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

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9th World Congress of the International Microsimulation Association (IMA2024) – Vienna 8-10 Jan 2024

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

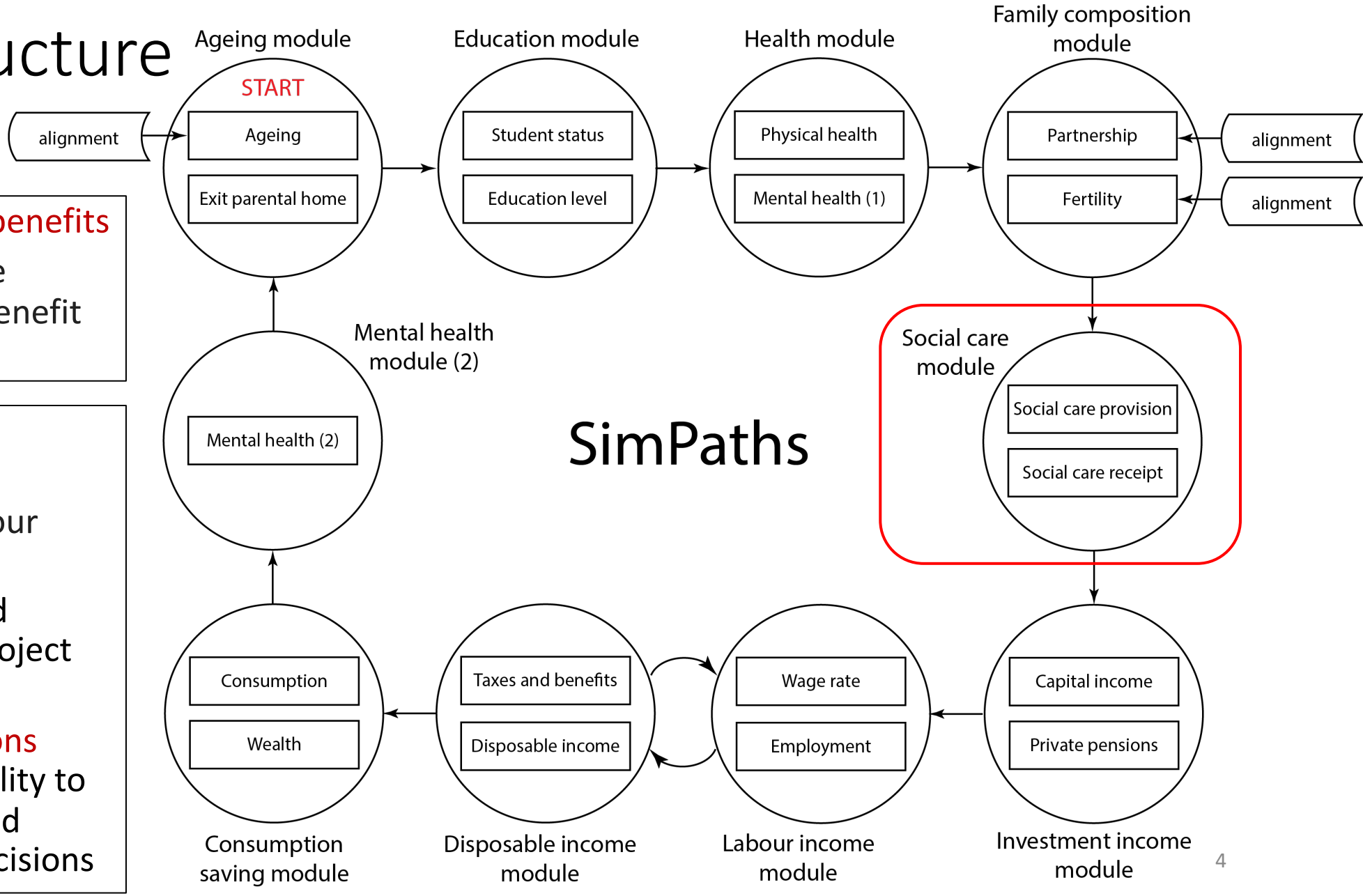
Projected using database derived from static tax benefit calculator (UKMOD).

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

WellCare – modelling provision of social care

- Model distinguishes between four alternatives of informal social care provision:
  i. no provision;
  ii. provision only to a partner;
  iii. provision to a partner and someone else; and
  iv. 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
  - Bronka, P., van de Ven, J., Kopasker, D., Katikireddi, S.V., Richiardi, M. (2023), "**SimPaths: an open-source microsimulation model for life course analysis**", CeMPA Working Paper 6/23
- Tax-benefit calculations
  - van de Ven, J., Bronka, P., Richiardi, M. (2022), "**Dynamic simulation of taxes and welfare benefits by database imputation**", CeMPA Working Paper 3/22
- Open-access Github repositories
  - https://github.com/centreformicrosimulation/SimPaths
  - https://github.com/jasmineRepo/JAS-mine-core
  - https://github.com/jasmineRepo/JAS-mine-gui