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The long-term effects of in-work benefits in a lifecycle model for policy evaluation

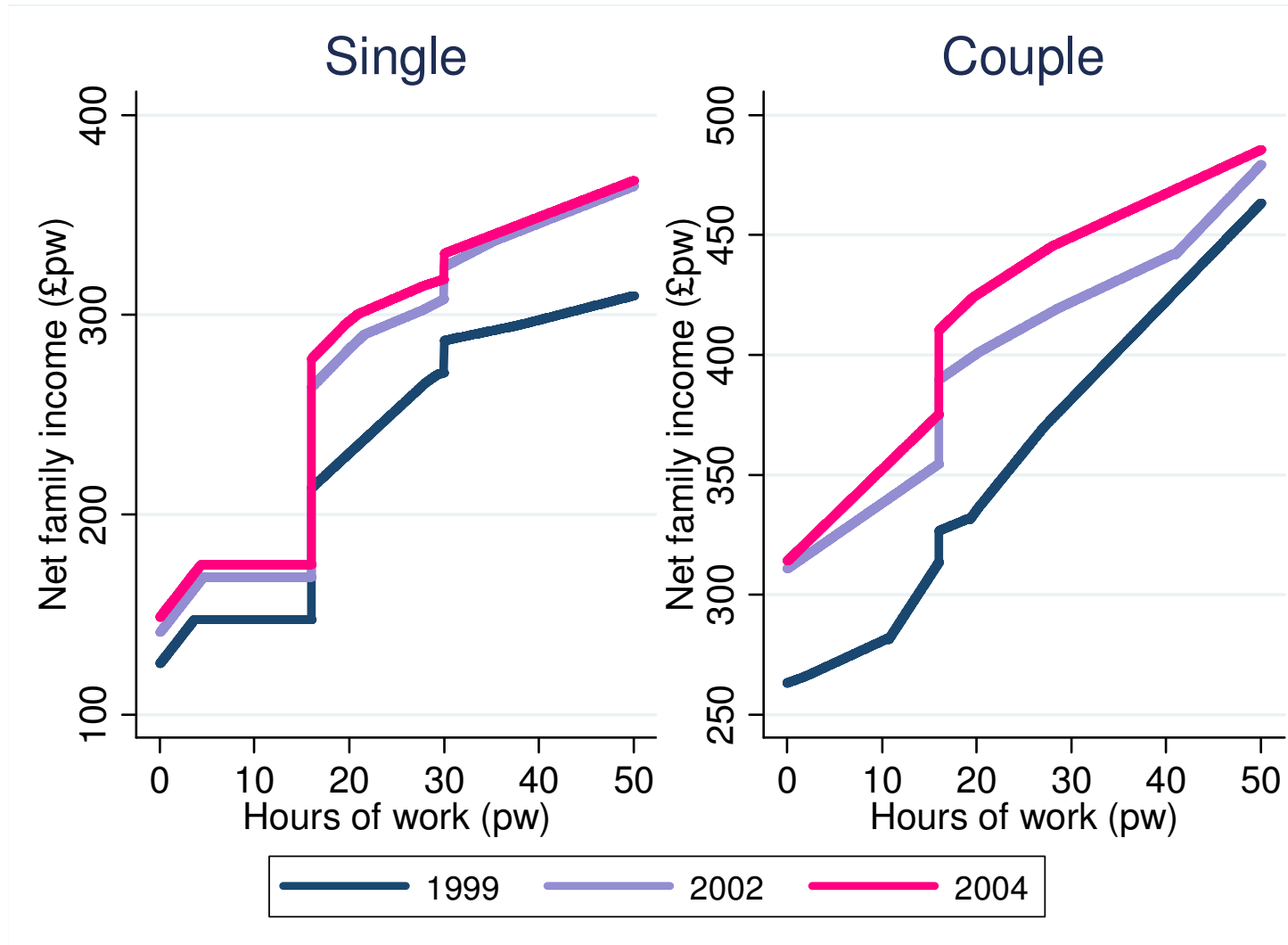Richard Blundell, Monica Costa Dias, Costas Meghir and Jonathan Shaw

What we do

- Study effect of tax credit reforms on education and employment decisions over the lifecycle

