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Labour Supply and Taxes

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Introduction

- Effect of taxes and benefits on labour supply a hugely studied issue in public and labour economics – why?
- Significant policy interest in topic
  - how should we design the tax and benefit system to encourage individuals on the margins of the labour market into employment?
  - What are the consequences of raising top income tax rates?
- Central to understanding interesting labour market phenomena
  - Substantial increase in employment rates among women
  - Role of LS in driving business cycle fluctuations
- Plan for this lecture
  - Outline simple static model of labour supply and introduce taxes
  - Discuss alternative methods of identifying effect of taxes on LS
  - On the way, introduce some empirical work in the field

Basic notions

- How should we measure labour supply?
  - Extensive margin: whether to work or not
  - Intensive margin: how much to work. Just hours? What about effort?
  - Individual or joint family decision?

- How should we think about effect of taxes on labour supply?
  - Income and substitution effect
  - Summarise reaction of LS with elasticity measure (ε)
  - But many elasticity concepts: important to think about what the relevant one is (see Blundell and MaCurdy, 1998)

A static model of labour supply

- Consider individual *i* with characteristics v_{it} and preferences over consumption c_{it} and leisure l_{it}
- Individual problem to maximise within-period utility function
  - $U(c_{it}, l_{it}, v_{it})$ subject to budget constraint $c_{it} = \mu_{it} + w_{it}(T - l_{it})$
  - where T is time endowment and μ_{it} non-labour income
- Under certain conditions, have interior solution for hours of work
  - Yields labour supply function $h_{it} = h^s(w_{it}, \mu_{it}, v_{it})$
  - Uncompensated (Marshallian) effect dh^s/dw measures how hours of work respond to a shift in hours worked holding μ_{it} constant
  - Uncompensated elasticity defined as $\varepsilon^u = w/h * dh^s/dw$
  - Compensated (Hicksian) effect holds utility constant instead
  - By Slutsky have $\varepsilon^c = \varepsilon^u - \eta$ where $\eta = w.dh^s/d\mu$, the income effect

Introducing taxes and benefits

- With proportional taxes and means-tested benefits, problem now Max $U(c_{it}, l_{it}, v_{it})$ s.t $c_{it} = \mu_{it} + (1-\tau_t)w_{it}(T - l_{it})$
- Yields labour supply function $h_{it} = h^s[(1-\tau_t)w_{it}, \mu_{it}, v_{it}]$
  - Note labour supply now function of net rather than gross wage
  - More complicated with non-linear taxes (discuss later)
- Have possible corner solution: zero hours
  - Work only if $(1-\tau_t)w_{it} > w^* = U_l/U_c$ evaluated at h=0
  - Taxes unambiguously reduce probability of working versus $\tau_t = 0$
- But effect of taxes on hours worked unclear
  - Depends on which effect dominates: empirical question
  - Note ε^c determines distortionary costs of taxation
- How do we go about identifying these effects of interest?

Estimating the elasticity directly

- Model suggests hours worked are a function of marginal net-of-tax hourly wages (w) and other income (μ)
- So why not just get some cross-sectional data and run regression of

$$h_i = \alpha + \beta w_i + \gamma \mu_i + \phi Z_i + \varepsilon_i$$

- Selection: only observe wages for individuals in work
  - Running regression only on observations with positive hours means can bias estimates: low wage earners must really like work/dislike leisure
- Endogeneity: *w* and μ in our hours equation are both likely to be correlated with error term resulting in biased OLS estimates
  - Hetrogeneity in tastes for work
  - Progressive taxes => reverse causality
  - Measurement error: results in attenuation bias

(Quasi) Natural Experiments

- Variation from tax reforms provide potential solution to these issues
  - Policy might act as exogenous source of variation, changing tax rates for some `treatment group' but not another `control group'
  - Compare labour supply of 'treated' group to that of 'untreated' group
- Diff-in-diff approach relies on 2 key assumptions
  - Common trends
  - No group compositional change
- Lots of work exploiting the 1986 Tax Reform Act in US
  - E.g. Eissa (1996): high income women saw large reductions in marginal rates, but also substantial increase in non-labour (husband's) income
  - Find small increase in hours, large increase in participation for 'treated'
  - Problems: differential shocks, assortative matching, other reforms, group composition affected by reforms

New tax responsiveness literature

- Individuals might respond on margins other than hours/employment
  - Intensity of effort; human capital investment

