

Do Government Audits Reduce Corruption? Estimating the Impacts of Exposing Corrupt Politicians

Avis, Ferraz, Finan (JPE 2018)

Presented by César Garro-Marín and Masyhur Hilmy

December 6, 2018

Corruption is bad. Audits reduce corruption.

Motivation: Politicians embezzle money, causing misallocations and distrust. Audits can reduce corruption through various channels: (i) electoral concern, (ii) legal concern, (iii) selection effect, (iv) entry and exit of politicians.

Approach: exploit random audits of municipalities in Brazil.

Results:

- Audits reduce corruption by 7.9%.
- Local media presence amplifies the effects.
- Legal disciplining effect explains 72% of corruption reduction.

Policy implications: measures increasing the expected legal cost of corruption would be the most effective.

- 1 Model and Literature
- 2 Government Audits in Brazil
- 3 Empirical research

- 1 Model and Literature**
- 2 Government Audits in Brazil
- 3 Empirical research

- This paper explores the role of government audits as an instrument for reducing political corruption.
- Previous literature documented that audits reduce corruption:
 - Olken (2007): RCT in Indonesian villages. Audits reduced missing funds in infrastructure projects.
 - Related papers: Bobonis et al. (2016), Zamboni and Litschig (2015).
- Audits also have electoral effects:
 - Ferraz and Finan (2008): incumbent corrupt mayors in Brazil were punished by voters.
- This paper disentangles the mechanisms through which audits reduce corruption.

This model


- Infinite horizon discrete time environment.
- There are three building blocks:
- **Mayors:**
 - they want to remain in office.
 - derive utility from rents extracted from office.
 - differ in their corruption ability.
 - subject to *legal* and *electoral* costs when extracting rents.
- **Voters:**
 - reelect the incumbent mayor or choose a new one.
- **Audits:**
 - randomly affect mayors.
 - affect chances of a legal action against the mayor.
 - make revelation of corruption to voters more likely.

- Mayors face of a two term limit.
- Let T be the mayor's term. Then $T \in \{F, S\}$, where F and S denote the first and second term respectively.
- Mayors derive utility from rents extracted from office, r^T :

$$r_i^T = e_i^T + X_i' \alpha + \varepsilon_i \quad (1)$$

- Mayors face of a two term limit.
- Let T be the mayor's term. Then $T \in \{F, S\}$, where F and S denote the first and second term respectively.
- Mayors derive utility from rents extracted from office, r^T :

$$r_i^T = e_i^T + X_i' \alpha + \varepsilon_i \quad (1)$$



Observable rent extraction ability. It is constant while in office

- Mayors face of a two term limit.
- Let T be the mayor's term. Then $T \in \{F, S\}$, where F and S denote the first and second term respectively.
- Mayors derive utility from rents extracted from office, r^T :

$$r_i^T = e_i^T + X_i' \alpha + \varepsilon_i \quad (1)$$

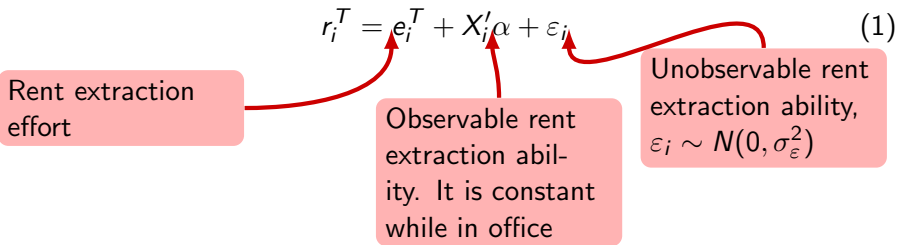
Observable rent extraction ability. It is constant while in office

Unobservable rent extraction ability, $\varepsilon_i \sim N(0, \sigma_\varepsilon^2)$

