

Estimating the Value Added Tax Gap in Tanzania

An Empirical Analysis

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Summary

By gathering administrative tax and auditing data, we estimate the VAT gap for 2014-2019.

1. We study audited firm data to provide a preliminary evidence.
 - We document evidence about strategic behavior to avoid stronger audit prob. and evade more.
2. We follow a bottom-up approach.
 - Our preferred estimation shows a VAT gap of 48% for the audited tax region and 53% for the country.
 - The VAT gap is decreasing over time but becomes stable for the period 2016-2019.
 - This is a lower-bound estimation.
3. Using the evasion prediction, we study the behavior of firms.
 - Firms at the beginning of VAT distribution evade more.
 - Small and large-sized firms evade more.
 - We document evidence that firms declare more VAT purchases to increase evasion. This produces smaller VAT declarations, mimicking small-sized firms.

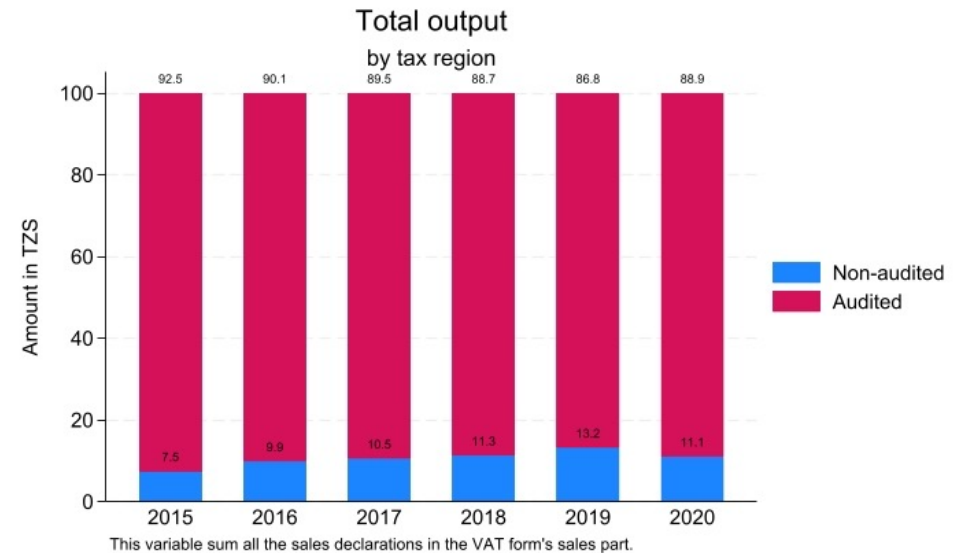
Institutional Background

- VAT is collected by the Tanzania Revenue Authority (TRA).
- Tanzania is divided into geographical localities (cities) and tax regions -> One city could have more than one tax region and vice-versa.
- Indirect tax rates are :
 - Zero-rated -> Declared in VAT act 2014. Include some exports and imports.
 - Exempted -> Declared in VAT act 2014.
 - VAT -> 18% in Mainland Tanzania.
- VAT:
 - Annual gross sale > TZS 40 million to be registered as a VAT agent.
 - Turnover > TZS 100 million must be registered for VAT -> Mandatory to have a VAT ID.
 - Tanzania has a credit-invoice computation method -> VAT = sales – purchases.
- Audits:
 - Annual audit plan by each tax region.
 - Auditing is based on taxpayer turnover trends and payments -> Risk assessment estimation.

Data

- Audit data at a firm level between 2018 – 2022. The period covered is between 2013-2021.
 - Date of auditing and period covered.
 - Type of auditing.
 - Amount recovered by type of tax -> We can identify “VAT compliers”.
- VAT declarations (sales and purchases) at the firm level between 2011-2021.
 - Monthly declarations in the VAT form.
 - Taxed and untaxed (exemptions and zero-rated) items.
 - Gross and tax-paid amounts. -> For some items.
- Firms’ information.
 - Firm’s ID.
 - Firm’s VAT ID.
 - Tax region, postal city, business activity, and industry (ISCI 4-digit code).

