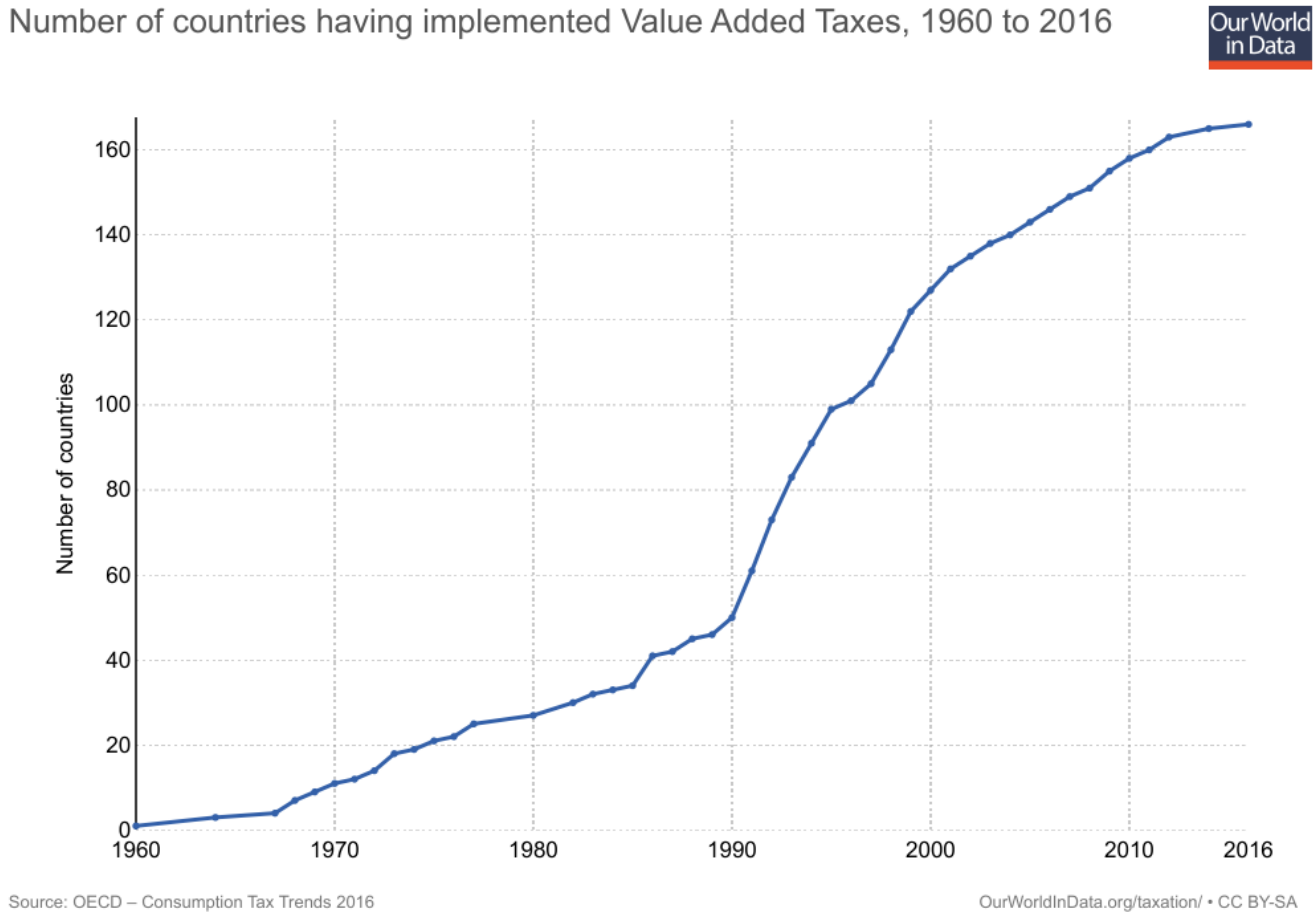
Tax Enforcement: Is Third Party Verification Effective?

Shekhar Mittal and Aprajit Mahajan

UCLA Anderson (GEM) & UC Berkeley (Dept. of ARE)

May 25, 2017

Rapid Increase in VAT Adoption Since 1960



- 1 country in 1960 $\rightarrow$ 50 in 1990 $\rightarrow$ 160 in 2015
  - In India: 2005

Third Party Verification

- Third party verification considered key to VAT
- But without IT, administrative cost of third party verification is high
    - Particularly in resource poor environments
- Reducing cost of third party verification may lead to better functioning VAT

Question

Does improving third party verification increase tax collections in a low compliance economy?

- How much heterogeneity in response?

Empirical Design

- Use administrative data from a large Indian city
- IDENTIFYING VARIATION
  - Policy change: Exogenous
    - Reduction in cost of third party verification
  - Comparison groups: Wholesalers vs Retailers
    - Firm level heterogeneity in effect of cross-checking
- Evaluate short & long term effects on: tax collected, tax credits, and output tax
- Using difference-in-difference approach

Results (Preview)

- Large, significant effects for wholesalers compared to retailers
  - VAT deposited by wholesalers increases by ₹.646 million (49.3%, $9,938) compared to retailers
- Effects driven by top 1% (in terms of VAT deposited) of wholesalers
  - Large firms monitored by special tax team (preliminary)
  - Information and monitoring seem to be complements (Almunia and Lopez Rodriguez (2015))
- Effects persist over 2 years, getting more data for later years

Related Literature

- Large literature on evasion, not going to talk about it here
- Policy reduces cost of monitoring, holding monitoring effort fixed:
  - Corporate income tax: Carrillo et al. (2017)
  - Small business owners' income tax: Slemrod et al. (2015) (administrative data), Kleven et al. (2011)
- Show increased collections by large firms, despite low audit rates:
  - Kleven et al. (2016), Kopczuk and Slemrod (2006)
- Compliance issues in VAT:
  - Almunia and Lopez Rodriguez (2015), Naritomi (2013), Pomeranz (2015)

Incentives under VAT

- In theory
  - Incentives to under-report sales and over-report purchases
  - Adversarial incentives between buyers and sellers
  - Note: Input credits only if buying from registered firms
- In practice
  - Returns are self-reported
  - Buyers and sellers can collude: anecdotally, off-the-book transactions are pervasive
  - Evidence of under-reporting of costs (Carrillo et al., 2017)

Primer

Policy Change: Firm Level Reports of Purchases and Sales

- VAT introduced in 2005 in Delhi
- Before 2012-13 (Year 3), returns did not have buyer or seller ids
- Firms claim input tax credits without identifying the seller
  - Tax authority can verify credit claims **only by instituting an audit**
- From Year 3, returns include firm tax-IDs, along with amounts & tax rate (for sales & purchases)
  - Automatic mismatch notices generated by computer system
- Exogenous increase in systemic monitoring
  - Should reduce input credits, increase output tax $\implies$ increase tax deposited
- But in low compliance environment, collusion could result in limited effects

Data Summary

- Administrative data from Delhi tax authority
- Entire universe of registered firms
  - 192k firms in Y1 to 271k firms in Y5
- 5 years of VAT returns - 2010-11 (Y1), 2011-12 (Y2), 2012-13 (Y3), 2013-14 (Y4), 2014-15 (Y5)
- 3 years of firm level interactions - Y3, Y4, Y5
  - Tax-ids, amounts and 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 firms which are ex-ante similar but 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 deposited in year 1, and 36% of increase in VAT deposited
  - 19515 wholesalers, 32979 retailers at annual level
- Use difference-in-difference strategy

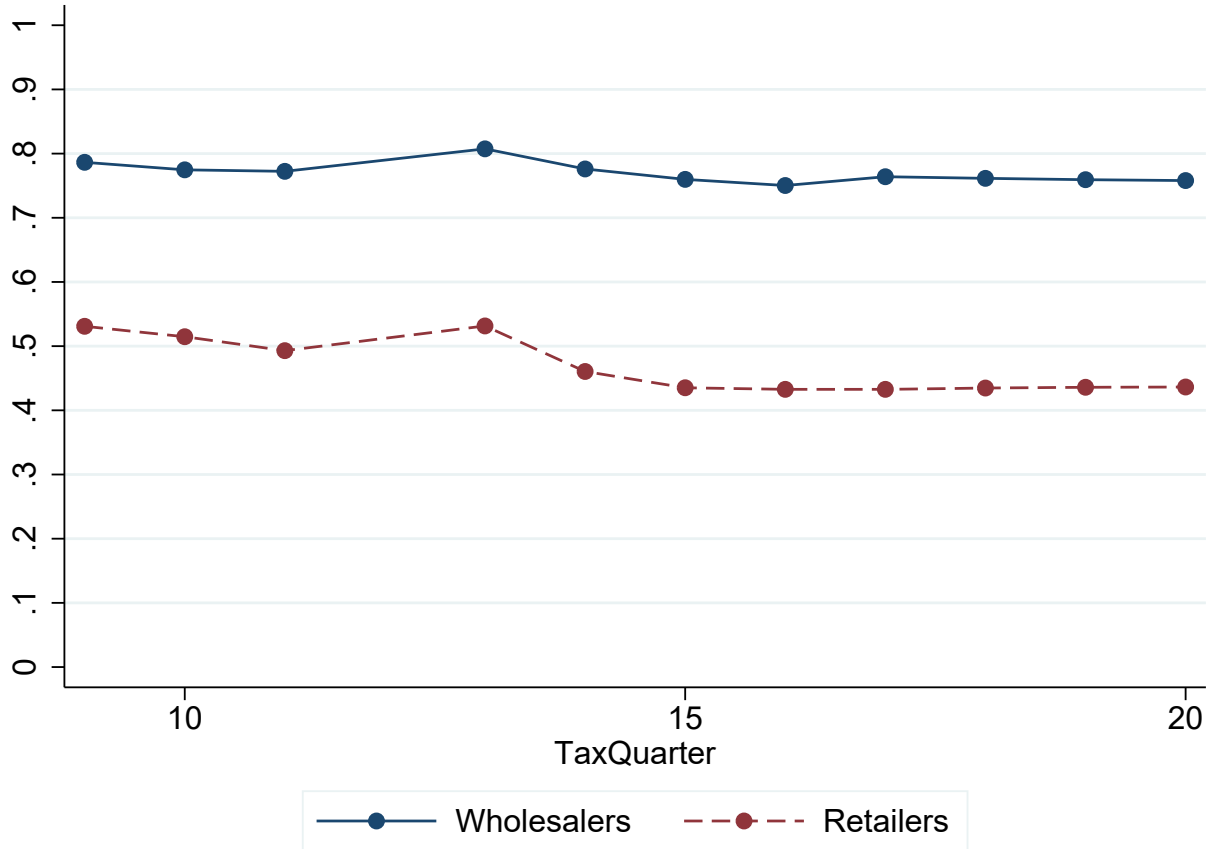
Summary

Wholesalers vs Retailers

- Credits claimed by both wholesalers and retailers are now automatically cross-checked
  - Mismatches generate automatic warning reports to firms
- On the output side, 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

Sales to Registered Firms



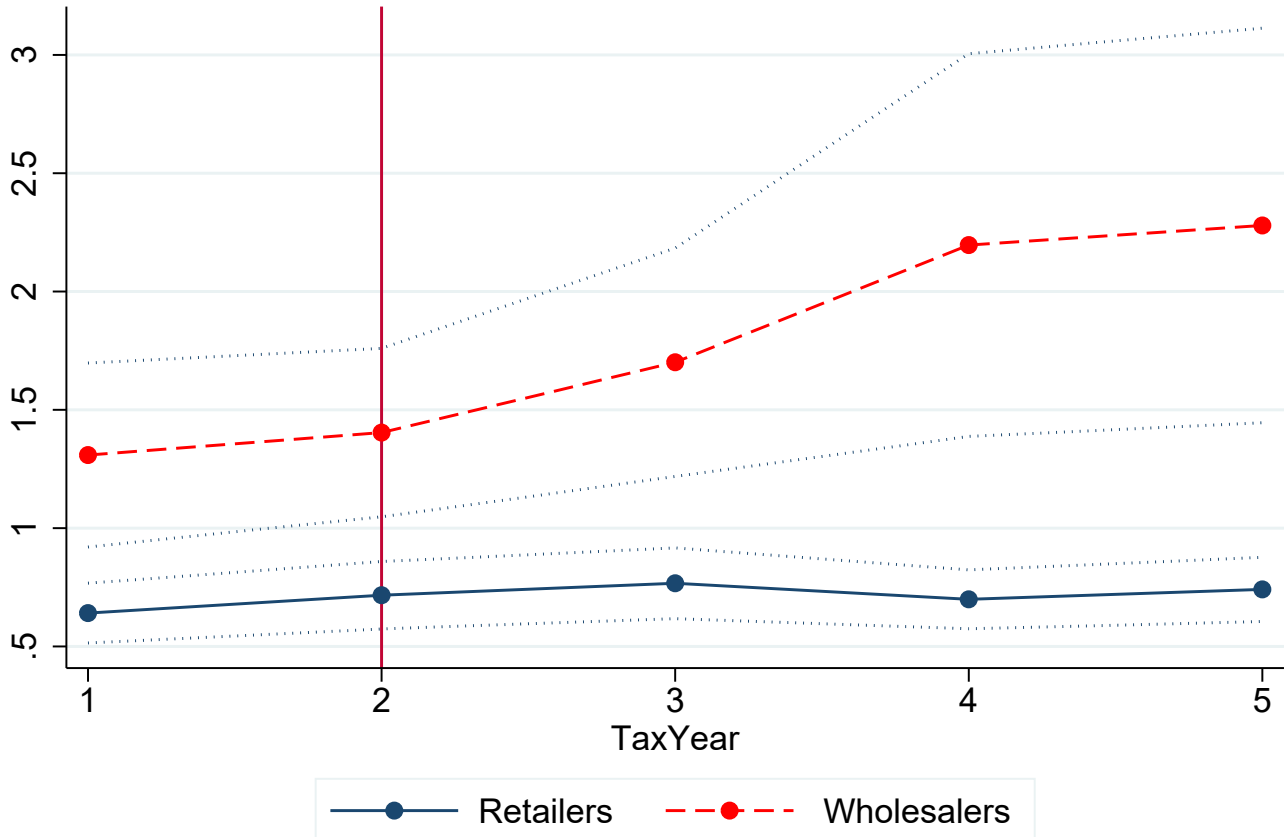
- Wholesalers sell more to registered firm than retailers
- However, retailers sell to registered firms as well (explore why in future work)

Estimating Equation

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

- Comparison groups:
  - Wholesaler & Retailer
- Outcomes:
  - I{VAT>0} : Positive VAT Deposited
  - VAT Amount Deposited
  - Input Credit
  - Total Output Tax
  - Output Tax - Input Credit
- Standard errors clustered at firm level
- Include time (ν_t) and firm fixed effects (α_i)

VAT Deposited



Average VAT deposited in million rupees. Number of wholesalers is 19515 and number of retailers is 32979. Monetary amounts are in million rupees, with ₹65 approximately equal to $1. 95% CI included.

