Female Labour Supply, Human Capital and Tax Reform
(NBER Working Paper, also on my webpage)

Richard Blundell (UCL & IFS), Monica Costa-Dias (IFS), Costas Meghir (Yale & IFS) and Jonathan Shaw (IFS & UCL)

October 2014
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?

2. 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’.

3. To what extent do dynamic ‘longer-run’ issues change our view of the impact and of the evaluation of these policies directed at low income workers?

4. What is the ‘insurance value’ of redistributive policies of this kind? And how does the trade-off between insurance and incentives play out?
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Focus here is on the labor supply, experience and education decisions of women:

- Labour supply of women has been found to be more responsive to incentives, especially low wage women with school age children.

- Time ‘out of paid work’ points towards the potential importance of returns to experience.

- Often argued that education and work experience investments are complementary in the production of human capital.

- This paper aims to unravel the way these two aspects of human capital interact with labour supply decisions at the extensive and intensive margin.
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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.

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The UK (WFTC) Tax Credit and IS Reform

IS and Tax credit award for lone parent with 1 child

IS and tax credit award (£pw)

Net family income (£pw)

1999 IS reform  WFTC reform

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Female Labour Supply, Human Capital and Tax Reform
Impact on married women in couples

The budget constraint for second-earner parents

![Graph showing the impact of IS and tax credit award vs. Net family income for different hours of work before and after 1999 WFTC reform.](image)

- **IS and tax credit award (£pw)**
- **Net family income (£pw)**
- **Hours of work (pw)**

- 1999
- WFTC reform

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Female Labour Supply, Human Capital and Tax Reform
Hours rules

- In a static Mirrlees setting, Blundell & Shephard (2012) have shown part-time hours rules of this type are unlikely to be optimal, even where there is some justification for an earned income tax credit.

- Do the hours rules impact on observed behaviour?
- What do we see in the data?
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Do the hours rules impact on observed behaviour?
What do we see in the data?
The Distribution of Weekly Hours of Work

Low Education Single Women with and without Children in the 1993 FRS.
After 16 Hour Rule (1993)
Policy Background

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.
What we find

- **Incentive effects:** labour supply elasticities are found to vary systematically by education group, family type and age.
- **Experience matters:** but only for those with more than basic formal education, and especially for those in full-time employment.
- **Education choices:** there is a small but important impact of tax policy reforms on education choices.
- **Part-time wage penalty:** experience effects can explain the part-time penalty in female wages.
- **Previous WFTC/IS policy reform evaluations:** the results can explain why our previous evaluations for low educated women provided a relatively accurate prediction of the ‘shorter-run’ impact of these policy reforms.
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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
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Wage Profiles by Education by Age

- Log wage vs. age for different levels of education:
  - Secondary
  - Further
  - Higher

Authors: R. Blundell, M. Dias, C. Meghir, and J. Shaw

Title: Female Labour Supply, Human Capital and Tax Reform
Employment over the life-cycle

All employment

Part–time employment

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Female Labour Supply, Human Capital and Tax Reform
Employment of mothers

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Female Labour Supply, Human Capital and Tax Reform
We estimate a dynamic model of labour supply and human capital with the following features:

- Labour supply and consumption choices are heterogeneous and are made in an uncertain environment with credit constraints.
- Women can work part-time, full time, or not at all.
- Wages depend on accumulated part-time and full-time experience. They are stochastic and subject to potentially persistent shocks.
- The value of experience is allowed to differ by education and by part-time/full time work.
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Model: female life-cycle

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 and 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.
Children:

- Children are born with an (weakly) exogenous arrival rate,
  - arrival probability depends on female age, education, older children, next youngest child and presence of partner
  - departure with certainty when child reaches age 18
  - past employment(?).

\[
\text{Prob}\left[ t^k = 0 \mid t, s, k_{t-1}, t^k_{t-1}, m_{t-1} \right]
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Partner:

- Arrival rate depending on level of education and age,
  - characterised by education, employment status, prior marriage, children and earnings
  - arrival rate for male with given education depends on female age and education
  - departure probability depends on female age, presence of child and male education

\[
\text{Prob}\left[ s^m_t \mid t, s, m_{t-1}, s^m_{t-1}, k_{t-1} \right]
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- In couples, female labour supply acts partly to insure shocks in other sources of income.
- Fertility and marriage behavior are ‘weakly exogenous’,
  - however, individual women account for the implications of their choices on marriage and fertility.
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- In couples, female labour supply acts partly to insure shocks in other sources of income.
- Fertility and marriage behavior are ‘weakly exogenous’,
  - however, individual women account for the implications of their choices on marriage and fertility.
Male employment depends on his education and on whether he worked in the previous period or not.

