Contagious Deregulation

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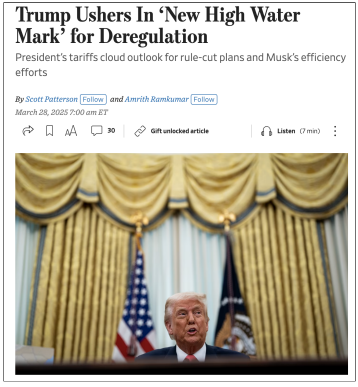
Paper available on SSRN

Economics of (de)regulation: important & understudied



Trump Ushers In 'New High Water Mark' for Deregulation

President's tariffs cloud outlook for rule-cut plans and Musk's efficiency efforts

By Scott Patterson Follow *and Amrith Ramkumar* Follow

March 28, 2025 7:00 am ET

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- Recently, a massive push to deregulate & defang regulatory agencies
- Little is known about the economics of deregulation
- Suppose we exempt some firms from regulation X
- Typical paper will show the effect on deregulated firms
  - Lower overhead, free cash flows...
- Our paper: **contagion effect** on non-deregulated firms

How does deregulation affect non-deregulated firms?

- **New dataset** on federal awards
  - Granular recipient-level dataset, covering $23.7 trillion during 1997-2022
  - Recipients above a threshold must be audited ("Single Audit")
- Study a **major deregulation reform** of federal awards
  - The audit threshold was raised from $500K to $750K
  - Auditors who lost deregulated clients issued more positive audits to the surviving, non-deregulated clients $\Leftarrow$ **Contagion effect**
  - Likely channel: lower demand for auditors motivated leniency
- **Structural model** to quantify the implications
  - Higher monitoring costs incentivize leniency, regardless of client's misconduct
- Implications for other deregulatory efforts
  - Compliance industry transmits deregulation shocks

Overview of the talk

1. Data & setting
2. Empirical evidence
3. Structural model
4. Quantitative implications
5. Conclusion

Federal awards: important source of cheap capital

- Many nonprofit organizations crucially rely on **Federal awards***
- Especially important for universities; in FY 2022/2023,
  - **UT Austin** expended $0.985 billion in Federal awards (42% of operating revenues)
  - **U Chicago**: $0.64 billion (10% of operating revenues)
  - **NYU**: $1.5 billion (10% of operating revenues)
  - **Duke**: $1.2 billion (12% of operating revenues)
  - **UNC-Chapel Hill**: $1.1 billion (23% of operating revenues)
- The funds are typically **free** and **lightly monitored**:
  - Only awards above a fixed threshold require monitoring
  - Monitoring done by private auditors, not by the government

* "Federal award" (aka "Federal financial assistance") includes any funds received directly from a Federal agency or indirectly from a pass-through entity, in the form of grants, donations, or loans. Precise definition: 2 CFR §200.1.

Federal awards and the Single Audit threshold

- The government has privatized the monitoring of federal awards
- The process is called Single Audit* –
  - Recipient hires a private auditor
  - Auditor reviews financial statements & regulatory compliance
  - Outcome: **positive** ("unqualified") or **negative** ("qualified" or "adverse") opinion
  - Severe issues can lead to funding freeze & exclusion from future awards
- Single Audit is required only if awards exceed a **fixed dollar threshold**
- The threshold was raised in 2016, from \$500k to \$750k
  - Deliberate attempt to deregulate small entities
  - We use this setting to identify the contagion effect

* In 1984, the Single Audit system replaced the need to conduct a separate audit for each federal award.

New dataset: Federal Audit Clearinghouse

- The central repository with all Single Audit reports
- For each report: recipient & auditor details; expenditures of federal awards; audit results
- 573,050 reports, from 1997 to 2022, covering $23.6 trillion
- Federal awards disbursed among 51,318 unique clients; monitored by 52,870 unique auditors

	count	mean	sd	p50
Amount ($1,000)	573,045	9,166	24,444	2,617
Relations:				
Pair Survival Rate	554,266	60.3	48.9	100.0
Client Switch Rate	554,266	13.3	34.0	0.0
Auditor Attrition Rate	554,266	12.9	33.6	0.0
Client Attrition Rate	554,266	13.5	34.1	0.0
Opinions:				
Unqualified Opinion	573,045	87.5	33.1	100.0
Qualified Opinion	573,045	9.1	28.7	0.0
Adverse Opinion	573,045	1.5	12.1	0.0