Quarterly pre-trends Event study plots

Difference-in-Difference

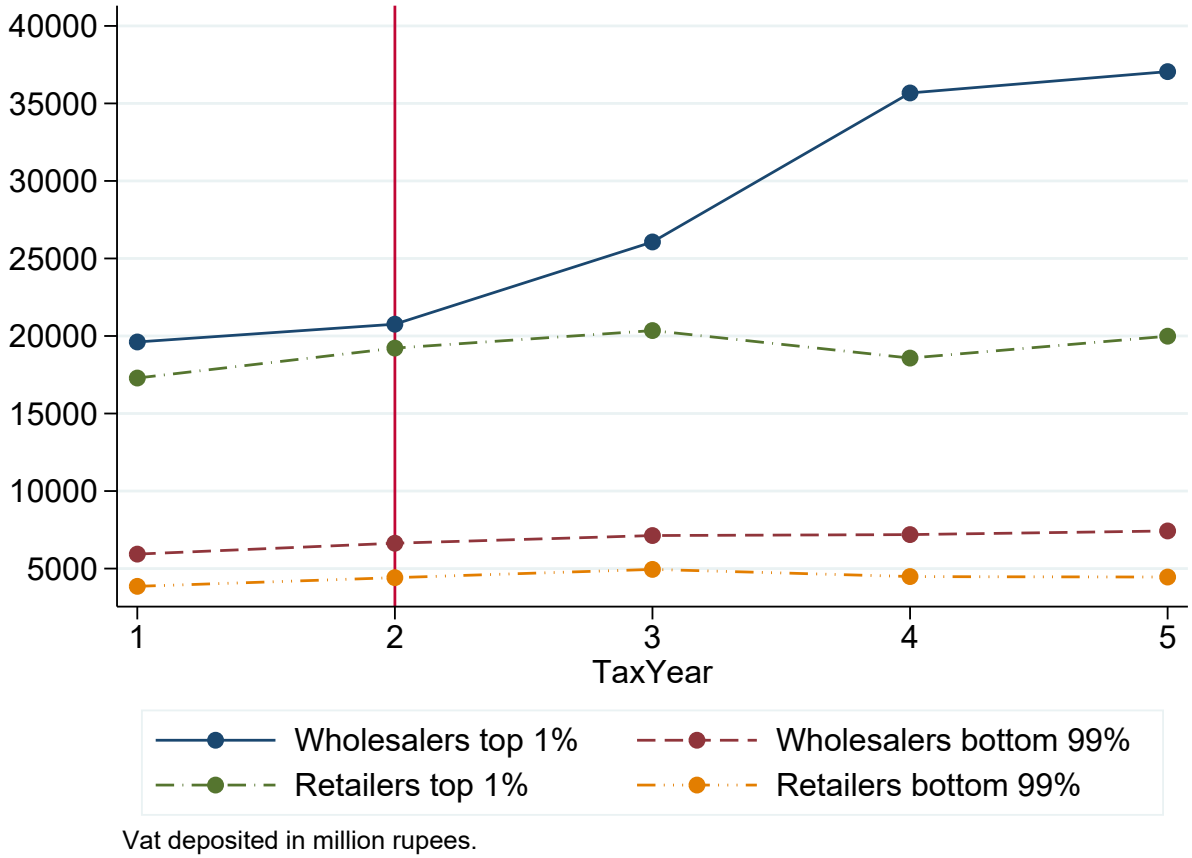
- Large effect on money deposited, 49.3% ⇑, via ⇑ in output tax
- Comparing col(1) with col(2) suggests heterogeneity

	(1) Positive VAT Deposited	(2) VAT Deposited	(3) Tax Credit	(4) Output Tax	(5) Output Tax - Tax Credit
Post	0.04***	-0.02	0.38***	0.35***	-0.04
	(0.00)	(0.06)	(0.05)	(0.05)	(0.06)
Post*Wholesaler	-0.02***	0.65***	-0.04	0.59***	0.63***
	(0.00)	(0.19)	(0.12)	(0.15)	(0.22)
Constant	.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	0.85	0.86	0.96	0.86
Number of Firms	52,494	52,494	52,494	52,494	52,494

Robust standard errors in parentheses, clustered at firm level. Number of wholesalers is 19515 and number of retailers is 32979. Monetary amounts are in million rupees, with ₹65 approximately equal to $1. Column (1) and (2) shows linear probability regressions of the probability of depositing a positive amount and the probability of an increase in VAT deposited from the previous year respectively. Column (3)-(5) respectively show regression of the mean VAT deposited by firms, of the input tax credit claimed by firms, and the 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. Row "Constant" shows mean and standard errors for wholesalers in year 1. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Logs Regression at quarterly level

Strong Effect in Top 1 Percent

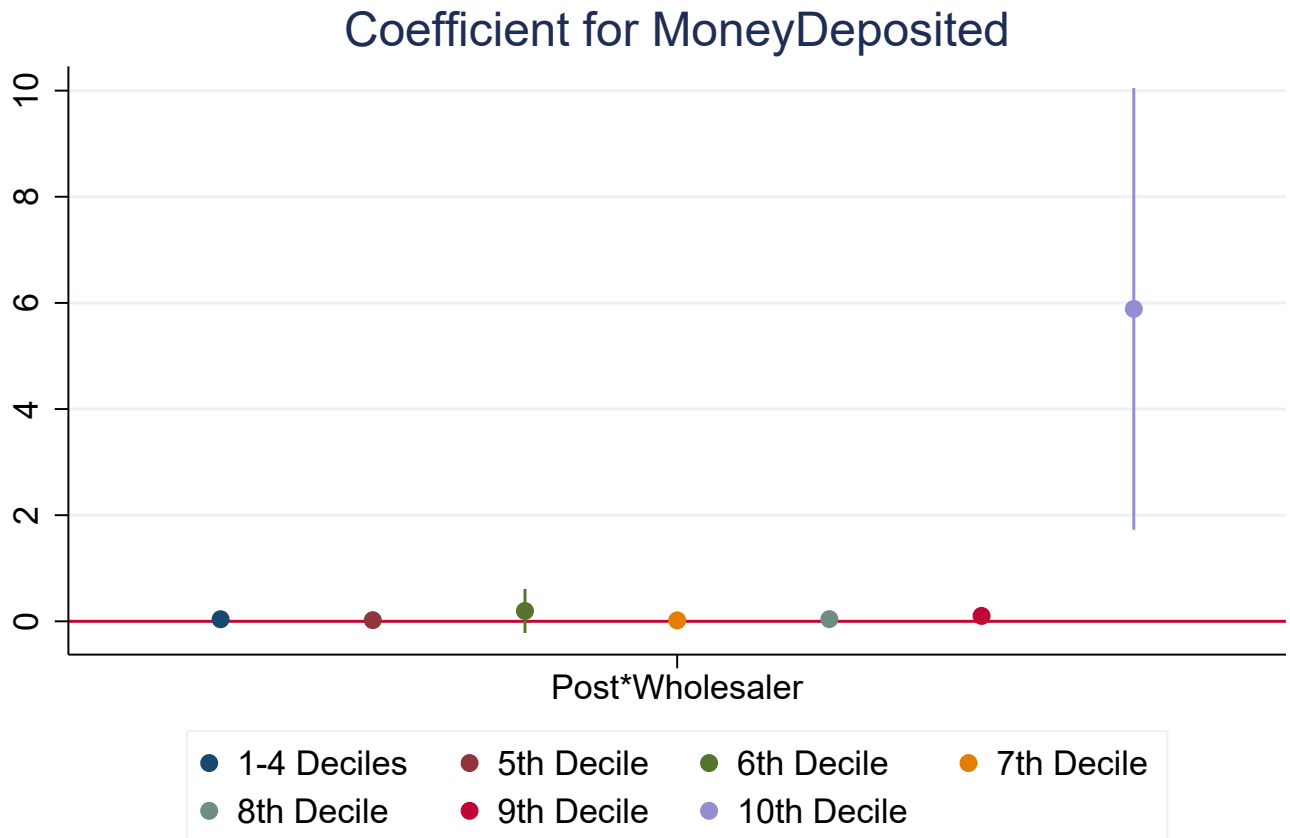


Vat deposited in million rupees.

- Top 1% in terms of VAT deposited in year 1
- 97% of the wholesale firms in top percentile (in terms of VAT deposited) monitored by special tax teams
    - Results consistent with monitoring and information being complementary

Top decile regression

No Effects on Small and Middle firms



Coefficient in million rupees.
Number of retailers is 32979 and number of wholesalers is 19515

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

Other plots

Conclusion

- Examined the effect of improving third party verification on wholesalers compared to retailers
- 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 firms
- Consistent with theoretical claims in Kleven et al. (2016): third party verification can be effective against large firms, despite low audit rates
- Highlight limitations of preventive deterrence for smaller firms
- Ongoing: Understanding heterogeneity better
  - Role of special tax teams

Thanks!

References

M. Almunia and D. Lopez Rodriguez. Under the radar: the effects of monitoring firms on tax compliance. *Available at SSRN*, 2015.

P. Carrillo, D. Pomeranz, and M. Singhal. Dodging the taxman: Firm misreporting and limits to tax enforcement. *American Economic Journal: Applied Economics*, 9 (2):144–164, 2017.

H. J. Kleven, M. B. Knudsen, C. T. Kreiner, S. Pedersen, and E. Saez. Unwilling or unable to cheat? evidence from a tax audit experiment in denmark. *Econometrica*, 79(3):651–692, 2011.

H. J. Kleven, C. T. Kreiner, and E. Saez. Why can modern governments tax so much? an agency model of firms as fiscal intermediaries. *Economica*, 83(330): 219–246, 2016.

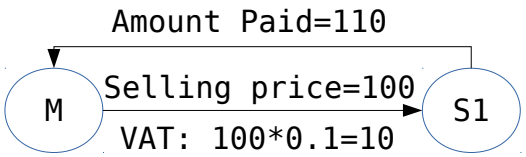
W. Kopczuk and J. Slemrod. Putting firms into optimal tax theory. *The American economic review*, 96(2):130–134, 2006.

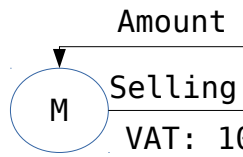
J. Naritomi. Consumers as tax auditors. *Job market paper, Harvard University*, 2013.

D. Pomeranz. No taxation without information: Deterrence and self-enforcement in the value added tax. *The American Economic Review*, 105(8):2539–2569, 2015.

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.

How does VAT Work?



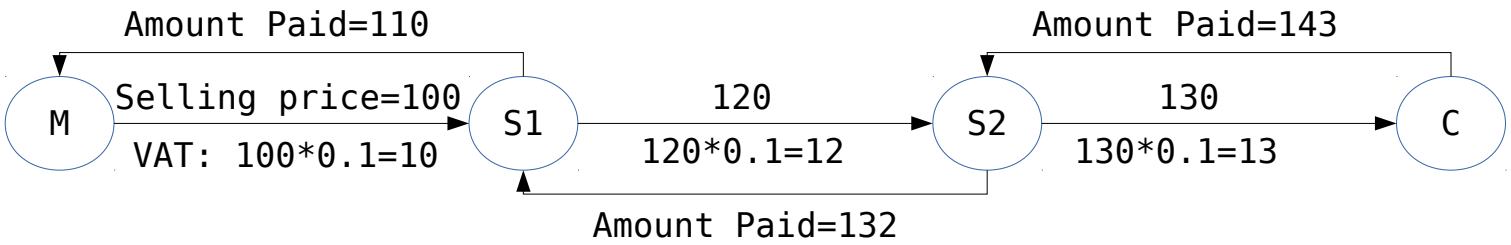


	M
Selling Price	100
Input Credit	0
Output Tax	10
Net Tax	10
Total Tax	

Selling Price
Input Credit
Output Tax
Net Tax
Total Tax

Back

Impact on VAT Network

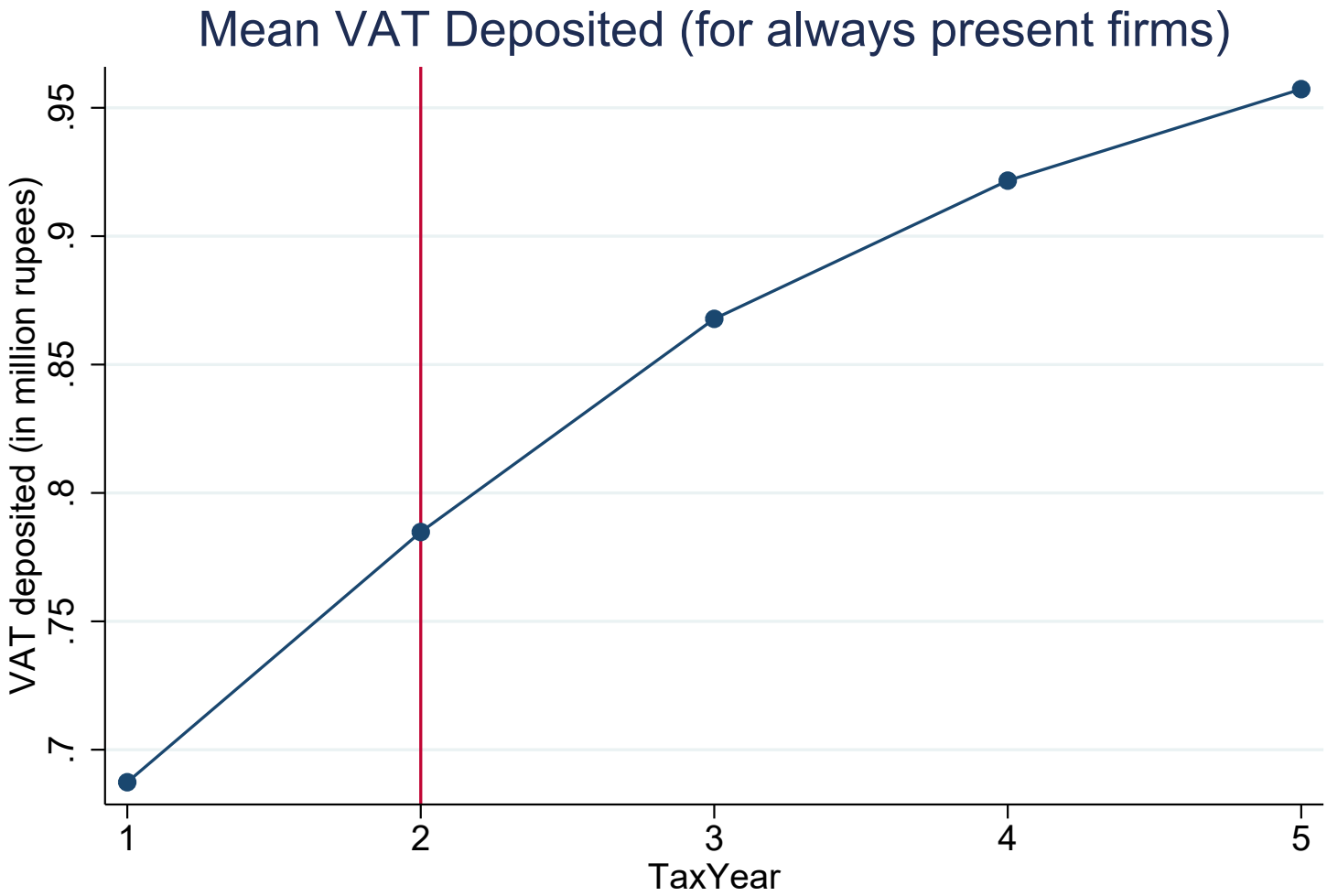


	SOLD TO	PURCHASED FROM
M	S1	NOT VERIFIED
S1	S2	M
S2	NOT VERIFIED	S1

- Sale records of the selling firm can be verified with purchase records of buying firm
- M can not claim any input credits

Back

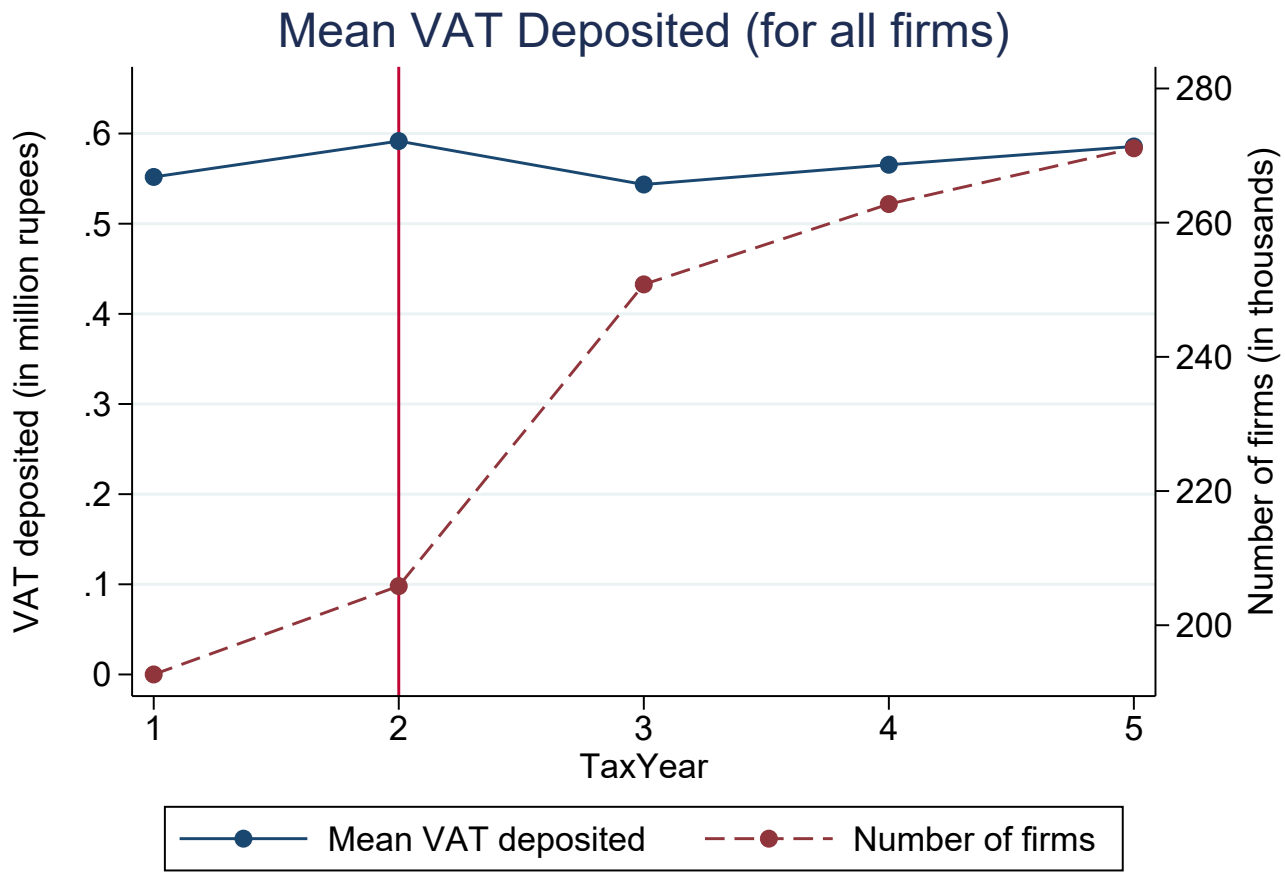
VAT Deposited (Always Present Firms)



Amount in million rupees. Number of firms:148434. Matching started after year 2

Back

VAT Deposited (All Firms)



Amount in million rupees. Matching started after year 2

Back

Summary Stats: All Firms

Table: Summary stats: All firms

(1) Year	(2) No. of Firms	(3) VATDeposited	(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	121783	48.72	9.51	7.72	31.40
3	250805	136310.4	47.57	15.05	5.94	31.68
4	262775	148579.1	49.70	13.68	5.70	32.70
5	271090	158777.2	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. 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.

