Female Labour Supply, Human Capital and Welfare Reform

(NBER Working Paper, also on my webpage)

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Motivation

Issues to be addressed:

1. How should labour supply, work experience dynamics and education decisions be accounted for in the evaluation of tax and welfare reform?
   - Especially in the design, and in the impact evaluation, of transfers to low wage families in the form of ‘in-work benefits’ or ‘earned income tax credits’.
   - Focus here is on the labor supply, experience and education decisions of women.

2. What is the ‘insurance value’ of redistributive policies of this kind? And how does the trade-off between insurance and incentives play out?

3. Unravel the way the two aspects of human capital interact with labour supply decisions at the extensive and intensive margin.
Policy Background

Tax and Welfare Reform in the UK:

- We study a specific reform - Working Families Tax Credit (WFTC) and Income Support (IS) in 1999/2000.
- This involved an increase in the generosity of the welfare and earned income tax credit system for families with children.
- A motivation for these policies is that by incentivising women into work, even when they have young children, preserves labour market attachment and reduces skill depreciation.
- An additional peculiarity of the UK tax-credit system is the minimum hours eligibility rules that focus incentives on part-time work.
The UK (WFTC) Tax Credit and IS Reform

IS and Tax credit award for lone parent with 1 child

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Impact on married women in couples

The budget constraint for second-earner parents

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Do the hours rules impact on observed behaviour?

The Distribution of Weekly Hours of Work: 1993 FRS

Low Education Single Women with and without Children.

Hours of Work, Lone Mothers

Hours of Work, Childless Single Women
The key question we ask is:

- How do the features of this broad kind of tax, tax-credit and welfare benefit system affect education choices, experience capital accumulation, employment and hours of work over the life-cycle?

The approach we take:

- A structural evaluation/estimation approach, using the time series of tax, tax credit, welfare benefit and tuition reforms for new cohorts of women to identify parameters. Conditioning on life-history family background variables.
- Comparing with Diff-in-Diff/quasi-experimental contrasts where possible.
British Household Panel Survey (BHPS)

Unbalanced panel of 4,200 females over 17 waves, 1991-2007

Measures of education, labour market outcomes, work-related and not-work-related training, childcare, detailed demographics, (limited) assets information.

IFS taxben working on every wave:

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

Linked life histories capture choices at age 16: educational qualifications; and detailed family background measures, including

- parental education, number of siblings, sibling order, whether lived with parents when aged 16, books at home as a child, etc
Wage Profiles by Education by Age

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Employment over the life-cycle

All employment

Part-time employment

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Employment of mothers

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Estimate a dynamic model of labour supply and human capital.

Life in three stages:

- **Education 's=0,1,2':** three levels chosen sequentially up to age 18/21
  - secondary (GCSE-level at 16), further/high school (A-levels or vocational at 18), higher (university and college at 21)

- **Working life:**
  - consumption 'c' and asset 'a' accumulation
  - labour supply 'l' (0, part-time or full-time)
  - experience accumulation
  - partnering
  - childbearing

- **Retirement:** pension incomes take effect exogenously at age 60
Model: female earnings

Wage equation for individual ‘i’, age ‘t’, in each birth cohort; with school level ‘s’, experience ‘e’, labour supply ‘l’

\[
\ln w_{sit} = \ln W_{sit} + \gamma_s \ln (e_{sit} + 1) + \nu_{sit} + \xi_{sit}
\]

\[
\nu_{sit} = \rho_s \nu_{sit-1} + \mu_{sit}
\]

\[
e_{sit} = e_{sit-1} (1 - \delta_s) + g_s (l_{sit})
\]

- \(g(l_{sit})\) set to unity for full-time, part-time is estimated.
- Persistence of shocks - distinguish heterogeneity from state dependence (experience effects).
- \(\xi_{sit}\) is a transitory shock/measurement error.
- Correlation of initial shock with preferences.
- Concave profile of experience effects.
- Depreciation of human capital - cost of not working.
Family formation dynamics

Children:

- Children are born with an (weakly) exogenous arrival rate,

\[ \Pr(t^k = 0 | t, s, k_{t-1}, t_{t-1}^k, m_{t-1}) \]

Partner:

