

Tax Bunching at the Kink in the Presence of Low Capacity of Enforcement: Evidence from Uruguay

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Motivation

- Major challenge for tax-systems in developing countries (Besley & Persson, 2013)
 - ▶ Boost tax collection-capacity: LATAM 22% of GDP vs OECD 34% (2016)
- Recent reforms to improve efficiency and equity of tax system:
 - ▶ PIT revenue increased almost 50% between 2000 and 2014 but still far behind (2% LATAM vs 8% OECD)
- What is the optimal progressivity and level of taxation in developing economies?
 - ▶ We need a measure of the behavioral response $\Rightarrow$ ETI (Feldstein, 1995, 1999)
- Relatively large evidence for developed countries, but:
 - ▶ Margins of response have different implications in terms of efficiency costs and policy design (e.g. deductions vs real response)
 - ▶ ETI is not structural parameter. It is endogenous to context and tax system (e.g. Kopczuk & Slemrod 2002; Kopczuk 2005; Chetty, 2009; Doerrenberg et al. 2017)

Research Question

In a low enforcement context:

- ① **How much** do individuals respond to personal income taxation ?
- ② **How** do taxpayers respond?

This paper

- We analyze the magnitude of taxpayers' responses to the first kink in the PIT schedule in Uruguay (UY) in the 2010-2014 period
- We analyze the mechanisms used to respond according to the two components of the taxable income:
 - 1 Deductions
 - 2 Gross Labor Income
- **Data:** We use a combination of administrative records (self and third party reported) that result in a rich and large administrative dataset (6M observations for the 2010-2014 period - About 1.3M different taxpayers)
- **Identification Strategy:** Bunching approach (change in the marginal tax rate in the bottom kink)

Preview of Results

Main Findings:

- 1 Statistically significant but moderate response to first kink in PIT - ETI ~ 0.16 both in wage earners and self employed
- 2 Evidence of an intensive use of *itemized* deductions
- 3 Suggestive evidence of income misreporting (unilateral) and coordinated misreporting (in the firm) for taxpayers with less coordination costs

Contributions

- **Bunching Responses:** Developed countries: Austria (Paetzold 2016); Australia (Hamilton 2018); Denmark (Chetty et al. 2011; Le Maire & Schjerning 2013), Germany (Schachtele 2016), Ireland (Hargarden 2015); Sweden (Bastani & Selin 2014), US (Mortenson & Whitten 2016); Developing countries: **Pakistan** (Kleven & Waseem 2013; Best 2014); **Ecuador** (Bohne & Nimczik 2016).
- **Anatomy of Responses and tax design:** Paetzold, 2018; Hamilton 2018; Doerrenberg et al 2017; Bohne, A and Nimczik, J. S. (2017); Schachtele (2016); Bastani & Selin, 2014; Mattika, 2014
- **Public Economics and Development** Alejos (2018); Bergolo et.al. 2018; Carrillo et al 2017; Best, 2015; Best et. al. 2013; Kleven & Waseem 2013; Kumler et al, 2013; Pomeranz 2013.

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 - ▶ Mechanisms used in low enforcement environments ⇒ Policy implications

Outline

- 1 Background
- 2 Bunching approach and data
- 3 Results
 - Bunching at the bottom kink
 - Channel I: Deduction Response
 - Channel II: Reported Income Response
- 4 Conclusion

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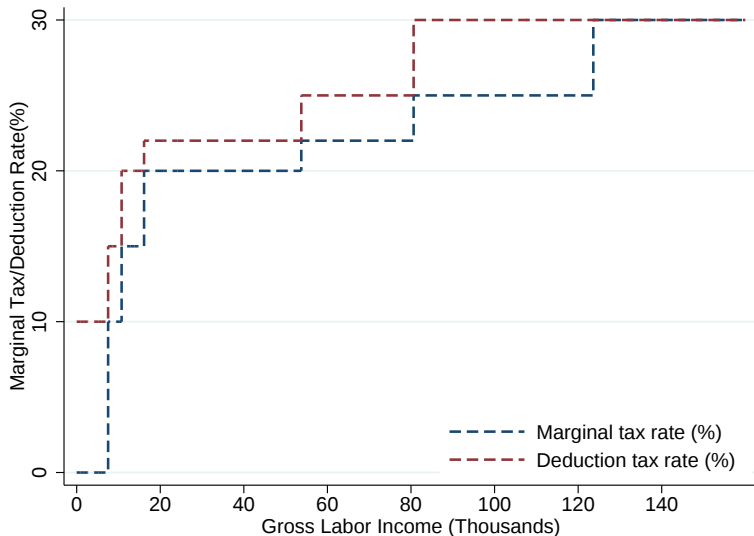
Background | Uruguay



- South American country between Brazil and Argentina
- Population: 3.5M
- GDP per capita $\sim$ 15,000 USD (2nd highest after Chile)
- Overall tax burden $\sim$ 27% in 2015 (OECD (34%) Latin America (23.1%))
- Novel PIT scheme (2008): 12% of total tax collection (2016) (Increased 30% since 2008)
- Unregistered employment: 25% in 2013
- VAT evasion $\sim$ 13% of potential revenue

- Gross Labor Income (GLI): wage income + 70% self-employment income
- Deductions:
 - 1 **Non-Itemized or Mechanical deductions:** payroll taxes, health insurance contributions and other proportional social security contributions
 - 2 **Itemized or Non-Mechanical deductions :**
 - ★ Personal deductions: child care expenses and other non proportional social security contributions (95% of itemizers use this type) - Can be claimed in the firm (*via* 3100 form)
 - ★ Housing expenses: rent and mortgage payments - MUST be claimed in a tax return
- Final tax liability is a two step process:
 - 1 GLI and deductions are passed through a progressive tax/deduction schedule (rates range from 10% to 30%) $\Rightarrow$ Provisional Tax Liability & Provisional Deductions [▶ Schedule Table](#)
 - 2 Final tax liability is computed as: provisional tax liability - provisional deductions