- New tax responsiveness literature: look instead at taxable income
  - Taxable income a proxy for total effort: includes various channels
  - Feldstein (1995): ETI a `sufficient statistic' for welfare analysis

- Basics of approach
  - Summary parameter indicating how responsive taxpayers are to changes in their marginal tax rate
  - Compare taxable income of some group affected by a reform to that of an unaffected group

Example: the 50p rate of income tax debate

- Budget 2009 announced introduction of 50p rate of income tax for those with incomes above £150,000 from April 2010
  - At the time, HMT scored measure as increasing tax revenues by £2.7bn a year post-behavioural response (£6.8bn pre-response)

- In Budget 2011, the Chancellor asked HMRC to produce a report on how much 50p rate was raising
  - Suggested yield of £1 billion using revised estimate of the ETI
  - Revised estimate based on work exploiting the reform

- Revenue yield sensitive to estimated ETI

Revenue yield highly sensitive to the ETI

Taxable income elasticity	Revenue raised by 50p rate assuming:	
	Indirect tax revenues unaffected (£ billion)	Expenditure falls as much as income (£ billion)
0.20	4.1	2.9
0.25	3.5	2.2
0.30	3.0	1.6
0.35	2.4	0.9
0.40	1.8	0.3
0.45	1.3	–0.4
0.46 (BSS)	1.1	–0.5
0.50	0.7	–1.0

Source: Browne (2012) IFS Green Budget

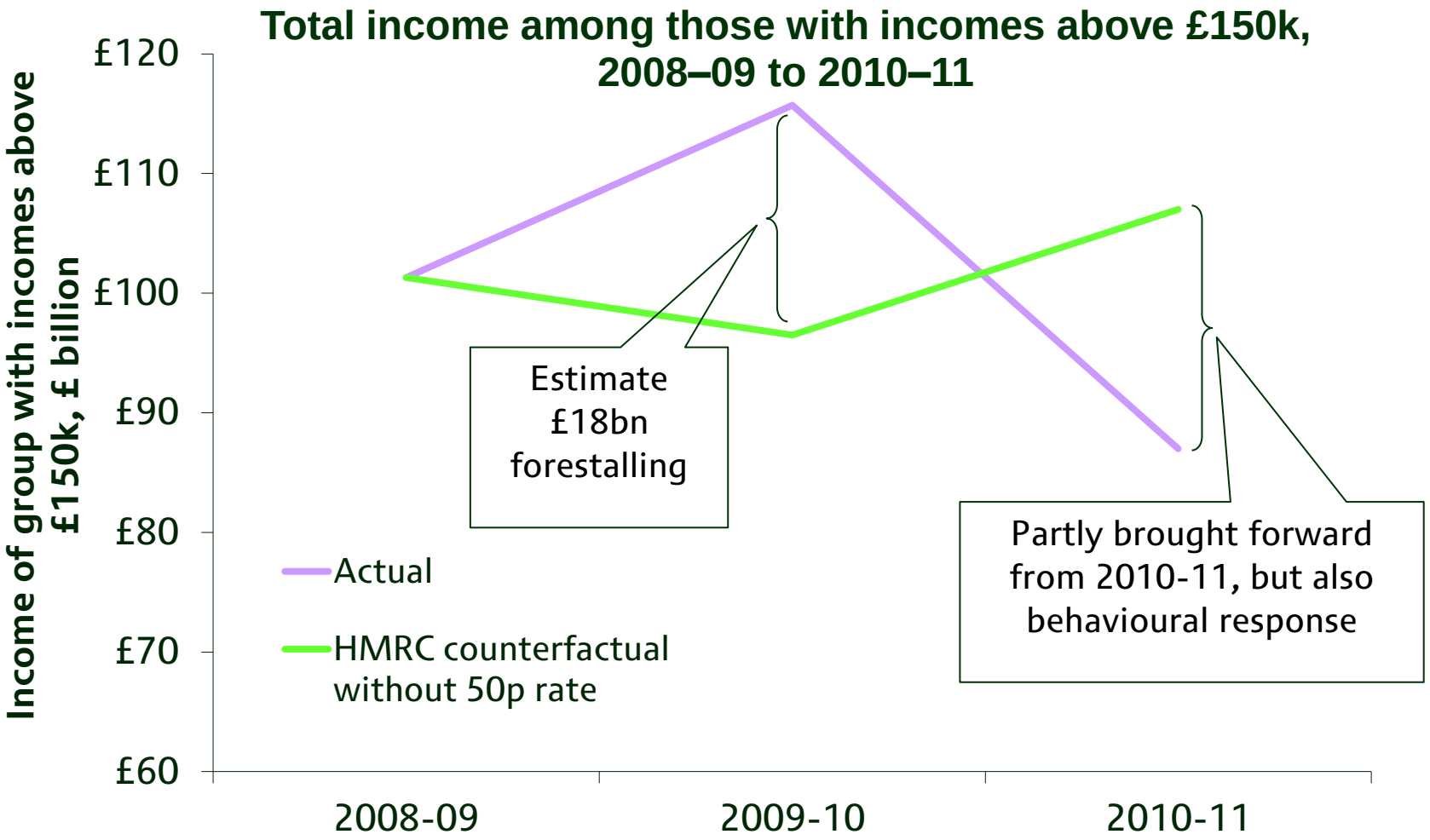
How did the HMRC estimate the ETI?