Back

Summary Stats: Always Present Firms

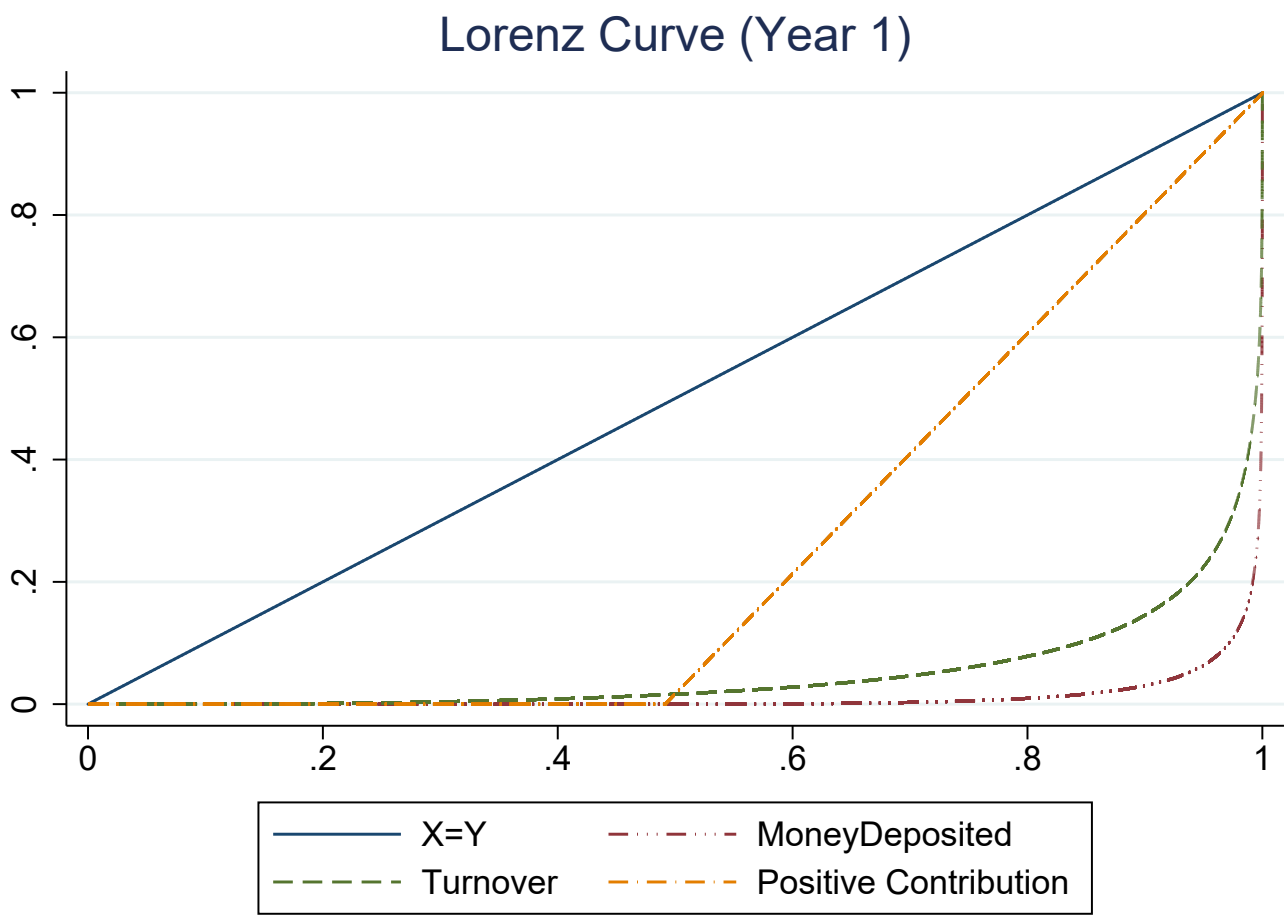
Table: Summary stats: Always present firms

(1) Year	(2) VATDeposited	(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	116489.3	54.09	3.09	5.95	31.14
3	128810.6	57.20	3.88	5.34	30.61
4	136801.3	57.50	5.35	5.18	30.45
5	142092.1	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 collected by the tax authority from all firms in that year in million rupees, with ₹65 approximately equal to $1. Column (3) shows percentage of firms that deposited 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.

Back

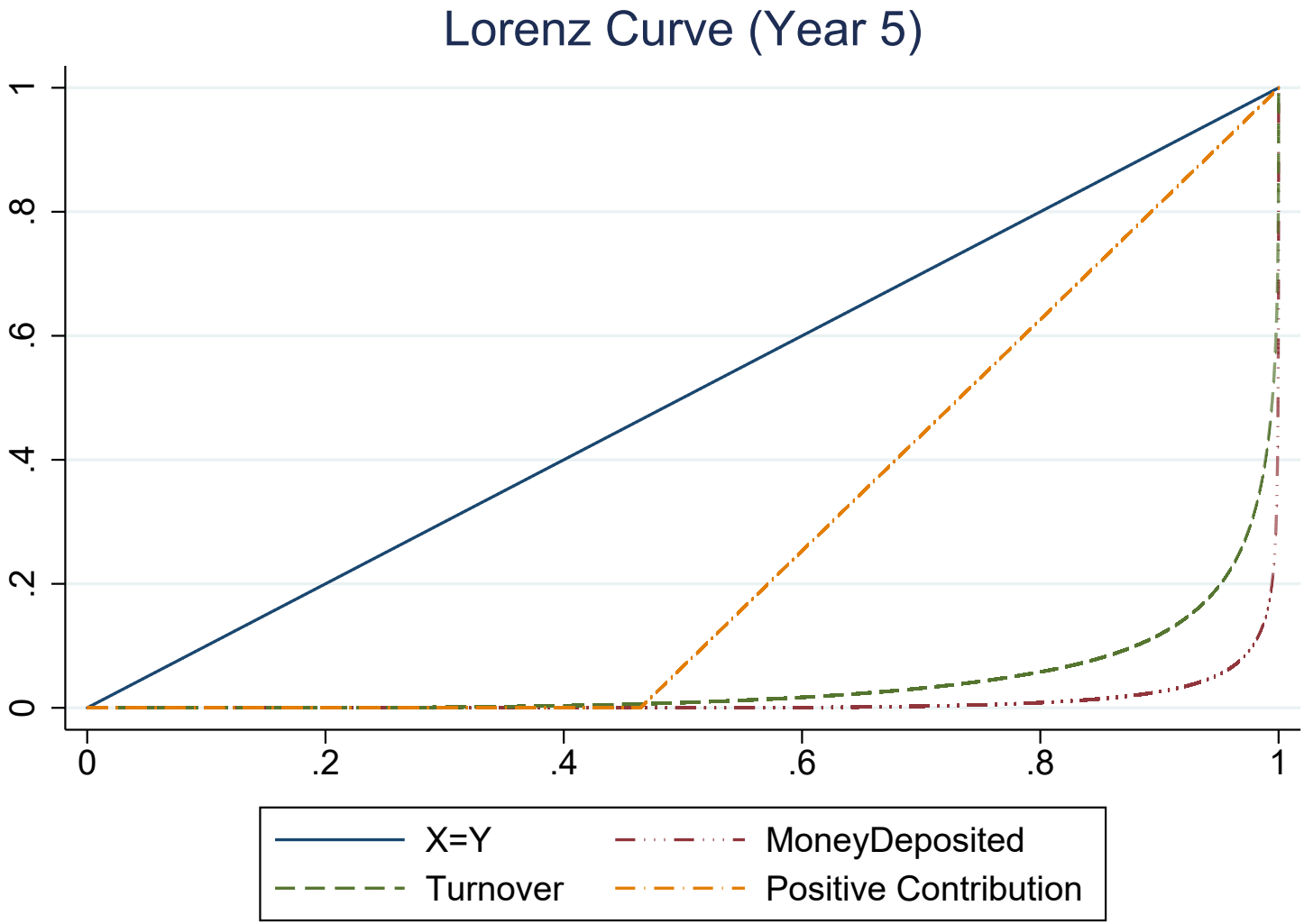
Lorenz Curve



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

Back

Lorenz Curve



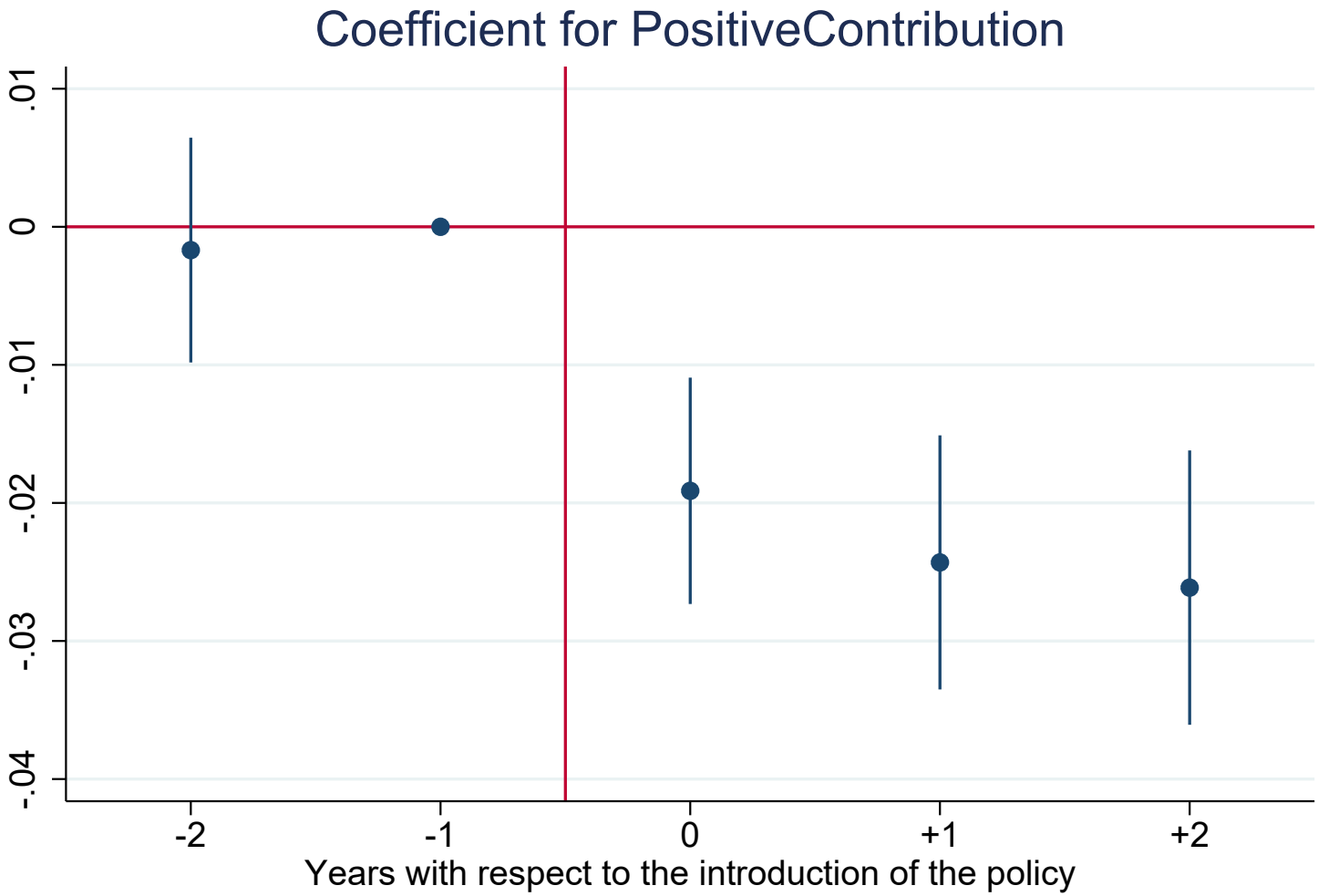
Back

Event Study Analysis: Vat Deposited

Coefficient in million rupees.
Number of retailers is 32979 and number of wholesalers is 19515

Back

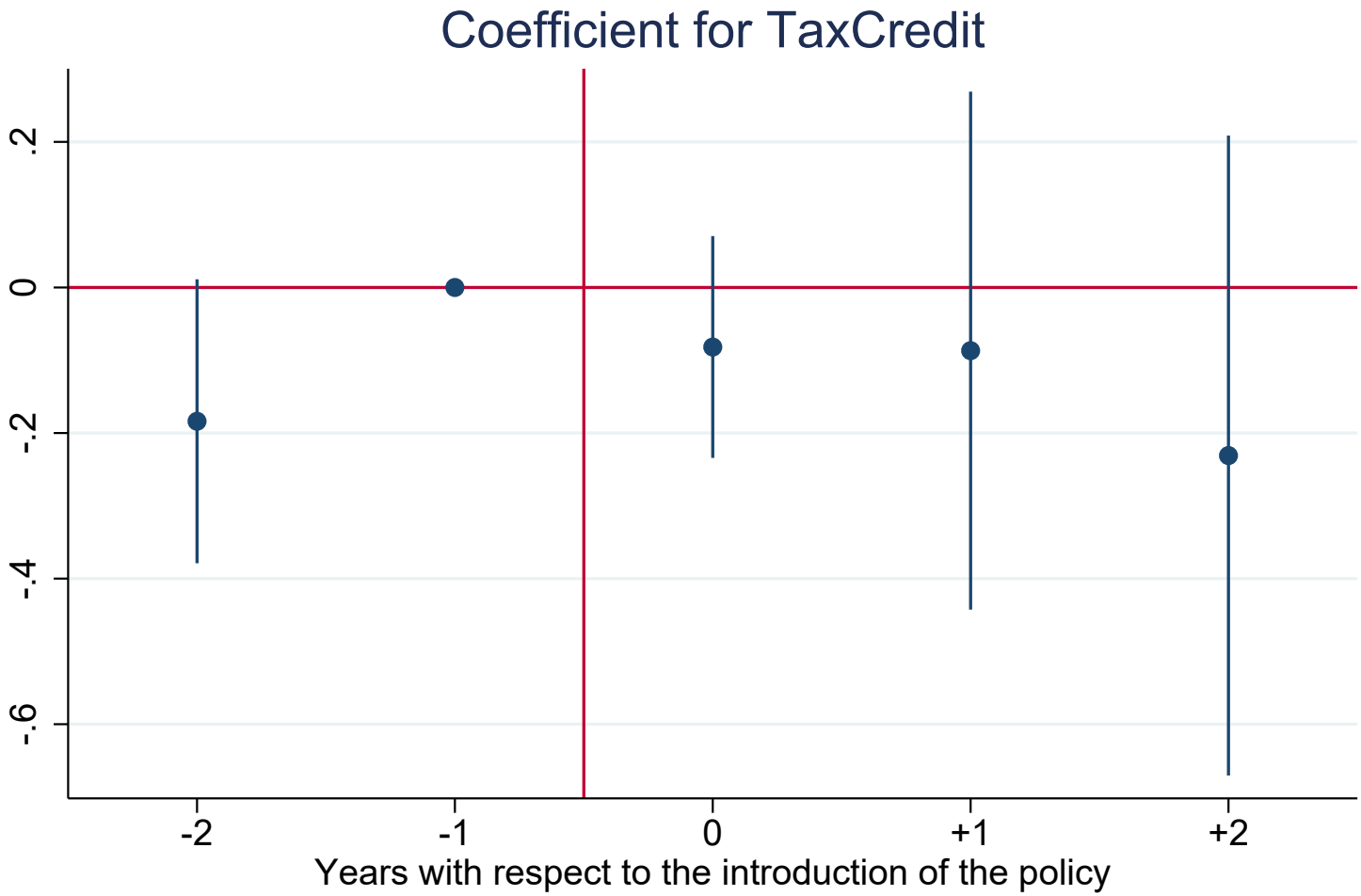
Event Study Analysis: Positive VAT Deposited