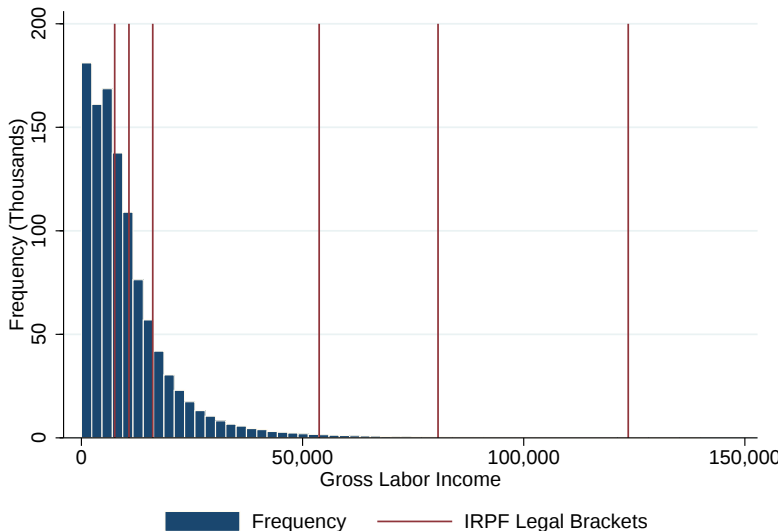
Tax and Deduction Marginal Rates Schedule - 2013



Summary Statistics

	All workers		Pure Wage Earners	
	Mean	SD	Mean	SD
Panel a. Income				
Total income (USD in 1000s)	10.44	16.38	9.74	14.9
Total Labor Income (USD in 1000s)	10.12	14.07	9.45	12.60
Wage Income (USD in 1000s)	9.53	13.16	9.45	12.60
Self Employed income (USD in 1000s)	0.59	4.89	0.00	0.00
Retirement Income (USD in 1000s)	0.18	1.48	0.17	1.43
Capital Income (USD in 1000s)	0.14	7.57	0.12	7.29
Panel b. Personal Income Tax				
Tax liability (USD in 1000s) (labor income)	0.58	2.41	0.51	2.21
Filling a tax return (%)	10.92	31.19	7.95	27.06
Panel c. Socio-Demographics				
Female (%)	46.12	49.85	45.81	49.82
Age	37.68	11.87	37.49	11.89
Source of income (%)				
One income source	.	.	75.61	42.94
Multiple income sources	.	.	24.39	42.94
Observations	5,587,711		5,351,080	
Individuals	1,526,301		1,471,560	

Distribution of Gross Labor Income - 2013



- Larger tax rates only affect very few taxpayers

PIT in UY | Tax filling rules

- Wage earners in only one firm are exempted from filing a tax return
 - ▶ They can claim personal deductions through the firm
 - ▶ Subject to monthly withholdings
- Every taxpayer can file a TR if she wants to (e.g. itemized deductions not claimed in 3100 form or tax credits)
- Three mandatory cases:
 - ① Wage earners whose income comes from different sources and the sum exceeds a threshold
 - ② Workers that earn income from self-employment
 - ③ Workers who want to claim housing expenses deductions

Stylized fact: In 2016, in UY only 14% of taxpayers file a tax return (for any of the reasons above)

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1 Background

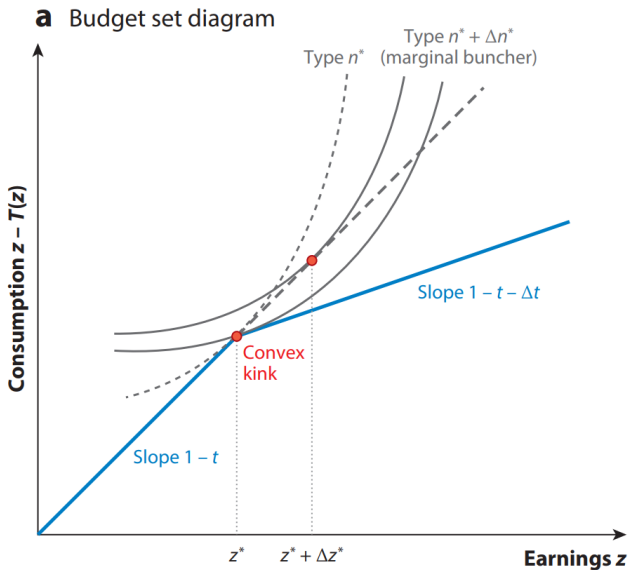
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- Bunching at the bottom kink
- Channel I: Deduction Response
- Channel II: Reported Income Response

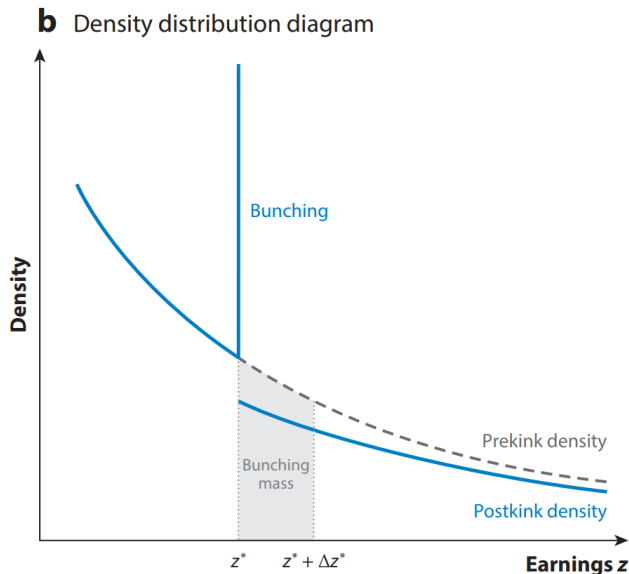
4 Conclusion

Introduction of a kink point



Source: Kleven, 2016

Taxable Income Distribution



Source: Kleven, 2016

Bunching Method

In a nutshell:

- Exploits discontinuities in incentives introduced by progressive tax schedules to identify behavioral responses
- The ETI is proportional to the excess of mass around the kink point (Saez et al 2010)
- The excess of mass is estimated by comparing the actual taxable income distribution to a smooth counterfactual density at the kink [▶ More Details](#)
- Identifying assumption: smoothness of the counterfactual in the kink
- We follow Chetty et al (2011) to estimate the counterfactual density, excess of mass and bootstrapped standard errors

Data

- Universe of personal income tax returns filed by wage earners and self-employed between 2010-2014 (Uruguay's IRS)
- Third party reports from employer statements (Similar to W-2 in the U.S.)
 - ▶ Employees' wage income, personal deductions, income tax withheld
- Firm-level data (merged at individual level)
- Primary focus:
 - ▶ Pure wage earners
 - ▶ Located around the exemption cutoff (1st kink point)
 - ▶ About 4M observations

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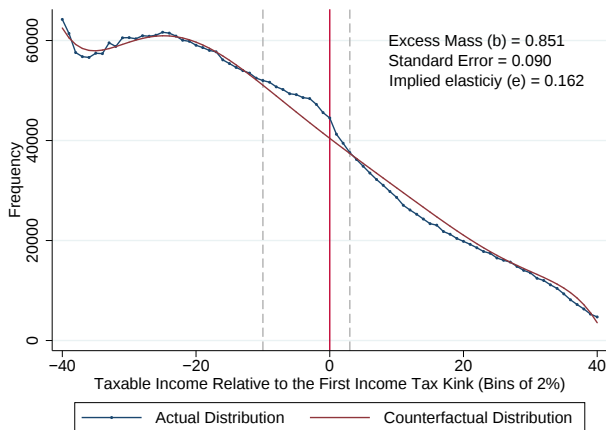
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Methodological Decisions

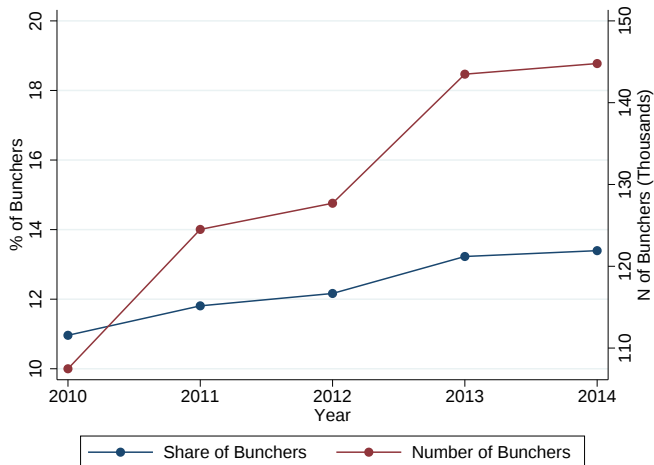
- We depict the distribution of taxable income **measured relative to the effective first kink** of each taxpayer:
 - ▶ Because of different “tax bases”, the effective threshold in which each taxpayers start paying taxes is different for all taxpayers
- Graphical bunching analysis:
 - ▶ We focus on the bottom kink
 - ▶ Grouped data in bins of 2% relative to the cutoff
 - ▶ Bunching zone defined individually by visual inspection
- We focus on the bunching behavior of pure wage earners (i.e. only receive income from wages):
 - ▶ Simpler setting to distinguish different mechanisms
 - ▶ Represent more than 95% of taxpayers

Bunching in pure wage earners



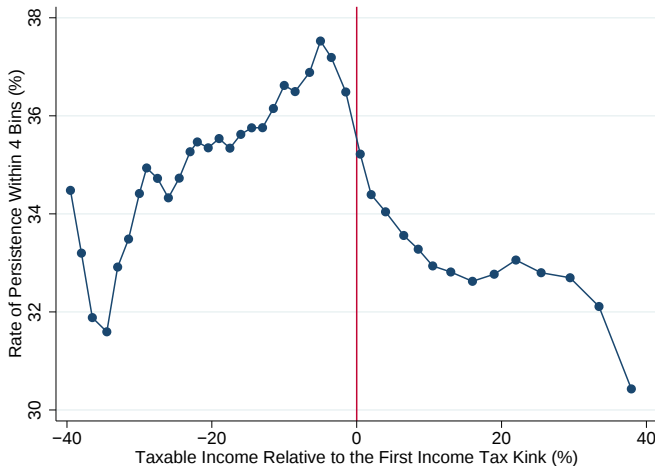
- There is a (diffuse) behavioral response to PIT $\Rightarrow$ optimization frictions (?)
- Self employed response is even smaller and the shape is similar ► By Source of Income
- PIT was first implemented in 2008 $\Rightarrow$ **Learning process?**

Bunching over time



- Both # of bunchers and % increased systematically (6% growth rate vs 4.1%)
 - ▶ No other reason to locate close to the kink rather than PIT learning

Taxable Income Persistence



- Bunchers close to the kink change less their income in subsequent years (8% window)

Additional Results [▶ Table](#)

Heterogeneity

- Female workers respond more than male workers → Consistent with previous evidence (Paetzold, 2018; Best, 2015; Chetty et. al. 2011) ▶ By gender
- Older workers respond more than younger workers → Contrary to our expectations → Additional signal of learning? ▶ By age
- Workers in one job react more than workers with multiple jobs → Consistent with coordination costs hypothesis ▶ By number of jobs
- Workers in smaller firms respond more than workers in larger firms → Consistent with opportunities of evasion/avoidance ▶ By size of firm
- No differences between firms in services and goods sector → A priori we expected more responses in services ▶ By sector

Robustness

- Results hold when changing degree of polynomial and bunching window
▶ Robustness - Degree and Window
- Results hold using a balanced sample of taxpayers
▶ Robustness - Degree and Window

Key findings:

- There is evidence of significant but modest response to the first kink point ($e \approx 0.16$)
- There is evidence that support the learning mechanism
- Some evidence of heterogeneous responses
- Results are robust to different specifications of the counterfactual polynomial and to sample selection

Remaining question: Mechanism

- We still don't know how taxpayers respond! They have two alternatives:
 - ① Deductions
 - ② Gross labor income response
- Next, we provide some (NOT CAUSAL) insights about the channels of response
- We exploit:
 - ① Particular features of tax administration rules (filing a tax return and claiming itemized deductions)
 - ② Multiple sources of data (Self and third-party reported)

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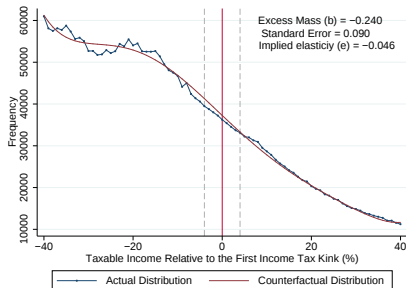
What about deductions?