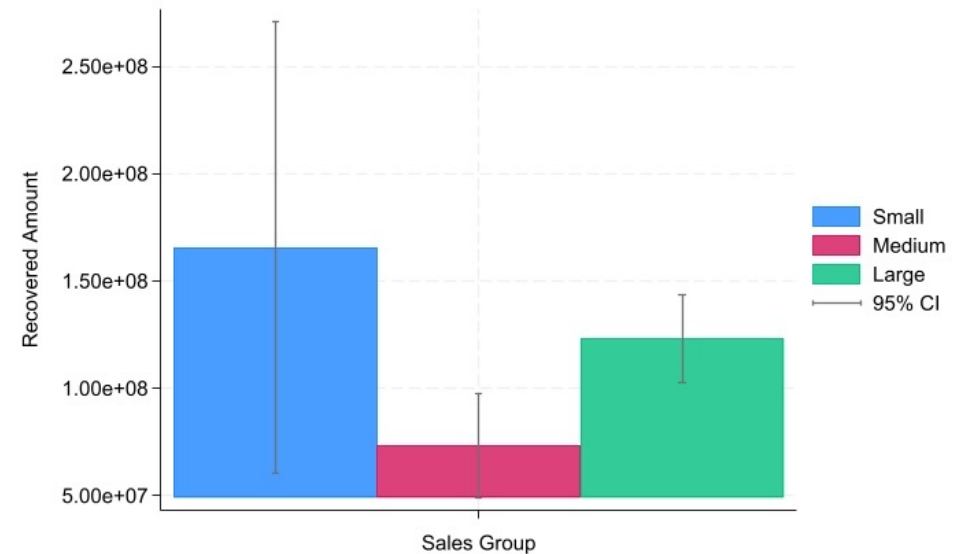
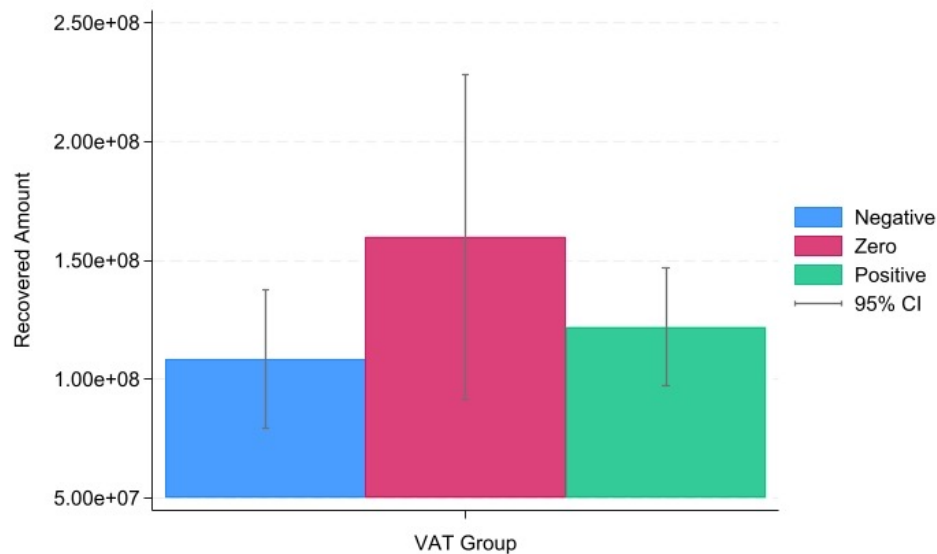
Data



- Audited tax regions have more firms, but the rate of audited firms is around 15%. The audited tax regions show a larger output, inputs, and VAT payment rate.
- Firms in audited and unaudited tax regions [bunch around zero](#) VAT declaration. VAT recovered is significant compared with the auditing rate (average 15%).

Preliminary Evidence

VAT evasion



- Firms with positive and negative VAT declarations and large-sized firms show more [auditing processes](#).
- Evasion is not so different regarding VAT declarations, but firms that bunch at zero evade more. For sales, this is similar, and small and large-sized firms evade more.
- Using the rate [evasion/sales](#), firms that bunch at zero VAT declaration and small-sized firms evade more.