Number of retailers is 32979 and number of wholesalers is 19515

Back

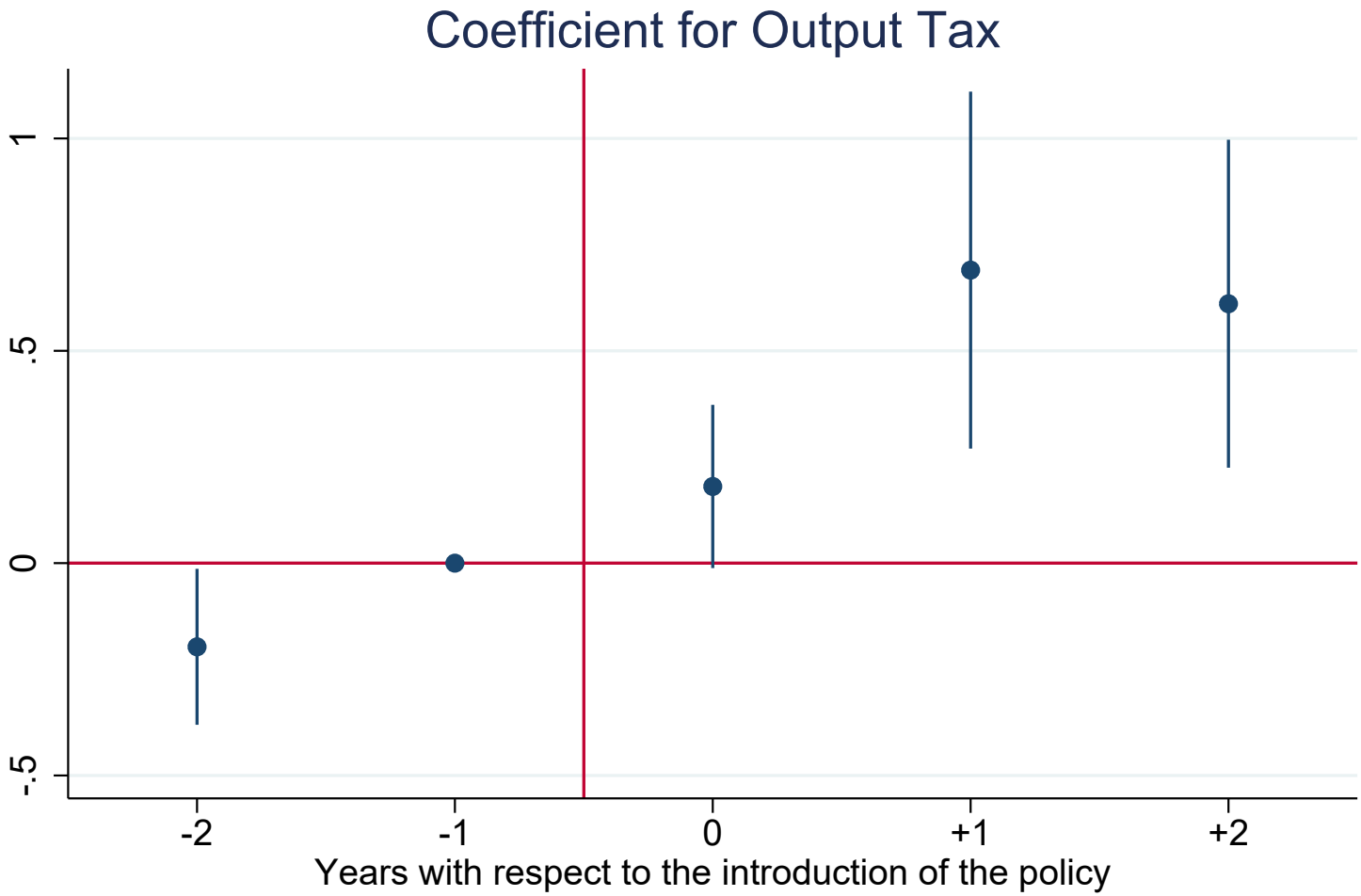
Event Study Analysis: Tax Credit



Coefficient in million rupees.
Number of retailers is 32979 and number of wholesalers is 19515

Back

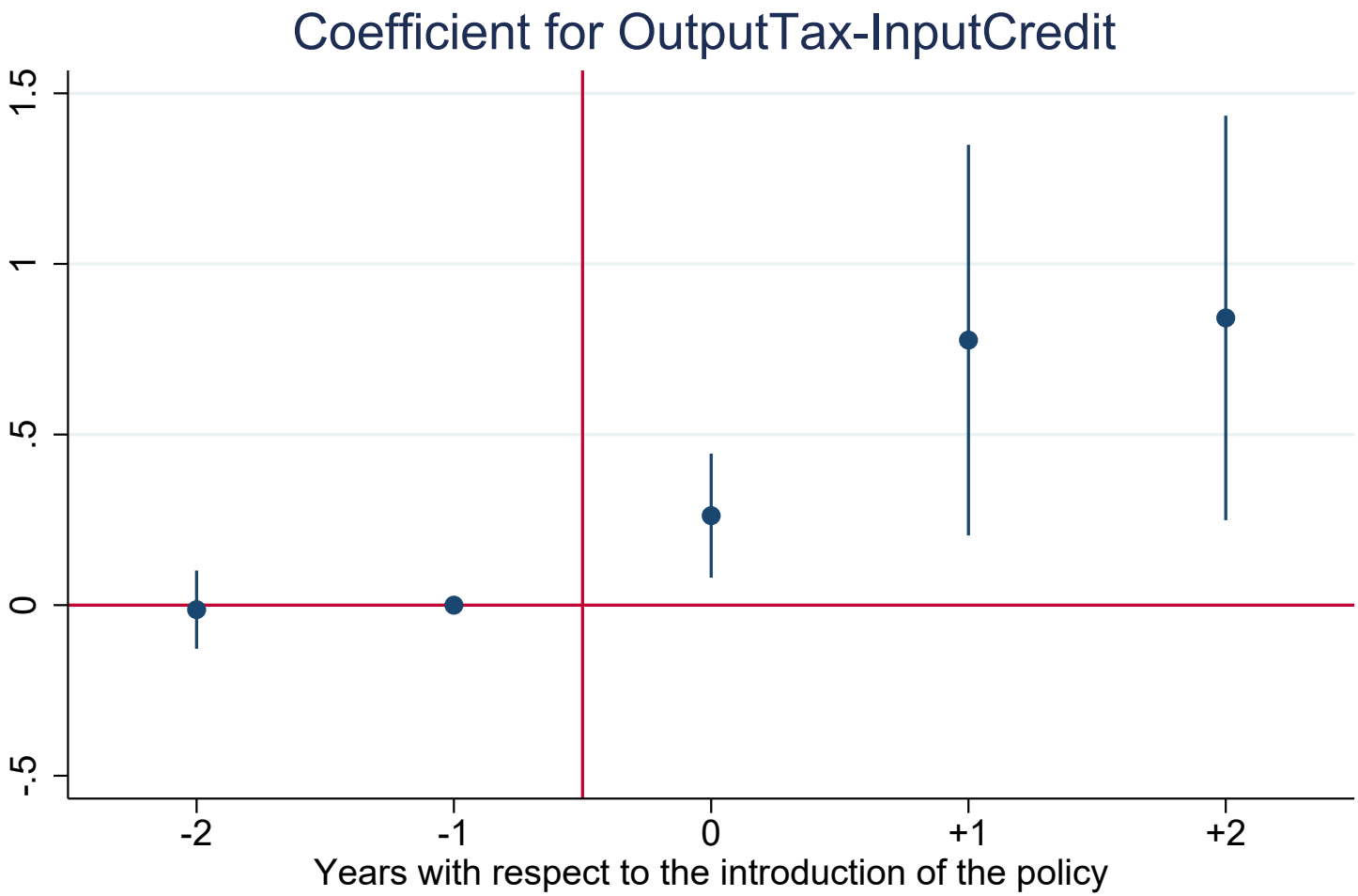
Event Study Analysis: Output Tax



Coefficient in million rupees.
Number of retailers is 32979 and number of wholesalers is 19515

Back

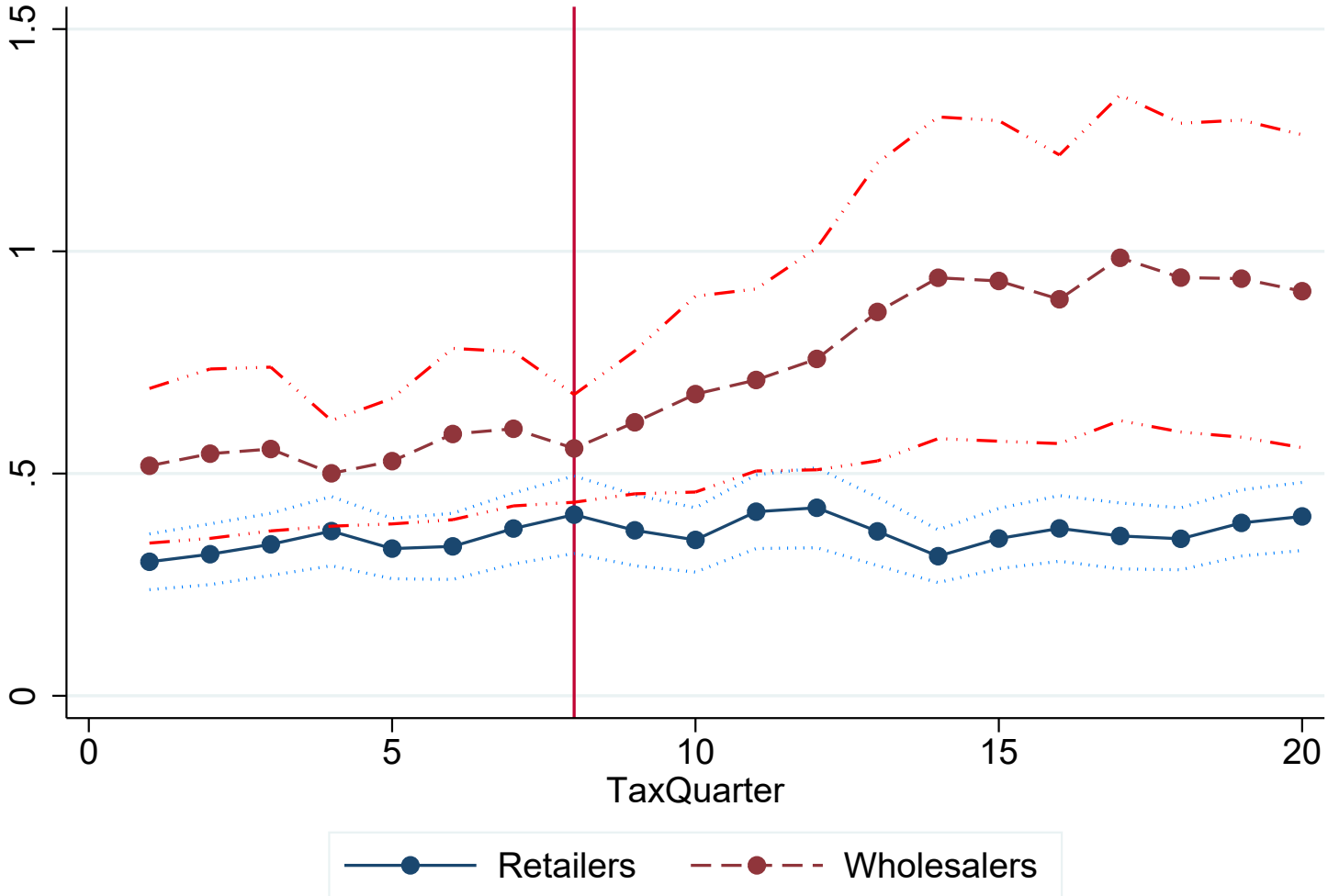
Event Study Analysis: Output Tax - Tax Credit



Coefficient in million rupees.
Number of retailers is 32979 and number of wholesalers is 19515

Back

Vat Deposited Trends (Quarterly)



Vat deposited in million rupees.

Back Event study plots

Comparison Summary (year 1)

Table: Summary stats: Wholesalers and Retailers

		(1)		(2)	(3)
Variables	Retailers	Mean	Wholesalers	Mean	MeanDiff
% Positive VAT Deposited Firms	32979	58.9	19515	53.3	5.6***
VAT Deposited	32979	0.64	19515	1.31	-0.67***
Total Turnover	32979	24.27	19515	80.80	-56.52***
Local Turnover	32979	18.43	19515	49.72	-31.288***
Credit Claimed	32979	0.95	19515	1.41	-0.46**
Tax Collected	32979	1.53	19515	2.63	-1.10***
MoneyDeposited/Turnover	32028	0.01	18994	0.01	0.002***
Credit/Turnover	32028	0.11	18994	0.07	0.04
OutputTax/Turnover	32028	0.05	18994	0.03	0.016***
NonlocalTurnover/TotalTurnover	32028	0.25	18994	0.37	-0.127***

Summary statistics of wholesalers and retailers in the year 1 of our data-set. Monetary amounts are in million rupees, with ₹65 approximately equal to $1. ***=p<0.01, **=p<0.05, * p=<0.1

Back

Wholesaler vs Retailer: Logs

- Number of Wholesalers: 4502 firms, number of Retailers: 9913 firms

Table: Diff-in-Diff in Logs: Wholesalers and Retailers (at Annual Level)

VARIABLES	(1) log(Money Deposited)	(2) log(Tax Credit)	(3) log(Output Tax)
Post	0.28***	0.23***	0.22***
	(0.01)	(0.01)	(0.00)
Post*Wholesaler	-0.02	0.04**	0.03**
	(0.02)	(0.02)	(0.01)
Observations	72,075	72,075	72,075
R-squared	0.86	0.90	0.94
Number of Firms	14,415	14,415	14,415

Robust standard errors in parentheses, clustered at firm level. Number of wholesalers is 4502 and number of retailers is 9913. Monetary amounts are in rupees, with ₹65 approximately equal to $1. Column (1)-(3) respectively show regression of the log of VAT deposited by firms, of the input tax credit claimed by firms, and the output tax collected by firms. We do these regressions on a common sample, that is all firms for which all three outcome variables are strictly positive. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Back

Model: Event Study (Quarterly)

$$y_{it} = \alpha_i + \nu_t + \beta * Post_{it} + \delta * Pre_{it} + \gamma * Post_{it} * \mathbb{I}\{\text{Wholesaler}_i\} + \mu * Pre_{it} * \mathbb{I}\{\text{Wholesaler}_i\} + \epsilon_{it} \quad (2)$$

- Comparison groups:
  - WholeSaler vs Retailer
- Outcome variables
  - I{VAT>0} : Positive VAT deposited
  - VAT amount deposited
  - Input Credit claimed
  - Output Tax liability
  - Output Tax - Input Credit
- Standard errors clustered at firm level
- Include time (ν_t) and firm fixed effects (α_i)