- Mayors face of a two term limit.
- Let T be the mayor's term. Then $T \in \{F, S\}$, where F and S denote the first and second term respectively.
- Mayors derive utility from rents extracted from office, r^T :

$$r_i^T = e_i^T + X_i' \alpha + \varepsilon_i \quad (1)$$

Rent extraction effort



Observable rent extraction ability. It is constant while in office

Unobservable rent extraction ability, $\varepsilon_i \sim N(0, \sigma_\varepsilon^2)$

Legal cost of corruption

- The legal cost is given by,

$$\text{legal cost}_i^T = b_0 + b_1 e_i^T \quad (2)$$

- Mayors face a legal action with probability,

$$P(\text{legal action}_i^T) = (\gamma_0 + \gamma_1 a_i^T) e_i^T \quad (3)$$

where $a_i^T = 1$ if the municipality i faced an audit in term T . Then,

$$c(e_i^T, a_i^T) = (\gamma_0 + \gamma_1 a_i^T)(b_0 e_i^T + b_1 (e_i^T)^2) \quad (4)$$

where we assume $\gamma_0, \gamma_1, b_0, b_1 > 0$.

- *Audits legal disciplinary effect:* $\gamma_1 > 0 \Rightarrow$ audits influence mayor behavior by increasing legal costs of corruption.

- Mayors' term utility is then rents net of legal costs:

$$u^T(e_i^T, X_i, \varepsilon_i, a_i^T) = e_i^T + X_i' \alpha + \varepsilon_i - c(e_i^T, a_i^T) \quad (5)$$

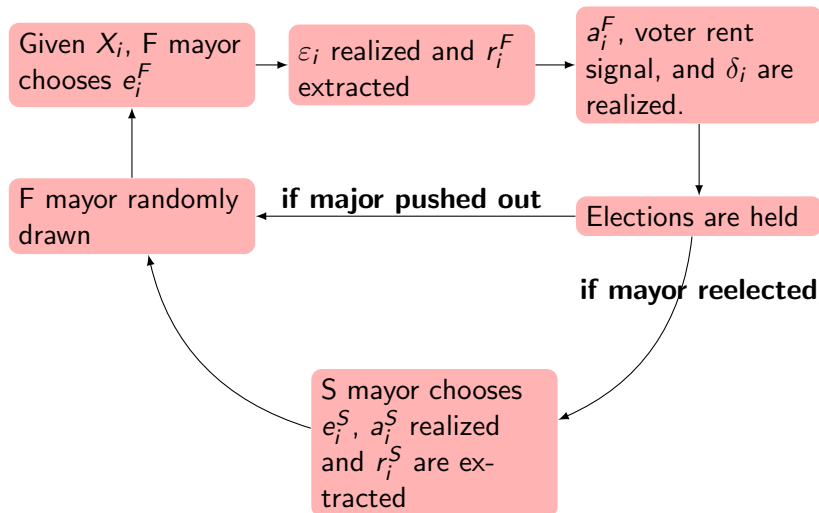
- Mayors seek to maximize discounted sum of utility over their tenure.

- There is a representative voter in each municipality.
- Voters' only decision is whether to reelect the first term mayor.
- Vote is decided on:
 - Mayor's observable characteristics X_i .
 - Voter's belief about mayor unobservable characteristics $\tilde{\epsilon}_i$.
 - Mayor's popularity $X_i\xi + \delta_i$, $\delta_i \sim U_D(\mu_D - \sqrt{3}\sigma_D, \mu_D + \sqrt{3}\sigma_D)$
- The voter's per period utility is given by,

$$v_i^T = \begin{cases} -r_i^F & \text{when there is a F mayor} \\ -r_i^F + X_i\xi + \delta_i & \text{if F mayor reelected} \\ -r_i^S & \text{when there is a S mayor} \end{cases} \quad (6)$$

- *Rent signal*: voters observe rents extracted by mayor with probability χ_i^T .
- *Audits electoral disciplinary effect*: audits make observing rents more likely $\chi_i^T = \chi_0 + \chi_1 a_i^T$.