Empirical Strategy

- For audited firms, we estimate

$$Evasion_{ikt} = \alpha + \beta_1 O' + \beta_2 I' + \beta_3 Net\ Profits_{ikt} + \lambda_1 Vat_{ikt} + \lambda_2 Sales_{ikt} + \lambda_3 date_t + \lambda_4 Tax\ region_{ik} + \lambda_5 Activity_i + \lambda_6 City_{ikt} + \lambda_7 ISIC4_{ikt} + u_{ikt}$$

where O is the sales inputs from the VAT form, and I is the purchase inputs. VAT and Sales are variables to capture the distribution of both variables.

- Using the estimated coefficients, we predict evasion in non-audited firms.
- We estimate the tax gap in the following way

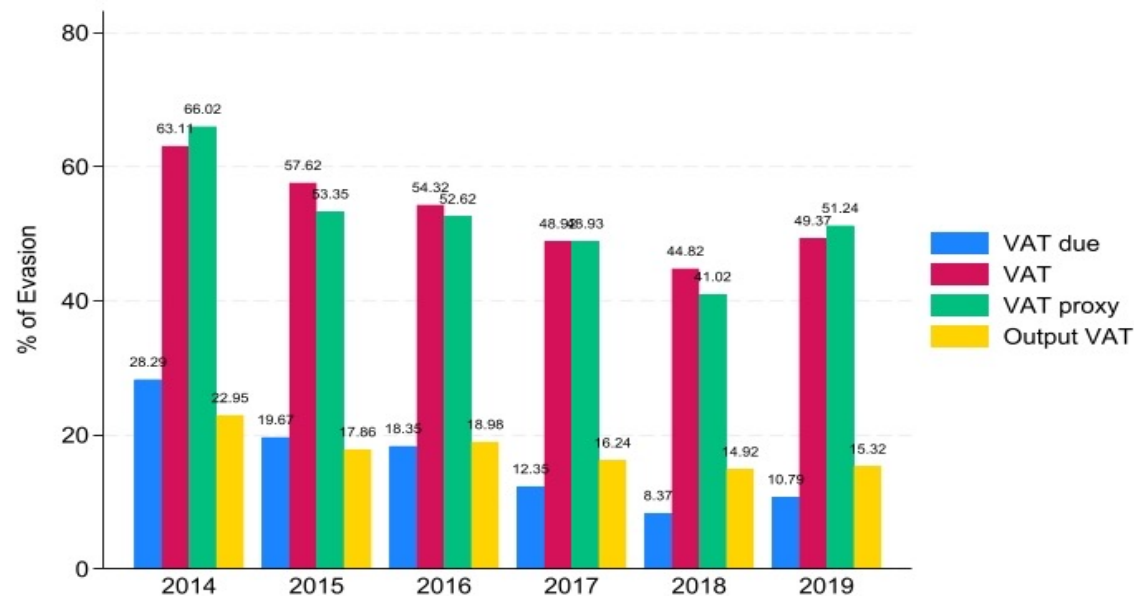
$$VAT\ GAP = \frac{\sum Tax\ Evasion}{\sum Tax\ Evasion + \sum Tax\ Paid}$$

where evasion can be the discovered amount and the estimation.

- We sum each variable per year.
- To estimate the country VAT gap, we assume the tax declaration rate between audited tax regions and country (*audited/country*) is the same for the VAT gap.
- To avoid calculation problems, we use absolute values in the tax declaration.