- Arrival rate depending on level of education and age,

\[ \Pr(s_t^m | t, s, m_{t-1}, s_{t-1}^m, k_{t-1}) \]

=> Feed these into a dynamic discrete choice model for labour supply and human capital with net worth borrowing constraints and unobserved heterogeneity.
### Female wage equation estimates

**(Method of Simulated Moments)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Secondary</th>
<th>Further</th>
<th>Higher</th>
</tr>
</thead>
<tbody>
<tr>
<td>wage rate (0 experience)</td>
<td>4.5 (.01)</td>
<td>4.9 (.02)</td>
<td>6.3 (.03)</td>
</tr>
<tr>
<td>returns to experience</td>
<td>.14 (.01)</td>
<td>.23 (.01)</td>
<td>.28 (.01)</td>
</tr>
<tr>
<td>autocorrelation coef</td>
<td>.92 (.00)</td>
<td>.95 (.00)</td>
<td>.89 (.01)</td>
</tr>
<tr>
<td>se innovation</td>
<td>.13 (.00)</td>
<td>.13 (.00)</td>
<td>.12 (.01)</td>
</tr>
<tr>
<td>initial prod</td>
<td>.10 (.01)</td>
<td>.10 (.01)</td>
<td>.20 (.01)</td>
</tr>
<tr>
<td>initial productivity: se</td>
<td>.30 (.01)</td>
<td>.26 (.01)</td>
<td>.26 (.03)</td>
</tr>
<tr>
<td>depreciation rate</td>
<td>.12 (.02)</td>
<td>.11 (.01)</td>
<td>.11 (.03)</td>
</tr>
<tr>
<td>accumulation of HC in PTE</td>
<td>.15 (.01)</td>
<td>.12 (.01)</td>
<td>.10 (.01)</td>
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</table>
Part-time Experience Penalty

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Life-cycle profiles of wages

- Data, secondary simulations, secondary data
- Data, further simulations, further data
- Data, higher simulations, higher data

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Model fit

Distribution of female wage rates by age

Percentiles 10, 25, 50, 75 and 90

Secondary education

Further education

Higher education

Percentiles 10, 25, 50, 75 and 90 data simulations

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Model fit

Employment over life-cycle

All employment

Part–time employment

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Model fit

Employment of mothers

All employment

Part-time employment

- data, secondary
- simulations, secondary
- data, further
- simulations, further
- data, higher
- simulations, higher

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Comparison with DiD

WFTC and IS Reforms for Lone Mothers

% Point employment impact and matched diff-in-diff for low educated lone parents:

<table>
<thead>
<tr>
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<th>Average Impact</th>
</tr>
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<tr>
<td>1999 - 2002</td>
<td></td>
</tr>
<tr>
<td>Simulations</td>
<td>+3.9</td>
</tr>
<tr>
<td>Matched Diff-in-diff</td>
<td>+3.6 (0.5)</td>
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Marshallian Elasticities by Age: Extensive Participation Elasticities

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Income Effects at Extensive Margin by Age

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Results: Impact of WFTC & Child IS Reform

Revenue Neutral Reform, basic tax rate adjustment

I. Impact on Employment of Younger Women:

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<th>Single Mother</th>
<th>Couple with Kids</th>
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<td>employment</td>
<td>3.8</td>
<td>1.5</td>
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II. Impact on Education Shares:

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<td>30.4</td>
<td>47.5</td>
<td>22.1</td>
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<td>2002</td>
<td>31.2</td>
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Risk Aversion and the Value of Insurance

Willingness to pay in consumption

% change in consumption

variance of innovations in female wage rates

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Experience effects are lower for the lower educated and for those in part-time work, *explaining the part-time penalty*.

Women with low labour market attachment have more elastic labour supply at younger ages and large income responses.

There is a small effect of tax credits on education choice, with some women obtaining less education, and attenuating the employment gains of the reform.

The insurance value of the welfare program is substantial, *particularly for the lowest education/skill groups*.

The results can explain previous structural and quasi-experimental results for the WFTC/IS, and similar, reforms.

Next steps: sector choice, training, and frictions.
Training participation rates by age and education

Work–related training participation rates (50h+)

Low Ed

Medium Ed

High Ed

Men Women

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