor's tenure is restricted to a 4-year term, and mayors in their first term can seek re-election. Mayors are affiliated with specific political parties

and typically garner support from a coalition of parties. Both politicians and citizens can support local parties or the coalition by becoming party members and making financial contributions, such as donations. Donations made by individuals can be made directly to political parties or the campaigns of mayoral or council candidates affiliated with a specific party.

# 3 Empirical Approach

## 3.1 Data

**Audits** We use publicly available information on all lottery rounds from Brazil's Comptroller Office (*Controladoria Geral da União*, CGU). Based on this information, we build a comprehensive dataset that comprises detailed information regarding the audits, such as the dates of occurrence, municipalities under scrutiny, and the reports outlining all irregularities identified by auditors.[9] Our primary analysis focuses on all audit rounds (lotteries 1-40), which took place between 2003 and 2015. Furthermore, we integrated metrics related to detected levels of mismanagement and corruption, specifically for lotteries 22-38, as outlined in Avis et al. (2018). These metrics are built from reports in which auditors classify irregularity as an act of mismanagement, an act of moderate corruption, or an act of severe corruption. Following Avis et al. (2018), we define as corruption the irregularities classified as moderate or severe in the CGU reports. On average, the audits revealed 2.5 instances of corruption and 0.88 cases of mismanagement per service order. Refer to Avis et al. (2018) for further details. Based on this data, we build a municipality-by-year panel containing the year in which each municipality was audited for the first time and the total amount of times it was audited before (if ever). For never-treated municipalities, we also compute whether at least one municipality in the same microregion had already been audited (in the vein of Colonnelli and Prem (2022)).[10]

**Municipal Public Sector Employees** Our primary data source about municipal public sector employees is the *Relação Anual de Informações Sociais* (RAIS), administered by the Ministry of the Economy (*Ministério da Economia*). This dataset is derived from annual surveys of the formal labor market and is widely used and well-established in terms of quality, as evidenced by previous studies (e.g., Colonnelli et al. (2020)). It consists of a rich panel of data that reports administrative information on the universe of formal labor contracts, which we use

[9] Available at CGU (2021a) and CGU (2021b).

[10] Microregions are collections of municipalities that share certain geographic and socioeconomic characteristics. IBGE, the Brazilian Institute of Geography and Statistics, defines them.

to identify municipal public sector employees in Brazil over time (public sector employees work in the formal sector). It includes a rich set of worker characteristics, such as employer, occupation, education, type of labor contract, wage, whether the worker was hired or fired that year, gender, age, and race. Importantly, we can observe a unique identifier for each worker, called individual tax identifier (CPF), which allows us to track individuals across jobs and different data sources.

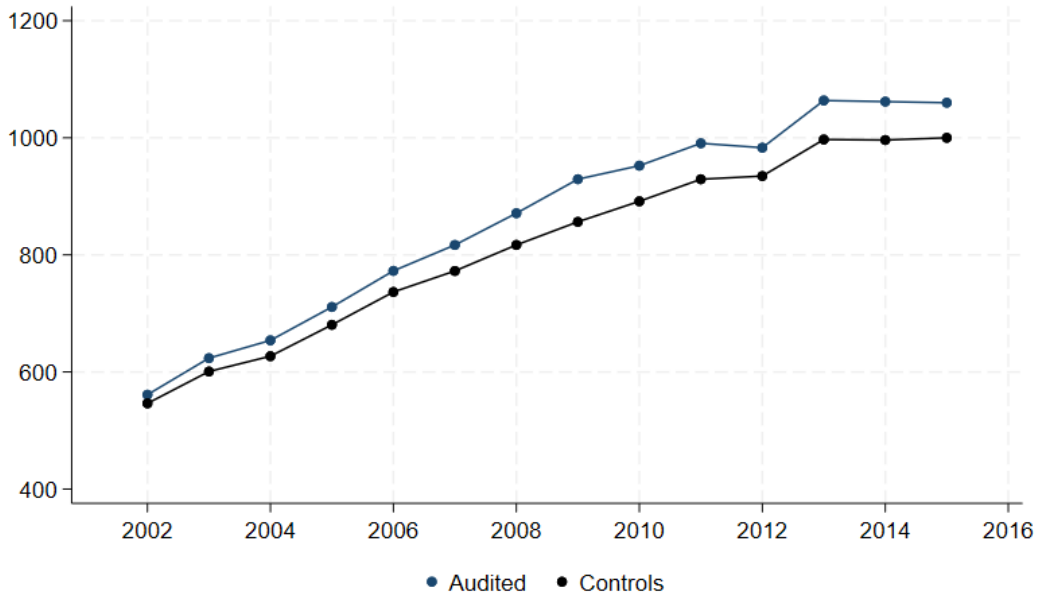
In building our dataset, we implement standard RAIS cleaning procedures, excluding a given individual's secondary jobs (i.e., those that pay less and are of smaller tenure) in a given year. Following Colonnelli et al. (2020), we classify as municipal public sector employees individuals employed by the municipal government, excluding elected officials. In our main analysis, in a vein similar to Colonnelli et al. (2020), we classify public sector occupations into four categories: *managers*, defined as individuals working at an occupation belonging to the ISCO major group 1 (e.g., manager of public sector agency at the municipal or state level, school headmaster, administrative director, health services manager); *bureaucrats*, individuals working at an occupation belonging to the ISCO major group 4 (e.g., administrative assistant, administrative supervisor, receptionist); *frontline-high skill*, individuals working at an occupation belonging to the ISCO major groups 2 and 3 (e.g., primary school teacher, secondary school teacher, doctor, nurse, nursing technician, and assistant); *frontline-low skill*, individuals working at an occupation belonging any of the remaining ISCO major groups except for "Armed Forces" (e.g., community health worker, garbage collector, street cleaner, night guard, driver, cook). Then, we classify managers and frontline-high-skill workers as qualified if they have completed a tertiary degree and bureaucrats if they have completed a secondary degree. Since the educational level is plausibly not the main determinant of performance for frontline-low skill professions, we cannot test how the audits affected the quality of hires for these positions. Colonnelli et al. (2020) incorporate information on the educational prerequisites for a subset (not the universe) of all occupations to categorize municipal public sector employees as qualified or unqualified. We use their classification in a robustness check, finding similar results. Finally, we use information about the labor contract to identify individuals hired via civil service examination (*servidor publico efetivo*).

Using this individual-level data, we construct a municipality-by-year panel that aggregates measures of the quality of bureaucratic selection. We focus on the stock of municipal public sector employees who meet the minimum educational requirements for the positions they hold compared to the stock of employees who do not meet these criteria. We denote the first category

as "qualified" employees and the second as "unqualified" employees. We compute this measure across and within the three occupational groups that require a certain degree of educational attainment to be performed effectively (managers, frontline high-skill, and bureaucrats).

Figure 3 shows the total number of employees identified as belonging to the municipal public sector from 2002 to 2015. The blue line represents the trend for municipalities audited during the period, while the black line represents never-audited municipalities. We observe an increasing trend in the total number of employees in both groups. However, although the numbers were similar in 2002, the number of employees grew more in the audited municipalities. This result aligns with previous evidence indicating that audits influence the size of the bureaucracy (Gonzales, 2021). As will be shown later, this increase was completely driven by qualified hires.

Figure 3: Number of Municipal Public Sector Employees




Notes: This figure depicts the number of municipal public sector employees based on administrative data from RAIS for 2002–2015. Audited municipalities are highlighted in blue, eligible but never-audited municipalities are marked in black.

**Mayors and Campaign Donors** We use publicly available data on electoral records from the 2000, 2004, 2008, 2012, and 2016 municipal elections from Brazil's preeminent electoral justice institution, the *Tribunal Superior Eleitoral* (TSE).[11] This dataset provides information about election outcomes, encompassing data on elected mayors' profiles, candidate details, party affiliations, coalition alignments, and the number of votes garnered. It also includes the total votes received by each candidate in the municipality, alongside the candidate's gender, education

[11] Available at TSE (2021).

level, age, and political allegiance. This dataset provides us with observable characteristics of the elected mayor for each municipality. It allows us to discern whether they face term limits (by being in their second or first term in office, respectively). In particular, this allows us to know whether an audit occurred in a municipality where the incumbent could run for re-election.

