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

• 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
Background to reforms: budget constraints
Families with child aged 4, £50 childcare
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

- **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))
Literature: impact of WFTC/EITC on other outcomes

- Couple formation and dissolution
  - 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

\[ w_{sia} = \ln W_s + \alpha_s \ln (e_{ia} + 1) + v_{sia} \]

\[ v_{sia} = \rho_s v_{sia-1} + u_{sia} \]

- Experience accumulation

\[ e_{ia+1} = e_{ia} (1 - \delta_s) + \delta_{sPT} 1[l_{ia} = 20] + \delta_{sFT} 1[l_{ia} = 40] \]
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
Model: dynamics of family income

- Male wage equation and selection into employment

\[ w_{s_{ia}}^m = \ln W_{s_{ia}}^m + \alpha_{s_{ia}}^m \ln(a - 18) + v_{s_{ia}}^m \]

Log wage  \quad Market wage rate  \quad Age  \quad Productivity

\[ v_{s_{ia}}^m = \rho v_{s_{ia-1}}^m + u_{s_{ia}}^m \quad u_{s_{ia}}^m \sim N(0, \sigma_{us}^2) \quad \text{Ongoing couples} \]
\[ v_{s_{ia}}^m \sim N(0, \sigma_{vs}^2) \quad \text{New couples} \]

- 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
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

\[ V_a(X_{ia}) = \max_{\{c,l\} \in \mathcal{A}} \mathbb{E}\left\{ \sum_{b=a}^{A} \beta^{b-a} U(c_{ib}, l_{ib}; X_{ib}) \mid X_{ia} \right\} \]

Value | State variables | Utility function | Consumption | Labour supply
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
Model fit: female log hourly wage

Mean log hourly wage (by education)

lpoly smoothing grid

s=1, data  s=1, sim
s=2, data  s=2, sim
s=3, data  s=3, sim
Model fit: female employment rate

Female employment rate (by education)
Model fit: female employment rate by age of child

Female employment rate (by education)

- s=1, data
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# Lifecycle employment effects of reforms

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Note: “Tax adjust” = change in basic rate of income tax
## Education effect of reforms

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<th>Basic</th>
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<th>Higher</th>
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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