Does Third Party Verification Matter?

VAT in Emerging Economies

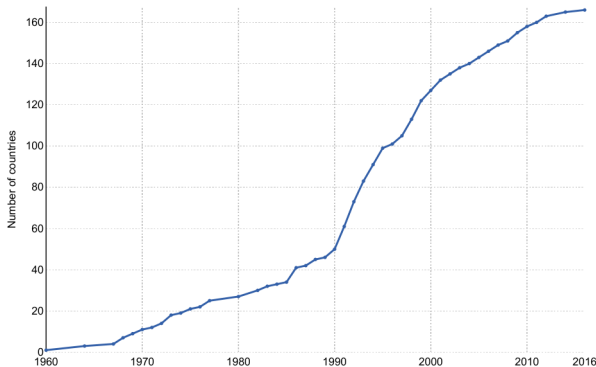**Shekhar Mittal**[1]   **Aprajit Mahajan**[2]

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Rapid Increase in VAT Adoption Since 1960

Number of countries having implemented Value Added Taxes, 1960 to 2016

Source: OECD – Consumption Tax Trends 2016

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- 1 country in 1960 → 50 in 1990 → 160 in 2015
  - In India: VAT in 2005; GST in 2017

Third Party Verification: Incentivizes Compliance

- VAT requires buyers and suppliers to maintain independent records of each transaction
- Standard value added tax

$$Tax\ Liability = \tau * Value\ Add = \underbrace{\tau}_{\text{Tax Rate}} * \underbrace{(Revenue - Creditable\ Costs)}_{\text{Tax Base}}$$

- Opposing incentives to report the transaction may reduce scope for collusion and evasion

Large Variance in Implementation

- Relying solely on opposing incentives may not be sufficient
    - Especially for emerging economies
- In resource poor environments, high administrative costs of third party verification
    - Requires IT infrastructure
    - Compliance technology commonly missing in developing countries (e.g. Africa)
- Rigorous third party verification may not ensure compliance
    - Newly launched Goods and Services Tax (GST) has much stricter third party verification
    - Compliance cost and risk completely borne by buying firms

Research Question

- How do firms respond to improved third party verification technology in a low compliance, high informality setting?
  - Does the response differ by firm size?
- Study mechanisms
  - Role of special teams that focus on high taxpaying firms
  - Proportion of sales made to registered firms that are now verifiable

Empirical Design

- Large administrative dataset:
  - 2010-14 universe of value added tax returns from Delhi, India
- Policy change
  - Introduction of technology to ease the administration of third party verification
- Difference-in-difference comparison
  - Wholesalers vs Retailers
    - Wholesalers more likely to sell to registered firms, transactions now verifiable
    - Retailers more likely to sell to final consumers, transactions still not verifiable
  - Evaluate short term & medium term effects on: tax remitted, tax credits, and output tax

Results

- Large, significant effects of the reform
    - VAT remitted by wholesalers increases by 29% (₹.38 million, $5,846) compared to retailers
- Effects driven by top 1% of taxpaying wholesalers
- Effects persist after 2 years
- Policy implications
    - Introducing technology could lead to ⇑ tax revenue, but from a small set of firms
    - Compliance costs incurred by all firms, possibly greater for smaller firms
    - Information and monitoring effort are complements

Contributions to Literature

- Evaluate reducing monitoring costs, holding monitoring effort fixed
    - Corporate income tax: Carrillo et al. (2017)
    - Small business owners' income tax: Slemrod et al. (2015), Kleven et al. (2011)
    - Value added tax: Pomeranz (2015), Bérgolo et al. (2017)
- Analyze compliance issues in VAT using administrative data in a low income, low compliance, and high informality setting
    - Almunia and Lopez Rodriguez (2017), Naritomi (2015)
- Show increased collections by large firms, despite low audit rates
    - Kleven et al. (2016), Kopczuk and Slemrod (2006)

Delhi and VAT

- Population: 16.8 million (2011 census)
- In Delhi, VAT introduced in 2005
- VAT accounts for 52.4% of total government revenues

Incentives under VAT

- In theory
    - Adversarial incentives between buyers and suppliers
    - Incentives to under-report sales and over-report purchases
    - Note: Input credits only if buying from registered firms

- In practice
    - Returns are self-reported
    - Buyers and suppliers can collude: anecdotally, off-the-book transactions are pervasive in India
    - 75% of firms make some sale to unregistered firms
    - Evidence of under-reporting of costs (Carrillo et al., 2017)

Policy Change

- Before 2012-13 (year 3 of data), firms not required to provide buyer or supplier IDs
- Firms claimed input tax credits without identifying the supplier
    - Tax authority could verify credit claims **only by instituting expensive audits**
- From year 3, firms required to provide tax-IDs, along with amounts & tax rate (for sales & purchases)
    - Automatic mismatch notices generated by computer system
- Exogenous increase in systemic monitoring
    - Should $\Downarrow$ input credits, $\Uparrow$ output tax $\implies$ $\Uparrow$ tax remitted

Policy Increases Third-Party Reported Income

- True income a combination of third-party reported and self-reported income
- To avoid detection, optimal to declare income greater than the third-party reported income
- For our purpose, think of policy as increasing the third-party verifiable income
  - Collusion could attenuate effects

Breakdown in VAT Chain

- To underreport sales, collusion necessary with all downstream firms
  - Needs high degree of collusion between multiple firms
- In high compliance environments, sales under-reporting in a VAT chain pinned down by the retailer
- If firms make significant sales to unregistered firms, then pairwise collusion sufficient
  - 75% firms make positive sale to unregistered firms

Data Summary

- Administrative data from Delhi Tax Authority
- 5 years of VAT returns - 2010-11 (Y1), 2011-12 (Y2), 2012-13 (Y3), 2013-14 (Y4), 2014-15 (Y5)
- Entire universe of registered firms
  - 192k firms in Y1 to 271k firms in Y5
- 3 years of firm level interactions - Y3, Y4, Y5
  - Tax-IDs, amounts, tax rates for sales & purchases for registered firms
  - Quarterly: Q9 to Q20
- Firm characteristics (self-reported on tax forms)

Always present firms   All firms   Summary   Lorenz curve

Identification Strategy

- Identify 2 groups of ex-ante similar firms that should respond differentially to cross-checking
- Limit analysis to
    - Self-identified sole retailers and wholesalers
    - Present in all 5 years of our data-set (Ignore: Selection effects)
    - Selected sample: 27% of total firms, 45% of VAT remitted in year 1, and 36% of increase in VAT remitted
   - 19515 wholesalers, 32979 retailers at annual level

Summary

Wholesalers vs Retailers

- Credits claimed by both wholesalers and retailers are cross-checked post policy
    - Mismatches generate automatic warnings to firms
- Can verify sales to registered firms
- Wholesalers more likely to sell to registered firms relative to retailers
- If cross-checking has bite, expect stronger effect on wholesalers than on retailers

Summary

Proportion of Sales to Registered Firms
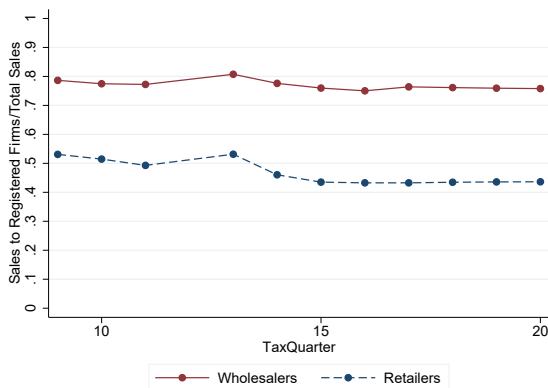
- Wholesalers sell more to registered firm than retailers
- However, retailers sell to registered firms as well (explore why in future work)
- Caveat: Data available only in the post policy period

