Equity vs Efficiency of Indirect Taxes: Evidence from a Large VAT Cut in India

Pierre Bachas [1] Davi Bhering [2] Pulak Ghosh [3]

[1]World Bank Research
[2]Paris School of Economics
[3]Indian Institute Of Management Bangalore

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Optimal tax instruments in developing countries

1. Tax revenues dependent on indirect taxes; weak income tax capacity.
   - Indirect taxes $\approx 55\%$ of revenue (UNU-WIDER, 2019).
2. Limited coverage and progressivity of income taxes.
   - PIT only covers 1%-10% of the workforce (Jensen, 2022).

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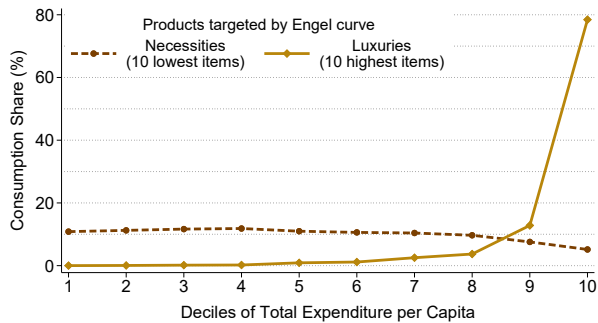
In practice: Administrative and political constraints bind income tax and transfers.

$\Longrightarrow$ **Role for differentiated commodity taxation**

Tax rate differentiation, with a twist

1. Frequent: lower necessity rate.
   - Limited targeting, further weakened by informal consumption patterns
2. Less common: higher luxury rate.
   - Strong targeting at the top

Consumption Shares in India:
Necessities vs Luxuries



Research question

Can differentiated rates for luxury goods complement a constrained tax and transfer system?

1. At what efficiency cost?
2. With what equity gains?
3. What is the optimal luxury rate differentiation given income tax and transfers?

This paper

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- Unique data: tax returns with firm-product-month sales, quantities and prices.

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  3. Initial luxury targeting was poor and could be significantly improved.
  4. Optimal luxury rate premium of 20 p.p. under current tax and transfers.

Contributions

1. Efficiency costs of indirect taxes (Pomeranz 2015; Waseem 2022; Brusco & Velayudhan 2025)
   - Estimate full set of sufficient statistics for broad set of goods: quantity and sales elasticities; extensive margin, misreporting.
   - Challenge the consensus policy view (e.g IMF Tax Policy Framework).

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2. Targeting of taxes and transfers (Hanna & Olken 2018; Benzarti & Carloni 2019; Jensen 2022; Gaarder 2022; Banerjee, Hannah, Olken & Sverdlin Lisker 2024; Benzarti, Garriga & Tortarolo 2025)
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   - + incidence on consumer prices for these goods using tax and scanner data.

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3. Optimal tax design in developing countries (Best, Brockmeyer, Kleven, Spinnewijn & Waseem 2015; Huang & Rios 2018; Londono-Velez & Avila-Mahecha 2021; Bachas, Gadenne & Jensen 2023; Tourek, Laroche, Bergeron, Naritomi, Weigel & Ngoma 2026)
   - Calibrate the optimal luxury rate differentiation in policy-relevant setting.
   - Quantify required expansion of income tax & transfers to approach A-S benchmark.

Roadmap

1. Context
2. Data and Empirical Strategy
3. Administrative Tax Data Analysis
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India's Value-Added Tax

Goods and Services Tax (GST):

- India unified federal and state-level VAT in July 2017, introducing the GST.
- GST has 5 tax rates: exempted, 5%, 12%, 18%, 28%.
  - Differentiated rates motivated by equity (GST Council Minute, 2016).
- Product: GST uses the Harmonized System Nomenclature (HSN) for classification with most rates defined at HSN-4 level (1,275 HSN-4 in total).

Rationale for the large tax cut

Reform: 10 p.p. rate reduction for most products at 28% rate on November 15th, 2017.

Motivation for the rate reduction:

- Incentive for federal government: GST as a flagship reform $\rightarrow$ strong incentive to make it simple and popular. Heated debate
- Public perception: outdated rates $\rightarrow$ many products are no longer perceived as luxury goods, consistent with consumption patterns we document.
- Incentive for states: low risk $\rightarrow$ states had guaranteed minimum revenue for 5 years.

Rate reduction in Nov 2017: large, diverse, and sudden

Large and diverse set of products with a rate reduction.

- 164 products with a rate reduction from 28% to 18%: 74% of products initially taxed at 28%, 12% of all products and 7% of all sales. Rate change matrix

Omnibus reform: alleviate concern of cherry-picking of goods with a rate reduction.

- Goods stayed at 28% due to negative externalities (e.g. cigarettes and tobacco, soda, large cars) or had a rate reduction later in July 2018 (e.g. home appliances).

Non-anticipated and sudden change:

- Meeting held on 10th of November, change effective on 15th of November.

Top 20 products with a tax rate reduction in Nov 2017

Product name (HSN)	Of treated (%)	Cumulative (%)
Make-Up	7.4	7.4
Shaving Preparations	6.9	14.3
Washing, Cleaning Or Degreasing Preparations	5.7	20.0
Hair Preparations	4.7	24.7
Rubber Articles (Gaskets, Seals, Bands)	3.8	28.5
Chocolate	3.8	32.3
Electrical Circuits (Switchers, Lamp-Holders, Fuses)	2.9	35.1
Malt Extract	2.9	38.0
Polishes And Creams	2.8	40.8
Eletrical Transformers	2.8	43.6
Insulated Electric Conductors (Wires)	2.8	46.4
Air Vacuum Pumps	2.4	48.9
Liquid Or Cream Soap	2.3	51.2
Plastic Articles (Office And School Supplies)	2.2	53.4
Mountings	2.2	55.5
Lamps	2.2	57.7
Ceramic Flags And Paving	1.9	59.6
Lighting Or Signalling Equipment	1.9	61.5
Perfumes And Toilet Waters	1.9	63.3
Furniture	1.8	65.2
Other Products	34.8	100

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Admnistrative Tax Data

Monthly VAT returns for all registered firms in Karnataka from July 2017 to March 2019.

1. Firm-product tax return (GSTR-1 Table 12): Descriptive statistics Descriptive firms
   - Mandatory above 15 million rupees in annual turnover ($\approx$ US$230,000).
   - Covers 19% of tax returns and 74% of sales.
   - Monthly product-level data on sales, quantity and tax rates.
   - Final sample: 28k firms, 260k firm-month, 2.3M firm-product-month. Sample
2. Firm tax returns (GSTR-3 and GSTR-1):
   - Use to restrict to firms selling primarily to final consumers pre-reform ($\geq 50\%$).
   - Complementary analysis including smaller firms and value-added.

Distributional analysis: Indian National Sample Survey (2012).

- Nationally representative household expenditure survey: 345 expenditure items.

Empirical Strategy

Event-study differences-in-differences at the firm-product level:

$$y_{ipt} = \sum_{t=Jul17, \neq Oct17}^{Mar19} \beta_t \cdot \text{treat}_p \times \text{month}_t + \alpha_{ip} + \gamma_{it} + \epsilon_{ipt}$$

"Standard" DiD: single treatment timing, no reversal, binary treatment (0/1).

- y_{ipt}: outcome for firm i, product p, month t (e.g., log sales).
- α_{ip} and γ_{it}: firm-product and firm-period fixed effects, respectively.
- Robust standard errors clustered at firm and HSN-4 level.

\+ Report estimates from a DiD before (Jul-Nov 17) and after (Apr 18-Mar 19).