Amount is the amount of federal awards spent by the recipient in 2023 USD. *Pair Survival Rate* is the likelihood a client continues to hire the same auditor in the next year; *Auditor Attrition Rate* (*Client Attrition Rate*) is the likelihood the auditor (client) ceases to exist in the sample next year; and *Client Switch Rate* is the likelihood a client changes its auditor next year, conditional on both client and auditor continuing to exist. *Unqualified Opinion=1* if the client receives a positive audit, *Qualified Opinion=1* for qualified opinion, and *Adverse Opinion=1* for an adverse opinion (more severe).

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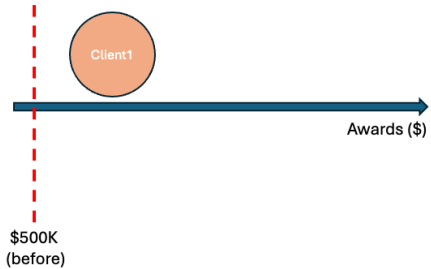
Intuition: raising the threshold for Single Audits



- Pre-reform, Client1 had to hire an auditor

* The reform applied for FY *starting* after 12/26/2014, and thus *ending* after 12/26/2015. The dataset is organized by the audit year which always follows the fiscal year end. For simplicity, we define the post-reform period starting in 1/1/2016.

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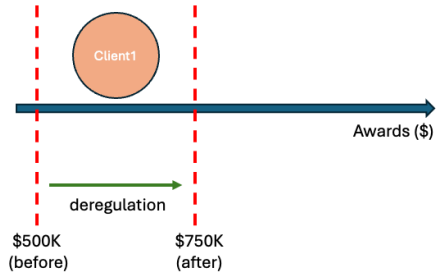

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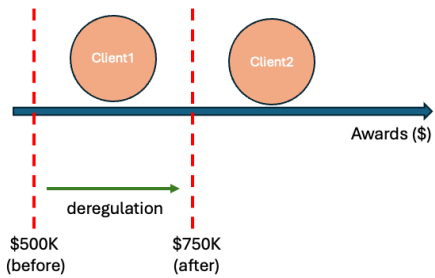

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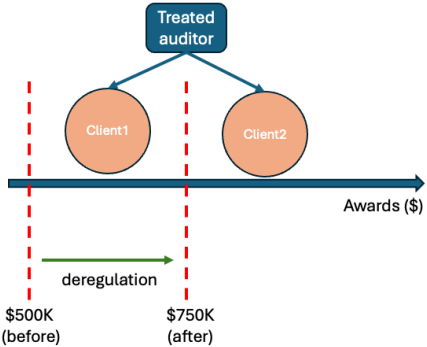

- Pre-reform, Client1 had to hire an auditor
- Post-reform, Client1 has been deregulated
- We focus on Client2, who was never deregulated
- Reduced demand motivates the auditor to offer Client2 leniency
- **Contagion effect** spreads from Client1 to Client2 through the treated auditor

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Difference-in-differences specification

$$NegativeAudit_{a,c,t} = \alpha + \beta \cdot Treated_a \times Post_t + \lambda_a + \lambda_c + \lambda_t,$$

- Panel of client×auditors, 2013-2018 (± 3 years around the reform)
- $NegativeAudit = 1$ if auditor a issued a negative opinion for client c
- $Post = 1$ from 2016 onwards
- $Treated = 1$ for treated auditors and 0 for control auditors
- β = contagion effect:
  - Change in outcome for auditors who lost their deregulated clients, relative to similar auditors who did not lose clients hypotheses
- We add year, client, and auditor FE (absorbing *Post* and *Treated*)
- SE double-clustered at the auditor and client level