For elections from 2004 to 2016, TSE also provides publicly available data on campaign donors. For non-corporate donors, we can identify their tax identifier (CPF), the amount of money they donated, and the candidate or party they financed. We identify donors who donated to winning mayors and match them perfectly to RAIS via their CPF. This allows us to compute our measure of the prevalence of patronage, namely the stock of municipal public sector employees who donated to the incumbent mayor (as Colonnelli et al. (2020)).

**Other Data** We obtain baseline municipality-level characteristics from the 2000 Census from *Instituto Brasileiro de Geografia e Estatística* (IBGE), to evaluate balance across treatment assignment.[12] The 2000 population census has information on various socioeconomic and demographic characteristics, such as municipal income per capita, income inequality, poverty incidence, population density, the proportion of the population residing in urban areas, informality, and the literacy rate.

Our final estimation sample consists of a balanced municipality-by-year panel combining information from administrative sources. To make the interpretation of the results clearer, we drop from the sample: (i) municipalities that were never eligible for the program (i.e. state capitals and municipalities with a population above 500,000, which represent 0.8% of municipalities), (ii) municipalities that were audited multiple times (4.9% of municipalities) and (iii) municipalities without information about municipal public sector employees (6.3% of municipalities). Our final sample has a set of 4,914 municipalities.

Table 1 presents descriptive statistics for our main sample's municipal public sector employees. In summary, frontline high-skilled employees constitute a significant portion of the public municipal workforce, accounting for approximately 40%. The other groups comprise a lesser share of the municipal bureaucracy: frontline low-skilled employees 35.7%, bureaucrats 16.7%, and managers 8.0%. There is an average of 828.3 employees overall. Excluding frontline low-skilled employees, 301.8 are qualified, and 260.0 are unqualified.

The data shows that 33.1% of public sector employees are unqualified. At 53.2%, this percentage is significantly greater among highly skilled frontline workers (e.g., a teacher without

[12] Available at https://loja.ibge.gov.br/catalogsearch/result/?q=censo.

a full tertiary degree). As mentioned before, this is to be expected, since (i) there is a lack of qualified individuals that can be potentially hired by the state and (ii) it is not a crime to hire individuals that do not have the recommended educational level. This is even though a majority of the workforce (80.9%) was hired via civil service exams (this share is 83% for frontline high-skilled workers). In fact, analyzing the employees hired through civil service exams, we find that 31.4% of them are unqualified, which is comparable to the percentage of unqualified public sector employees in general (note that these are different positions, comparing e.g. a teacher to a secretary of health). Additionally, 0.8% of the workforce comprises past donors of the incumbent mayor.

Table 1: Descriptive Statistics - Municipal Public Sector Employees

| | Mean | SD | Median |
|---|---|---|---|
| *Panel A: Composition by Occupational Category (%)* | | | |
| Share of Managers | 8.0 | 14.3 | 4.4 |
| Share of Bureaucrats | 16.7 | 17.7 | 11.5 |
| Share of Frontline High Skills | 39.6 | 14.7 | 40.2 |
| Share of Frontline Low Skills | 35.7 | 14.5 | 37.9 |
| *Panel B: Count* | | | |
| Number of Employees | 828.3 | 1282.5 | 424.0 |
| Number of Qualified Employees | 301.8 | 638.4 | 120.0 |
| Number of Unqualified Employees | 260.0 | 423.3 | 130.0 |
| *Panel C: Skill-Task Mismatch (%)* | | | |
| Share of Unqualified | 33.1 | 17.0 | 30.3 |
| Share of Unqualified, Managers | 69.8 | 24.2 | 73.8 |
| Share of Unqualified, Bureaucrats | 27.3 | 20.9 | 22.7 |
| Share of Unqualified, Frontline High Skills | 53.2 | 25.3 | 51.1 |
| *Panel D: Merit-based Hiring (%)* | | | |
| Share Hired via Civil Service Examination | 80.9 | 23.0 | 89.4 |
| Share Hired via Civil Service Examination, Frontline High Skills | 83.0 | 24.5 | 95.1 |
| Share of Unqualified, hired via Civil Service Examination | 31.4 | 18.2 | 28.1 |
| *Panel E: Patronage (%)* | | | |
| Share of Donors | 0.8 | 1.5 | 0.4 |
| Share of Donors, Frontline High Skills | 0.7 | 2.4 | 0.0 |
| Observations | 68,796 | | |

*Notes.* This table presents descriptive statistics for municipal public sector employees in our regression sample. Our final sample comprises 4,914 eligible municipalities in Brazil during the period from 2002 to 2015. Our source is RAIS, and the sample is at the municipality-year level.

## 3.2 Empirical Strategy

Our empirical strategy exploits the randomized audits as an exogenous transparency shock. It compares bureaucratic selection patterns in audited municipalities to those in never-audited municipalities within a staggered differences-in-differences design. Our identifying assumption is that, in the absence of an audit, bureaucratic selection patterns in ever-treated and eligible but

never-treated municipalities would have followed parallel trends. The absence of pretrends in the results presented below will support this assumption. The balancing results in Table A1 in Appendix A provide further evidence supporting our design.

Regarding estimation, since treatment effects might be heterogeneous over time or across municipalities, we obtain our results using the robust estimator developed by Callaway and Sant'Anna (2021). Since many municipalities were never audited (3,359), we always use them as a control group. Regarding inference, we cluster standard errors at the municipality level, and our inference procedure adjusts for multiple hypothesis testing (Callaway and Sant'Anna, 2021). The only exception being the results where we define treatment at the microregion level. For these regressions, we cluster standard errors at the microregion level. Finally, Appendix A provides robustness checks for our main results, where we use a two-way-fixed-effects (TWFE) estimator. Notably, our main result, namely the overall improvement in the quality of the bureaucracy, and the fact that this is driven by frontline positions which require qualifications to be performed effectively, is robust to using the TWFE estimator.

# 4 Results

## 4.1 Audits' Effect on the Quality of the Bureaucracy

We begin our analysis by evaluating how anti-corruption audits affect the total number of municipal public employees, distinguishing between those categorized as qualified and unqualified. Panels A and B delineate the outcomes for qualified and unqualified employees, respectively. Additionally, we categorize the results by occupational groups within the columns (2), (3), and (4). Due to multiple zero counts (e.g. 28% of the municipalities lacked managers in 2002), we apply the inverse hyperbolic sine transformation to the dependent variable. This ensures a balanced panel (necessary for using Callaway and Sant'Anna (2021)) and comparability of the results across occupational categories.[13] We estimate average treatment effects on the treated (ATT) using Callaway and Sant'Anna (2021).[14]

Table 2 presents our main findings. Audits have a positive effect on the number of qualified

[13]For robustness, we also run our main regressions in logarithmic terms and present the results in Table A3 in Appendix A. Note that in this case, the outcome is identified in municipalities with at least one employee in each occupation. We exclude the results for managers from consideration, in this case. Moreover, to maintain a balanced panel, we drop municipalities where the number of employees is zero for at least one year. The results hold.

[14]We also estimate our main results using the TWFE estimator and present the results in Table A4 and Figure A3 in Appendix A. The results hold when using this estimator.

public employees, resulting in a 4.4% increase. The audits do not affect the number of unqualified employees. The increase occurs among bureaucrats (5%) and more strongly among frontline high-skill employees (8.9%). The audits do not affect the number of qualified managers.[15] The audits also do not affect the number of unqualified employees within any particular occupational group.

