Empirical Evidence and Earnings Taxation: Lessons from the Mirrlees Review

EALE-SOLE

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Empirical Evidence and Earnings Tax Design

- First, a little background to the Mirrlees Review
- Then a discussion on the role of evidence loosely organised under five headings:

1. Key margins of adjustment to tax reform
2. Measurement of effective tax rates
3. The importance of information, complexity and salience
4. Evidence on the size of responses
5. Implications for tax design

Empirical Evidence and Earnings Tax Design

- Sub-heading (and subtext) for the talk:

Labor Supply Responses at the Extensive Margin:

What Do We Know and Why Does It Matter?

The extensive – intensive distinction is important for a number of reasons:

- Understanding responses to tax and welfare reform
  - Heckman, Wise, Prescott, Rogerson, .. all highlight the importance of extensive labour supply margin,
  - perhaps too much….
- The size of extensive and intensive responses are also key parameters in the recent literature on earnings tax design
  - used heavily in the Mirrlees Review.
- But these elasticities have changed over time and the relative importance of the extensive margin is specific to particular groups
  - I'll examine a specific example of low earning families in more detail in what follows

What is the Mirrlees Review?

- Review of tax design from first principles
  - For modern open economies in general and UK in particular
  - Reflect changes in the world, changes in our understanding and increased empirical knowledge
- Two volumes:
  - 'Dimensions of Tax Design': 13 chapters on specific areas co-authored by international experts and IFS researchers, along with 30 expert commentaries (MRI) –on web and at OUP
  - I will draw on contributions by Adam, Browne, Diamond, Hoynes, Laroque, Meghir, Moffitt, Phillips, Saez, Shephard..
  - 'Tax by Design': an integrated picture of tax design and reform, written by the editors (MRII)

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Increased empirical knowledge: – some examples

- labour supply responses for individuals and families
  - at the intensive and extensive margins
  - by age and demographic structure
- taxable income elasticities
  - top of the income distribution using tax return information
- income uncertainty
  - persistence and magnitude of earnings shocks over the life-cycle
- ability to (micro-)simulate marginal and average rates
  - simulate reforms

The focus here is on earnings taxation

- Leading example of the mix of theory and evidence
- Key implications for tax design
- Earnings taxation, in particular, takes most of the strain in distributional adjustments of other parts of the reform package

Thinking about Responses at the Intensive and Extensive Margin

- Write within period utility as

$$U = \begin{cases} c - \dfrac{h^{1+1/\alpha}}{1+1/\alpha} - \beta & \text{if } h > 0 \\ c & \text{if } h = 0 \end{cases}$$

- α is the intensive labour supply elasticity and she works when the value of working at wage w exceeds the fixed cost β.
- Convenient to describe the distribution of heterogeneity through the conditional distribution of β given α, $F(\beta|\,\alpha)$ and the marginal distribution of α.
- The labour supply and employment rate for individuals of type α, is

$$h(w,\alpha) = w^{\alpha} \quad \text{and} \quad p(w,\alpha) = F\left(\frac{w^{1+\alpha}}{1+\alpha}\right)$$

Thinking about Responses at the Intensive and Extensive Margin

- The intensive and the employment rate elasticity are

$$\varepsilon_I(\alpha) = \alpha \quad \text{and} \quad \varepsilon_E(\alpha) = w^{(1+\alpha)} f\left(\frac{w^{(1+\alpha)}}{1+\alpha}\right) / F\left(\frac{w^{(1+\alpha)}}{1+\alpha}\right)$$

- The aggregate hours elasticity is a weighted sum across the intensive and extensive margins

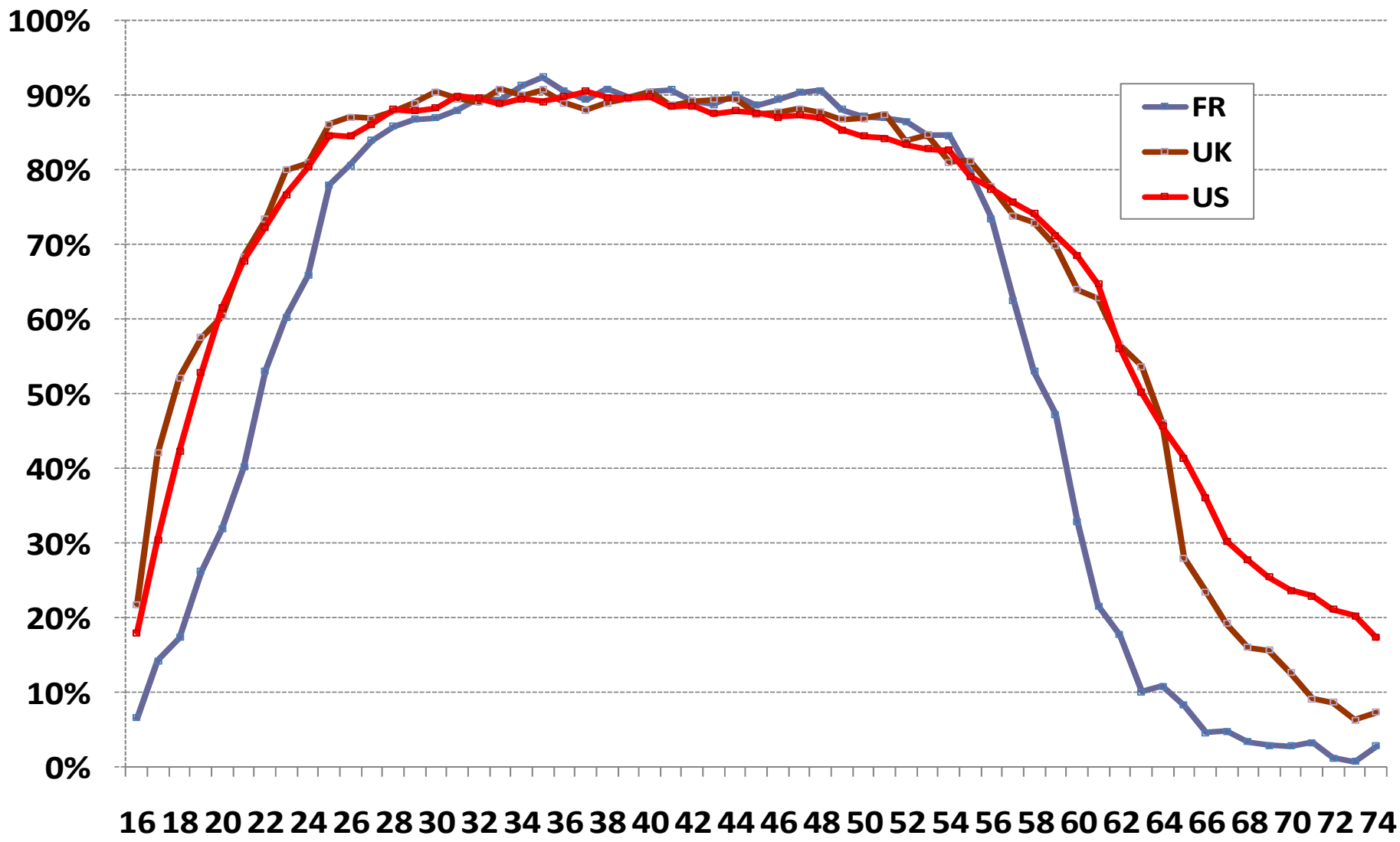
$$\frac{d\ln H}{d\ln w} = \frac{1}{H}\int_{\alpha}[\alpha w^{\alpha} F\left(\frac{w^{1+\alpha}}{1+\alpha}\,|\,\alpha\right) + w^{\alpha} w^{1+\alpha} f\left(\frac{w^{1+\alpha}}{1+\alpha}\,|\,\alpha\right)]dG(\alpha)$$

$$= \frac{1}{H}\int_{\alpha} p(w,\alpha)h(w,\alpha)[\varepsilon_I(\alpha) + \varepsilon_E(\alpha)]dG(\alpha)$$

- Of course, quasi-linear utility is highly restrictive and we expect income effects to matter, at least for some types of households – we use more general models with fixed costs

- So where are the key margins of response?
- Evidence suggests they are not all the extensive margin..
  - Intensive and extensive margins both matter
  - They matter for tax policy evaluation and earnings tax design
  - And they matter in different ways by age and demographic groups
- Getting it right for men

Employment for men by age – FR, UK and US 2007



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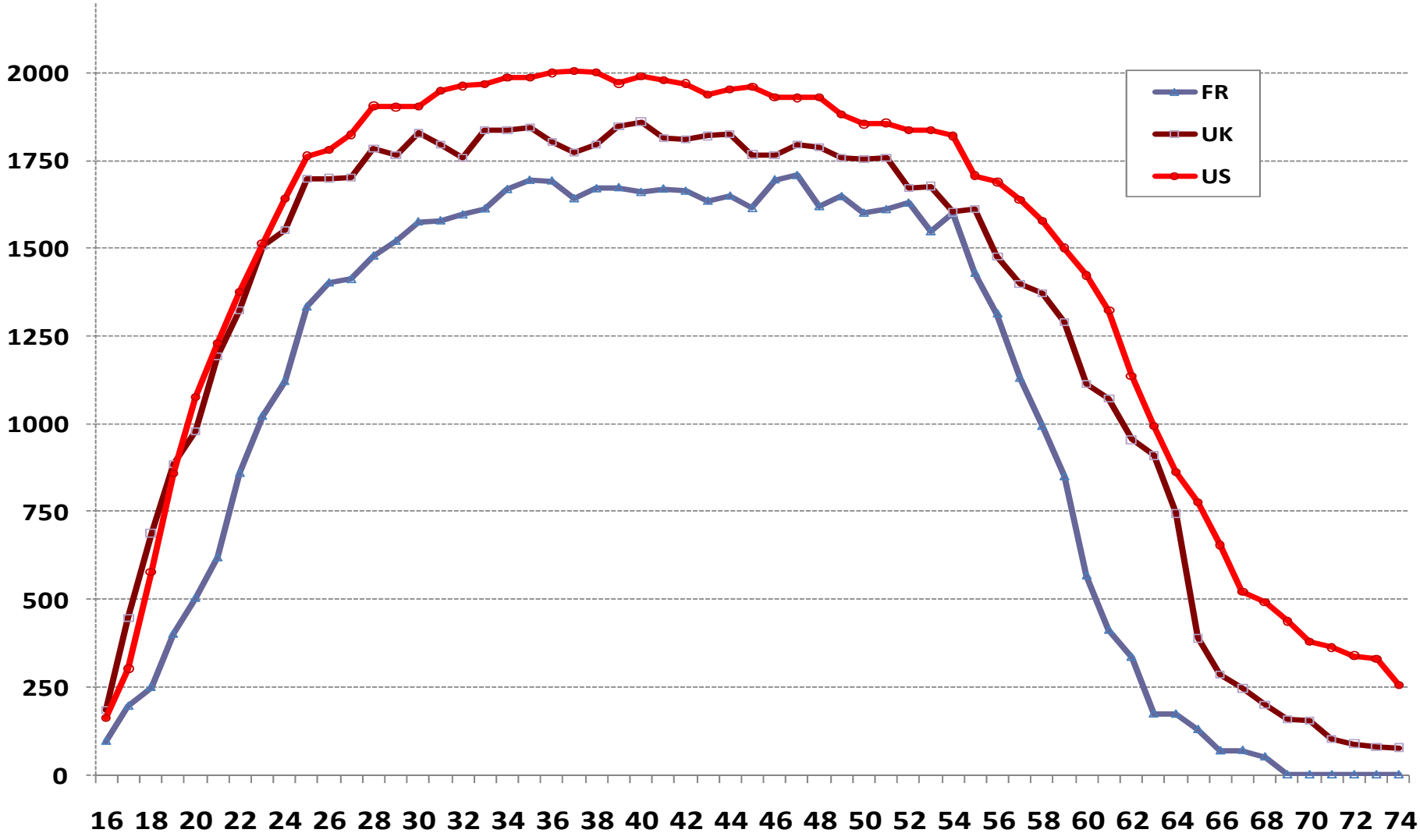
Total Hours for men by age – FR, UK and US 2007



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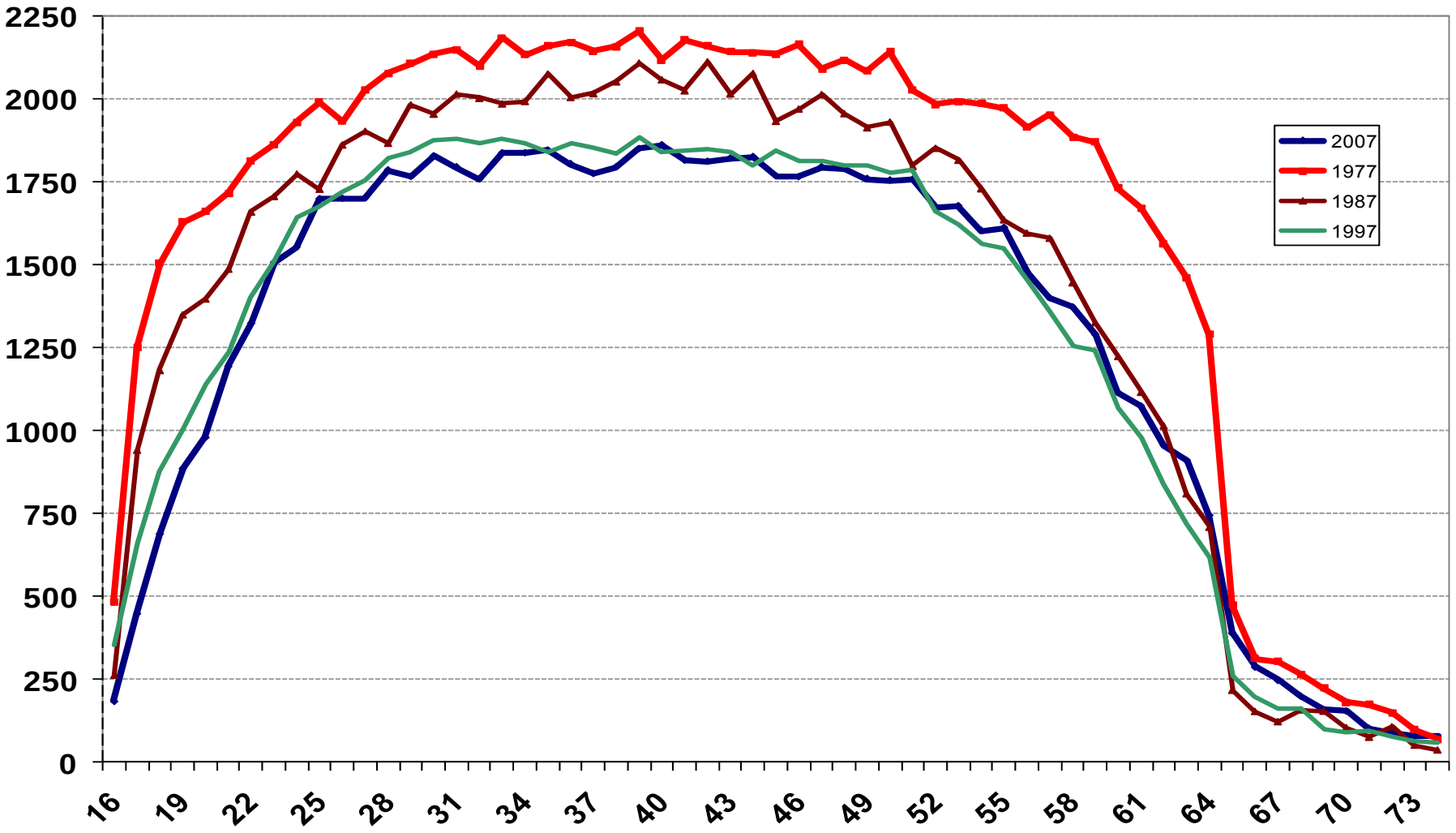
Total Hours for men by age in the UK: 1977 - 2007



