The Response of Salaried Workers to the Personal Income Tax: Evidence from a Regression Discontinuity Design in Argentina

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Introduction

How do taxes (tax reforms) affect the labor supply of salaried workers?

- The response of wage earners to the personal income tax has long been of interest to economists and policymakers.

- The magnitude of this response is of critical importance for tax and transfer policies, and welfare analysis.

- However, the empirical literature has not yet reached a consensus on the magnitude of the elasticity of earnings with respect to tax rates.

- Empirical estimates range from no effect to very sizeable responses (Saez et al. 2012 for a recent survey).

- Moreover, most of the literature is based on developed countries.
This project

- We exploit a unique natural experiment in Argentina in 2013-2016 that introduced a **discontinuity in the income tax**

- Reform: In August 2013, the president passed a Decree that exempted a group of salaried workers (1.4m) below an **earnings threshold** from the Personal Income Tax (PIT) for 2.5 years

- Key: **tax cut based on earnings accrued prior the reform**; unexpected; affected differentially what would otherwise be comparable workers

- We use this exogenous variation to estimate earnings responses of (upper) salaried workers with **admin data from SSA**

- We use a **RD design**, which overcomes identification difficulties that have plagued previous work
Preview of the findings

- The tax cut created a large and salient discontinuity in tax liabilities
  - MTR went from 27% to 0%
  - Annual tax savings of about 10% for single workers

- Evidence suggests that salaried workers didn’t react to the tax cut...
  - No discontinuity in earnings around the threshold after 2.5 years
Institutional context: the income tax

- Argentina has a progressive personal income tax (PIT) schedule with 7 brackets and marginal tax rates ranging from 9 to 35 percent.

- In practice, employers must withhold the income tax from employees’ monthly paychecks.

- The amount to withhold depends on employee’s taxable income.

- Can deduct Social Security contributions, Personal exemptions (spouse and dependents), and other minor General deductions (mortgage, etc).

- In Argentina the PIT is borne by relatively high-earning individuals.
<table>
<thead>
<tr>
<th>Annual Taxable Income</th>
<th>Annual Payment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>From AR$</strong></td>
<td><strong>To AR$</strong></td>
</tr>
<tr>
<td>0</td>
<td>10,000</td>
</tr>
<tr>
<td>10,000</td>
<td>20,000</td>
</tr>
<tr>
<td>20,000</td>
<td>30,000</td>
</tr>
<tr>
<td>30,000</td>
<td>60,000</td>
</tr>
<tr>
<td>60,000</td>
<td>90,000</td>
</tr>
<tr>
<td>90,000</td>
<td>120,000</td>
</tr>
<tr>
<td>120,000</td>
<td></td>
</tr>
</tbody>
</table>

Table: Personal Income Tax Schedule in Argentina
Key facts

4 key facts have characterized the evolution of the PIT in the last years

1. PIT schedule fixed in nominal terms since 2000

2. Huge inflation during the 2000s

3. Nominal earnings adjusted every year

4. Exemptions adjusted irregularly, behind average increase in wages

The PIT lost progressivity in the last 15 years

⇒ in 2013 the gov implemented a large and salient tax cut
**Timeline and Reforms**

**TIME**
- Mar 1st 2013
- Aug 28th 2013
- Sep 1st 2013
- May 5th 2015
- Feb 22nd 2016

**LINE**
- Decree No 244/2013
- Decree No 1242/2013
- Reform Begins
- Regulation 3770/2015
- Decree No 394/2016
- Repeals Decree 1242/2013

**DECREE 2013**
- Tax Exempt
- ↑ 20% Personal Exemptions
- No Changes
- 15k
- 25k
- Max Gross Earnings Jan-Aug 2013

**REGUL. 2015**
- Still Exempt
- ↑ 20% Personal Exemptions (progressive)
- Runoff Round
- 15k
- 25k
- Max Gross Earnings Jan-Aug 2013

**DECREE 2016**
- Repeals Decree 2013 and ↑ 160% Personal Exemptions for Everyone
- 15k
- 25k
- Max Gross Earnings Jan-Aug 2013
The variation we exploit...

Decree 1242/2013 (August 28th 2013, starting on September 1st 2013)

\[ \bar{W} \equiv \max\{\text{gross earnings}|\text{Jan to Aug 2013}\} \]

Regardless of subsequent income, salaried workers with...