Results

Audited tax regions

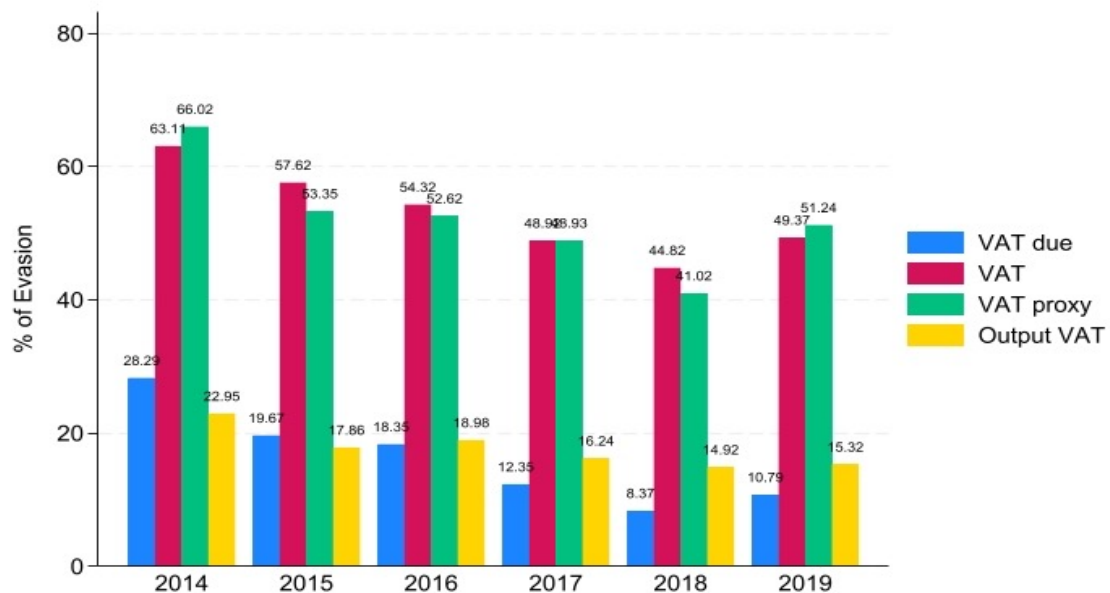


	2014	2015	2016	2017	2018	2019	Average
VAT due	24,99	17,95	16,61	11,1	7,72	9,59	14,66
VAT	60,57	53,86	48,76	44,58	38,12	45,26	48,53
VAT proxy	63,67	50	48,29	43,77	37,84	42,71	47,71
Output VAT	21,34	16,26	16,62	14,15	12,93	13,17	15,75

- Preferred estimation, using only positive evasion predictions.
- The average VAT gap decreases across the years.
- Average VAT gap: 48,5%.
- Between 2016-2019 became more stable, reaching an average of 44%.
- [Without LTD](#), group estimations rise 20pp approx.
- This shows we are obtaining a lower-bound.

Results

Country

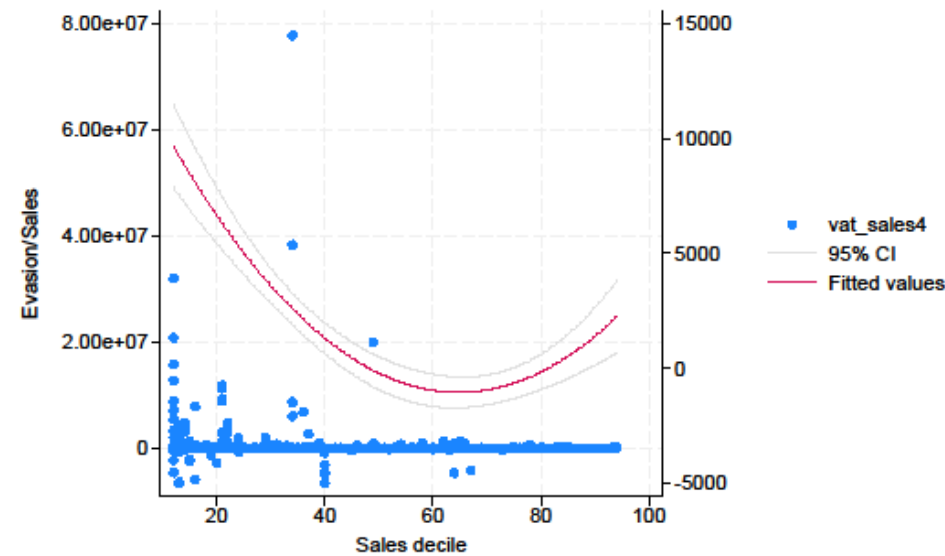
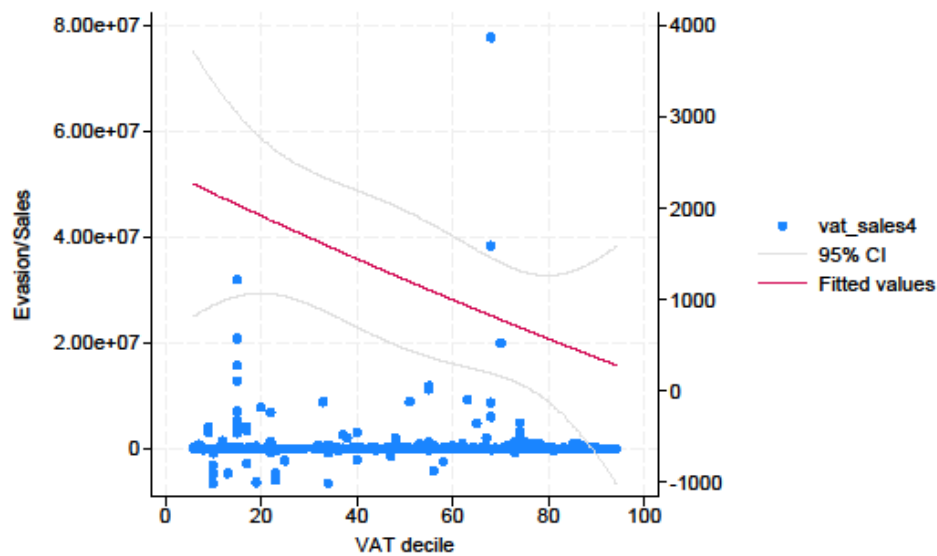