Test 1: Compare distributions of GLI (i.e. before considering deductions) with TLI (i.e. after deductions)

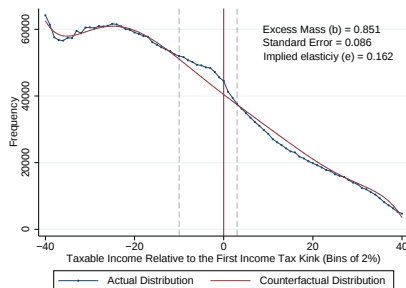
Mechanism: If deductions are a relevant margin of response, we should observe no response in GLI distribution

GLI vs TLI distribution

a. Gross Labor Income



b. Taxable Labor Income



- There is no jump in GLI distribution $\Rightarrow$ Deductions play a role

What about deductions?

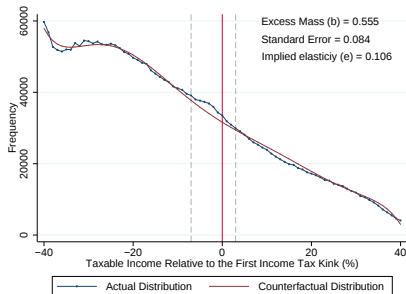
Test 2: Compare TLI distribution for *itemizers* vs *non-itemizers*

- *itemizers* are 21% of pure wage earners
- *itemized* deductions represent about 20% of total deductions [▶ Itemized Deductions](#)
- We exclude taxpayers with housing deductions (Started in 2011 and play a relatively minor role)

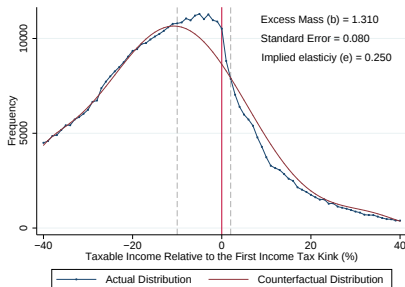
Mechanism: *itemizers* should react more since *itemized* deductions are the margin of response (not mechanical deductions)

Itemizers vs Non-Itemizers

a. Non-itemizing



b. Itemizing



- Taxpayers that claimed *itemized* deductions are much more responsive
- Intensity in the use of *itemized* deductions peaks around the kink
 - ▶ Intensity of Itemized Deductions
- Probability of being located in the bunching zone increases with the intensity of *itemized* deductions
 - ▶ Share of Bunchers by Intensity of Itemized Deductions

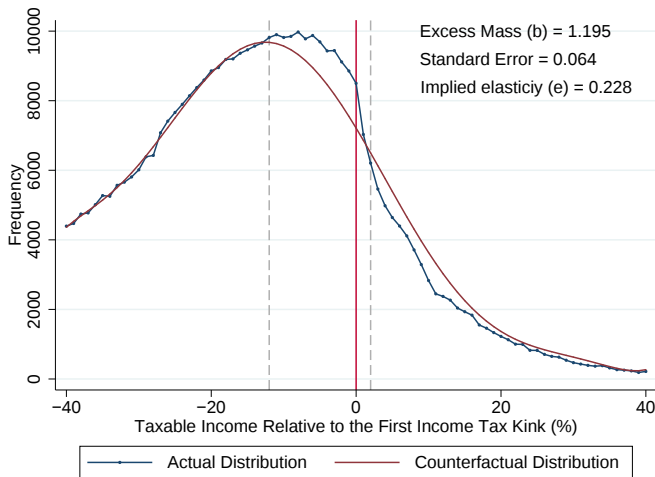
What about deductions?

But claiming *itemized* deductions is strongly correlated with filing a TR $\Rightarrow$ is the response driven by deductions or is it driven by filing a TR?

Test 3: Since correlation is not 1:1 we can see what happens in *itemizers* non-filers

Mechanism: If deductions are a relevant margin of response, we should observe an excess of mass around the kink. In this case, it cannot be attributed to a filing a TR

Itemizers and Non-filers



- Similar response in magnitude to the average *itemizer* $\Rightarrow$ response in *itemizer* taxpayers cannot be explained only by tax return behavior

What about deductions?

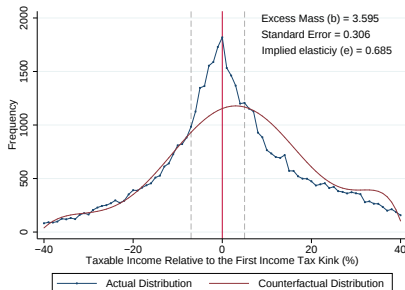
For taxpayers that filed a tax return we have two sources of data

Test 4: Compare sources of data for *itemizer* taxpayers that filed a TR

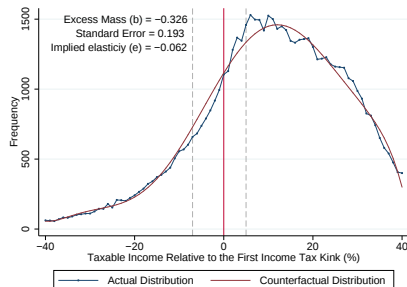
Mechanism: If filing a tax return is the channel of response, we should not observe an excess of mass before filing it (i.e. with the information reported by the firm)

Itemizers and filers

a. In the tax return



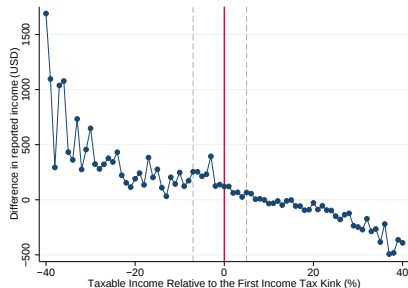
b. In the paysheet



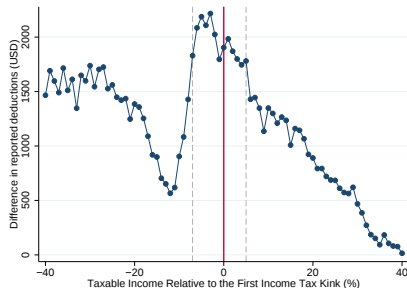
- Conditional on filing a tax return and having claimed *itemized* deductions:
 - ▶ There is no evidence of bunching at the firm
 - ▶ Tax returns seem to be the mechanism chosen to bunch
- But how?