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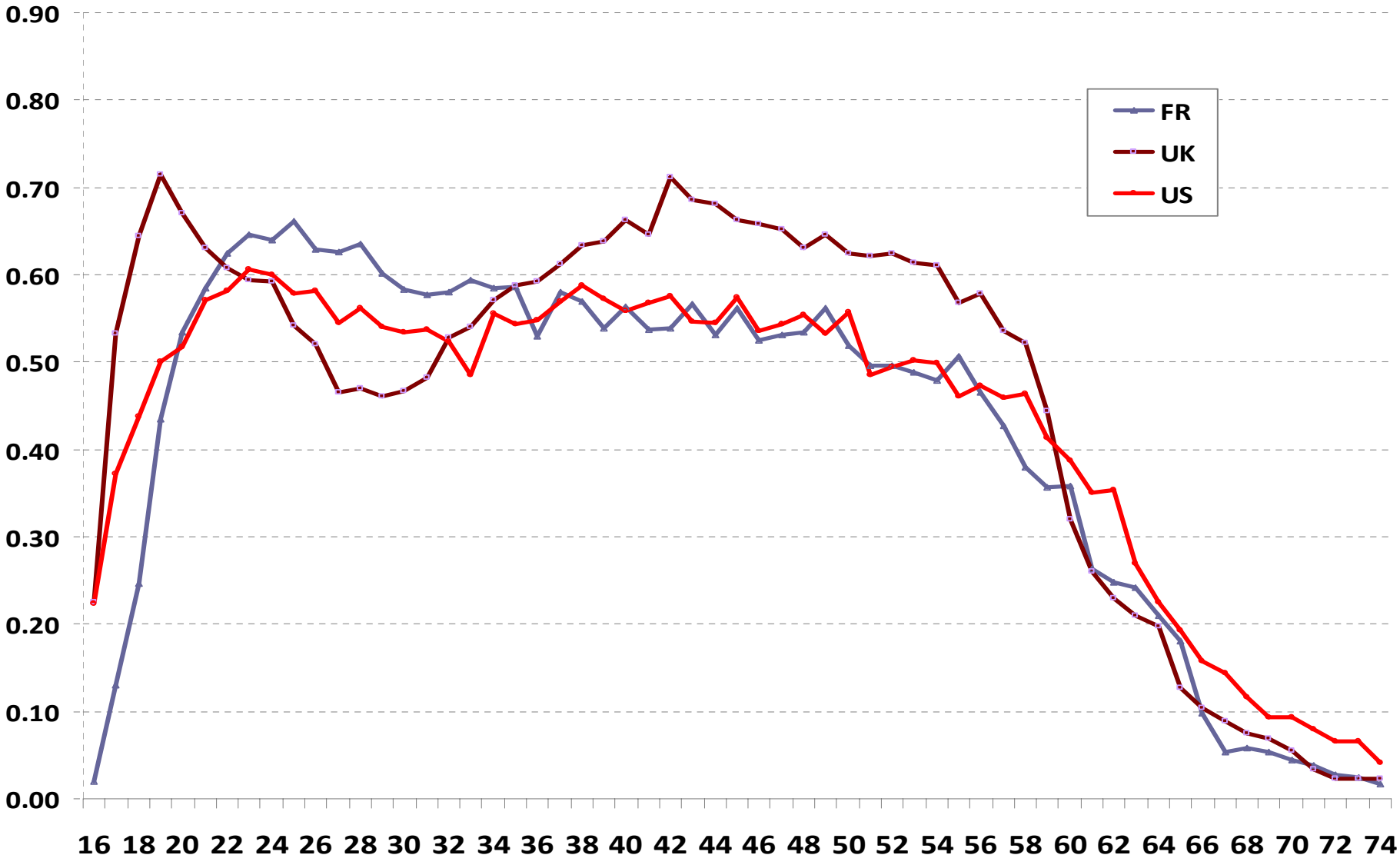
Key Margins of Adjustment

- Extensive and extensive margins for women

Female Employment by age – US, FR and UK 1977



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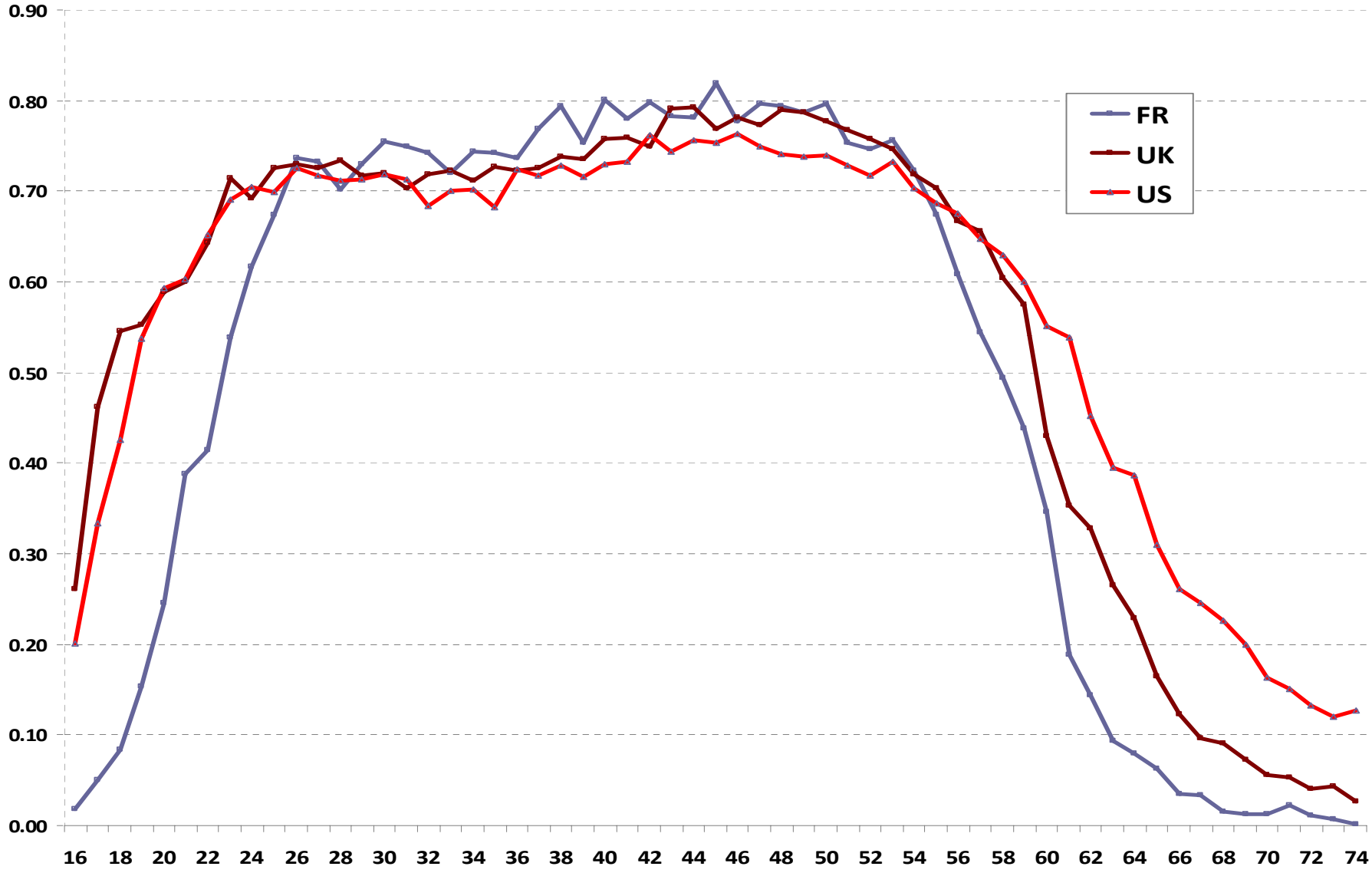

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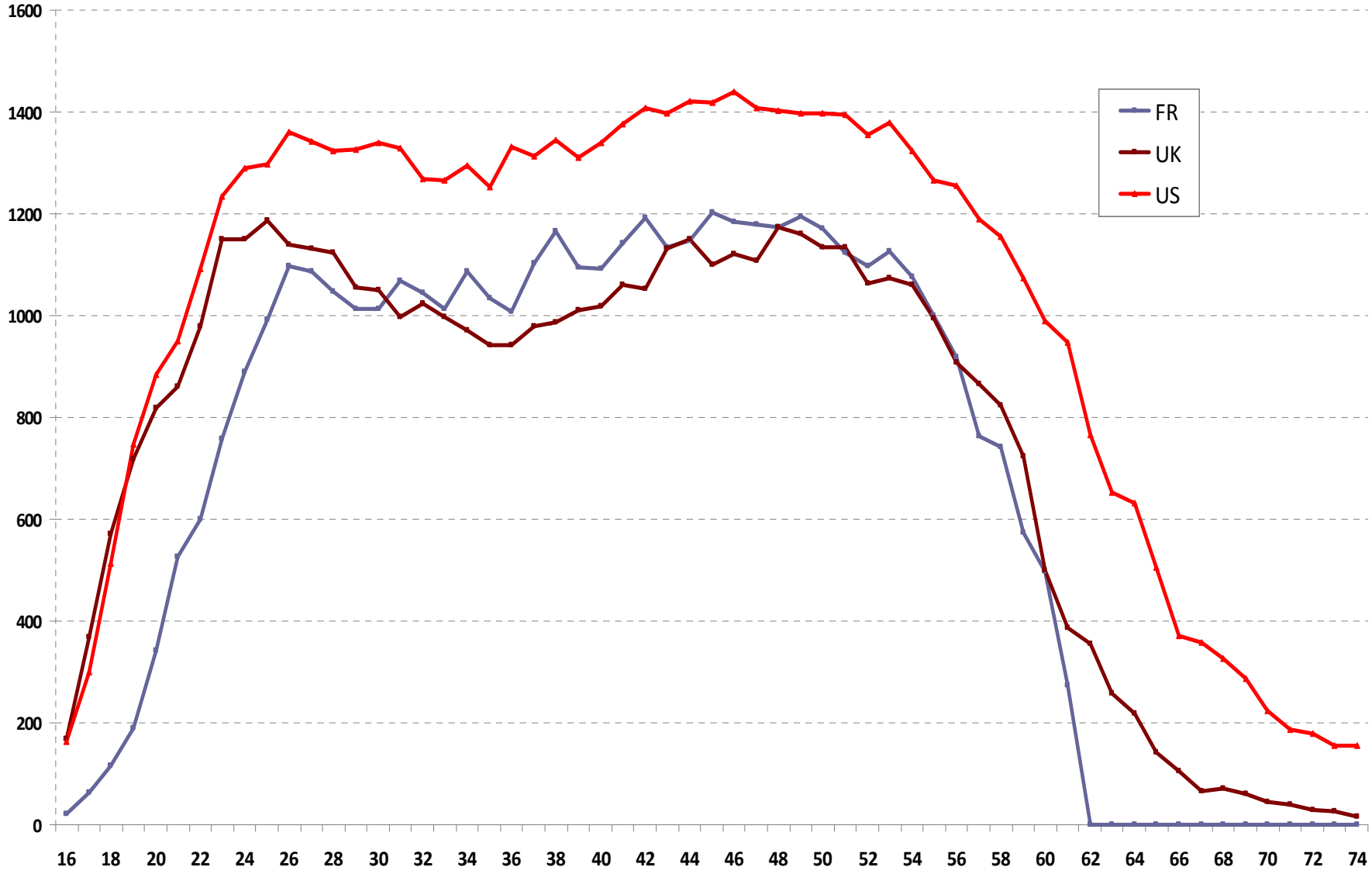

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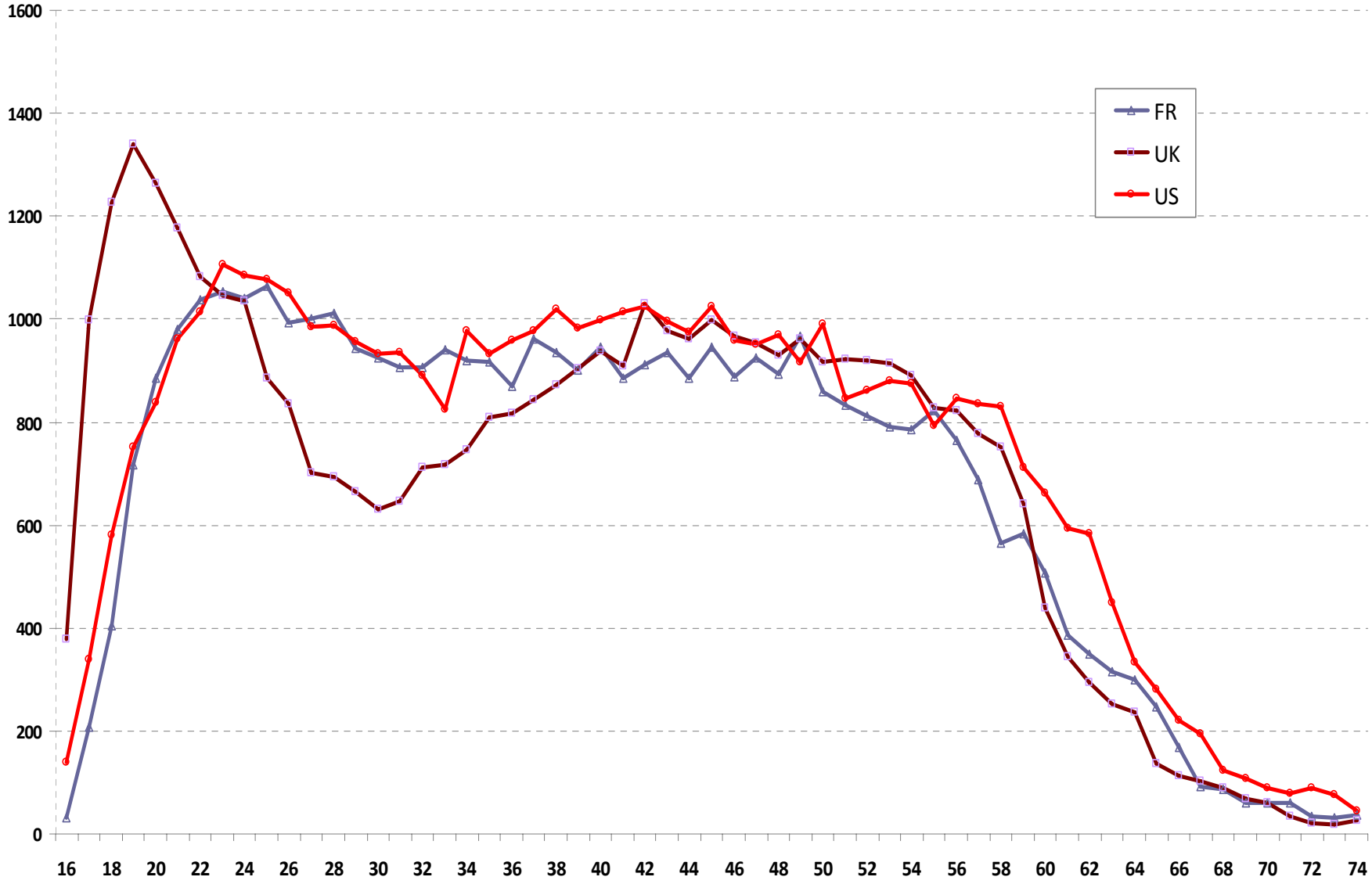

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Measuring Responses at the Intensive and Extensive Margin

- Suppose the population share at time *t* of type *j* is q_{jt}, then total hours $$H_t = \sum_{j=1}^{J} q_{jt} H_{jt} \quad \text{and} \quad H_{jt} = p_{jt} h_{jt}$$
- Changes in total hours per person written as the sum of changes across all types of workers and the change in structure of the population

$$H_t - H_{t-1} = \Delta_t + S_t$$

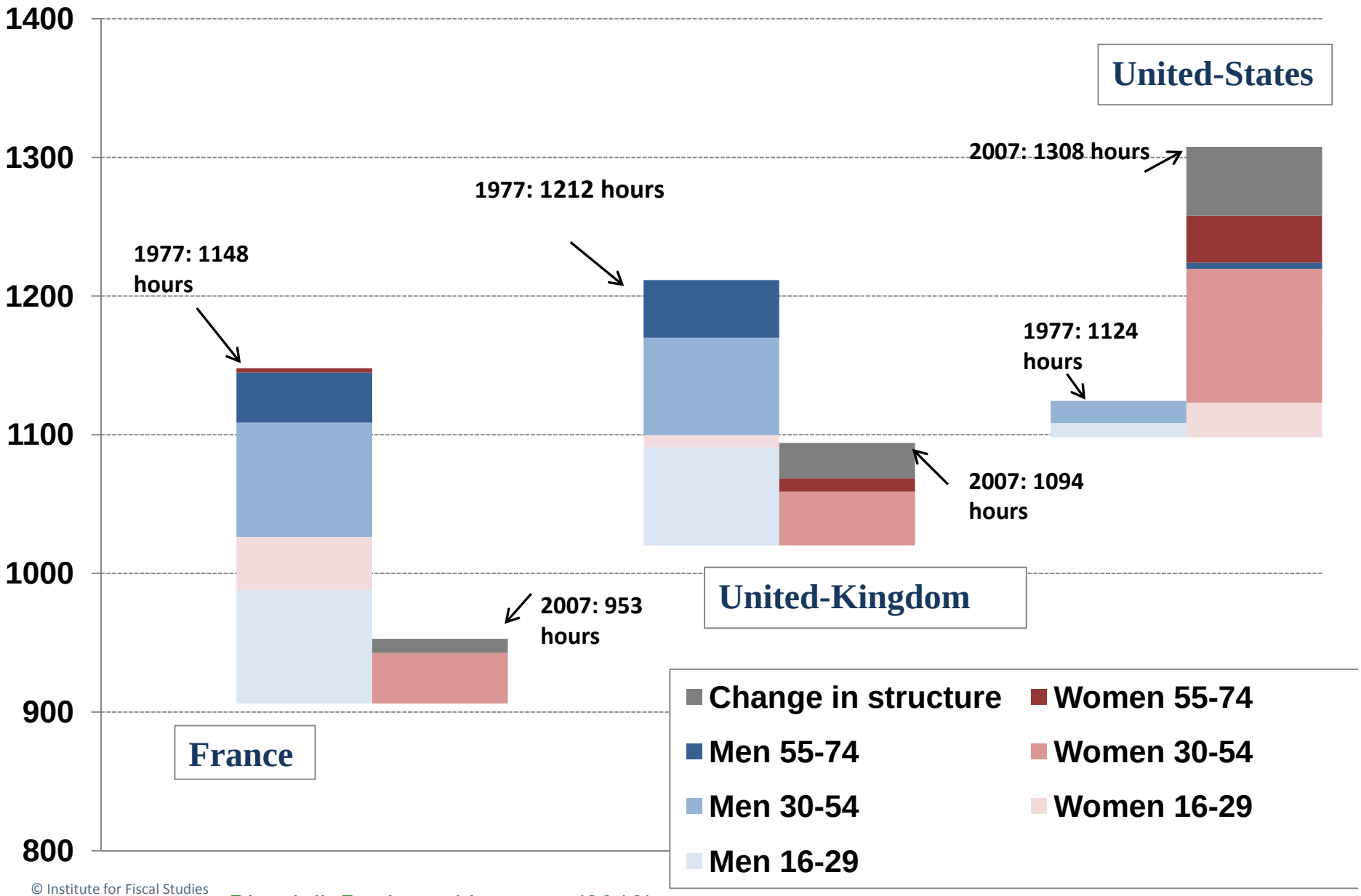
$$\text{where} \quad \Delta_t = \sum_{j=1}^{J} \Delta_{jt} \quad \text{with} \quad \Delta_{jt} = q_{jt-1}[H_{jt} - H_{jt-1}]$$