Main result: Contagion effect

Treatment reduced negative audits, especially ones with severe issues

	NegativeAudit				*Qualified*	*Adverse*
	(1)	(2)	(3)	(4)	(5)	(6)
Treated × Post	-3.035***	-3.102***	-1.894**	-2.013***	-1.453**	-1.648**
	(0.919)	(0.948)	(0.811)	(0.759)	(0.701)	(0.833)
Auditor FE	Yes	No	No	No	No	No
Client FE	Yes	No	No	No	No	No
Year FE	Yes	Yes	No	No	Yes	Yes
Pair FE	No	Yes	Yes	Yes	Yes	Yes
Entity Type × Year FE	No	No	Yes	No	No	No
Entity State × Year FE	No	No	No	Yes	No	No
2015 Mean	7.24	7.18	7.18	7.18	5.23	1.95
Effect (%)	-41.91	-43.21	-26.39	-28.04	-27.79	-84.58
Observations	106899	104063	104003	104058	104063	104063

$NegativeAudit = 1$ if the auditor provided a negative audit of the client. $Qualified = 1$ ($Adverse = 1$) if the negative opinion was specifically "qualified" ("adverse"), which represents less (more) severe compliance concerns. $Treated = 1$ if the auditor had at least one client with expenditures below \$750K in 2015. $Treated = 0$ if the auditor had no clients below \$750K but had at least one client between \$1 million and \$1.5 million, in 2015. $Post = 1$ from 2016 onwards.

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Robustness:

- parallel trends
- alternative controls
- auditor-level results
- placebo
- fixed client pool

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What can generate the contagion effect?

- Following deregulation, we see **better audit outcomes**
  - Decline in negative audits among treated auditors
- Channel #1: Increase in **auditor leniency**
  - Resource constraints limit ability to conduct rigorous audits
  - Marginal cost of losing clients is higher
- Channel #2: Decline in **client misconduct**
  - Clients who hire treated auditors are less prone to misconduct
- Subsequent tests are **more consistent with Channel #1**, for example:
  - Negative audits, in general, push clients away costly audits
  - The reform increased risk of client desertion client desertion
  - Channels not mutually exclusive, not fully observable

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Model setup

- A risk-neutral auditor is engaged by the client to audit a project funded by a federal award
- Auditor chooses a negative ($d_t = 1$) or positive ($d_t = 0$) audit
- State variables (x_t) are auditor size (a_t) and yesterday's audit (d_{t-1})
  - Both variables affect the auditor's costs
- The auditor's utility function is:

$$u_t(x_t, d_t) = \underbrace{\pi(p_t)}_{\text{fees}} - \underbrace{c(a_t, d_t, d_{t-1})}_{\text{costs}} + \underbrace{\varepsilon(d_t)}_{\substack{\text{unobserved} \\ \text{utility}}}$$

The auditor's cost function

$$c(a_t, d_t, d_{t-1}) = \underbrace{\theta \cdot d_t}_{\text{recurring cost}} + \underbrace{\eta \cdot (1 - d_{t-1}) \cdot d_t}_{\text{switching cost}} + \underbrace{\delta \cdot a_t \cdot (1 - d_{t-1}) \cdot d_t}_{\text{scale discount}}$$

- **Recurring cost** θ: fixed cost* of effort & risk of revenue loss
  - Incurred iff negative opinion today ($d_t = 1$)
- **Switching cost** η: extra effort & risk from changing audit rigor
  - Incurred iff shifting from positive ($d_{t-1} = 0$) to negative ($d_t = 1$)*
  - In the data: high autocorrelation of audit outcomes
- **Scale discount** δ: increases with auditor size a_t
  - Economies of scale, marginal client matters less
  - In the data: large auditors more likely to issue a negative audit

* Similar results if recurring costs increase with project size, and if there is also a cost for switching from negative to positive.

Accounting for client misconduct

- The auditor's utility includes the term $\varepsilon_t(d_t)$
  - A **private information shock**, unobserved by the econometrician
  - Its value depends on the audit outcome
- Imagine the client engaged in misconduct:
  - We do not observe it, but it is included in ε_t
  - Auditor derives positive utility from negative audit ($\varepsilon_t(1) > 0$; e.g., satisfaction)
  - Auditor derives negative utility from positive audit ($\varepsilon_t(0) < 0$; e.g., reputational costs)
- Our goal is to estimate the structural parameters:
  - Recurring cost (θ), switching cost (η), and scale discount (δ)
  - They are scaled by the σ, the SD of ε
  - Focus on **relative values**, e.g., how parameters change across subsamples

* Standard feature of dynamic discrete choice models (Rust, 1994)

