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
- 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

![Graph showing net family income (£pw) vs hours of work (pw) for single and couple households over years 1999, 2002, and 2004. The graph indicates a trend of increasing net family income with more hours of work.]
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**

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

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

  - Log wage
  - Market wage rate
  - Experience
  - Productivity

  \( s = \text{schooling} \)
  \( i = \text{individual} \)
  \( a = \text{age} \)

- **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
Model: dynamics of family income

- Male wage equation and selection into employment

\[
\begin{align*}
\ln W^m_{s^m_{ia}} &= \ln W^m_{s^m_{ia}} + \alpha^m_{s^m_{ia}} \ln (a - 18) + v^m_{s^m_{ia}} \\
& \quad \text{Log wage} \quad \text{Market wage rate} \quad \text{Age} \quad \text{Productivity}
\end{align*}
\]

\[
\begin{align*}
\rho^m_{s^m_{ia}} v^m_{s^m_{ia-1}} + u^m_{s^m_{ia}} &= u^m_{s^m_{ia}} \sim N(0, \sigma^2_{us^m}) \\
v^m_{s^m_{ia}} &= v^m_{s^m_{ia}} \sim N(0, \sigma^2_{vs^m}) \\
& \quad \text{Ongoing couples} \quad \text{New couples}
\end{align*}
\]

- 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

\[ V_a(X_{ia}) = \max_{\{c,l\}a,...,A} E \left\{ \sum_{b=a}^{A} \beta^{b-a} U(c_{ib},l_{ib};X_{ib}) | X_{ia} \right\} \]
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)
Model fit: female employment rate

Female employment rate (by education)

Ipoly 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 by age of child

Female employment rate (by education)
# 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>
<th>Intermediate</th>
<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