A lifetime perspective on the distributional and incentive effects of UK personal taxes

Mike Brewer, Monica Costa Dias and Jonathan Shaw
Background

• Tax/benefit reform often driven by
  – Redistributive purposes
  – Desire to encourage certain behaviours – labour supply, education

• Heterogeneous and complex responses
  – Depend on how economic incentives are affected
    • Overall tax policy environment
    • Individual idiosyncratic circumstances that vary over the course of life
  – and how incentives influence behaviour
    • Present and future costs and gains
    • (Market conditions)

• To understand the effects of tax reform need to consider
  – heterogeneous incentives in a complex net of taxes and benefits
  – heterogeneous responses to incentives
  – lifetime consequences of such responses
Background

Two related branches of the literature

1. Studies assessing the impact of personal taxes allowing for heterogeneous effects and behavioural responses
   • Effect of work-contingent benefits on labour supply of parents (Brewer et al., 2006, Francesconi and van der Klaauw (2007) and others)
   • Optimal taxation of low income families with children (Blundell and Shephard, 2009)
     – Static framework: individuals disregard future consequences of their actions
     – Yet, many individual decisions are dynamic in nature
       • Education and human capital formation, labour supply, marriage and child bearing
       • Large changes in incentives may have life-cycle effects
         – Progressive taxation and the value of education and human capital
         – Work-contingent subsidies: human capital formation and job-attachment
         – Insurance value of taxation and insurance value of human capital
     – Often dependence of results on tax environment not clearly established
Background

2. Studies of the lifecycle and cross-sectional distribution of income and tax burden
   - Progressivity of tax system from life-cycle and cross section perspectives (Bengtsson and others, 2011, Piketty and Saez, 2007)
   - Distribution of top incomes (Atkinson, 2005, Dell, 2006)
      - Focus on how the tax system changes the income distribution
      - Consider all sources of income and pay, with particular attention to top incomes
      - But no attempt to understand how taxation changes incentives and affects behaviour
This project

- Aims to bring together the two branches of the literature
  - To characterise the transfer system from a lifetime perspective
    - Who pays and at what stage of the lifecycle
    - Implied redistribution
    - Insurance role
  - While understanding how the transfer system shapes working and education incentives
  - How incentives change over time
  - And the induced behavioural responses and dynamic lifecycle consequences
  - Which partly explain the observed lifetime patterns in public transfers

- Study UK personal tax system
  - Focus on earned income
  - Using a detailed description of personal taxes and subsidies
    - Analysis relevant for the bottom 95% of the income distribution
  - But disregard retirement pensions
Some questions

1. How do financial work incentives change over lifecycle?
   - Build on previous “snapshot” studies of METR and PTR
   - Describe distributions of METR and PTR by age and other factors
   - Cross-section versus lifetime incentives

2. How do financial work incentives vary over the income distribution?
   - Annual versus lifetime income
   - Relation to tax progressivity
   - Changes over time

3. How is tax burden distributed over the lifecycle and population?
   - Lifecycle tax burden and its distribution across life periods
   - Distribution of lifecycle tax burden over population and relation to history of family composition, education and initial family background
   - Implied level of lifecycle redistribution of current UK tax system
Framework

- Structural dynamic model of education, labour supply and savings
  - Coupled with detailed description of personal tax system
  - Allowing for study of current system, consequences of recent changes and counterfactual analysis of hypothetical reforms

- Focus on women, for whom behavioural responses are more important
  - Role of family composition
  - Importance of childcare costs

- 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
Framework (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

- Individual decisions conditioned by market failures: insurance and credit markets

- 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
Model fit (1)
Log hourly wage over the lifecycle by education level
Model fit (2)
Employment rate over the lifecycle by education level

![Chart showing employment rate over age by education level.](chart.png)

- **Sim: secondary** (solid line)
- **Data: secondary** (dashed line)
- **Sim: A-levels** (dotted line)
- **Data: A-levels** (dashed-dotted line)
- **Sim: university** (solid line)
- **Data: university** (dashed line)
Model fit (3)
Employment rate over the lifecycle by presence of child
### Model fit (4)

**Impact of WFTC reform on employment**

Combined effect of WFTC and other reforms between 1999 and 2002

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lone mothers</td>
<td>+4.4%</td>
<td>+3.6%</td>
<td></td>
<td>+3.7%</td>
</tr>
<tr>
<td>Women in couples</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>-2.0%</td>
<td></td>
<td>+0.7%</td>
<td>-0.4%</td>
</tr>
<tr>
<td>Partner working</td>
<td>-3.0%</td>
<td>-0.1%</td>
<td>+0.1 to +0.6%</td>
<td></td>
</tr>
<tr>
<td>Partner not working</td>
<td>+4.1%</td>
<td>+2.6%</td>
<td>+3.1%</td>
<td></td>
</tr>
</tbody>
</table>

BBS (2005) = Blundell, Brewer and Shephard (2005); reduced form estimate
FRK (2009) = Francesconi, rainer and van der Klaauw (2009); reduced form estimate
BDSS (2006) = Brewer, Duncan, Shephard and Suarez (2006); static structural estimate

© Institute for Fiscal Studies
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

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

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

\[
E_0 = \text{gross family earnings}
\]
\[
E_1 = \text{incremented gross family earnings}
\]
\[
Y_0 = \text{net family earnings}
\]
\[
Y_1 = \text{incremented net family earnings}
\]
ATR including subsidies

• Definition: tax burden as a proportion of gross family earnings
• Tax burden is net of subsidies
• Excludes foregone subsidies while unemployed

\[
ATR = \frac{T}{E} \quad T = \text{family tax burden net of subsidies} \\
E = \text{gross family earnings}
\]