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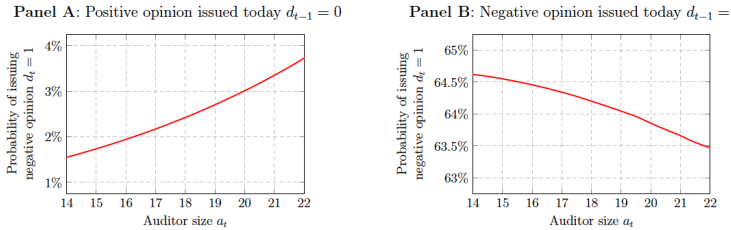
Optimal audit policy



- Audit outcomes are **persistent**, due to the switching cost η
  - More costly to switch positive⇔negative
- However, large auditors are **more flexible**
  - More likely to switch positive⇔negative
  - Due to the substantial scale discount δ

Model-implied probability of issuing a negative opinion today (d_t), as a function of the audit outcome yesterday (d_{t-1}) and auditor size (a_t). Panel A (Panel B) corresponds to an auditor who issued a positive (negative) opinion yesterday.

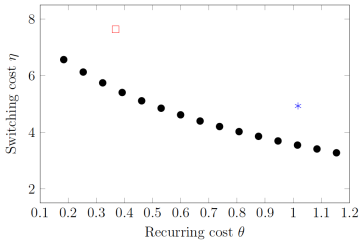
Deregulation increases auditor costs

		θ	η	δ
Pre-treatment:	Estimate	0.369	7.635	-0.178
	Std. error	(0.037)	(0.362)	(0.019)
Post-treatment	Estimate	1.017	4.929	-0.065
	Std. error	(0.034)	(0.393)	(0.021)
SL test—p-value	0.000 (1st stage)			

- Recurring costs↑ for all auditors; switching costs↑ for large auditors
  - Recurring cost θ more than doubled $((1.017 - 0.37)/0.37)$
  - Scale discount δ decreased in absolute value by 63% $((-0.065 + 0.178)/ - 0.178)$
  - Model-implied treatment effect similar to data-implied one
- The model is agnostic on "why" costs have risen; likely due to competition

We estimate the model using the NFXP algorithm (Rust (1987)) and report the p-values from testing whether parameter estimates across different subsamples are different (Swait and Louviere (1993)). In short, we verify that the scales of two data sets are equal (first stage), and whether parameters differ after accounting for differences in scale (second stage).

Designing contagion-free deregulation



- The goal: deregulate one segment without spillovers to other segments
  - Compensate auditors who issue negative audits, to offset their rising costs
- Takeaways:
  - Contagion-free policy trades off recurring and switching costs (move in opposite directions)
  - Actual post-reform costs (**blue star**) led to contagion
  - Actual pre-reform costs (**red square**) were offset by scale discount

We hold the scale discount δ fixed at the post-treatment level, and compute combinations of θ and η which preserve the pre-treatment negative audit rate. The red square indicates the actual parameter estimates from the *pre*-treatment sample: (θ, η)=(0.369,7.635). The blue asterisk indicates the actual parameter estimates from the *post*-treatment sample: $(\theta, \eta) = (1.017, 4.929)$.

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What did we learn from the paper?

1. **New dataset** on federal awards
   - An **understudied & crucial** source of capital
   - Of interest, e.g., to studies on nonprofit & municipal finance

2. Deregulation has a **contagion effect** on non-deregulated awards
   - **Natural experiment** points to weaker monitoring by auditors
   - **Structural model** shows how deregulation raises auditing costs
   - Adds to studies on the direct effect on deregulated firms

3. Future work on contagious deregulation –
   - Deregulation reduces demand for compliance professionals
   - Their response will spill over to non-deregulated sectors
   - Consolidation? Regulatory arbitrage?

Deregulation has a contagion effect on non-deregulated firms

Appendix

How would deregulation affect audit outcomes?