Table 2: Effect of Audits on the Number of Public Sector Employees

| | (1) Total | (2) Managers | (3) Lower-level Bureaucrats | (4) Frontline High-Skill |
|---|---|---|---|---|
| *Panel A: Qualified* | | | | |
| PostAudits | 0.006 | 0.016 | 0.050* | 0.089*** |
| | (0.007) | (0.028) | (0.028) | (0.031) |
| Observations | 68796 | 68796 | 68796 | 68796 |
| Avg dep var | 2.371 | 2.185 | 4.249 | 4.708 |
| *Panel B: Unqualified* | | | | |
| PostAudits | 0.000 | 0.009 | 0.002 | 0.037 |
| | (0.018) | (0.036) | (0.033) | (0.030) |
| Observations | 68796 | 68796 | 68796 | 68796 |
| Avg dep var | 5.568 | 3.065 | 3.057 | 4.938 |
| Municipality FE | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |

*Notes.* This table shows the main effects of the audit on the number of public municipal employees by occupational category and quality classification. We transform the dependent variable by estimating the inverse hyperbolic sine transformation ($\log(y_i + (y_i^2 + 1)^{0.5})$). Results are obtained using Callaway and Sant'Anna (2021). We balance the panel in calendar time and use never-treated municipalities as the control group. It covers the window $[-4, +8]$ years around the audit year. Our final sample comprises 4,914 eligible municipalities in Brazil during the period from 2002 to 2015. Avg dep var is computed using eligible non-audited municipalities and audited municipalities in the year before the audit. Robust standard errors are clustered at the municipality level. ***p< 0.01, ** p< 0.05, * p< 0.1.

We also examine how the impact on the number of qualified employees changes over time using event-study estimators. Figure A1 in Appendix A shows the results by occupation. First, we observe that the impact on managers' qualifications is not significant, reinforcing the average findings from Table 2. While the improvement amongst bureaucrats takes longer to materialize, we observe an improvement amongst frontline high-skill employees as early as the second year following the audit, with effects increasing over time. This is consistent with audited mayors pushing for a quick improvement in professions that directly deal with citizens and require qualifications to be performed effectively.

[15] It is important to note that while having unskilled doctors clearly may affect state effectiveness, it may be the case that managers' ability is better captured by a more holistic set of characteristics, as shown by the CEO fixed-effects literature (see, e.g., Bertrand and Schoar (2003)). Similar arguments apply to frontline-low skill employees, whose quality we cannot measure.

We test the robustness of our main findings against an alternative definition of qualification in Table A2 in Appendix A. In this table, we employ the educational mismatch measure developed by Colonnelli et al. (2020), which leverages manually collected data on the ideal educational qualifications for each public sector occupation. Our results confirm that the impact of audits on the total number of qualified employees remains positive and statistically significant when using this measure, particularly among frontline-high skilled employees.

To better understand how these effects take place, we now turn to whether the improvement was driven by discretionary or merit-based positions. To do this, we study the effects of the audits on the number of qualified employees, differentiated by type of contract.[16] Table 3 shows the results. Panel A refers to qualified meritocratic hires, and Panel B refers to qualified discretionary hires. As in previous tables, the columns refer to occupation categories.

We see that the increase in qualified bureaucrats occurs only among discretionary hires and that the increase in qualified frontline high-skill employees is unaccompanied by a similar increase in unqualified hires only among meritocratic hires. This suggests that examinations are a more important mechanism through which an improvement in the bureaucracy is operationalized for positions where qualifications are of particular relevance – such as doctors, nurses, and teachers. To better understand what happens with these positions, Figure A2 in Appendix A displays the results of an event study with the number of qualified frontline high-skill employees by type of contract as the outcome. We can see that while there is a short-term and long-term improvement via both discretionary and meritocratic hires for these positions, the effects are more significant for merit-based positions. This is consistent with incumbent and future mayors facing a greater incentive to guarantee a qualified bureaucracy, and taking advantage of examinations as an effective screening device to achieve this objective.

To sum up, our main findings demonstrate that the bureaucracy's quality improves in response to anti-corruption audits, especially among professions that directly impact the provision of public goods and require qualifications to be performed effectively. The effect exists already in the short term for these positions and is mainly mediated by improvements in meritocratic hires. The long-term effects suggest that audits change the behavior not only of incumbents, but also of future mayors.

[16] As shown in Table A5 in Appendix A, audits do not affect the incidence of meritocratic relative to discretionary hires.

Table 3: Effect of Audits on the Number of Qualified Public Sector Employees by Contract Type

| | Total | Managers | Lower-level Bureaucrats | Frontline High-Skill |
|---|---|---|---|---|
| *Panel A: Merit-Based Qualified* | | | | |
| PostAudits | 0.040 | -0.012 | 0.038 | 0.094*** |
| | (0.028) | (0.030) | (0.031) | (0.034) |
| Observations | 68796 | 68796 | 68796 | 68796 |
| Avg dep var | 5.120 | 1.416 | 3.833 | 4.387 |
| *Panel B: Merit-Based Unqualified* | | | | |
| PostAudits | -0.009 | -0.007 | -0.002 | 0.034 |
| | (0.027) | (0.040) | (0.036) | (0.036) |
| Observations | 68796 | 68796 | 68796 | 68796 |
| Avg dep var | 5.146 | 2.059 | 2.623 | 4.615 |
| *Panel C: Discretionary Qualified* | | | | |
| PostAudits | 0.088** | 0.025 | 0.121*** | 0.076* |
| | (0.043) | (0.030) | (0.043) | (0.040) |
| Observations | 68796 | 68796 | 68796 | 68796 |
| Avg dep var | 3.128 | 1.393 | 2.164 | 2.084 |
| *Panel D: Discretionary Unqualified* | | | | |
| PostAudits | 0.059 | 0.034 | 0.038 | 0.081* |
| | (0.048) | (0.040) | (0.039) | (0.049) |
| Observations | 68796 | 68796 | 68796 | 68796 |
| Avg dep var | 3.131 | 2.013 | 1.363 | 2.025 |
| Municipality FE | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |

*Notes.* This table shows the main effects of the audit on the number of qualified public municipal employees by occupational category and contract type. We transform the dependent variable by estimating the inverse hyperbolic sine transformation ($\log(y_i+(y_i^2+1)^{0.5})$). Results are obtained using Callaway and Sant'Anna (2021). We balance the panel in calendar time and use never-treated municipalities as the control group. It covers the window $[-4,+8]$ years around the audit year. Our final sample comprises 4,914 eligible municipalities in Brazil during the period from 2002 to 2015. Avg dep var is computed using eligible non-audited municipalities and audited municipalities in the year before the audit. Robust standard errors are clustered at the municipality level. ***p< 0.01, ** p< 0.05, * p< 0.1.

## 4.2 Why do Audits Improve Bureaucratic Selection?

We now delve into the possible explanations as to why audits improve bureaucratic selection. We begin by re-stating our main interpretation, followed by presenting supporting results. In the short term, audits incentivize officials to enhance their performance to mitigate the negative electoral impact caused by the exposure of corruption. To achieve this, mayors relinquish corruption rents (Avis et al., 2018). Additionally, since mayors can influence the allocation of municipal public sector jobs (Colonnelli et al., 2020), they invest time and effort in improving the quality of the bureaucracy. They do this by demanding more stringent criteria for positions

filled through civil service examinations, which serve as effective screening devices (Dahis et al., 2023). Audits also provide information about the program's actual "bite" (Avis et al., 2018), motivating future mayors to perform better due to the possibility of subsequent audits. This results in sustained improvements in hiring practices. Among all positions in the bureaucracy, those directly affecting public service delivery and requiring specific qualifications see the most significant quality improvements, as better bureaucratic selection for these roles generates the greatest electoral returns.

**Heterogeneity in terms of detected corruption and term limits.** Ferraz and Finan (2008) show that audits negatively affect the re-election odds of mayors (that were not term-limited) in municipalities with above-median levels of detected corruption. If our proposed interpretation is correct, then effects should be driven by these municipalities since this is where the audits (i) generated the strongest incentives for the incumbent to improve their performance and (ii) the perception of the program's bite was more strongly updated upwards. Moreover, this heterogeneity should be present for frontline high-skill positions in the bureaucracy, since it is for these positions that the greatest electoral gains from improving hiring can be obtained.