- HMRC produced estimate of income growth in 2009–10 and 2010–11 among those with incomes above £150k in the absence of the 50p rate, using information on:
  - income growth among the group with incomes between £115k and £150k in 2009–10 and 2010–11 and
  - stock market growth 2009–10 and 2010–11
- For this estimate to be unbiased, requires income growth among those with lower incomes to be unaffected by reforms. Unlikely:
  - If people reduce their income below £150k in response to 50p rate, would increase total income of this lower income group
  - Lower income group may also be affected by other policies introduced at the same time, e.g. withdrawal of personal allowance above £100k
- Also need to account for a forestalling effect

Accounting for forestalling

- Affected individuals might bring income forward to 40p regime:
  - HMRC estimate suggests £16bn to £18bn shifted forward to 2009–10
  - Overall, incomes among those with incomes above £150k increased by 14% in 2009–10 but fell by 25% in 2010–11
  - Particularly for dividend income: grew by 78% among this group in 2009–10 and then fell by 73% in 2010–11
  - Actual incomes therefore much higher in 2009–10 than in counterfactual scenario without 50p rate, and much lower in 2010–11
- Part of the fall in income in 2010 – 11 the result of forestalling, and part the result of other changes in behaviour
  - Forestalling will only affect the first few years' yield: can only bring a certain amount of income forward to avoid 50p rate
  - To get the medium term costing, need to separate out unwinding of forestalling from other behavioural changes
  - HMRC attempt to distinguish between the two effects, but requires assumption about how quickly forestalling unwound

HMRC estimate of forestalling



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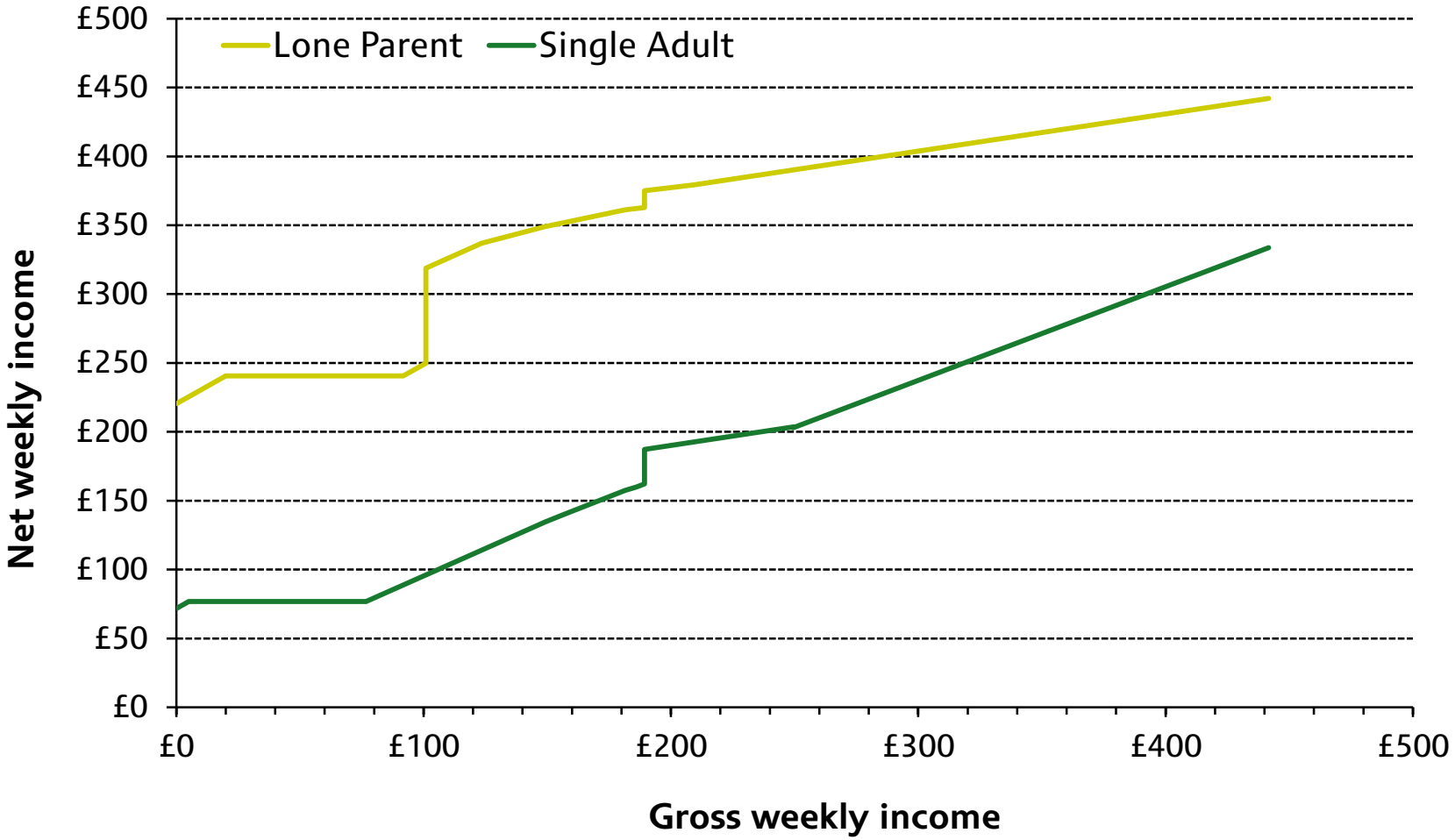
How did the HMRC estimate the ETI?