Estimating Equation

$$y_{it} = \beta * Post_{it} + \gamma * Post_{it} * \mathbb{I}\{\text{Wholesaler}_i\} + \alpha_i + \nu_t + \epsilon_{it} \quad (1)$$

- Comparison groups:
    - Wholesaler & Retailer
- Outcomes:
    - $\mathbb{I}\{\text{VAT} > 0\}$: Positive VAT Remitted
    - VAT Amount Remitted (in million rupees, point mass at 0 ≈ 0.57)
    - Input Credit (in million rupees)
    - Total Output Tax (in million rupees)
    - Output Tax - Input Credit (in million rupees)
- Standard errors clustered at firm level
- Include time (ν_t) and firm fixed effects (α_i)
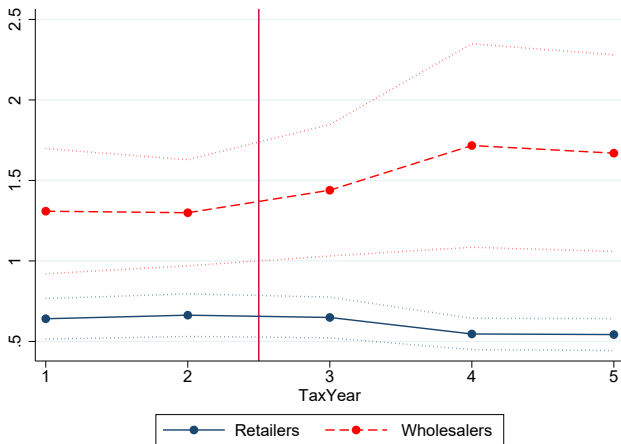
VAT Remitted

Quarterly trends   Event study plots   Pre Trend Analysis

Difference-in-Difference Estimates

- Large effect on VAT remitted, 29% ⇑, via ⇑ in output tax
- Comparing Col(1) with Col(2) suggests substantial heterogeneity

Table: Diff-in-Diff: Wholesalers and Retailers (Annual)

VARIABLES	(1) Positive VAT Remitted Firms	(2) VAT Remitted	(3) Tax Credit	(4) Output Tax	(5) Output Tax - Input Credit
Post*Wholesaler	-0.02***	0.38***	-0.12	0.25**	0.37***
	(0.00)	(0.14)	(0.15)	(0.11)	(0.14)
Post	0.04***	-0.09*	0.18***	0.09**	-0.09**
	(0.00)	(0.05)	(0.05)	(0.04)	(0.05)
Mean Dep.Var.	.53	1.31	1.41	2.63	1.22
	(.00)	(.20)	(.24)	(.41)	(0.20)
Observations	262,470	262,470	262,470	262,470	262,470
R-squared	0.63	0.89	0.83	0.97	0.89
Number of Firms	52,494	52,494	52,494	52,494	52,494

Robust standard errors in parentheses, clustered at firm level. $N_W = 19515$, $N_R = 32979$. Monetary amounts are in million rupees, with ₹65 approximately equal to $1. All monetary amounts have been inflation adjusted to 2010-11 price levels. Column (1) shows linear probability regressions of the probability of depositing a positive amount. Column (2)-(4) respectively show regression of the mean VAT remitted by firms, input credit claimed by firms, and output tax collected by firms. To address the concern that VAT deposited has a significant mass at zero, Column(5) shows regression of the difference between output tax and input credit declared by firms. Mean Dep. Var. shows the mean and standard errors for wholesaler firms in year 1. *** p<0.01, ** p<0.05, * p<0.1.

Falsification Test

Strong Effect for Top 1%

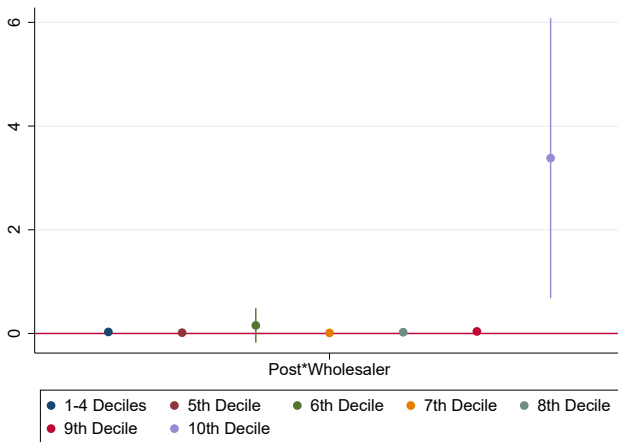Vat deposited in million rupees, values adjusted to 2010 real terms.
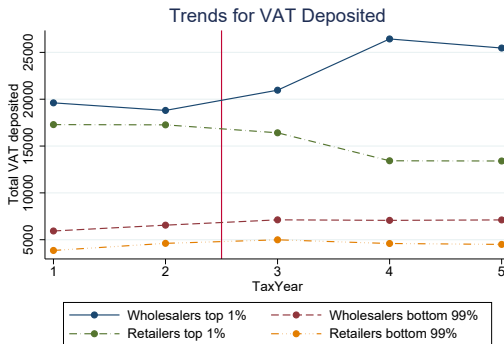
- Top 1% in terms of VAT remitted in year 1
- 97% of the wholesale firms in top percentile monitored by special teams
    - Monitoring and information are complementary (?)

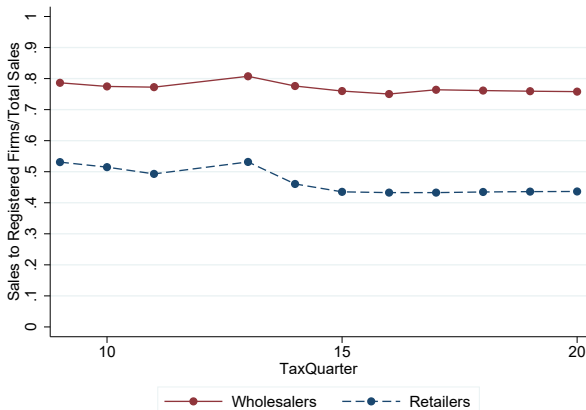Top decile   Top 1%   Bottom 99%

No Effect on Small and Middle Firms

- Difference-in-difference regression for each decile (in terms of VAT remitted in year 1)

Proportion of Sales to Registered Firms

- Wholesalers sell more to registered firm than retailers
- However, retailers sell to registered firms as well (explore why in future work)
- Caveat: Data available only in the post policy period

Diff-in-Diff-in-Diff: Sales to Registered Firms

$$y_{it} = \alpha_i + \nu_t + \beta * \text{Post}_{it} +$$
$$\delta * \text{Post}_{it} * \text{PropRegistered}_i + \gamma * \text{Post}_{it} * \mathbb{I}\{\text{Wholesaler}_i\}$$
$$+ \lambda * \text{Post}_{it} * \mathbb{I}\{\text{Wholesaler}_i\} * \text{PropRegistered}_i + \epsilon_{it} \quad (2)$$