Table 4 depicts the results of this test, where we focus exclusively on front-line high-skill employees and split the sample according to the level of detected corruption and the electoral term of the audited mayor. We find that the results are fully concentrated among municipalities with an above-median level of corruption and those audited under a first-term incumbent. In column (1), we show that audits generate a 13.5% increase in the number of qualified frontline high-skilled employees in municipalities where the audits revealed an above-median level of corruption. In contrast, we find no effect in municipalities where the audit revealed a below-median level of corruption. Moreover, column (5) shows an 8.0% increase in the number of qualified frontline high-skilled employees in municipalities where the audited mayor was in their first term. There are no effects in municipalities where the audited mayor was in their second term. Finally, note that the audits do not affect the number of unqualified employees hired for these positions, regardless of the estimation sample.

Figures A4 and A5 further explore these results, depicting the dynamic effects of audits on the number of qualified frontline high-skill employees. Figure A4 shows a larger impact in municipalities where corruption was discovered at levels above the median starting in the third year following the audit. In fact, we find no dynamic effects in municipalities where the audit detected a below-median number of irregularities. Figure A5 shows no effects in municipalities

Table 4: Audits' Effects on Frontline High-Skill Employees, by Corruption and Term

| | Above Median | | Below Median | | First-Term Mayor | | Second-Term Mayor | |
|---|---|---|---|---|---|---|---|---|
| | (1) Qualified | (2) Unqualified | (3) Qualified | (4) Unqualified | (5) Qualified | (6) Unqualified | (7) Qualified | (8) Unqualified |
| PostAudits | 0.135** | 0.045 | 0.033 | 0.066 | 0.080** | 0.053 | 0.032 | -0.012 |
| | (0.065) | (0.076) | (0.058) | (0.058) | (0.040) | (0.042) | (0.084) | (0.084) |
| Observations | 50298 | 50298 | 50605 | 50605 | 56415 | 56415 | 48550 | 48550 |
| Avg dep var | 4.721 | 4.934 | 4.721 | 4.932 | 4.717 | 4.934 | 4.721 | 4.933 |
| Municipality FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

*Notes.* This table shows the main effects of the audit on the number of public municipal frontline high-skilled employees by quality classification, detected levels of corruption, and mayor term. We transform the dependent variable by estimating the inverse hyperbolic sine transformation ($\log(y_i + (y_i^2+1)^{0.5})$). Results are obtained using Callaway and Sant'Anna (2021). We balance the panel in calendar time and use never-treated municipalities as the control group. It covers the window $[-4, +8]$ years around the audit year. Our final sample comprises 4,914 eligible municipalities in Brazil during the period from 2002 to 2015. Avg dep var is computed using eligible non-audited municipalities and audited municipalities in the year before the audit. Robust standard errors are clustered at the municipality level. ***p< 0.01, ** p< 0.05, * p< 0.1.

where the audit occurred under a term-limited mayor. On the other hand, in municipalities where the audit took place under a mayor who could be re-elected, we find a sustained increase over time.

Taken together, the results in this subsection are consistent with the idea that "consequential" audits improve bureaucratic selection in the short and long term by (i) creating an incentive for the incumbent to improve their performance and (ii) updating of the "bite" of the program upwards. Moreover, if an autonomous bureaucratic response to the audits, independent of mayoral influence, were the primary driver of the results, we would expect audits to affect bureaucratic selection even when mayors lack strong electoral incentives to perform well in office. However, as demonstrated in this subsection, this is not observed.

**Neighboring Audits** If our proposed interpretation is correct and the long-term effects of the audits are driven by an increase in the perceived cost of being audited again in the future, then our baseline results should hold when comparing municipalities that learned about the audit's "bite" without actually experiencing it to municipalities that didn't experience an audit and didn't learn about its "bite". To evaluate if this is the case, we follow Colonnelli and Prem (2022) (among others) in exploiting the fact that the results of the audits were disseminated via radio to neighboring municipalities to investigate the effects of indirect exposure to audits. More specifically, we compare never-treated municipalities located in microregions where at least one municipality had already been audited to never-treated municipalities located in microregions where no municipality was ever audited. Table 7 presents the findings. We surprisingly find positive (5.6%) and negative (10.1%) effects on the number of qualified and unqualified employees, respectively. Regarding frontline high-skilled employees, we observe a sizable negative effect on

the number of unqualified employees (16.2%).

Table 5: Effect of Audits on the Number of Public Sector Employees - Neighbors

| | (1) Total | (2) Managers | (3) Lower-level Bureaucrats | (4) Frontline High-Skill |
|---|---|---|---|---|
| *Panel A: All* | | | | |
| PostAudits | -0.061 | 0.006 | -0.006 | -0.136* |
| | (0.048) | (0.094) | (0.084) | (0.071) |
| Observations | 47026 | 47026 | 47026 | 47026 |
| Avg dep var | 6.828 | 3.469 | 4.628 | 5.712 |
| *Panel B: Qualified* | | | | |
| PostAudits | 0.056** | -0.066 | -0.019 | 0.138 |
| | (0.022) | (0.098) | (0.082) | (0.117) |
| Observations | 47026 | 47026 | 47026 | 47026 |
| Avg dep var | 2.373 | 2.195 | 4.255 | 4.721 |
| *Panel C: Unqualified* | | | | |
| PostAudits | -0.101* | 0.031 | -0.024 | -0.162** |
| | (0.053) | (0.089) | (0.101) | (0.067) |
| Observations | 47026 | 47026 | 47026 | 47026 |
| Avg dep var | 5.564 | 3.070 | 3.053 | 4.933 |
| Municipality FE | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |

*Notes.* This table shows the main effects of the audit on the number of public municipal employees by occupational category and quality classification. We transform the dependent variable by estimating the inverse hyperbolic sine transformation ($\log(y_i+(y_i^2+1)^{0.5})$). Results are obtained using Callaway and Sant'Anna (2021). We restrict the sample to never-treated municipalities and use neighbors to audited municipalities as the control group. It covers the window $[-4,+8]$ years around the audit year. Our final sample comprises 4,914 eligible municipalities in Brazil during the period from 2002 to 2015. Avg dep var is computed using eligible non-audited municipalities and audited municipalities in the year before the audit. Robust standard errors are clustered at the municipality level. ***p< 0.01, ** p< 0.05, * p< 0.1.

These results also shed light on the plausibility of some alternative explanations. First, if direct effects of the audits, such as the dismissal of corrupt state employees, were a primary driver of their impact on bureaucratic selection, we would expect indirect exposure to audits to have no effect. However, as demonstrated in this subsection, this is not the case. Second, if changes in the type of politician in power, for instance, through voters removing corrupt mayors (Ferraz and Finan, 2008), were driving the audits' effects on bureaucratic selection, we would expect these effects to exist only when audits provide information about the incumbent. Since neighboring audits do not reveal information about the local incumbent and thus do not influence their re-election chances, the findings in this subsection do not support an interpretation centered on political selection. For the same reasons, these results do not support the idea that bureaucratic

turnover induced by political changes (Akhtari et al., 2022) is a key mechanism.

**State and Federal Public Sector Employees** If audits improve bureaucratic selection by incentivizing mayors' effort, then there should be no effects on the quality of public sector employees hired by the state or federal government – whose hiring mayors cannot easily affect. We test this directly, taking advantage of our administrative data. Table 6 presents results using the number of public employees in state or federal positions as the dependent variable. Our findings reveal that audits do not improve the quality of public sector employees whose selection is not under the mayor's influence. Furthermore, if audits created a generalized fear prompting all public officials (both within the municipal administration and beyond) to raise public standards, we would expect an improvement in the quality of hires by the federal and state government to take place. However, as shown, this doesn't occur.