His earnings are uncertain:

**Male wage equation**

\[
\ln w_{smit} = \ln W_{smit} + \gamma_{sm} \ln (t - 18) + \nu_{smit} + \xi_{it}
\]

\[
\nu_{smit} = \rho_{sm} \nu_{smit-1} + \mu_{smit}
\]

Linked administrative, national insurance, earnings data are/will be key here.
Taxes and Assets

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.

**Assets:**

- Initial period assets from the survey.
- Deal with the initial conditions problem by simulating from the start of life.
- Transfers implicit through funding of education.
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Model: post education optimisation problem

\( \{ c_{it}, l_{it} \}_{t=t, \ldots, \bar{t}} \) are chosen over the life-cycle to maximise

\[
V_{\bar{t}}(X_{it}) = E_t \left[ \sum_{t=t}^{\bar{t}} \frac{(c_{it}/n_{it})^\eta}{\eta} \exp(f(l_{it}, l_{it}^m, X_{it}) + \theta_i l_{it}) \right] X_{it}
\]

subject to the budget constraint

\[
a_{it+1} = (1 + r)a_{it} + l_{it}w_{sit} + d_{it}^m l_{it}^m w_{it}^m - T(X_{it}, l_{it}, l_{it}^m) - CC_t(t^K_{it}, l_{it}, l_{it}^m, X_{it}) - c_{it}
\]

- net worth liquidity constraints \( a > 0 \).
- uncertain environment: earnings (own and partner’s) and family composition
- \( f(l_{it}, l_{it}^m, X_{it}) \) is a function of family composition, education, partner, partner labour supply, and unobserved heterogeneity
- childcare costs and housing rents vary by location and time.
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Model: education decisions

- Education decisions are taken when the individual is 16
- Education costs correlated with initial level of productivity
- Future earnings and family composition are uncertain
- Allow for borrowing constraints, tuition costs and student loans.
- Condition on factors formed of many family background variables at age 16, including
  - parental education/occupation, financial circumstances, siblings or region of birth may affect education and earnings capacity.
Model: education decisions

\[ V^{High} = x' \gamma_{high} + EV^{high} + e_{sec} \]

\[ V^{Col} = x' \gamma_{col} + EV^{col} + e_{col} \]

\[ ed = \text{argmax}\{ V^{Sec}, V^{high}, V^{col} \} \]

- family background (two principal components) that also enter preferences
- Also include earnings of parents when child was 16.
Table: Education Choice and Background Factors

<table>
<thead>
<tr>
<th></th>
<th>H/h</th>
<th>L/h</th>
<th>H/l</th>
<th>Parental earnings when 16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coeff.</td>
<td>0.515</td>
<td>0.199</td>
<td>0.234</td>
<td>0.509</td>
</tr>
<tr>
<td>t-stat</td>
<td>(3.48)</td>
<td>(3.09)</td>
<td>(3.19)</td>
<td>(3.24)</td>
</tr>
</tbody>
</table>

Notes: Two factors (f1/f2) drawn from parental characteristics including education, number of siblings, birth order, lived with parents when 16 and books at home. H is high for the first factor and L is low. Lower case for 2nd factor.

- Factors enter wages and preferences
- Parental earnings act as an exclusion restriction
Estimate processes for **male earnings and employment, family dynamics and childcare costs**, recursively ‘outside’ the model.

**Method of Simulated Moments** for the remaining parameters: Simulate individuals under different tax regimes; Compute overall moment to match with those in the data.