Identification

Compare evolution of products with rate reduction from 28% to 18% (treated) to products without change taxed at 18% or 12% (control), within firms. Groups Control products

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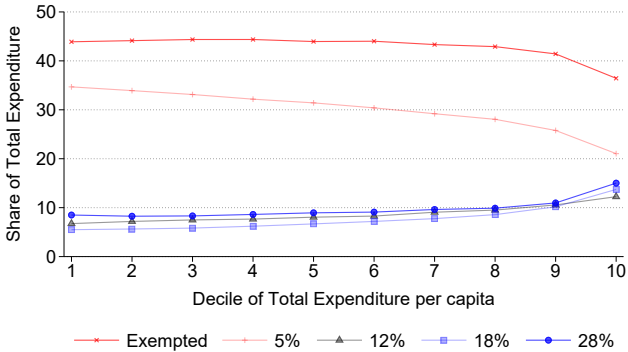
- Products taxed at 12% and 18% had similar consumption profile as those at 28%.

Share of consumption by tax rate per income decile



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- Analysis level: firm–product alleviates quality and composition shift concerns.
- Within-firm design: controls for firm-month shocks $\rightarrow$ 66% of tax returns are multi-product and 83% include a control product when a treated product is present.

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Identification assumptions:

- Parallel trends (within firm).
- SUTVA: analyze spillovers to control products across and within firms.

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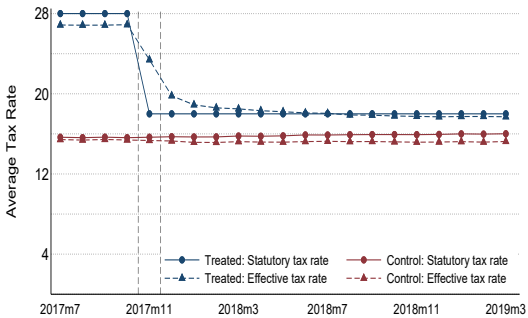
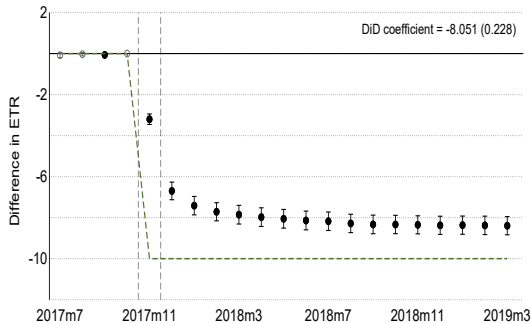
Large reduction in effective tax rates

Average statutory and effective tax rates of treated and control groups

(a) Level



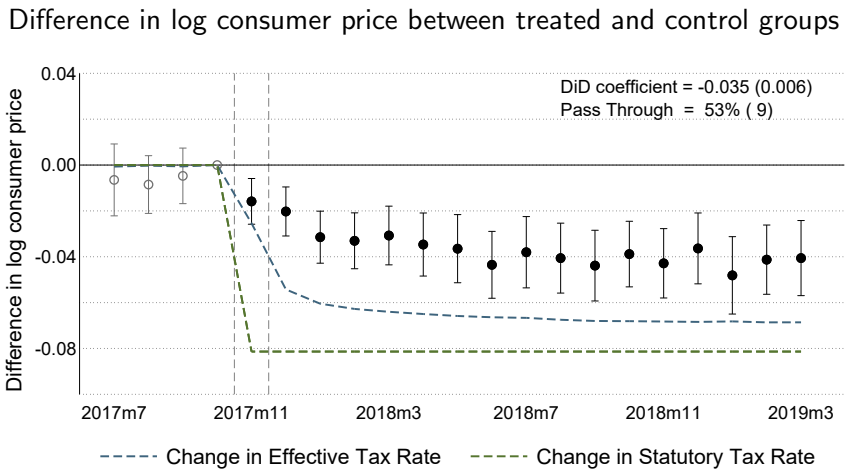
(b) Event-study



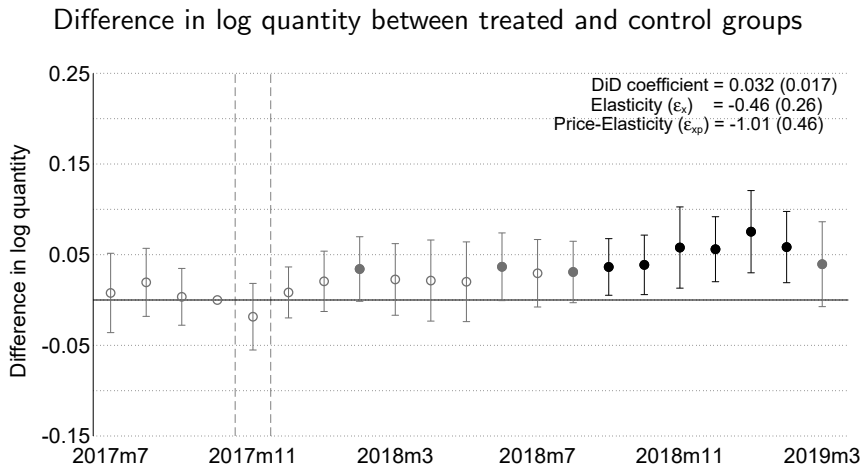
Initial gap explained by observability limitation and non-strategic mistakes:

1st stage investigation | Histogram rate changes | Non-strategic on observables

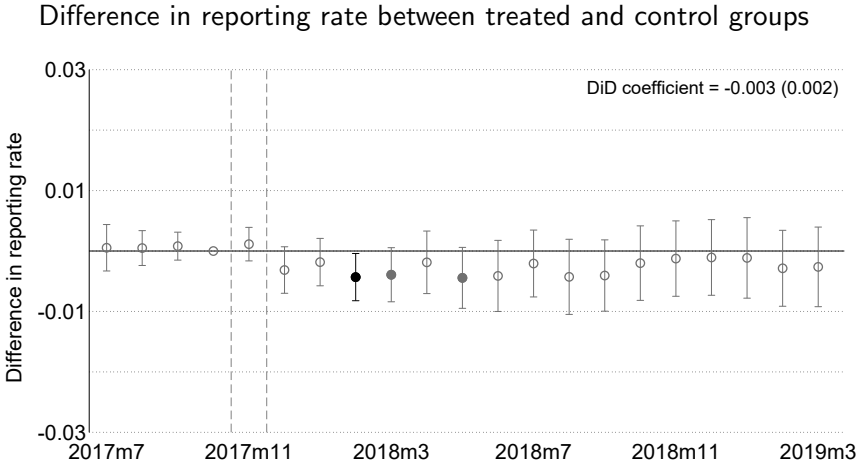
Partial pass-through to consumer prices



Modest quantity response to the tax cut ...