- \( \bar{W} \leq 15k: \) fully exempt from the income tax
- \( 15k < \bar{W} \leq 25k: \) 20% increase in personal exemptions
- \( \bar{W} > 25k: \) continued paying the tax normally

The reform introduced a discontinuity at 15k and 25k

KEY: affected differentially what would otherwise be comparable workers

Example: Earned <15k before August, get a promotion to 20k, no taxes!
Empirical Strategy: regression discontinuity design

- The regression of interest is

\[ \ln(Y_{it}) = e \ln(1 - \tau_{it}) + error_{it} \]

- Standard OLS leads to a biased estimate of the elasticity \( e \)

- Hence, literature uses (imperfect) instruments + tax reforms to identify \( e \)

- We use a RD design, which overcomes identification difficulties

  Basic idea is to plot average outcomes for bins of running variable

**First stage**: Does tax burden change sharply around the threshold?

**Second stage**: Does the discontinuity in tax liability translate into a discontinuity in labor outcomes later on?
Data

- Admin data from the Social Security (SIPA) 2012-2016 (third-party reporting by employers, Form # 931)

- Panel of social security records of all employer-employee links

- Source: Observatorio de Empleo y Dinamica Empresarial - MTEySS

- Can follow the full working history of salaried workers, month by month

- Data are anonymized to preserve confidentiality

- Some variables:
  - Earnings: gross monthly labor income
  - Demographics: age, gender, geographic location
  - Labor: private worker, tenure, 4-digit sector, unionized, type of contract

- In March 2013, the year of the reform, the data included around 400k private firms and more than 6m private salaried workers (9m total)
### Summary statistics

**Table: Summary Statistics of Registered Wage Earners in Argentina, 2013**

<table>
<thead>
<tr>
<th></th>
<th>Group 1: 8.3k-15k</th>
<th>Group 2: 15k-25k</th>
<th>Group 3: 25k-40k</th>
<th>Group 4: 14k-16k</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
</tr>
<tr>
<td>Salaried workers (%)</td>
<td>0.262</td>
<td>0.114</td>
<td>0.041</td>
<td>0.044</td>
<td>1</td>
</tr>
<tr>
<td>Decile of max earnings Jan-Aug 2013</td>
<td>7-8</td>
<td>9</td>
<td>10</td>
<td>8-9</td>
<td>1-10</td>
</tr>
<tr>
<td>Average age</td>
<td>41.4</td>
<td>43.7</td>
<td>44.6</td>
<td>43</td>
<td>40.4</td>
</tr>
<tr>
<td>Public worker (%)</td>
<td>0.332</td>
<td>0.359</td>
<td>0.315</td>
<td>0.345</td>
<td>0.287</td>
</tr>
<tr>
<td>Collective Barg. Agreement (%)</td>
<td>0.490</td>
<td>0.499</td>
<td>0.542</td>
<td>0.497</td>
<td>0.497</td>
</tr>
<tr>
<td>Female (%)</td>
<td>0.389</td>
<td>0.333</td>
<td>0.279</td>
<td>0.355</td>
<td>0.395</td>
</tr>
<tr>
<td>Average gross earnings Aug 2012</td>
<td>7,576</td>
<td>11,769</td>
<td>16,772</td>
<td>9,768</td>
<td>7,379</td>
</tr>
<tr>
<td>Average gross earnings Aug 2013</td>
<td>9,540</td>
<td>15,124</td>
<td>22,229</td>
<td>12,432</td>
<td>9,108</td>
</tr>
<tr>
<td>Average gross earnings Aug 2014</td>
<td>13,228</td>
<td>20,489</td>
<td>29,914</td>
<td>16,949</td>
<td>12,749</td>
</tr>
<tr>
<td>Average gross earnings Aug 2015</td>
<td>17,973</td>
<td>27,626</td>
<td>39,949</td>
<td>22,977</td>
<td>17,414</td>
</tr>
<tr>
<td>Number of jobs</td>
<td>1.02</td>
<td>1.08</td>
<td>1.09</td>
<td>1.06</td>
<td>0.95</td>
</tr>
<tr>
<td>Multiple jobs (%)</td>
<td>0.066</td>
<td>0.109</td>
<td>0.131</td>
<td>0.091</td>
<td>0.052</td>
</tr>
<tr>
<td>Number of workers</td>
<td>2,763,269</td>
<td>1,205,096</td>
<td>431,908</td>
<td>462,911</td>
<td>10,543,800</td>
</tr>
</tbody>
</table>

Note: This table displays summary statistics for private and public registered wage earners. Groups 1-4 are defined based on the highest gross monthly salary between January and August 2013. ER for October 2013 was 5.8.
Identification check #1 - incumbents

**Figure:** Density of $\max\{\text{earnings} | \text{Jan to Aug 2013}\}$ around 15k and 25k
Identification check #2 - covariate balance

**Figure:** RD for age and gender around the 15k cutoff
First stage (simulation)

**Figure:** single workers without children

(a) Share of tax liability on annual earnings

(b) Marginal tax rate

Note: to get the taxable income, I subtract from gross monthly earnings 17% of Social Security contributions and personal exemptions using the values reported in the law. Then I multiply by 13 to annualize taxable earnings. Finally, I compute tax liability and MTR from PIT schedule. Post reform considers an inflation of 34%.
Main result in one slide: no response!!