- HMRC then estimate the elasticity of taxable income
  - Central estimate of 0.48: if net-of-tax rate rises by 1%, taxable income rises by 0.48% => 50p rate raises £1 billion relative to 40p
- But estimates produced by their model are very imprecise
  - Standard errors suggest that only two-thirds chance that true elasticity in the model is between 0.14 and 0.81
  - And as we saw, revenue estimates are highly sensitive to the ETI
- Overall, reasonable attempt using approach
  - Similar to IFS central estimate of 0.46 (based on tax cuts in the 1980s)
  - But estimated parameter depends on avoidance opportunities: suggests government can (to an extent) increase the revenue maximising rate by reducing avoidance opportunities
  - See Saez et al JEL 2012 for critical review of literature: mean reversion, anticipation effects, re-allocation over the lifecycle

Bunching at tax (and benefit) kink points

- Tax and benefit system make budget set highly non-linear
  - Progressive tax structure with numerous kinks
  - Withdrawal of means-tested benefits and odd cliff-edges

Non-linear budget sets in the UK



Source: TAXBEN, using April 2013 system. Hourly wage of £6.31 (2013 minimum wage)

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Bunching at tax (and benefit) kink points

- Tax and benefit system make budget set highly non-linear
  - Progressive tax structure with numerous kinks
  - Withdrawal of means-tested benefits and odd cliff-edges

- Results in two main econometric problems
  - Reverse causality: w and μ both functions of hours
  - Model mis-specification: no longer get structural parameter of interest

