Impact of the GST on Corporate Tax Evasion: Evidence from Indian Tax Records

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Motivation

- Large literature shows third-party reporting (TPR) increases indirect tax collections.
  - Primarily focused on developed countries which are capital intensive, where input costs are verifiable.

  Does the conventional wisdom apply to developing economies where employment tends to be informal and hard to verify?

- In Ecuador, TPR increased reported costs by 96 cents per dollar of revenue adjustment (Carrillo et al., 2017).
  - Identification Challenge: Hard to know if this is due to evasion shifting or endogenous production responses.

- This paper: We propose a novel technique to detect cost overreporting and apply it to Indian data to show that firms overreport non-verifiable expenses (eg. wages of informal workers) in response to an increase in TPR.

Institutional Setting

Statutory corporate tax rates in India are among the highest in the world.

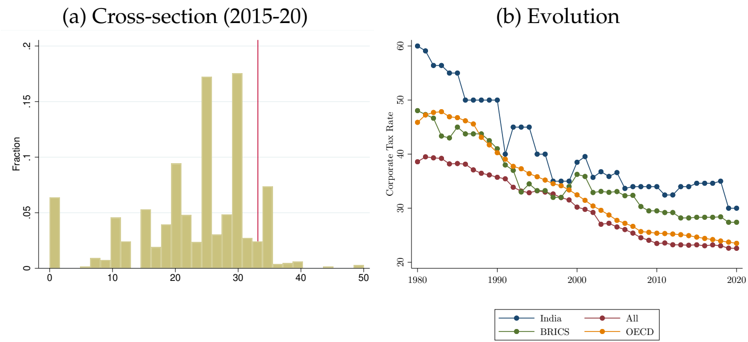


Figure: Statutory Corporate Tax Rates

Source: Tax Foundation Database.

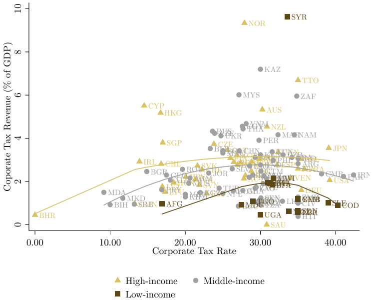
High corporate tax rate $\implies$ high return on evasion

Prevalence of Financial Statement Fraud

- Survey evidence suggests that financial statement fraud is pervasive in India, whereby a substantial amount of firms hide sales or inflate expenses, often via ghost employees and fictitious contracts.
- Deloitte India Fraud survey:
  - In their large companies survey, 10% of the respondents experienced financial misreporting over the last two years.
  - In the small and medium companies survey, 21% of survey respondents experienced financial misreporting over the previous two years.
  - In their working professionals survey, 40% of the respondents suspected their organization had experienced financial statement fraud.

(a) Tax Revenues on GDP

(b) Tax Revenues on Tax Rates



Source: Tax Foundation Database, UNU-WIDER Government Revenue Dataset, World Bank World Development Indicators Database.

Notes: Observations reflect averages over the period 2000-2015. Countries with less than one million in population are excluded. In panel (b), we estimate Laffer curves (across income groups according to the World Bank classification) by fitting a fractional polynomial of degree two.

Recent Developments in the Indirect Tax Regime

- In 2017, India replaced its fragmented indirect tax structure with a nationwide Goods and Services Tax (GST).
- In the previous system:
  - Companies were paying taxes at different production stages and were also being taxed separately by various government authorities.
  - Did not permit input tax credits for several taxes.
- Under the new regime:
  - All state and central taxes were subsumed under a single system.
  - Taxpayer reports were verified against third-party information using invoice-matching.
  - Registered firms were required to routinely self-declare details of all outward supplies made, input tax credit claimed, tax liability ascertained, and taxes paid.

These changes made intermediate good transactions easier to verify.

