A lifetime perspective on the incentive and distributional effects of the UK tax system

Mike Brewer, Monica Costa Dias and Jonathan Shaw

PRELIMINARY
Motivation

- Tax and benefit reform should be based on a solid understanding of the effects of the tax and benefit system
- A cross-sectional perspective is inadequate – lifecycle outcomes are important
- But understanding of the lifecycle effect of the tax and benefit system limited
Literature

Work incentives
- Extensive work from cross-sectional perspective (Brewer et al, 2010; Adam et al, 2006; Bell et al, 2006)
- But not much that takes lifecycle perspective

Distribution of income and tax burden
- Progressivity of tax system from lifecycle and cross-sectional perspectives (Bengtsson and others, 2011, Piketty and Saez, 2007)
- Redistribution across lifecycle vs across individuals (Bovenberg et al, 2008)
- Distribution of top incomes (Atkinson, 2005, Dell, 2006)
What we do

• Study incentive and distributional effects of current UK personal tax system using a structural dynamic model of the life course

• Focus on:
  – Earned income and its distribution
  – Working life
  – Constant tax and benefit system throughout life to compare cross-section and lifetime effects

• Within this framework, we can
  – Analyse work incentives and how they vary with characteristics
  – Study redistribution from cross-section and lifecycle perspectives
  – Investigate the insurance role of the tax system
  – Control for factors like cohort effects
  – Experiment with policy changes never implemented
This presentation

Two issues:

• How do financial work incentives change over lifecycle?
• How is tax burden distributed over the lifecycle and population?

But first ...
Model: key features (1)

Lifecycle model of female labour supply, human capital and savings

- 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 {0, PT, FT} and consumption
     - Marriage and childbearing
  3. Retirement (60-69)
     - Deterministic at age 60
Model: key features (2)

• Heterogeneous individuals
  – Start of life: preferences for work/study, ability, initial wealth
  – During life: family formation, productivity (health)

• Uncertainty faced by individuals
  – Own productivity (health)
  – Family dynamics: partnering/separation, child bearing
  – Partner employment and income
  – Personal insurance mechanisms include human capital and savings
Model: key features (3)

• Individual decisions conditioned by market failures
  – Insurance market
  – Credit market

• Role for policy
  – Redistribution: *ex-ante* inequality and permanent productivity shocks
  – Mutualising risk by facilitating life-cycle transfers
    • transitory income shocks in the presence of market failures

• Detailed UK personal tax and benefit system
Model fit (1): Female wage rates

Female Wage Rate
Percentiles 10, 25, 50, 75 and 90

Low education
A-levels and equivalent
University education

Percentiles 10, 25, 50, 75 and 90

age

data
sim

© Institute for Fiscal Studies
PRELIMINARY - DO NOT CITE
Model fit (2): Female earnings

Female Earnings
Percentiles 10, 25, 50, 75 and 90

Low education

A-levels or equivalent

University education

Percentiles 10, 25, 50, 75 and 90

Female Earnings
data sim
Model fit (3): Gross income distributions

Equivalised gross annual family income
Sample window

Low education

A-levels or equivalent

College education

Gross income

Sample window
Equivalised gross annual family income
data simulations

© Institute for Fiscal Studies
PRELIMINARY - DO NOT CITE
Model fit (4): gross income across the lifecycle

Equivalised family LC gross income
by female education and age

mean

st deviation

- data, s=1
- data, s=2
- data, s=3
- simulation, s=1
- simulation, s=2
- simulation, s=3
Q1: How do financial work incentives change over lifecycle?
METR and PTR

- Definition: proportion of the change in gross family earnings from changing hours of work lost to increased taxes and reduced benefits
- Difference between METR and PTR is size of hours change

\[
METR / PTR = 1 - \frac{Y_1 - Y_0}{E_1 - E_0}
\]

- We treat childcare two ways:
  - “No childcare costs”
  - “Varying childcare costs” – treated like a tax
- METR based on working one extra hour
METR by education level