- *PropRegistered$_i$*: Proportion of sales made to registered firms (in quarter 9)
- Caveat: *PropRegistered$_i$* not available for periods before the policy

Diff-in-Diff-in-Diff: Quarterly Regression

- Number of wholesalers: 11482 firms, number of retailers: 15337 firms

VARIABLES	(1) Positive VAT Remitted	(2) VAT Remitted	(3) Input Credit	(4) Output Tax	(5) Output Tax - Input Credit
Post*Wholesaler*Registered Sales	0.02**	0.17**	-0.04	0.12*	0.16**
	(0.01)	(0.07)	(0.07)	(0.06)	(0.08)
Post*Wholesaler	-0.02***	0.06**	-0.01	0.05**	0.07***
	(0.00)	(0.02)	(0.02)	(0.03)	(0.02)
Post*Registered Sales	0.01	0.02	0.02	0.04**	0.03
	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)
Post	0.01**	-0.07**	0.03	-0.04	-0.07**
	(0.00)	(0.04)	(0.03)	(0.04)	(0.03)
Observations	536,380	536,380	536,380	536,380	536,380
R-squared	0.55	0.86	0.78	0.96	0.86
Number of Firms	26,819	26,819	26,819	26,819	26,819

Regressions run at the quarterly level on the set of firms that file returns in all quarters. $N_W = 11482, N_R = 15337$. All regressions include time dummies and firm fixed-effects. Column (1) displays results from a linear probability model where the outcome is a dummy for any VAT remitted. The outcomes in Column (2)-(4) are VAT remitted, input credit claimed and output tax collected. The outcome in column (5) is the difference between output tax and input credit (as one method to deal with the point mass at zero in the VAT remitted outcome). Monetary amounts are in million rupees, inflation adjusted to 2010-11 price levels, with ₹65 approximately equal to $1. Robust standard errors in parentheses, clustered at the firm level. *** p<0.01, ** p<0.05, * p<0.1.

Conclusion

- Examined the effect of using technology to improve third party verification

- A crucial scalable policy, as supposed to audits (Slemrod, 2016)

- Strong positive results on average, which mask considerable heterogeneity
    - Results driven by top 1% of the wholesale firms
    - Top 1% firms monitored by special teams
    - No effect on small and medium firms

- Compliance response to enforcement initiative for high tax paying firms is different than for others (Slemrod et al., 2001)

- Highlight limitations of preventive deterrence on small and medium firms

Next Steps

- Policy implications
    - Introducing technology could lead to ⇑ tax revenue, but from a small set of firms
    - Compliance costs incurred by all firms, possibly greater for smaller firms
    - Information and monitoring effort are complements

- Future research
    - Understanding heterogeneity better: Role of special teams
    - Using machine learning to catch shell firms, revenue impact
   - Bunching analysis: size dependent regulations **graphs**

Thanks!

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- Website: http://shekhar.me

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J. Slemrod, B. Collins, J. Hoopes, D. Reck, and M. Sebastiani. Does credit-card information reporting improve small-business tax compliance? Technical report, National Bureau of Economic Research, 2015.
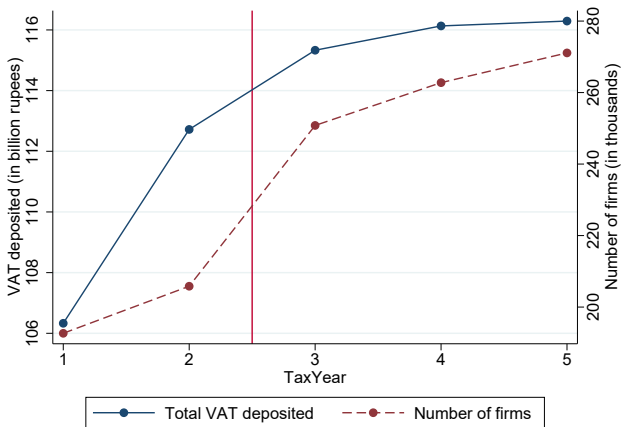
Total VAT Remitted (For Always Present Firms)
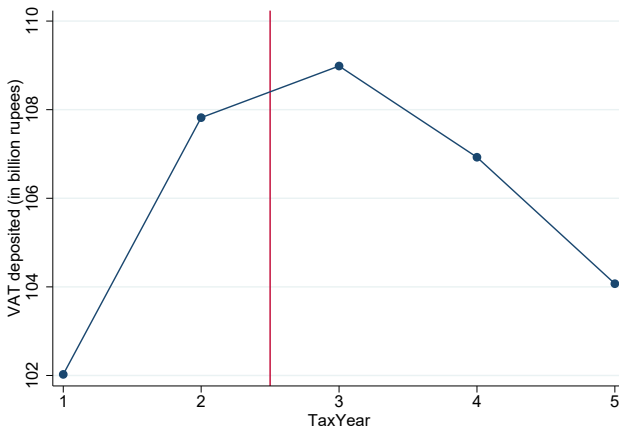
Amount in billion rupees, in real terms. Number of firms:148434. Matching started after year 2

Back

Total VAT Remitted (For All Firms)

Amount in billion rupees. Matching started after year 2

Back

Summary Stats: All Firms

(1) Year	(2) No. of Firms	(3) VAT Remitted	(4) % Positive VAT Deposited Firms	(5) % Zero-Turnover Firms	(6) % Interstate Firms	(7) % Local Firms
1	192664	106330.3	50.88	7.10	9.03	31.26
2	205832	112720.1	48.72	9.51	7.72	31.40
3	250805	115330.6	47.57	15.05	5.94	31.68
4	262775	116132.1	49.70	13.68	5.70	32.70
5	271090	116292.4	53.60	13.98	6.00	32.64

Summary of all the firms that filed a return in the given year. Column (3) shows total VAT collected by the tax authority from all firms in that year in million rupees, with ₹65 approximately equal to $1. All monetary amounts have been inflation adjusted to 2010-11 price levels. Column (4) shows percentage of firms that deposited a positive amount of VAT. Column (5) show percentage of firms which filed a return but declared a turnover of zero. Column (6) shows percentage of firms that had a non-zero turnover and entire sales were interstate. Column (7) shows percentage of firms who had a non-zero turnover and all sales were local. For example, in year 1, 31.26% firms had only local sales, 9.03% had only interstate sales, and 7.1% had a turnover of 0. Therefore, roughly 53% of the firms had a non-zero turnover and had declared both local as well as inter-state sales.
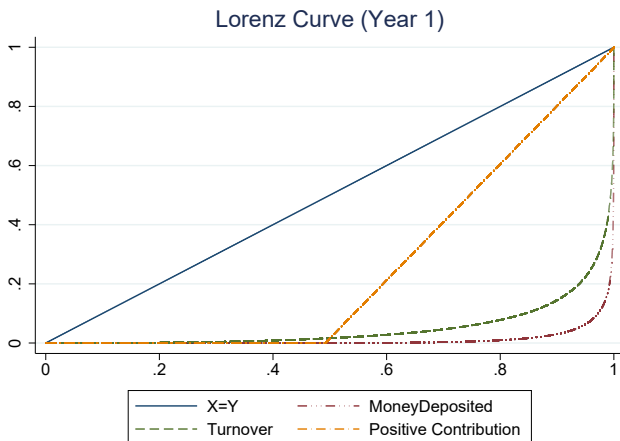
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Summary Stats: Always Present Firms