Table 6: Effect of Audits on the Number of State or Federal Sector Employees

| | (1) Total | (2) Managers | (3) Lower-level Bureaucrats | (4) Frontline High-Skill |
|---|---|---|---|---|
| *Panel A: All* | | | | |
| PostAudits | 0.015 | 0.009 | 0.013 | 0.031 |
| | (0.031) | (0.013) | (0.020) | (0.022) |
| Observations | 68642 | 68642 | 68642 | 68642 |
| Avg dep var | 0.692 | 0.168 | 0.351 | 0.376 |
| *Panel B: Qualified* | | | | |
| PostAudits | 0.019 | 0.000 | 0.009 | 0.011 |
| | (0.022) | (0.009) | (0.019) | (0.018) |
| Observations | 68642 | 68642 | 68642 | 68642 |
| Avg dep var | 0.435 | 0.110 | 0.321 | 0.294 |
| *Panel C: Unqualified* | | | | |
| PostAudits | 0.029 | 0.010 | 0.006 | 0.033* |
| | (0.022) | (0.012) | (0.014) | (0.018) |
| Observations | 68642 | 68642 | 68642 | 68642 |
| Avg dep var | 0.340 | 0.108 | 0.146 | 0.249 |
| Municipality FE | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |

*Notes.* This table shows the main effects of the audit on the number of public non-municipal employees by occupational category and quality classification. We transform the dependent variable by estimating the inverse hyperbolic sine transformation $(\log(y_i + (y_i^2+1)^{0.5}))$. Results are obtained using Callaway and Sant'Anna (2021). We balance the panel in calendar time and use never-treated municipalities as the control group. It covers the window $[-4, +8]$ years around the audit year. Our final sample comprises 4,914 eligible municipalities in Brazil during the period from 2002 to 2015. Avg dep var is computed using eligible non-audited municipalities and audited municipalities in the year before the audit. Robust standard errors are clustered at the municipality level. ***p< 0.01, ** p< 0.05, * p< 0.1.

**Patronage** Is the improvement in bureaucratic selection mediated by a reduction in corrupt hiring practices in the public sector? This is ex-ante plausible given that (i) campaign donors (Colonnelli et al., 2020) and co-partisans (Barbosa and Ferreira, 2023) of the incumbent mayor receive local public sector jobs in Brazil and (ii) these politically connected individuals are of lower quality on average (Colonnelli et al., 2020). We exploit individual-level data on campaign donors hired as municipal public sector employees to perform a direct test of how audits affect the allocation of public sector jobs to politically connected individuals. Table 7 depicts our results, which show that the audits do not change the number of jobs in the local bureaucracy assigned to campaign donors. There is also no effect when considering only frontline high-skilled employees. These results suggest that a reduction in corrupt hiring practices does not mediate the overall improvement in bureaucratic quality. Furthermore, these results are inconsistent with the idea that the effects on bureaucratic selection are driven by a perception that all forms of misbehavior (such as corrupt hiring practices) are now under stronger scrutiny (Montenegro, 2020).

Table 7: Effect of Audits on the Number of Public Sector Employees - Patronage

| | (1) Total | (2) Managers | (3) Lower-level Bureaucrats | (4) Frontline High-Skill |
|---|---|---|---|---|
| PostAudits | -0.018 | -0.005 | 0.014 | -0.019 |
| | (0.040) | (0.032) | (0.028) | (0.029) |
| Observations | 50776 | 50776 | 50776 | 50776 |
| Avg dep var | 1.462 | 0.731 | 0.534 | 0.632 |
| Municipality FE | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |

*Notes.* This table shows the main effects of the audit on the number of public municipal employees that are mayor supporters by occupational category. We transform the dependent variable by estimating the inverse hyperbolic sine transformation ($\log(y_i+(y_i^2+1)^{0.5})$). Results are obtained using Callaway and Sant'Anna (2021). We restrict the sample to never-treated municipalities and use neighbors to audited municipalities as the control group. It covers the window $[-4,+8]$ years around the audit year. Our final sample comprises 4,914 eligible municipalities in Brazil during the period from 2005 to 2015. Avg dep var is computed using eligible non-audited municipalities and audited municipalities in the year before the audit. Robust standard errors are clustered at the municipality level. ***p< 0.01, ** p< 0.05, * p< 0.1.

**Public Sector Employees' Age** If the improvement in bureaucratic selection were a mechanic consequence of new hires being disproportionately drawn from younger cohorts – which are more educated on average –, then we would expect audits to reduce the average age of public sector employees. We investigate this channel directly, examining the dynamic effect of audits on the average age of hired employees. Focusing on frontline high-skill workers, we see in Figure A7 in Appendix A that there are no significant effects.

# 5 Conclusion

The quality of personnel selection in the public sector is a fundamental driver of effective public service delivery. Yet, adequately qualified public employees are lacking in many parts of the world – particularly so in developing countries. This paper exploits individual-level administrative data on the universe of public sector employees and an anti-corruption program based on randomized audits that took place in Brazil between 2003 and 2015 to investigate whether increases in political accountability can help address this problem. We find that audits induce an immediate and sustained improvement in the quality of the match between the skills and tasks performed by public employees. The improvement occurs mainly for frontline positions that require qualifications and directly affect public service delivery, and is not accompanied by an increase in the discretionary allocation of public sector jobs to politically connected individuals. In terms of mechanisms, our results are consistent with an interpretation whereby audits generate sustained political incentives to improve bureaucratic selection.

More broadly, this paper suggests that, at least in some settings, transparency might enhance public capacity not only by reducing the leakage of fiscal resources via corruption but also by helping create the necessary political incentives for a qualified bureaucracy to flourish. Nonetheless, in light of evidence that in other contexts transparency shocks can increase corrupt hiring practices (Olken, 2007), future work should evaluate whether our results generalize to different settings – particularly those where electoral concerns might be less binding.

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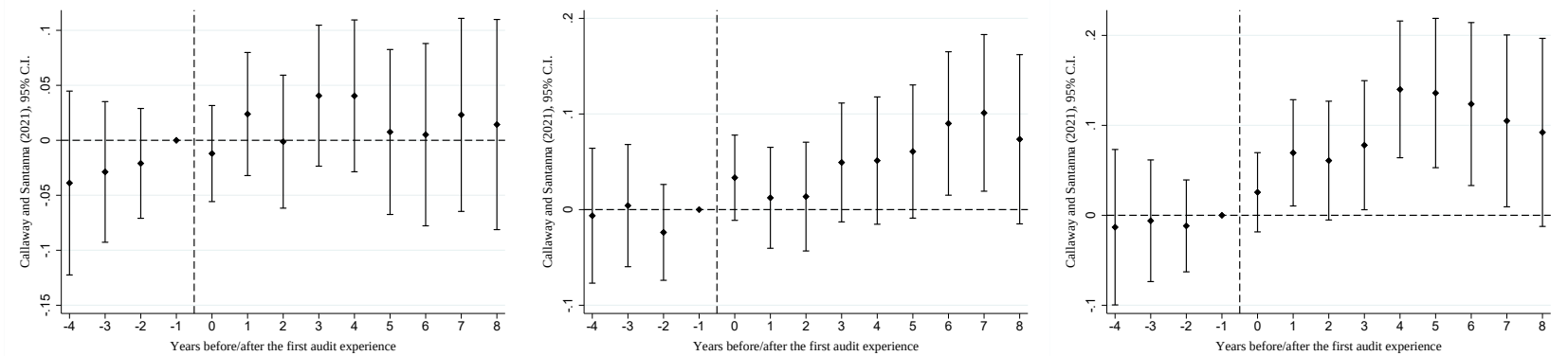
# A Appendix

