

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

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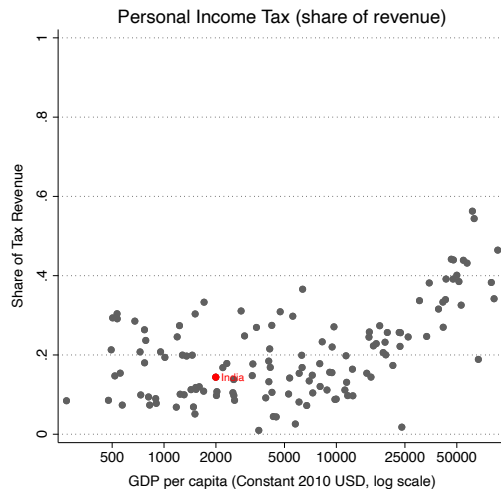
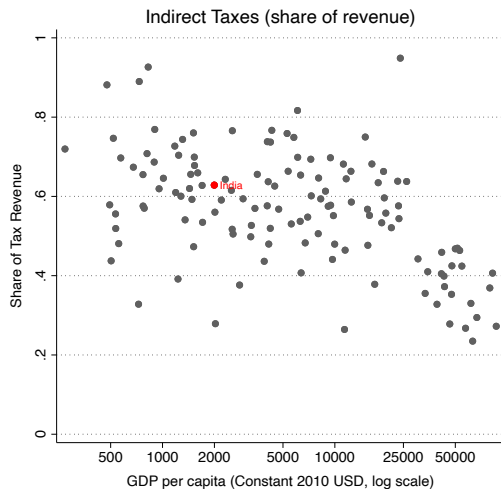
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Indirect tax collection is larger than PIT in EMDEs



N=131 countries, Data for 2018 from Bachas, Jensen, Fisher-Post & Zucman (2022).

Tax to GDP ratio

Indirect taxation and tax progressivity

Many countries tax system characterized by:

1. Strong reliance on indirect taxes and low personal income tax collection.
2. Low tax progressivity: PIT often covers less than 10% of active population (Jensen 2022)

Atkinson & Stiglitz (1976) show that differentiated indirect tax rates are not part of optimal tax mix when a non-linear personal income tax can be applied to all households ...

..but recognize that it is unlikely to apply when income is hard to observe → optimal tax design then involves **differentiated commodity taxes**

- ▶ To benefit poorer households: lower rates on essential goods
 - ▶ suboptimal if can target cash transfers & with large informal consumption by the poor
- ▶ To collect revenue from richer households: **higher rates on non-essential goods**

Questions

1. To what extent can indirect commodity taxes raise progressivity?
2. At what efficiency cost?
3. What is the optimal design of differentiated commodity tax rates?

Timely analysis: September 2025 reform unified the system further (kept 5% and 18% rate) but also introduced "de merit/luxury" rate of 40%

Setting: India's Goods and Services Tax, November 2017 reform

- ▶ Large reform: 10 pp cut in VAT rate for 125 non-essential goods (HS-4) in November 2017
- ▶ Data: tax returns with firm-product-month sales, quantities and output tax.
 - ▶ all GST firms in Karnataka with annual sales above 15 million rupees ($\approx$ US\$230,000).
 - ▶ Differences-in-differences at firm-product-level
- ▶ Complemented with several datasets to paint fuller picture:
 - ▶ Scanner data from large supermarket chain
 - ▶ Total monthly sales for smaller firms
 - ▶ Second reform in 2018 for some products still taxed at 28%
- ▶ Optimal differentiated commodity taxation
 - ▶ Household survey to measure consumption patterns by income

Key Results

1. partial pass-through of tax cut to consumer prices (40-50%), in line with literature
2. Moderate efficiency gains of lowering VAT rates on non-essential goods:
 - ▶ No extensive margin response (new firms or firms previously not selling products)
 - ▶ No evidence of re-labeling of related products
 - ▶ Moderate changes to quantity reported of goods sold & sales of those goods: elasticities $\epsilon_q \approx -0.30$, $\epsilon_{sales} \approx -0.50$

⇒ Points to inelastic demand by consumers & adequate compliance at baseline

3. Tax design and policy:
 - ▶ Behavioral response only offsets 10% of revenue loss from tax cut
 - ▶ Effective tax rate reduction: 0.15% for bottom decile vs 0.35% for top
 - ▶ Optimal assignment of products to tax rates could substantially raise progressivity

⇒ In this context differentiated rates on non-essential goods are fairly progressive, at low efficiency cost. Role to complement constrained income tax?