(1) Year	(2) VAT Remitted	(3) % Positive VAT Deposited Firms	(4) % Zero-Turnover Firms	(5) % Interstate Firms	(6) % Local Firms
1	102024.5	54.60	2.50	6.97	30.76
2	107820.3	54.09	3.09	5.95	31.14
3	108985.1	57.20	3.88	5.34	30.61
4	106926.4	57.50	5.35	5.18	30.45
5	104071.8	60.49	8.50	5.22	29.74

Summary of firms that filed a return in all the 5 years for which we have the data (2010-11 to 2014-15). Number of such firms in our sample is 148434. Column (2) shows total VAT remitted by the tax authority from all firms in that year in million rupees, with ₹65 approximately equal to $1. All monetary amounts have been inflation adjusted to 2010-11 price levels. Column (3) shows percentage of firms that remitted a positive amount of VAT. Column (4) show percentage of firms which filed a return but declared a turnover of zero. Column (5) shows percentage of firms that had a non-zero turnover and entire sales were interstate. Column (6) shows percentage of firms who had a non-zero turnover and all sales were local. For example, in year 1, 30.76% of the 148434 firms that are present in all the years of our sample, had only local sales, 6.97% had only interstate sales, and 2.5% had a turnover of 0. Therefore, roughly 60% of the firms had a non-zero turnover and had declared both local as well as inter-state sales.
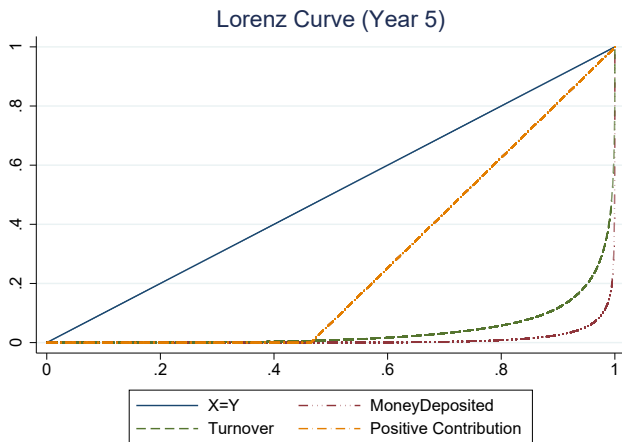
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Lorenz Curve

- 5% of the firms remit roughly 95% of the VAT collected

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Lorenz Curve

Comparison Summary (year 1)

Variables	(1) Retailers	(2) Diff	(3) Wholesalers	(4) Diff
% Positive VAT Remitted Firms	0.59	-0.00	0.53	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)
VAT Remitted	0.64	0.02	1.31	-0.01
	(0.06)	(0.02)	(0.20)	(0.05)
Total Turnover	24.27	2.23	80.80	4.70
	(1.31)	(0.74)	(6.47)	(2.59)
Turnover (Local)	18.43	1.89	49.72	4.66
	(1.18)	(0.68)	(4.45)	(1.23)
Credit Claimed	0.95	0.10	1.41	0.23
	(0.04)	(0.01)	(0.24)	(0.08)
Output Tax	1.53	0.12	2.63	0.22
	(0.08)	(0.02)	(0.41)	(0.07)
Tax Remitted/TotalTurnover	0.01	-0.00	0.01	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Credit/TotalTurnover	0.11	-0.07	0.07	-0.04
	(0.04)	(0.04)	(0.03)	(0.03)
Output Tax/TotalTurnover	0.05	0.00	0.03	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Nonlocal Turnover/TotalTurnover	0.25	0.00	0.37	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)

Summary statistics for selected variables in Year 1. Amounts are in million rupees, with ₹65 approximately equal to $1. $N_W = 32979$, $N_R = 19515$. 951 wholesalers and 521 retailers report zero turnover. Column (2) and Column (4) report mean differences between real values of year 2 and year 1. Values have been price adjusted in year 1 terms. Standard error in parenthesis.

Event Study: Estimating Equation

$$y_{it} = \alpha_i + \nu_t + \gamma_t * \nu_t * \mathbb{I}\{\text{Wholesaler}_i\} + \epsilon_{it} \qquad (3)$$

- Comparison groups:
    - Wholesaler & Retailer
- Outcomes:
    - $\mathbb{I}\{\text{VAT} > 0\}$: Positive VAT Remitted
    - VAT Amount Remitted (in million rupees, point mass at 0 ≈ 0.57)
    - Input Credit (in million rupees)
    - Total Output Tax (in million rupees)
    - Output Tax - Input Credit (in million rupees)
- Standard errors clustered at firm level
- Include time (ν_t) and firm fixed effects (α_i)

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Pre Trends Analysis

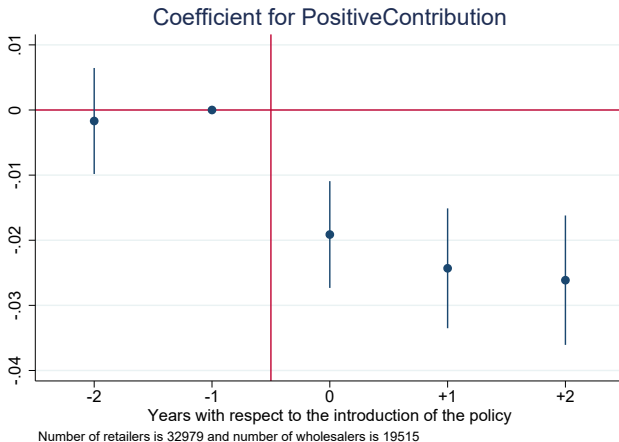| VARIABLES	(1) Annual	(2) Quarter	(3) Top Decile (Annual)	(4) Top Decile (Quarter)
Positive VAT Remitted	0.68	0.27	0.02	0.00
VAT Remitted	0.61	0.20	0.46	0.27
Tax Credit	0.12	0.36	0.69	0.43
Output Tax	0.23	0.65	0.98	0.28
Output Tax - Tax Credit	0.56	0.54	0.56	0.69

To formally test the hypothesis that pre-policy trends between wholesalers and retailers are not different, we test the null hypothesis $\gamma_1 = \gamma_2 = .. = \gamma_{l-1} = 0$ where l denotes the time period in which the automatic third party verification policy was introduced. l is 3 in column (1) and (3), and 9 in column (2) and (4). Column (1) does the test for returns data at annual frequency, column (2) does the test for returns at quarterly frequency, and column (3) and (4) do the test for returns data at annual and quarterly frequency but only for firms in the top decile (of both retailers and wholesalers) of VAT remitted in year/quarter 1.
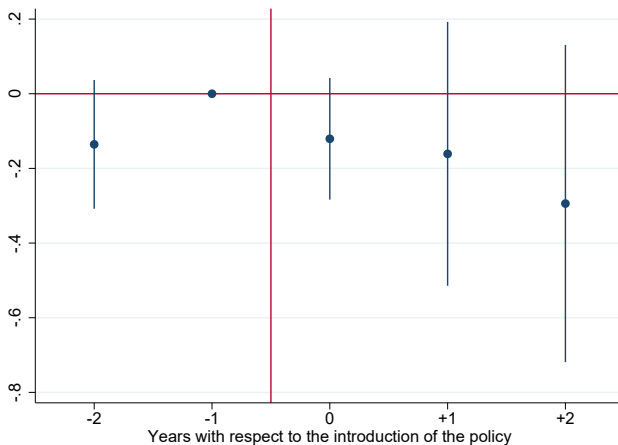
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Event Study Analysis: Vat Remitted