Back

Wholesaler vs Retailer: Quarterly Regression

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

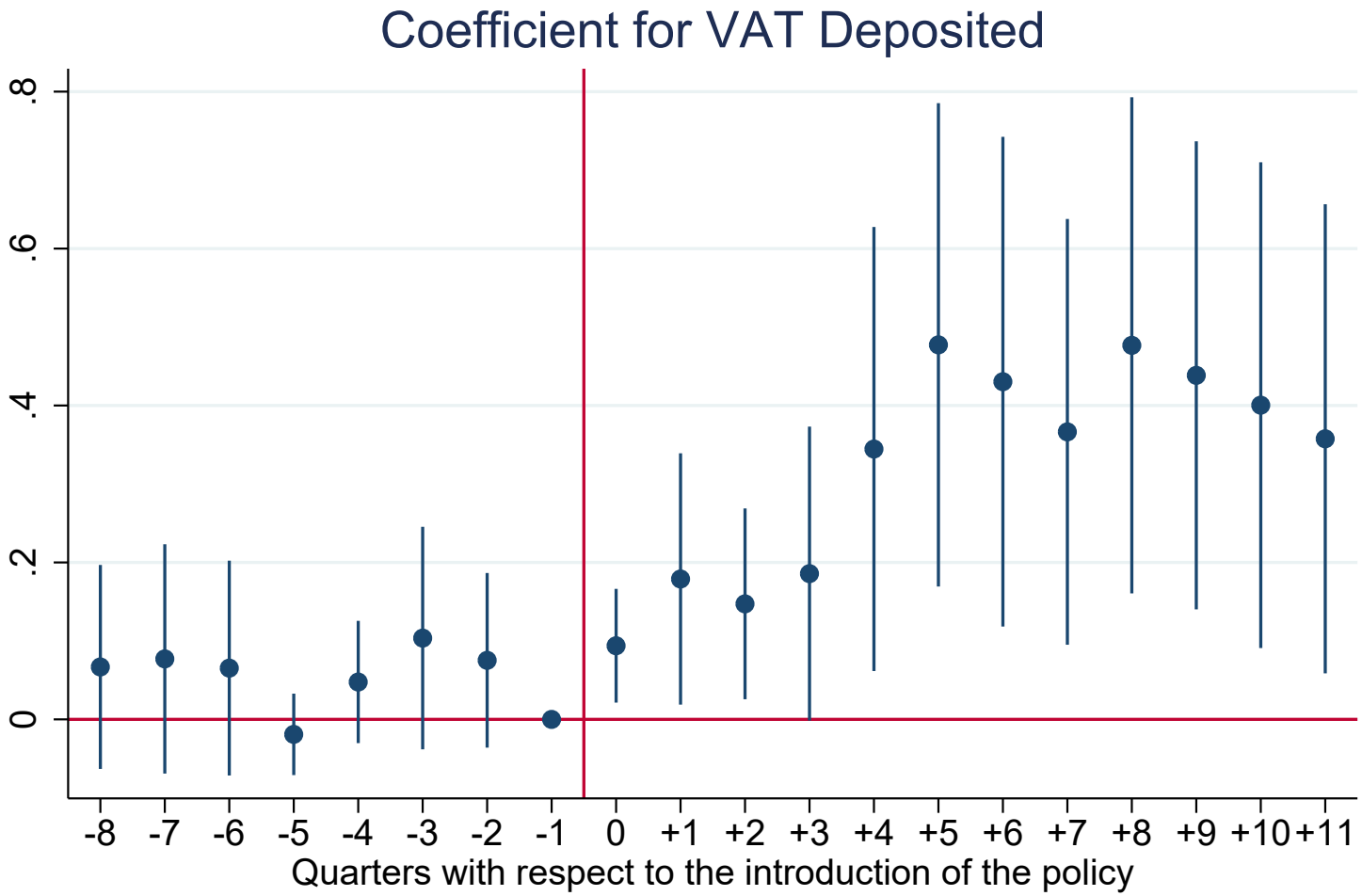
Table: Diff-in-Diff in Levels: Wholesalers and Retailers (Quarterly)

VARIABLES	(1) Positive VAT Deposited	(2) VAT Deposited	(3) Tax Credit	(4) Output Tax	(5) Output Tax - Tax Credit
Post	0.0139***	-0.0324	0.131***	0.0961**	-0.0345
	(0.00349)	(0.0429)	(0.0251)	(0.0471)	(0.0393)
Post*Wholesaler	-0.0147***	0.268***	-0.0185	0.247***	0.265***
	(0.00355)	(0.0809)	(0.0480)	(0.0650)	(0.0822)
PrePolicy	0.0189***	0.0856***	0.144***	0.225***	0.0813***
	(0.00352)	(0.0234)	(0.0231)	(0.0362)	(0.0226)
PrePolicy*Wholesaler	-0.00278	-0.0193	0.0493	0.0276	-0.0217
	(0.00372)	(0.0311)	(0.0412)	(0.0328)	(0.0330)
Constant	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	0.826	0.802	0.949	0.826
Number of Firms	26,819	26,819	26,819	26,819	26,819

Robust standard errors in parentheses, clustered at firm level. Number of wholesalers is 11482 and number of retailers is 15337. Monetary amounts are in million rupees, with ₹65 approximately equal to $1. Column (1) shows linear probability regression of the probability of depositing a positive amount. Column (2)-(4) respectively show regression of the mean VAT deposited by firms, of the input tax credit claimed by firms, and the 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. Row "Constant" shows mean and standard errors for wholesalers in year 1. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Back

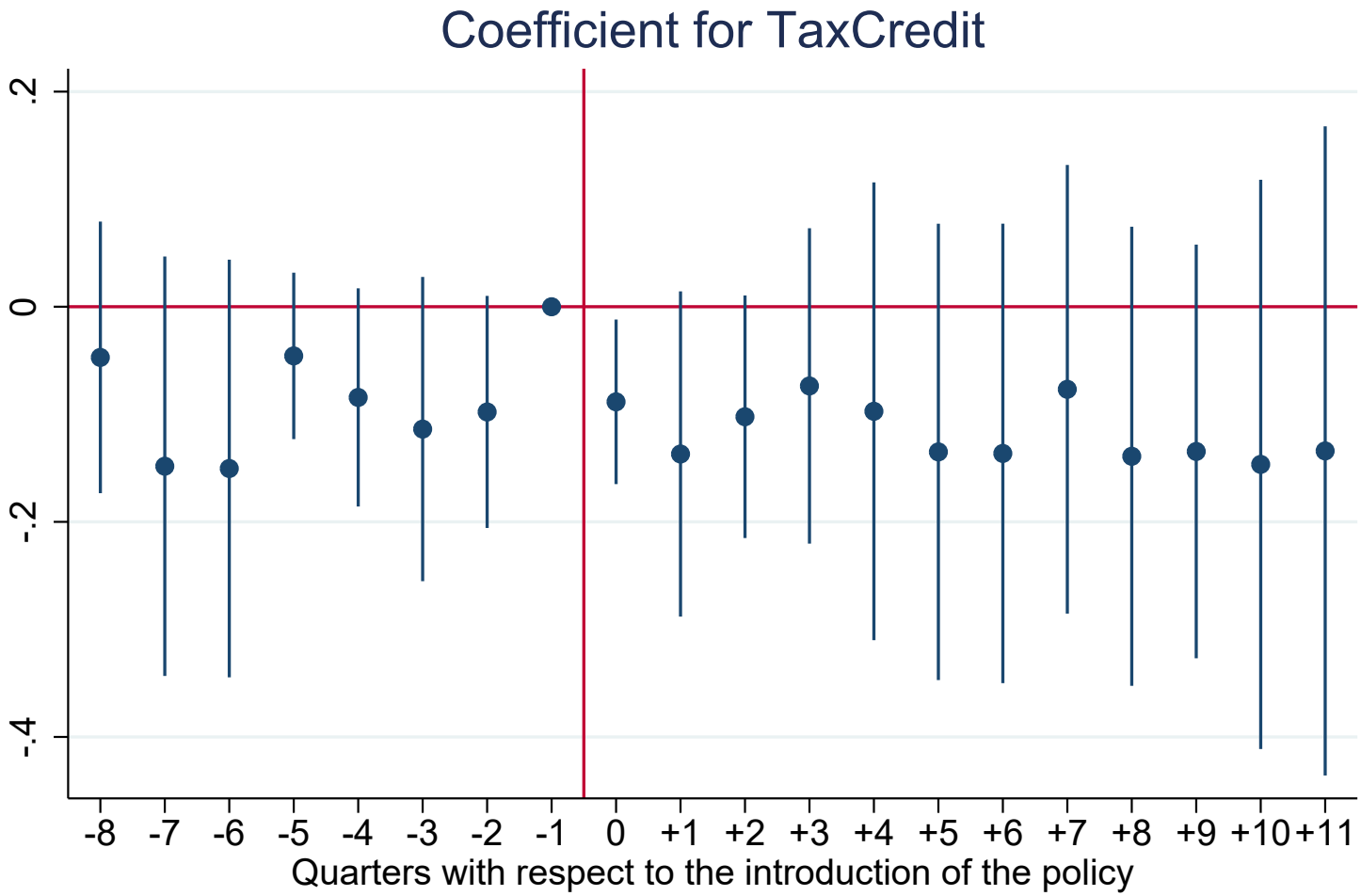
Event Study Analysis: Vat Deposited (Quarterly)



Coefficient in million rupees.
Number of retailers is 15337 and number of wholesalers is 11482

Back

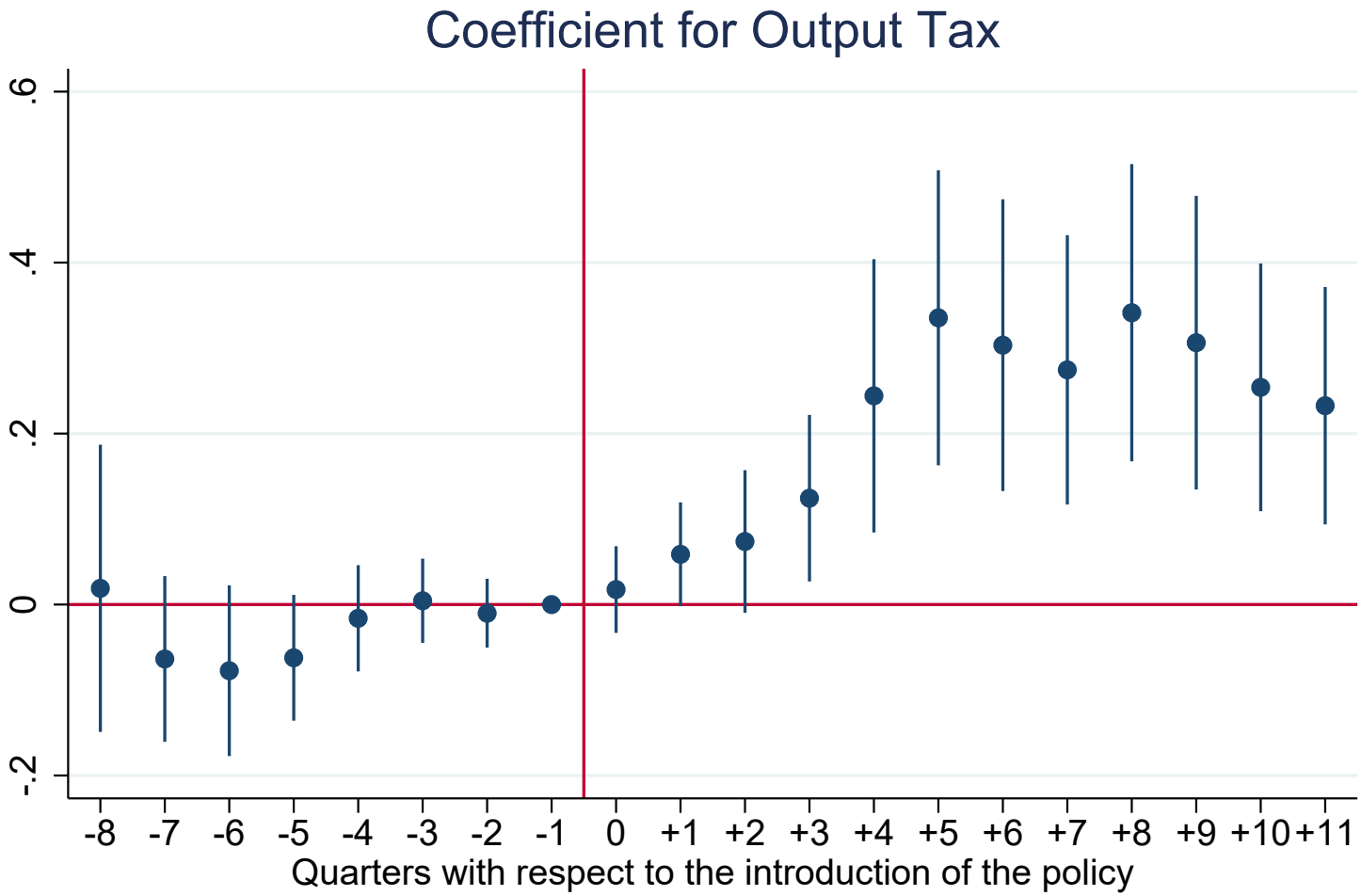
Event Study Analysis: Tax Credit (Quarterly)



Coefficient in million rupees.
Number of retailers is 15337 and number of wholesalers is 11482

Back

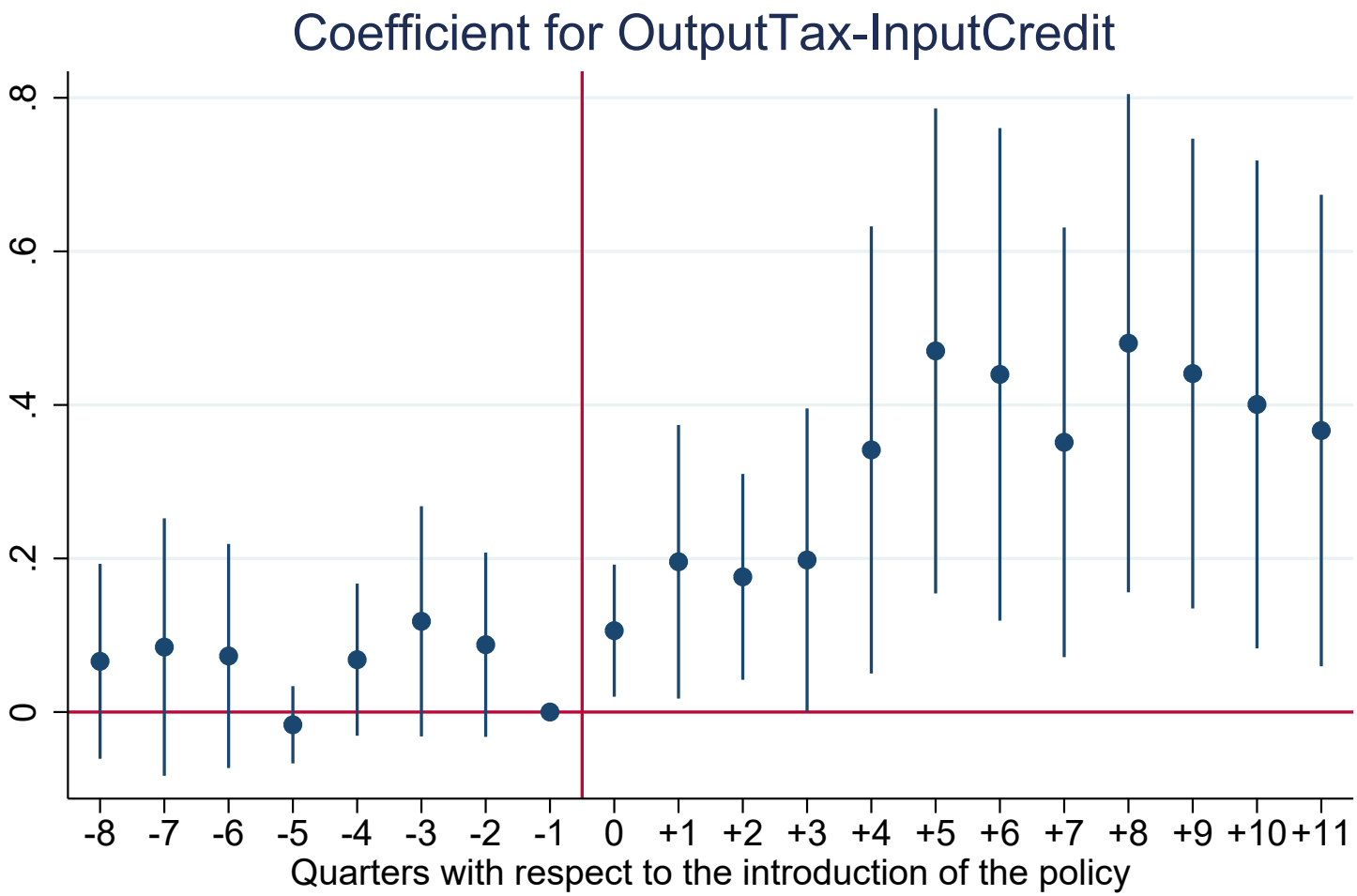
Event Study Analysis: Output Tax (Quarterly)