Data

1. Monthly VAT returns for all registered firms in Karnataka from July 2017 to March 2019.
 - ▶ **Firm-product tax return:**
 - ▶ Monthly product-level data on sales, quantity and output taxes
 - ▶ Mandatory above 15 million rupees in annual turnover ($\approx$ US\$230,000)
 - ▶ Covers 30% of VAT registered firms, 51% of sales, 77% of taxes remitted
 - ▶ Firm tax return:
 - ▶ Total sales, B2B vs B2C sales, input credits ($\rightarrow$ value-added).
 - ▶ Registration form with main products sold by firm
 - ▶ Mandatory above 10 million rupees in annual turnover ($\approx$ \$150,000)
2. Scanner data: large supermarket chain, barcode level transactions, August 2016-March 2019.
3. Distributional analysis: Indian National Sample Survey (Round 68, year 2012).
 - ▶ Nationally representative household consumption survey: 345 expenditure items.

Empirical Strategy

Product Groups:

- ▶ Treated: rate cut from 28% to 18% in November 2017 for HS-4 products (125 goods)
- ▶ Control: HSN-4 products without a rate change, taxed at 12% or 18% (498 goods)
- ▶ Not included: exempted, 5%, always 28% or with other rate changes (653 goods) [other products](#)

Identification:

- ▶ Compares evolution of products with 10 pp rate cuts vs without, within firm
- ▶ Assumptions: parallel trends + no spillovers
- ▶ “Standard” DiD: one treatment period, no treatment reversal, 0/1 treatment

Implementation:

- ▶ Interested in final consumption (B2C rather than B2B): [Details](#)
 - ▶ Keep firms that are majority B2C (baseline B2C sales share > 50%).
- ▶ Unit and product level detail: keep at the level reported by the firm [Details](#)
- ▶ Unbalanced panel at firm and firm-product level: study firm and firm-product entrance & exit

Top 20 HS-4 products with a tax rate reduction

Product name (HSN)	Product Code (4d)	Of treated (%)	Cumulative (%)
Make-Up	3304	13.1	13.1
Washing, Cleaning Or Degreasing Preparations	3402	8.8	21.9
Plastic Articles (Office And School Supplies)	3926	5.9	27.8
Chocolate	1806	5.4	33.2
Rubber Articles (Gaskets, Seals, Bands)	4016	5.1	38.3
Insulated Electric Conductors (Wires)	8544	4.7	42.9
Electrical Circuits (Switchers, Lamp-Holders, Fuses)	8536	4.5	47.5
Polishes And Creams	3405	4.1	51.5
Mountings	8302	3.3	54.9
Perfumes And Toilet Waters	3303	3	57.9
Lighting Or Signalling Equipment	8512	2.5	60.4
Ceramic Flags And Paving	6907	2.4	62.8
Mattress Supports	9404	1.9	64.7
Baths And Sinks	3922	1.7	66.4
Batteries	8506	1.7	68.1
Sanitary Fixtures	6910	1.7	69.7
Inner Tubes	4013	1.6	71.3
Painters' Colours	3213	1.4	72.7
Razors	8212	1.4	74.1
Organic Solvents	3814	1.2	75.4
Other Products	-	24.6	100

Table Control

Roadmap

1. Main Analysis

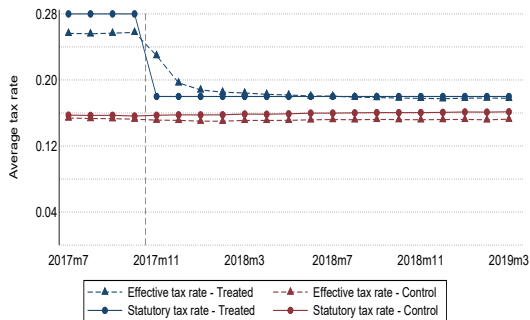
2. Results: Further Analysis and Robustness