Years with respect to the introduction of the policy
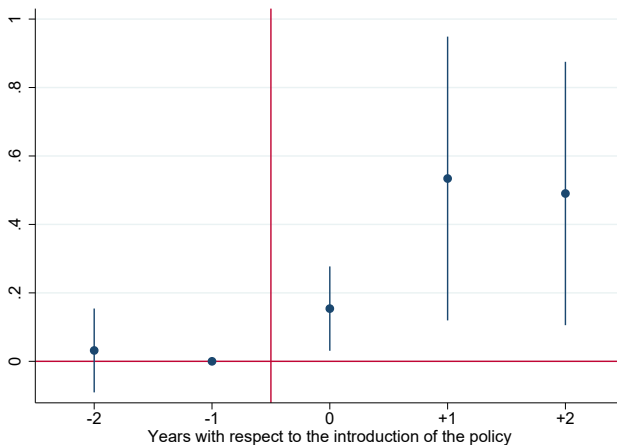
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Event Study Analysis: Positive VAT Remitted

Coefficient for PositiveContribution

Years with respect to the introduction of the policy

Number of retailers is 32979 and number of wholesalers is 19515

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Event Study Analysis: Tax Credit

Years with respect to the introduction of the policy

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Event Study Analysis: Output Tax

Years with respect to the introduction of the policy
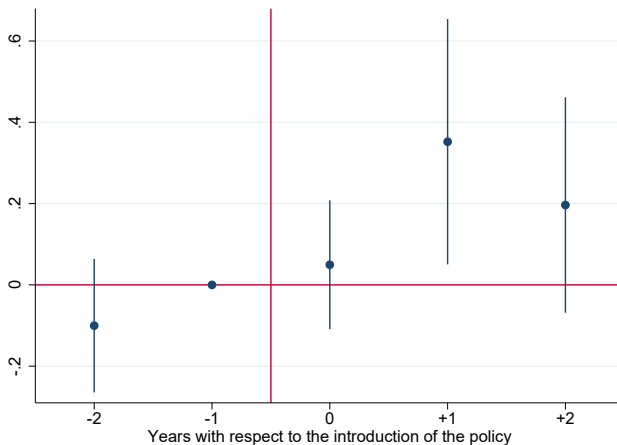
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Event Study Analysis: Output Tax - Tax Credit

Years with respect to the introduction of the policy
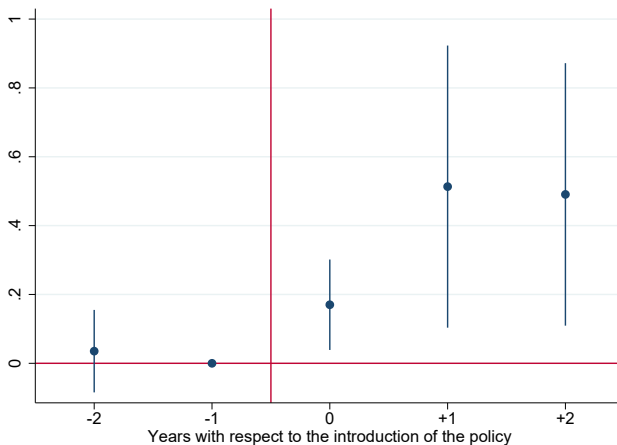
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Vat Remitted Trends (Quarterly)
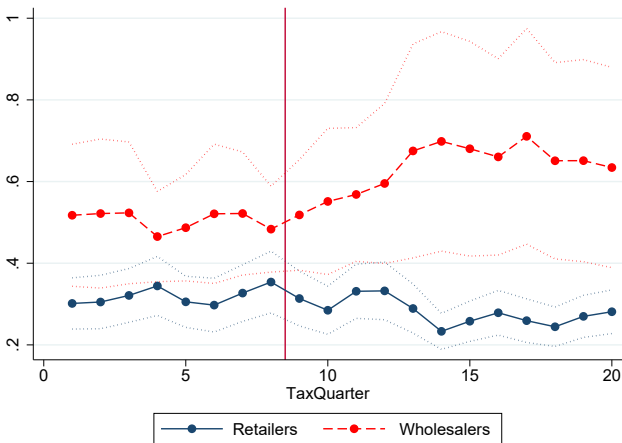
Falsification Test (Quarterly)

$$y_{it} = \alpha_i + \nu_t + \beta * Post_{it} + \delta * Pre_{it} + \gamma * Post_{it} * \mathbb{I}\{\text{Wholesaler}_i\}$$
$$+ \mu * Pre_{it} * \mathbb{I}\{\text{Wholesaler}_i\} + \epsilon_{it} \quad (4)$$

- Comparison groups:
    - WholeSaler vs Retailer

- Outcomes:
    - $\mathbb{I}\{VAT > 0\}$: Positive VAT Remitted
    - VAT Amount Remitted (in million rupees, point mass at 0 ≈ 0.57)
    - Input Credit (in million rupees)
    - Total Output Tax (in million rupees)
    - Output Tax - Input Credit (in million rupees)

- Standard errors clustered at firm level

- Include time (ν_t) and firm fixed effects (α_i)

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Wholesaler vs Retailer: Quarterly Regression

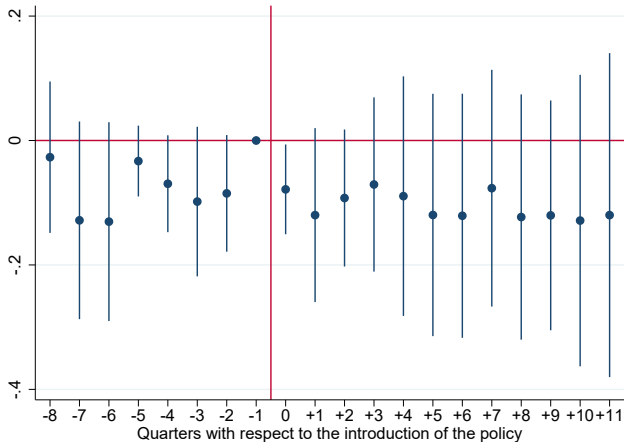| VARIABLES	(1) Positive VAT Remitted	(2) VAT Remitted	(3) Tax Credit	(4) Output Tax	(5) Output Tax - Tax Credit
Post*Wholesaler	-0.0147***	0.158***	-0.0240	0.132***	0.156***
	(0.00355)	(0.0491)	(0.0496)	(0.0392)	(0.0501)
PrePolicy*Wholesaler	-0.00278	-0.0312	0.0385	0.00530	-0.0332
	(0.00372)	(0.0304)	(0.0308)	(0.0269)	(0.0320)
Post	0.0139***	-0.0604*	0.0382*	-0.0194	-0.0576**
	(0.00349)	(0.0322)	(0.0220)	(0.0392)	(0.0289)
PrePolicy	0.0189***	0.0288	0.0637***	0.0928***	0.0291
	(0.00352)	(0.0210)	(0.0240)	(0.0359)	(0.0201)
Mean Dep.Var.	0.44	0.52	0.54	1.02	.48
	(0.00)	(0.09)	(0.15)	(0.22)	(0.09)
Observations	536,380	536,380	536,380	536,380	536,380
R-squared	0.549	0.86	0.78	0.96	0.86
Number of Firms	26,819	26,819	26,819	26,819	26,819