Coefficient in million rupees.
Number of retailers is 15337 and number of wholesalers is 11482

Back

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



Coefficient in million rupees.
Number of retailers is 15337 and number of wholesalers is 11482

Wholesaler vs retailer: Top Decile

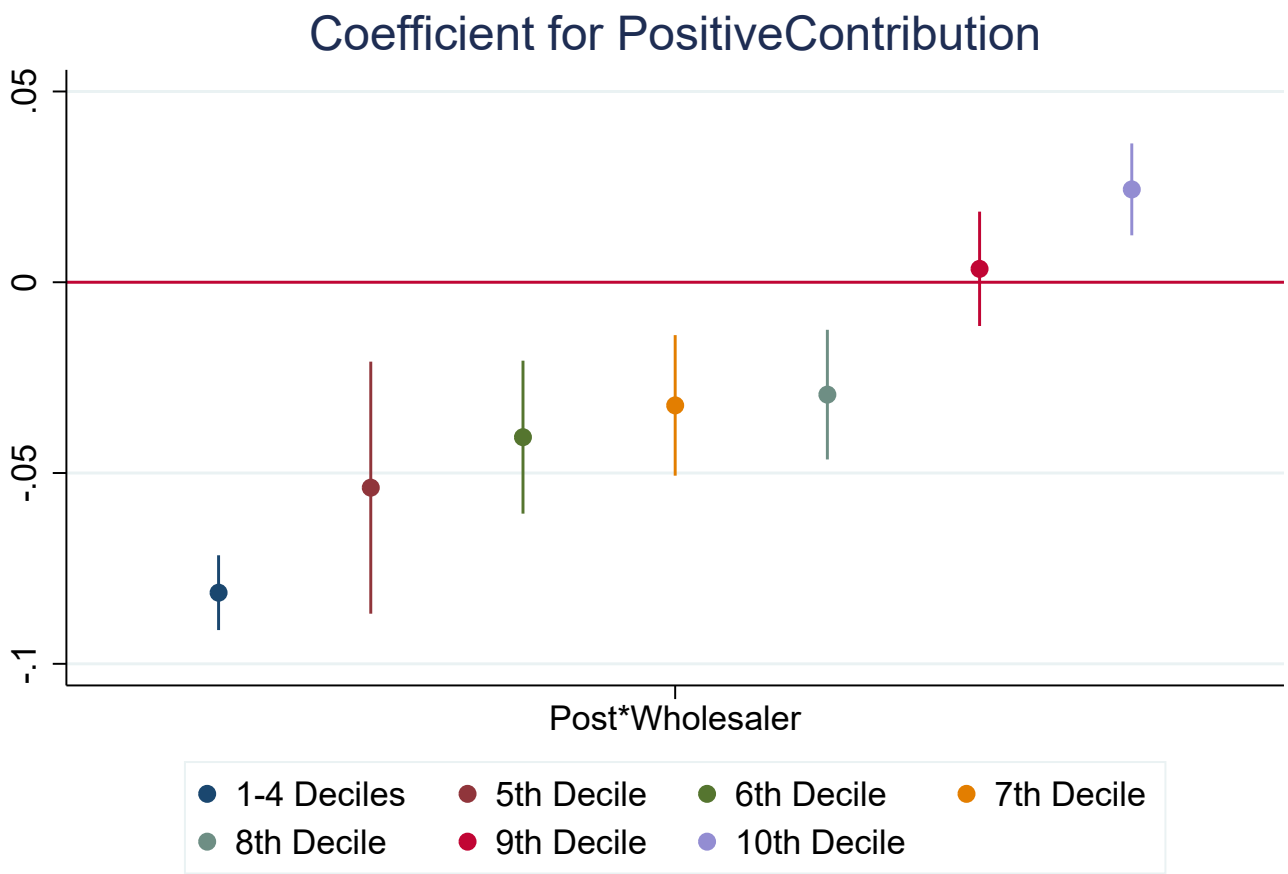
Table: Diff-in-Diff for top decile: Wholesalers and Retailers (at annual level)

VARIABLES	(1) Positive VAT Deposited	(2) VAT Deposited	(3) Tax Credit	(4) Output Tax
Post	-0.06***	-0.45	2.19***	1.63***
	(0.00)	(0.56)	(0.46)	(0.45)
Post*Wholesaler	0.02***	5.89***	-1.89	4.11***
	(0.01)	(1.90)	(1.18)	(1.40)
Observations	26,240	26,240	26,240	26,240
R-squared	0.41	0.85	0.86	0.96
Number of Firms	5,248	5,248	5,248	5,248

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, with ₹65 approximately equal to $1. Column (1) and (2) shows linear probability regressions of the probability of depositing a positive amount and the probability of an increase in VAT deposited from the previous year respectively. Column (3)-(5) respectively show regression of the mean VAT deposited by firms, of the input tax credit claimed by firms, and the output tax collected by firms. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Back

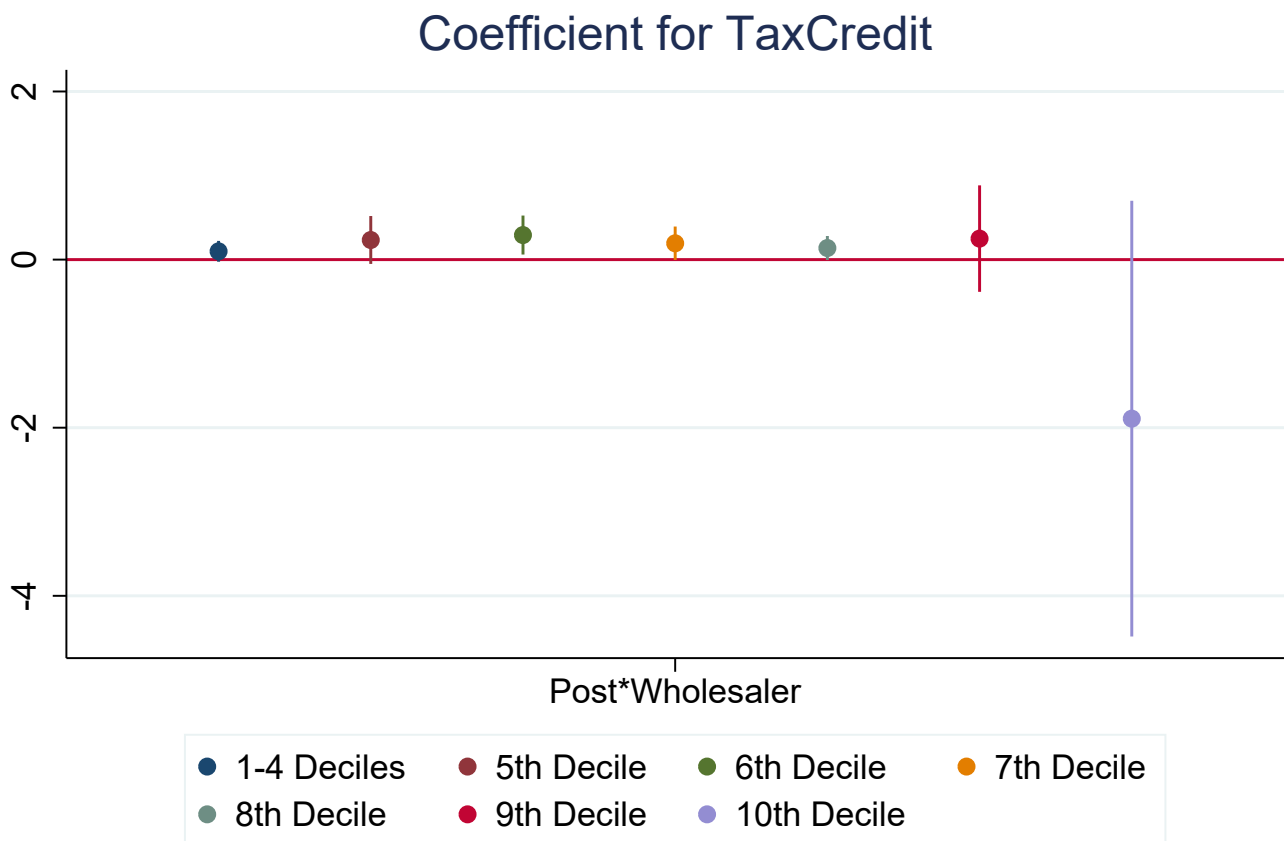
No Effects on Small and Middle Firms



Number of retailers is 32979 and number of wholesalers is 19515

Back

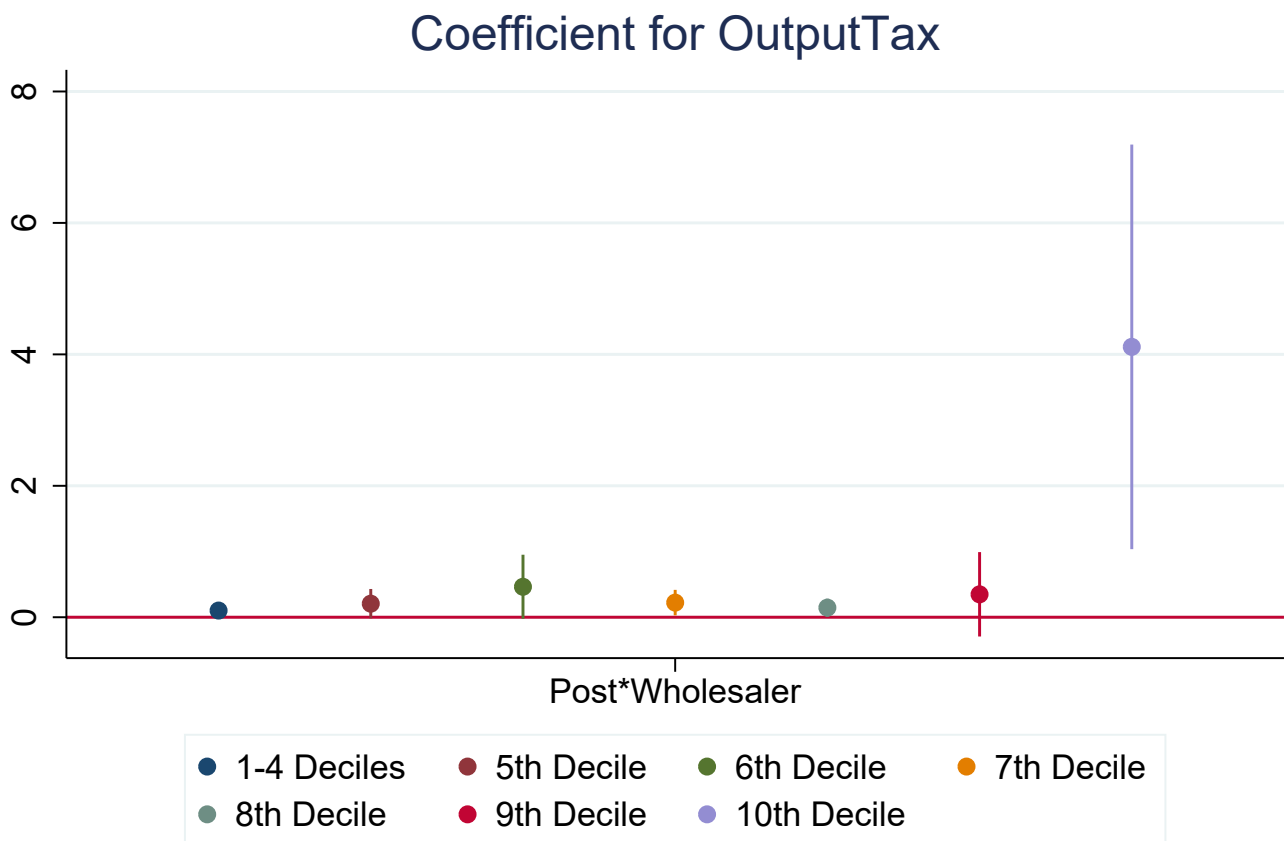
No Effects on Small and Middle Firms



Coefficient in million rupees.
Number of retailers is 32979 and number of wholesalers is 19515

Back

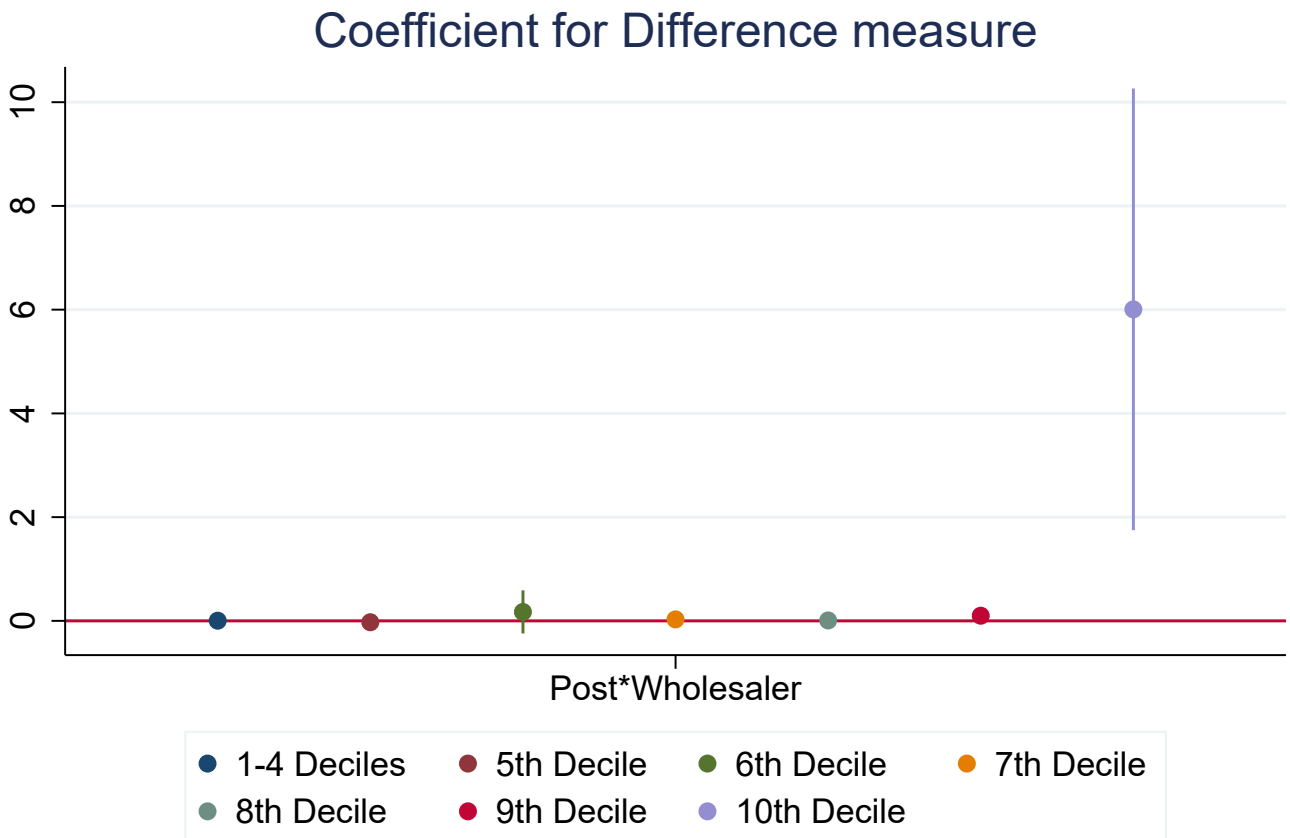
No Effects on Small and Middle Firms



Coefficient in million rupees.
Number of retailers is 32979 and number of wholesalers is 19515