- Same patterns as before.
- Average VAT gap: 53%.

	2014	2015	2016	2017	2018	2019	Average
VAT due	28,29	19,67	18,35	12,35	8,37	10,79	16,30
VAT	63,11	57,62	54,32	48,92	44,82	49,37	53,03
VAT proxy	66,02	53,35	52,62	48,93	41,02	51,24	52,20
Output VAT	22,95	17,86	18,98	16,24	14,92	15,32	17,71

Results

Firms' Behavior



Normalizing by sales, firms evade more at the beginning of VAT declaration distribution. Regarding sales, evasion has a U-shape.

Preliminary conclusions

Results:

- Our preferred estimation shows a VAT gap of 48% for the audited tax region and 53% for the country.
- This is a lower-bound estimation.
- We document evidence that firms declare more purchases VAT to increase evasion. This produces smaller VAT declarations and mimics small-sized firms.

Policy Implications:

- VAT gap prediction needs to consider heterogeneity across VAT declaration and sales.
- Evasion is *monotonous* across VAT declaration but not across sales. Large-sized firms need attention.
- Firms are strategic agents, and auditing needs to be perceived as random as possible.

Next Steps.....

- Improve estimation of evasion:
 - Machine Learning to improve evasion predictions.
 - Model á-la-Heckman: Implicit function that determines evasion.
 - Censored model: Tobit, other? -> Evasion is censored: $y_i \geq 0$
- Study the determinants of evasion:
 - Event study design.
 - Staggered DiD.
 - Study audit and compliance probability.
- Estimate the revenue consequences of evasion.