Timing of the game



- *Equilibrium concept*: perfect bayesian equilibrium in pure strategies.
- Let q_i be the probability of facing an audit.
- **Mayor strategy**:
 - A strategy for the mayor is given by an effort choice $e_i^T(q_i, X_i)$, $T = F, S$.
- **Voter strategy**
 - Voter strategies are a choice $R_i(\tilde{\epsilon}_i, \delta_i, q_i, X_i)$ of whether to reelect the mayor.
- The PBE is a sequence of mayor's and voter's strategies such that,
 - 1 mayor's strategy is optimal given voter's strategy
 - 2 voter's strategy is optimal given the mayor's
 - 3 the voter's belief are consistent with the mayor strategy on the equilibrium path.

What determines corruption?

- Denote as $r_i^{T*}(q_i, X_i)$ and $e_i^{T*}(q_i, X_i)$ the equilibrium rents and extractive effort of the mayor, respectively.
- Rents will be determined by,
 - **Selection**

$$r_i^{T*}(q_i, X_i) = e_i^{T*}(q_i, X_i) + X_i\alpha + \varepsilon_i$$

- **Legal cost parameters:** $b_0, b_1, \gamma_0, \gamma_1$.

$$e^{S*}(q_i) = \frac{1 - b_0(\gamma_0 + \gamma_1 q_i)}{2b_1(\gamma_0 + \gamma_1 q_i)}$$
$$e^{F*}(q_i, X_i) = \frac{1 - b_0(\gamma_0 + \gamma_1 q_i)}{2b_1(\gamma_0 + \gamma_1 q_i)} - \frac{\beta^2(\chi_0 + \chi_1 q_i)\sigma_D U^{S*}(q_i, X_i)}{2b_1(\gamma_0 + \gamma_1 q_i)}$$

- An increase in any of these parameters \implies corruption becomes more costly \implies rent extraction decreases.

What determines corruption?

- Denote as $r_i^{T*}(q_i, X_i)$ and $e_i^{T*}(q_i, X_i)$ the equilibrium rents and extractive effort of the mayor, respectively.
- Rents will be determined by,
 - **Selection**

Selection: mayor characteristics

$$r_i^{T*}(q_i, X_i) = e_i^{T*}(q_i, X_i) + X_i\alpha + \varepsilon_i$$

- **Legal cost parameters:** $b_0, b_1, \gamma_0, \gamma_1$.

$$e^{S*}(q_i) = \frac{1 - b_0(\gamma_0 + \gamma_1 q_i)}{2b_1(\gamma_0 + \gamma_1 q_i)}$$
$$e^{F*}(q_i, X_i) = \frac{1 - b_0(\gamma_0 + \gamma_1 q_i)}{2b_1(\gamma_0 + \gamma_1 q_i)} - \frac{\beta^2(\chi_0 + \chi_1 q_i)\sigma_D U^{S*}(q_i, X_i)}{2b_1(\gamma_0 + \gamma_1 q_i)}$$

- An increase in any of these parameters \implies corruption becomes more costly \implies rent extraction decreases.

What determines corruption?

- Denote as $r_i^{T*}(q_i, X_i)$ and $e_i^{T*}(q_i, X_i)$ the equilibrium rents and extractive effort of the mayor, respectively.
- Rents will be determined by,

- **Selection**

$$r_i^{T*}(q_i, X_i) = e_i^{T*}(q_i, X_i) + \chi$$

Audits disciplining effect: $\gamma_1 > 0 \Rightarrow$ audits increase expected legal costs.

- **Legal cost parameters: $b_0, b_1, \gamma_0, \gamma_1$.**

$$e^{S*}(q_i) = \frac{1 - b_0(\gamma_0 + \gamma_1 q_i)}{2b_1(\gamma_0 + \gamma_1 q_i)}$$

$$e^{F*}(q_i, X_i) = \frac{1 - b_0(\gamma_0 + \gamma_1 q_i)}{2b_1(\gamma_0 + \gamma_1 q_i)} - \frac{\beta^2(\chi_0 + \chi_1 q_i)\sigma_D U^{S*}(q_i, X_i)}{2b_1(\gamma_0 + \gamma_1 q_i)}$$

- An increase in any of these parameters \implies corruption becomes more costly \implies rent extraction decreases.