Back

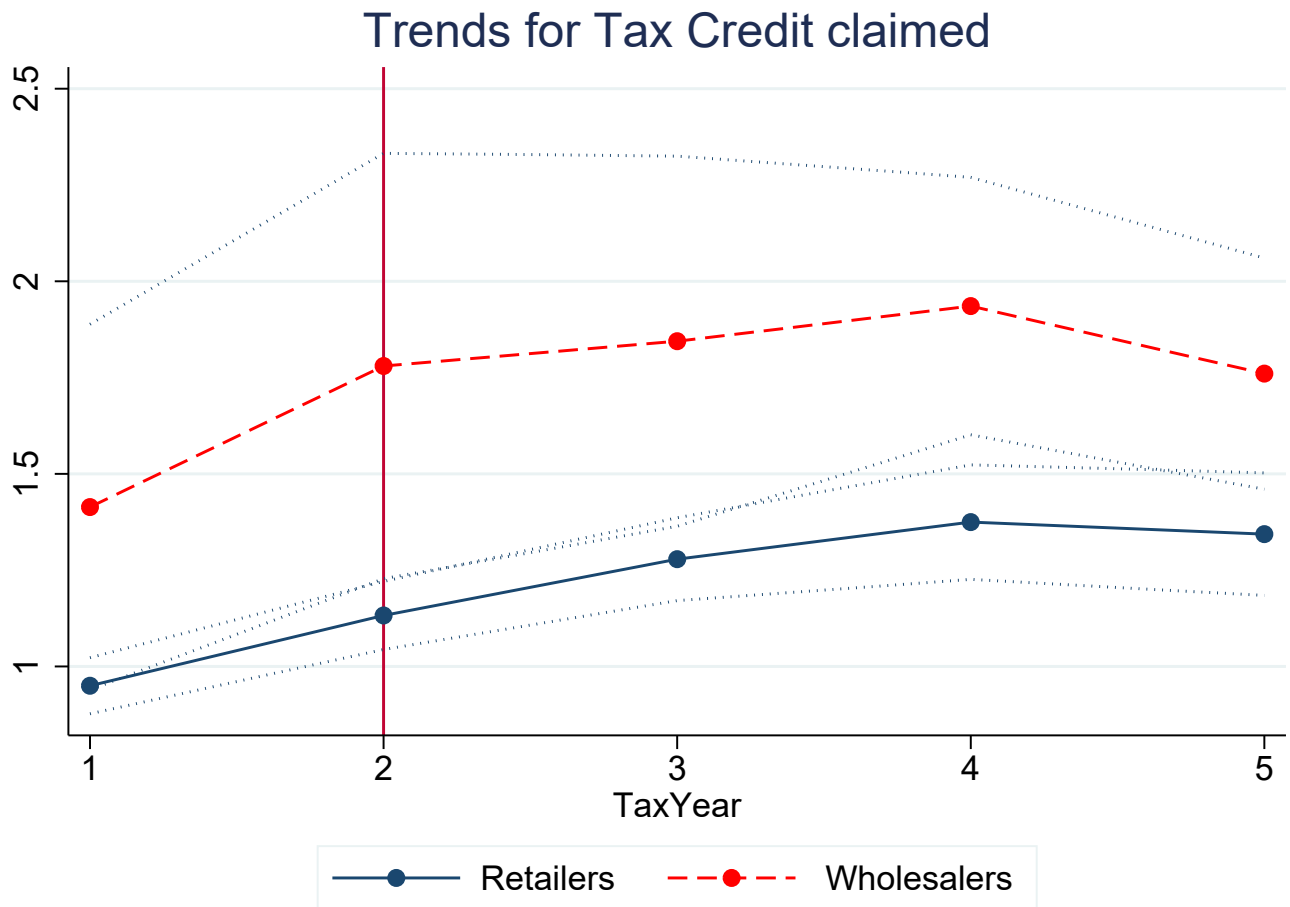
No Effects on Small and Middle Firms



Coefficient in million rupees. Calculate difference measure by subtracting input credits from output tax.
Number of retailers is 32979 and number of wholesalers is 19515

Back

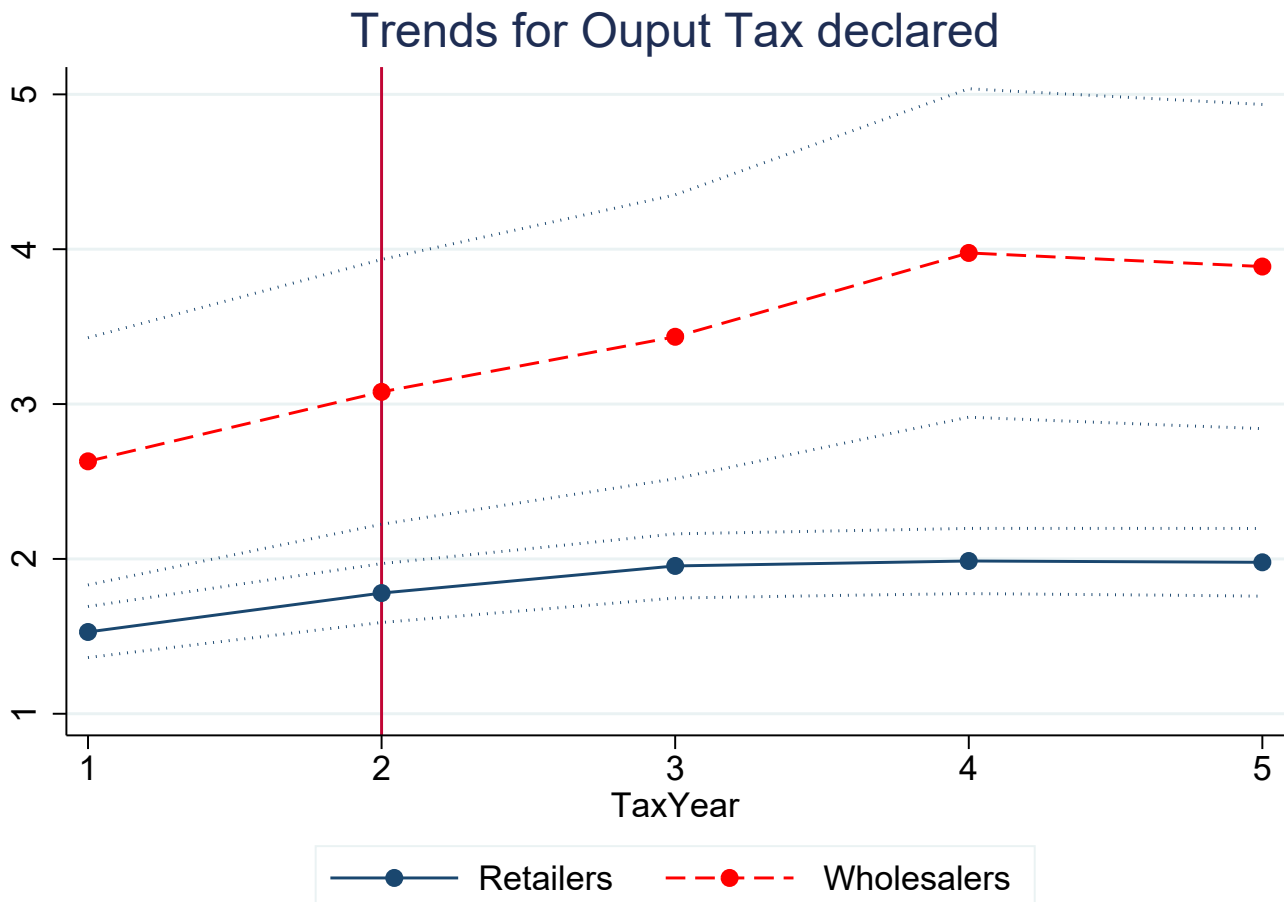
Time-series for Input Credits



Average input credit is in million rupees. Number of wholesalers is 19515 and number of retailers is 32979. Monetary amounts are in million rupees, with ₹65 approximately equal to $1. 95% CI included.

Back

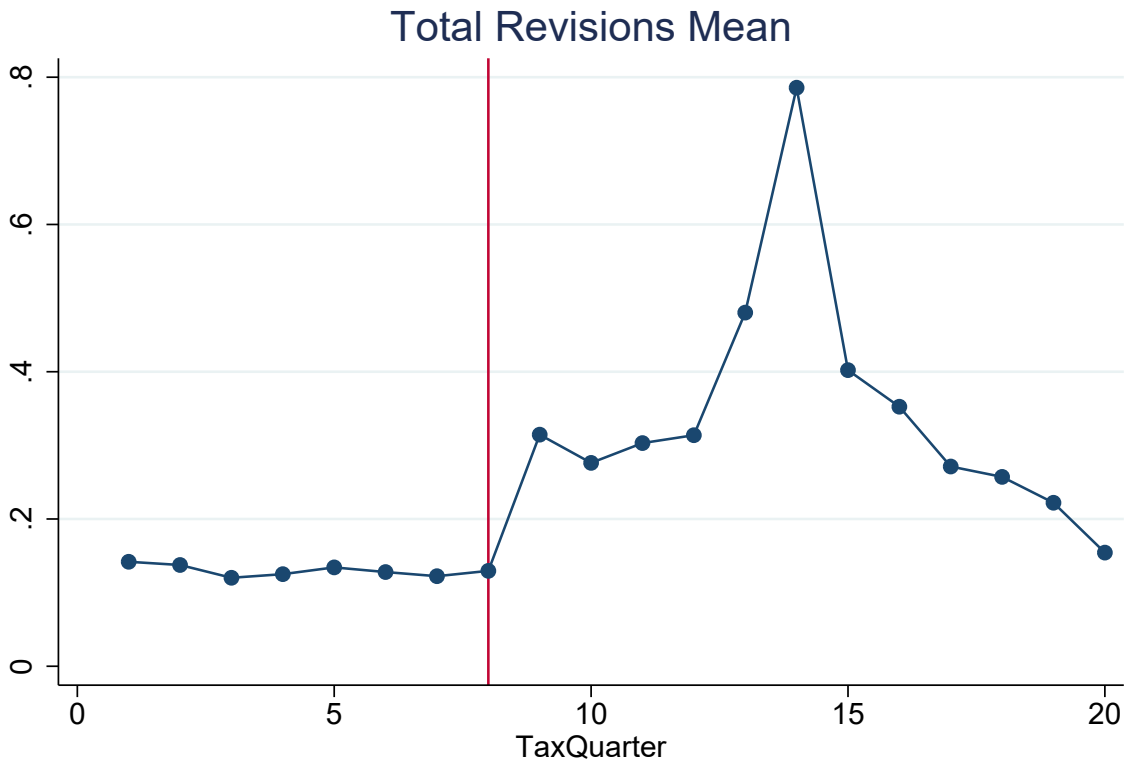
Time-series for Output Tax



Average output tax is in million rupees. Number of wholesalers is 19515 and number of retailers is 32979. Monetary amounts are in million rupees, with ₹65 approximately equal to $1. 95% CI included.