Thank you

Sebastián Castillo Ramos

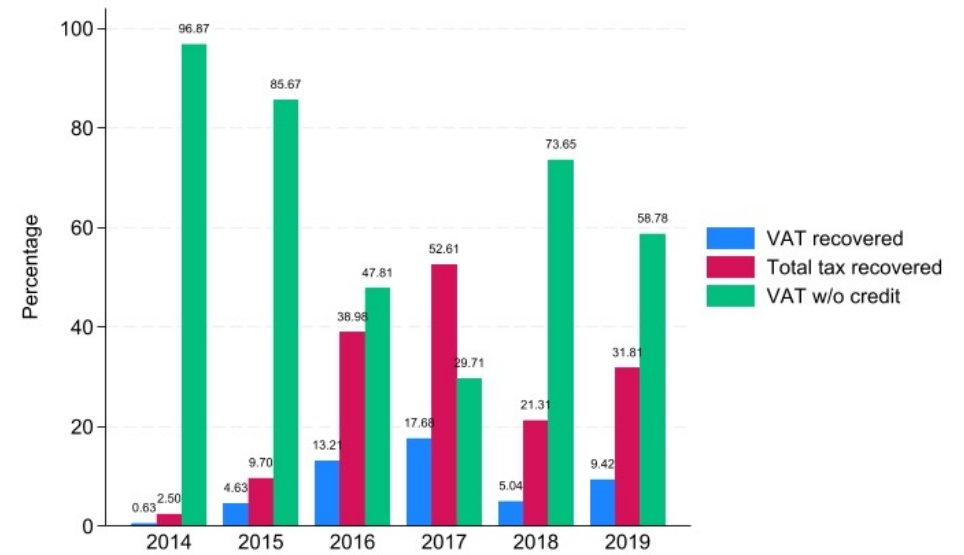
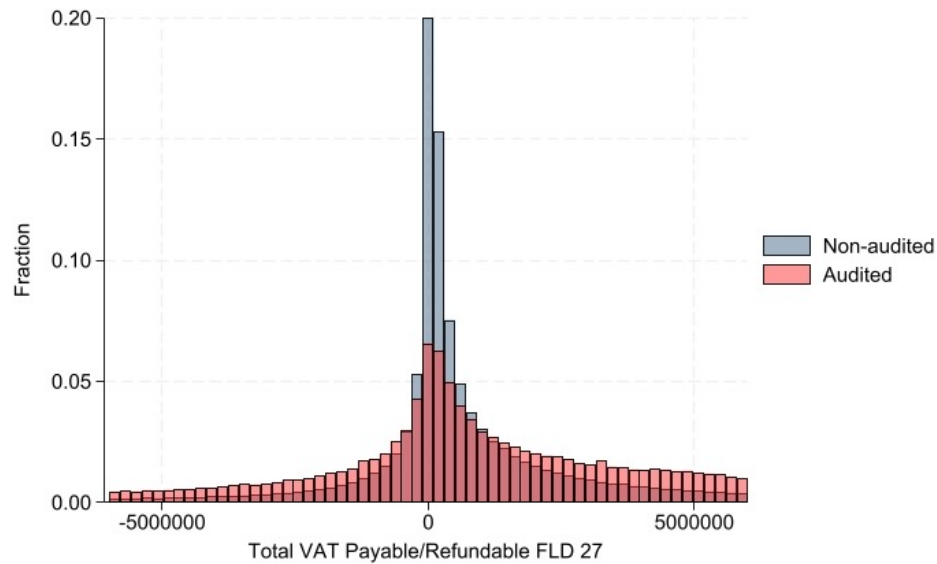
Any comments are welcome, reach me at
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Appendix



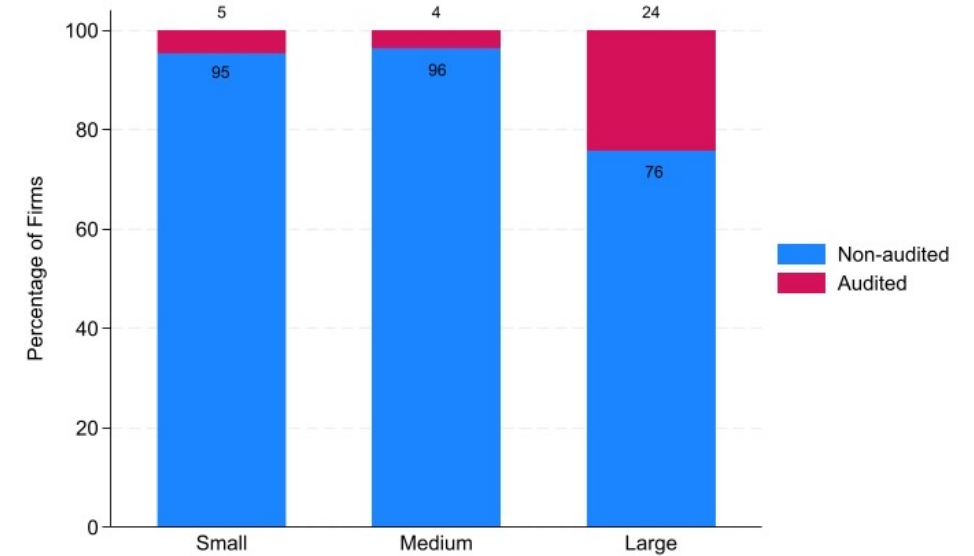
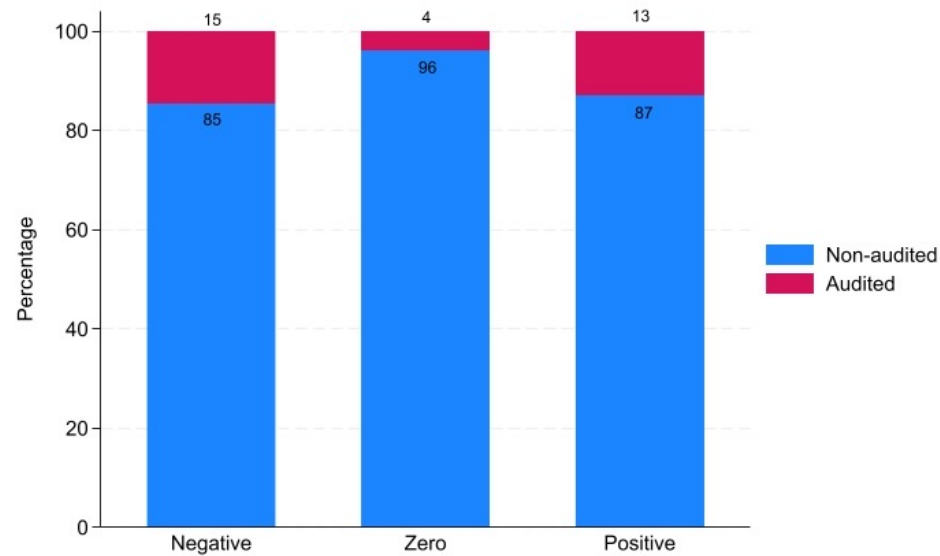
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Firms in audited and unaudited tax regions bunch around zero VAT declaration. VAT recovered is significant compared with the auditing rate (average 15%).