Robust standard errors in parentheses, clustered at firm level. $N_W = 11482$, $N_R = 15337$. Monetary amounts are in million rupees, inflation adjusted to price levels of Q1 of 2010-11, with ₹65 approximately equal to $1. Column (1) shows linear probability regression of the probability of remitting a positive amount. Column (2)-(4) respectively show regression of the mean VAT remitted by firms, of the input tax credit claimed by firms, and the output tax collected by firms. To address the concern that VAT remitted has a significant mass at zero, column(5) shows regression of the difference between output tax and input credit declared by firms. Dependent variables have been price adjusted in Q1 of 2010-11 terms. Row "Mean Dep.Var." shows mean and standard errors for wholesalers in quarter 1. *** $p<0.01$, ** $p<0.05$, * $p<0.1$
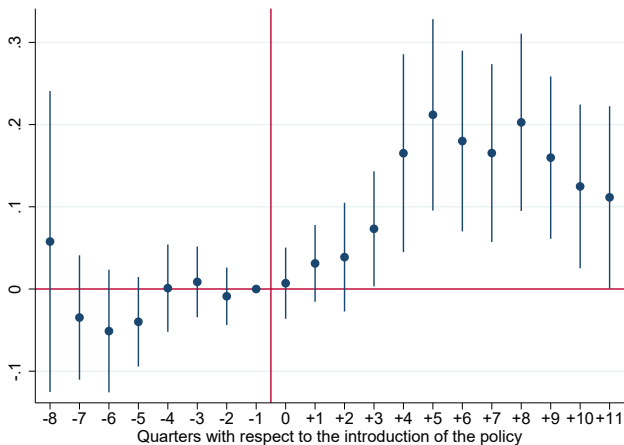
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Event Study Analysis: Vat Remitted (Quarterly)

Quarters with respect to the introduction of the policy
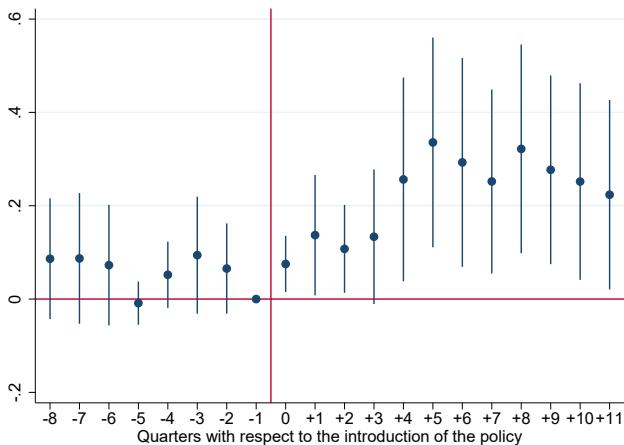
Event Study Analysis: Tax Credit (Quarterly)

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Event Study Analysis: Output Tax (Quarterly)

Quarters with respect to the introduction of the policy

Event Study Analysis: Output Tax - Input Credit (Quarterly)

Quarters with respect to the introduction of the policy
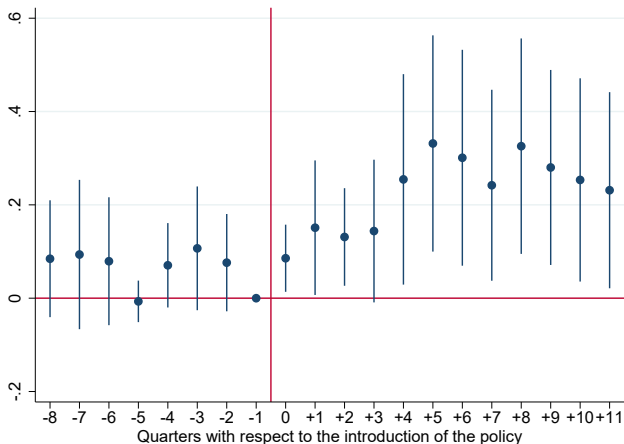
Wholesaler vs retailer: Top Decile (Annual)

VARIABLES	(1) Positive VAT Remitted Firms	(2) VAT Deposited	(3) Tax Credit	(4) Output Tax	(5) Output Tax - Input Credit
Post*Wholesaler	0.02***	3.38**	-1.77	1.68	3.46**
	(0.01)	(1.38)	(1.43)	(1.04)	(1.42)
Post	-0.06***	-1.11**	1.00**	-0.21	-1.20***
	(0.00)	(0.47)	(0.42)	(0.39)	(0.45)
Mean Dep.Var.	1	12.65	6.98	19.73	12.75
	(.00)	(1.97)	(2.40)	(4.04)	(1.95)
Observations	26,240	26,240	26,240	26,240	26,240
R-squared	0.41	0.89	0.84	0.97	0.89
Number of Firms	5,248	5,248	5,248	5,248	5,248

Limiting the set of wholesalers and retailers to the top 10% of each group in terms of VAT remitted in year 1. Robust standard errors in parentheses, clustered at firm level. Number of wholesalers is 1951 and number of retailers is 3297. Monetary amounts are in million rupees, inflation adjusted to 2010-11 price levels, with ₹65 approximately equal to $1. Column (1) shows linear probability regressions of the probability of remitting a positive amount of VAT. Column (2)-(4) respectively show regression of the mean VAT remitted by firms, of the input tax credit claimed by firms, and the output tax collected by firms. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

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Entire Effect from Top 1 % (Annual)

VARIABLES	(1) Positive VAT Remitted Firms	(2) VAT Remitted	(3) Input Credit	(4) Output Tax	(5) Output Tax - Input Credit
Post*Wholesaler	0.02*	34.75**	-15.94	19.96**	35.90**
	(0.01)	(13.62)	(13.38)	(8.89)	(14.06)
Post	-0.02**	-12.02**	9.31**	-3.47	-12.78***
	(0.01)	(4.68)	(4.07)	(3.65)	(4.46)
Mean Dep.Var.	1	100.59	36.27	138.29	102.02
	(0.00)	(18.55)	(23.42)	(39.17)	(18.39)
Observations	2,620	2,620	2,620	2,620	2,620
R-squared	0.42	0.88	0.84	0.98	0.88
Number of Firms	524	524	524	524	524

Robust standard errors in parentheses, clustered at firm level. $N_W = 195$, $N_R = 329$. Monetary amounts are in million rupees, inflation adjusted to annual 2010-11 price levels, with ₹65 approximately equal to $1. Column (1) shows linear probability regressions of the probability of remitting a positive amount. Column (2)-(4) respectively show regression of the mean VAT remitted by firms, input tax credit claimed by firms, and output tax collected by firms. To address the concern that VAT remitted has a significant mass at zero, Column(5) shows regression of the difference between output tax and input credit declared by firms. Mean Dep. Var. shows the mean and standard errors for top 1% wholesaler firms in year 1. *** p<0.01, ** p<0.05, * p<0.1
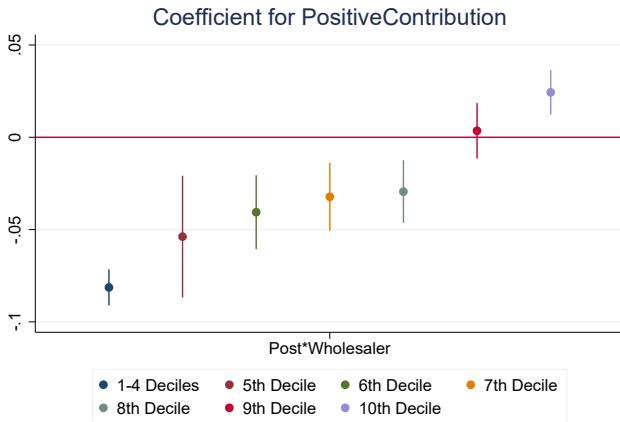
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No Effect on Bottom 99% (Annual)