Data

- Administrative tax records from the Ministry of Corporate Affairs (MCA), Government of India
  - Random sample of all registered companies in India.
  - Ranges from 2015 to 2020.
  - Covers 21,538 firms.
  - Stock Data: Breakdown of balance sheet positions.
  - Flow Data: Breakdown of profit & loss accounts.
- Supplement with data from the Annual Survey of Industries (ASI)

Part 1: Impact of the GST on Reported Revenues and Costs

Finding 1: Reported revenues and costs both increased due to GST

DD Strategy: Compare the response of firms who supplied goods that were exempt from GST to those that were not.

$$y_{i,t} = \beta \text{GST}_{i,t} + \phi_i + \psi_t + \epsilon_{i,t},$$

where

$$\text{GST}_{i,t} = \mathbb{1}_{p_i \in \text{Non-exempted goods}} \times \mathbb{1}_{r_{i,t} > \text{ INR 20 lakhs}} \times \mathbb{1}_{t > 2017}$$

Here i denotes a firm; t denotes the tax filing year; p_i denotes the HSN code of the product supplied by firm i; $r_{i,t}$ denotes the revenue of firm i in period t; $y_{i,t}$ denotes outcome variables for firm i in period t; ϕ_i denotes firm fixed effects; and ψ_t denotes year fixed effects.

▸ Parallel Trends Assumption

Impact of the GST on Reported Revenues and Costs

Table: Effect of Treatment on Firm Revenues and Costs

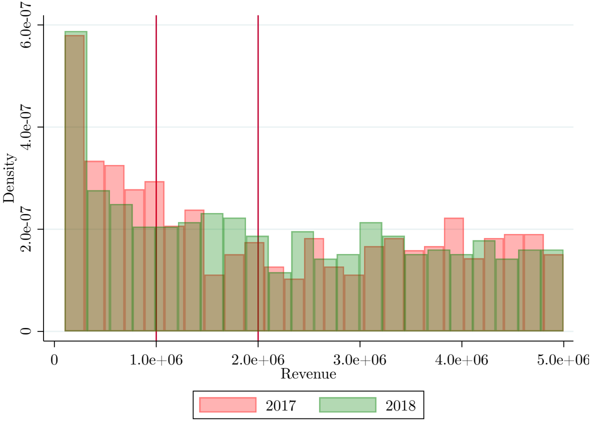
Sample of firms	Full sample		Truncated sample	
Outcome variable	log(Revenue)	log(Expenses)	log(Revenue)	log(Expenses)
GST	1.403^{***}	0.986^{***}	1.329^{***}	0.914^{***}
	(0.0701)	(0.0525)	(0.0813)	(0.0597)
Firm FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	85842	86866	85283	86312

Notes: In the truncated sample, we exclude observations satisfying INR 10 lakhs $\leq r_{i,t}$ < INR 20 lakhs to avoid contaminating the control group. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.

- GST increased reported revenues by 132.9% and reported expenses by 91.4%.
  - Is this due to increased production efficiency or greater tax compliance?
- To ascertain the effect of the GST on tax compliance, we focus on two margins of financial statement fraud: revenue underreporting and cost overreporting.

Part 2: Revenue Underreporting

Finding 2: Revenue underreporting decreased after the GST was implemented



Notes: We restrict attention to firms with revenues above INR 1 lakhs and below INR 50 lakhs. The VAT exemption threshold was changed from INR 10 lakhs to INR 20 lakhs under the new tax regime.

We follow Saez (2010), Kleven and Waseem (2013), and Chetty et al. (2011) to formally measure the extent of revenue underreporting.

We estimate the counterfactual density by fitting a p degree polynomial, excluding observations in a range $[r_L, r_U]$ around the exemption threshold T:

$$c_j = \sum_{i=0}^{p} \beta_i (r_j)^i + \sum_{i=r_L}^{r_U} \gamma_i \mathbb{1}[r_j = i] + \epsilon_j.$$

The excess number of firms who locate near the kink relative to the counterfactual density is given by $B = \sum_{j=r_L}^{r_H} (c_j - \hat{c}_j)$, where $\hat{c}_j = \sum_{i=0}^{p} \hat{\beta}_i (r_j)^i$ denotes the estimated counterfactual density.

