Microsimulation in the UK: TAXBEN

Stuart Adam, IFS

Workshop on microsimulation modelling for fiscal policy analysis
European Commission Joint Research Centre, Seville
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TAXBEN

• Static microsimulation model of the UK tax and benefit system

• First built early 1980s, continuous development since
  – Now increasing investment in upgrades

• Current version written in Delphi (Object Pascal)

• Not open source, and poorly documented (for now)
Coverage

Tax and benefit systems since 1975
   - Plus, crucially, hypothetical alternatives

Includes:
   • Income tax
   • Employee and employer social security contributions
   • Council tax (local housing tax)
   • VAT
   • Most taxes on specific goods (fuel, alcohol, tobacco)
   • State pensions and all significant state benefits and tax credits

But not:
   • ‘Capital taxes’: capital gains tax, inheritance tax, stamp duties (property and share transaction taxes)
   • ‘Business taxes’: corporation tax, business rates (property tax)
   • Public services
Data

• Runs on several household survey datasets (with population weights)
  – Family Resources Survey (from 1994)
  – Living Costs and Food Survey (from 1978)
  – English Longitudinal Study of Ageing (from 2002)
  – (Labour Force Survey 2007)
• Hoping to add more soon
  – Wealth and Assets Survey
  – Understanding Society
• Also simulated datasets (e.g. simulated lifecycles)
• Not administrative data
  – Doesn’t contain crucial information (family circumstances, rent, etc.)
  – Sometimes use it separately
Static model

• Single period
• No behavioural responses or economic effects embedded in model
• But used extensively as input to behavioural modelling
  – e.g. TAXBEN-generated budget constraints used to estimate labour supply models and simulate labour supply under different tax and benefit systems
  – also consumer demand systems, etc.
• Allows us to use different behavioural models as appropriate
  – Best model to use won’t be the same in every case
  – TAXBEN calculator can be called by other programs
• Recent development: FORTAX
  – Slimmed-down tax and benefit model written in Fortran
  – Less functionality than TAXBEN, but faster
  – Useful for dynamic lifecycle models of behaviour (need millions of runs)
Main UK microsimulation models outside IFS

• Static tax and benefit models
  – IGOTM (HM Treasury) and PSM (Department for Work and Pensions)
  – EUROMOD (based at University of Essex)
  – One or two think tanks

• Dynamic models with a tax/benefit element
  – PENSIM2 (Department for Work and Pensions)
  – SAGE (LSE)
  – LINDA (developed by NIESR, occasionally used by HM Treasury)
The Institute for Fiscal Studies

- An independent not-for-profit microeconomic research institute

- Aim: ‘to promote the development of effective policy on taxation and government spending by providing high-quality impartial evidence and analysis to inform the public debate’
  - Bridge the gap between academia and policy discussion

- About 50 research staff, of whom about 6 main TAXBEN users
  - Plus network of academic Research Fellows etc.

- Funded by research grants

- Unique and important role in UK policy debate
How is TAXBEN used?

• Best known for estimating revenue and distributional effects

• Also analysis of work incentives...
  – Interesting in its own right

• ...which feeds into labour supply modelling
  – Estimating/simulating effects of policies on employment, hours of work, earnings

• Input to other behavioural modelling too
  – Benefit take-up, consumer demand, human capital investment, etc.
When is TAXBEN used?

Reactive:
- Day after Budgets etc.
- Election campaigns (government’s record, parties’ proposals)
- Ad hoc analysis of new announcements/proposals

Proactive:
- Annual IFS Green Budget (analysis of options for Budget)
- Academic / policy research projects
  - ‘The trade-off between work incentives and redistribution’
  - ‘A retrospective evaluation of the EU VAT system’
  - ‘The effect of working families’ tax credit on lone mothers’ labour supply’
  - The Mirrlees Review of taxation
Increasing the income tax personal allowance
Distributional impact of an increase from £10,000 to £12,500