What determines corruption?

- **Electoral concern of the mayors**

$$e^{F^*}(q_i, X_i) = \frac{1 - b_0(\gamma_0 + \gamma_1 q_i)}{2b_1(\gamma_0 + \gamma_1 q_i)} - \frac{\beta^2(\chi_0 + \chi_1 q_i)\sigma_D U^{S^*}(q_i, X_i)}{2b_1(\gamma_0 + \gamma_1 q_i)}$$

- *Electoral disciplining effect of audits:* $\chi_1 > 0 \Rightarrow$ voters are more likely to observe rents \Rightarrow chances of reelection are diminished.

Implications of the model

- Second term mayors are subjected to *legal disciplining* effect of audits only.
- First term mayors are subjected both to *legal* and *electoral disciplining* effects of audits.
 - ⇒ *Legal disciplining effect* identified out of responses of audited second term mayors.
 - ⇒ In the absence of selection effects, difference in response to audits between F and S mayors would identify electoral disciplining effect of audits.
- Making audits more likely ($\uparrow q_i$) will decrease corruption.

- 1 Model and Literature
- 2 Government Audits in Brazil**
- 3 Empirical research

Government audits in Brazil

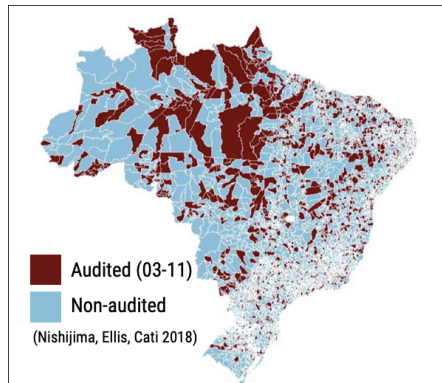
In 2003, the Brazilian government introduced random audits to combat corruption.

Research questions: Did the program reduce corruption? If so, how?

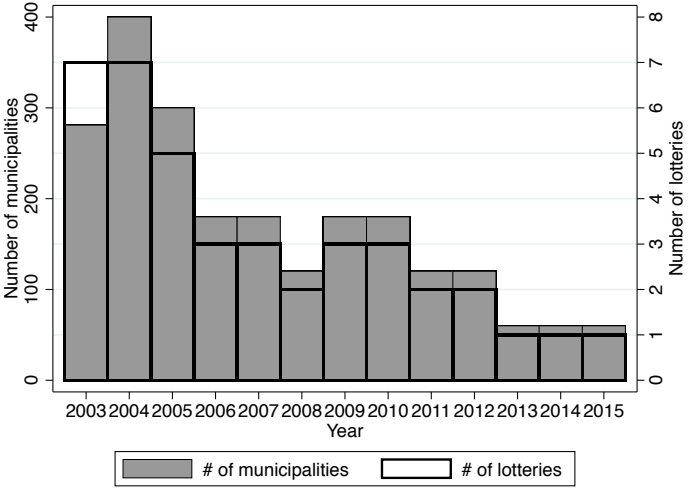
This program overcomes typical empirical challenges:

- Corruption is hard to measure ← audit report measure corruption.
- Corrupt places are usually targeted for audit ← lottery assigns audit randomly.

Municipalities are selected randomly in a lottery



Mayors can't predict audits



Audit process is hard to manipulate

- CGU selects municipalities to be audited using lottery.
- CGU sends a team of 12-15 auditors to the selected municipalities.
- CGU randomly selects programs to be audited, issues service order for the audit. Programs with federal funding in the past three years can be audited, including:
 - infrastructure projects (e.g., school constructions);
 - public employee wages (e.g. teachers); or
 - social protection programs (e.g., Bolsa Familia).
- Auditors report findings publicly. They also send copies to Federal Court, Federal Public Prosecutors, local judiciary, Federal Police, and municipal legislative branch.

Audit can find acts of corruption or mismanagement



(Frederico Finan, CGU)



Audit findings are publicized online and in media

The image displays three overlapping browser screenshots from the Brazilian government's transparency and audit portals.