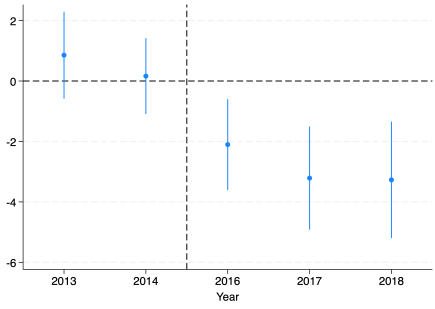
$$NegativeAudit_{a,c,t} = \alpha + \beta \cdot Treated_a \times Post_t + \lambda_a + \lambda_c + \lambda_t,$$

- Null hypothesis: no contagion ⇒ **same rate of negative audits** ($\beta = 0$)
  - The surviving clients continue to abide by the same regulatory requirements
- H1a: deregulation ⇒ **fewer negative audits** ($\beta < 0$)
  - **Leniency**: auditors compete for the surviving clients by offering leniency*
  - **Compliance**: recipients of large awards engage in fewer misconduct
- H1b: deregulation ⇒ **more negative audits** ($\beta > 0$)
  - **Effort**: auditors compete for the surviving clients by offering more effort (Hallman et al. (2022))

* Alternatively, they may offer lower price which would inadvertently force them to compromise on audit quality.

BACK

No detectable pre-trends



- Before the treatment (2015 or earlier), insignificant differences between the groups
- Only after the treatment (2016 or later), the treated group demonstrates substantially lower rates of negative audits
- Gap persists up to 3 years after the reform

Results from estimating a dynamic diff-in-diff specification: $NegativeAudit_{p,t} = \alpha + \sum_{\tau=2013}^{2018} \beta^{\tau} \cdot Treated_p \times 1_{t=\tau} + \vec{X}_{p,t} + \lambda_t + \lambda_p$.

BACK

Robustness: alternative control groups

	NegativeAudit					
Upper bound:	\$1.5M	\$1.6M	\$1.7M	\$1.8M	\$1.9M	\$2.0M
	(1)	(2)	(3)	(4)	(5)	(6)
Treated × Post	-3.102***	-2.879***	-2.865***	-2.782***	-2.645***	-2.735***
	(0.948)	(0.942)	(0.934)	(0.932)	(0.931)	(0.927)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Pair FE	Yes	Yes	Yes	Yes	Yes	Yes
2015 Mean	7.18	7.21	7.25	7.28	7.30	7.30
Effect (%)	-43.21	-39.91	-39.50	-38.20	-36.24	-37.48
Observations	104063	105768	106843	107850	108723	109279

This table is identical to the main specification, except for the definition of control auditors. Here, the control group (*Treated=0*) includes auditors who did not have any clients under the \$750K threshold in 2015, and had at least one client in 2015 with expenditures between \$1 million and the specified upper bound (\$1.6M to \$2.0M). $Post = 1$ from 2016 onwards.

BACK

Contagion effect at the auditor level

Effect drives both extensive and intensive margins of auditing

	Any Negative	Negatives (#)	Negatives (%)
	(1)	(2)	(3)
Treated × Post	-6.110***	-0.665***	-2.594***
	(1.602)	(0.143)	(0.733)
Auditor FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
2015 Mean	22.38	0.71	6.45
Effect (%)	-27.30	-93.86	-40.23
Observations	10786	10786	10786

Results from estimation at the auditor level, rather than auditor-client level. The outcome is an indicator for any negative audit issued by the auditor to any of their clients (column 1), the number of negative audits (column 2), and the rate of negative audits defined as the number of negative audits divided by number of clients (column 3). $Treated = 1$ if the auditor had at least one client with expenditures below \$750K in 2015. $Treated = 0$ if the auditor had no clients below \$750K but had at least one client between \$1 million and \$1.5 million, in 2015. $Post = 1$ from 2016 onwards.

BACK

Client compliance #1: Placebo test

- Perhaps compliant clients generally apply for large awards?
- We find no differences around the $750K threshold in 2004-2012 (pre-pre-reform)

	NegativeAudit					
	(1)	(2)	(3)	(4)	(5)	(6)
Above 750K	-0.005	-0.007**	0.000	-0.004	0.002	0.003
	(0.003)	(0.003)	(0.003)	(0.004)	(0.002)	(0.002)
Year FE	No	Yes	Yes	Yes	Yes	Yes
Entity Type FE	No	Yes	No	No	No	Yes
Entity State FE	No	No	Yes	No	No	Yes
Relationship Age FE	No	No	No	Yes	No	Yes
Auditor FE	No	No	No	No	Yes	Yes
Sample Mean	0.097	0.097	0.097	0.097	0.097	0.097
Observations	217693	217688	217693	217693	205608	205604