Discrepancies: Tax Return vs Paysheet

a. Diff. in Reported Income



b. Diff. in reported Deductions



- Evidence of income misreporting but not particularly at the kink
- *itemized* deductions increase sharply near the bunching zone

⇒ Even when using tax returns, *itemized* deductions are a relevant margin of response

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Gross Labor Income Responses

What is the role of gross labor income responses?

- We found that even non-itemizing taxpayers response ($e \approx 0.1$)
- What do they do? They have two options
 - 1 Real labor supply responses
 - 2 Income misreporting (unilateral or coordinated in the firm)

Gross Labor Income Responses

For taxpayers that did not claim *itemized* deductions and filed a tax return we have two sources of data

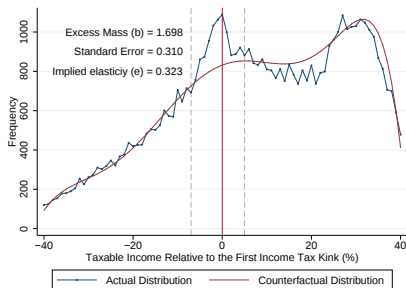
Test 1: Compare sources of data for *non-itemizer* taxpayers that filed a TR

Mechanism: Differences in the magnitude of bunching will be suggestive of the following:

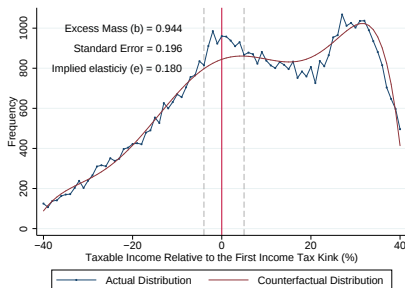
- If there is an excess of mass in the firm $\Rightarrow$ Consistent with real labor supply responses or coordinated misreporting (cannot identify between the two)
- If there is an excess of mass in the TR $\Rightarrow$ we can compare both income reports and check for unilateral income misreporting

Bunching Responses of Non-Itemizers Filers

a. In the tax return

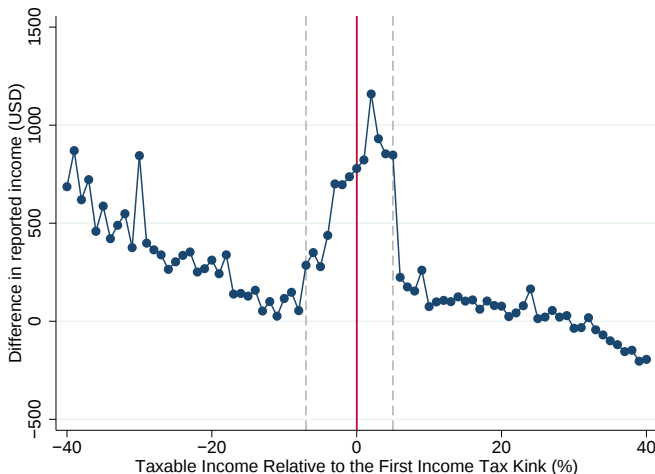


b. In the paysheet



- Conditional on filing a tax return and not claiming for itemized deductions:
 - ▶ Some evidence of unilateral misreporting
 - ▶ Some evidence of coordinated misreport/real labor supply response

Discrepancies: Tax Return vs Paysheet - GLI



- Sharp jump in income misreporting around the kink point

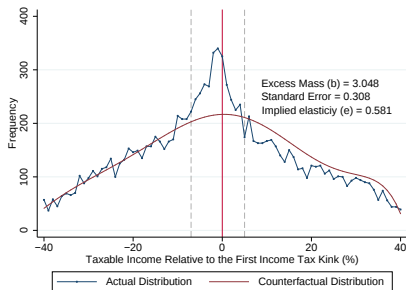
Gross Labor Income Responses

Test 2: Compare taxpayers by their number of jobs

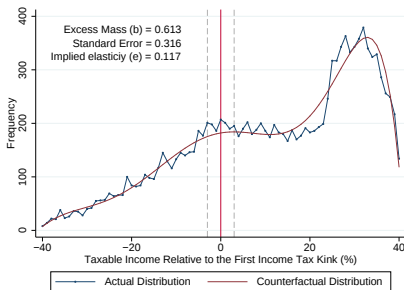
Mechanism: If taxpayers that work in only one place have less coordination costs within the firm they should be more responsive → Consistent with coordinated misreport hypothesis

Bunching Responses of Non-Itemizers Filers - No Discrepancies

a. One Job



b. Multiple Jobs



- Response is larger in taxpayers that have less coordination costs $\Rightarrow$ Consistent with coordinated misreport (?) - (Best, 2015)
- Also supported by non-itemizers non-filers ▶ Non-Itemizers - Non-Filers