Back

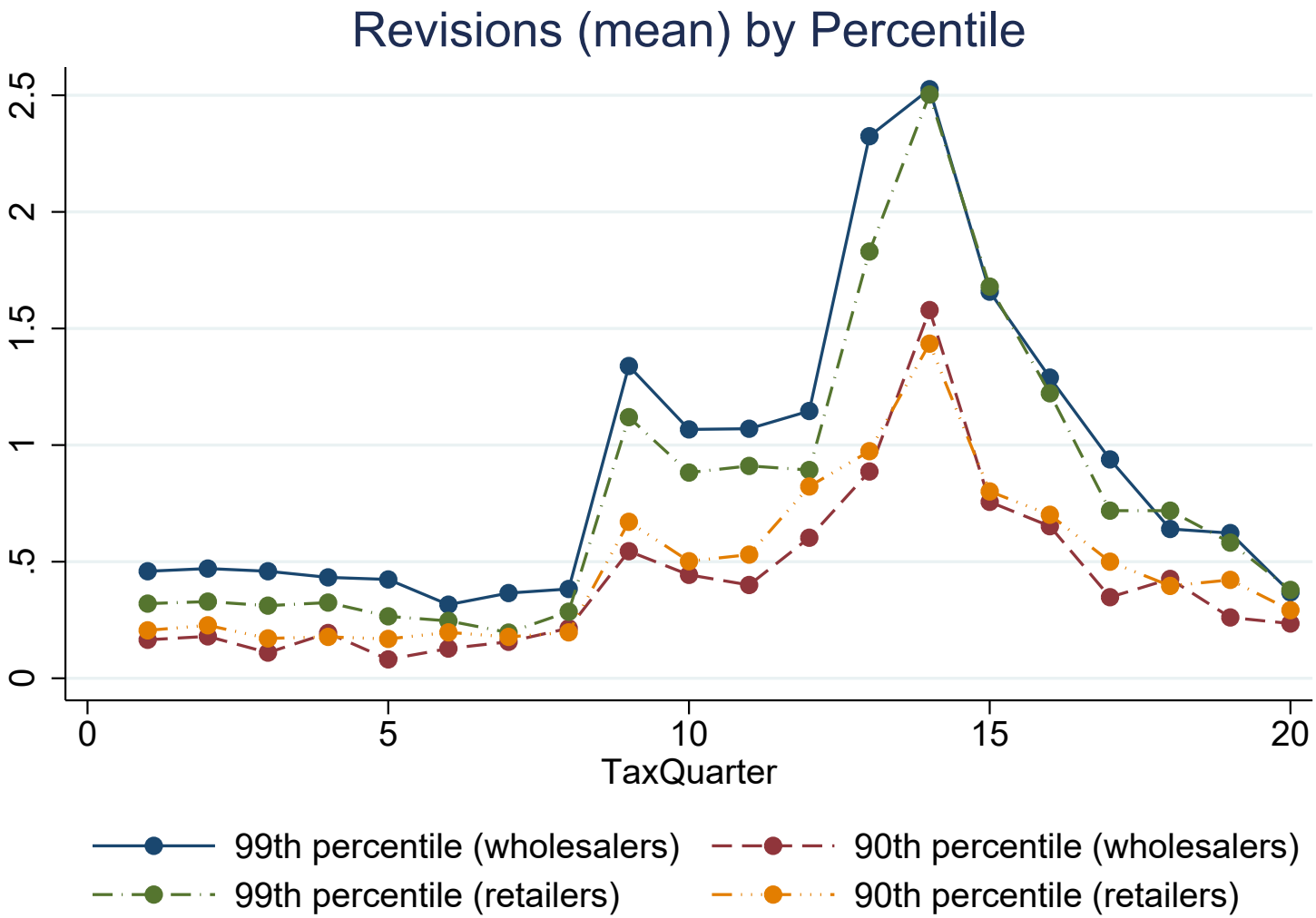
Revision analysis



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

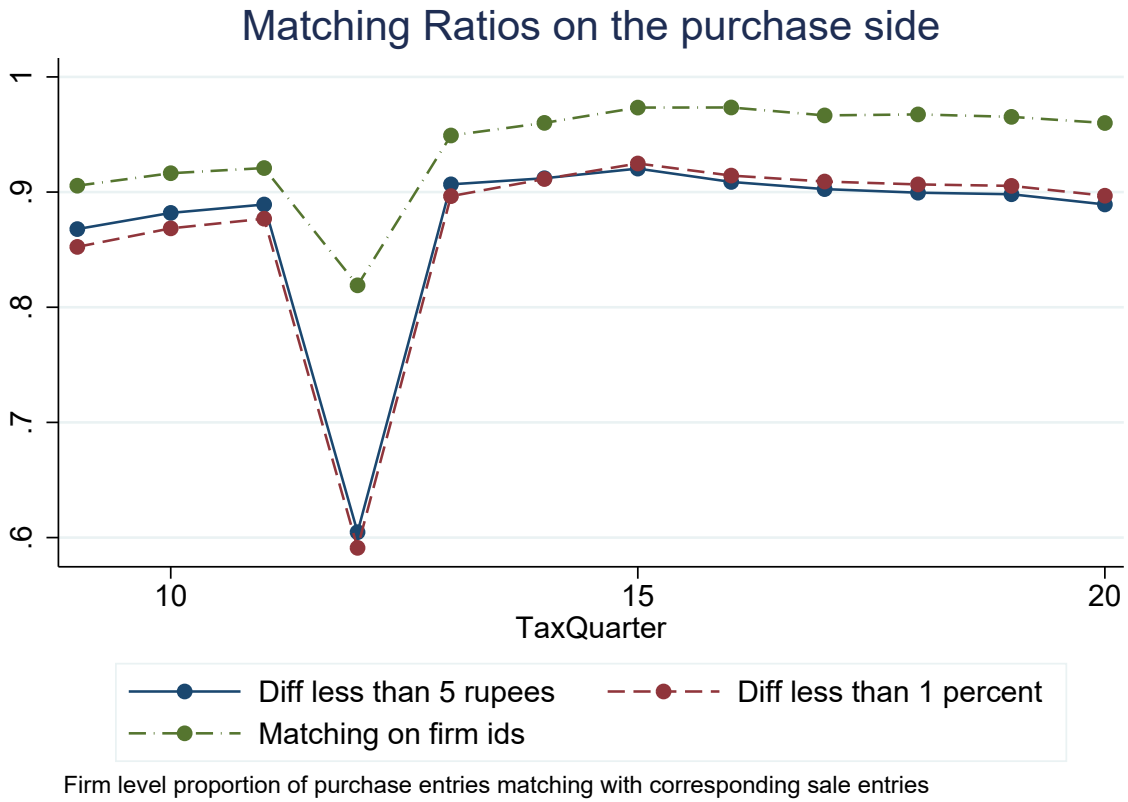
Top percentile revisions

Revision analysis: Top percentile



Back

Matching analysis



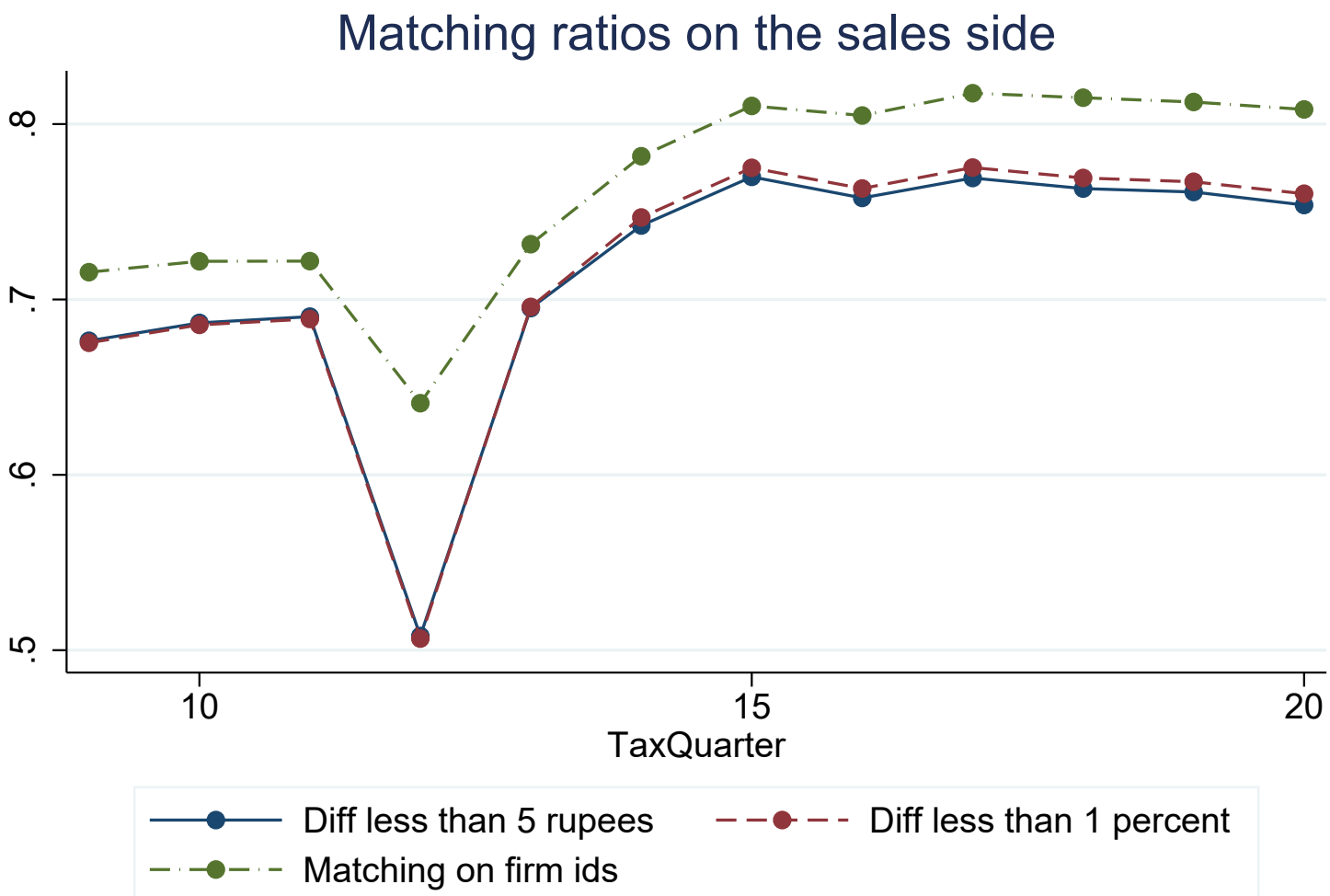
Firm level proportion of purchase entries matching with corresponding sale entries

- Purchase transactions of buying firms should match with sale transactions of selling firms

Sale side matching

Treatment and control comparison

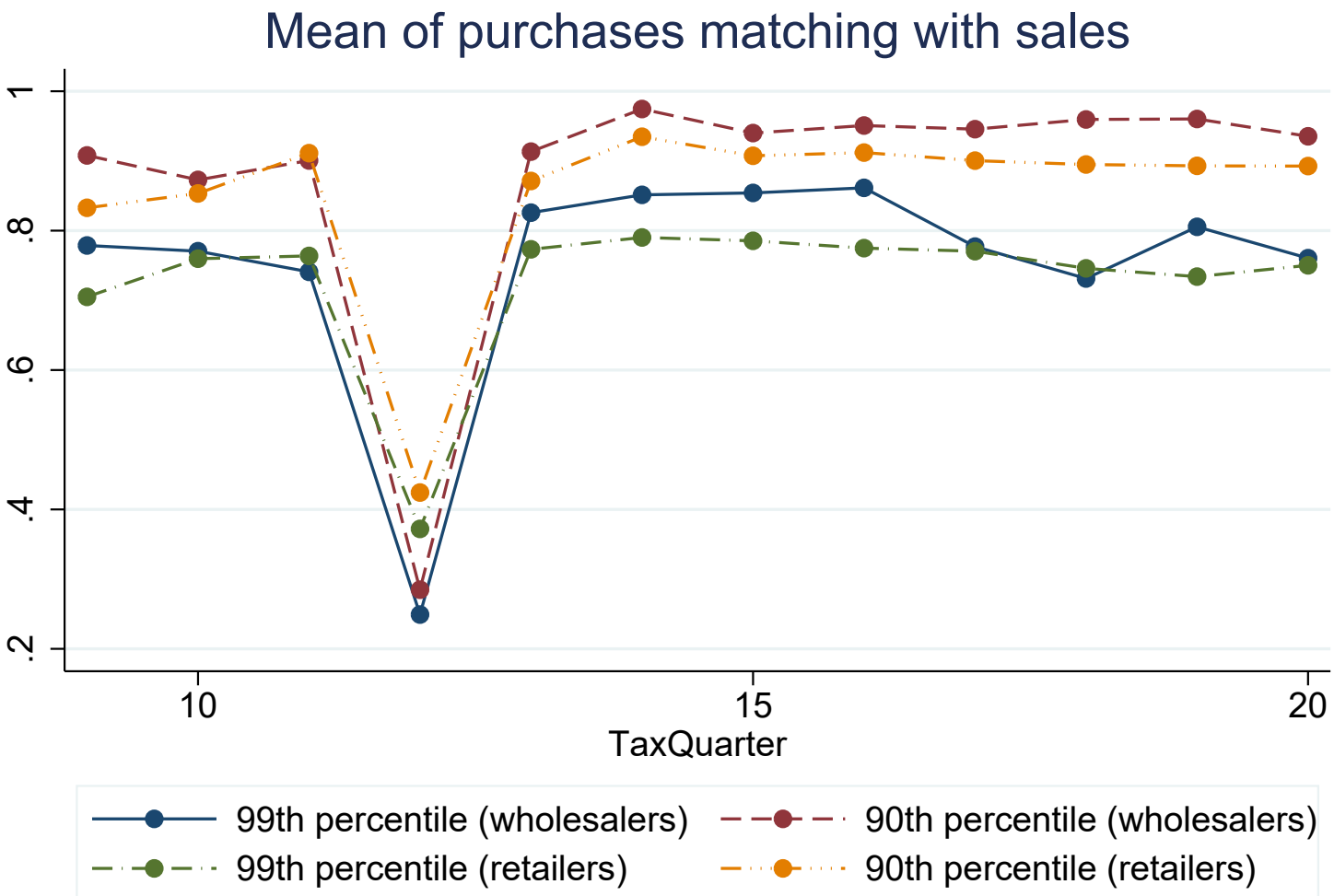
Matching analysis: Sale side matching



Firm level proportion of sales entries matching with corresponding purchase entries

Back

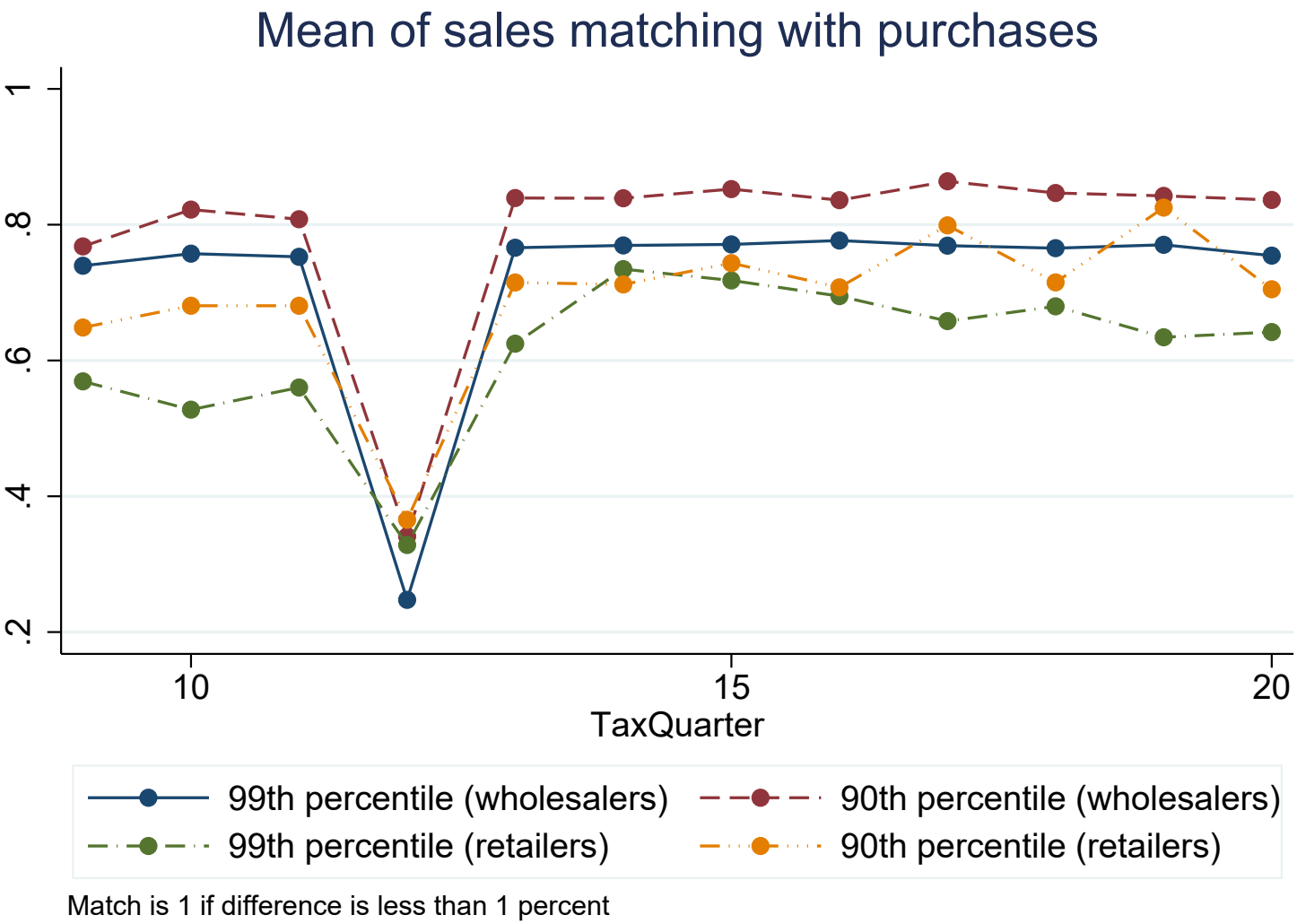
Matching analysis: Retailer Vs wholesaler (purchases)



Match is 1 if difference is less than 1%

Back

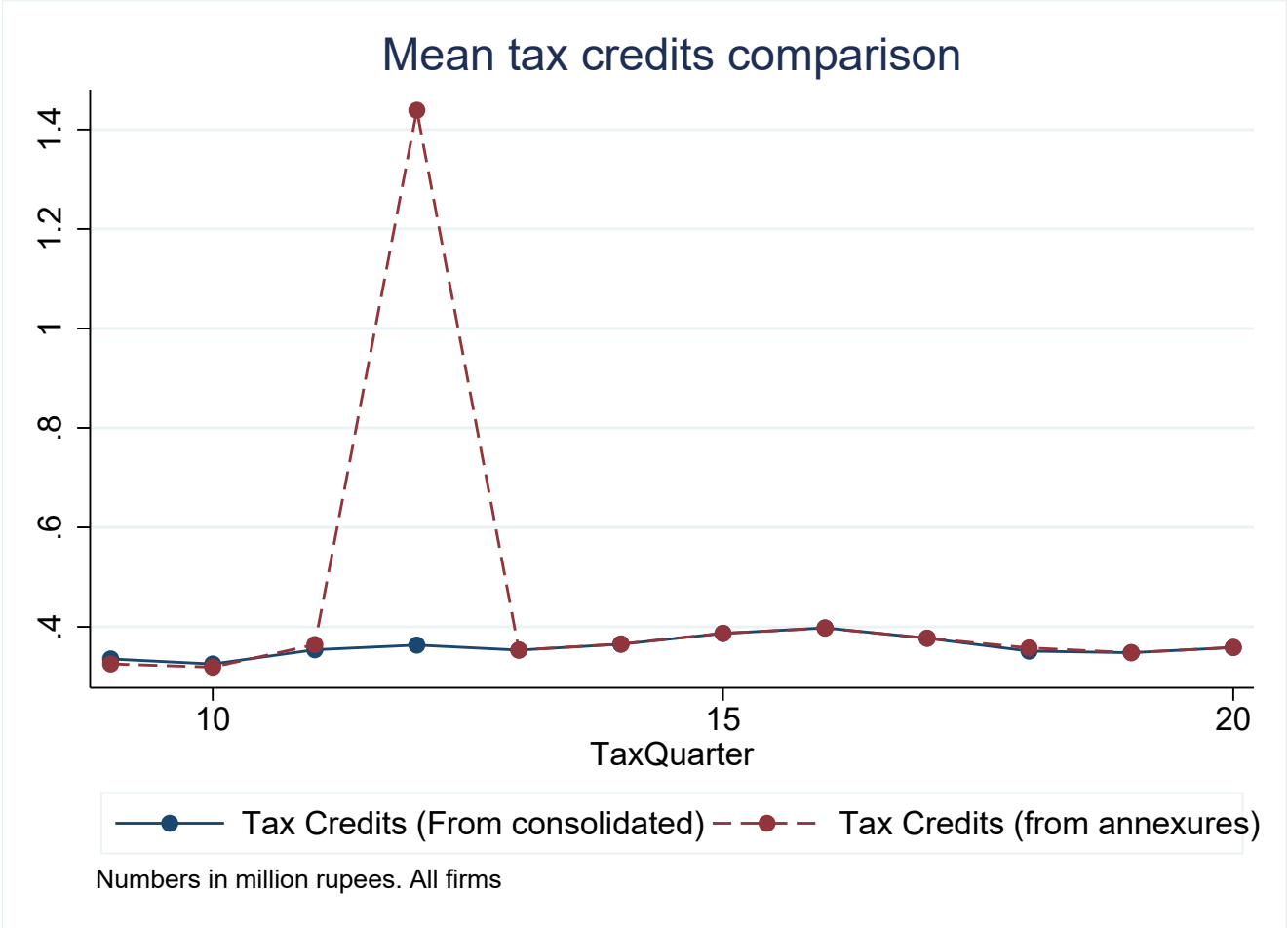
Matching analysis: Retailer Vs wholesaler (sales)



Match is 1 if difference is less than 1 percent

Back

Consolidated vs transactional data



- In the first year, transaction data was not matched with the consolidated returns
- Firms were clearly manipulating
- Fixed in the subsequent years