The excess mass is $b = \frac{B}{\sum_{j=r_L}^{r_H} \hat{c}_j / (r_H - r_L)}$.

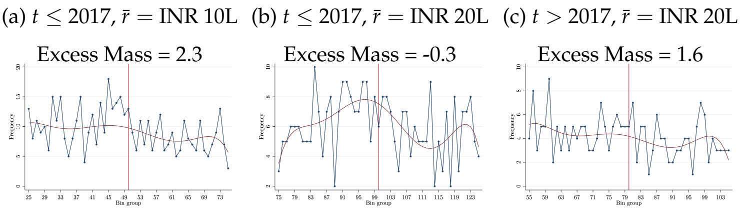


Figure: Revenue Bunching at GST Exemption Thresholds

Notes: These figures show the revenue distribution around the GST exemption (demarcated by the vertical red lines) for firms between between 2015-2019. The series shown in dots is a histogram of revenues. Each point shows the number of observations in a INR 20,000 bin for panels (a) and (b), and a INR 25,000 bin for panel (c). The solid line beneath the empirical distribution is a sixth-degree polynomial fitted to the empirical distribution excluding 25 bins above and below the cutoff. Leftmost (rightmost) bin in bunching windows is 6 (1) bins below (above) the bunch point. Firms with revenues below INR 1 lakh and above INR 50 lakhs are discarded. In panel (a), we consider observations on or before 2017 around the threshold of INR 10 lakhs. In panel (b), we consider observations on or before 2017 around the threshold of INR 20 lakhs. In panel (c), we consider observations after 2017 around the threshold of INR 20 lakhs.

Part 3: Cost Overreporting

Finding 3: Cost overreporting increased after the implementation of GST.

Constant Input Shares under Full Verification

There is a continuum of firms, indexed by i. Firm i can access the following technology

$$F_i(\{x_{ij}\}) \equiv z_i \prod_j (x_{ij})^{\alpha_{ij}},$$

where x_{ij} denotes input j of firm i, $\alpha_{ij} > 0\ \forall j$ and $\sum_j \alpha_{ij} \leq 1$.

We focus on equilibrium outcomes where there is free entry and exit due to which firms earn zero profits:

$$z_i \prod_j (x_{ij})^{\alpha_{ij}} - \sum_j w_j x_{ij} = 0\ \forall i.$$

Proposition

If $\alpha_{ij} = \alpha_j\ \forall i$ and inputs are verifiable, then reported expenditure shares of inputs are independent of revenues.

Discontinuities in Reported Input Shares under Partial Verification

The optimal cost reporting decision of a firm can be derived as the solution to the following problem:

$$\min_{\hat{c}^n} \mathbb{1}(r \geq c^v + \hat{c}^n)\tau(r - c^v - \hat{c}^n) + \chi\mathbb{P}(r \geq T)(\hat{c}^n - c^n)^2/2,$$

where r denotes the revenue of the firm; $\hat{c}^n$ denotes reported non-verifiable costs; c^v and c^n denote verifiable and non-verifiable input costs, respectively; τ captures the corporate tax rate; and T denotes the GST exemption threshold.

Proposition

Suppose a positive fraction of inputs is non-verifiable, and the fraud detection probability is sufficiently high and increasing in revenues. Then the reported expenditure share of non-verifiable inputs is

(i) increasing in revenues below the GST exemption threshold,

(ii) exhibits a negative jump at the threshold, and

(iii) decreasing in revenues above the threshold.