Sample covers the years 2004-2012. *NegativeAudit* is an indicator variable that takes one if the auditor provided a negative audit of the client in a given year, and zero otherwise. *Above 750K* is an indicator variable that takes one if a client's expenditure is above $750,000, and zero otherwise. Robust standard errors are adjusted for clustering at the auditor and client level and are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

BACK

Client compliance #2: Fixed pool of clients

- Perhaps compliant clients applied for large awards after the reform?
- Contagion effect holds for clients with large awards before & after

	NegativeAudit		
Client:	Baseline	Exists pre & post	Above 750K pre & post
	(1)	(2)	(3)
Treated × Post	-3.102***	-3.102***	-2.587***
	(0.948)	(0.948)	(0.814)
Year FE	Yes	Yes	Yes
Pair FE	Yes	Yes	Yes
2015 Mean	7.18	6.95	6.06
Effect (%)	-43.21	-44.61	-42.66
Observations	104063	95567	60708

We estimate our main diff-in-diff specification in three different subsamples. Column 1 is the baseline sample. Column 2 uses only clients that existed both before and after the reform. Column 3 uses only clients that were above the $750,000 threshold at all times, even before the reform took place. Robust standard errors are adjusted for clustering at the auditor and client level and are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

BACK

Auditor leniency #1: negative audits are costly

	Retained						*Exited*	*Switched*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
NegativeAudit	-11.215***	-3.529***	-2.885***	-2.563***	-3.428***	-3.815***	2.148***	2.558***
	(0.731)	(0.869)	(0.761)	(0.756)	(0.473)	(0.502)	(0.491)	(0.421)
Year FE	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Entity Type FE	No	Yes	No	No	No	Yes	Yes	Yes
Entity State FE	No	No	Yes	No	No	Yes	Yes	Yes
Relationship Age FE	No	No	No	Yes	No	Yes	Yes	Yes
Auditor FE	No	No	No	No	Yes	Yes	Yes	Yes
Sample Mean	60.31	64.76	60.31	60.306	63.49	67.39	12.57	22.79
Effect (%)	-18.60	-5.45	-4.78	-4.25	-5.40	-5.66	17.09	11.22
Observations	554266	483649	554266	554266	526373	464624	464624	404469

Client×auditor panel, 1997-2021. $NegativeAudit = 1$ if the auditor provided a negative audit of the client at time t. $Retained = 1$ if the client continues to hire the auditor in $t+1$, $Exited = 1$ if the client exits the sample in $t+1$, and $Switched = 1$ if the client did not exit but chose a new auditor in $t+1$. SE double-clustered at the auditor and client level.

BACK

Auditor leniency #2: change in clientele

	1(Lost client)	1(fewer clients)	Clients ($M)	Clients (#)	Clients if Fewer
	(1)	(2)	(3)	(4)	(5)
Treated × Post	12.540***	15.162***	7.518**	-1.696***	-1.946***
	(1.675)	(1.647)	(3.491)	(0.226)	(0.395)
Auditor FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
2015 Mean	54.55	32.26	11.04	103.64	198.62
Effect (%)	22.99	46.99	68.07	-1.64	-0.98
Observations	9491	9841	9841	9841	2896

Results from estimating auditor-level regressions with different outcomes: indicator for losing any client (even if the total number of clients went up or did not change) and for having fewer clients (columns 1-2), dollar value of clients (column 3), number of clients (column 3), and number of clients conditional on losing clients (column 5).

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Suggestive evidence: the reform increased auditor competition

	Auditor-client ratio	
	(1)	(2)
Exposure × Post	0.147***	0.147***
	(0.046)	(0.046)
Exposure	-0.274*	
	(0.143)	
Post	-0.218***	
	(0.021)	
Year FE	No	Yes
State FE	No	Yes
2015 Mean	0.25	0.25
Effect (%)	59.29	59.29
Observations	1300	1300

Sample of state×year observations. Outcome is the number of auditors per clients in the state. *Exposure* is the ratio of treated auditors to total unique auditors in that state, as of 2015 (pre-period). *Post* = 1 after 2016. SE clustered at the state level.

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