Table A1: Balance Test

| | (1) Ever-Treated | (2) 03-05 | (3) 06-08 | (4) 09-11 | (5) 12-15 |
|---|---|---|---|---|---|
| Share of candidates for mayor that belong to a traditional parties (PT/PMDB/PSDB) | 0.018* | 0.019** | 0.004 | 0.002 | 0.002 |
| | (0.010) | (0.009) | (0.008) | (0.007) | (0.006) |
| Share of candidates for mayor that were born in Brazil | -0.004 | 0.000 | -0.007** | 0.000 | -0.000 |
| | (0.004) | (0.004) | (0.003) | (0.003) | (0.003) |
| Average candidate for mayor's age | -0.009 | -0.002 | -0.013 | -0.011 | 0.011 |
| | (0.013) | (0.011) | (0.009) | (0.009) | (0.007) |
| Share of candidates for mayor that are male | 0.000 | 0.006 | 0.001 | 0.001 | -0.008** |
| | (0.007) | (0.006) | (0.005) | (0.005) | (0.004) |
| Share of candidates for mayor that are college-educated | -0.004 | 0.006 | -0.002 | -0.011 | -0.001 |
| | (0.012) | (0.011) | (0.009) | (0.008) | (0.007) |
| Share of candidates for mayor that are married | 0.000 | 0.003 | -0.005 | -0.002 | 0.001 |
| | (0.008) | (0.008) | (0.006) | (0.006) | (0.005) |
| Elected mayor belongs to a traditional parties (PT/PMDB/PSDB) | -0.021* | -0.010 | -0.015* | -0.009 | -0.000 |
| | (0.012) | (0.011) | (0.009) | (0.009) | (0.007) |
| Elected mayor was born in Brazil | -0.002 | -0.004 | 0.003 | 0.002 | -0.003 |
| | (0.004) | (0.004) | (0.003) | (0.003) | (0.003) |
| Elected mayor was born in the state s/he was elected | -0.005 | 0.001 | -0.000 | -0.007 | -0.002 |
| | (0.006) | (0.005) | (0.004) | (0.004) | (0.003) |
| Elected mayor's age | 0.016 | 0.015 | -0.004 | 0.020** | -0.004 |
| | (0.014) | (0.012) | (0.010) | (0.010) | (0.008) |
| Elected mayor is male | 0.001 | -0.001 | 0.001 | 0.000 | 0.000 |
| | (0.005) | (0.005) | (0.004) | (0.004) | (0.003) |
| Elected mayor is college-educated | 0.002 | -0.011 | 0.000 | 0.010 | 0.007 |
| | (0.012) | (0.011) | (0.009) | (0.009) | (0.007) |
| Elected mayor is married | 0.008 | 0.002 | 0.006 | 0.008 | -0.001 |
| | (0.007) | (0.006) | (0.005) | (0.005) | (0.004) |
| Average log of household income per capita (2000 Census) | 0.036 | 0.045** | -0.011 | 0.016 | 0.009 |
| | (0.025) | (0.022) | (0.018) | (0.018) | (0.014) |
| Share of households below the BF threshold (2000 Census) | 0.024 | 0.035* | -0.007 | 0.007 | 0.008 |
| | (0.021) | (0.019) | (0.015) | (0.015) | (0.012) |
| Household income Gini (2000 Census) | 0.007 | 0.013** | -0.003 | 0.005 | -0.004 |
| | (0.007) | (0.007) | (0.005) | (0.005) | (0.004) |
| Population (2000 Census) | 0.007 | 0.007 | 0.001 | 0.009 | -0.003 |
| | (0.013) | (0.012) | (0.010) | (0.010) | (0.008) |
| Share of urban households (2000 Census) | 0.013 | 0.019* | 0.006 | -0.005 | -0.000 |
| | (0.011) | (0.010) | (0.008) | (0.008) | (0.006) |
| Share of male citizens (2000 Census) | -0.004 | -0.003 | 0.002 | -0.010 | 0.004 |
| | (0.010) | (0.009) | (0.007) | (0.007) | (0.006) |
| Share of literate citizens (2000 Census) | -0.002 | 0.013 | -0.031 | 0.022 | -0.001 |
| | (0.028) | (0.025) | (0.020) | (0.020) | (0.016) |
| Average years of education (2000 Census) | -0.024 | -0.040 | 0.025 | -0.034* | 0.006 |
| | (0.029) | (0.026) | (0.021) | (0.020) | (0.017) |
| Share of informal workers (2000 Census) | 0.008 | -0.002 | 0.001 | 0.007 | 0.010* |
| | (0.009) | (0.009) | (0.007) | (0.007) | (0.005) |
| Existence of AM/FM Radio (2002 MUNIC) | 0.003 | 0.007 | -0.004 | 0.001 | 0.001 |
| | (0.008) | (0.007) | (0.006) | (0.006) | (0.005) |
| Existence of TV (2002 MUNIC) | -0.005 | -0.007 | 0.003 | 0.000 | -0.003 |
| | (0.008) | (0.007) | (0.006) | (0.005) | (0.004) |
| Number of Qualified Bureaucrats | 0.005 | 0.005 | 0.003 | -0.002 | 0.002 |
| | (0.011) | (0.010) | (0.008) | (0.007) | (0.006) |
| Number of Qualified Managers | 0.012 | 0.010 | 0.004 | 0.004 | 0.001 |
| | (0.010) | (0.009) | (0.007) | (0.007) | (0.006) |
| Number of Qualified Frontline High-Skilled Employees | -0.012 | -0.006 | -0.006 | -0.005 | -0.006 |
| | (0.010) | (0.009) | (0.008) | (0.008) | (0.006) |
| Number of Unqualified Managers | -0.010 | -0.006 | -0.009 | -0.003 | -0.001 |
| | (0.009) | (0.008) | (0.007) | (0.006) | (0.005) |
| Number of Unqualified Bureaucrats | -0.016 | -0.009 | -0.008 | -0.005 | -0.002 |
| | (0.010) | (0.009) | (0.007) | (0.007) | (0.006) |
| Number of Unqualified Frontline High-Skilled Employees | 0.002 | -0.004 | 0.005 | 0.002 | -0.000 |
| | (0.011) | (0.010) | (0.008) | (0.008) | (0.007) |
| Observations | 4,914 | 4,078 | 3,697 | 3,668 | 3,545 |
| State FE | Yes | Yes | Yes | Yes | Yes |
| $R^2$ | 0.0275 | 0.0323 | 0.0170 | 0.0176 | 0.0165 |

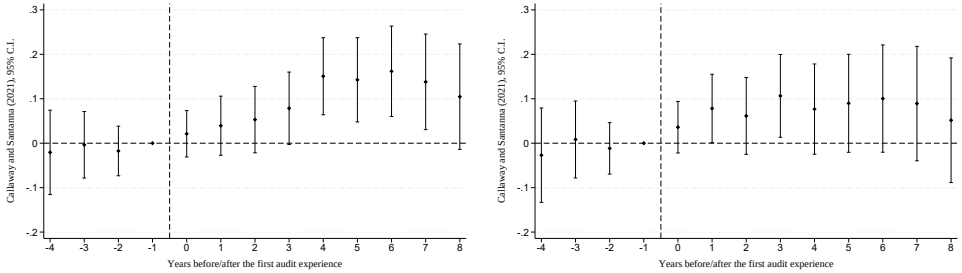
*Notes.* This table presents the coefficients obtained from a regression of municipalities' characteristics on the outcome variable *Ever-Treated*, which indicates whether the municipality was audited by the program at least once. Our final sample comprises 4,914 eligible municipalities in Brazil during the period from 2002 to 2015. Our source is RAIS, and the sample is at the municipality-year level. In Column (1), we include municipalities' characteristics from the year 2002 as regressors. In Columns (2) to (5), the regressors represent municipalities' characteristics from the year preceding the indicated year. For instance, Column (3) utilizes characteristics set in 2005 ($t-1$). This does not apply to the census and municipality characteristics from the census of 2000 and 2002 MUNIC. All specifications incorporate state-fixed effects. Each regressor is standardized using its mean and standard deviation. Robust standard errors are presented in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.




(a) Managers (b) Bureaucrats (c) Frontline High-Skill

Figure A1: Effect of Audits on the Number of Qualified Public Sector Employees

*Notes.* This figure reports the dynamic effects of audits on the number of qualified public municipal employees by occupational category. We transform the dependent variable by estimating the inverse hyperbolic sine transformation ($\log(y_i + (y_i^2 + 1)^{0.5})$). Results are obtained using Callaway and Sant'Anna (2021). We balance the panel in calendar time and use never-treated municipalities as the control group. It covers the window $[-4, +8]$ years around the audit year. Our final sample comprises 4,914 eligible municipalities in Brazil during the period from 2002 to 2015. 95% confidence intervals.




(a) Merit-Based (b) Discretionary

Figure A2: Effect of Audits on the Number of Qualified Frontline High-Skill Employees by Contract Type

*Notes.* This figure reports the dynamic effects of audits on the number of qualified public municipal employees among frontline high-skilled occupations. We transform the dependent variable by estimating the inverse hyperbolic sine transformation ($\log(y_i + (y_i^2 + 1)^{0.5})$). Results are obtained using Callaway and Sant'Anna (2021). We balance the panel in calendar time and use never-treated municipalities as the control group. It covers the window $[-4, +8]$ years around the audit year. Our final sample comprises 4,914 eligible municipalities in Brazil during the period from 2002 to 2015. 95% confidence intervals.