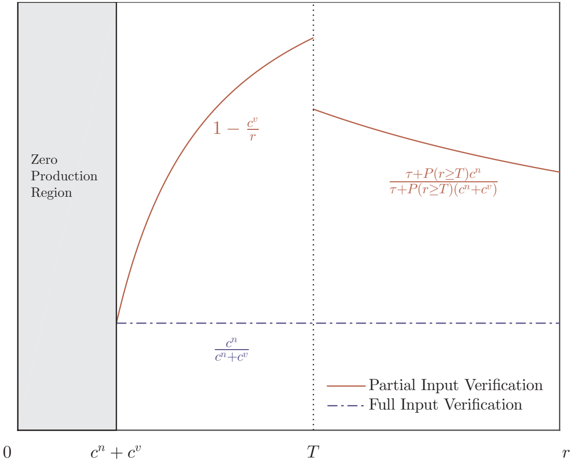


Figure: Reported Input Shares as a Function of Revenues

Notes: We assume $P(r \geq T) = r/\bar{r}$ and use the following parameterization for the numerical illustration: $(c^n, c^v, T, \tau, \bar{r}) = (0.1, 0.4, 1.5, 0.5, 3)$.

Empirical Strategy (Sharp RD Design)

We construct a score for the treatment as follows:

$$s_{i,t} \equiv \begin{cases} r_{i,t} - \text{INR 10 lakhs} & t \leq 2017 \\ r_{i,t} - \text{INR 20 lakhs} & t > 2017 \end{cases}.$$

We consider the following specification for estimating the RD treatment effect:

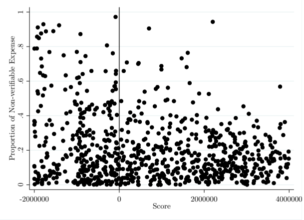
$$y_{i,t} = \alpha + \beta \mathbb{1}(s_{i,t} \geq 0) + f(r_{i,t}) + \epsilon_{i,t} \quad \forall r_{i,t} \in (0, \text{INR 50 lakhs}),$$

where $y_{i,t}$ is the outcome variable (i.e., non-verifiable expense ratio) and f is continuous function.

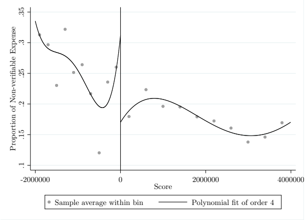
Main identifying assumption: production technologies of firms with revenues around the exemption thresholds are similar, barring differences in productivity, i.e., $\alpha_{ij} = \alpha_j \; \forall i : r_{i,t} \in (0, \text{INR 50 lakhs}) \; \forall t$.

RD Results

(a) Scatterplot



(b) RD Plot



Sample of firms	Full sample		Non-exempted firms	
Sample period	2017-18	2015-20	2017-18	2015-20
Panel A: Excluding covariates				
RD estimate	-0.11784**	-0.04573	-0.1185**	-0.0486
	(0.05407)	(0.03104)	(0.05438)	(0.03133)
Panel B: Including covariates				
RD estimate	-0.11225**	-0.02982	-0.11411**	-.03578
	(0.0523)	(0.03405)	(0.05257)	(0.03324)

Notes: To compute the RD estimates, we use a linear estimator with a triangular kernel and MSE-optimal bandwidth. Standard errors are reported in parenthesis and are clustered at the firm level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Validity of the RD Design

- No discontinuity of the score density was detected using tests of Cattaneo et al. (2017) and McCrary (2008).
- No evidence of discontinuous jumps in covariates at the cutoff.
- Results not sensitive to observations near exemption threshold.
- Placebo Tests:
  - Alternative exemption thresholds render insignificant RD estimates.
  - No discontinuity in verifiable expense ratios at the exemption threshold.

Evidence on the Mechanism

- Exploit variation in the visibility of intermediate inputs relative to labor inputs.
- Inputs of firms procuring from out-of-state were being monitored at state borders prior to GST, but not immediately after.