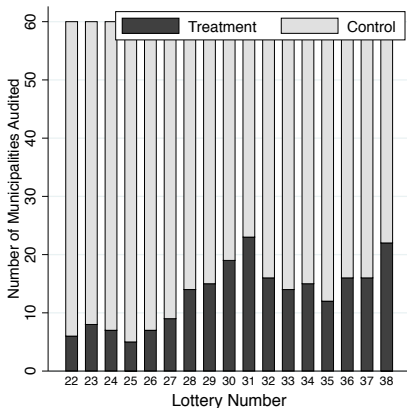
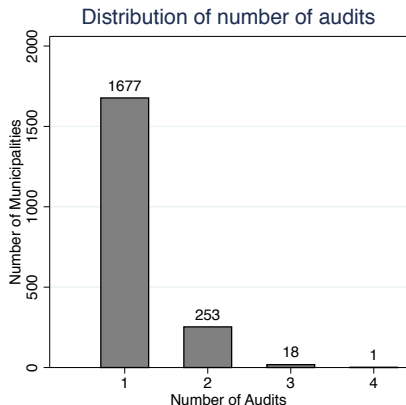
- Top Left Screenshot:** Portal da Transparência (Transparency Portal). It shows the 'Pesquisa de Relatórios' (Reports Search) section with filters for 'Orçamento da Despesa em 2018' (R\$ 3.45 TRILHÕES) and 'Localidade' (Estado e Município).
- Top Right Screenshot:** Ministério da Transparência e Controladoria-Geral da União (CGU) website. It features a search bar and a 'Pesquisa de Relatórios' button. Below the search bar, there are sections for 'Auditoria e Fiscalização' and 'Integridade'.
- Bottom Screenshot:** A detailed report from the Controladoria-Geral da União (CGU) for 'Município 06 – Malhada de Pedras/BA'. The report states: 'O total de recursos fiscalizados foi de R\$ 1.621.661,40. Principais constatações: 1) Fraudes, desvios e notas fiscais frias com recursos do Fundef: os fiscais identificaram R\$ 100 mil em notas fiscais frias, emitidas nos últimos três anos, e usadas pela Prefeitura para comprovar despesas com recursos relativos à parcela dos 40% do Fundef. Todas as doze empresas, indicadas nas notas fiscais como fornecedoras de produtos, e consultadas pelos fiscais afirmaram que nunca realizaram negócios com a Prefeitura. Os fiscais constataram, também, mais de R\$ 610 mil, relativos aos 60% da parcela do Fundef, utilizados irregularmente, em 2002 e 2003, no pagamento de salários a pessoas que não têm vínculo com o magistério no município. São, no total, 209 servidores.'

Corruption findings highlighted in the report:

- R\$100,000 in fake receipts, a dozen firms listed say never did business with the government.
- R\$610,000 diverted from teachers' salaries to other individuals

- 1 Model and Literature
- 2 Government Audits in Brazil
- 3 Empirical research**

Research strategy: within the same lottery, authors compared municipalities audited for the first time to those that have been audited before



Estimation sample are audits between July 2006-March 2013 (electoral terms 2004-2008 and 2008-2012).

Lottery produced a balanced treatment assignment

	Control mean	Treatment mean
Population	22992.72	26000.85
Share urban	0.57	0.58
Inequality (Gini)	0.55	0.56
Income pc (log)	5.58	5.50
Share poor	0.44	0.49
Illiteracy	0.25	0.27
Has AM radio	0.21	0.24
Judiciary district	0.45	0.52
Mayors reelection rates	0.41	0.44
Service orders	25.21	24.80
Observations	881	222

Specifications

Corruption is only observed when a municipality is being audited.
To estimate the effect of audits, we compare municipalities that had been randomly audited in the past to municipalities audited for the first time.

$$\text{Corruption}_{mst} = \alpha + \beta \text{PastAudit}_{mst} + Z'_{ms} \gamma + f(\text{nos})_{mst} + \nu_s + \mu_t + \varepsilon_{mst},$$

where m indexes municipalities, s indexes states, and t indexes audit date.