Matched moments include employment rates by family type, employment and hours transition rates, means, variances and percentiles of earnings distribution, earnings at entrance in working life, change in earnings by past hours, education achievement,...
### Female wage equation estimates

<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>
</tr>
</tbody>
</table>
Experience Effects

- **Experience factor in wage units**
  - Years since left education:
    - 0
    - 10
    - 20
    - 30
    - 40
  - Levels:
    - Full time work
    - Part time work

- **Education Levels**:
  - Secondary
  - High school
  - University

- **Graph Titles**:
  - Full time work
  - Part time work
Part-time Experience Penalty

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<table>
<thead>
<tr>
<th></th>
<th>all employment</th>
<th></th>
<th>part-time employment</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>secondary</td>
<td>further</td>
<td>university</td>
<td>secondary</td>
</tr>
<tr>
<td>intercept</td>
<td>0.41 (.00)</td>
<td>0.41 (.00)</td>
<td>0.47 (.01)</td>
<td>-0.15 (.01)</td>
</tr>
<tr>
<td>children</td>
<td></td>
<td>0.05 (.01)</td>
<td></td>
<td>-0.06 (.01)</td>
</tr>
<tr>
<td>child aged 0-2</td>
<td>0.15 (.01)</td>
<td></td>
<td></td>
<td>-0.05 (.01)</td>
</tr>
<tr>
<td>child aged 3-5</td>
<td>0.07 (.01)</td>
<td></td>
<td></td>
<td>-0.06 (.01)</td>
</tr>
<tr>
<td>child aged 6-10</td>
<td>-0.02 (.01)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>child aged 11-18</td>
<td>-0.07 (.01)</td>
<td></td>
<td></td>
<td>0.06 (.01)</td>
</tr>
<tr>
<td>male</td>
<td>-0.06 (.01)</td>
<td></td>
<td></td>
<td>-0.02 (.02)</td>
</tr>
<tr>
<td>male working</td>
<td>-0.17 (.01)</td>
<td></td>
<td></td>
<td>0.09 (.01)</td>
</tr>
</tbody>
</table>
Model fit

Life-cycle profiles of wages

![Graph showing life-cycle profiles of wages with different simulations and data sets.](image-url)
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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Female Labour Supply, Human Capital and Tax Reform
Model fit

Employment over life-cycle

![Graph showing employment rates over age for all employment and part-time employment, with data and simulations indicated by different line styles.](image-url)

Data, secondary simulations, secondary data, further simulations, further data, higher simulations, higher data.
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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Female Labour Supply, Human Capital and Tax Reform
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>
<th></th>
<th>Average Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simulations</td>
<td>+3.8</td>
</tr>
<tr>
<td>Matched Diff-in-diff</td>
<td>+3.6 (0.3)</td>
</tr>
</tbody>
</table>
### Overall Marshallian Labour Supply Elasticities

<table>
<thead>
<tr>
<th></th>
<th>extensive</th>
<th>intensive</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>0.47</td>
<td>0.23</td>
</tr>
<tr>
<td>Secondary</td>
<td>0.71</td>
<td>0.31</td>
</tr>
<tr>
<td>High School</td>
<td>0.43</td>
<td>0.23</td>
</tr>
<tr>
<td>University</td>
<td>0.28</td>
<td>0.15</td>
</tr>
<tr>
<td>Lone mother</td>
<td>1.65</td>
<td>0.41</td>
</tr>
<tr>
<td>Mothers in couples</td>
<td>0.53</td>
<td>0.29</td>
</tr>
<tr>
<td>Childless women</td>
<td>0.22</td>
<td>0.22</td>
</tr>
</tbody>
</table>
Marshallian Elasticities by Age: Extensive Participation Elasticities

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Female Labour Supply, Human Capital and Tax Reform
Income Effects at Extensive Margin by Age

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Female Labour Supply, Human Capital and Tax Reform
### Results: Frisch Wage Elasticities of Labour Supply

<table>
<thead>
<tr>
<th></th>
<th>extensive</th>
<th>intensive</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>0.66</td>
<td>0.28</td>
</tr>
<tr>
<td>Secondary</td>
<td>1.01</td>
<td>0.40</td>
</tr>
<tr>
<td>High School</td>
<td>0.61</td>
<td>0.27</td>
</tr>
<tr>
<td>University</td>
<td>0.36</td>
<td>0.15</td>
</tr>
<tr>
<td>Lone mother</td>
<td>1.65</td>
<td>0.45</td>
</tr>
<tr>
<td>Mothers in couples</td>
<td>0.69</td>
<td>0.30</td>
</tr>
<tr>
<td>Childless women</td>
<td>0.29</td>
<td>0.22</td>
</tr>
</tbody>
</table>

R Blundell, M Dias, C Meghir and J Shaw
Results: Impact of WFTC & Child IS Reform