$\Longrightarrow$ Net increase in the monitoring of intermediate goods was smaller for these firms

$\Longrightarrow$ These firms have a lower incentive to inflate labor costs than other firms

Table: Heterogeneity in RD Estimates (by Out-of-state Input Procurement)

Sample period	Post-GST		Pre-GST	
Sample of firms	High OPR	Low OPR	High OPR	Low OPR
RD estimate	0.10754	-0.28084**	-0.00281	0.84957
	(0.14725)	(0.14217)	(0.05847)	(0.58084)
	[122]	[153]	[126]	[186]

Notes: High (low) out-of-state input procurement ratio (OPR) refers to the subsample of firms with OPR greater than or equal to (less than) mean values. To compute the RD estimates, we use a linear estimator with a triangular kernel and MSE-optimal bandwidth. Standard errors are clustered at the firm level. Observations are reported in square brackets. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Cost Overreporting

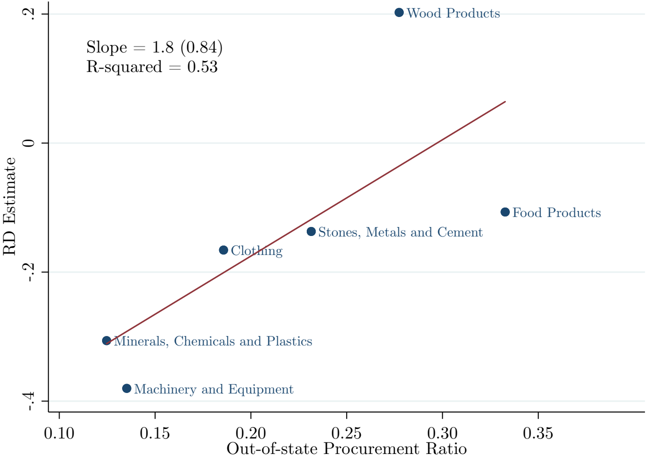


Figure: Variation in RD estimates by Out-of-state Input Procurement

Heterogeneity

Our baseline results are driven by labor-intensive firms, which seems natural since wages comprise a substantial share of such firms' expenses, so there is more room to evade.

Table: Heterogeneity in RD Estimates (by Industry and Factor Intensity)

		by industry		by factor intensity	
Sample of firms	All	Service providers	Non-service providers	Labor-int. firms	Capital-int. firms
RD estimate	-0.11784**	-0.12772**	0.17855	-0.14471*	-0.02016
	(0.05407)	(0.06012)	(0.29219)	(0.07836)	(0.05398)
	[804]	[672]	[132]	[514]	[290]

Notes: Service providers are classified under heading numbers above 9900 as per the NPCS. Capital-intensive firms are firms that a ratio of the cost of materials to total expenses above average; labor-intensive firms are the residual. To compute the RD estimates, we use a linear estimator with a triangular kernel and MSE-optimal bandwidth. Standard errors are reported in parenthesis and are clustered at the firm level. Observations are reported in square brackets. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Implications for large firms?

Estimating the Level of Cost Overreporting

We compute the level of cost overreporting by

$$\Omega(c^v, c^n, \chi, \tau, T; P) \equiv \int_{c^n+c^v}^{T} (r - c^v)dr + \int_{T}^{\bar{r}} \left\{ \frac{\tau}{\chi \mathbb{P}(r \geq T)} + c^n \right\} dr - (\bar{r} - c^n - c^v)c^n,$$

To estimate Ω, we use Generalized Method of Moments (GMM). Specifically, we first estimate firm expenses, $\{c^n, c^v\}$, and the penalty parameter, χ, using

$$(c^{n*}, c^{v*}, \chi^*) \in \operatorname{argmin}_{(c^n, c^v, \chi) \in \mathbb{R}^3_+} \mathcal{D}(c^n, c^v, \chi \mid \tau, T)' W \mathcal{D}(c^n, c^v, \chi \mid \tau, T),$$

where W is a weighting matrix, and the i^{th} entry of $\mathcal{D}$ is given by

$$\mathcal{D}_i(c^n, c^v, \chi \mid \tau, T) \equiv \begin{cases} 1 - \frac{c^v}{\hat{r}_i} - \frac{\hat{c}_i^n}{\hat{c}_i^n + \hat{c}_i^v} & \text{if } \hat{r}_i < T \\ \frac{\tau + \chi \mathbb{P}(\hat{r}_i \geq T)c^n}{\tau + \chi \mathbb{P}(\hat{r}_i \geq T)(c^n + c^v)} - \frac{\hat{c}_i^n}{\hat{c}_i^n + \hat{c}_i^v} & \text{if } \hat{r}_i \geq T \end{cases},$$