... and no increase along extensive margin response

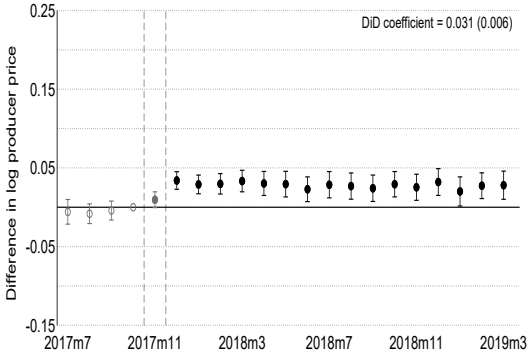


Raw level

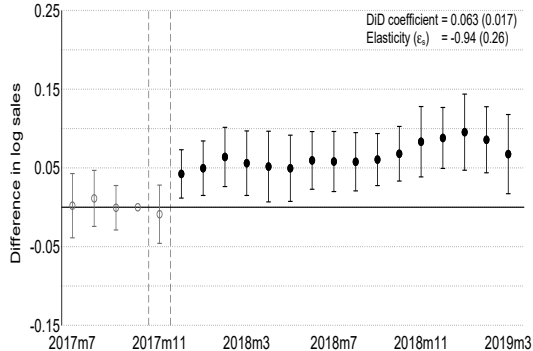
Producer prices ↑, leading to moderate ↑ in reported sales

Difference in log producer prices and sales between treated and control groups

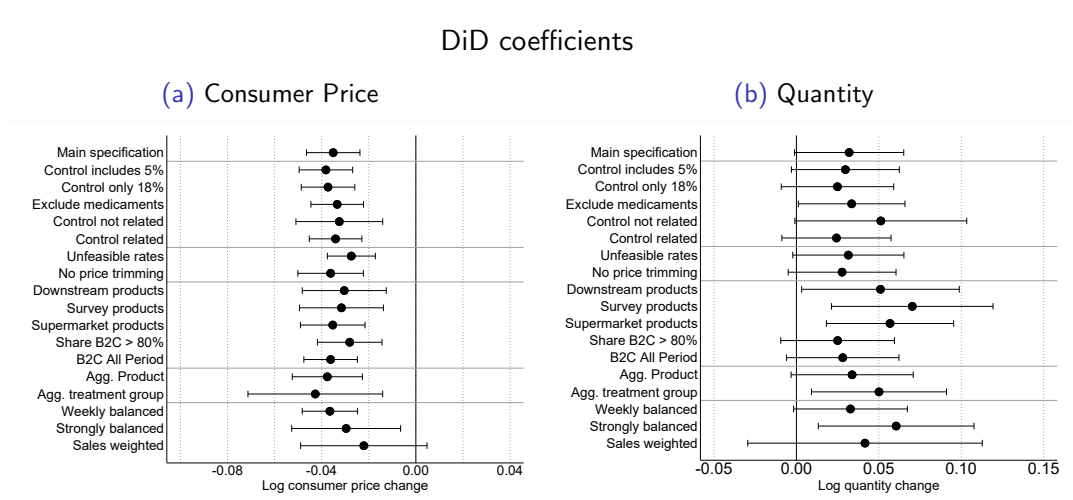
(a) Producer price



(b) Sales (pre-tax)



Results robust to control, sample and aggregation choices



Sales and Extensive margin

No evidence of mislabeling or substitution to related products

- Rate cut may reduce mislabeling or induce substitution $\rightarrow$ related products' sales $\downarrow$?
- Compare untreated products related to treated products (same HSN-2) to unrelated ones (no treated products in HSN-2) Product names

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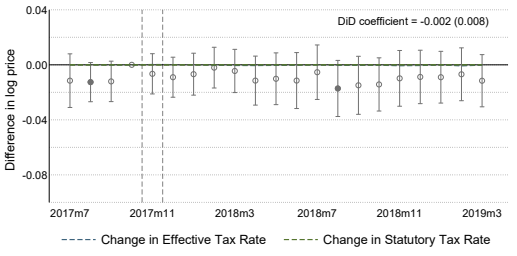
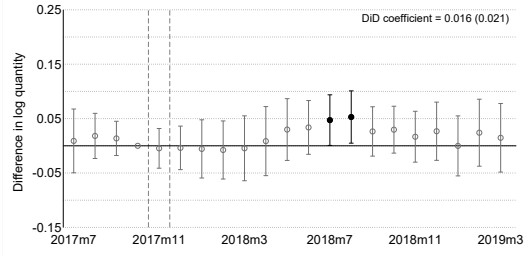
(a) Consumer Price



(b) Quantity



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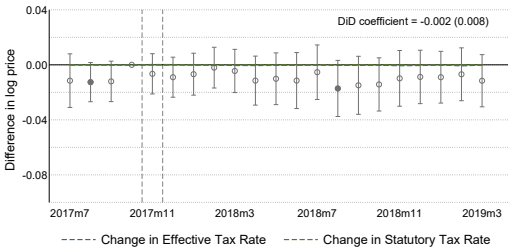

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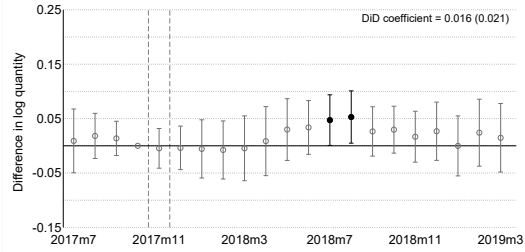

- Robust to: (i) restricting to firms selling both treated and related products; (ii) high-exposure HSN-2; (iii) LLM selection of substitutes. Table

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Complementary Analyses

Main analysis limitations: (i) only 4 pre-periods to test trends; (ii) product composition may change within firm-product; (iii) all sales are not necessarily to final consumers.

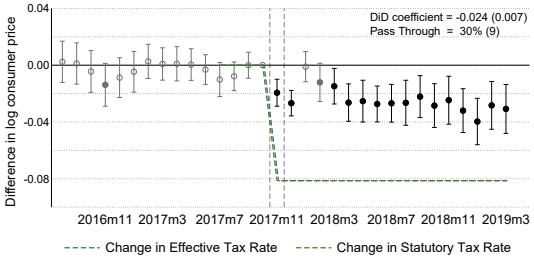
Complementary data and analysis:

1. Scanner level data from very large hypermarket chain in the state: Supermarket results
   - Many pre-periods, detailed and stable products, only sales to final consumers.
   - Lower pass-through, in line with large firms; comparable quantity elasticity.

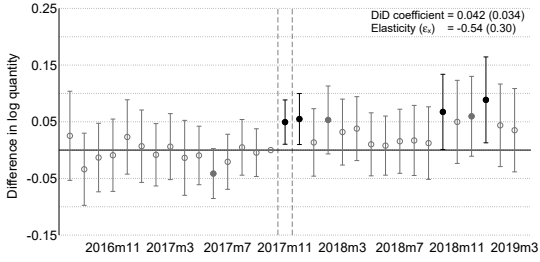
Scanner data analysis: same reform and strategy, new data

Difference in log price and log quantity between treated and control barcodes

(a) Consumer price



(b) Quantity



Initially discount only, then ↓ prices

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1. Scanner level data from very large hypermarket chain in the state: Supermarket results
2. Reform in July 2018: rate reduction of 32 products still taxed at 28%. 2018 reform
   - More distant from GST introduction.
   - Similar pass-through; slightly higher quantity elasticity.

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Complementary data and analysis:

1. Scanner level data from very large hypermarket chain in the state: Supermarket results
2. Reform in July 2018: rate reduction of 32 products still taxed at 28%. 2018 reform
3. Firm-level data: Firm-level results
   - Includes small firms and value-added as an outcome.
   - Slightly higher value-added elasticity; Small firms are more elastic.

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Revenue and efficiency cost

Revenue change

Decompose revenue raised for a small increase in t between mechanical and behavior response:

$$dR = \left(1 + \frac{t}{1+t} \cdot \varepsilon_s\right) dM$$

Given $\varepsilon_S = -0.94$ and $t = 0.28$:

$$dR = 0.79\, dM$$

One dollar of mechanical revenue loss translates into \$0.79 of actual loss (behavioral offset of \$0.21).

