Frictions and the elasticity of taxable income: evidence from bunching at tax thresholds in the UK

Barra Roantree, Stuart Adam, James Browne, David Phillips

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Introduction

- Large literature seeks to estimate responsiveness of agents to taxes
  - Key determinant of revenues from and efficiency costs of taxation
  - Under certain conditions, elasticity of taxable income (ETI) is a sufficient statistic that measures the excess burden of taxes (Feldstein, 1999)
  - But optimising frictions can attenuate reduced-form estimates of the elasticity of taxable income or labour supply (Chetty, 2012)

- Paper exploits cross-sectional variation created by tax thresholds in the UK to estimate the ETI and magnitude of frictions workers face
  - Rise in marginal or average tax rate at threshold should create bunching that can use to estimate ETI (Saez, 2010; Kleven & Waseem, 2013)
  - Look at lots of thresholds, in many years, at different earnings levels and across groups to see where and when bunching happens (& by who)
Outline

1. Thresholds in the UK personal tax system

2. Using bunching at tax thresholds to estimate the ETI

3. Data

4. Results
   a) Bunching at kink-points
   b) Bunching at notches

5. Conclusions
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Thresholds in the UK personal tax system

- UK has progressive income tax with several bands
  - Paid at basic, higher and additional rate above Personal Allowance
  - Higher-rate threshold (HRT): rate rises from 20-40% ~£40k
  - Additional-rate threshold: rate rises from 40-50% at £150k
  - Personal Allowance withdrawn from £100k: rate rises from 40-60% at £100k and falls back from 60-40% ~£113k

- Earnings also subject to National Insurance contributions (NICs)
  - Nominally paid by both employees and employers
  - Very weak link to benefit entitlement unlike in rest of EU or US
  - Three notches above the LEL from 1986-1998
  - NICs capped at Upper Earnings Limit before 1985 (fall in marginal rate)
  - Kinks at Primary & Secondary Thresholds from 1998 onwards

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Bunching at kink points

Before-tax income $z$

Density distribution

- With smooth tax schedule
- With kinked tax schedule

$k$

$k + \Delta z$
Bunching at notches

Notches create dominated region no one should locate in…

1. Bunching below threshold
2. Zero mass in dominated region
3. Gradual convergence back to no-notch density
Bunching at notches

... which we can exploit to estimate unattenuated earnings elasticity $\varepsilon$

1. Estimate no-notch counterfactual

2. Gives estimate of ratio of observed to counterfactual density in dominated region: Call this $a^* = a(\phi)$

3. Scale bunching up by $a^*$

4. ... and back out earnings response (and so elasticity) of marginal buncher

Assumes $a(\phi)$ locally constant: biases earnings response down
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Use large admin and employer survey datasets

- Survey of Personal Incomes (SPI): 2003-2011
  - Sample of income tax administrative records (~700,000 observations)

- New Earnings Survey (NES): 1978-
  - Large mandatory employer survey
  - Targets 1% random sample of civilian employees using NI numbers
  - Little measurement error & gives earnings in correct period for NICs
  - But some problems:
    1. Incomplete sample below LEL: we might understate bunching
    2. Earnings reported for period around turn of fiscal year: dual thresholds mean will pick up mixture of immediate and medium-run responses
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Do see bunching at the higher-rate threshold
SPI data from 2003-04 to 2007-08

Note: All figures in 2007–08 prices. Source: 2003–04 to 2007–08 SPI.
... but driven by company owner-managers
SPI data from 2003-04 to 2007-08

Note: All figures in 2007–08 prices. Source: 2003–04 to 2007–08 SPI.
... and implies very small elasticities

<table>
<thead>
<tr>
<th>Kink</th>
<th>All taxpayers</th>
<th>Self-employed</th>
<th>Company owner managers</th>
<th>Other taxpayers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher rate threshold</td>
<td>0.032***</td>
<td>0.058***</td>
<td>0.246***</td>
<td>0.015***</td>
</tr>
<tr>
<td>£100,000</td>
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<tr>
<td>£150,000</td>
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Note: ** = statistically significant at 5%, *** = statistically significant at 1% level.
Source: Author’s calculations using 2003–04 to 2007–08 Survey of Personal Incomes.
... as does bunching at the 100k threshold

Table 2

<table>
<thead>
<tr>
<th>Kink</th>
<th>All taxpayers</th>
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<tr>
<td>threshold</td>
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<tr>
<td>£100,000</td>
<td>0.014***</td>
<td>0.020***</td>
<td>0.039***</td>
<td>0.007**</td>
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<td>£150,000</td>
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Note: ** = statistically significant at 5%, *** = statistically significant at 1% level.
Source: Author’s calculations using 2003–04 to 2007–08 Survey of Personal Incomes.
... and the 150k threshold