3. Tax Design and Policy Implications

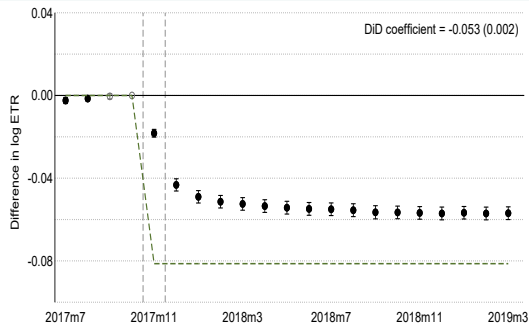
1st stage: Large reduction in effective tax rates at firm-product level

Average statutory and effective tax rates (firm-product level unweighted)

(a) Level

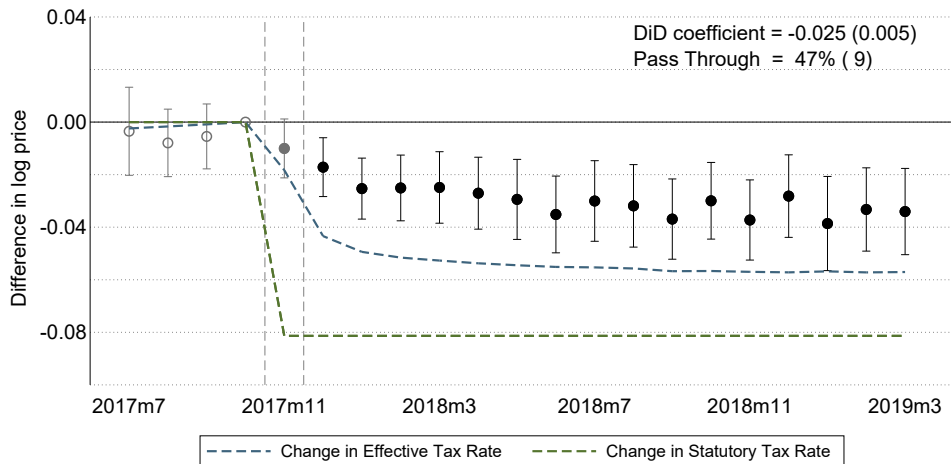


(b) Event-study

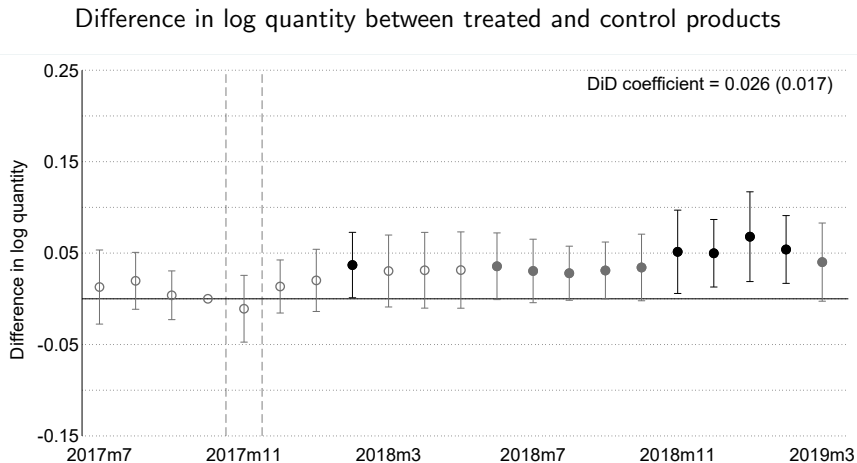


Partial pass-through to consumer prices (After-tax at counter price)

Difference in log consumer price between treated and control products



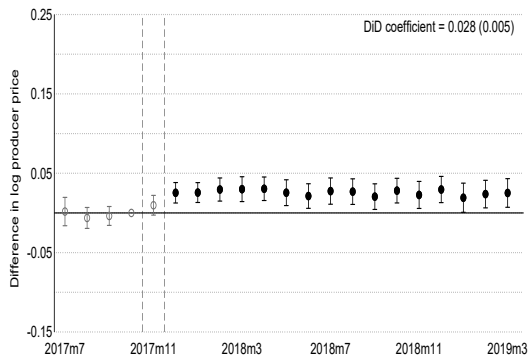
Modest impact on quantities sold of treated products ...