- We can also mirror the weighted elasticity decomposition

$$\frac{\Delta H}{H} \simeq \frac{1}{H} \sum_{j=1}^{J} q_j \left[p_j h_j \frac{\Delta h_j}{h_j} + p_j h_j \frac{\Delta p_j}{p_j} \right]$$

- And derive *bounds* on extensive and intensive responses for finite changes

Decomposition of change in annual hours worked (1977-2007)



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Bounds on Intensive and Extensive Responses (1977-2007)

	Year	Men 16-29	Women 16-29	Men 30-54	Women 30-54	Men 55-74	Women 55-74
FR	I-P, I-L	[-37,-28]	[-23, -19]	[-59, -56]	[-49, -35]	[-11, -8]	[-10, -9]
	E-L, E-P	[-54, -45]	[-19, -16]	[-27, -23]	[71, 85]	[-28, -25]	[6, 7]
	Δ	-82	-38	-82	36	-36	-3
UK	I-P, I-L	[-42, -36]	[-26, -23]	[-48, -45]	[-3, -2]	[-22, -19]	[-8, -6]
	E-L, E-P	[-35, -29]	[14, 17]	[-25, -22]	[41, 41]	[-23, -20]	[15, 17]
	Δ	-71	-9	-70	39	-42	10
US	I-P, I-L	[-6, -6]	[1, 1]	[-5, -5]	[14, 19]	[3, 3]	[3, 5]
	E-L, E-P	[-13, -13]	[21, 21]	[-14, -14]	[72, 77]	[3, 3]	[33, 35]
	Δ	-19	22	-19	90	6	38

Blundell, Bozio and Laroque (2010)

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Why is this distinction important for tax design?

- Some key lessons from recent tax design theory (Saez, Laroque, ..)
- A ‘large’ extensive elasticity at low earnings can ‘turn around’ the impact of declining social weights
  - implying a higher optimal transfer to low earning workers than to those out of work
  - a role for earned income tax credits
- But how do individuals perceive the tax rates on earnings implicit in the tax credit and benefit system - salience?
  - are individuals more likely to ‘take-up’ if generosity increases? – marginal rates become endogenous…
- Importance of margins other than labour supply/hours
  - use of taxable income elasticities to guide choice of top tax rates
- Importance of dynamics and frictions

An Analysis in Two Steps

- The first step (impact) is a positive analysis of household decisions. There are two dominant empirical approaches to the measurement of the impact of tax reform
  - both prove useful:
  - 1. A 'quasi-experimental' evaluation of the impact of historic reforms /and randomised experiments
  - 2. A 'structural' estimation based on a general discrete choice model with (unobserved) heterogeneity
- The second step (optimality) is the normative analysis or optimal policy analysis
  - Examines how to best design benefits, in-work tax credits and earnings tax rates with (un)observed heterogeneity and unobserved earnings 'capacity'

Alternative approaches to measuring the impact:

- Structural model
  - Simulate effect of actual or hypothetical reforms
  - Useful for optimal design too, but, robust?
- Quasi-experiment/Difference-in-differences
  - Compares outcomes of eligibles and non-eligibles and estimates ‘average’ impact of past reform
  - Only indirectly related to what is needed for optimal design
  - At best, partially identify parameters of interest
- Randomised experiment? SSP?

Focus here on tax rates on lower incomes

Main defects in current welfare/benefit systems

- Participation tax rates at the bottom remain very high in UK and elsewhere
- Marginal tax rates are well over 80% for some low income working families because of phasing-out of means-tested benefits and tax credits
  - Working Families Tax Credit + Housing Benefit in UK
  - and interactions with the income tax system
  - for example, we can examine a typical budget constraint for a single mother in the UK…

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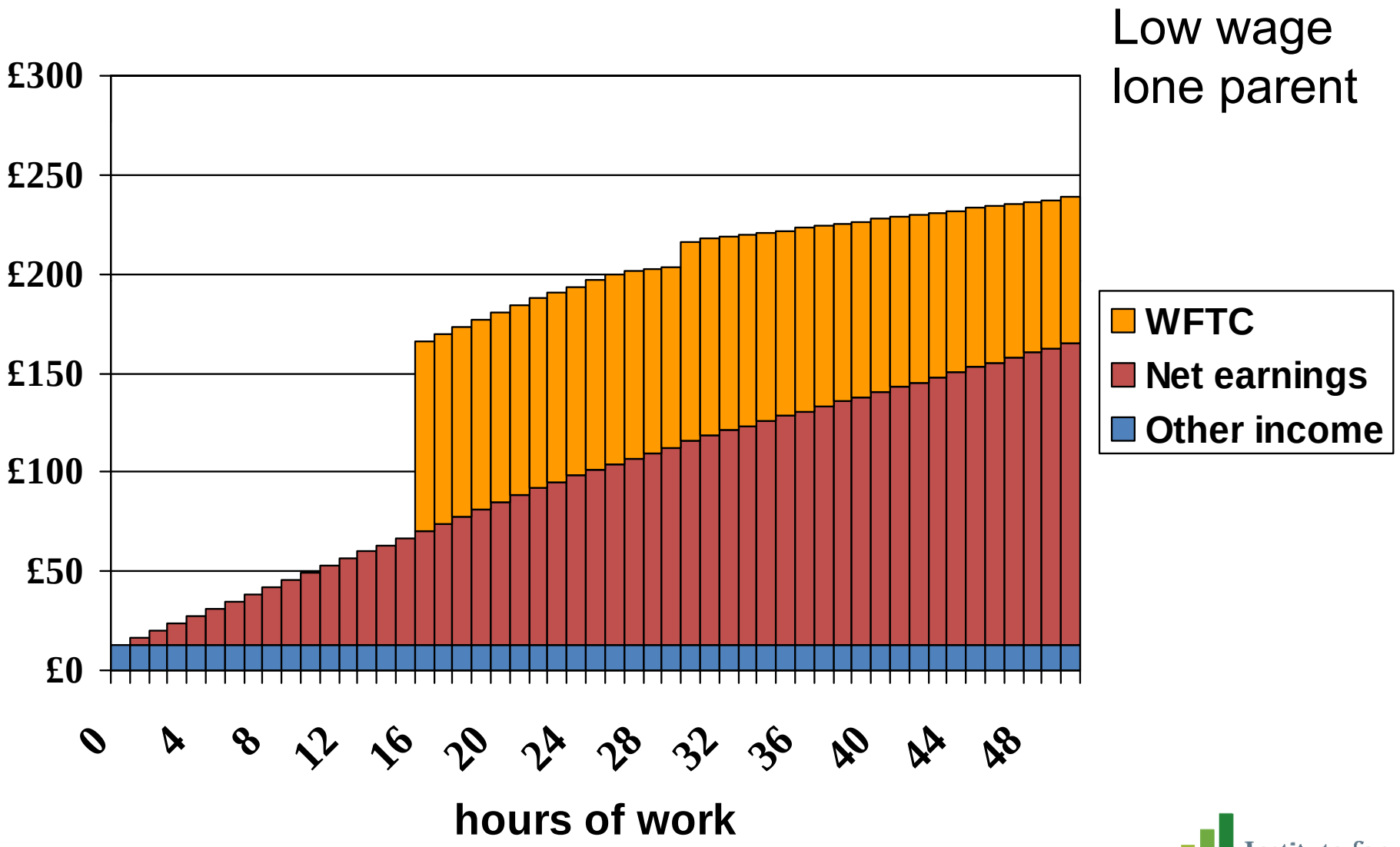
The interaction of WFTC with other benefits in the UK



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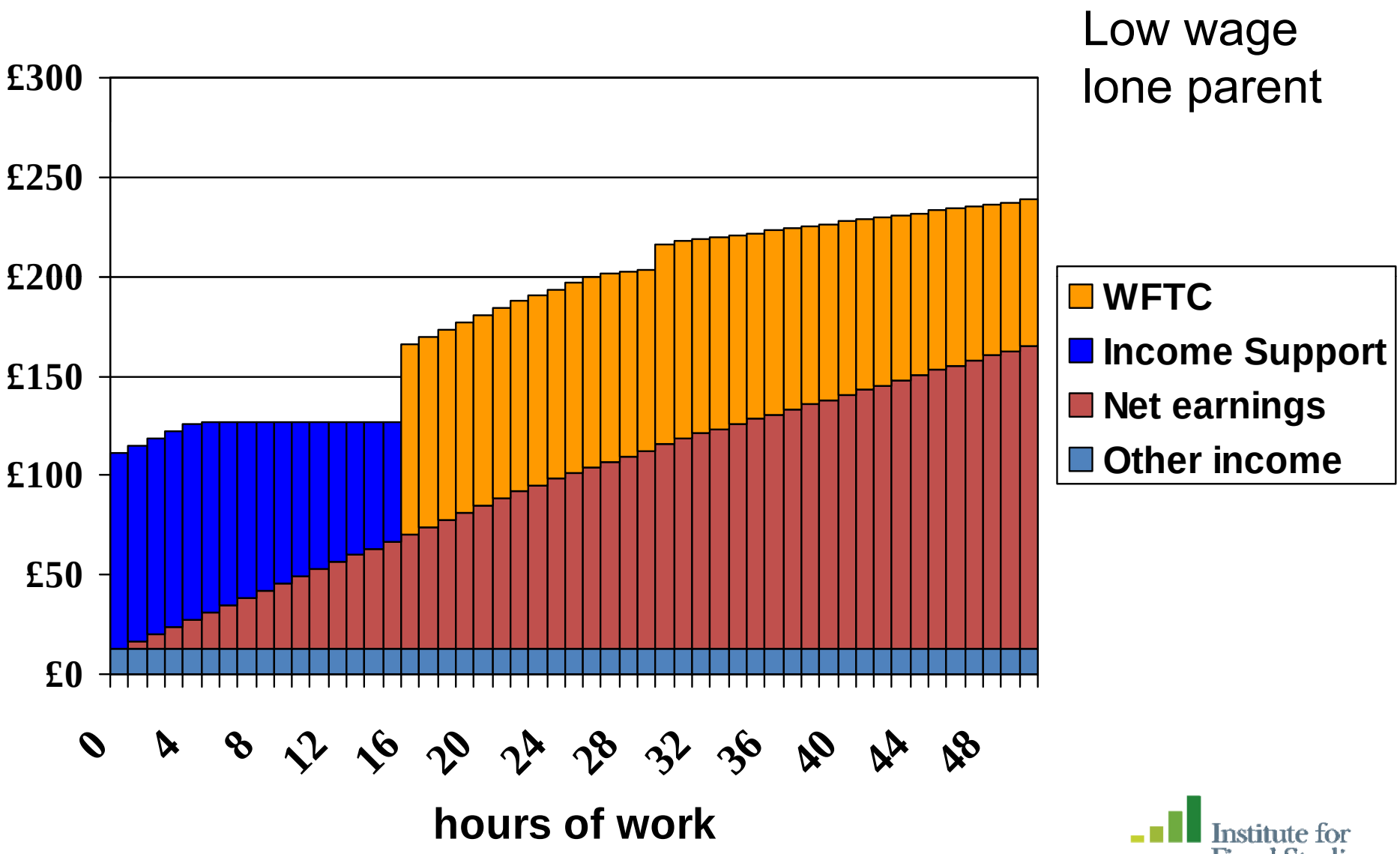

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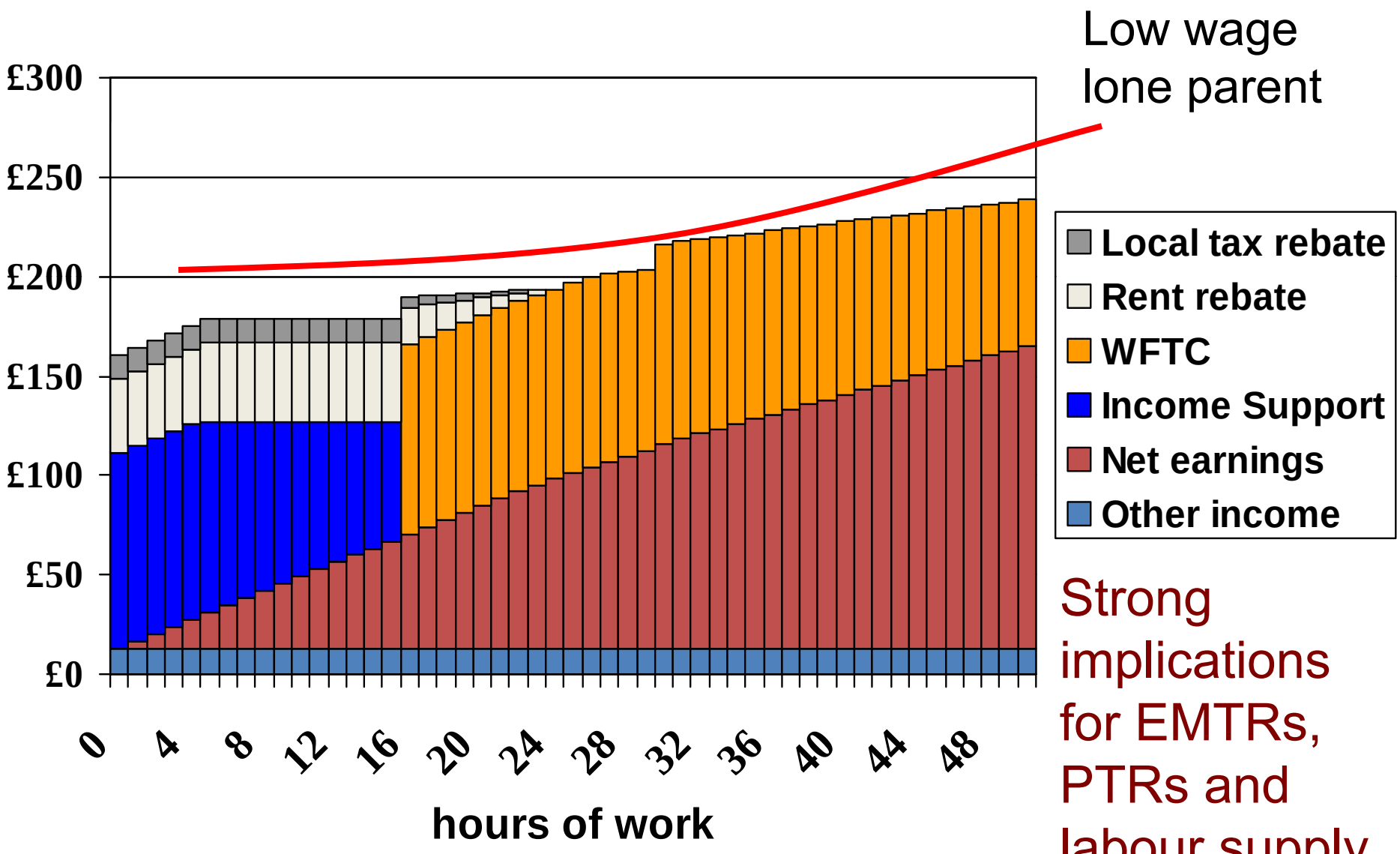
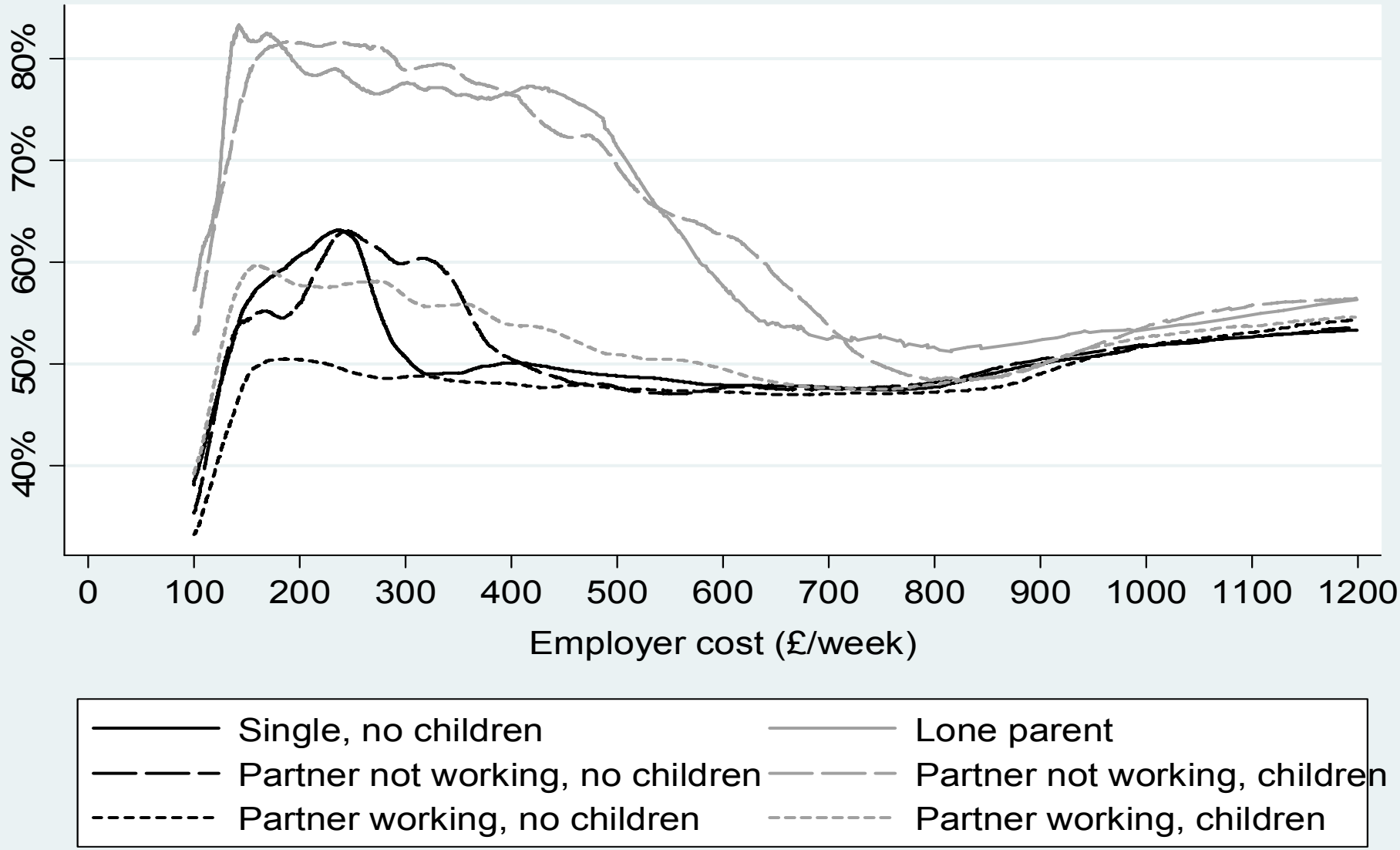