VARIABLES	(1) Positive VAT Remitted Firms	(2) VAT Remitted	(3) Input Credit	(4) Output Tax	(5) Output Tax - Input Credit
Post*Wholesaler	-0.02***	0.03	0.04	0.05	0.02
	(0.00)	(0.03)	(0.06)	(0.07)	(0.02)
Post	0.04***	0.03***	0.09***	0.13***	0.03***
	(0.00)	(0.01)	(0.02)	(0.02)	(0.01)
Mean Dep.Var.	0.53	0.31	1.06	1.26	0.20
	(0.00)	(0.01)	(0.06)	(0.06)	(0.02)
Observations	259,850	259,850	259,850	259,850	259,850
R-squared	0.63	0.58	0.78	0.78	0.82
Number of Firms	51,970	51,970	51,970	51,970	51,970

Robust standard errors in parentheses, clustered at firm level. $N_W = 19,320$, $N_R = 32,650$. Monetary amounts are in million rupees, inflation adjusted to 2010-11 price levels, with ₹65 approximately equal to $1. Column (1) shows linear probability regressions of the probability of remitting a positive amount. Column (2)-(4) respectively show regression of the mean VAT remitted by firms, input tax credit claimed by firms, and output tax collected by firms. To address the concern that VAT remitted has a significant mass at zero, Column(5) shows regression of the difference between output tax and input credit declared by firms. Mean Dep. Var. shows the mean and standard errors for wholesaler firms in year 1. *** p<0.01, ** p<0.05, * p<0.1
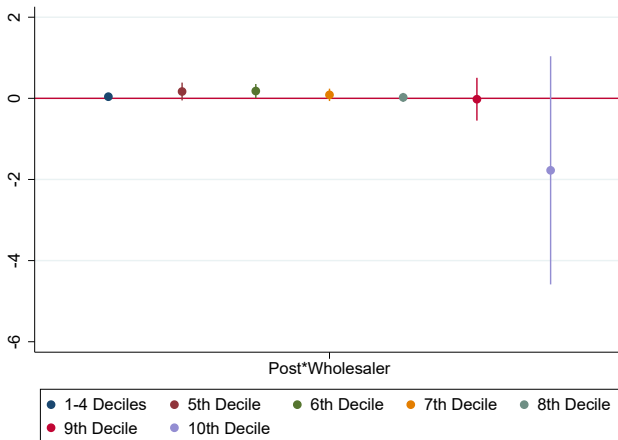
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Positive VAT: No Effects on Small and Middle Firms

Coefficient for PositiveContribution

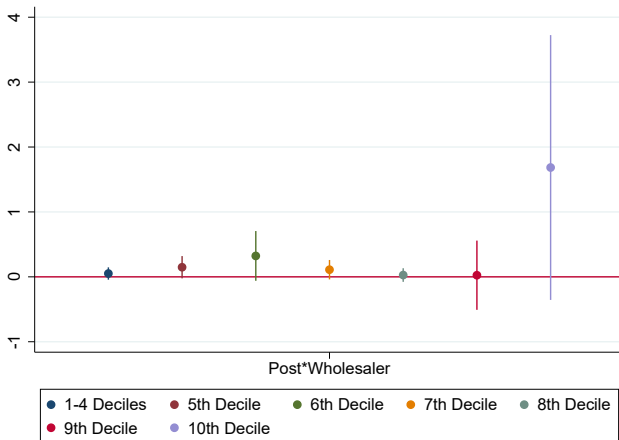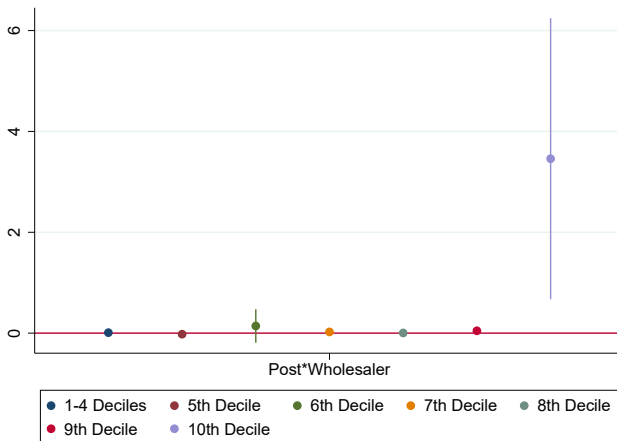Number of retailers is 32979 and number of wholesalers is 19515
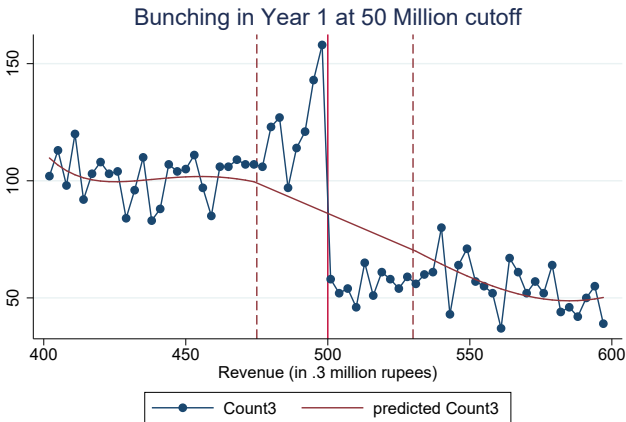
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Input Credit: No Effects on Small and Middle Firms

Output Tax: No Effects on Small and Middle Firms
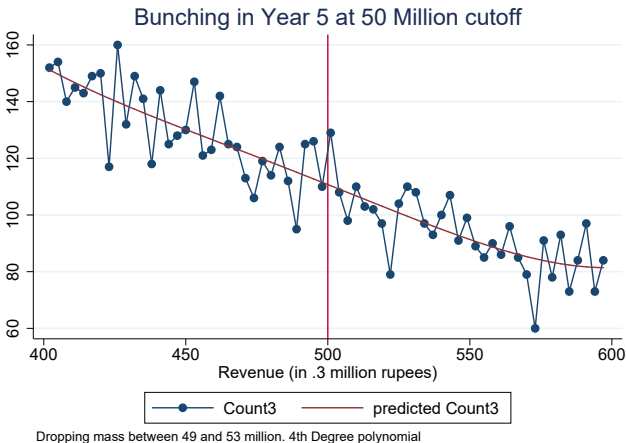
Output - Input: No Effects on Small and Middle Firms

Bunching at 50 Million (Year 1)

Bunching in Year 1 at 50 Million cutoff

Dropping mass between 47.5 and 53 million. 4th Degree polynomial

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Bunching at 50 Million (Year 5)

