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

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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. 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

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

5. Conclusions
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Thresholds in the UK personal tax system

• Several kinks in income tax schedule
  – Higher-rate threshold (HRT): rate rises from 20-40% ~£40k
  – Additional-rate threshold: rate rises from 40-50% at £150k
  – Personal allowance above which income tax starts to be paid
  – Personal allowance withdrawn from £100k: rate rises from 40-60% at £100k and falls back from 60-40% ~£113k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
Bunching at kink points

• With smooth distribution of (convex) preferences, people should bunch sharply at thresholds where marginal rate increases
  – Amount of bunching proportional to compensated ETI locally
  – Saez (2010) derived method to estimate the excess (bunching) mass at a kink-point and from this the compensated ETI
  – Should also see dip in distribution where marginal rate falls

• But optimisation frictions mean some individuals won’t/can’t bunch
  – e.g. adjustment costs, hours constraints, inattention,
  – Attenuates estimates of elasticity from bunching at kink-points
  – Fundamental problem that can’t distinguish low ETI from high frictions
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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

Obs in £100 bins

Distance from threshold

No-notch density
Density with notch
Bunching at notches
… unless they face substantial frictions

Bunching mass
diffuse, not sharp

1. Estimate no-notch counterfactual

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

See some mass in dominated region

Obs in £100 bins

Distance from threshold
Bunching at notches
Use estimate of frictions $a^*$ to get unattenuated response $\Delta z$

1. Estimate no-notch counterfactual
   - Assumes $a(\phi)$ locally constant: biases earnings response down

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 of marginal buncher
Bunching at notches
... and so the unattenuated elasticity $\varepsilon$

- Kleven and Waseem (2013) propose two ways to get unattenuated elasticity $\varepsilon$ from this earnings response $\Delta z$

1. ‘Structural approach’
   - Specifying a functional form for utility yields expression that links % earnings response, % change in net-of-tax rate, and elasticity
   - Use quasi-linear utility specification: ignores income effects and get mixture of compensated and uncompensated elasticity

2. ‘Reduced-form approach’
   - Use implicit marginal tax rate created by notch between N and N+$\Delta z$
   - … but the notch generates larger earnings response than hypothetical kink, so will overstate the compensated elasticity
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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)
  - But doesn’t include non-taxpayers (e.g. those below Personal Allowance)

- **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>
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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

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Source: Author’s calculations using 2003–04 to 2007–08 Survey of Personal Incomes.
… and the 150k threshold

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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
  – … nor any dip at thresholds where income tax/NICs rate falls

• 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
… which implies unattenuated elasticity of ~ 0.10

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|                              |         |         |         |
| Actual/counterfactual density in bunching region | 1.0904  |
| Actual/counterfactual density in dominated region | 0.8737  |
| Δz/z convergence method      | 14.5%   |
| Δz/z bunching-hole method    | 23%     |
| Polynomial order             | 12      |

Note: Bootstraped standard errors in italics calculated drawing with-replacement from the observed distribution.
Source: Author’s calculations using New Earnings Survey, 1978-1999
Sharper bunching between 1986 and 1989
... but frictions fall, limiting rise in elasticity

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Note: Bootstrapped standard errors in italics calculated drawing with-replacement from the observed distribution.
Source: Author’s calculations using New Earnings Survey, 1978-1999
Bunching sharper again between 1990–99
... and frictions larger, giving estimate of 0.5–0.7

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Source: Author’s calculations using New Earnings Survey, 1978-1999
But some caveats on these elasticity 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:
  - $\Rightarrow$ 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 $\Rightarrow$ 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 $\Rightarrow$ very high frictions
  - but plenty for PT employees $\Rightarrow$ lower frictions (mostly women)
  - employees in retail/hospitality sector also face lower frictions
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Conclusions (1/3)

- Some bunching at income tax kinks, but implied elasticities small
  - ... even for company owner-managers at HRT who drive bunching
  - ... and likely attenuated by frictions such as adjustment costs

- No evidence of bunching at smaller NICs kinks

- Some bunching at notch where NICs became payable (LEL)
  - implies local unattenuated elasticity of 0.1-0.7
  - ... though some problems with data here

- No bunching at the NICs notches above LEL
  - implies large frictions for employees at 0.8 to 2 times median earnings
  - Sufficient to help reconcile macro and micro elasticity estimates?
Conclusions (2/3)

- Little bunching at 100k or 150k income tax thresholds and more bunching at LEL from 1985 despite smaller notch: salience?
  - 100k/150k thresholds new & 60% band not transparently described
  - Nigel Lawson made much of reforming the notch: increased salience?

- Find heterogeneity in frictions that 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?

- But 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
Conclusions (3/3)

- And are we implicitly assuming something about incidence?
  - Taxable income/hours elasticities usually interpreted as labour supply/individual preference parameters: lit. rarely mentions demand
  - If labour demand perfectly elastic ⇒ incidence fully on employees
  - What if labour demand not perfectly elastic? Is there then an identification or just an interpretation issue?