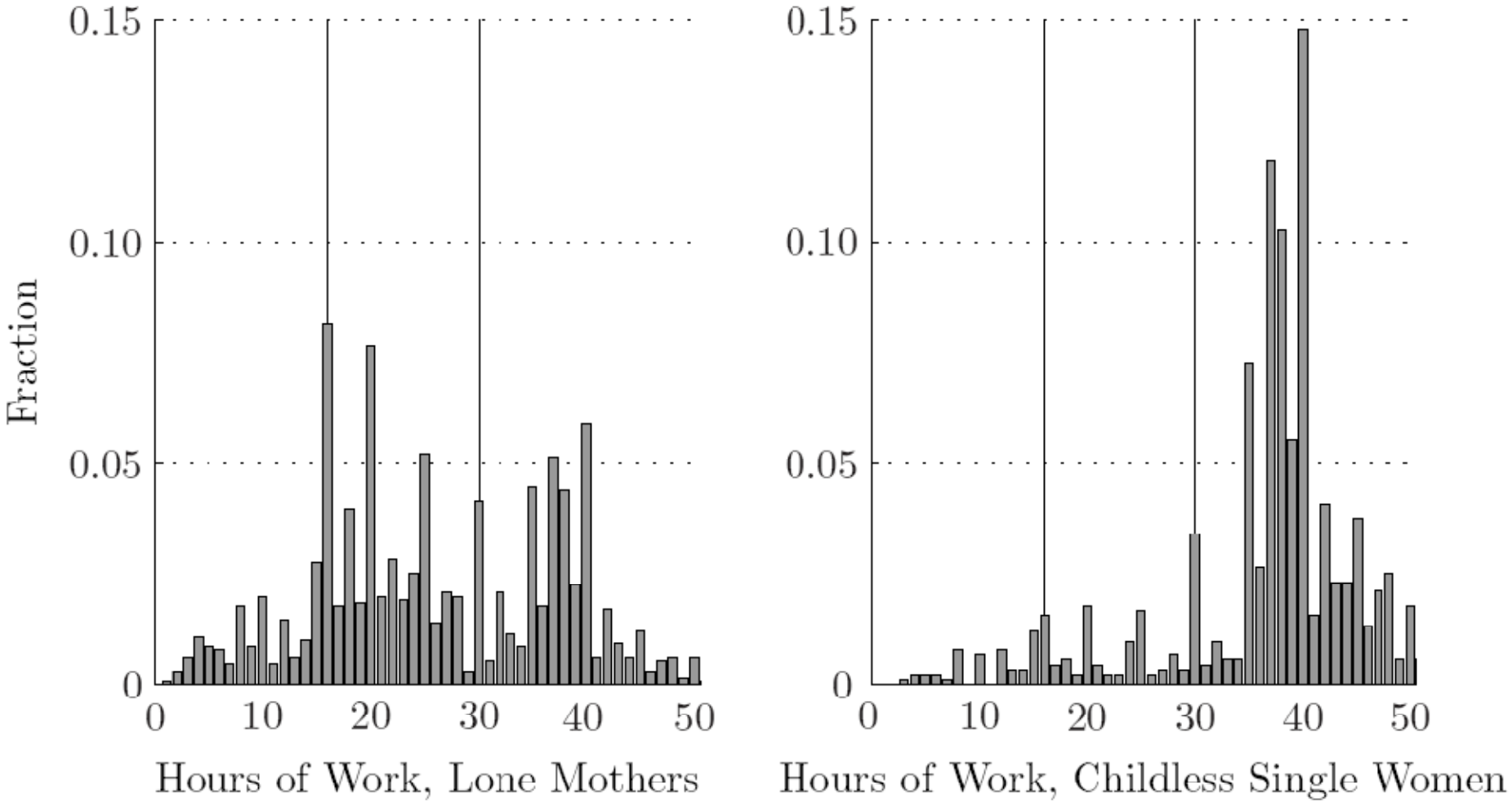
Strong implications for EMTRs, PTRs and labour supply

Average EMTRs across the earnings distribution for different family types



Can the reforms explain weekly hours worked?

Single Women (aged 18-45) - 2002



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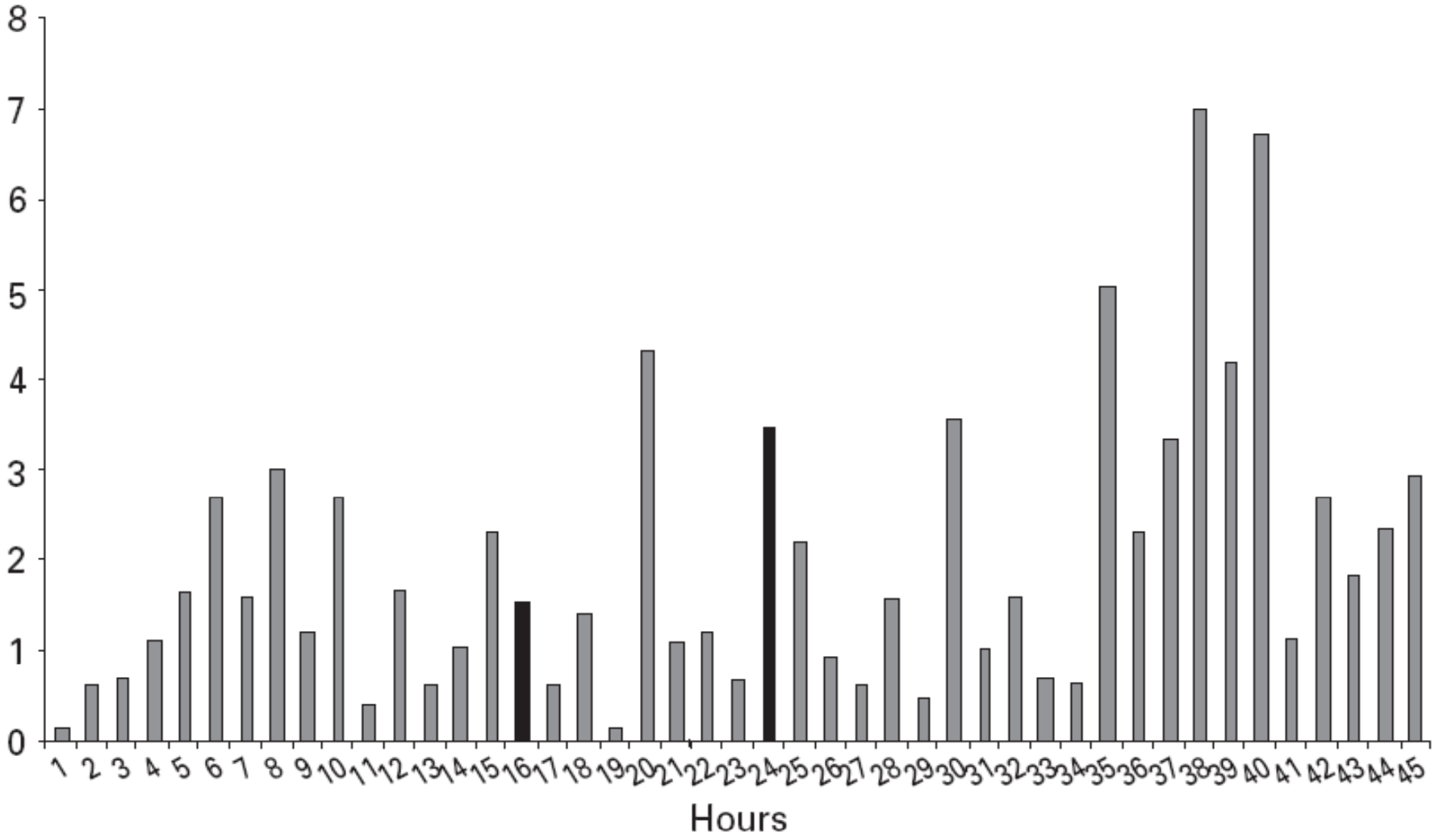
Hours' distribution for lone parents, before WFTC



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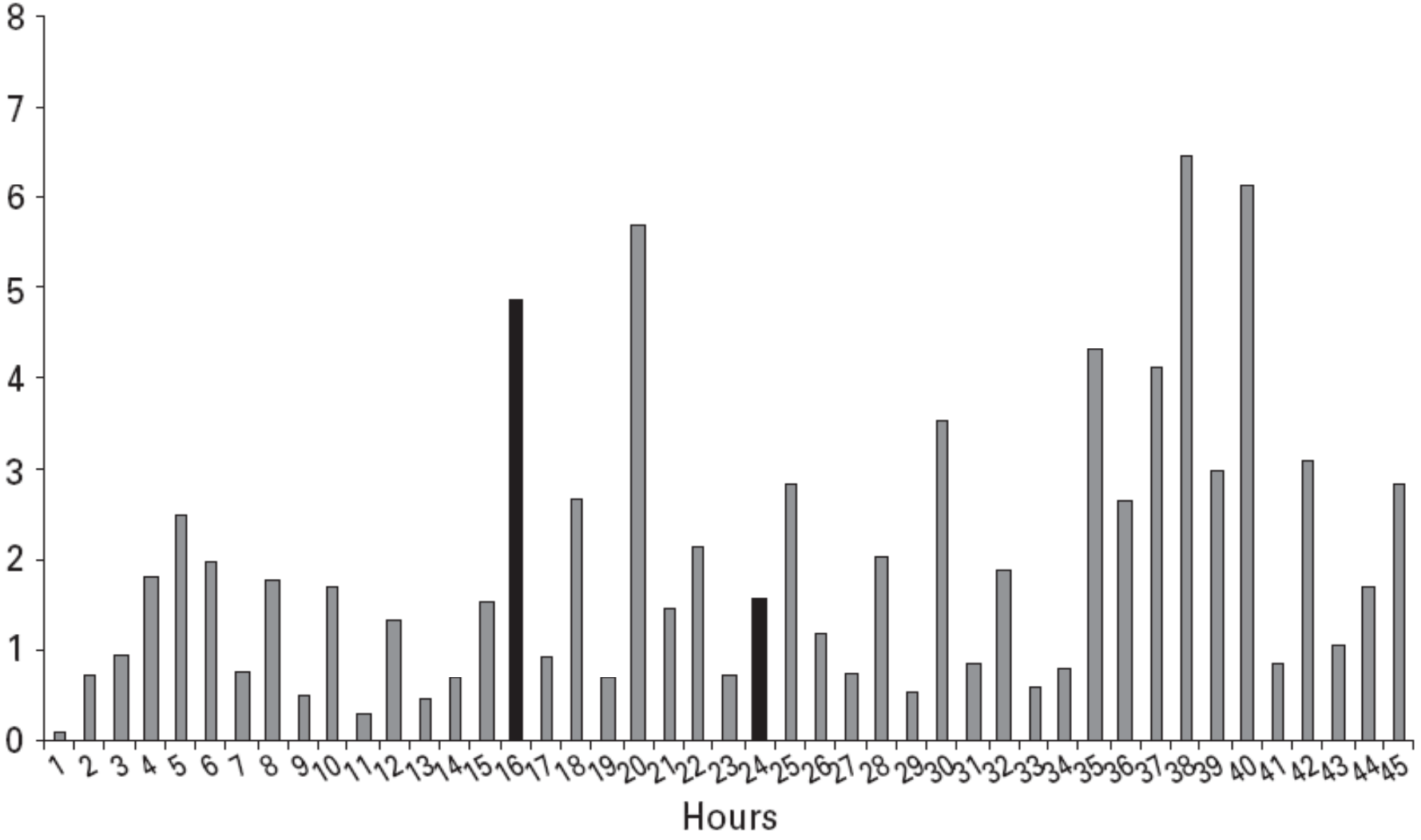