![Chart showing change in net income by household net income decile group. The chart illustrates that the richest decile group (9) and the all decile group experience the largest increase in net income, while the poorest decile group (2) experience the smallest increase.](chart.png)
Impact of tax and benefit reforms between January 2010 and April 2019

Source: IFS post-Budget briefing, July 2015

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In cross-section, increase in out-of-work benefits is most progressive
Over the lifetime, increases in in-work and out-of-work benefits are similarly progressive.
Explanation: the poorest individuals spend most of working-age life in work.
Effect of tax and benefit reforms on income inequality

**Source:** Adam and Browne (2010)
Universal credit and relative poverty rates

Note: take-up assumptions important here
Source: J. Browne, A. Hood and R. Joyce (2013), *Child and working-age poverty in Northern Ireland from 2010 to 2020*
Effect of universal credit on work incentives

UC gets rid of many of the very weakest work incentives:
- reduces number of people with PTRs >75% by half (1.5m)
- reduces number of people with EMTRs >85% by more than 90% (0.5m)

Effect on average work incentives:

<table>
<thead>
<tr>
<th></th>
<th>Percentage point change in average:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RR</td>
</tr>
<tr>
<td>Single, no children</td>
<td>-0.9</td>
</tr>
<tr>
<td>Lone parent</td>
<td>+0.3</td>
</tr>
<tr>
<td>Partner not working, no children</td>
<td>-3.2</td>
</tr>
<tr>
<td>Partner not working, children</td>
<td>-5.7</td>
</tr>
<tr>
<td>Partner working, no children</td>
<td>+0.1</td>
</tr>
<tr>
<td>Partner working, children</td>
<td>+0.9</td>
</tr>
<tr>
<td>All</td>
<td>-0.7</td>
</tr>
</tbody>
</table>

Source: Adam and Browne (2013)
Effect of UC on average PTR, by earnings

Change in mean PTR (ppts) vs. Labour cost

-30 -25 -20 -15 -10 -5 0 5 10 15

£0 £10,000 £20,000 £30,000 £40,000 £50,000

-30 -25 -20 -15 -10 -5 0 5

Source: Adam and Browne (2013)
Distribution of VAT payments in the UK

Source: IFS et al, ‘A retrospective evaluation of the EU VAT system’
Distribution of VAT payments in the UK

Source: IFS et al, ‘A retrospective evaluation of the EU VAT system’
Revenue-neutral move to a uniform VAT rate
Effect on spending shares

<table>
<thead>
<tr>
<th>Good Category</th>
<th>Existing system</th>
<th>Revenue-neutral uniform VAT rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero-rated food</td>
<td>12.1%</td>
<td>13.1%</td>
</tr>
<tr>
<td>Standard-rated food, catering and alcohol</td>
<td>12.1%</td>
<td>10.9%</td>
</tr>
<tr>
<td>Leisure goods and services (inc. tobacco)</td>
<td>22.3%</td>
<td>22.4%</td>
</tr>
<tr>
<td>Domestic energy</td>
<td>5.7%</td>
<td>6.7%</td>
</tr>
<tr>
<td>Household goods and services</td>
<td>11.9%</td>
<td>12.7%</td>
</tr>
<tr>
<td>Personal goods (inc. clothes) and services</td>
<td>14.5%</td>
<td>14.4%</td>
</tr>
<tr>
<td>Private transport</td>
<td>19.2%</td>
<td>18.4%</td>
</tr>
<tr>
<td>Other zero-rated goods</td>
<td>2.3%</td>
<td>1.4%</td>
</tr>
</tbody>
</table>

Source: IFS et al, ‘A retrospective evaluation of the EU VAT system’
Revenue-neutral move to a uniform VAT rate

Effect on welfare

Welfare gain/loss as % expenditure

Income Decile Group

Poorest 2 3 4 5 6 7 8 9 Richest Average

Source: IFS et al, ‘A retrospective evaluation of the EU VAT system’
Distributional impact of changes 2015-2019

Figure 1. Personal tax and benefit measures

Figure 2. ‘National Living Wage’

Source: Joyce (2015)
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