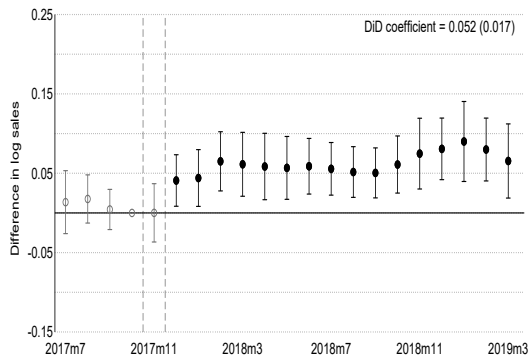
Producer prices $\uparrow \Rightarrow$ 5-6% $\uparrow$ in reported sales value

Difference in log producer prices and sales between treated and control groups (firm-product level)

(a) Producer prices



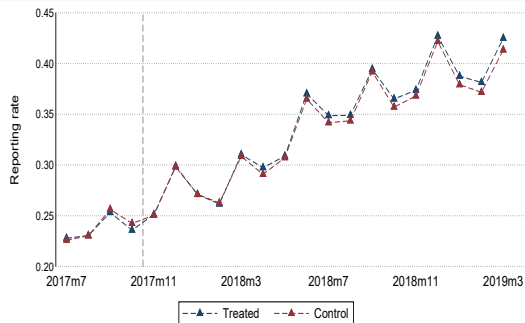
(b) Sales



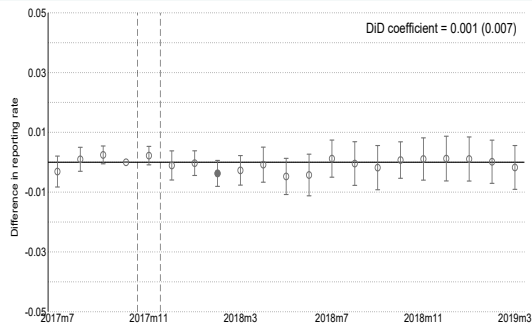
... and no extensive margin response

Difference in reporting rate between treated and control products (firm-product level) - Create balanced panel of all products ever sold by firm

(a) Level



(b) Event study



Roadmap

1. Main Analysis

2. Results: Further Analysis and Robustness

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Further analysis: alternative data and reforms

Limitations of firm-product tax data:

- ▶ Only have 4 full pre-periods to test trends
- ▶ All sales are not B2C
- ▶ When firms report products at HS-4 it remains coarse (different products?)

Complementary strategies:

1. Scanner level data: same reform, many pre-periods, barcode level Supermarket results
2. Reform in August 2018: different timing and many pre-periods. 2018 results
3. Firm-level data: results on firms' sales covering smaller firms, based on firm-level tax returns and firms' initial product registration. Firm-level results

(1) Supermarket scanner level data

Scanner level data from one of the largest supermarket chains in the state:

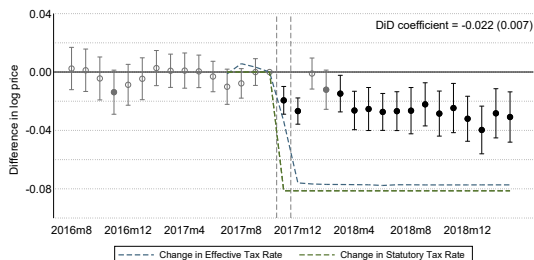
- ▶ Detailed products: barcode level
(e.g Heinz Tomato Ketchup 200 Gm Bottle, Nivea Mens Deo Sport 150 MI).
- ▶ Longer pre-trends: data starts in August 2016.
- ▶ Sales to final consumers
- ▶ Full baseline compliance