- Using a lifecycle model of female labour supply, human capital and savings
  - Eckstein and Wolpin (1989) and (1999), Keane and Wolpin (1997), Adda et al (2008), Todd and Wolpin (2006), Eckstein and Lifshitz (2011)

- With parameters estimated using British panel data (BHPS)

Standard approaches

- Features of traditional welfare evaluations (e.g. Brewer et al, 2006):

  1. Estimate impact of reform packages

  2. Use static framework

  3. Focus on short-run labour supply response

- Counter-examples: Ham and Lalonde (1996), Todd and Wolpin (2006), Haan and Prowse (2010), etc

- This paper: first attempt to study UK tax and benefit system in dynamic context

  – Focus is on female response to UK tax credit reforms

  – Dynamic effects via education, experience, productivity and family composition

  – Also investigate impact on education
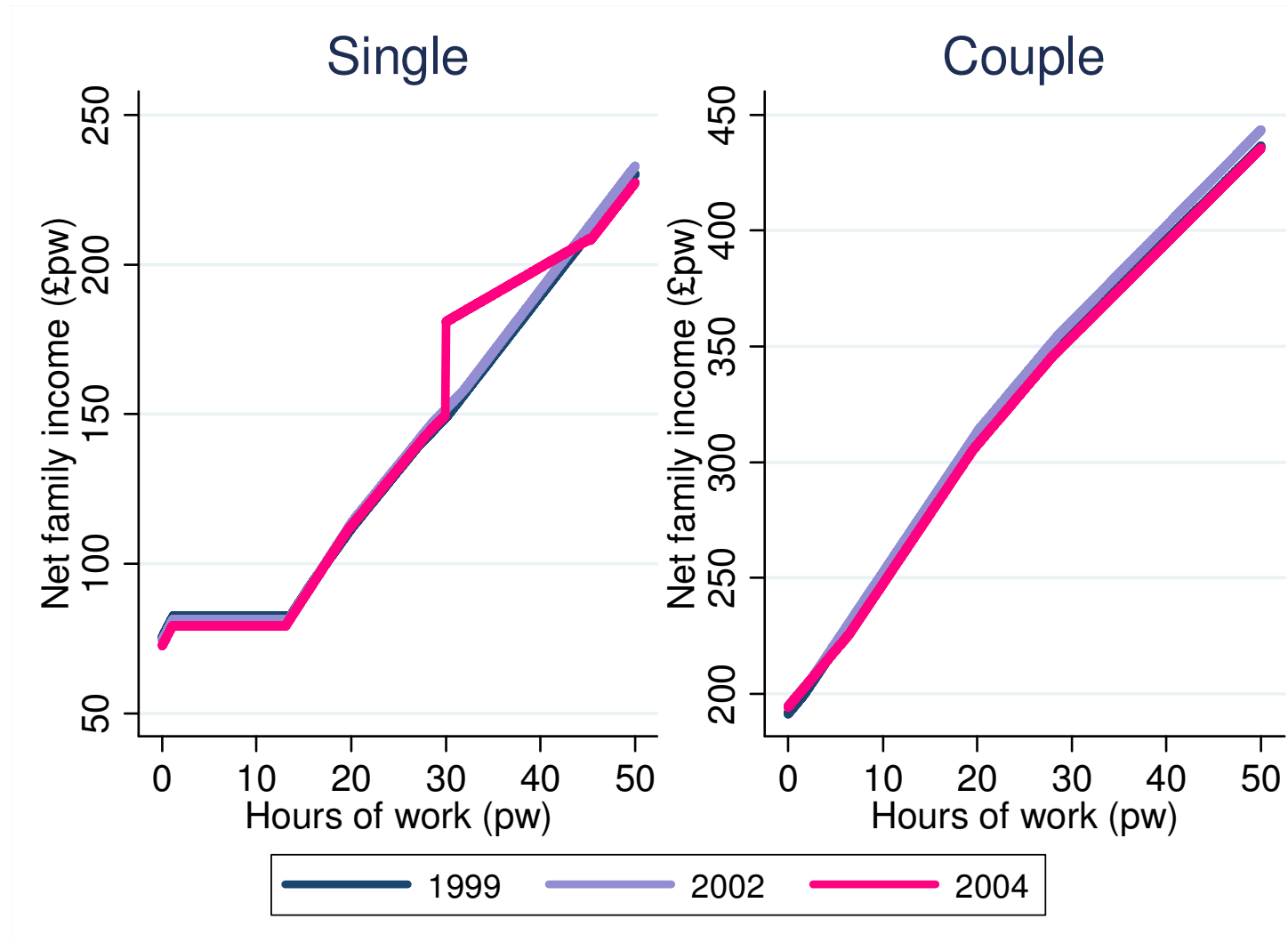
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Background to reforms: budget constraints
Families with child aged 4, £50 childcare