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Efficiency cost

Assuming quasi-linear utility (no income effect), price-taker firms, and no cross-price effect, the welfare loss is:

$$dW \;=\; -\,t\,\varepsilon_q\, dM$$

Welfare loss per dollar raised ($\varepsilon_q = -0.46,\ t = 0.28$):

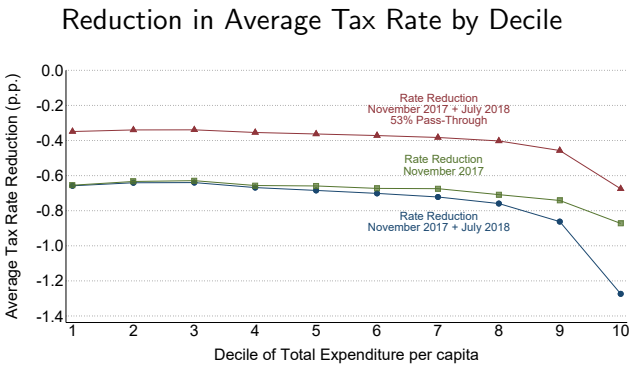
$$\frac{dW}{dR} \;=\; 0.13\,\frac{dM}{dR}$$

Hence the marginal efficiency cost per \$1 raised is \$0.13.

Tax cuts benefit all, but disproportionately the rich

- Reduction in average tax rate with partial incidence: 0.35 p.p. for bottom decile vs 0.68 p.p. for top decile.
- Initial target could be significantly improved.

Average Tax Rate | Improved Targeting

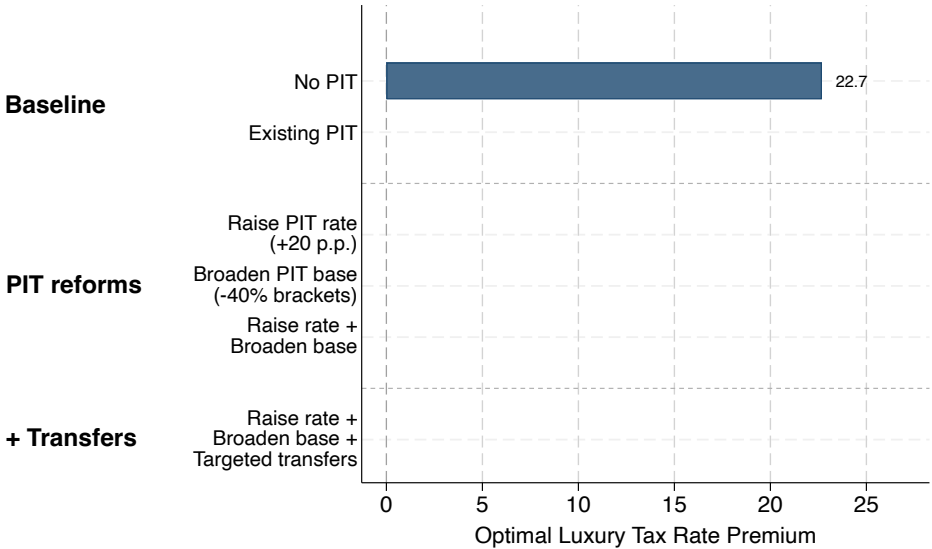


Optimal Commodity Tax Formula (Diamond, 1975)

$$\frac{t_j}{1+t_j} = \frac{1 - \int_i \frac{g^i}{\mu} a_j^i \varepsilon_j^p \, di}{\varepsilon_j^s}$$

- Elasticity of pre-tax sales wrt the tax rate (ε_j^s): estimated from reform.
  - No significant evidence that luxury goods are less elastic. Use of the interaction between Engel curve steepness and tax base elasticity.
- Pass-through (ε_j^p): estimated from reform price responses.
- Consumption share of good j for group i (a_j^i): observed in survey.
- Social welfare weights of group i (g^i): inverse of group total survey expenditure.
- Marginal utility of public funds (μ): calibrated so that the optimal rate for goods initially taxed at 18% equals 18% $\rightarrow$ allows us to focus on tax differentiation.

Optimal luxury tax premium



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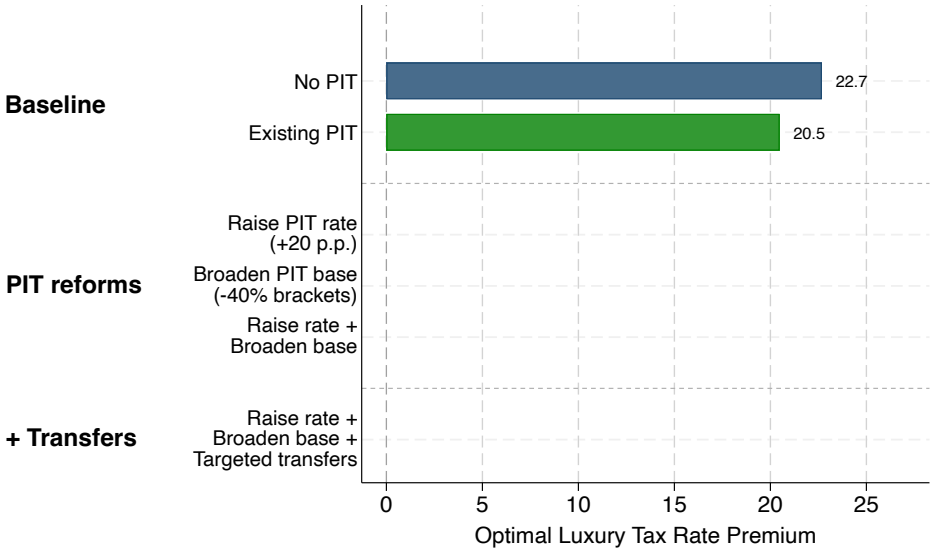

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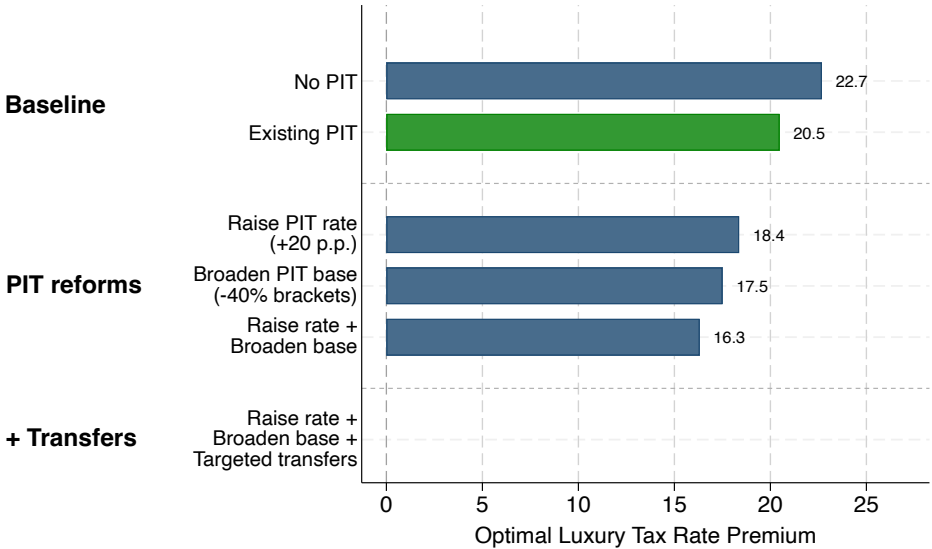