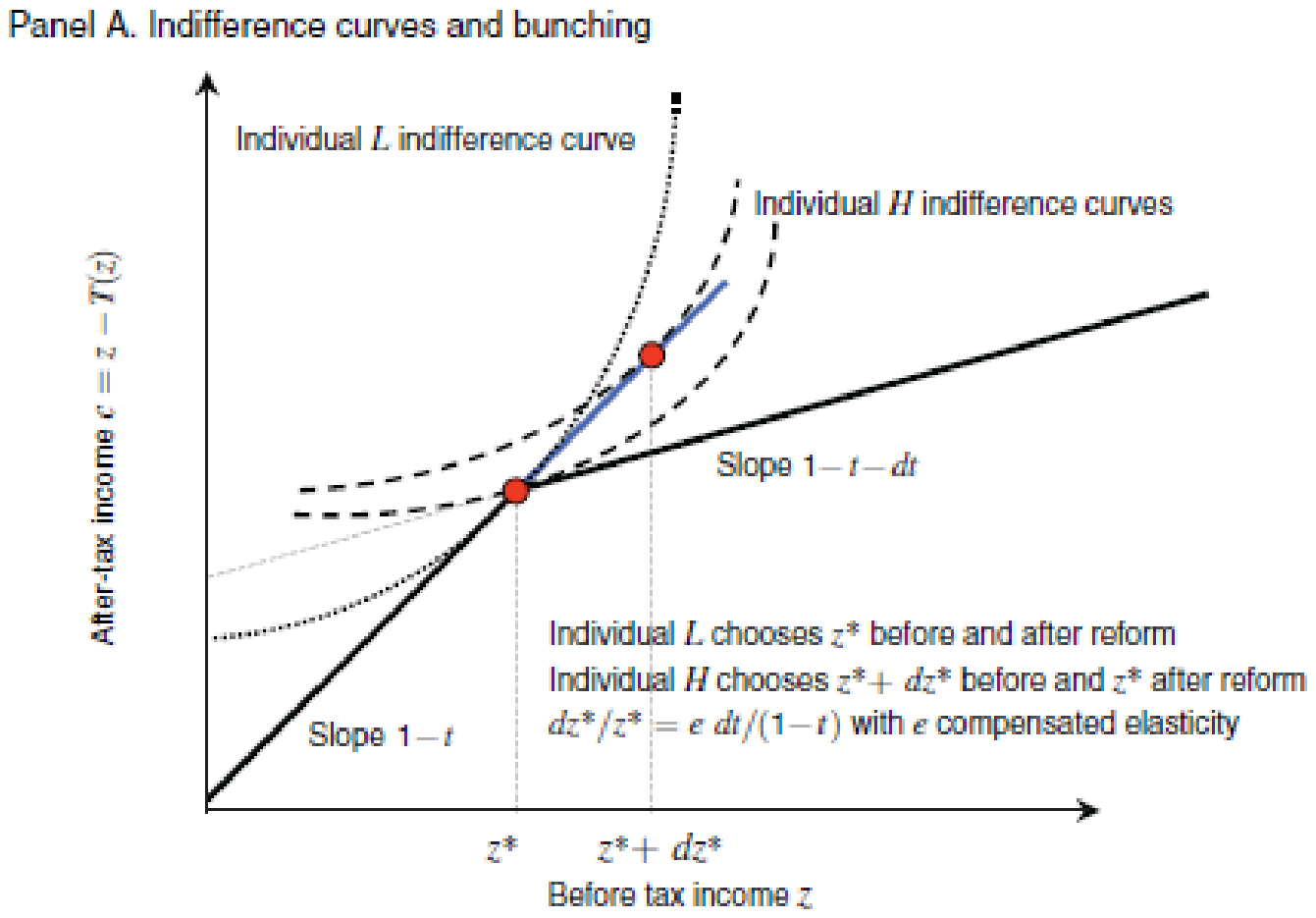
Bunching at tax (and benefit) kink points

- Also provides the possibility of identifying behavioural responses
  - Model predicts individuals should bunch at kink points of tax schedule
  - Only non-parametric source of identification with cross-sectional data

- Saez (2010) develops method that relates observed bunching to ε^c
  - Consider increase in marginal tax rate from *t* to *t + dt* at income level z^*
  - Highest (no-kink) income individual bunching at z^* comes from $z^* + dz$
  - Bunching proportional to average ε^c at income level z^* and net-of-tax ratio