To estimate the effect of audit on the likelihood of a federal conviction or investigation, we can use the full sample:

$$\text{Legal}_{mt} = \alpha + \beta \text{Audited}_{mt} + \nu_m + \mu_t + \varepsilon_{mt}$$

Result previews: Audits are effective.

- Effects of the audits:
 - Audits reduce irregularities.
 - Audits effect spill over to neighboring municipalities.
 - Audits increase legal action.
- Mechanisms:
 - Legal disciplining effects is stronger than reelection concern.
 - Political selection works.
 - Entry effect is negligible.
- Audits reduce corruption, not merely displacing it. Politicians do not hide corruption better after audits.

1a. Audits reduce corruption but not mismanagement

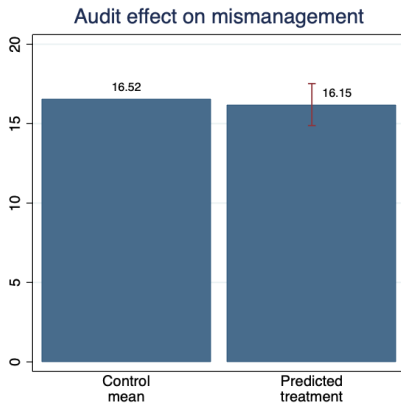
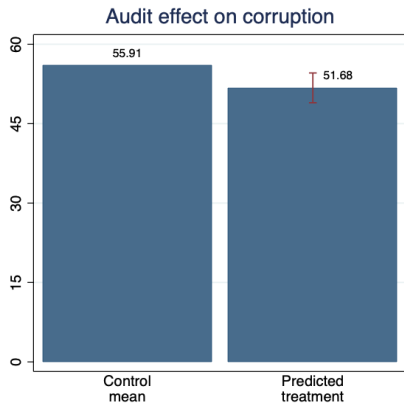
Authors' preferred OLS regression coefficients:

	Irregularities	Mismanagement	Corruption
Audited in the past	-0.058* [0.021]	-0.023 [0.042]	-0.079* [0.028]
Population (log)	0.064* [0.011]	0.037+ [0.022]	0.064* [0.015]
Inequality (Gini)	0.361* [0.138]	0.177 [0.276]	0.459* [0.188]
Income pc (log)	-0.102* [0.042]	0.103 [0.079]	-0.176* [0.054]
Illiteracy	0.003+ [0.002]	0.000 [0.003]	0.005* [0.002]
Share urban	0.118* [0.050]	-0.068 [0.113]	0.182* [0.072]
Observations	983	982	983

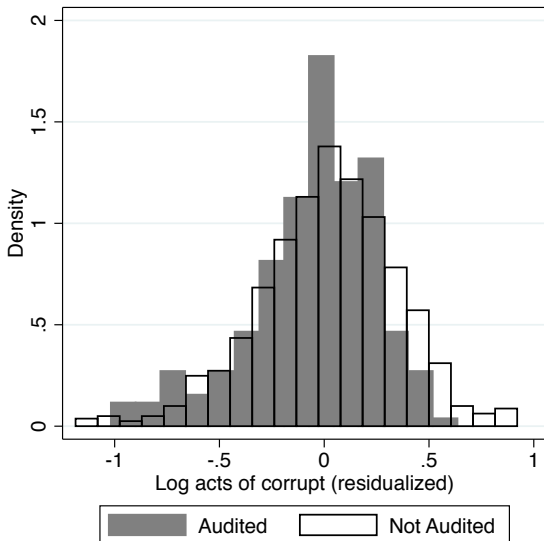
+ $p < 0.10$, * $p < 0.05$. From Table 2, col 3, 6, and 9.

Dependent variable in logs. Controls include state and lottery dummies; number of service orders are controlled for non-parametrically.