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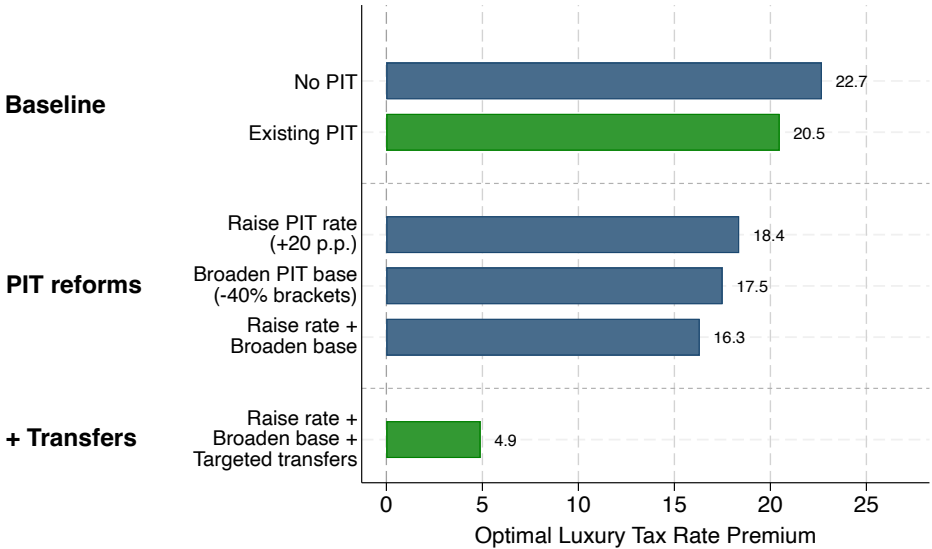

Conclusion

Establish the empirical grounds for luxury rate differentiation, to complement constrained income taxes. In our context:

1. Moderate efficiency cost.
2. Strong targeting potential, even with partial pass-through to consumer prices.

$\rightarrow$ More nuanced view, challenging "policy consensus" (based on thin evidence).

For discussion:

- External validity: equalization vs differentiation?
- External validity: reform context within GST.
- Horizontal equity and moral arguments against luxury taxation.

Thank you very much!

Heated Political Debate

Opposition leaders on GST rates

(a) Leading Congressman

(b) Former Minister of Finance

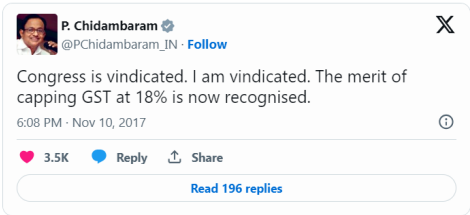

Table: Tax Rates in July 2017 and March 2020

Before \ After	0%	5%	12%	18%	28%	Total before (%)	Treated before (%)
0%	122 (10)	0 (0)	0 (0)	0 (0)	0 (0)	9 (10)	0 (0)
5%	11 (0)	267 (29)	0 (0)	0 (0)	0 (0)	20 (30)	4 (1)
12%	4 (0)	16 (0)	167 (15)	0 (0)	0 (0)	14 (16)	11 (2)
18%	1 (0)	4 (0)	33 (1)	513 (17)	0 (0)	40 (19)	7 (8)
28%	0 (0)	0 (0)	6 (0)	194 (15)	29 (11)	17 (26)	87 (57)
Total after (%)	10 (10)	21 (30)	15 (17)	52 (32)	2 (11)		
Treated after (%)	12 (6)	7 (0)	19 (10)	27 (46)	0 (0)		

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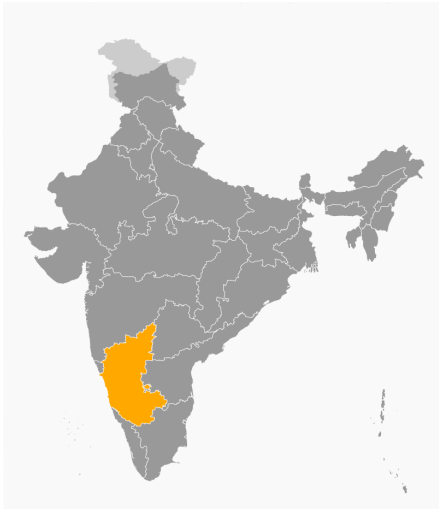
Setting: State of Karnataka



- 66 million population.
- 5th largest state by GDP.
- Above average income p.c. ($3,500).
- Capital: Bangalore (tech hub).

Table: Description of observation-level sample cleaning and restriction steps

Cleaning Step	Number of observations	Share (%)
Initial sample	12,815,721	100.0
Services	832,835	6.5
Incomplete Tax Returns		
Missing product code	361,296	2.8
Non-existant code	384,889	3.0
HSN 2-digit code	105,158	0.8
Multiple rates	154,946	1.2
No quantity	236,195	1.8
Final consumers focus		
Final consumer sales share < 0.5	5,837,308	45.5
Final consumer sales share missing	642,063	5.0
Consistency filters		
Unfeasible rate	468,690	3.7
Extreme price variation	177,652	1.4
Final sample	3,614,689	28.2
Before November 2017	469,671	-

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Table: Description of treatment and control group

	Treated	Control	All
Products	164	680	844
Firm-HSNs	133,255	316,113	449,368
Before November 2017:			
Months reported	2.05 (1.17) [2.00]	2.04 (1.16) [2.00]	2.04 (1.16) [2.00]
HSN level reported	6.29 (1.97) [8.00]	6.28 (1.97) [8.00]	6.29 (1.97) [8.00]
Final consumers sales (Firm share)	0.81 (0.15) [0.83]	0.79 (0.16) [0.80]	0.80 (0.16) [0.81]
Sales (Log value)	9.05 (2.42) [8.96]	9.00 (2.56) [8.88]	9.02 (2.52) [8.90]
Price pre-tax (Log value per unit)	5.30 (2.01) [5.07]	4.84 (2.12) [4.57]	4.98 (2.10) [4.74]
Observations	706,104	1,672,913	2,379,017

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Top 20 products in control group

Product name (HSN)	Product Code (4d)	Of control (%)	Cumulative (%)
Medicaments In Measured Doses	3004	21.9	21.9
Insecticides, Rodenticides, Herbicides	3808	6.9	28.8
Bar Soap	3401	3.4	32.2
Tubes, Pipes And Hoses Of Plastic	3917	3.4	35.6
Medical Instruments	9018	3.0	38.6
Brooms And Brushes	9603	3.0	41.5
Screws, Bolts, Nuts Of Iron/Steel	7318	2.9	44.4
Petroleum And Bituminous Oil	2710	2.6	47.0
Telephone Sets	8517	2.5	49.6
Prepared Glues And Adhesives	3506	2.5	52.1
Computers	8471	2.3	54.3
Medicaments (Not In Measured Doses)	3003	2.1	56.4
Packing And Closure Goods Of Plastic	3923	2.0	58.4
Centrifuges And Filtering Apparatus	8421	1.9	60.3
Wadding, Gauze, Bandages	3005	1.9	62.2
Household And Hygienic Articles Of Iron Or Steel	7323	1.8	64.0
Butter And Other Milk Fats And Oils	0405	1.8	65.8
Household And Hygienic Articles Of Plastic	3924	1.7	67.5
Pens	9608	1.7	69.2
Prepared Or Preserved Fruit And Nuts	2008	1.7	70.9
Other Products	-	29.1	100