Empirical Specification

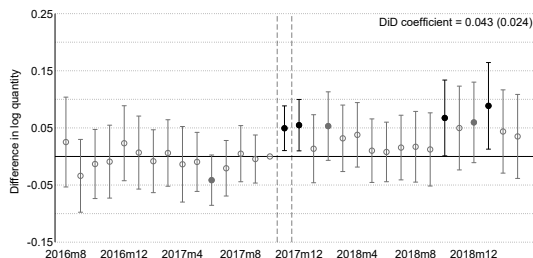
Scanner data: consumer prices fall by similar magnitude as tax data

Scanner data: difference in log price and log quantity between treated and control products

(a) Log consumer price



(b) Log quantity



Initially discount only, then ↓ prices

Back: Further Analysis

Further analysis: alternative data and reforms

1. Scanner level data → qualitatively similar results
2. Reform in August 2018
→ qualitatively similar results, slightly $\uparrow \epsilon_q$ 2018 results
3. Firm-level returns: covers smaller firms, Value-Added & B2C sales
→ $\epsilon_{sales,IV} \approx *2$ Firm-level
4. **Mislabeling/substitution to related products**
5. Heterogeneity by products, size of informal sector, firm size

Potential impact on products related to the treated products

1. **With multiple rates, potential for misreporting: frequent concern for policymakers**

- ▶ Firms might mislabel a product's HSN digits to claim lower rate
- ▶ The reform reduced tax rate gaps, lowering the incentive for mislabeling

2. Cross-price elasticities: consumers substitute to cheaper goods

Hypothesis 1: reduction in sales of products related to treated ones

- ▶ Data-driven operationalization: products sharing HS-2 defined as “related”; products not sharing HS-2 “control”

Hypothesis 2: reduction in the sales of related products proportional to exposure

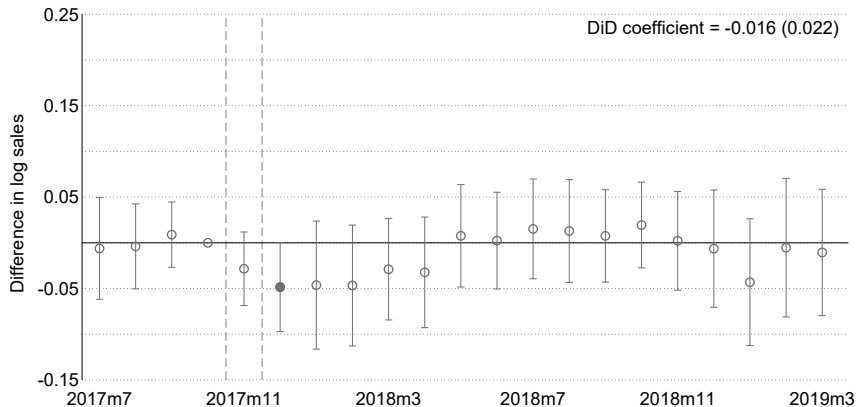
- ▶ (1) Could operate at any level, but with more treated products easier to mislabel (?)
- ▶ (2) Depends on the share of treated products' sales within 2-digit HSN (& degree of substitutability/complementarity, harder to measure)
- ▶ ⇒ Subset analysis based on sales share of treated products within HSN 2-digit at baseline

Main substitute product per treated product (Within HS-2)

Treated product (HS-4)	Related product (HS-4)	Treated sales share in 2-digit HSN	Related product share in substitutes
Organic Solvents	Insecticides, Rodenticides, Herbicides	5	7.7
Instruments For Demonstrational Purposes	Medical Instruments	8	3.9
Lighters	Brooms And Brushes	2	3.4
Plastic Articles (Office And School Supplies)	Tubes, Pipes And Hoses Of Plastic	24	3.2
Sanitary Ware Of Iron/Steel	Screws, Bolts, Nuts Of Iron/Steel	1	3.2
Gaskets And Joints Of Metal (Combined Or Layered)	Computers	5	2.5
Mountings	Padlocks And Locks	61	1.5
Rubber Articles (Gaskets, Seals, Bands)	Tubes, Pipes And Hoses Of Rubber	14	1.5
Insulated Electric Conductors (Wires)	Monitors, Projectors And Tv Receivers	12	1.5
Wallpaper	Paper And Paperboard Cut	1	1.4
Articles Of Cement	Abrasive Powder Or Grain	23	1.1
Make-Up	Essential Oils	48	.8
Razors	Hand Tools (Blow Lamps, Clamps, Anvils)	21	.8
Fairground Amusements	Wheeled Toys And Dolls	0	.8
Painters' Colours	Synthetic Organic Colouring Matter	3	.8
Safety Glass	Glassware For Kitchen, Toilet, Office, Decoration	25	.6
Washing, Cleaning Or Degreasing Preparations	Candles, Tapers	43	.4
Watches	Alarm Clocks, Wall Clocks	92	.3
Plywood	Wood Sawn Or Chipped Lengthwise	22	.3
Mattress Supports	Medical Furniture	12	.2