Preliminary Evidence

Number of firms

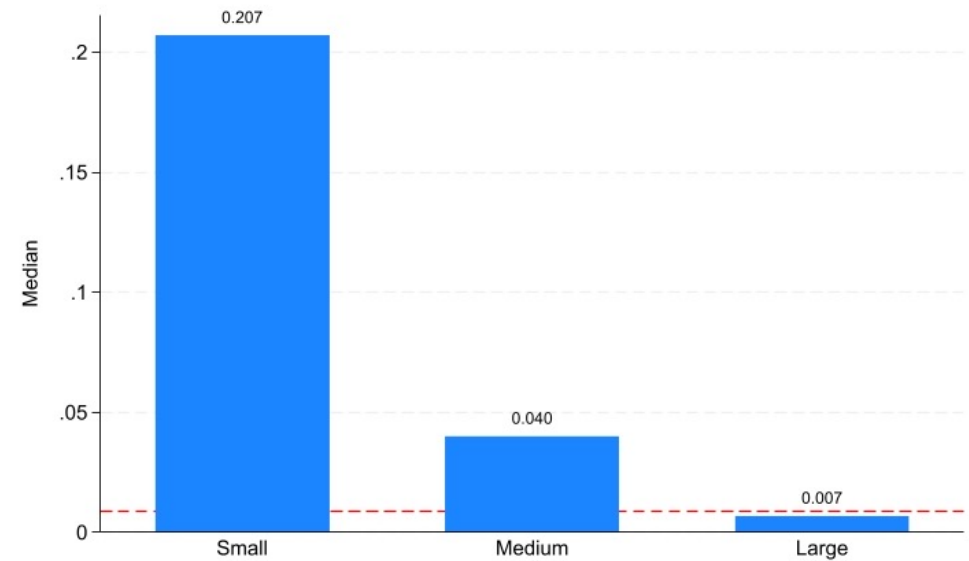
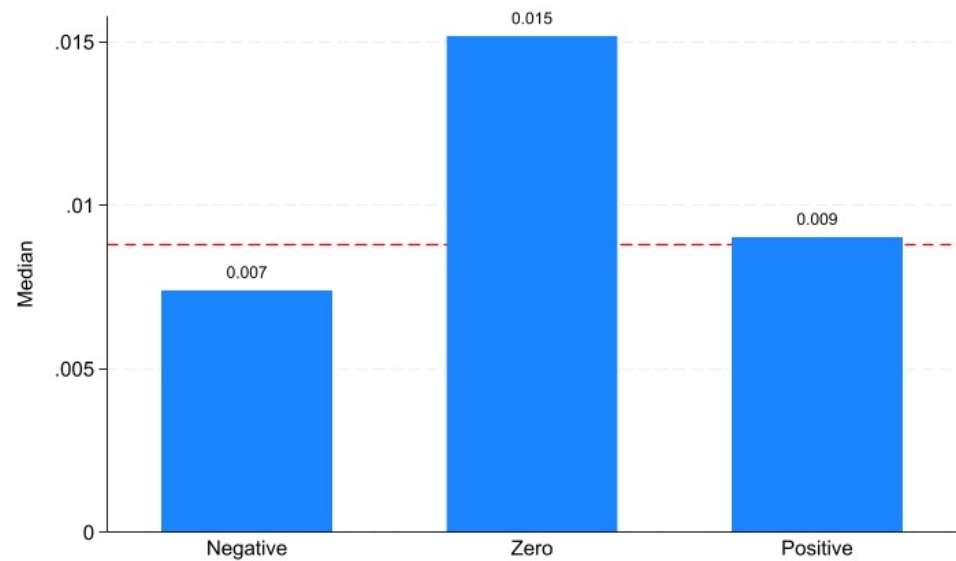