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Table: Description of firms

Firms	27,081	
Firms before Nov 17	17,783	
Tax returns	248,379	
Tax returns before Nov 17	42,899	
For tax returns before Nov 17:	Mean	Median
Sales ('000 rupees)	6,770	881
Sales treated	446	0
Sales control	2,200	44
Sales excluded	4,123	137
HSNs	11.20	3
HSNs treated	2.19	0
HSNs control	5.13	1
HSNs excluded	3.87	1
Has treated product	0.42	0
Has treated product (Sales)	0.57	1
Has $>$ 1 product	0.66	1
Has $>$ 1 product (Sales)	0.89	1
Conditional on selling treated product:		
Has $>$ 1 product	0.91	1
Has $>$ 1 product (Sales)	0.99	1
Has control product	0.81	1
Has control product (Sales)	0.88	1

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Table: Description of product-level sample restrictions

Treatment Group	Products	Observations (N)	Observations share	Sales share
Totals before November 2017	1363	469,671	100	100
Treated products	164	93,970	20.0	6.7
Control products	680	220,107	46.8	32.9
Not related	332	91,287	19.4	10.0
Related	348	128,820	27.4	22.9
Other treated	104	35,987	7.7	5.7
Aug 2018	32	16,797	3.6	2.6
Other periods	18	8,582	1.8	2.2
Other rates	54	10,608	2.3	0.9
Other control	415	119,607	25.4	54.7
Rate 0% (exempted)	140	25,405	5.4	29.6
Rate 5%	246	74,867	15.9	15.4
Rate 28%	29	19,335	4.1	9.7

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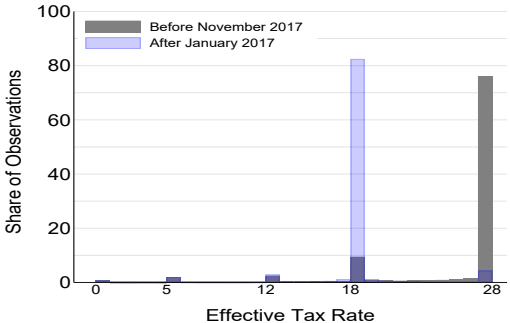
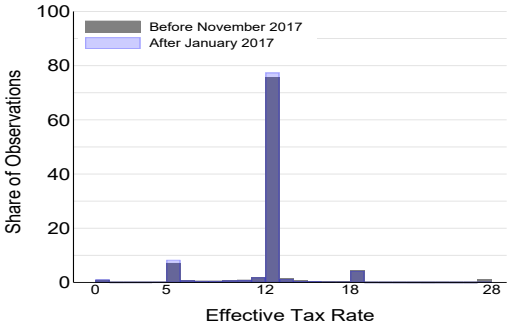
Imperfect compliance is symmetric

Histogram of effective tax rates

(a) Treated



(b) Control (12%)



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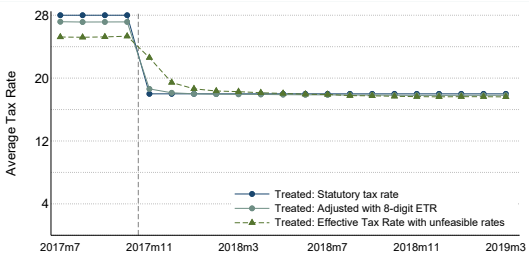
1st stage investigation

Investigation of Effective Tax Rate of Treated Products

(a) Observability



(b) B2B

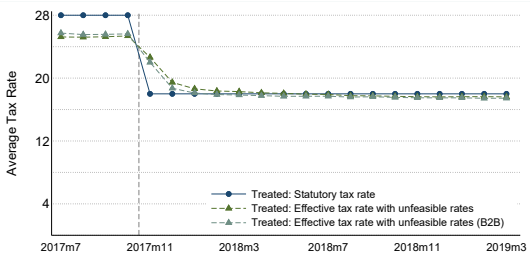


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Table: Determinants of the STR-ETR initial gap

	STR-ETR Initial Gap		
	(1)	(2)	(3)
Sales (log)	-0.137	-0.108	-0.041
	(0.052)	(0.040)	(0.033)
No. periods reported	-0.160	-0.132	-0.109
	(0.065)	(0.045)	(0.037)
Share of non-ITC sales	2.133	1.847	-
	(0.615)	(0.484)	
Bangalore urban	0.237	0.088	-
	(0.199)	(0.168)	
Lower-rated product	2.017	-	-
	(0.434)		
Reported at HSN-8	-1.678	-	-
	(0.436)		
Product FE	No	Yes	Yes
Firm FE	No	No	Yes
Observations	117,336	116,817	115,180
R^2	0.059	0.286	0.491

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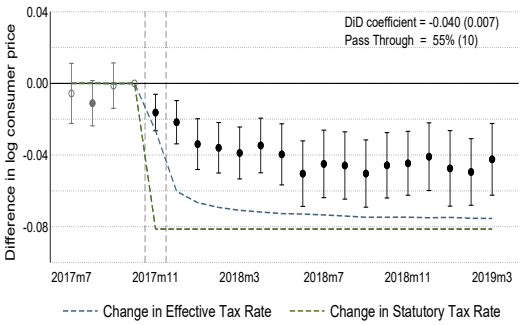
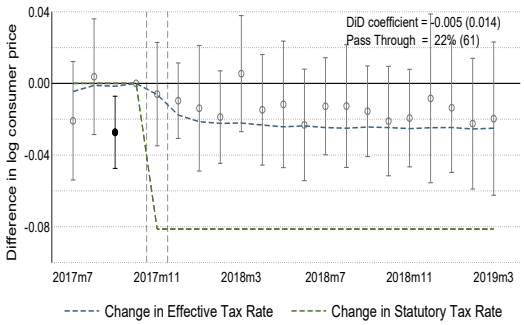
Pass-through to consumer prices: firm-product STR-ETR initial match

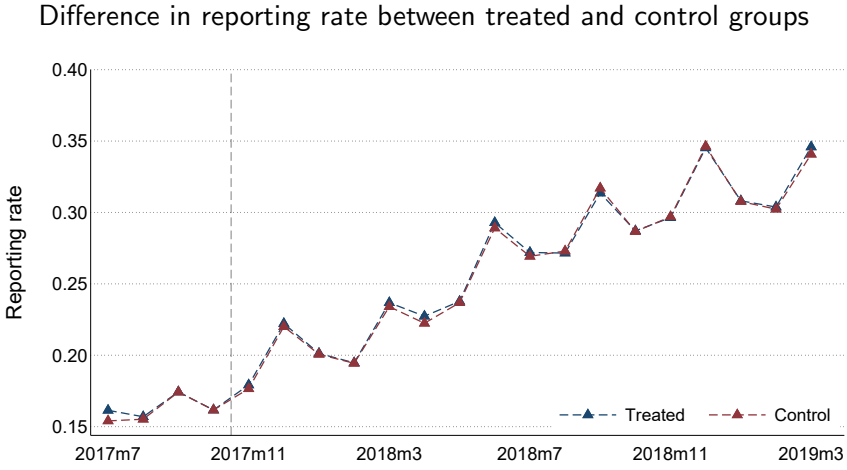
(c) Initial tax rate = 28%



(d) Initial tax rate < 28%



... and no increase along extensive margin response



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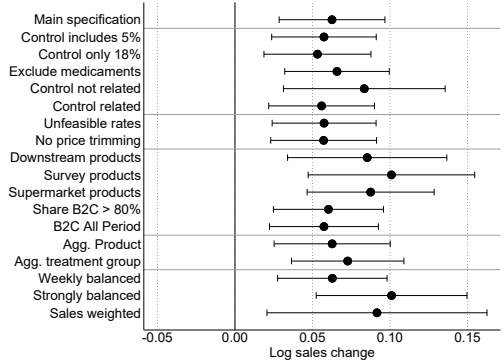
Alternative sample definitions: sales and reporting rate