Single

Couple

Net family income (£pw)

Hours of work (pw)

—— 1999 —— 2002 —— 2004

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Background to reforms: budget constraints
Families without children

Literature: employment impact of WFTC/EITC

- WFTC

  - + 2-7ppt increase in employment rate for lone parents

  - Smaller, possibly negative impact for second earners in couples

  - Blundell et al (2005), Brewer et al (2006), Francesconi and van der Klaauw (2004), Francesconi et al (2009)

- EITC

  - Positive and substantial impact on employment rate for lone parents (e.g. Eissa and Liebman (1996), Meyer and Rosenbaum (2001))

  - Modest negative impact for second earners (e.g. Eissa and Hoynes (1998))

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Literature: impact of WFTC/EITC on other outcomes

- Couple formation and dissolution
  - WFTC: mixed evidence (Francesconi and van der Klaauw (2004), Gregg et al (2007), Francesconi et al. (2009))
  - EITC: small and ambiguous (Eissa and Hoynes (1999), Ellwood (2000))
- Childbearing
  - WFTC: Fall in fertility for lone parents, rise for couples (Francesconi and van der Klaauw, (2004), Brewer et al (2008))
  - EITC: little effect (Baughman and Dickert-Conlin (2009))
- Anticipation and labour market attachment effects?

Model: overview of female lifecycle

Life in three stages:

1. Education (up to 18/21)

   – Secondary, A-levels or university (determines type of human capital)

2. Working life (18/21-59)

   – Labour supply {0hrs, 20hrs, 40hrs} and consumption

   – Partnering and childbearing

3. Retirement (60-69)

   – Consumption only

Model: dynamics of female earnings

- Log wage equation

s=schooling
i=individual
a=age

$$w_{sia} = \ln W_s + \alpha_s \ln(e_{ia} + 1) + v_{sia} \qquad v_{sia} = \rho_s v_{sia-1} + u_{sia}$$

Log wage   Market wage rate   Experience   Productivity

- Experience accumulation

$$e_{ia+1} = e_{ia}(1 - \delta_s) + \delta_{sPT} 1[l_{ia} = 20] + \delta_{sFT} 1[l_{ia} = 40]$$

Depreciation rate   PT accumulation rate   FT accumulation rate

Model: dynamics of family income

- (Exogenous) family formation dynamics

  – Children

    - Model youngest child

    - Characterised by age

    - Arrival probability depends on family characteristics

    - Departure with certainty when child reaches age 18

  – Partners

    - Characterised by education, employment status and wage

    - Arrival and departure probabilities depend on family characteristics

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Model: dynamics of family income

- Male wage equation and selection into employment

$$w_{s^m ia}^m = \ln W_{s^m}^m + \alpha_{s^m}^m \ln(a - 18) + v_{s^m ia}^m$$

Log wage   Market wage rate   Age   Productivity

$$v_{s^m ia}^m = \rho^m v_{s^m ia-1}^m + u_{s^m ia}^m \qquad\qquad u_{s^m ia}^m \sim N(0, \sigma_{us^m}^2) \quad \text{Ongoing couples}$$

$$v_{s^m ia}^m \sim N(0, \sigma_{vs^m}^2) \quad \text{New couples}$$

- Detailed model of UK tax and benefit system (FORTAX)

  – Taxes: income tax, NI, council tax

  – Benefits: child benefit, maternity grant, tax credits, income support, housing benefit, council tax benefit, free school meals

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Model: decision-making environment

- Risk averse individuals faced with uncertainty

  – Own productivity (health)