Bunching in Year 5 at 50 Million cutoff

Dropping mass between 49 and 53 million. 4th Degree polynomial
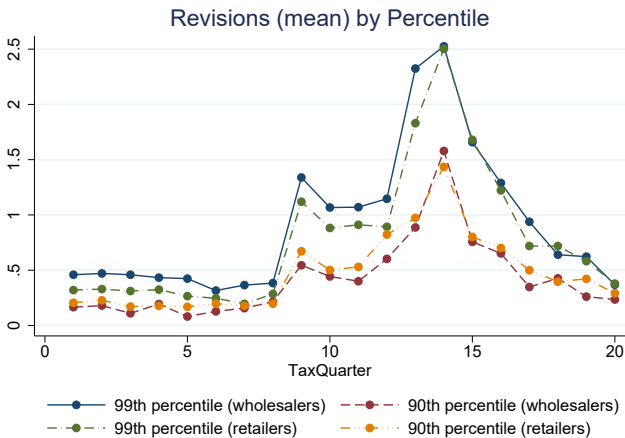
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Revision analysis

Total Revisions Mean
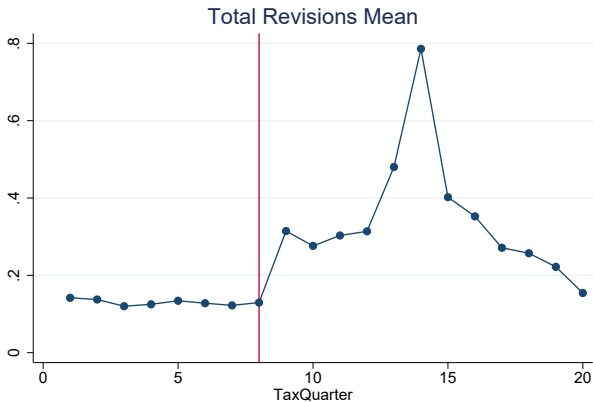
Matching started after taxquarter 8. Mean of revisions filed by all firms.

- Firms are allowed to revise their returns even after filing
- The rate of revision goes up
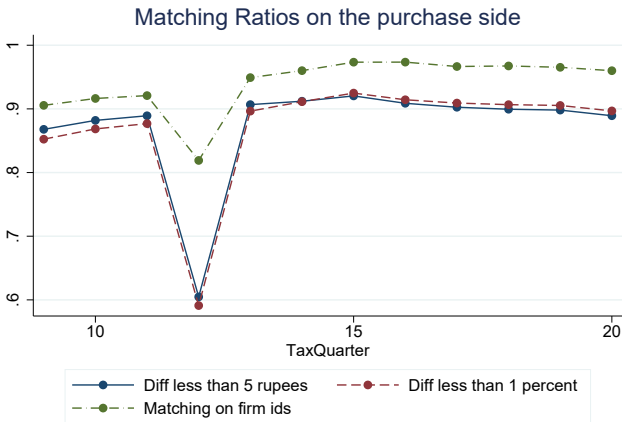- The cost of compliance is going up

Top percentile revisions

Revision analysis: Top percentile

Revisions (mean) by Percentile

99th percentile (wholesalers) — 90th percentile (wholesalers)
99th percentile (retailers) — 90th percentile (retailers)

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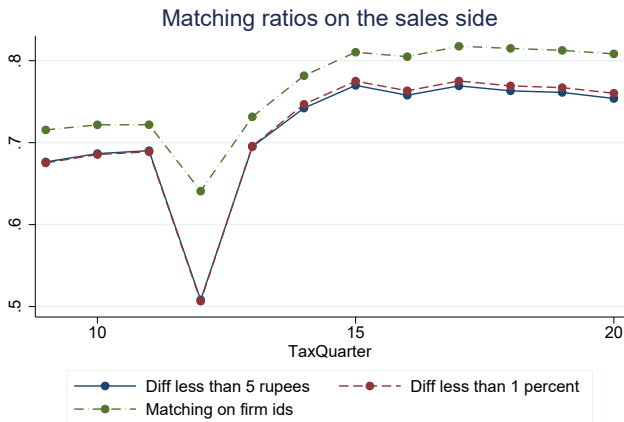# Matching Analysis

Matching Ratios on the purchase side

Firm level proportion of purchase entries matching with corresponding sale entries

- Purchase transactions of buying firms should match with sale transactions of selling firms
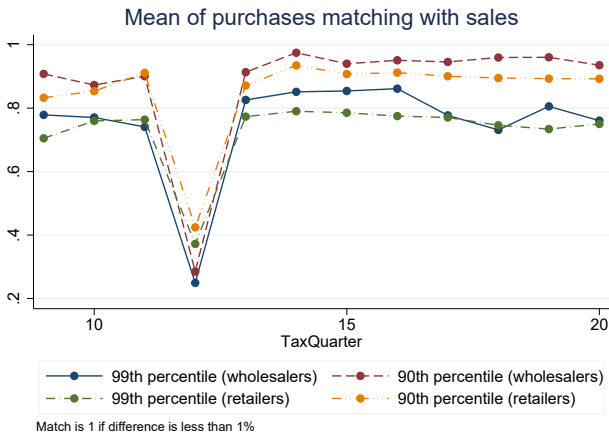
Matching analysis: Sale Side Matching
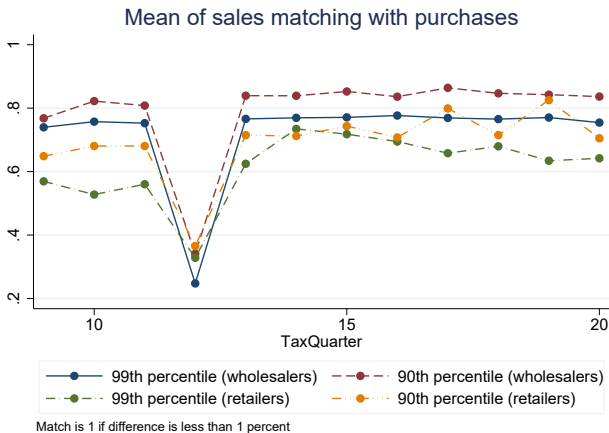

Matching ratios on the sales side

Firm level proportion of sales entries matching with corresponding purchase entries

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Matching Analysis: Retailer Vs Wholesaler (Purchases)

Mean of purchases matching with sales

Match is 1 if difference is less than 1%

Matching Analysis: Retailer Vs Wholesaler (Sales)

Mean of sales matching with purchases

Match is 1 if difference is less than 1 percent

Consolidated vs Transactional Data

Tax Credits: Consolidated vs Transaction Data

For all firms. Numbers in million rupees
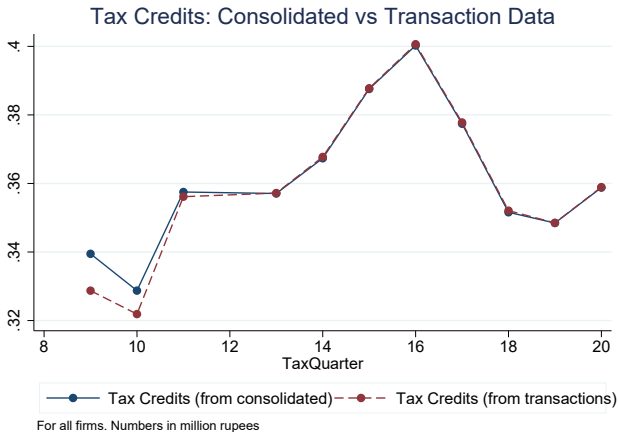
- In the first year, transaction data was not matched with the consolidated returns
- Firms were clearly manipulating
- Fixed in the subsequent years