Limited re-labeling/substitution to related products

Difference in log sales between related products and “pure” control products



Roadmap

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Revenue raised and efficiency cost

Revenue change

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

$$dR = \underbrace{dS \cdot \tau}_{dB} + \underbrace{d\tau \cdot S}_{dM} = (1 - \varepsilon_S \tau) dM$$

Given $\varepsilon_S = 0.54$ and $t = 0.18$:

$$dR = 0.90 dM$$

For \$1 the government intends to raise (lose) it actually raises (loses) \$0.90.

Efficiency cost

Assuming quasi-linear utility (no income effect), price-taker firms, and no cross-price elasticities (no distortion in other markets), the welfare loss from a tax change is

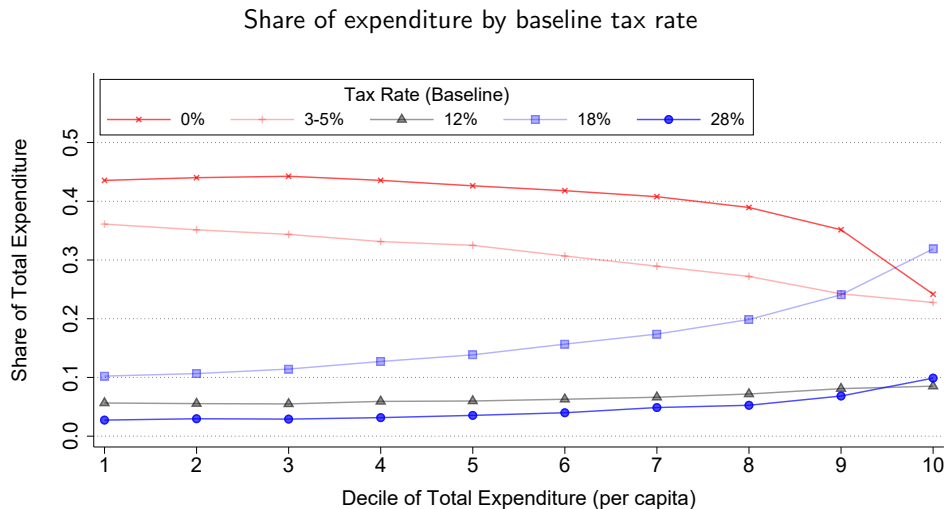
$$dW = -t \varepsilon_q dM$$

Welfare loss per dollar raised ($\varepsilon_q = 0.26$, $t = 0.18$):

$$\frac{dW}{dR} = 0.047 \frac{dM}{dR}$$

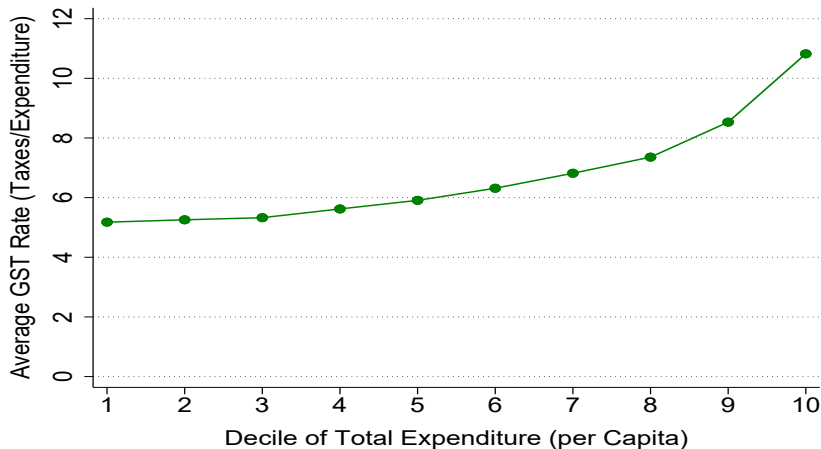
Hence the marginal efficiency cost per \$1 raised is \$0.05.