Table A2: Effect of Audits on the Number of Bureaucrats - Alternative Measure of Qualified Employee

| | (1) Total | (2) Managers | (3) Lower-level Bureaucrats | (4) Frontline High-Skill |
|---|---|---|---|---|
| *Panel A: All* | | | | |
| PostAudits | 0.018 | 0.015 | 0.033 | 0.039 |
| | (0.013) | (0.035) | (0.028) | (0.028) |
| Observations | 68796 | 68796 | 68796 | 68796 |
| Avg dep var | 6.827 | 3.461 | 4.625 | 5.710 |
| *Panel B: Qualified* | | | | |
| PostAudits | 0.043** | -0.038 | 0.055** | 0.071** |
| | (0.022) | (0.028) | (0.027) | (0.029) |
| Observations | 68796 | 68796 | 68796 | 68796 |
| Avg dep var | 6.196 | 1.325 | 4.259 | 5.124 |
| *Panel C: Unqualified* | | | | |
| PostAudits | 0.017 | -0.023 | -0.003 | 0.058* |
| | (0.023) | (0.035) | (0.034) | (0.034) |
| Observations | 68796 | 68796 | 68796 | 68796 |
| Avg dep var | 5.549 | 1.676 | 3.034 | 4.323 |
| Municipality FE | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |

*Notes.* This table shows the main effects of the audit on the number of public municipal employees by occupational category and quality classification following Colonnelli et al. (2020). We transform the dependent variable by estimating the inverse hyperbolic sine transformation ($\log(y_i + (y_i^2 + 1)^{0.5})$). Results are obtained using Callaway and Sant'Anna (2021) We balance the panel in calendar time and use never-treated municipalities as the control group. It covers the window $[-4, +8]$ years around the audit year. Our final sample comprises 4,914 eligible municipalities in Brazil during the period from 2002 to 2015. Avg dep var is computed using eligible non-audited municipalities and audited municipalities in the year before the audit. Robust standard errors are clustered at the municipality level. ***p< 0.01, ** p< 0.05, * p< 0.1.

Table A3: Effect of Audits on the Number of Bureaucrats - Log

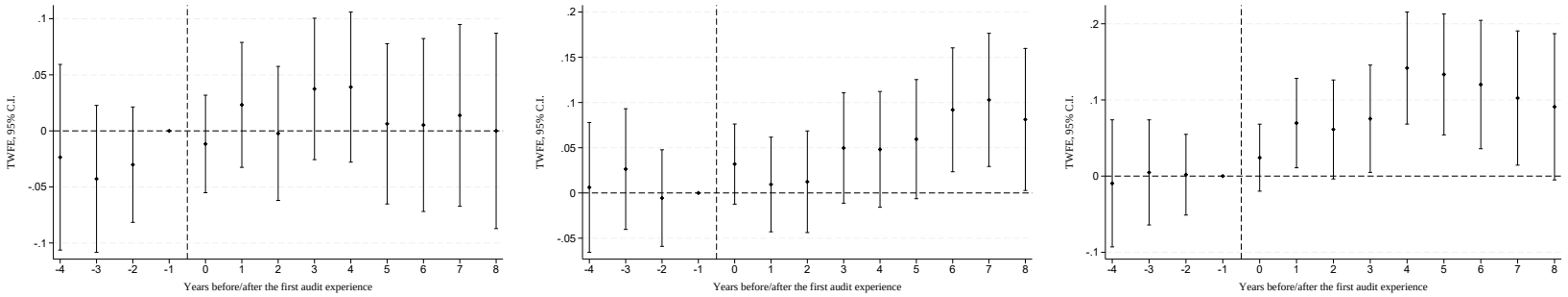
| | (1) Total | (2) Lower-level Bureaucrats | (3) Frontline High-Skill |
|---|---|---|---|
| *Panel A: All* | | | |
| PostAudits | 0.022** | 0.043* | 0.015 |
| | (0.010) | (0.023) | (0.018) |
| Observations | 57470 | 57470 | 57470 |
| Avg dep var | 6.206 | 4.035 | 5.228 |
| *Panel B: Qualified* | | | |
| PostAudits | 0.045** | 0.040* | 0.074*** |
| | (0.018) | (0.022) | (0.026) |
| Observations | 57435 | 57263 | 56785 |
| Avg dep var | 4.910 | 3.680 | 4.304 |
| *Panel C: Unqualified* | | | |
| PostAudits | 0.018 | 0.028 | 0.008 |
| | (0.015) | (0.031) | (0.021) |
| Observations | 57443 | 54435 | 57207 |
| Avg dep var | 4.919 | 2.596 | 4.456 |
| Municipality FE | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes |

*Notes.* This table shows the main effects of the audit on the number of public municipal employees by occupational category and quality classification. We transform the dependent variable by estimating the log transformation. Results are obtained using Callaway and Sant'Anna (2021). We balance the panel in calendar time and use never-treated municipalities as the control group. It covers the window $[-4, +8]$ years around the audit year. Our final sample comprises 4,914 eligible municipalities in Brazil during the period from 2002 to 2015. Avg dep var is computed using eligible non-audited municipalities and audited municipalities in the year before the audit. Robust standard errors are clustered at the municipality level. ***p< 0.01, ** p< 0.05, * p< 0.1.

Table A4: Effect of Audits on the Number of Bureaucrats - TWFE

| | (1) Total | (2) Managers | (3) Lower-level Bureaucrats | (4) Frontline High-Skill |
|---|---|---|---|---|
| *Panel A: Overall* | | | | |
| PostAudits | 0.026** | 0.046 | 0.049** | 0.034 |
| | (0.011) | (0.030) | (0.025) | (0.024) |
| Observations | 63,722 | 63,722 | 63,722 | 63,722 |
| Avg dep var | 6.827 | 3.461 | 4.625 | 5.710 |
| *Panel B: Qualified* | | | | |
| PostAudits | 0.048** | 0.033 | 0.038 | 0.081*** |
| | (0.019) | (0.025) | (0.024) | (0.029) |
| Observations | 63,722 | 63,722 | 63,722 | 63,722 |
| Avg dep var | 5.496 | 2.185 | 4.249 | 4.708 |
| *Panel C: Unqualified* | | | | |
| PostAudits | 0.030* | 0.050 | 0.065** | 0.041 |
| | (0.017) | (0.031) | (0.031) | (0.026) |
| Observations | 63,722 | 63,722 | 63,722 | 63,722 |
| Avg dep var | 5.568 | 3.065 | 3.057 | 4.938 |
| Municipality FE | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |

*Notes.* This table shows the main effects of the audit on the number of public municipal employees by occupational category and quality classification. We transform the dependent variable by estimating the inverse hyperbolic sine transformation ($\log(y_i + (y_i^2 + 1)^{0.5})$). Results are obtained using TWFE. We balance the panel in calendar time and use never-treated municipalities as the control group. It covers the window $[-4, +8]$ years around the audit year. Our final sample comprises 4,914 eligible municipalities in Brazil during the period from 2002 to 2015. Avg dep var is computed using eligible non-audited municipalities and audited municipalities in the year before the audit. Robust standard errors are clustered at the municipality level. ***p< 0.01, ** p< 0.05, * p< 0.1.




(a) Managers (b) Lower-level Bureaucrats (c) Frontline High-Skill

Figure A3: Number of Qualified Bureaucrats, by Occupational Category - TWFE

*Notes.* This figure reports the dynamic effects of audits on the number of public municipal employees by occupational category and quality classification. We transform the dependent variable by estimating the inverse hyperbolic sine transformation ($\log(y_i + (y_i^2 + 1)^{0.5})$). Results are obtained using TWFE. We balance the panel in calendar time and use never-treated municipalities as the control group. It covers the window $[-4, +8]$ years around the audit year. Our final sample comprises 4,914 eligible municipalities in Brazil during the period from 2002 to 2015. 95% confidence intervals.