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Conclusions

- There is strong and robust evidence that wage earners (diffusely) bunch around the bottom tax kink
 - ▶ Bunching response translates into a moderate elasticity of 0.16
 - ▶ Similar order of magnitude compared to developed countries (Paetzold 2018; Schachtele, 2016; Chetty, 2015)
- The three channels of response we analyze seem to be operating
 - ▶ The order of magnitude of each seems to be correlated with the opportunities that they face (e.g. income misreporting does not play a role in taxpayers itemizing but it is important for non-itemizers)
- Overall, the key channel seems to be itemized deductions
 - ▶ Consistent with recent evidence for developed countries (Hamilton, 2018; Doerremberg, 2018, among others)
- Bunching seems to be correlated with coordination costs:
 - ▶ Taxpayers with only one source of income seem to respond more → Consistent with (Best, 2015): coordination at the firm

Implications

- We provide further evidence against interpreting the ETI as a sufficient statistic for optimal design (Slemrod and Kopczuk 2002) and welfare analysis (Slemrod 1995, Chetty 2009, Doerrenberg et al. 2016).
- In the presence of deduction possibilities and deduction responses to taxation, it is important to understand the direction of the externality (Doerrenberg et al. 2018).
- Instead of changing MTRs, limiting taxpayers ability to claim tax deductions could reduce efficiency cost of personal income taxation.

Back-up Slides

- ▶ Personal Income Tax

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Tax and Deduction Rates Schedule - Table

► Personal Income Tax

a. Tax rates			b. Deductions rates		
Bracket (2013 USD)	Mg. rate	$\ln(\frac{1-\tau_i}{1-\tau_{i+1}})$	Bracket (2013 USD)	Mg. rate	$\ln(\frac{1-\tau_i}{1-\tau_{i+1}})$
0-7,525	0		0 - 3,225	0.10	0.105
7,525 - 10,750	0.10	0.105	3,225 - 8,600	0.15	0.057
10,750 - 16,126	0.15	0.057	8,600 - 46,226	0.20	0.061
16,126 - 53,752	0.20	0.061	46,226 - 73,102	0.22	0.025
53,752 - 80,628	0.22	0.025	73,102 - 116,104	0.25	0.039
80,628 - 123,629	0.25	0.039	More than 116,104	0,30	0.069
More than 123,629	0,30	0.069			

Panel b. PIT

Summary Statistics - Socio Demographics

► Summary Statistics

	All		Pure Wage		Pure Self		Both	
	Mean (1)	SD (2)	Mean (3)	SD (4)	Mean (5)	SD (6)	Mean (7)	SD (8)
Panel c. Socio-Dem.								
Female (%)	46.12	49.85	45.81	49.82	50.38	50.00	55.40	49.71
Age	37.68	11.87	37.49	11.89	42.36	10.69	41.70	10.14
Under 40 years	41.83	49.33	41.22	49.22	57.07	49.50	54.36	49.81
Over 40 years	58.17	49.33	58.78	49.22	42.93	49.50	45.64	49.81
Source of income (%)								
One inc.	.	.	75.61	42.94	100.00	0.00	.	.
Mult. inc.	.	.	24.39	42.94	0.00	0.00	.	.
Firm's activity (%)								
Services	50.48	50.00	49.74	50.00	67.93	46.68	82.55	37.96
Goods	49.52	50.00	50.26	50.00	32.07	46.68	17.45	37.96
Sales (%)								
Below median sales	19.41	39.55	19.52	39.63	.	.	13.87	34.56
Above median sales	80.59	39.55	80.48	39.63	.	.	86.13	34.56
Obs.	5,587,711		5,351,080		107,594		129,037	
Ind.	1,526,301		1,471,560		29,383		25,358	

More Details - Bunching Estimation ► In a Nutshell

Let z be the taxable income and τ the marginal tax rate. It can be proved that ETI:

$$\tilde{e}(k) = \frac{dz}{d(1-\tau)} \frac{1-\tau}{k} = \frac{b}{k \times \log \frac{1-\tau_1}{1-\tau_2}}$$

where k is the kink point and $b = \frac{B(dz)}{h_0}$ which is the excess of mass at the bunching zone normalized by the counterfactual distribution.

To estimate $\tilde{e}$ we need an estimate of b . Chetty et al (2011) propose:

$$C_j = \sum_{i=0}^q \beta_i^0 (Z_j)^i + \sum_{i=k^-}^{k^+} \gamma_i^0 \cdot 1\{Z_j = i\} + \varepsilon_j^0$$

where C_j is the number of observations in the income bin j , q is the order of the polynomial and ε_j^0 is the error term. The indicatrix function $1\{Z_j = i\}$ signals whether the income bin j lies on the bunching zone. This function controls for the effect of being located near the kink.

More Details - Bunching Estimation ► In a Nutshell

Hence, the excess of mass at the kink point ($B(dz)$) is given by the difference between the observed and the estimated counterfactual distributions:

$$B = \sum_{j=k^-}^{k^+} (C_j - \hat{C}_j)$$

where $\hat{C}_j$ is the counterfactual mass in bin j estimated before. Then, the estimated excess of mass at k between k^- and k^+ normalized by the counterfactual distribution can be expressed as:

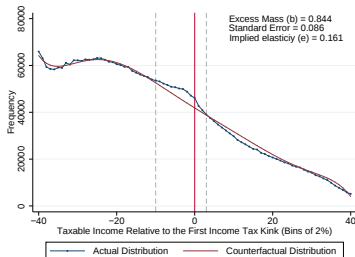
$$\hat{b} = \frac{\sum_{j=k^-}^{k^+} (C_j - \hat{C}_j)}{\left[\frac{k^+ - k^-}{w} \right]^{-1} \sum_{j=k^-}^{k^+} \hat{C}_j} \quad (1)$$

where w is the bandwidth chosen to group the data and the denominator is the average density of the counterfactual taxable income distribution between k^- and k^+ .