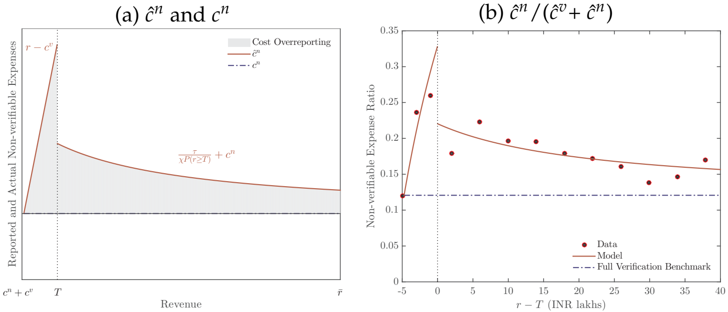


Figure: Estimating the Level of Cost Overreporting

- The above procedure suggests costs were overreported by 7.9% during 2017-18.
- Accounting for endogenous production responses, this figure increases to 9.8%.
- Using this model, we also study several ways of increasing tax revenues.

Conclusion

- This paper highlights the limitations of TPR in curbing corporate tax evasion in developing countries.

- Using an administrative dataset of corporate tax returns of Indian firms over the period 2015-2020, we obtain three main results:
  1. Firms reported higher revenues and costs after the implementation of GST.
  2. Much of the increase in reported revenue was due to reduced income underreporting.
  3. The regime change prompted labor-intensive firms to shift toward overreporting their wage bills that were relatively harder to verify.

- Our methodological innovation is to use variation in the relative visibility of specific inputs to detect the presence of cost overreporting.

Appendix

Parallel Trends Assumption for DD Design

$$y_{i,t} = \sum_{l=-3}^{0} \beta_l \text{GST}_{i,t}(t = 2018 + l) + \phi_i + \psi_t + \epsilon_{i,t}.$$

A test of the parallel trends assumption is $\beta_l = 0 \; \forall l < 0$.

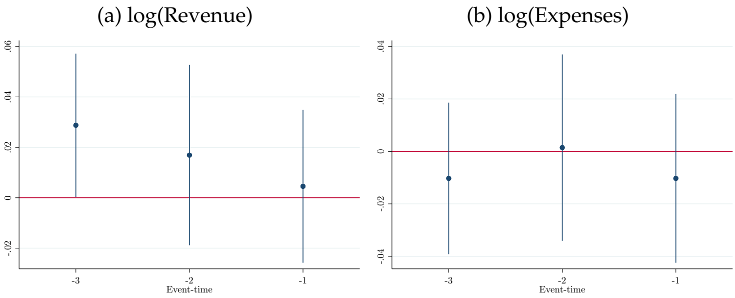


Figure: Testing the Parallel Trend Assumption

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Continuity of the Score Density

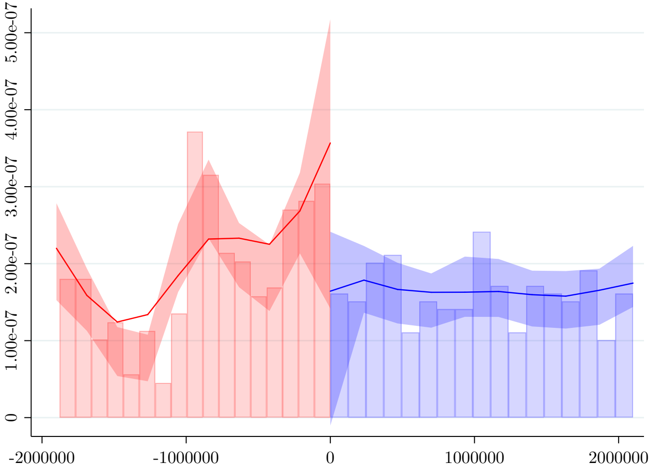

Figure: Estimated Density of Running Variable

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Table: Testing Balance of Covariates around GST Exemption Thresholds