  – Family dynamics: partnering/separation, child bearing

  – Partner employment and income

- No insurance market

  – Only implicit insurance through human capital, savings and public policy

- Credit constraints during working life

  – So public policy may facilitate transfers across lifecycle

- Decisions taken to maximise expected lifetime utility

$$V_a(X_{ia}) = \max_{\{c,l\}a,...,A} E\left\{ \sum_{b=a}^{A} \beta^{b-a} U(c_{ib}, l_{ib}; X_{ib}) \,|\, X_{ia} \right\}$$
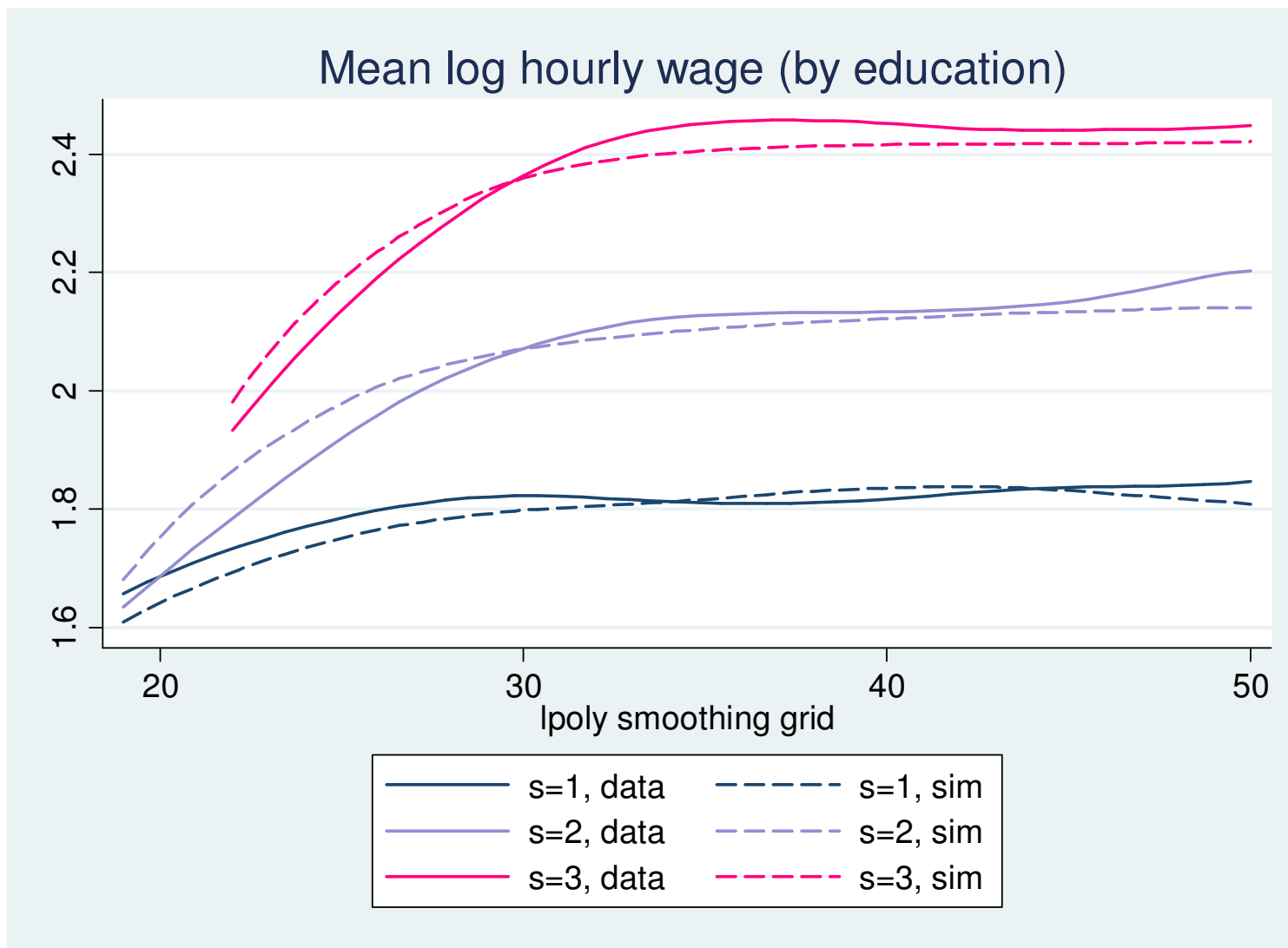
Value   State variables   Utility function   Consumption   Labour supply