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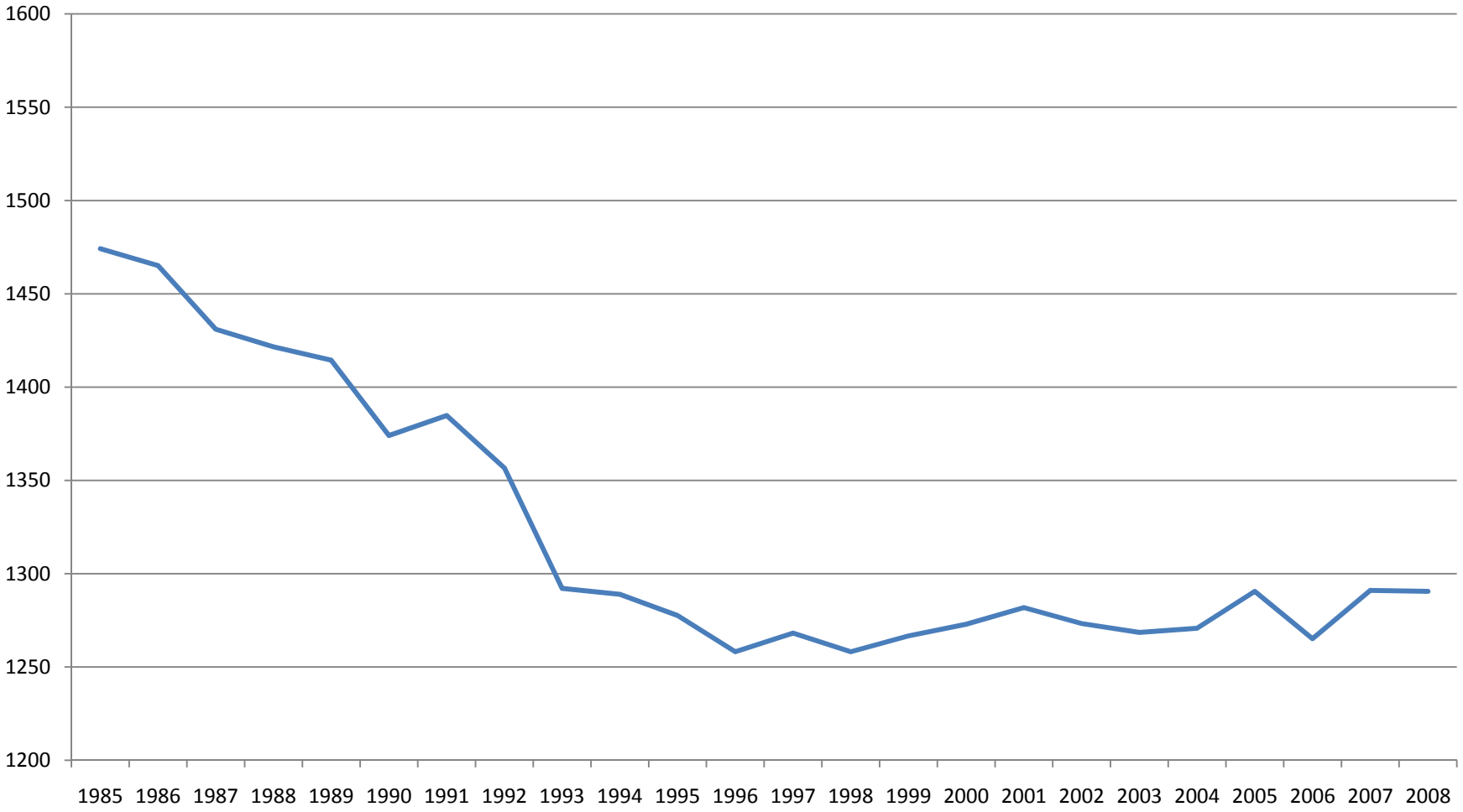
Hours trend for low ed lone parents in UK



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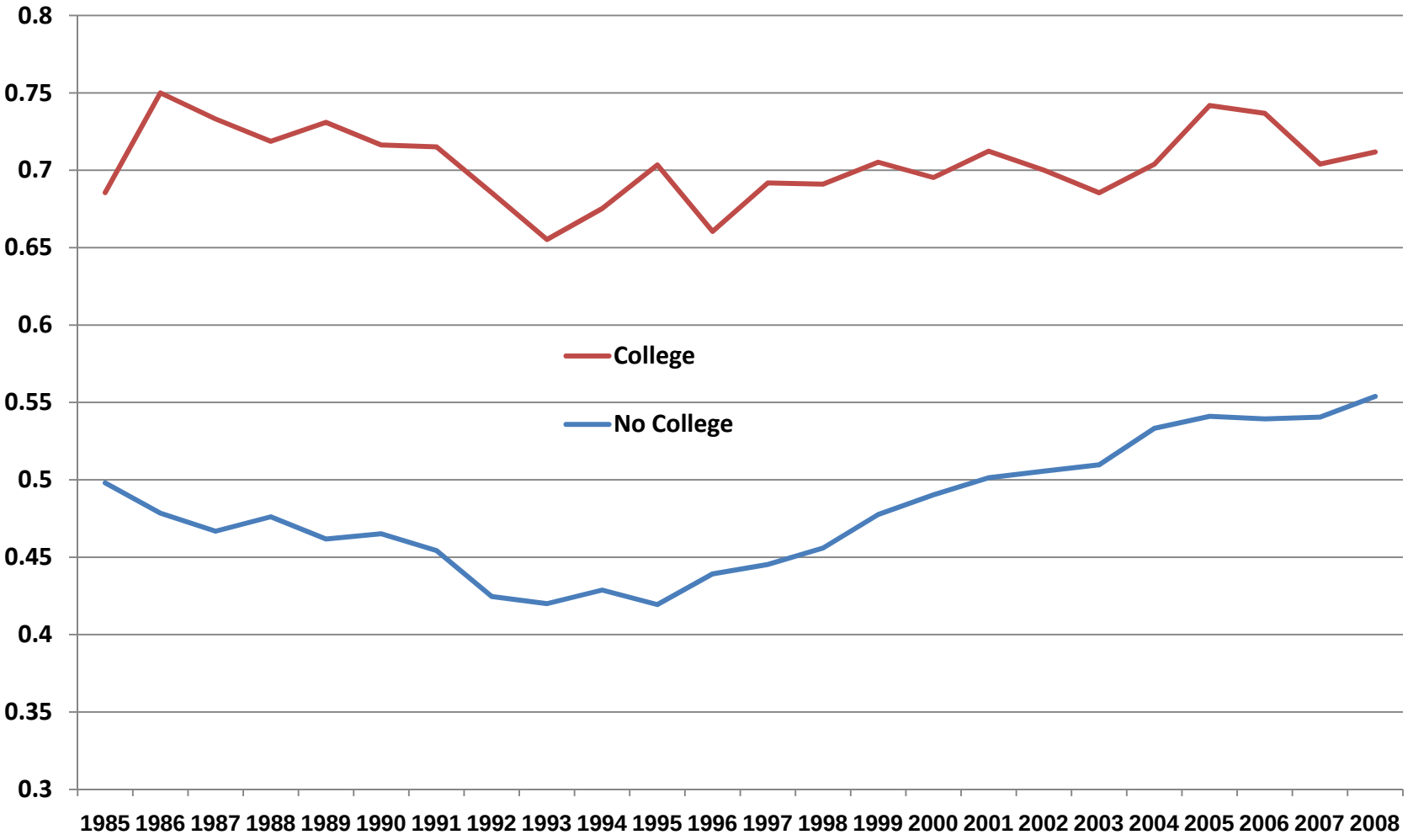
Employment trends for lone parents in UK



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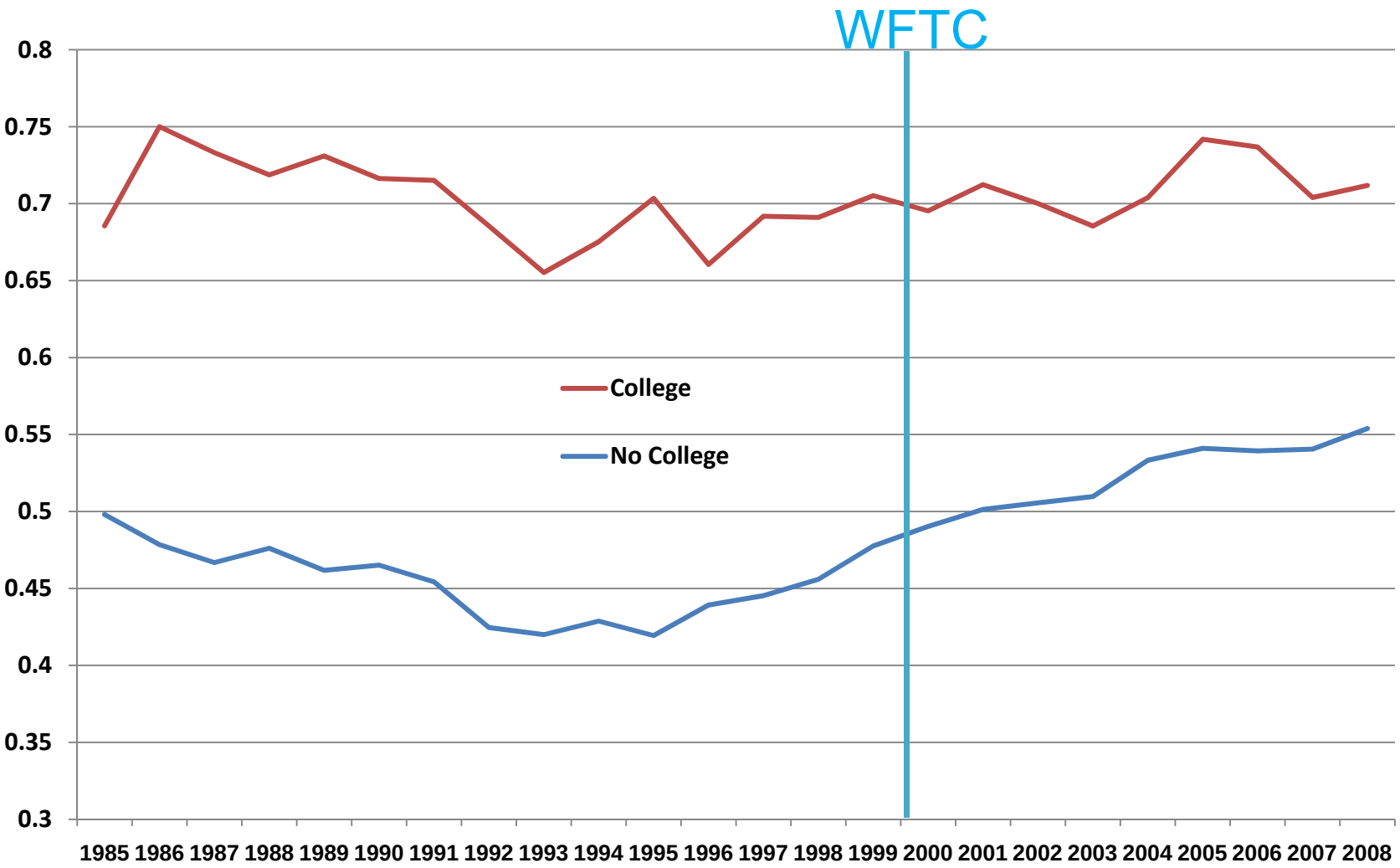

Matching and anticipation

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WFTC Reform: Quasi-experimental Evaluation
Matched Difference-in-Differences

Average Impact on % Employment Rate of Single Mothers

Single Mothers	Marginal Effect	Standard Error	Sample Size
Family Resources Survey	4.3	*1.55*	25,163
Labour Force Survey	4.5	*0.55*	233,208

Data: FRS, 45,000 adults per year, Spring 1996 – Spring 2002.

Base employment level: 45% in Spring 1998.

Matching Covariates: age, education, region, ethnicity,..

But quasi-experimental evidence is rarely enough for tax design

Key features of the structural model

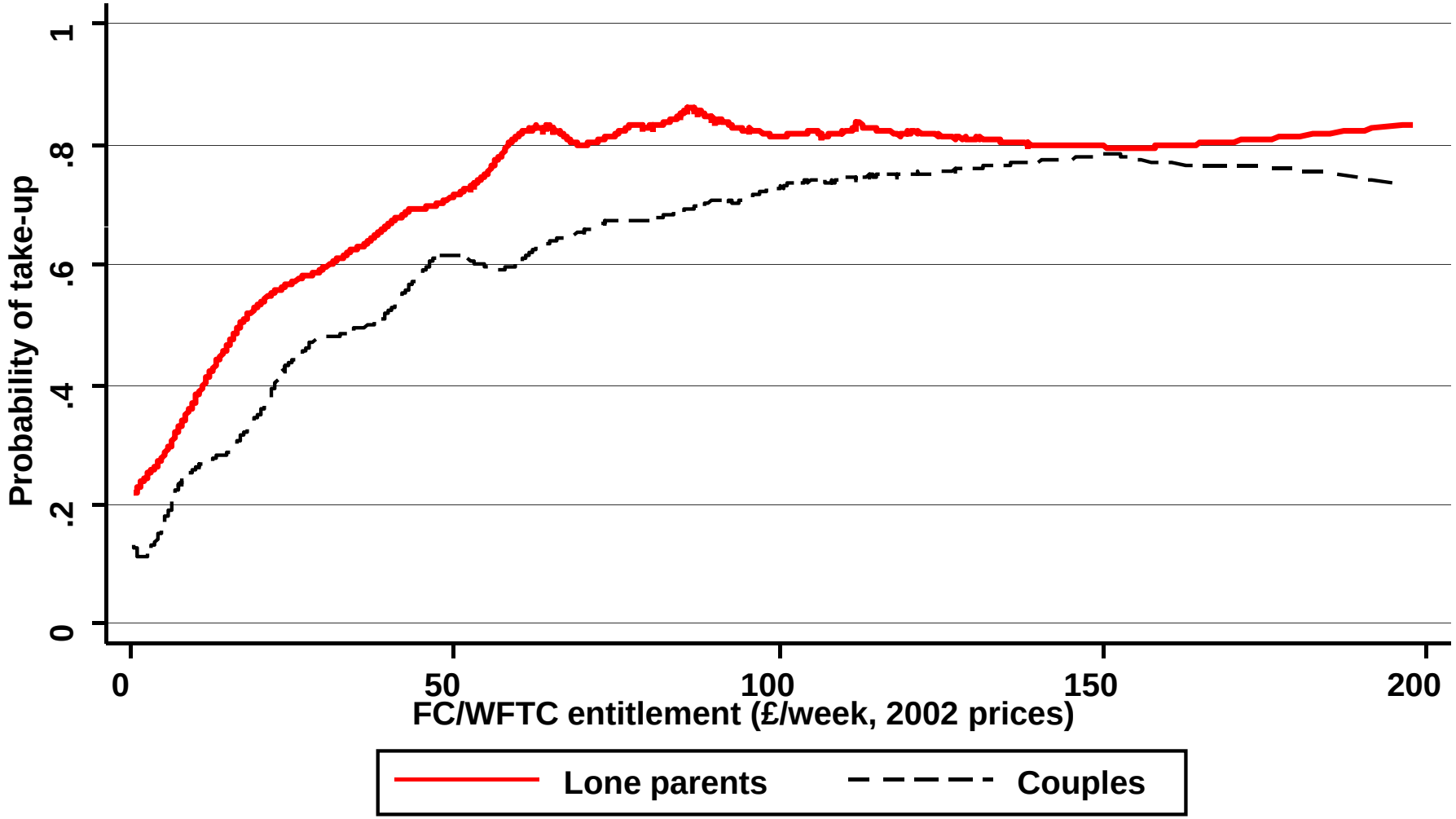
Preferences $U(c_h, h; X, \varepsilon)$

typically approximated by shape constrained sieves

- Structural model also allows for
  - unobserved work-related fixed costs
  - childcare costs
  - observed and unobserved heterogeneity
  - programme participation ‘take-up’ costs

Importance of take-up and information/hassle costs

Variation in take-up probability with entitlement to FC/WFTC



Structural Model Elasticities – low education lone parents

(a) Youngest Child Aged 5-10

Weekly Earnings	*Density*	*Extensive*	*Intensive*
0	0.4327		
50	0.1575	0.280 (.020)	0.085 (.009)
150	0.1655	0.321 (.009)	0.219 (.025)
250	0.1298	0.152 (.005)	0.194 (.020)
350	0.028	0.058 (.003)	0.132 (.010)
Employment elasticity		0.820 (.042)	

Blundell and Shephard (2009)

Structural Model Elasticities – low education lone parents

(b) Youngest Child Aged 11-18

Weekly Earnings	*Density*	*Extensive*	*Intensive*
0	0.3966		
50	0.1240	0.164 (.018)	0.130 (.016)
150	0.1453	0.193 (.008)	0.387 (.042)
250	0.1723	0.107 (.004)	0.340 (.035)
350	0.1618	0.045 (.002)	0.170 (.015)
Employment elasticity		0.720 (.036)	

Blundell and Shephard (2009)

Structural Model Elasticities – low education lone parents

(c) Youngest Child Aged 0-4

Weekly Earnings	*Density*	*Extensive*	*Intensive*
0	0.5942		
50	0.1694	0.168 (.017)	0.025 (.003)
150	0.0984	0.128 (.012)	0.077 (.012)
250	0.0767	0.043 (.004)	0.066 (.010)
350	0.0613	0.016 (.002)	0.035 (.005)
Participation elasticity		0.536 (.047)	

- Differences in intensive and extensive margins by age and demographics have strong implications for the design of the tax schedule... Non-monotonic in age of youngest child

But do we believe the structural model estimates?

Structural Simulation of the WFTC Reform:

WFTC Tax Credit Reform

	All	y-child 0 to 2	y-child 3 to 4	y-child 5 to 10	y-child 11 to 18
Change in employment rate:	6.95	3.09	7.56	7.54	4.96
	0.74	*0.59*	*0.91*	*0.85*	*0.68*
Average change in hours:	1.79	0.71	2.09	2.35	1.65
	0.2	*0.14*	*0.23*	*0.34*	*0.2*

Notes: Simulated on FRS data; Standard errors in italics.