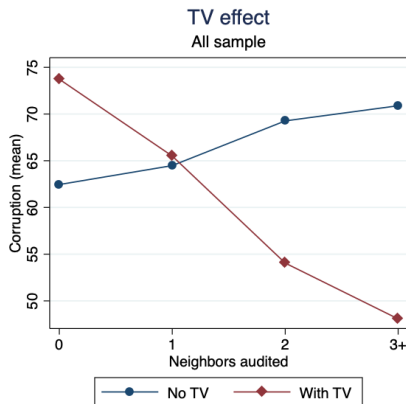
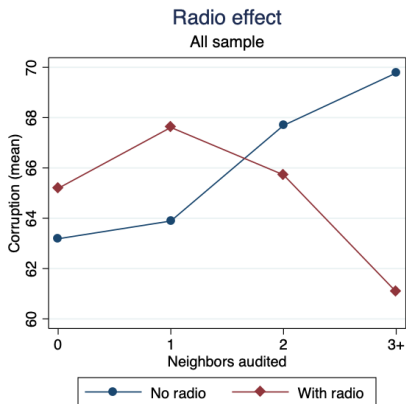
1a. Audits reduce corruption but not mismanagement



1a. Audits reduce the worst of corruption



1b. Spillover: local TV and radio amplify the effect of audits.



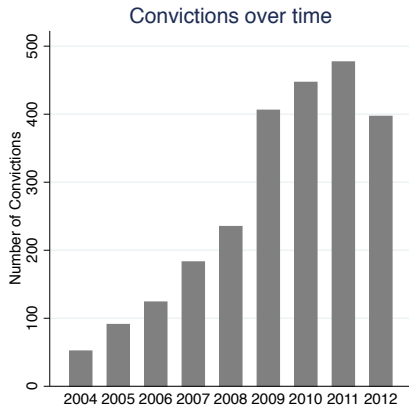
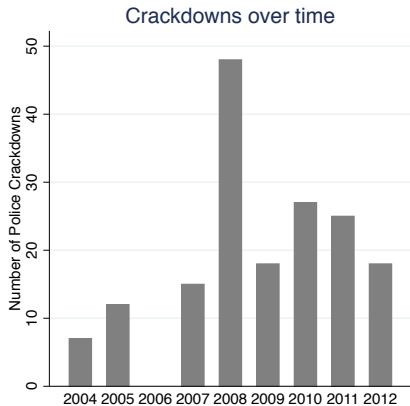
Anecdote: In 2010, the Federal Police arrested the mayor of Satubinha after the audit found he diverted federal funds. When the radio announced it, the mayor from neighboring Sao Bento spotted fleeing on a plane.

1b. Local media amplify the effect of audits, effect from party network modest.

	Corruption	Corruption	Corruption
Audited in the past	-0.081*	-0.084*	-0.093*
Neighbors audited	0.003	-0.002	0.000
Radio=1	0.065		0.044
Radio=1 × Neighbors audited	-0.075*		-0.052 ⁺
TV=1		0.032	0.013
TV=1 × Neighbors audited		-0.104*	-0.081*
Same party audited			-0.005*
Observations	983	983	983

⁺ $p < 0.10$, * $p < 0.05$. From Table 3, col 2-4.

1c. Legal actions against corrupt politicians have increased over time



1c. Audits increase legal actions and convictions, mainly in places with a judiciary district.

	Legal Actions	Legal Actions
Audited	0.00562*	0.000241
Audited=1 \times Judiciary dist=1		0.0119*
Observations	70902	70902

	Convictions	Convictions
Audited	0.00443 ⁺	0.000195
Audited=1 \times Judiciary dist=1		0.00933*

⁺ $p < 0.10$, * $p < 0.05$. From Table 4, col 3-6.

1c. Legal cost of corruption is substantial. Corruption findings make legal actions more likely.

	Crackdowns	Convictions	Legal Actions
Corruption	0.0369 ⁺	0.0601*	0.0882*
Mismanagement	-0.0116	-0.00647	-0.0146
Observations	982	982	982

⁺ $p < 0.10$, * $p < 0.05$. From Table 4, col 7-9.