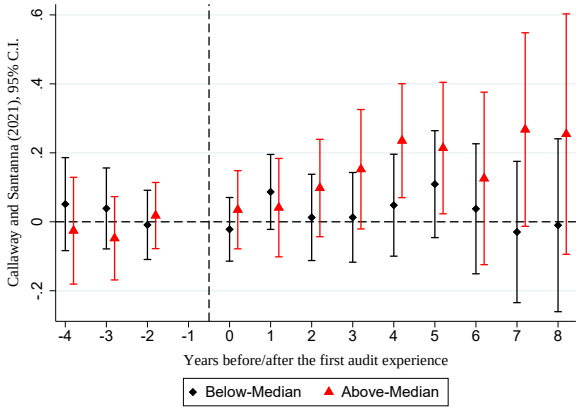



Figure A4: Effect of Audits on the Number of Qualified Frontline High-Skilled Employees by Detected Levels of Corruption

*Notes.* This figure reports the dynamic effects of audits on the number of qualified public municipal frontline high-skilled employees by detected levels of corruption. We transform the dependent variable by estimating the inverse hyperbolic sine transformation ($\log(y_i + (y_i^2 + 1)^{0.5})$). Results are obtained using Callaway and Sant'Anna (2021). We balance the panel in calendar time and use never-treated municipalities as the control group. It covers the window $[-4, +8]$ years around the audit year. Our final sample comprises 4,914 eligible municipalities in Brazil during the period from 2002 to 2015. 95% confidence intervals.

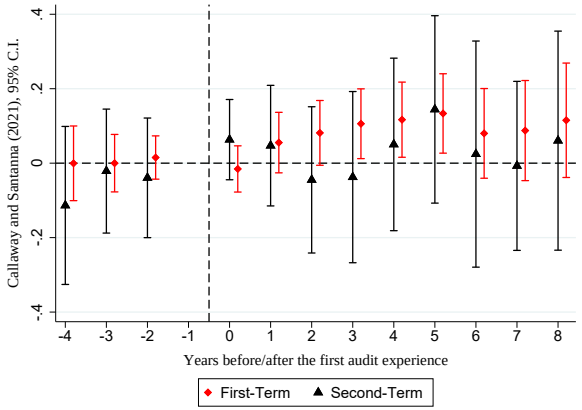
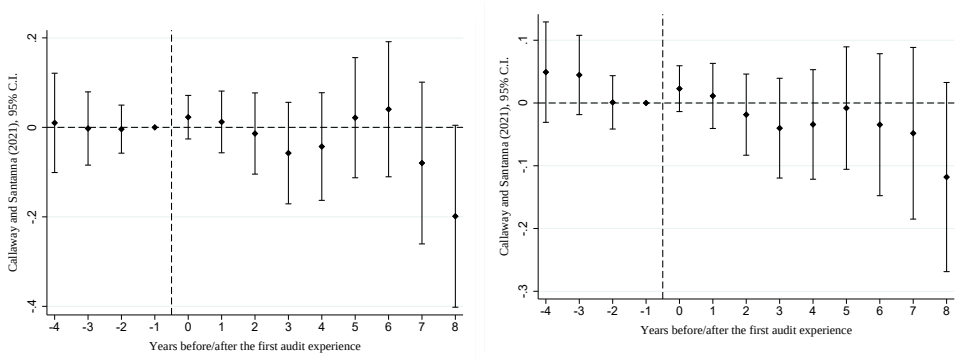



Figure A5: Effect of Audits on the Number of Qualified Frontline High-Skilled Employees by Mayor Term

*Notes.* This figure reports the dynamic effects of audits on the number of qualified public municipal frontline high-skilled employees by mayor term. We transform the dependent variable by estimating the inverse hyperbolic sine transformation ($\log(y_i + (y_i^2 + 1)^{0.5})$). Results are obtained using Callaway and Sant'Anna (2021). We balance the panel in calendar time and use never-treated municipalities as the control group. It covers the window $[-4, +8]$ years around the audit year. Our final sample comprises 4,914 eligible municipalities in Brazil during the period from 2002 to 2015. 95% confidence intervals.

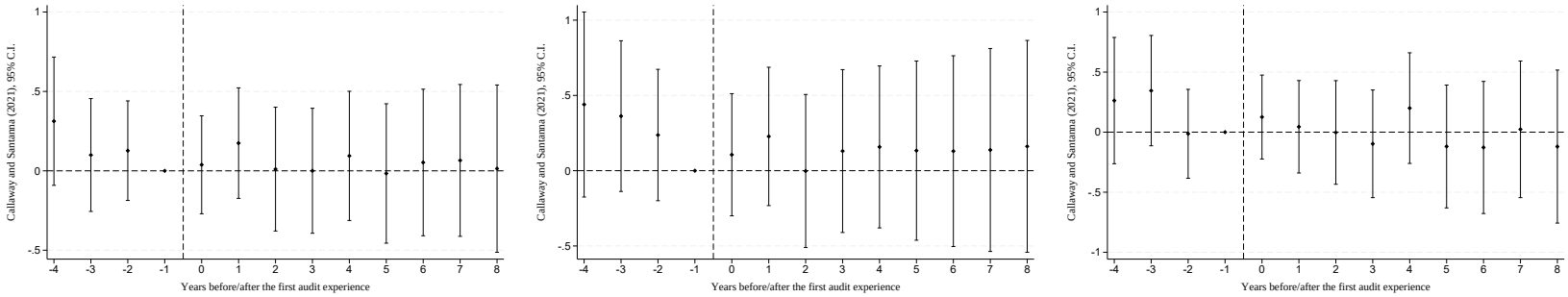



(a) Number of Campaign Donors

(b) Number of Campaign Donors - Front-line High-Skill

Figure A6: Patronage in the Municipal Bureaucracy

*Notes.* This figure reports the dynamic effects of audits on the number of municipal public sector employees who are campaign donors of the incumbent mayor. We transform the dependent variable by estimating the inverse hyperbolic sine transformation ($\log(y_i + (y_i^2 + 1)^{0.5})$). Results are obtained using Callaway and Sant'Anna (2021). We balance the panel in calendar time and use never-treated municipalities as the control group. It covers the window $[-4, +8]$ years around the audit year. Our final sample comprises 4,914 eligible municipalities in Brazil during the period from 2002 to 2015. 95% confidence intervals.




(a) Total (b) Qualified (c) Unqualified

Figure A7: Effect of Audits on Frontline High-Skilled Employees' Age

*Notes.* This figure reports the dynamic effects of audits on the average age of the public municipal frontline high-skilled employees. We transform the dependent variable by estimating the inverse hyperbolic sine transformation ($\log(y_i + (y_i^2 + 1)^{0.5})$). Results are obtained using Callaway and Sant'Anna (2021). We balance the panel in calendar time and use never-treated municipalities as the control group. It covers the window $[-4, +8]$ years around the audit year. Our final sample comprises 4,914 eligible municipalities in Brazil during the period from 2002 to 2015. 95% confidence intervals.

Table A5: Effect of Audits on the Share of Public Sector Employees Hired via Civil Service Examination

| | (1) Total | (2) Managers | (3) Lower-level Bureaucrats | (4) Frontline High-Skill |
|---|---|---|---|---|
| PostAudits | -0.014 | -0.009 | -0.004 | 0.004 |
| | (0.013) | (0.007) | (0.005) | (0.006) |
| Observations | 32631 | 63321 | 74934 | 69344 |
| Municipality FE | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |
| Avg dep var | 0.587 | 0.800 | 0.817 | 0.883 |

*Notes.* This table shows the main effects of the audit on the share of public municipal employees hired via civil service examination (*concurso*). We transform the dependent variable by estimating the inverse hyperbolic sine transformation ($\log(y_i + (y_i^2 + 1)^{0.5})$). Results are obtained using Callaway and Sant'Anna (2021). We balance the panel in calendar time and use never-treated municipalities as the control group. It covers the window $[-4, +8]$ years around the audit year. Our final sample comprises 4,914 eligible municipalities in Brazil during the period from 2002 to 2015. Avg dep var is computed using eligible non-audited municipalities and audited municipalities in the year before the audit. Robust standard errors are clustered at the municipality level. ***p< 0.01, ** p< 0.05, * p< 0.1.