– relatively 'large' impact

Blundell and Shephard (2009)

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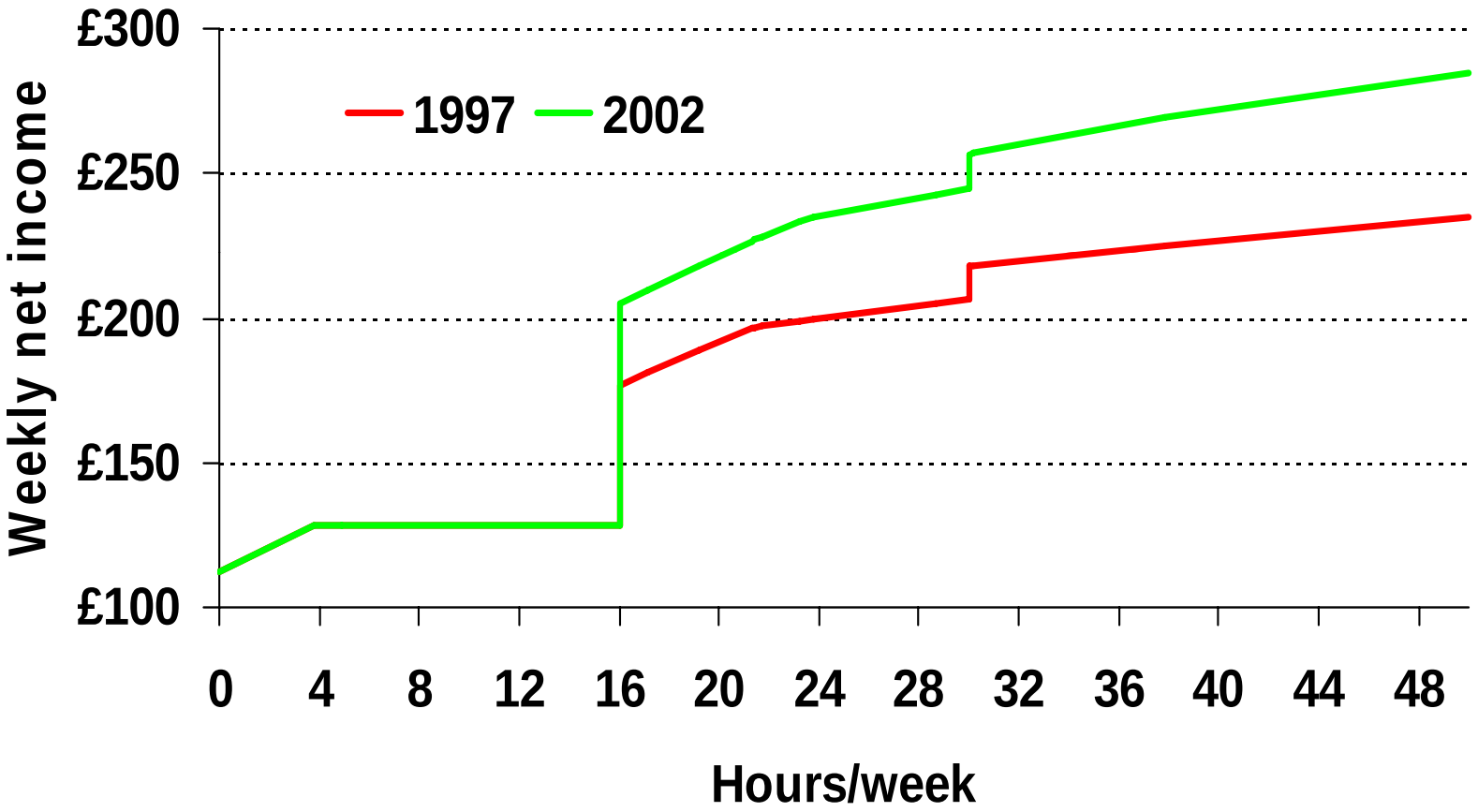
Impact of WFTC reform on lone parent, 2 children



- ***Notes:*** **Two children under 5. Assumes hourly wage of £4.10, no housing costs or council tax liability and no childcare costs.**

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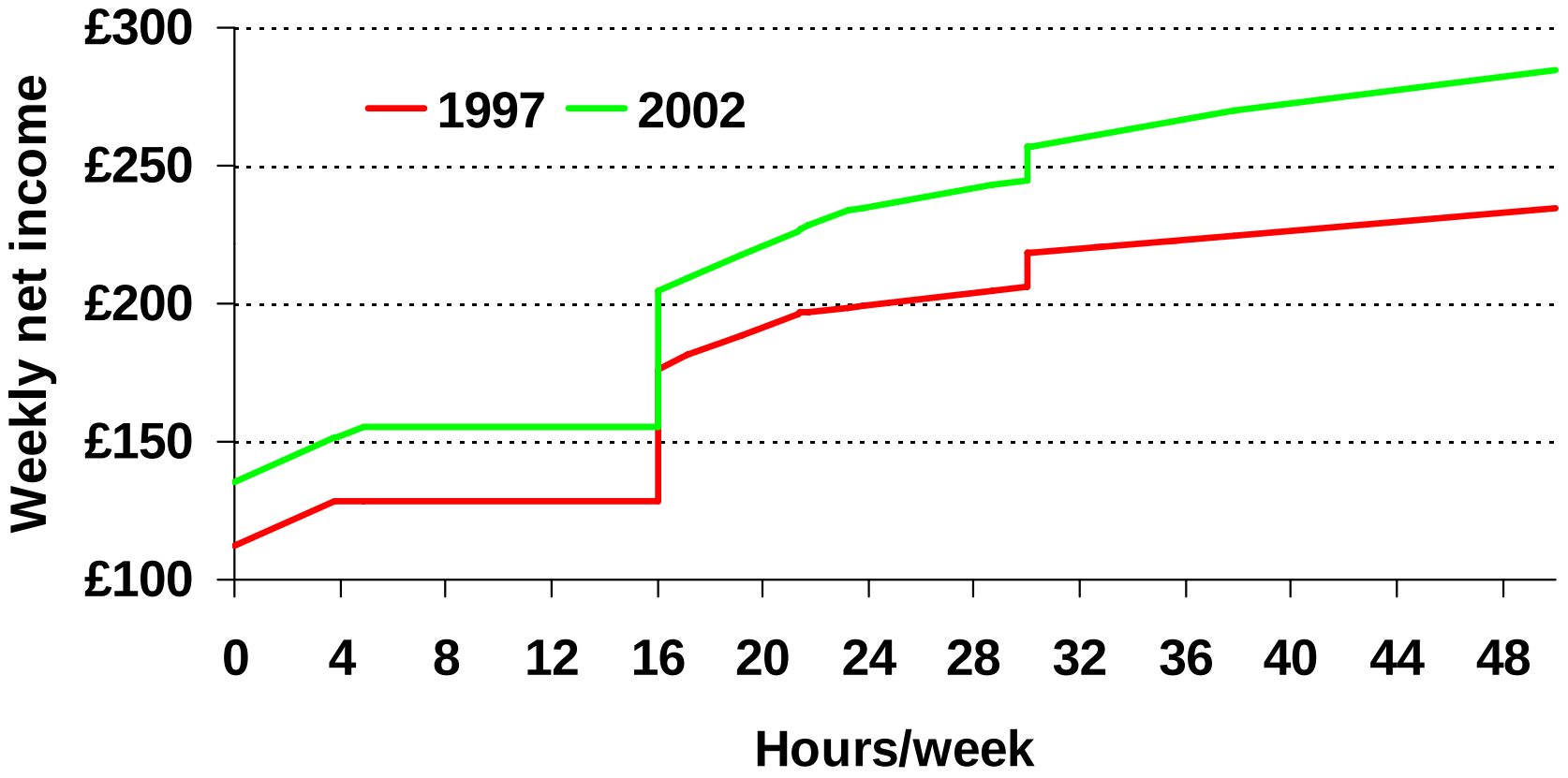
Impact of WFTC and IS reforms on lone parent, 2 children



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Structural Simulation of the WFTC Reform:

Impact of all Reforms

	All	y-child 0 to 2	y-child 3 to 4	y-child 5 to 10	y-child 11 to 18
Change in employment rate:	4.09	0.65	4.53	4.83	4.03
	0.84	*0.6*	*0.99*	*0.94*	*0.71*
Average change in hours:	1.02	0.01	1.15	1.41	1.24
	0.23	*0.21*	*0.28*	*0.28*	*0.22*

- shows the importance of getting the effective tax rates right especially when comparing with quasi-experiments.
- Compare with experiment or quasi-experiment.

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Evaluation of the 'ex-ante' structural model

- The diff-in-diff impact parameter can be identified from the structural evaluation model
- *Simulated* diff-in-diff parameter
- The structural model then defines the average impact of the policy on the treated as:

$$\alpha_{SEM}(X) = \Pr[h > 0 \mid X, D = 1] - \Pr[h > 0 X, D = 0]$$

- Compare *simulated diff-in-diff moment* with *diff-in-diff*

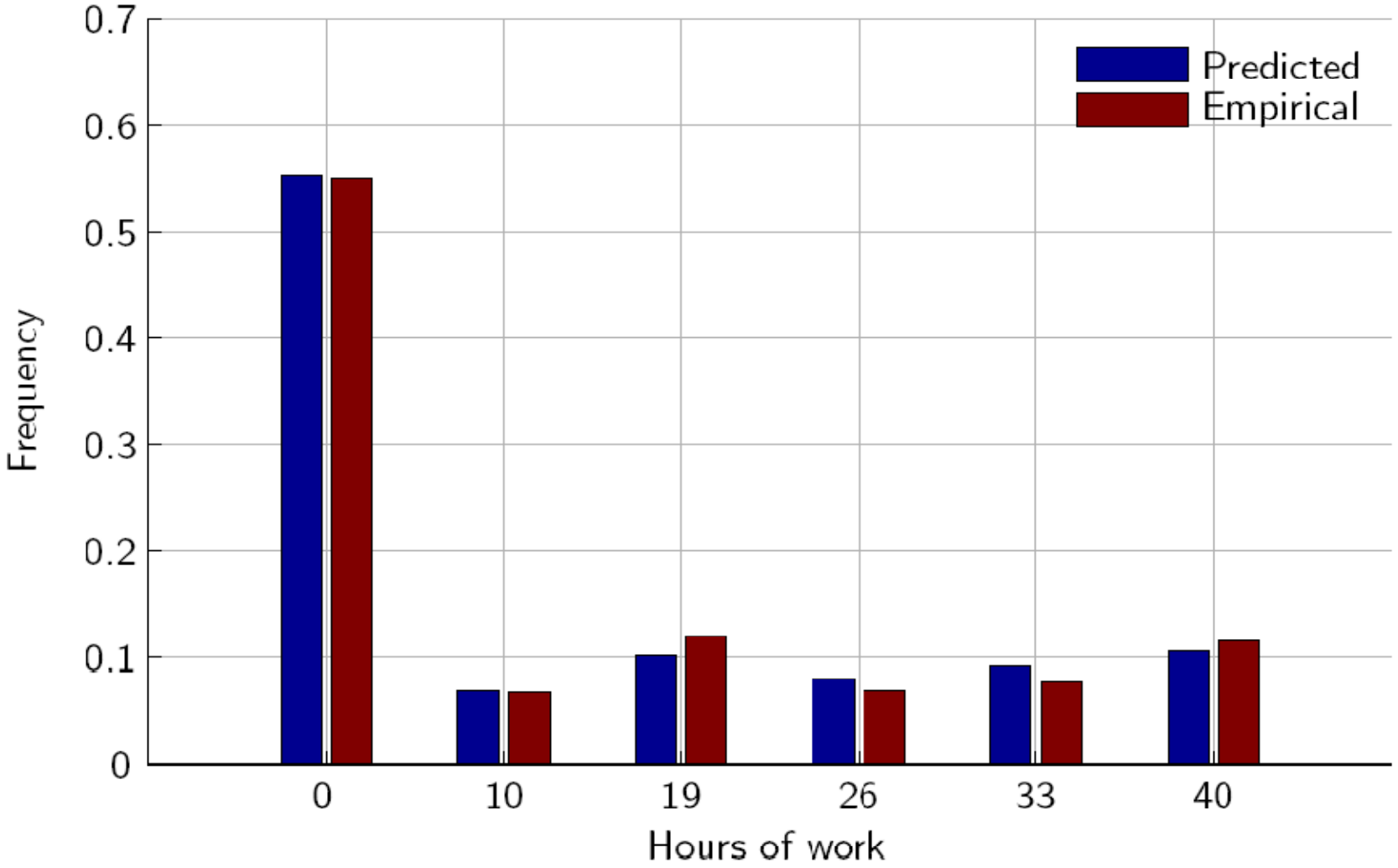
$$\alpha_{SEM}^{DD} = \int_X \int_X \int_\varepsilon f(X, \varepsilon, D = 1) dF_\varepsilon^{T=1,t=1} dF_X - \int_X \int_\varepsilon f(X, \varepsilon, D = 0) dF_\varepsilon^{T=1,t=0} dF_X$$

$$- \left[\int_\varepsilon f(X, \varepsilon, D = 0) dF_\varepsilon^{T=0,t=1} dF_X - \int_X \int_\varepsilon f(X, \varepsilon, D = 0) dF_\varepsilon^{T=0,t=0} dF_X \right]$$

Evaluation of the ex-ante model

- The *simulated* diff-in-diff parameter from the structural evaluation model is precise and does not differ significantly from the diff-in-diff estimate
- Compare *simulated diff-in-diff moment* with *diff-in-diff*
  - .21 (.73), chi-square p-value .57
- Consider additional moments
  - education: low education: 0.33 (.41)
  - youngest child interaction
    - Youngest child aged < 5: .59 (. 51)
    - Youngest child aged 5-10: .31 (.35)

Structural Model Comparisons



Blundell and Shephard (2009)

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A optimal tax design framework

- Assume earnings (and certain characteristics) are all that is observable to the tax authority
  - relax below to allow for 'partial' observability of hours

Social welfare, for individuals of type X

$$W = \sum_{w,X} \int_{\varepsilon} \int \Gamma(U(wh - T(w,h;X),h;X,\varepsilon))dF(\varepsilon)dG(w;X)$$

The tax structure $T(.)$ is chosen to maximise W, subject to:

$$\sum_{w,X} \int_{\varepsilon} \int T(wh,h;X)dF(\varepsilon)dG(w;X) = \overline{T}(=-R)$$

for a given R.

Control preference for equality by transformation function:

$$\Gamma(U \mid \theta) = \frac{1}{\theta}\left\{(\exp U)^{\theta} - 1\right\}$$

when θ is negative, the function favors the equality of utilities.

If $\theta < 0$ then analytical solution to integral over (Type I extreme-value) j state specific errors

$$\frac{1}{\theta}\left[\Gamma(1-\theta)\cdot(\exp u(j))^{\theta} - 1\right]$$

Want robust policies for fairly general social welfare weiaghts

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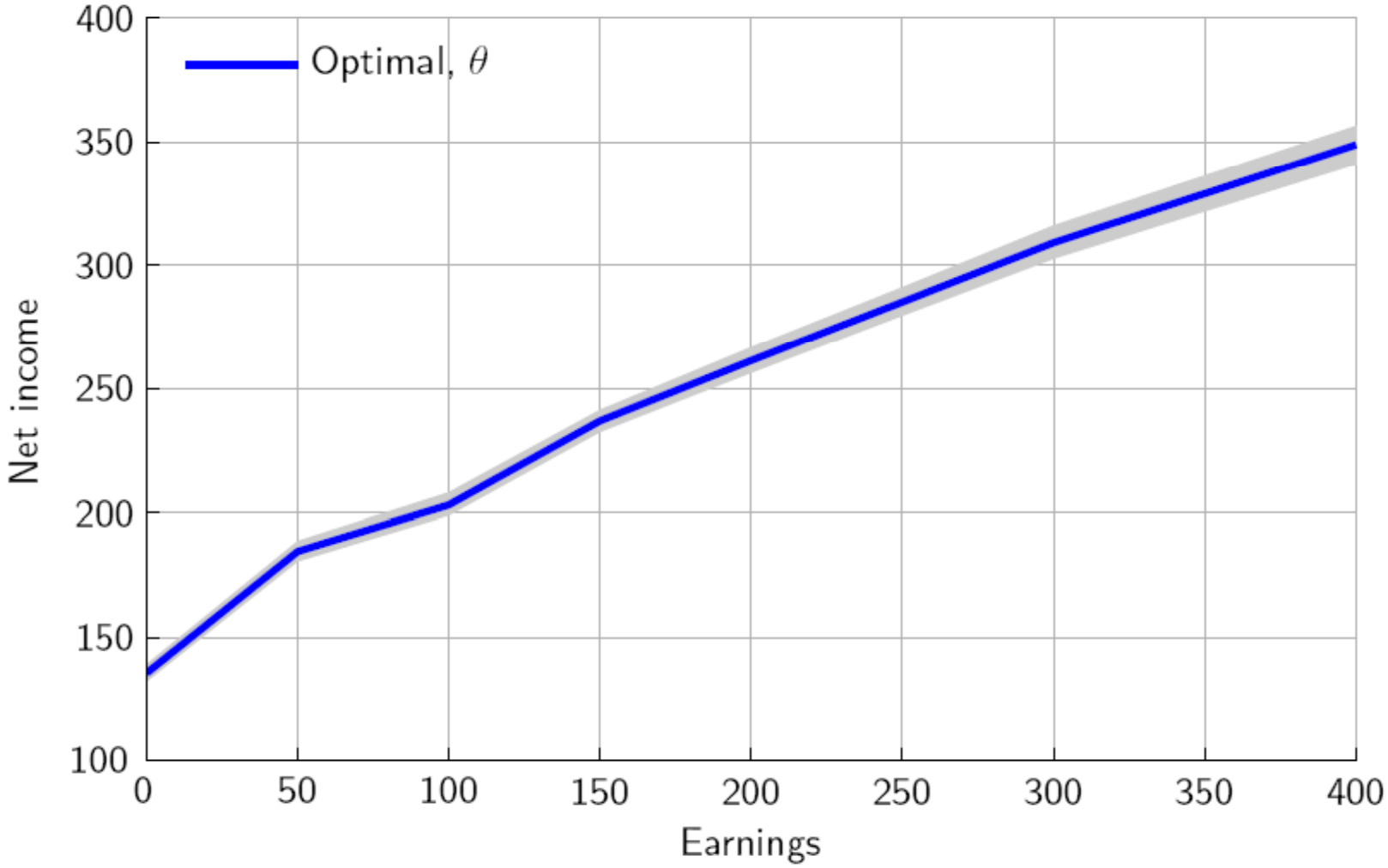
Implied Optimal Schedule, Youngest Child Aged 5-11