• We treat childcare in two ways:
  – “No childcare costs”
  – “Varying childcare costs” – treated like a tax
METR for working females (no childcare costs)  
Model versus BHPS data  
1999 tax system
METR by family type
1999 tax system

Cumulative distribution for working females

No childcare costs

Varying childcare costs

- Childless single
- Childless couple
- Lone parent
- Couple parent
METR by age and education
Varying childcare, 1999 tax system
PTR for working females (no childcare costs)
Model versus BHPS data
1999 tax system
PTR by employment status
All females, 1999 tax system

PTR: cumulative distribution for females
By employment status

No childcare costs
Varying childcare costs

Not working Part time Full time

Proportion

© Institute for Fiscal Studies
PTR by employment status: full-time work
All females, 1999 tax system

Full-time PTR: cumulative distribution for females
By employment status

No childcare costs

Varying childcare costs

Not working  Part time  Full time

© Institute for Fiscal Studies
Working incentives
1999 tax system

• Over 70% of working females face same METR

• Mothers, especially lone mothers, face largest disincentives at the intensive margin

• Disincentives are stronger for low-skilled workers, who are more likely to be on taper regions for Family Credit

• We predict women respond to incentives at the extensive and intensive margins:
  – Unemployed women face higher PTR
  – Women in part-time work face especially low PTRs for PT work
METR by annual earnings
Working females, 1999 tax system

METR: cumulative distribution for working females
By quintile of cross-sectional female gross income
No childcare costs
Varying childcare costs

Bottom quintile 2nd 3rd 4th Top quintile
PTR by annual earnings
Working females, 1999 tax system

PTR: cumulative distribution for working females
By quintile of cross-sectional female gross income

No childcare costs
Varying childcare costs

Bottom quintile  2nd  3rd  4th  Top quintile
PTR by annual earnings: full-time work
Working females, 1999 tax system

Full-time PTR: cumulative distribution for working females
By quintile of cross-sectional female gross income
No childcare costs
Varying childcare costs

Bottom quintile 2nd 3rd 4th Top quintile
PTR by annual family earnings
Working females, 1999 tax system

PTR: cumulative distribution for working females
By quintile of cross-sectional gross per-adult income
No childcare costs
Varying childcare costs

Bottom quintile
2nd
3rd
4th
Top quintile

Proportion
0 .2 .4 .6 .8 1

Proportion
0 .2 .4 .6 .8 1

PTR

PTR

Bottom quintile
2nd
3rd
4th
Top quintile
ATR (including subsidies) by annual earnings
Working females, 1999 tax system

ATR: cumulative distribution for working females
By quintile of cross-sectional female gross income
No childcare costs
Varying childcare costs

Bottom quintile
2nd
3rd
4th
Top quintile

Proportion
0 .2 .4 .6 .8
Average tax rate
0 .2 .4 .6 .8

© Institute for Fiscal Studies
ATR (including subsidies) by annual family earnings
Working females, 1999 tax system

ATR: cumulative distribution for working females
By quintile of cross-sectional gross per-adult income
No childcare costs
Varying childcare costs

Bottom quintile 2nd 3rd 4th Top quintile
Work incentives and progressivity
1999 tax system

- High taxes at the intensive labour supply margin affect disproportionally the bottom of the earnings distribution
  - Likely to be exposed to benefit and tax credit withdrawal

- At the extensive margin, the women on lower earnings face lower PTRs
  - But partly due to choice of lower hours of work

- However, when considering family income quintiles, high PTRs affect the lowest quintile more

- But the tax system looks mildly progressive from an annual perspective, with ATRs increasing with income among working women

- Although ATRs much more homogeneous than METR or PTRs
ATR (including subsidies) by age
Annual vs lifetime income, 1997 tax system

1997: median ATR for working females
No childcare costs

By annual income quintile
By lifecycle income quintile

Median ATR
Top quintile 4th 3rd 2nd Bottom quintile
Institute for Fiscal Studies
ATR (including subsidies) by age
Annual vs lifetime income, 2006 tax system

2006: median ATR for working females
No childcare costs

By annual income quintile

By lifecycle income quintile

Top quintile

4th

3rd

2nd

Bottom quintile
ATR (including subsidies) by income decile
2006 versus 1997 tax systems

Median ATR by decile of female gross income
No childcare costs; excludes periods when female not working

Female gross income decile (annual or lifecycle)

1997 annual income
1997 lifecycle income
2006 annual income
2006 lifecycle income
Lifetime versus annual tax progressivity
1997 versus 2006 tax systems

- Among workers, the personal tax system is more progressive from an annual perspective

- And became much more so in the early 2000s with the increasing generosity of tax credits targeted at families

- Major differences at the bottom quintile during childbearing years
  - Mobility across income deciles during lifetime
  - Large subsidies towards families with children affect women with very different earnings ability
    - The effective ATRs of the bottom 3 lifetime income quintiles look almost identical

- But this analysis excludes women out of work
Concluding remarks

- Strong heterogeneity in working incentives, even when restricting attention to working women

- While working women on low earnings face lower PTRs, this is in part a consequence of their choice of lower hours
  - Mothers are heavily represented in this group
  - But working women in low income families face high PTRs with the withdrawal of (unemployment) benefits

- Among working women, the transfer system seems to be mildly progressive
  - Became more so in the early 2000s
  - While increasing transfers across lifecycle periods
  - And creating strong incentives to move across income levels to benefit from generous benefits during childbearing years