$$\varepsilon^c = \frac{dz / z^*}{dt / (1-t)}$$

Bunching at tax (and benefit) kink points



Source: Saez (2010) Figure 1

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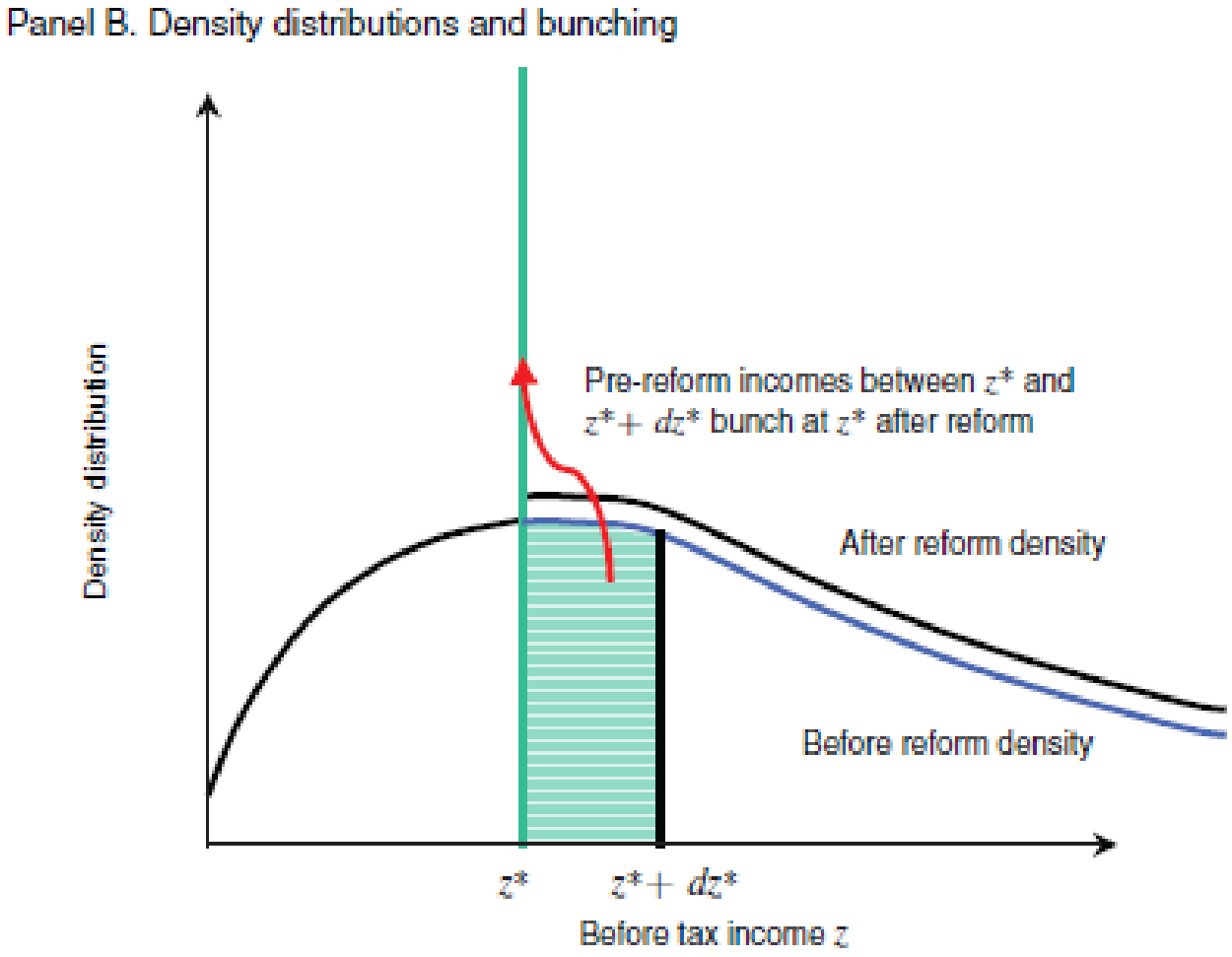
Bunching at tax (and benefit) kink points