Revenue Neutral Reform, basic tax rate adjustment

I. Impact on Employment of Younger Women:

<table>
<thead>
<tr>
<th>No Education Choice</th>
<th>Single Mother</th>
<th>Couple with Kids</th>
</tr>
</thead>
<tbody>
<tr>
<td>employment</td>
<td>3.8</td>
<td>1.5</td>
</tr>
</tbody>
</table>

II. Impact on Education Shares:

<table>
<thead>
<tr>
<th></th>
<th>Sec.</th>
<th>Fur.</th>
<th>Uni.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>30.2</td>
<td>47.2</td>
<td>22.5</td>
</tr>
<tr>
<td>2002</td>
<td>31.1</td>
<td>46.9</td>
<td>21.8</td>
</tr>
</tbody>
</table>
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</thead>
<tbody>
<tr>
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<tr>
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<td>46.9</td>
<td>21.8</td>
</tr>
</tbody>
</table>
### Results: Employment Impact of WFTC & Child IS Reform

#### Revenue Neutral Reform (basic tax rate adjustment):

<table>
<thead>
<tr>
<th></th>
<th>Single Mother</th>
<th></th>
<th>Couple with Kids</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>employment</td>
<td>3.8</td>
<td>1.5</td>
<td>-0.5</td>
<td>-2.5</td>
</tr>
</tbody>
</table>

**With Education Choice**

<table>
<thead>
<tr>
<th></th>
<th>Single Mother</th>
<th></th>
<th>Couple with Kids</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>employment</td>
<td>3.8</td>
<td>1.2</td>
<td>-0.6</td>
<td>-2.6</td>
</tr>
</tbody>
</table>

Classified according to original education choice.
## Impact on Welfare and Income

### WFTC and IS

<table>
<thead>
<tr>
<th></th>
<th>pre education choice</th>
<th>post education choice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welfare (△%)</td>
<td>1.45</td>
<td>.54</td>
</tr>
<tr>
<td>Lifetime Income (△%)</td>
<td>.63</td>
<td>-.85</td>
</tr>
</tbody>
</table>

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Female Labour Supply, Human Capital and Tax Reform
Risk Aversion and the Value of Insurance

Willingness to pay in consumption

% change in consumption

variance of innovations in female wage rates

secondary high school university

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Female Labour Supply, Human Capital and Tax Reform
### Program Preference - Insurance versus Incentives

No Education Adjustment

<table>
<thead>
<tr>
<th>Pre-reform education choice by baseline educ</th>
<th>sec</th>
<th>further</th>
<th>higher</th>
<th>all</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Pre-Tax Earnings</td>
<td>.29</td>
<td>.21</td>
<td>.09</td>
<td>.20</td>
</tr>
<tr>
<td>(3) Welfare (post-ed)</td>
<td>.40</td>
<td>.94</td>
<td>.77</td>
<td>.71</td>
</tr>
</tbody>
</table>

#### Panel A: Adjustment in basic tax rate

| (1) Pre-Tax Earnings | 1.32 | -.01 | -.18 | .37 |
| (7) Welfare (post-ed) | 1.58 | 1.30 | .21 | 1.03 |

#### Panel B: Adjustment in tax credits maximum award

| (9) Pre-Tax Earnings | -2.49 | -1.34 | -.38 | -1.40 |
| (11) Welfare (post-ed) | .90 | .70 | .09 | .56 |

- Welfare Effects of increasing Expenditure by 0.5% of Earnings
- Tax rate decreases by 0.93pp or Max Tax Credit increases by 22 pounds or IS increases by 4.2 pounds
Program Preference - Insurance versus Incentives
With Education Adjustment

<table>
<thead>
<tr>
<th>Post-reform education choice by baseline educ</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>sec</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>further</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>higher</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>all</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Panel A: Adjustment in basic tax rate

<table>
<thead>
<tr>
<th></th>
<th>Earnings</th>
<th>Welfare (post-ed)</th>
<th>Welfare (pre-ed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>.63</td>
<td>.42</td>
<td>.48</td>
</tr>
<tr>
<td>(3)</td>
<td>.23</td>
<td>.98</td>
<td>.81</td>
</tr>
<tr>
<td>(4)</td>
<td>.10</td>
<td>.81</td>
<td>.74</td>
</tr>
</tbody>
</table>