Blundell and Shephard (2009)

Weekly earnings
April 2002 prices

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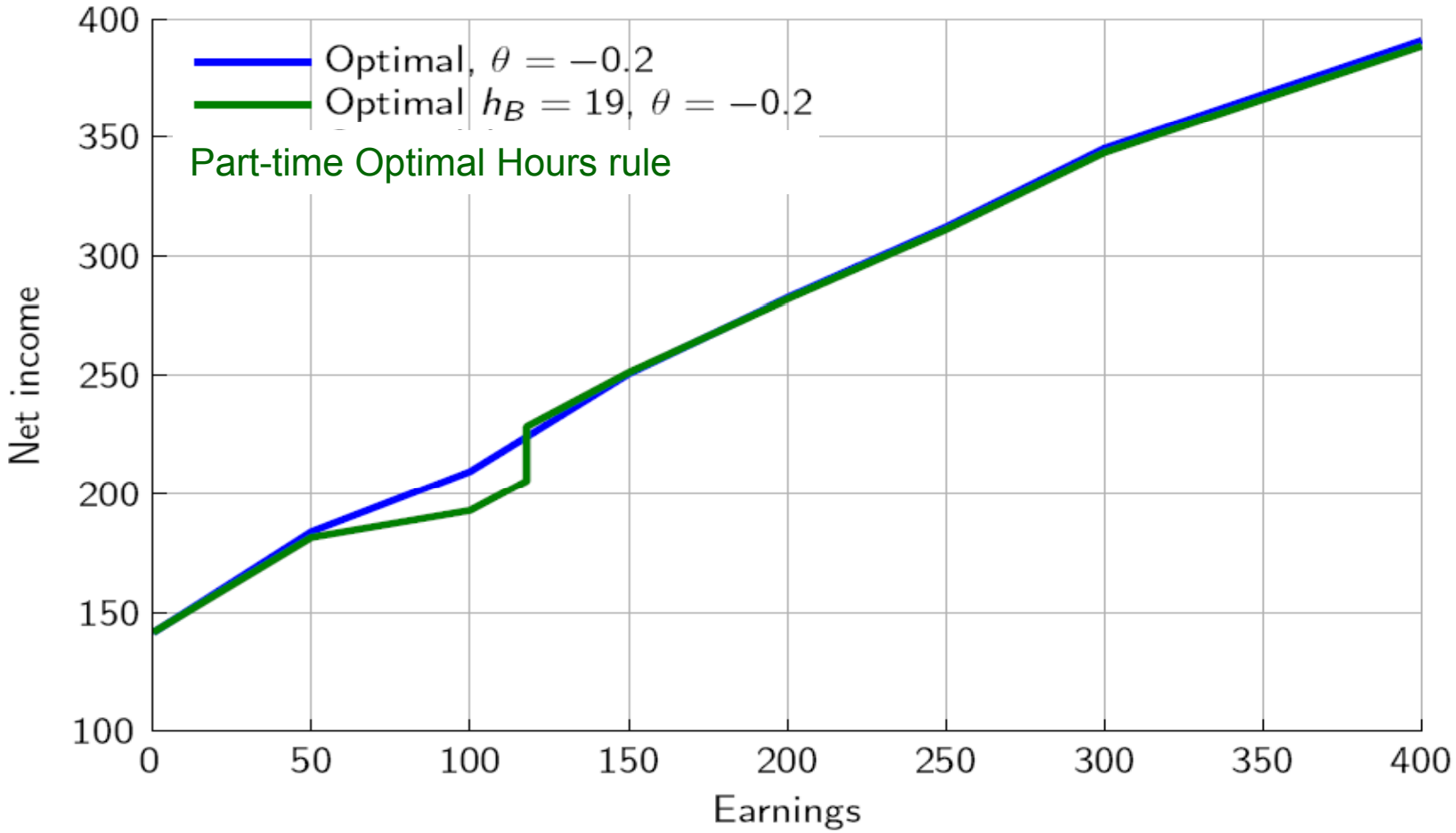
Implied Optimal Schedule, Youngest Child Aged 0-4



Blundell and Shephard (2009)

Weekly earnings
April 2002 prices

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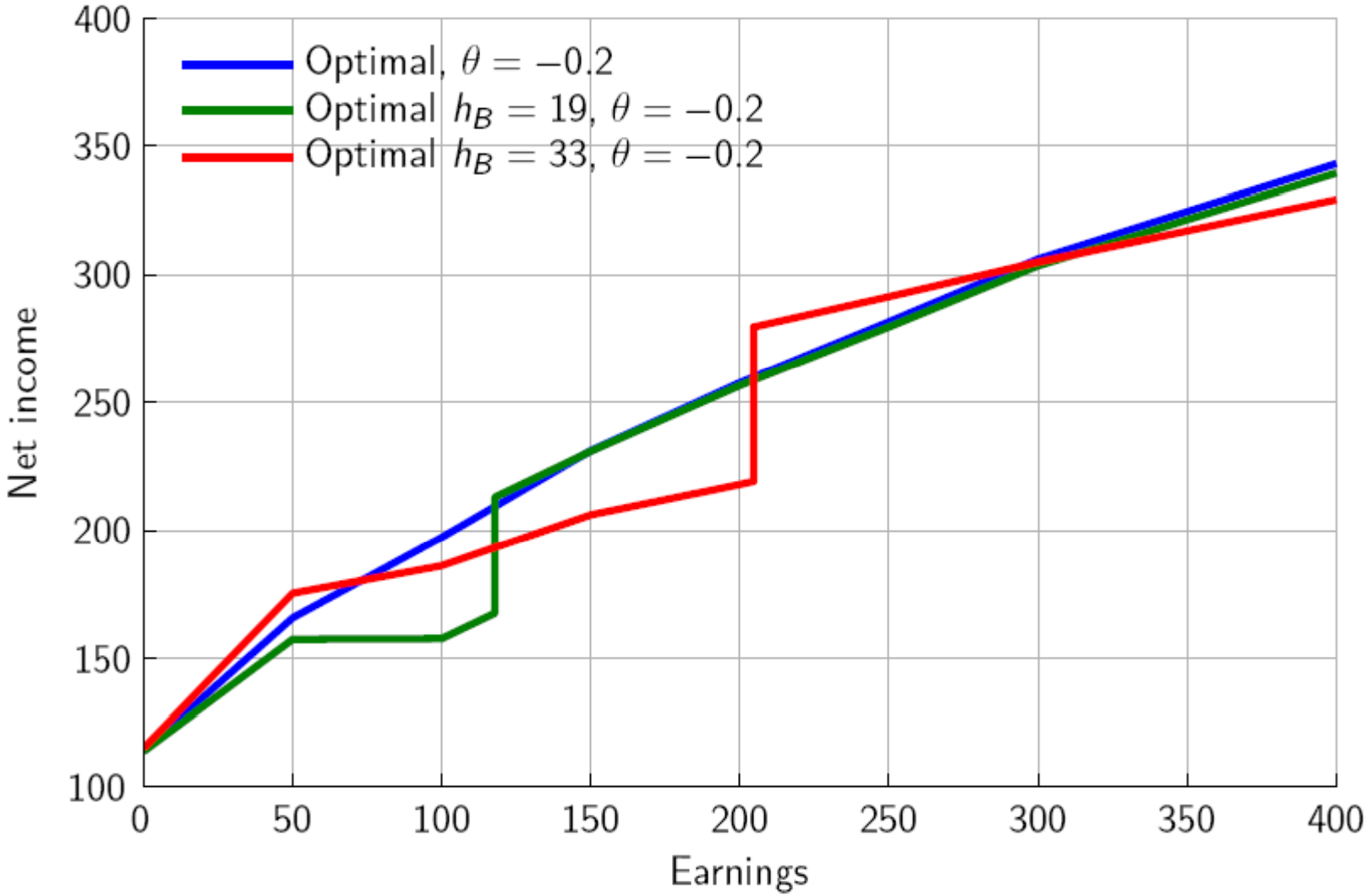
Implied Optimal Schedule, Youngest Child Aged 11-18



- Suggests ‘dynamic’ tax incentives according to age of (youngest) child
- Redistributing towards early years

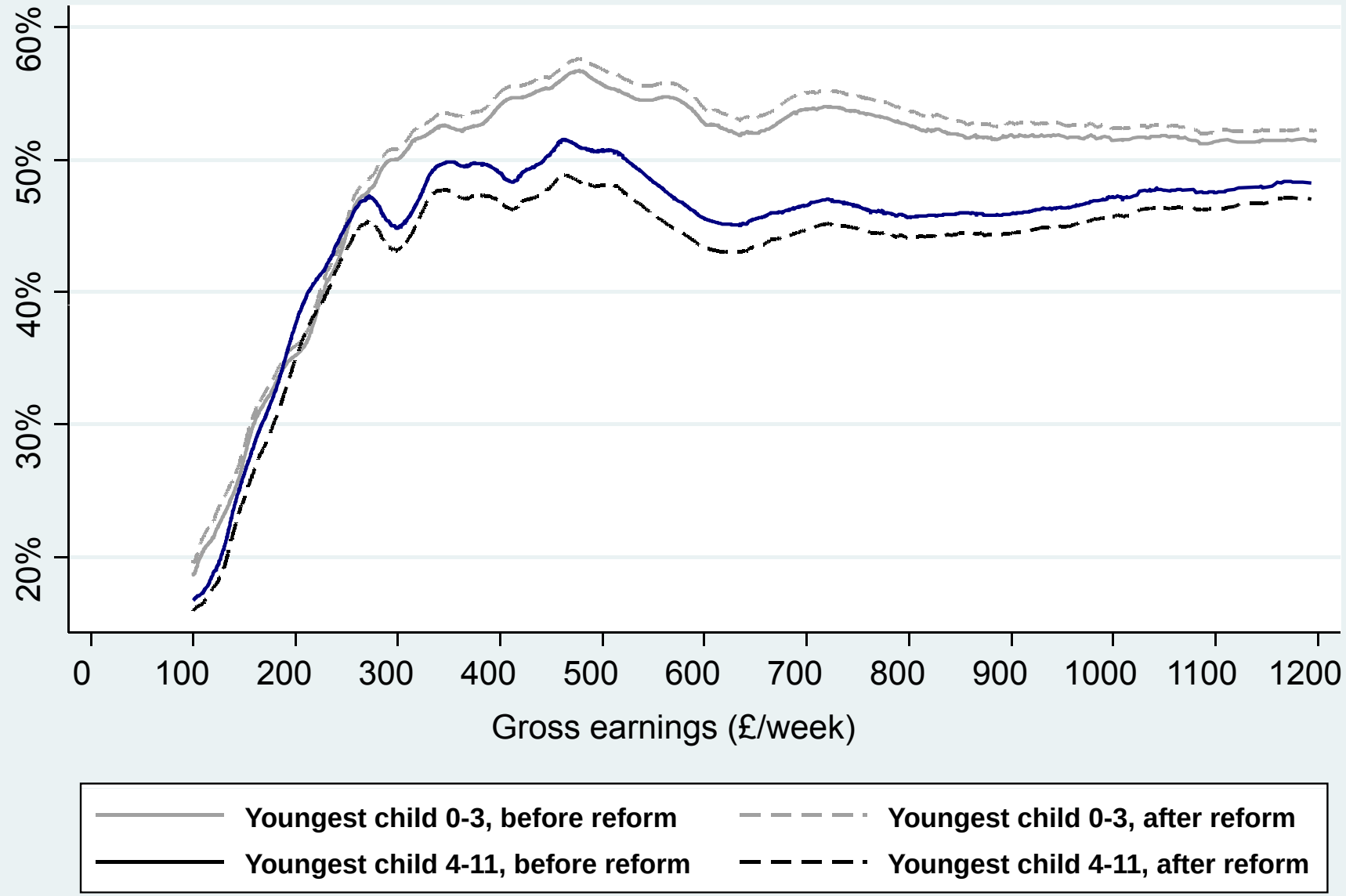
Implications for Tax Reform

- Change transfer/tax rate structure to match lessons from 'new' optimal tax analysis and empirical evidence
- Similar design framework for family labour supply and early retirement
- Key role of labour supply responses at the extensive and intensive margins
- Both matter but differ by gender, age, education and family composition
  - lone parents, married parents, pre-retirement low earners.
- Results suggest lower marginal rates at the bottom
  - means-testing should be less aggressive
  - at least for some key groups =>

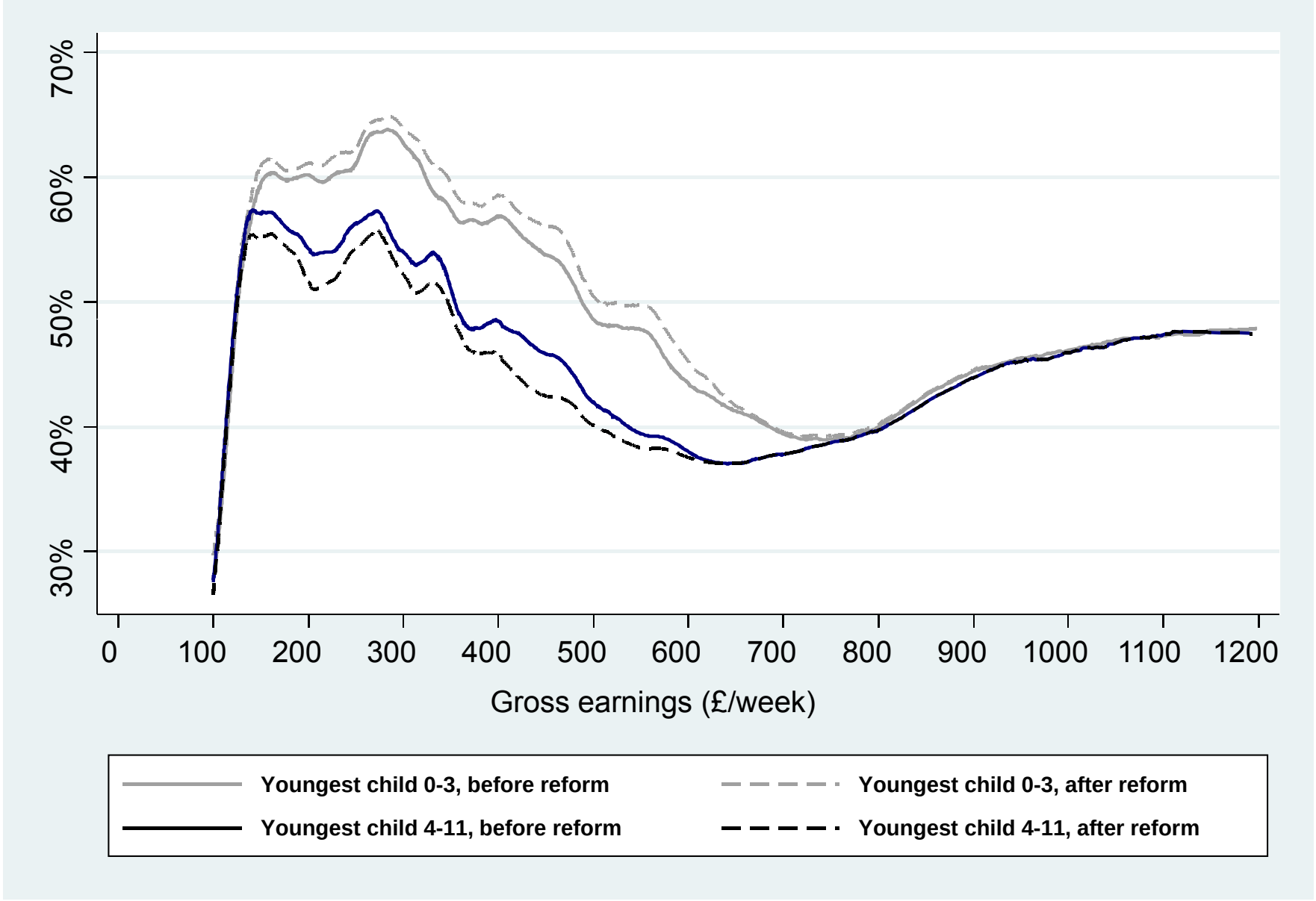
Implications for Tax Reform

- Life-cycle view of taxation
  - distinguish by age of (youngest) child for mothers/parents
  - pre-retirement ages
  - effectively redistributing across the life-cycle
  - a ‘life-cycle’ rearrangement of tax incentives and welfare payments to match elasticities and early years investments
  - results in significant employment and earnings increases