2a. Legal effect is stronger than reelection concern.

Mayors can change his behavior within a term. We could observe it by comparing (i) mayors who had been audited earlier in their term vs (ii) mayors who were audited for the first time.

First term mayor: Total effect = Reelection concern + Legal effect

Second term mayor: Total effect = Legal effect

	Corruption	Corruption	Corruption
Audited in past	-0.127*	-0.113 ⁺	-0.133*
2nd term=1		-0.032	
Audited in past=1 × 2nd term=1		-0.050	
Audited in past × Run higher			-0.025
Run higher			-0.066
Observations	821	821	821

⁺ $p < 0.10$, * $p < 0.05$. From Table 5, col 1-3.

2b. Voters reelect mayors who are less corrupt. No evidence of recency bias.

If voters reelect cleaner mayors, we could observe it by comparing (i) mayors who were audited and reelected vs (ii) mayors who were not audited but also reelected.

Total effect = Voter selection effect + Legal effect

	Same term	Reelected	All	All
Audited in past	-0.127*	-0.149*		-0.079*
Term since last audit=1			-0.078*	
Term since last audit=2			-0.074 ⁺	
Years since last audit				-0.011
Observations	821	596	983	983

⁺ $p < 0.10$, * $p < 0.05$. From Table 5, col 1 and 4.

Dependent variable is corruption level (log).

2c. Political entry effect is negligible.

Audits can induce better candidates to enter politics. We could observe it in places electing a new mayor, by comparing (i) municipalities audited before election vs (ii) municipalities not audited.

Political entry effect = Total effect - (Electoral concern + Legal effect)

	Same term	Open seat
Audited in past	-0.127* [0.050]	-0.122 [0.075]
Observations	821	665

+ $p < 0.10$, * $p < 0.05$. From Table 5, col 1 and 7. Std errors in brackets.

3. Audits reduce corruption, not merely displace it.

Audited mayors do not then learn to hide corruption.

	Embezzlement	Procurement	Over-invoicing
Audited in past	-0.132 [0.123]	0.117 [0.123]	-0.050 [0.069]
Observations	821	821	821

+ $p < 0.10$, * $p < 0.05$. From Table 6, col 4-6. Std errors in brackets.

	Corruption
Share of same sectors audited	0.200 [0.299]
Observations	217

+ $p < 0.10$, * $p < 0.05$. From Table 6, col 7. Std errors in brackets.

Structural estimation is consistent with reduced form findings.

Authors recovered parameters ($\gamma_0, \gamma_1, \chi_0, \chi_1$) using MLE, then test out-of-sample fit with 2012-2016 data. Decomposition:

- Legal discipline: set $\gamma_1 = 0$, compare rents.
- Reelection concern: set $\chi_1 = 0$, compare first-term mayor rents.
- Voters selection: set $\chi_1 = 0$, compare second-term mayor rents.

	Red form est differential	Structural estimates	
Reduction in rents due to:			
Legal discipline	0.113	0.138	[0.067]
Reelection concern	(0.014)	0.053	[0.030]
Voters selection	(0.022)	0.0007	[0.057]

1st column is from Table 5, col 1, 2, and 4.

Estimates differential in parenthesis.

2nd column is from Table 8. Std errors in brackets.

Result summary: Audits are effective.

- Effects of the audits:
 - Audits reduce irregularities.
 - Audits effect spill over to neighboring municipalities.
 - Audits increase legal action.
- Mechanisms:
 - Legal disciplining effects is stronger than reelection concern.
 - Political selection works.
 - Entry effect is negligible.
- Audits reduce corruption, not merely displacing it. Politicians do not hide corruption better after audits.

Remark on external validity: the estimated reduction in corruption may not be generalizable to other contexts. The reduced form estimates picked up reduction in corruption conditional on the audit probability in Brazil.

Do Government Audits Reduce Corruption? Estimating the Impacts of Exposing Corrupt Politicians

Avis, Ferraz, Finan (JPE 2018)

Presented by César Garro-Marín and Masyhur Hilmy

December 6, 2018