(a) Sales



(b) Reporting rate

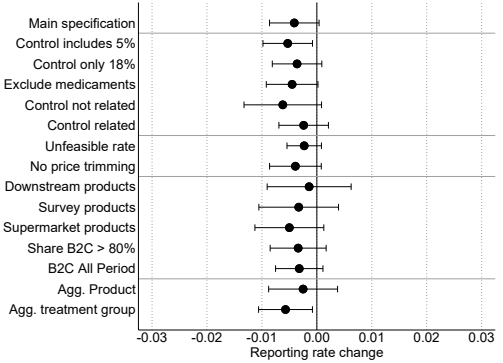


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Table: Indirect Effect of the Tax Cut

	(1) Main specification	(2) Abv. median exposure	(3) Include 5%	(4) Within firm
ETR	-0.000	-0.001	-0.001	-0.001
	(0.000)	(0.001)	(0.000)	(0.001)
Consumer Price	-0.002	-0.006	-0.014	0.004
	(0.008)	(0.010)	(0.007)	(0.010)
Quantity	0.016	0.035	-0.002	0.038
	(0.021)	(0.025)	(0.018)	(0.026)
Sales	0.014	0.030	-0.015	0.043
	(0.020)	(0.023)	(0.017)	(0.023)
Reporting Rate	-0.002	-0.002	-0.003	-0.009
	(0.002)	(0.003)	(0.002)	(0.005)
N	1,517,273	1,036,135	2,036,713	900,925
N (extensive)	6,551,685	4,490,388	8,548,113	3,501,876

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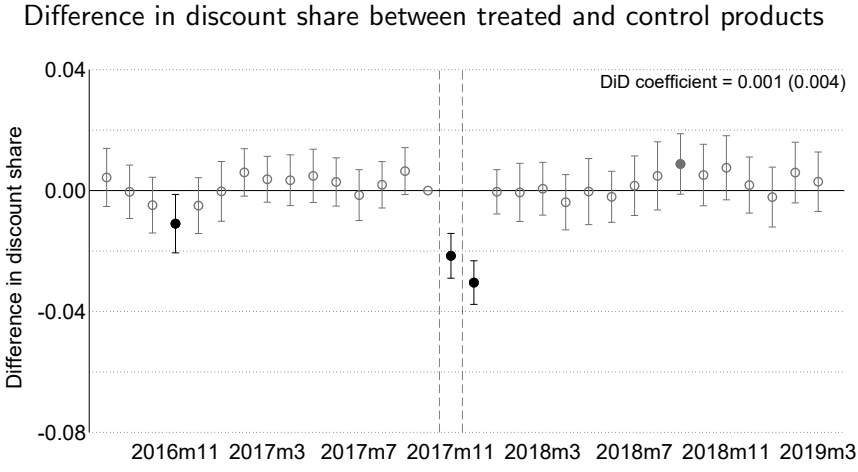
Hypermarket chain is strategic: discount only, then ↓ prices



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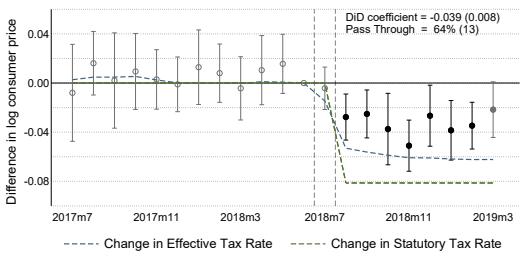
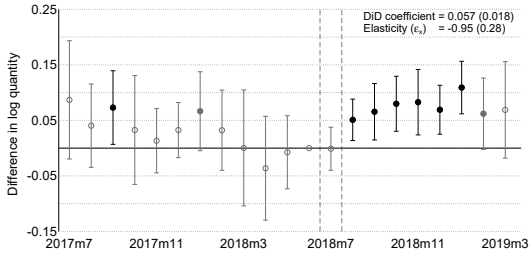
Reform in 2018: remaining products reduced from 28% to 18%

Difference in log consumer price and quantity between treated and control products

(a) Consumer price



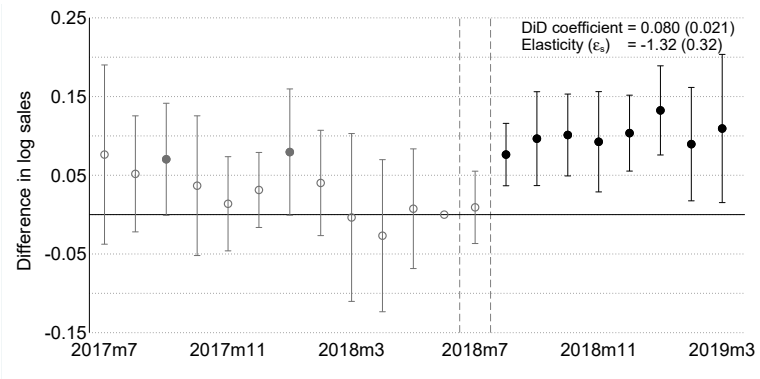
(b) Quantity



Sales Back

Reform in 2018: remaining products reduced from 28% to 18%

Difference in log sales between treated and control products



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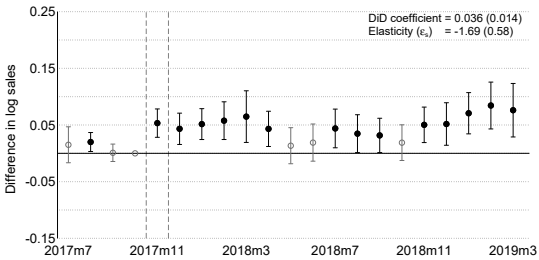
Firm-level returns: sales and value-added

Difference in log sales and value-added
between treated and control firms

(a) Sales



(b) Value-Added

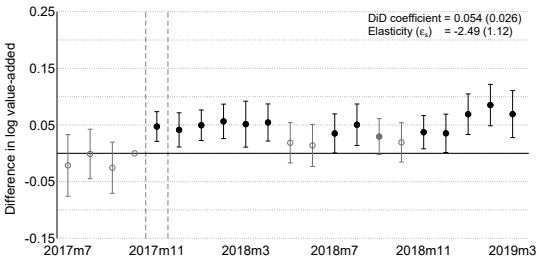
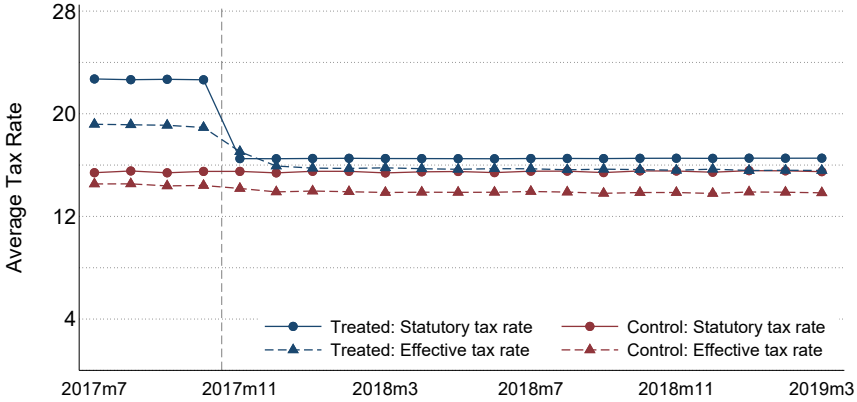