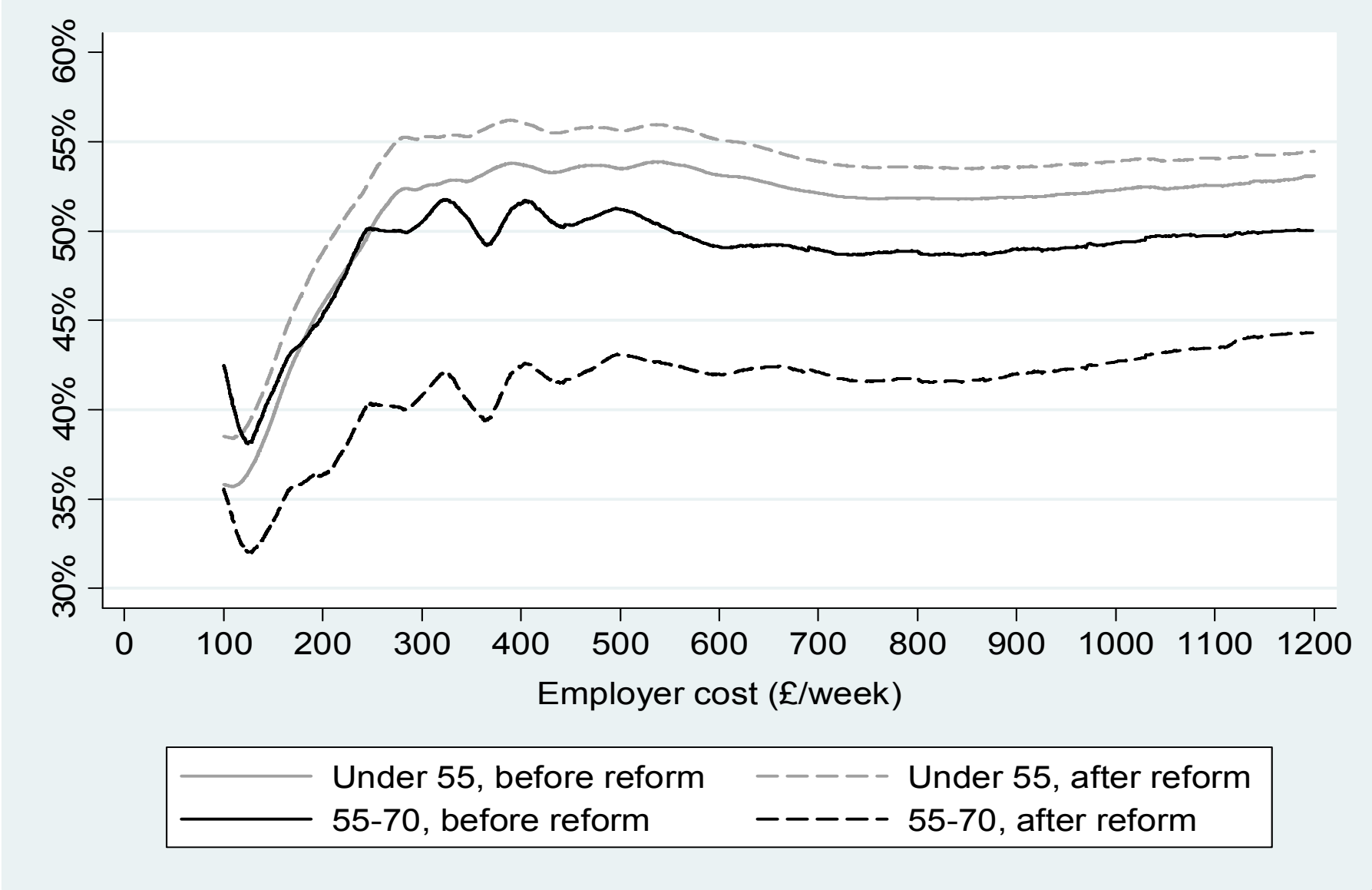
Effect of child age revenue neutral reforms on average PTRs across the earnings distribution, by age of youngest child



Effect of child age revenue neutral reforms on average EMTRs across the earnings distribution, by age of youngest child



Effect of early retirement revenue neutral reforms on average PTRs across the earnings distribution, by age



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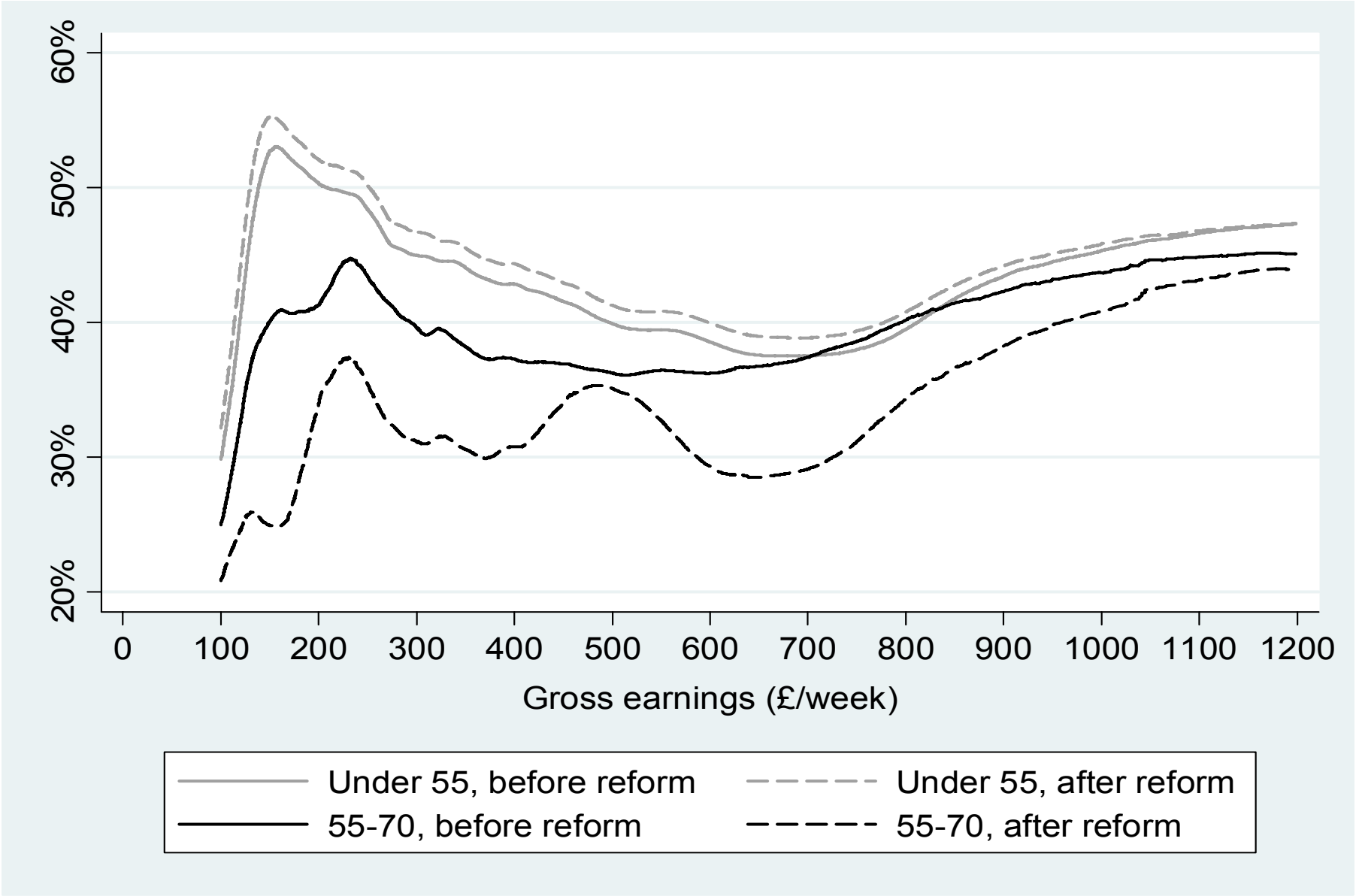
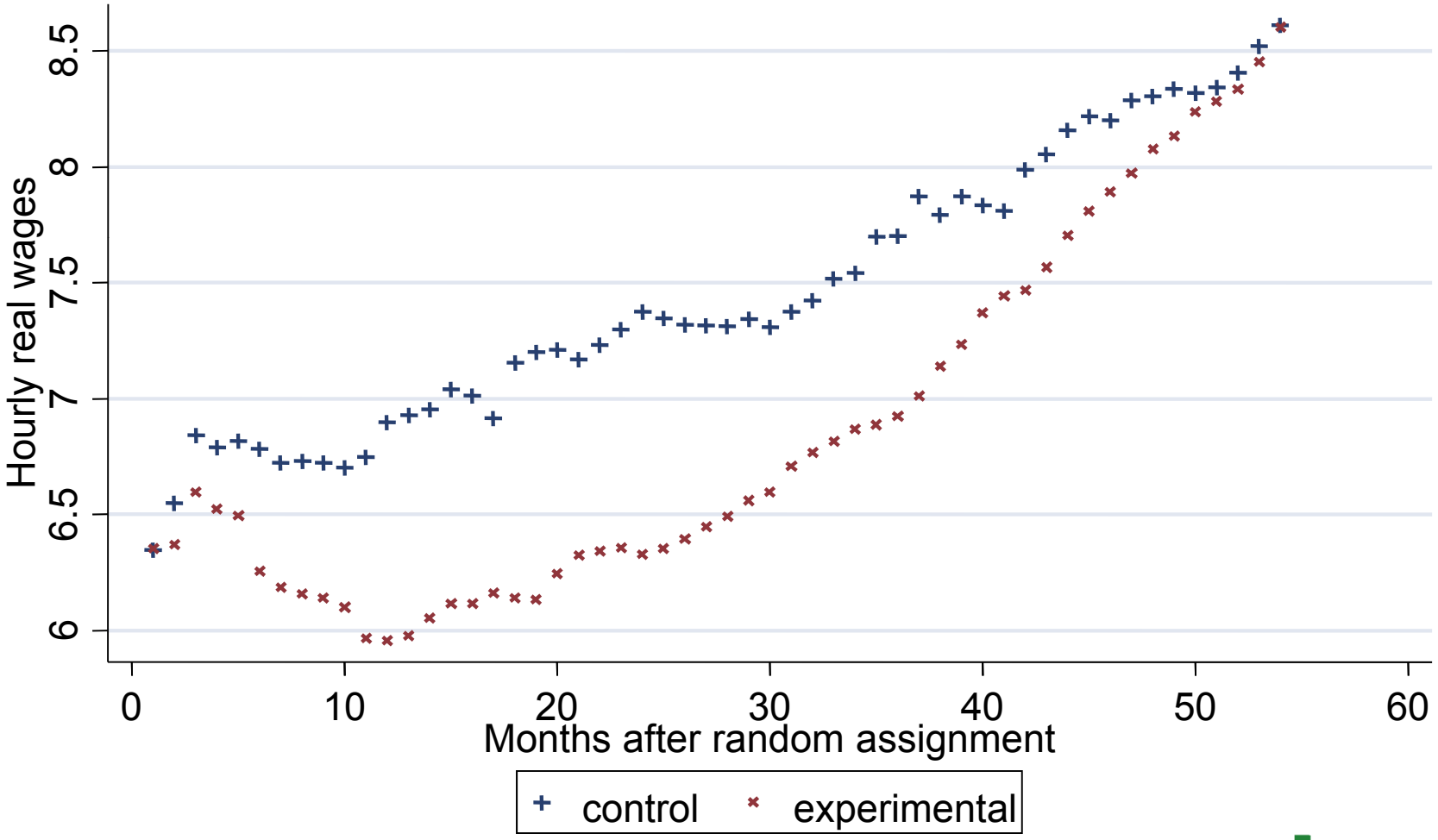


Implications for Tax Reform

- Life-cycle view of taxation
  - distinguish by age of (youngest) child for mothers/parents
  - pre-retirement ages
  - effectively redistributing across the life-cycle
  - a ‘life-cycle’ rearrangement of tax incentives and welfare payments to match elasticities and early years investments
  - results in significant employment and earnings increases
- Hours rules? – at full time for older kids,
  - welfare gains depend on ability to monitor hours
- Dynamics and frictions?
  - some time to adjust but little in the way of experience effects for low skilled

Dynamic effects on wages for low income welfare recipients?

SSP: Hourly wages by months after RA



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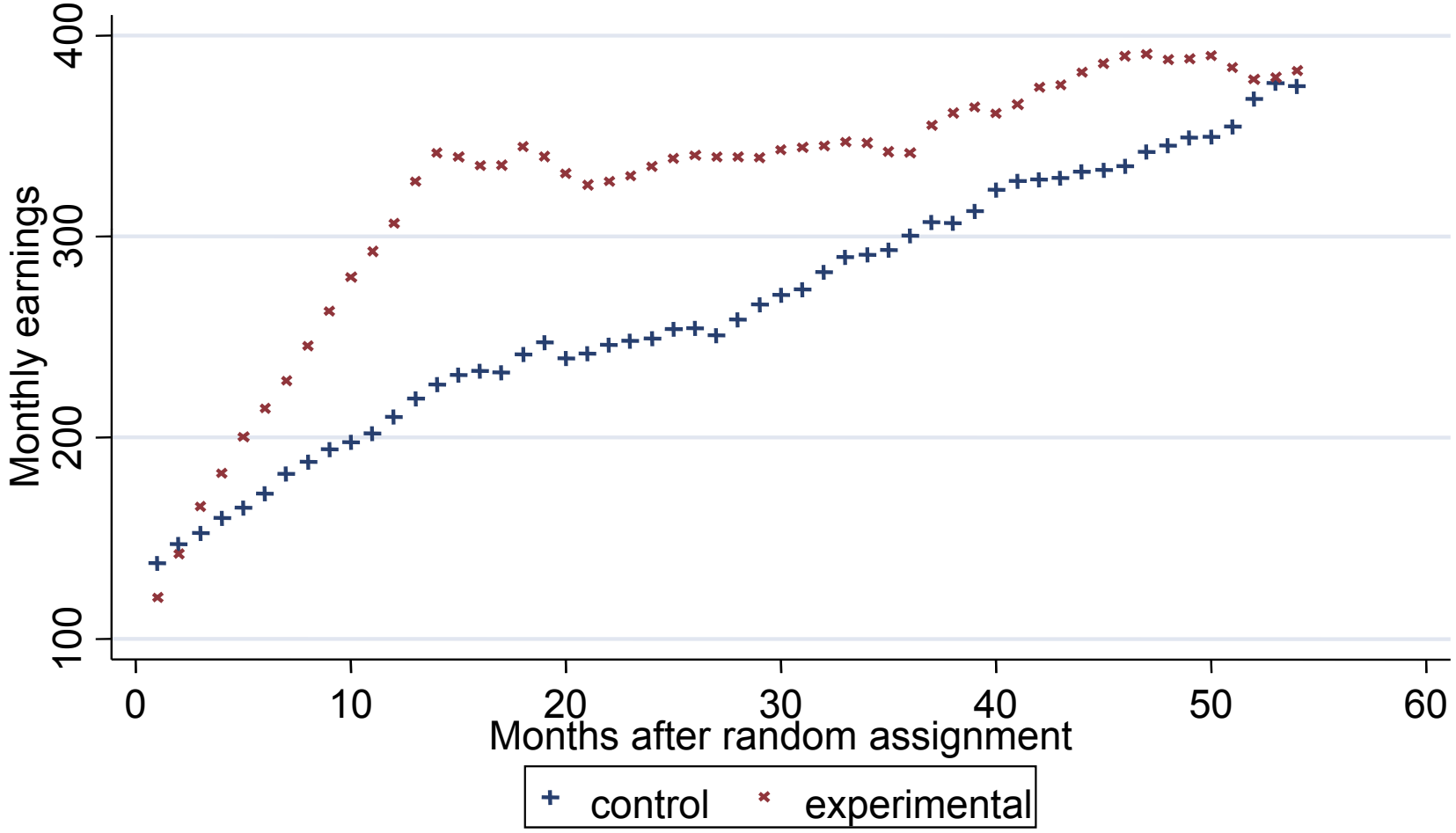
SSP: Monthly earnings by months after RA



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That's all for now!

http://www.ifs.org.uk/mirrleesReview

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June 2010

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