SimPaths: An open-source framework for life-course analysis – A WellCare study

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Overview of SimPaths

- A rich, dynamic microsimulation model of individual life course events, designed to jointly model health, demographic, and socioeconomic characteristics
  - Model generates panel data for a simulated population
- Evolving population cross-section projected forward through time
  - Requires account of migratory flows, mortality, and fertility
- Model is ideal for exploring the medium to long-term implications of policy counterfactuals
  - Implications of altered incentives associated with policy alternatives
- A family of models
  - Currently available: UK and Italy - In development: Poland, Hungary and Greece
Open-source

- Model source code can be downloaded and run “out of the box” from: https://github.com/centreformicrosimulation/SimPaths
- Built upon JAS-mine framework:
  - https://www.microsimulation.ac.uk/jas-mine/
  - Implemented in Java.
  - Embedded relational database tools (H2) with object-relational mapping, automatic output to CSV
  - Regression library implementing common econometric models (linear, multinomial logit and probit, bootstrapping)
  - Libraries for matching and alignment
  - Automatically created GUI, rich graphical library for plotting outcomes in real-time
Model structure

**Simulation of taxes and benefits**
Projected using database derived from static tax benefit calculator (UKMOD).

**Simulation of behaviour**
Reduced form estimated equations to project labour supply decisions

Random utility estimated preference relation to project labour supply decisions

Intertemporal expectations calibrated nested CES utility to project labour/leisure and consumption/savings decisions
WellCare – modelling formal childcare costs

- Formal childcare costs are simulated at the benefit unit level using a double hurdle model
  - Probit equation governs incidence
  - Log-linear equation governs value given incidence
- Both equations include the same set of benefit unit explanatory variables:
  - number and age of dependent children
  - relationship status of adults
  - employment status of adults
  - education level of adults
  - region and year
- Influence on decision making:
  - Anticipatory effects
  - Impact effects
  - Persistent effects
WellCare – modelling receipt of social care

- Probit equations govern incidence of needing and receiving social care
  - vary by gender, education, relationship status, whether care was needed in the preceding year, self-reported health, and age

- Multinomial logit equation used to determine if an individual receives:
  - only informal care;
  - formal and informal care; or
  - only formal care.

- For individuals projected to receive informal care, a multi-level model is used to distinguish between alternative care providers, including partners, sons, daughters, and “others”

- Log-linear equations used to project number of hours of care received from each carer.
  - Hours of formal care converted into a cost, based on assumed year-specific mean hourly wages for social care workers

- Influence on decision making
  - labour/leisure decisions
  - consumption/savings decisions
Modelling provision of social care

- Model distinguishes between four alternatives of informal social care provision:
  1. no provision;
  2. provision only to a partner;
  3. provision to a partner and someone else; and
  4. provision but only to non-partners

- Probit equations distinguish between (ii) and (iii) for those with partners identified as receiving care from their partner; and between (i) and (iv) otherwise

- A log linear equation is then used to project number of hours of care provided, given the classification of who care is provided to

- Influence on decision making
  - labour/leisure decisions
References

- Model description and validation of UK parameterisation

- Tax-benefit calculations

- Open-access Github repositories
  - https://github.com/centreformicrosimulation/SimPaths
  - https://github.com/jasmineRepo/JAS-mine-core
  - https://github.com/jasmineRepo/JAS-mine-gui