Firms with positive and negative VAT declarations and large-sized firms show more auditing processes.

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Preliminary Evidence

Evasion / Sales rate

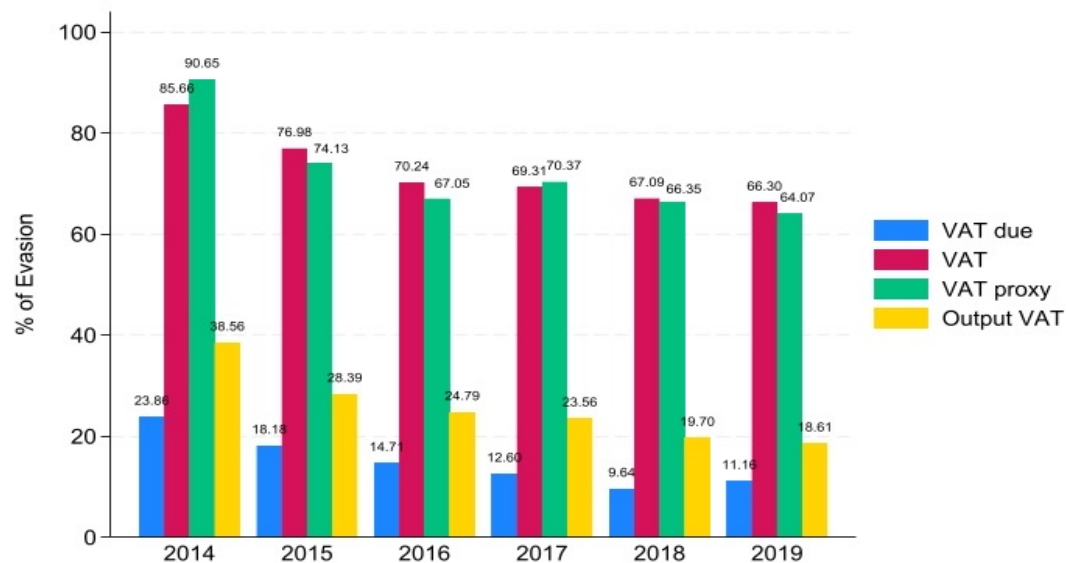


Using the rate evasion/sales, firms that bunch at zero VAT declaration and small-sized firms evade more.

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Results

Without LTD group



- Without LTD, group estimations rise 20pp approx.
- This shows we are obtaining a lower-bound.

	2014	2015	2016	2017	2018	2019	Average
VAT due	23,86	18,18	14,71	12,6	9,64	11,16	15,03
VAT	85,66	76,98	70,24	69,31	67,09	66,3	72,60
VAT proxy	90,65	74,13	67,05	70,37	66,35	64,07	72,10
Output VAT	38,56	28,39	24,79	23,56	19,7	18,61	25,60

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