Variable	Optimal Bandwidth	RD Estimator	p-value	Confidence Interval
Panel A: MSE-optimal bandwidth				
Total assets	7.91×10^5	67.82	0.354	[-92.98, 259.90]
Borrowings	3.88×10^5	-111.72	0.846	[-1110.22,1354.81]
Equity	6.52×10^5	-51.89	0.561	[-213.03, 115.52]
Cash	3.73×10^5	404.79	0.346	[-2405.13, 6857.65]
Panel B: CER-optimal bandwidth				
Total assets	2.71×10^5	181.28	0.438	[-1761.30, 4068.60]
Borrowings	2.81×10^5	-460.03	0.424	[–1162.55, 489.21]
Equity	4.73×10^5	-60.41	0.569	[-260.92,143.54]
Cash	5.74×10^5	93.41	0.348	[-110.63, 314.20]

Notes: All variables are denominated in INR Crore. To compute the RD estimates, we use a linear estimator with a triangular kernel. Standard errors are reported in parenthesis and are clustered at the firm level.

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Sensitivity to Observations near the Exemption Threshold

We exclude observations with $| r_{i,t} | < \Lambda$ and recompute MSE-optimal bandwidths for $\Lambda \in \{5000, 10000, 15000\}$.

Table: RD Estimation for the Donut-Hole Approach

Donut Hole Radius (in INR)	0	5000	10000	15000
RD estimate	-0.11784**	-0.11844**	-0.12252*	-0.13009*
	(0.05407)	(0.05906)	(0.06646)	(0.06905)
	[804]	[803]	[800]	[799]

Notes: To compute the RD estimates, we use a linear estimator with a triangular kernel and MSE-optimal bandwidth. Standard errors are reported in parenthesis and are clustered at the firm level. Observations are reported in square brackets. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

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Placebo Test 1: Alternative Exemption Thresholds

- Examine discontinuity in the non-verifiable expense ratio at the INR 20 lakhs cutoff for the pre-GST period, and at the INR 10 lakhs cutoff for the post-GST period.
- Since the tax exemption thresholds were revised from INR 10 lakhs to INR 20 lakhs under the GST, we should not see any discontinuous pattern at the respective cutoffs for these placebo outcomes.

Table: Placebo Tests: Alternative Exemption Thresholds

Sample period	Pre-GST	Post-GST
Running variable	$r_{i,t}$ − INR 20 lakhs	$r_{i,t}$ − INR 10 lakhs
RD estimate	-0.04156	0.11846
	(0.06463)	(0.17682)
	[1451]	[643]

Notes: To compute the RD estimates, we use a linear estimator with a triangular kernel and MSE-optimal bandwidth. Standard errors are clustered at the firm level. Observations are reported in square brackets. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

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Placebo Test 2: Verifiable Expense Ratios

No discontinuity in the share of verifiable expenses at the tax exemption thresholds.

Table: Placebo Tests: Share of Verifiable Expenses

	Cost of Materials	Power and Fuel Costs	Finance Cost	Insurance Expenses	Auditing Expenses
RD estimate	0.04216	0.06197	-0.03953	0.00309	0.00027
	(0.10593)	(0.04357)	(0.03769)	(0.00277)	(0.00254)
	[788]	[755]	[805]	[755]	[755]

Notes: To compute the RD estimates, we use a linear estimator with a triangular kernel and MSE-optimal bandwidth. Standard errors are clustered at the firm level. Observations are reported in square brackets.* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

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