Panel B: Adjustment in tax credits maximum award

<table>
<thead>
<tr>
<th></th>
<th>Earnings</th>
<th>Welfare (post-ed)</th>
<th>Welfare (pre-ed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(5)</td>
<td>.95</td>
<td>1.11</td>
<td>.72</td>
</tr>
<tr>
<td>(7)</td>
<td>-.13</td>
<td>.91</td>
<td>.15</td>
</tr>
<tr>
<td>(8)</td>
<td>-1.04</td>
<td>.15</td>
<td>.72</td>
</tr>
</tbody>
</table>

Panel C: Adjustment in IS award

<table>
<thead>
<tr>
<th></th>
<th>Earnings</th>
<th>Welfare (post-ed)</th>
<th>Welfare (pre-ed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(9)</td>
<td>-2.05</td>
<td>.72</td>
<td>.46</td>
</tr>
<tr>
<td>(11)</td>
<td></td>
<td>.55</td>
<td>.45</td>
</tr>
<tr>
<td>(12)</td>
<td></td>
<td>.07</td>
<td>.45</td>
</tr>
</tbody>
</table>

Notes: The values measure the impact of exogenously increasing public spending by 0.5% of total gross earnings and distribute it through a drop in the basic tax rate (panel A), an increase in the tax credits maximum award (panel B) and an increase in the IS award (panel C). All comparisons are against the 1999 tax and benefits system. Columns 1 to 4 display results if education is not allowed to respond, in which case the extra spending allows the basic tax rate to drop by 0.93pp, the IS award to increase by £4.2 per week, or the tax credits award to increase by £22.2 per week. Columns 5 to 8 display results when education choices can adjust the new system, in which case the extra spending allows the basic tax rate to drop by 0.97pp, the IS award to increase by £3.4 per week, or the tax credits award to increase by £16.6 per week. Rows 1 and 2 display effects on pre- and post-tax lifetime income, respectively. Rows 3 and 4 show effects on welfare measured by the willingness to pay in consumption terms to keep pre-reform wellbeing with post-reform family budget. These are measured at the beginning of working life (row 3) and at the start of life (row 4). See footnote to table ?? for more details.

- Tax rate decreases by 0.97pp or Max Tax Credit increases by 16.6 pounds or increases IS by 3.4 pounds.
Summary and Discussion

- Experience effects are lower for the lower educated, *complementarity between formal education and human capital on-the-job*.
- Experience effects are lower 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 WFTC type reforms.
- Provide an empirically driven approach to structural analysis of tax reform. Next steps: sector choice, training, and frictions.
Experience effects are lower for the lower educated, complementarity between formal education and human capital on-the-job.

Experience effects are lower 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.

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Training participation rates by age and education

Work–related training participation rates (50h+)

Low Ed

Medium Ed

High Ed

Men

Women

R Blundell, M Dias, C Meghir and J Shaw
Female Labour Supply, Human Capital and Tax Reform
### Table: Descriptive statistics - family demographics in 2002

<table>
<thead>
<tr>
<th></th>
<th>Mothers</th>
<th>Childless women</th>
<th>Number of observations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>singles</td>
<td>in couples</td>
<td></td>
</tr>
<tr>
<td>women aged 18-50</td>
<td>0.137</td>
<td>0.439</td>
<td>0.424</td>
</tr>
<tr>
<td></td>
<td>(0.008)</td>
<td>(0.011)</td>
<td>(0.011)</td>
</tr>
<tr>
<td>women aged 30-45</td>
<td>0.165</td>
<td>0.582</td>
<td>0.253</td>
</tr>
<tr>
<td></td>
<td>(0.011)</td>
<td>(0.015)</td>
<td>(0.013)</td>
</tr>
<tr>
<td>Women aged 30-45, by education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>secondary</td>
<td>0.213</td>
<td>0.571</td>
<td>0.216</td>
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<tr>
<td></td>
<td>(0.017)</td>
<td>(0.020)</td>
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<td>high school</td>
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<td></td>
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<td>(0.026)</td>
<td>(0.023)</td>
</tr>
<tr>
<td>university</td>
<td>0.048</td>
<td>0.564</td>
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</tr>
<tr>
<td></td>
<td>(0.016)</td>
<td>(0.036)</td>
<td>(0.036)</td>
</tr>
</tbody>
</table>

Notes: Based on BHPS data for 2002, standard errors in parenthesis under estimates.