Comparing model and BHPS, no childcare costs

METR for working females, by education

Model
BHPS

PRELIMINARY - DO NOT CITE
METR over the lifecycle by education level

2006: METR}s for working females; family composition (cc0)
METR over the lifecycle for different tax systems

METRs for working females; family composition (s=1, cc0)

Median
p25-p75
p10-p90
mean

Mother
Lone mother

© Institute for Fiscal Studies
PRELIMINARY - DO NOT CITE
PTR by education level

Comparing model and BHPS, no childcare costs

PTR for working females, by education

Model
BHPS
PTR over the lifecycle by education level

2006: PTRs for all females; family composition (cc0)

Median
p25-p75
p10-p90
mean

Mother
Lone mother

© Institute for Fiscal Studies
PRELIMINARY - DO NOT CITE
PTR over the lifecycle for different tax systems

PTRs for all females; family composition (s=1, cc0)
Lifecycle PTR by age, for selected family types
1999 tax system; no childcare costs

LCptr (cc0): s=1, dm=0, nkd=0

LCptr (cc0): s=1, dm=0, nkd=1, akd=4

LCptr (cc0): s=3, dm=1, nkd=0

© Institute for Fiscal Studies
PRELIMINARY - DO NOT CITE
Q2: How is tax burden distributed over the lifecycle and population?
Distribution of net and gross annual family income
Equivalised; no childcare costs

Equivalised annual family income (£000s)
Net Gross

Distribution of annual family income
2006 tax system
Distribution of annual family income by age
2006 tax system

Distribution of annual family income, by age
Equivalised; no childcare costs

Gross

Net

<table>
<thead>
<tr>
<th>Age</th>
<th>p10-p90</th>
<th>p25-p75</th>
<th>p50</th>
<th>Mean</th>
</tr>
</thead>
</table>

Equivalised annual gross family income (£000s)
Equivalised annual net family income (£000s)
Distribution of annual and lifetime net income
2006 tax system

Distribution of annual and lifecycle net family income
Equivalised income; no childcare costs

Equivalised net family income (£000s)
0 20 40 60

Density
0 .02 .04 .06 .08 .1

Net
Annualised lifecycle

© Institute for Fiscal Studies
PRELIMINARY - DO NOT CITE
Decomposition of lifecycle inequality by source
2006 tax system

<table>
<thead>
<tr>
<th></th>
<th>Initial conditions</th>
<th>Education</th>
<th>Family</th>
<th>Residual</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female earnings</td>
<td>0.314</td>
<td>0.244</td>
<td>0.020</td>
<td>0.419</td>
<td>1</td>
</tr>
<tr>
<td>Equivalised gross family income</td>
<td>0.169</td>
<td>0.234</td>
<td>0.055</td>
<td>0.538</td>
<td>1</td>
</tr>
<tr>
<td>Equivalised net family income</td>
<td>0.174</td>
<td>0.216</td>
<td>0.035</td>
<td>0.571</td>
<td>1</td>
</tr>
<tr>
<td>% reduction in variance</td>
<td>62.1</td>
<td>65.9</td>
<td>76.0</td>
<td>60.8</td>
<td>63.1</td>
</tr>
</tbody>
</table>
Median net tax and ATR by gross income decile
2006 tax system

2006: Median net tax and ATR by decile of gross family income
Equivalised; no childcare costs

Net tax
ATR

Annual income
Annualised lifecycle income
Median cross-sectional ATR by age and quintile
2006 tax system

2006: Median cross-sectional ATR for all females
No childcare costs

By cross-sectional income quintile

By lifecycle income quintile

PRELIMINARY - DO NOT CITE
Median ATR over time, by income quintile
2006 tax system

1990-2006: Median ATR across all families
By gross family income quintile; no childcare costs

Annual

Lifecycle

© Institute for Fiscal Studies
PRELIMINARY - DO NOT CITE
Conclusions

Work incentives

• In-work benefits are key
• Complete picture of work incentives summarised by lifecycle PTR

Redistribution

• Tax and benefit system less redistributive from lifecycle perspective than cross-sectional perspective
• Initial conditions and education account for over half of variability in lifecycle earnings