Baseline tax rates were fairly progressive



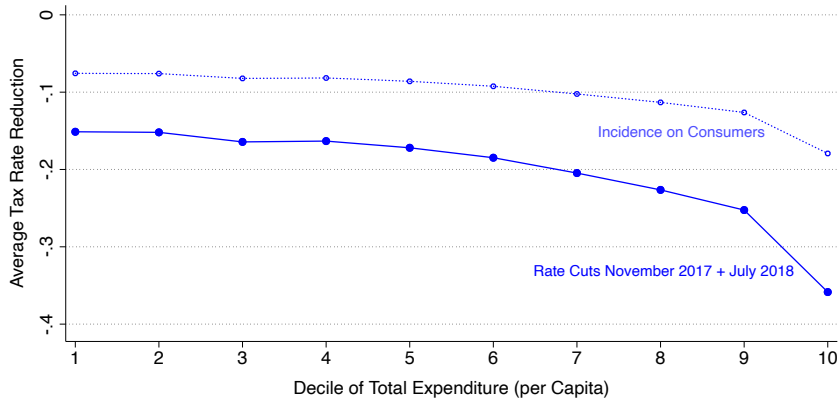
Resulting in increasing average tax rates by income

Average tax by expenditure decile at GST baseline



All deciles benefited but top deciles benefited more

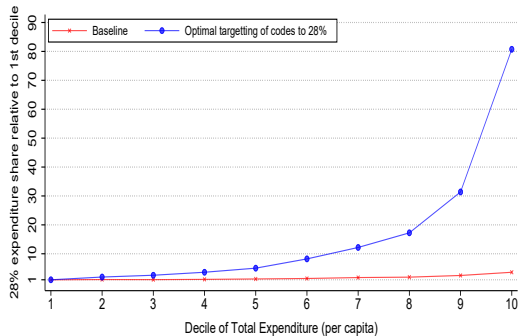
Average Tax Rate Cut: Incidence on Consumers (50%)



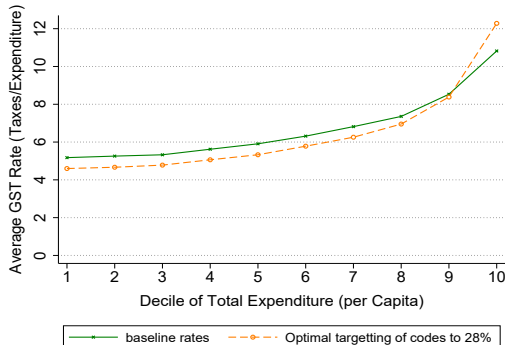
Better product targeting can significantly raise progressivity

- ▶ Reshuffling products taxed at 28% can improve progressivity (maintaining the aggregate consumption share taxed at 28% at its base level of 4.7%).

(a) 28% rate expenditure share relative to 1st decile



(b) Average Tax Rate



Conclusion

Novel empirical results of large VAT cuts for range of non-essential products:

1. **Incidence** shared between firms and consumers
2. **Only moderate efficiency cost** of indirect taxation
3. **Differentiated tax rates** do not lead to product mis-classification

(2) + (3) go against “policy wisdom” (based on thin evidence) $\Rightarrow$ more nuanced view on differentiated rates for luxury products: useful complement to constrained income taxes?

The initial GST system was rather progressive and efficient. What about the new reforms?

- ▶ Recent reform further homogenized rates: Q: How much was passed-through to consumers?
 $\rightarrow$ Both rate cuts and rate hikes, asymmetric response of pass-through?
- ▶ New de-merit 40% rate targeted at **true luxury goods**
- ▶ How does this reform interact with the personal income tax?

Thank you for your attention

Please contact me with any comments: [pbachas at worldbank.org](mailto:pbachas@worldbank.org)