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<tr>
<td>£100,000</td>
<td>0.014***</td>
<td>0.020***</td>
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<tr>
<td>£150,000</td>
<td>0.022***</td>
<td>0.011</td>
<td>0.070***</td>
<td>0.015***</td>
</tr>
</tbody>
</table>

Note: ** = statistically significant at 5%, *** = statistically significant at 1% level.
Source: Author’s calculations using 2003–04 to 2007–08 Survey of Personal Incomes.
But frictions could explain results at kinks

- Little bunching at income tax kinks, implying small elasticities
  - ... even for the self-employed & company owner-managers

- No bunching at kinks in NICs schedule from 1998 where rate rises

- Could be that underlying responsiveness small
  - ... but estimates seem implausibly small

- Estimates are consistent with larger elasticities if allow for frictions: with adjustment cost of 1% net earnings:
  - @100k: all taxpayers estimate of 0.01 could be = 0.49
  - @HRT: company owner-manager estimate of 0.25 could be = 1.58
  - @150k: self-employed estimate of 0.01 could be = 2.35
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See some bunching at LEL notch from 1978–85
... sharper bunching between 1986 and 1989
... & sharper again between 1990–99
Implies unattenuated elasticities of ~ 0.10-0.70

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<thead>
<tr>
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<tr>
<td><strong>Reduced-form approach</strong></td>
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<tr>
<td>Bunching-hole method</td>
<td>0.0965</td>
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<td>0.6891</td>
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<tr>
<td>s.e.</td>
<td>(0.0014)</td>
<td>(0.0046)</td>
<td>(0.0210)</td>
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<td><strong>Structural approach</strong></td>
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<td>s.e.</td>
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<td>(0.0036)</td>
<td>(0.0186)</td>
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<tr>
<td><strong>Actual/counterfactual</strong></td>
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<tr>
<td>density in bunching region</td>
<td>1.0904</td>
<td>1.1468</td>
<td>1.1493</td>
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<td>density in dominated region</td>
<td>0.8737</td>
<td>0.8257</td>
<td>0.8932</td>
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<td>Δz/z convergence method</td>
<td>14.5%</td>
<td>16%</td>
<td>38.5%</td>
</tr>
<tr>
<td>Δz/z bunching-hole method</td>
<td>23%</td>
<td>28.25%</td>
<td>52.25%</td>
</tr>
<tr>
<td>Polynomial order</td>
<td>12</td>
<td>12</td>
<td>15</td>
</tr>
</tbody>
</table>

Note: Bootstraped standard errors in italics calculated drawing with-replacement from the observed distribution.
Source: Author’s calculations using New Earnings Survey, 1978-1999
But some caveats on these estimates…

• Data problems
  – Might understate bunching below threshold
  – Can overstate frictions when notch is small and dominated regions from tax years ending 5 April/starting 6 April don’t overlap
  – Ambiguous effect on estimate of unattenuated elasticity

• Even with ~1% sample data quite noisy
  – Makes identifying bunching region and estimating counterfactual hard

• Local estimate for particular group from quite some time ago
  – Low-earning employees in the 1980s & 1990s
Yet evidence frictions v. large for most workers

- Observe large mass in dominated region above LEL 1978-85:
  - => frictions large enough to prevent majority of employees relocating just below threshold where taxes up to 17% of earnings lower

- Complete absence of bunching at notches higher up distribution:
  - locating in dominated region at third notch in 1989 => additional tax wedge of ~£500 on earnings of ~£18k per year (April 2012 prices)
  - Notches at dense part of earnings distribution effecting many workers: e.g. in 1989 at 0.8, 1 and 2 times median earnings

- Also find interesting heterogeneity in frictions faced across groups:
  - At LEL see no missing mass for FT employees => very high frictions
  - But plenty for PT employees => lower frictions (mostly women)
  - Employees in retail/hospitality sector also face lower frictions
Outline

1. Thresholds in the UK personal tax system

2. The economics and econometrics of bunching
   a. Bunching at kink-points (increase in marginal rate)
   b. Bunching at notches (increase in average rate)

3. Data

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Conclusions

• Frictions facing most employees are substantial
  – Sufficient to help reconcile macro and micro elasticity estimates?

• Heterogeneity in frictions corresponds to well-documented differences in elasticity estimates
  – Men/FT workers face far higher frictions than women/PT workers
  – Might also explain why company owner-managers bunch more at kinks
  – Is literature estimating differences in preferences or frictions?

• And also find variation in frictions across sectors e.g. lower in retail
  – Hours constraints imposed by firms?
  – Reminder that ETI can capture labour demand responses too