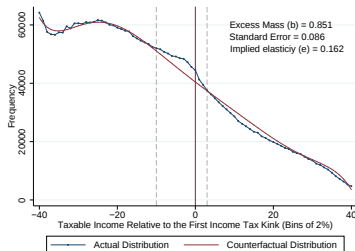
Bunching by source of income

► Bunching in pure wage earners

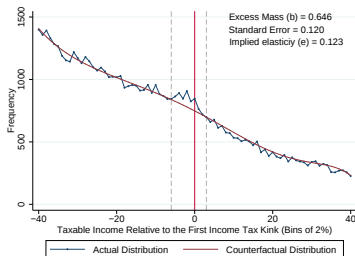
a. All Workers



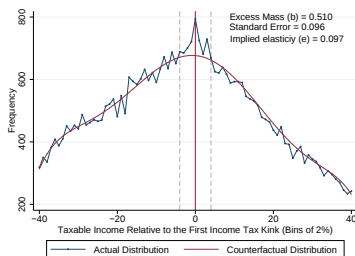
b. Pure Wage Earners



c. Pure Self Employed (SE)



d. Both Wage Earners & SE



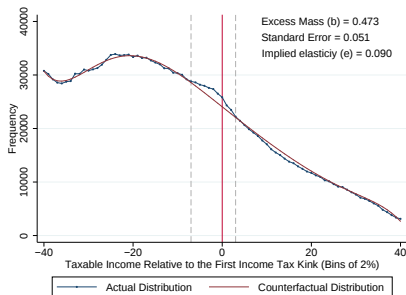
Heterogeneity - Table ► Additional Results

Workers Characteristics			Firms Characteristics		
	Excess of mass (1)	Implied Elasticity (2)		Excess of mass (3)	Implied Elasticity (4)
Male	0.473 (0.051) [290,908]	0.090	Services	0.740 (0.061) [306,363]	0.141
Female	1.558 (0.193) [319,574]	0.297	Goods	0.681 (0.102) [215,178]	0.130
< 40 years	0.674 (0.071) [363,606]	0.128	< Median Sales	2.164 (0.264) [96,216]	0.412
> 40 years	1.036 (0.109) [240,127]	0.197	> Median Sales	0.431 (0.046) [369,714]	0.082
Mult. empl.	0.350 (0.054) [88,704]	0.067			
One empl.	0.967 (0.104) [524,682]	0.184			