**Figure**: Average gross earnings around 15k, October 2015

Note: this figure is done for the pool of wage earners around the 15k cutoff. The vertical spikes denote 95% confidence intervals.
Thought experiment

what we should’ve seen with $e = 0.2$

Note: this is the simulated response of workers in a frictionless world with $e = 0.2$ and an inflation rate of 34% and 31% between 2013, 2014, 2015. Earnings to the left of 15k are shifted by $0.2 \times \Delta \log(1 - \tau_t)$, where $\tau_1 = 0\%$ and $\tau_0 = 27\%$. 
Some numbers, for completeness...

**Table**: RD estimates using local polynomial regression

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Panel A: RD around 15k</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RD estimate</td>
<td>4.9</td>
<td>-114.6</td>
<td>-29.3</td>
<td>-159.9</td>
</tr>
<tr>
<td></td>
<td>(36.1)</td>
<td>(85.2)</td>
<td>(132.1)</td>
<td>(214.9)</td>
</tr>
<tr>
<td>Obs</td>
<td>367,538</td>
<td>380,115</td>
<td>366,912</td>
<td>357,016</td>
</tr>
<tr>
<td>Obs to the left of c</td>
<td>195,154</td>
<td>202,026</td>
<td>194,934</td>
<td>189,844</td>
</tr>
<tr>
<td>Obs to the right of c</td>
<td>172,384</td>
<td>178,089</td>
<td>171,978</td>
<td>167,172</td>
</tr>
<tr>
<td>BW est. (h)</td>
<td>311.9</td>
<td>207.5</td>
<td>199.1</td>
<td>210.6</td>
</tr>
</tbody>
</table>

|                  |                   |                  |                  |                  |
| **Panel B: RD around 25k** |                   |                  |                  |                  |
| RD estimate      | -32.4             | -271.8           | -238.1           | -299.7           |
|                  | (127.2)           | (275.1)          | (470.1)          | (699.1)          |
| Obs              | 149,002           | 149,211          | 144,331          | 140,050          |
| Obs to the left of c | 80,963            | 81,319           | 78,607           | 76,244           |
| Obs to the right of c | 68,039            | 67,892           | 65,724           | 63,806           |
| BW est. (h)      | 344.1             | 260.7            | 353.2            | 423.6            |

Note: standard errors reported between parentheses. Point estimates computed with `rdrobust` routine using local linear regressions and a uniform kernel.
So, no response after 2.5 years...

- What about other margins? **Switchers** (to “.” and 0)

- Did any subgroup respond? **Heterogeneities**

- Maybe salaried workers were unaware... **Saliency**
Fraction missing

**Figure:** Fraction missing around 15k, October 2015

Note: missing as a proxy for formal workers dropping out
Results: heterogeneities ($c = 15k$)

(a) Female, private

(b) Male, private

(c) Unionized, private

(d) Non-Unionized, private
Results: robustness \((c = 15k)\)

Other things I’ve tried...

1. **Firm size**: small [10-] vs large [200+]  
2. **Age groups**: young [18-35] vs prime-age [36-55]  
3. **Sectors**: manufacturing, transport, professionals, retail, financial  
4. **Labor unions**: commerce, banks, public transport, truck drivers, metalworkers, oil workers  
5. **Other checks**: % Change 2015-2013; Percentiles 10, 50, 90, 99 within each bin; \(Prob[\Delta earnings > inflation]\)  
6. **Closest case of an “effect”**: (i) Private, manufacturing, prime-age; (ii) Private, professionals, prime-age
Saliency

Were workers unaware of the reform?