Figure reconciliation ETR Back

Firm-level returns: statutory and effective tax rates

Average statutory and effective tax rate for treated and control firms



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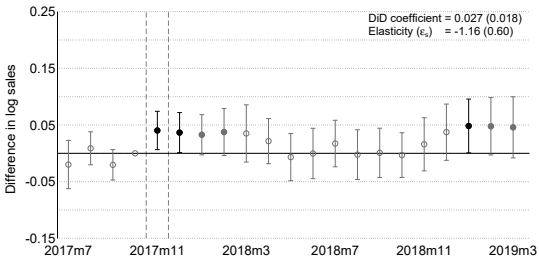
Firm-level returns: sales and value-added (reconciliation)

Difference in log sales and value-added
between treated and control firms with firm-product returns

(a) Sales



(b) Value-Added

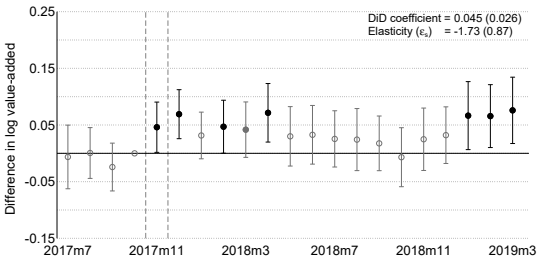


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Table: Main Treated and Related Product per HSN-2

HSN-2	Treated product	HSN-4	Related product	HSN-4	Share of treated sales HSN-2	Share of related group
38	Organic Solvents	3814	Insecticides, Rodenticides, Herbicides	3808	5.5	7.2
34	Washing, Cleaning Or Degreasing Preparations	3402	Liquid Or Cream Soap	3401	46.1	3.6
90	Equipment For Photographic	9010	Medical Instruments	9018	8.0	3.4
39	Plastic Articles (Office And School Supplies)	3926	Tubes, Pipes And Hoses Of Plastic	3917	24.5	3.0
96	Lighters	9613	Brooms And Brushes	9603	1.8	2.7
73	Sanitary Ware Of Iron/Steel	7324	Screws, Bolts, Nuts Of Iron/Steel	7318	0.7	2.5
84	Air Vacuum Pumps	8414	Computers	8471	15.5	2.4
85	Electrical Circuits (Switchers, Lamp-Holders, Fuses)	8536	Telephone Sets	8517	17.6	2.0
19	Malt Extract	1901	Bread, Pastry, Cakes, Biscuits	1905	18.5	1.6
40	Rubber Articles (Gaskets, Seals, Bands)	4016	Tubes, Pipes And Hoses Of Rubber	4009	13.3	1.2
83	Mountings	8302	Padlocks And Locks	8301	59.3	1.1
33	Make-Up	3304	Dental Hygiene Preparations	3306	83.1	1.1
48	Wallpaper	4814	Paper And Paperboard Cut	4823	1.0	1.1
68	Worked Monumental Or Building Stone	6802	Abrasive Powder Or Grain	6805	94.7	1.0
17	Sugar Confectionery	1704	Sugars, Sugar Syrups, Artificial Honey, Caramel	1702	0.4	0.9
21	Extraxts Of Coffee	2101	Sauces And Mixed Condiments	2103	5.8	0.8
76	Roofs, Dors And Windows	7610	Table, Kitchen Or Household Articles Of Aluminium	7615	0.4	0.8
82	Razors	8212	Hand Tools (Blow Lamps, Clamps, Anvils)	8205	21.6	0.7
32	Painters' Colours	3213	Synthetic Organic Colouring Matter	3204	4.0	0.6
95	Festive Articles	9505	Wheeled Toys And Dolls	9503	0.6	0.5
70	Mirrors	7009	Glassware For Kitchen, Toilet, Office, Decoration	7013	32.8	0.5

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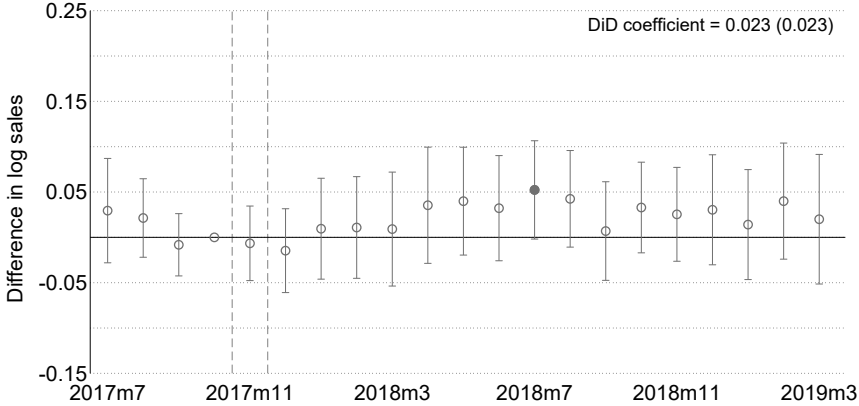
No substitution/re-labeling to close products

Difference in log sales between related products and pure control group



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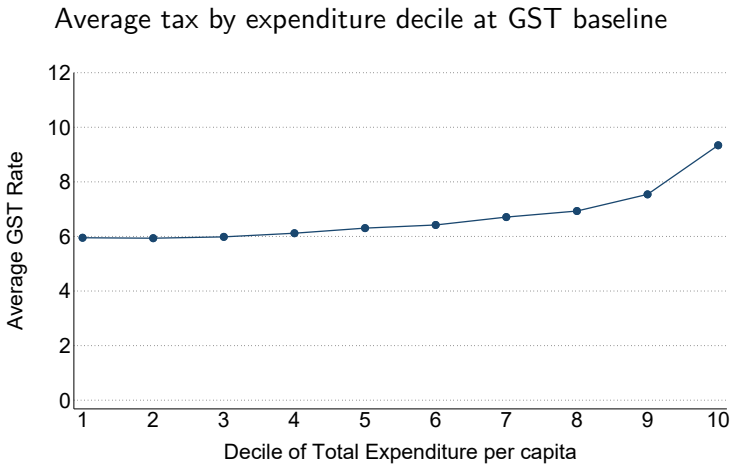
Initial average tax rate



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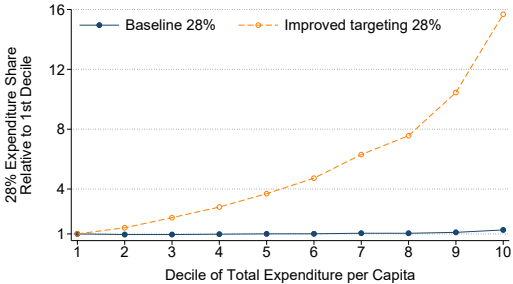
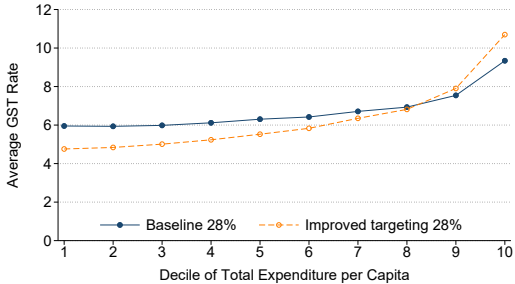
Targeting can significantly increase progressivity

- Better targeting goods taxed at 28% can improve progressivity while maintaining the consumption share taxed at 28% at its initial level of 4.7%.

(a) 28% rate expenditure (1st decile = 1)



(b) Average Tax Rat



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