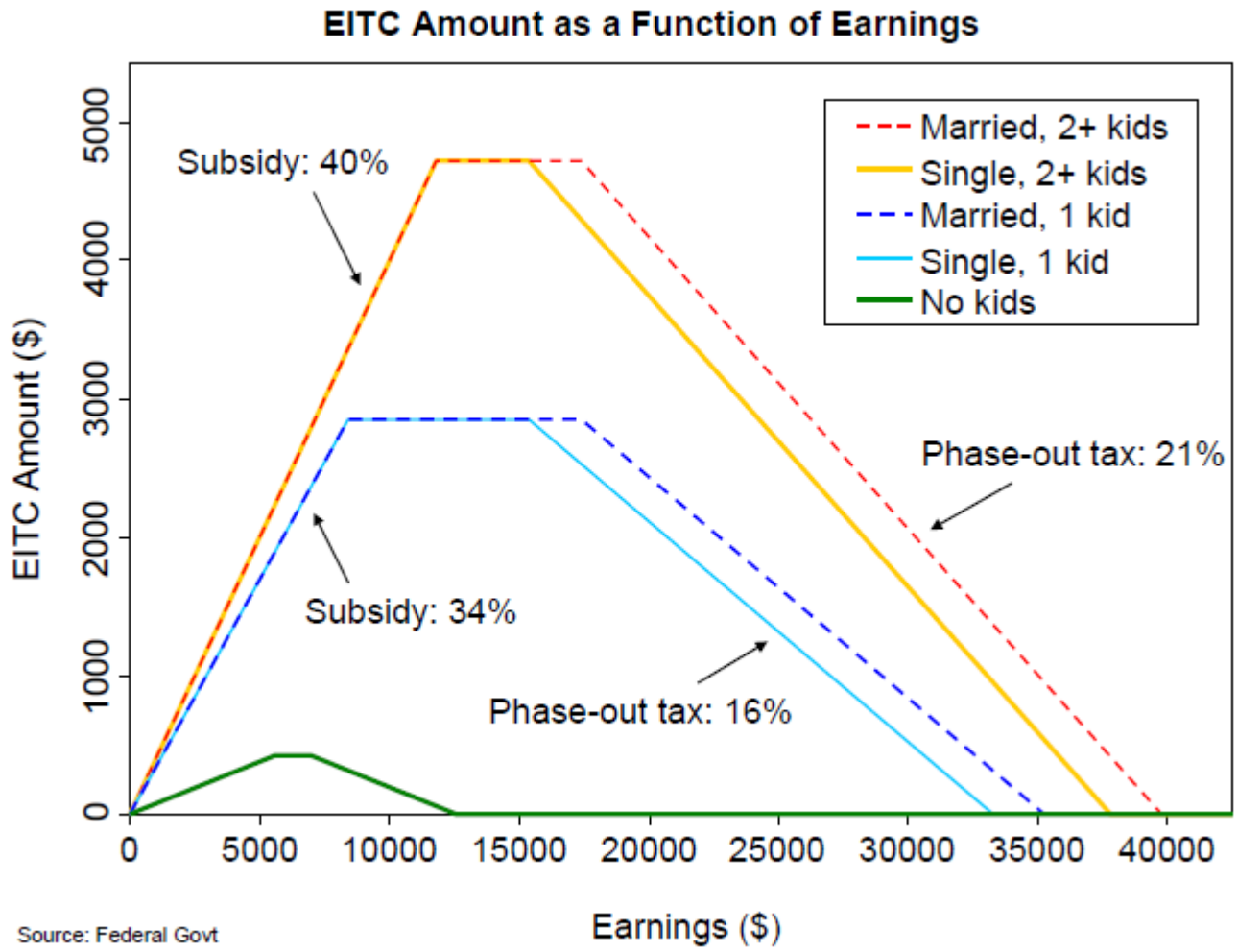


Source: Saez (2010) Figure 1

Bunching at tax (and benefit) kink points

- Saez looks at kink points of Earned Income Tax Credit schedule
  - Use individual tax return administrative data

Bunching at tax (and benefit) kink points



Source: Saez (2010)