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Model: data and estimation

- Model estimated using BHPS data:

  - Unbalanced panel of 5,300 females over 16 waves, 1991–2006

- Multi-step estimation procedure

  1. Fix interest rate, discount rate, intertemporal preference parameter

  2. Estimate some parameters outside structural model

     - Male selection model

     - Family dynamics and childcare costs (reduced form)

  3. Estimate remaining parameters by method of simulated moments (MSM)

     - Parameters include: cost of education, female wage equation, experience accumulation, taste for employment, distribution of unobserved heterogeneity

- Results below based on data simulated by the model

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Model fit: female log hourly wage

Mean log hourly wage (by education)

Legend:
- s=1, data
- s=1, sim
- s=2, data
- s=2, sim
- s=3, data
- s=3, sim

x-axis: lpoly smoothing grid

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Model fit: female employment rate

Female employment rate (by education)

Legend:
- s=1, data
- s=1, sim
- s=2, data
- s=2, sim
- s=3, data
- s=3, sim

lpoly smoothing grid

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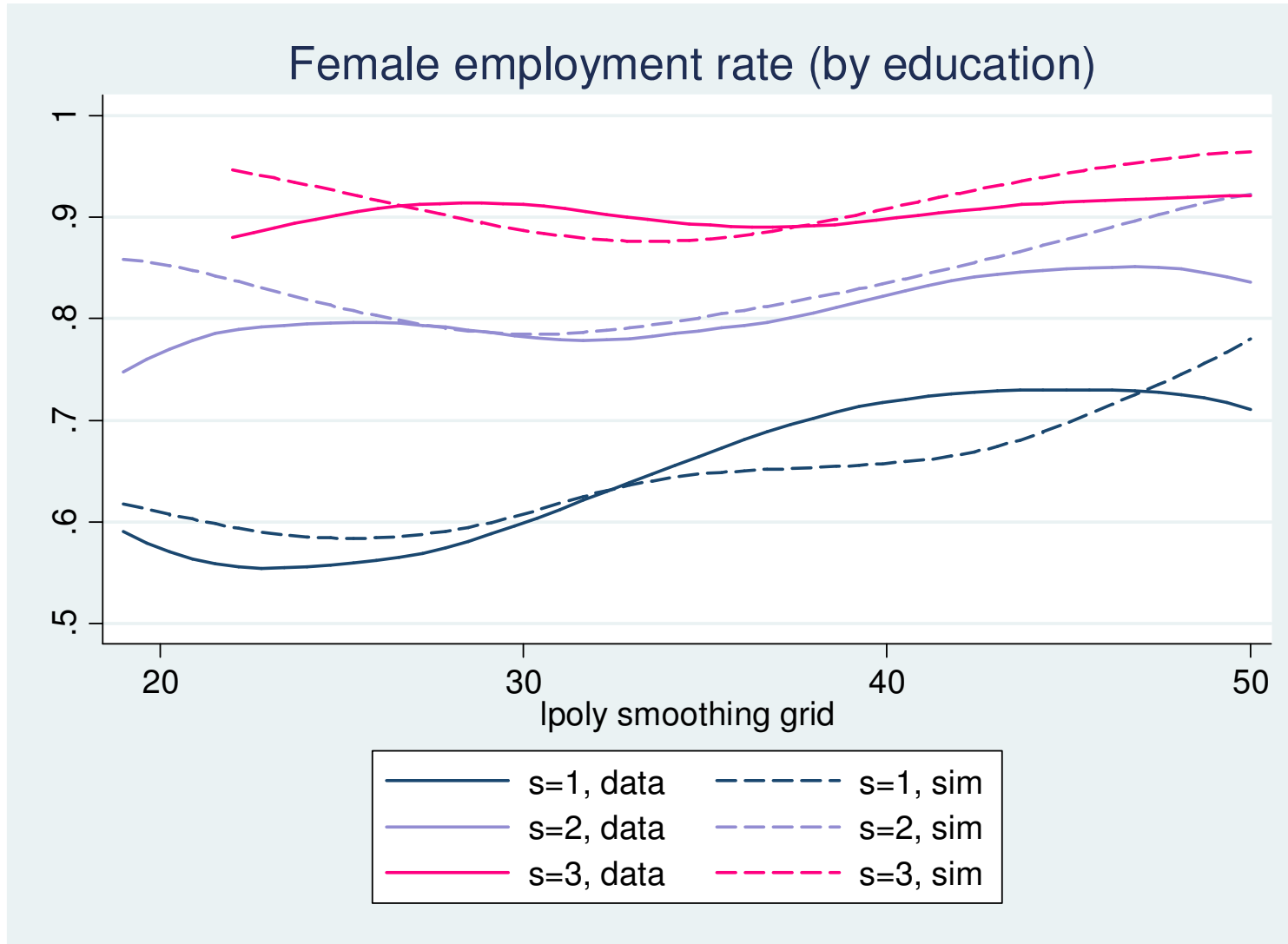
Model fit: female employment rate by age of child