- The income tax is indeed very salient in Argentina
- People can see in their paycheck if they cross the threshold
- Some anecdotal evidence from newspapers
- Google trends
Figure: Main Newspapers in Argentina (La Nacion and Clarin)
**Figure:** Saliency, example from Google Trends

Interest over time

Worldwide. Past 5 years.
Someone’s paycheck (Sept 2015)

**Income tax concepts**

**Gross monthly earnings**

**TTTTTTT Y ASOCIADOS SA**

**AV. PASEO COLON 275 10 CABA - Capital Federal**

**APPELLIDO Y NOMBRE**

**CUIT N° 30-XXXXXXXX-X**

**SEGMENT**

**CATEGORIA**

**CALIFICACION PROFESIONAL**

**CONCEPTO**

**UNIDADES**

**REMUNERACION ASIGNADA**

**REMUNERACIONES SUJETAS A RETENCION EXENTAS**

**DESCUENTOS**

**PERIODO DE PAGO**

**CONTRATACION**

**LUGAR Y FECHA DE PAGO:**

**FORMA DE PAGO:**

**TOTAL NETO:**

**INCOME TAX CONCEPTS**

**GROSS MONTHLY EARNINGS**
**Someone's paycheck (Sept 2015)**

<table>
<thead>
<tr>
<th>Concept</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>0100 SU: LO SÍLABO BÁSICO</td>
<td>13.719,60</td>
</tr>
<tr>
<td>0401 JUBILACION 11%</td>
<td>-4.487,40</td>
</tr>
<tr>
<td>0402 LEY 19.032</td>
<td>1.980,00</td>
</tr>
<tr>
<td>0405 OBRA SOCIAL</td>
<td>-4.487,40</td>
</tr>
<tr>
<td>6980 RETENCION GANANCIAS</td>
<td>2.668,94</td>
</tr>
<tr>
<td>6999 Beneficio Decreto PEN 1242/13</td>
<td>13.031,00</td>
</tr>
<tr>
<td>TOTAL NETO  →</td>
<td>13.031,00</td>
</tr>
</tbody>
</table>

**Income tax concepts**

**Gross monthly earnings**
Potential explanations

(1) Substitution effect and Income effect offset each other

(2) Low intensive elasticity of earnings w.r.t. marginal tax rates (Zidar, 2017)

(3) Large adjustment costs, slow dynamic response to the tax cut

(4) Firms mediate tax responses of employees. Hard to coordinate
Final Remarks

• First stage: shows a discontinuous change in tax liabilities

• Second stage: precisely measured zero effect of the tax cut

• Labor supply of upper wage earners (≈ decile 8) is not responsive. Striking given the size and saliency of the cut

• This zero result is consistent with the paper by Saez (2010, AEJ), Saez et al. (2012, QJE), Bastani and Selin (2014, JPubE)

• Could imply that the costs of raising PIT in Argentina are not large... ... at least for the intensive margin and upper income earners

• Similarity of income tax in other developing countries and lack of evidence make the topic of this paper a very important venue for future research
Many thanks!

Comments? Questions?

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Figure: Inflation rate (%), 2004-2016

Source: Argentina’s Inflation Series from The Billion Prices Project at MIT.
Figure: Evolution of exemptions (married with 2 kids), average wages of formal workers (left axis), and ratio of exemptions to average wages (right axis)
Figure: Number of taxpayers filing tax returns (DDJJ), 2000-2014

Source: Own elaboration based on statistical yearbooks of the national tax authority (AFIP).
**Figure:** Inflation reduced the significance of the taxable threshold
Results: second stage at $c = 25k$ (pool & zoom)

**Figure:** Average gross earnings around 25k, October 2015

![Graph showing average gross earnings around 25k](image)

- Sample average within bin
- Polynomial fit of order 1

N_I = 76244; N_r = 63806
(a) Small firms

N left = 20826
N right = 12915

(b) Large firms

N left = 127157
N right = 99239
(c) Young

(d) Prime age
(e) Manufacturing

(f) Transport

(g) Professionals

(h) Financial
(i) Commerce

(j) Truck drivers

(k) Banks

(l) Public transport
Percentage change in gross earnings August 2015-2013

-3000 -2000 -1000 0 1000 2000 3000
Max[earnings | Jan-Aug 2013]

% Change in Earnings

-3000 -2000 -1000 0 1000 2000 3000
Max[earnings | Jan-Aug 2013]

N left = 439558
N right = 268470

Sample average within bin 95% C.I.
Probability that increase in earnings 2015-2013 is greater than inflation

```
Prob [ Earnings > inflation ]
```

Max[earnings | Jan-Aug 2013] relative to 15k

Sample average within bin

95% C.I.

N left = 439558
N right = 268470

• Sample average within bin  
  95% C.I.
Percentiles 10, 50, 90, 99 within each bin, October 2015
Private, manufacturing, prime-age workers

Average Earnings vs. Max[earnings | Jan-Aug 2013] relative to 15k

- Sample average within bin
- 95% C.I.

N left = 30569
N right = 24177
Private, professional, prime-age workers

Back to Robustness

N left = 7541
N right = 5796

Sample average within bin 95% C.I.