Bunching at tax (and benefit) kink points

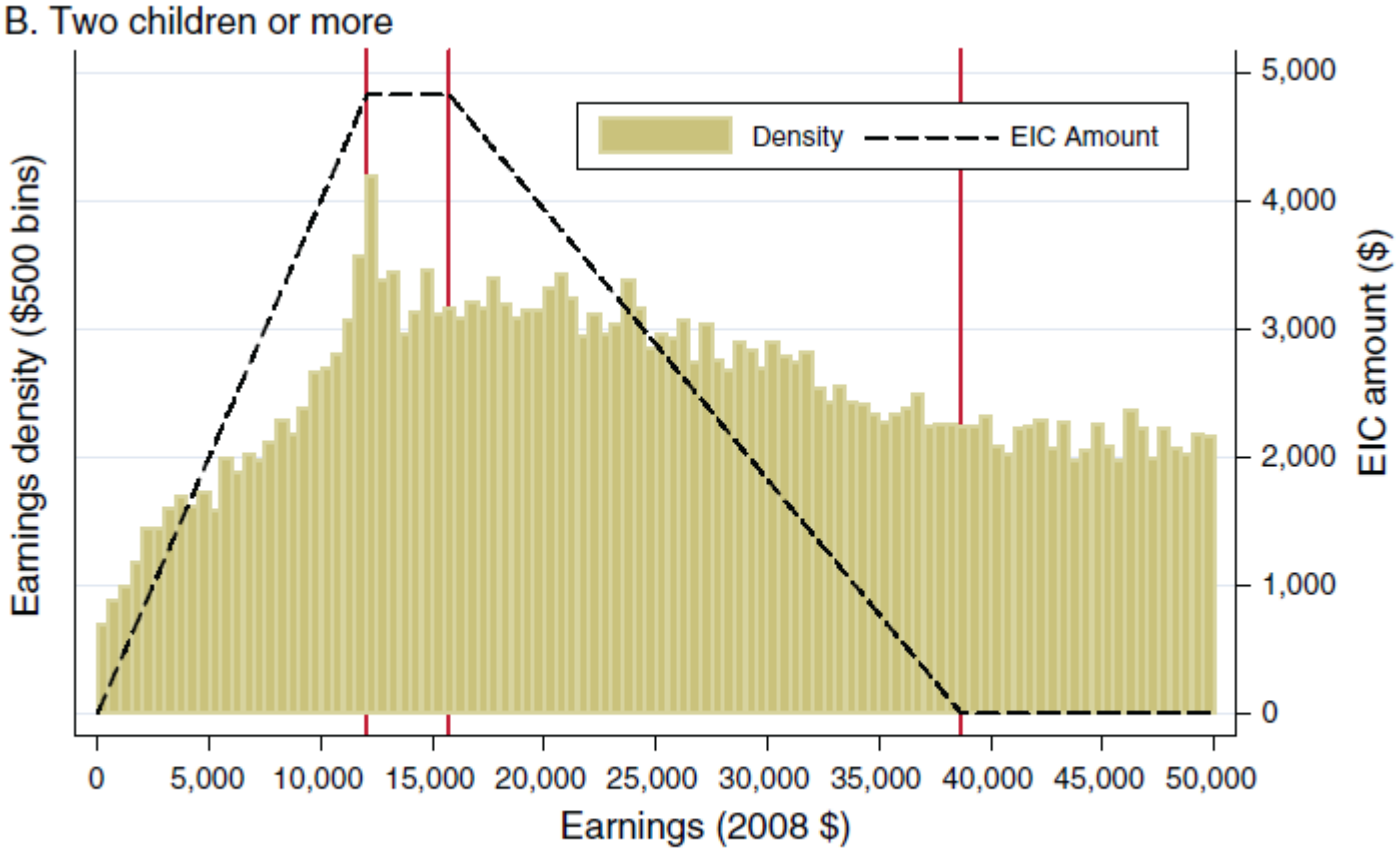


FIGURE 3. EARNINGS DENSITY DISTRIBUTIONS AND THE EITC

Source: Saez (2010)

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Bunching at tax (and benefit) kink points

- Saez looks at kink points of Earned Income Tax Credit schedule
  - Use individual tax return administrative data
  - Find bunching at first EITC kink, especially for self-employed
  - But no bunching at other EITC kink points, and implied ε^c very small
- Why don't we see bunching at kink points?
  - Behavioural responses to taxation are actually small
  - Information and salience (Chetty & Saez, 2013)
  - Adjustment costs (Chetty et al, 2011)
- Kleven and Waseem (2013, QJE) extend approach to notches
  - Jump in average rather than marginal rates
  - Use proportion of individuals observed in dominated region to estimate adjustment costs
  - But also find elasticities low (for very selected sample in Pakistan)

Discrete choice models

- Alternative approach to dealing with non-linear budget sets is to model labour supply as a discrete choice
  - e.g. decision is to work full-time, part-time, or not at all
  - Can then apply well established maximum likelihood methods to retrieve labour supply parameters of interest
  - Advantage is can easily simulate effect of hypothesised policy reform once behavioural parameters have been uncovered
  - But requires (restrictive) assumptions on preferences and error terms
- Example: Brewer et al (2006)
  - Examine effect of WFTC reform on labour supply of mothers
  - Find reform increased employment rate of lone mothers by around 5ppt but slightly reduced labour supply of couples with children
- See Blundell et al. (2007) for survey of approach

Summary

- Understanding effect of taxes on labour supply crucial for many areas of policy and bigger questions about labour market trends
- But identifying behavioural responses and LS parameters difficult
  - Endogeneity and selection hamper standard OLS approach in x-section
  - Hard to find credible treatment-control groups for experimental design

- Yet relative consensus on labour supply responses
  - Prime-aged males very unresponsive in intensive and extensive margin, but taxable income elasticities around 0.2-0.6
  - Married women more sensitive, particularly on extensive margin
  - Presence and age of children in household important
  - See Meaghir & Philips (2010) for accessible survey, and Blundell and MaCurdy (1999) for more comprehensive one

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