Female employment rate (by education)

Legend:
- s=1, data
- s=1, sim
- s=2, data
- s=2, sim
- s=3, data
- s=3, sim

x-axis: lpoly smoothing grid

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Lifecycle employment effects of reforms

	Total	Single childless	Single mother	Couple childless	Couple mother	Tax adjust
Non-revenue neutral effect (ppt/100):						
1999+WFTC	0.015	0.000	0.103	-0.001	-0.042	–
2002						
2004						

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Lifecycle employment effects of reforms

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Non-revenue neutral effect (ppt/100):						
1999+WFTC	0.015	0.000	0.103	-0.001	-0.042	–
2002	0.005	0.007	0.050	0.000	-0.038	–
2004						

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Lifecycle employment effects of reforms

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Non-revenue neutral effect (ppt/100):						
1999+WFTC	0.015	0.000	0.103	-0.001	-0.042	–
2002	0.005	0.007	0.050	0.000	-0.038	–
2004	0.006	0.025	0.032	-0.003	-0.031	–

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Lifecycle employment effects of reforms

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2004	0.006	0.025	0.032	-0.003	-0.031	–
Revenue neutral effect (ppt/100):						
1999+WFTC	0.014	-0.002	0.103	0.000	-0.043	+0.014
2002	0.002	0.002	0.046	0.001	-0.039	+0.039
2004	0.005	0.021	0.029	-0.003	-0.027	+0.029

Note: "Tax adjust" = change in basic rate of income tax

Education effect of reforms

	Basic	Intermediate	Higher
1999 baseline	0.318	0.472	0.209
Revenue neutral effect (ppt/100):			
1999+WFTC	0.014	-0.003	-0.011
2002	0.023	-0.005	-0.017
2004	0.034	-0.009	-0.025

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Employment effects of reforms, allowing for education response

	Total	Single childless	Single mother	Couple childless	Couple mother	Tax adjust
Revenue neutral effect, no education response (ppt/100):						
1999+WFTC	0.014	-0.002	0.103	0.000	-0.043	+0.014
2002	0.002	0.002	0.046	0.001	-0.039	+0.039
2004	0.005	0.021	0.029	-0.003	-0.027	+0.029

Note: "Tax adjustment" = change in basic rate of income tax

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Lifecycle employment effects of reforms allowing for education response

	Total	Single childless	Single mother	Couple childless	Couple mother	Tax adjust
Revenue neutral effect, no education response (ppt/100):						
1999+WFTC	0.014	-0.002	0.103	0.000	-0.043	+0.014
2002	0.002	0.002	0.046	0.001	-0.039	+0.039
2004	0.005	0.021	0.029	-0.003	-0.027	+0.029
Revenue neutral effect, with education response (ppt/100):						
1999+WFTC	0.005	-0.006	0.080	-0.002	-0.051	+0.021
2002	-0.010	-0.006	0.014	-0.001	-0.048	+0.050
2004	-0.012	0.012	-0.017	-0.006	-0.037	+0.045

Note: "Tax adjustment" = change in basic rate of income tax

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Conclusion

- Develop a female lifecycle model to study UK tax and benefit system in dynamic context

  - Dynamics via education choices, experience accumulation, productivity and family composition

- Estimated on UK data

- Used to understand effect of UK tax credit reforms

- Results suggest:

  - Lifecycle employment effects (holding education fixed):

    - Large for lone mothers and mothers in couples
    - Marginally positive overall

  - But education choices sensitive to reforms

  - Lifecycle employment effects (allowing education response):

    - Effects fall substantially
    - Overall effect now negative

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