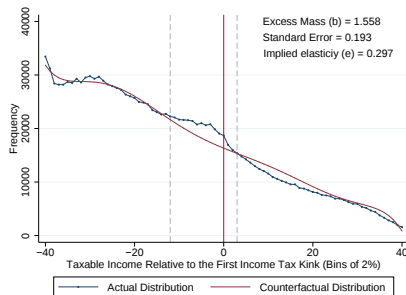
Heterogeneity - By gender

► Additional Results

a. Male



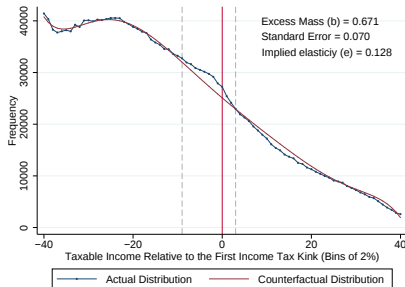
b. Female



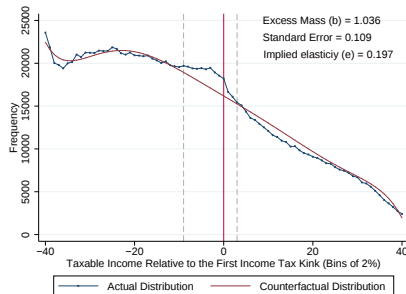
Heterogeneity - By age

► Additional Results

c. Below 40 Years Old



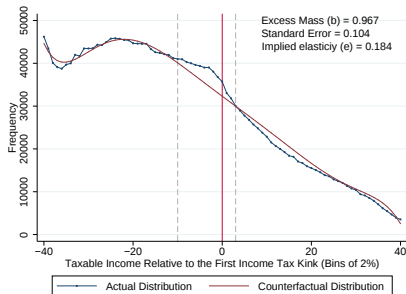
d. Above 40 Years Old



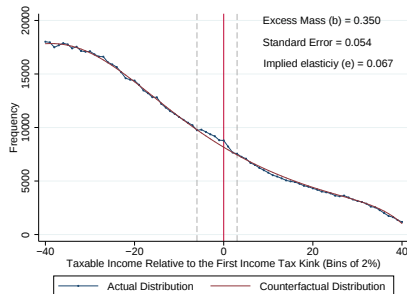
Heterogeneity - By number of jobs

► Additional Results

e. One Job



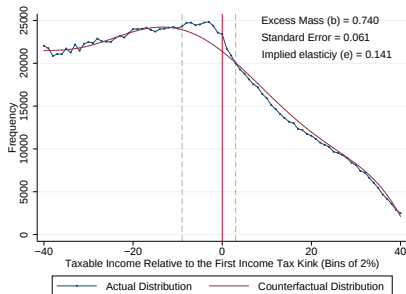
f. Multiple Job



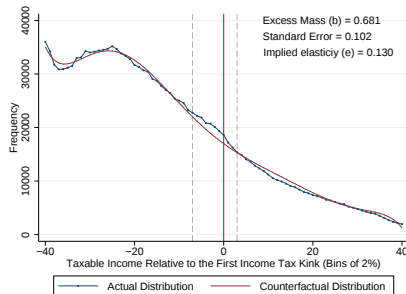
Heterogeneity - By sector

► Additional Results

a. Services



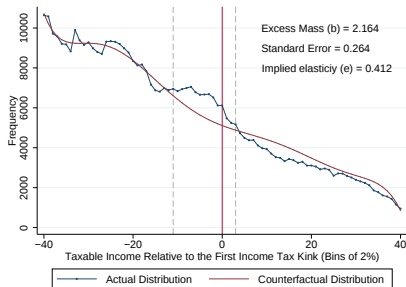
b. Goods



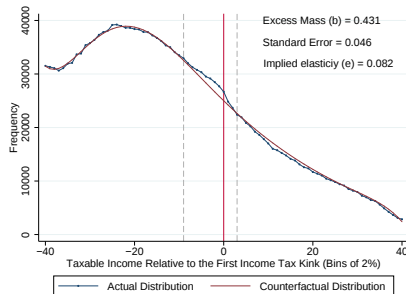
Heterogeneity - By size of firm

► Additional Results

c. Below Median Sales



d. Above Median Sales



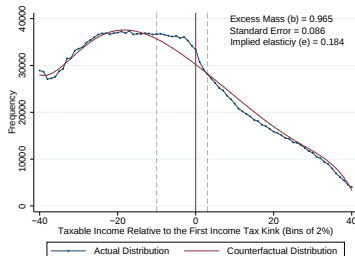
► Additional Results

Excess of mass	Implied elasticity	Polynomial Degree	Bunching Window (%)
(1)	(2)	(3)	(4)
0.637 (0.103) [744,430]	0.121	6	(-22, 8)
0.611 (0.097) [655,739]	0.116	6	(-20, 6)
0.572 (0.088) [566,151]	0.109	6	(-18, 4)
0.945 (0.100) [744,430]	0.180	7	(-22, 8)
0.851 (0.088) [655,739]	0.162	7	(-20, 6)
0.753 (0.081) [566,151]	0.143	7	(-18, 4)
0.549 (0.052) [744,430]	0.105	8	(-22, 8)
0.527 (0.046) [655,739]	0.100	8	(-20, 6)
0.493 (0.039) [566,151]	0.094	8	(-18, 4)

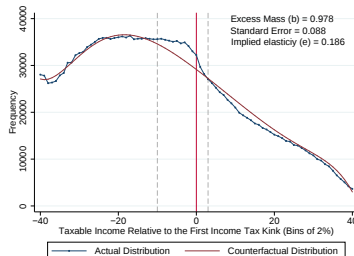
Robustness - Balanced Sample

► Additional Results

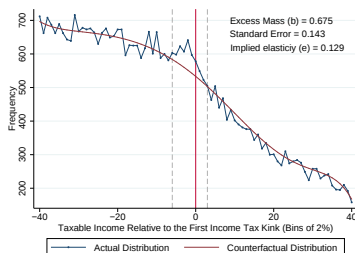
a. All Workers



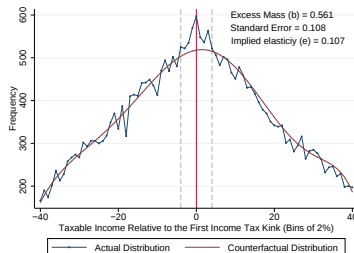
b. Pure Wage Earners



c. Pure Self Employed (SE)



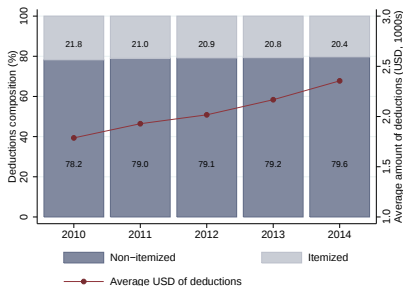
d. Both Wage Earners & SE



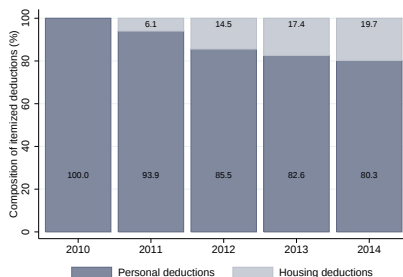
Itemized Deductions

► Test II

a. Growth of Total Deductions and Composition Over Time

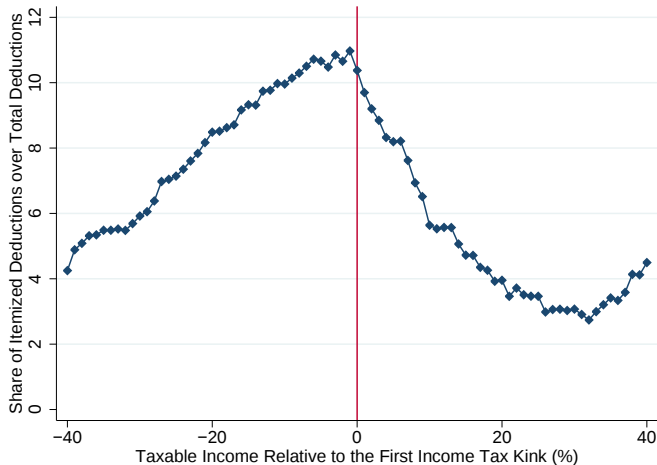


b. Composition of Itemized Deductions Over Time



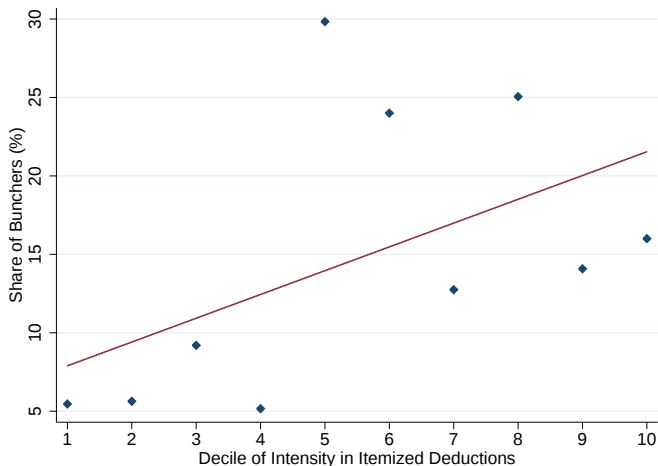
Intensity of Itemized Deductions

► Itemizers vs Non-Itemizers Taxpayers



Share of Bunchers by Intensity of Itemized Deductions

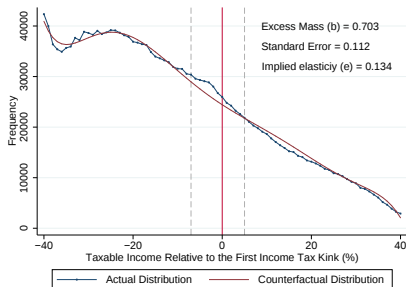
► Itemizers vs Non-Itemizers Taxpayers



Bunching Responses - Non-itemizers and Non-filers

► Non Itemizers - Non Filers

a. One Job



b. Multiple Jobs

