Focus on the I: Migration modelling in the SCID project

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Overview

• Description of the SCID project

• Tackling migration modelling in SCID: Implementation, needs and challenges
  – Current: voter model
  – Future: employment model

• Concluding remarks
Who is SCID?

Social Science Group (SSG) provides knowledge (theories & empirical data) about a specific social issue

Modellers attempt to integrate the information provided by SSG by building complex simulations

Outcomes from simulations are analysed and simplified by theoretical physics group
What is SCID?

• Social Complexity of Immigration and Diversity
  – Using agent-based simulations (ABSs) to integrate the various processes at play in immigration- and diversity-related issues, enabling us to explore
    • “What ifs” and “Hows”
    • Potential longer term consequences

• Develop “chains” of explicitly related models at different levels of abstraction, bridging the gap from evidence up to theory in a series of smaller, less ambitious jumps...
  – Attempt to obtain relevance and rigour
What does SCID do?

- SNA Model
- Analytic Model
- Abstract Simulation Model 1
- Abstract Simulation Model 2
- Data-Integration Simulation Model (DIM)
- Micro-Evidence
- Macro-Data

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What is a DIM?

• A simulation that integrates as much as possible of the relevant available evidence, both qualitative and statistical, regardless of how complex this makes it

• A description of a specified kind of situation (not a general theory) that represents the evidence in a single, consistent and dynamic simulation

• This simulation is then a fixed and formal target for later analysis and abstraction

• A relatively tight interactive “loop” between the social scientists who are experts in the subject matter and data and the simulation developers...

• ...trying to give as much ownership and control to social scientists as possible.
Main themes of SCID

1. Diversity, homophily, and trust
   – What factors underlie and influence perceptions and feelings of ‘us’ and ‘them’?
   – How does this affect
     • The construction and operation of social networks?
     • Norms of trust and reciprocity?
   – Key outcomes: Attitudes; Trust

2. Socio-political integration
   – How do diversity and immigration influence the behaviour of (a) individuals? (b) political parties?
   – What is the role of multiple, overlapping social networks?
   – Key outcomes: Electoral turnout Party / issue choice

3. Socio-economic integration
   – How do processes resulting from immigration and diversity affect socio-economic positioning?
     • Of immigrants/ethnic minorities?
     • Of the majority?
   – What is the role of multiple, overlapping social networks?
   – Key outcomes: Employment; Education
Importance of migration modelling in SCID

• Migration is an omnipresent feature of the project
  – Impact of internal and international migration on the outcomes under study by the project
  – Modelling population movement in and out of the ‘system’
  – Characteristics of agents (and their behaviour)
  – Importance of geographical location shaping some of the outcomes under investigation
Implementation, needs and challenges

TACKLING MIGRATION MODELLING IN SCID
Current: Voter model

Underlying Data from Surveys about Population Composition, etc.

Demographics of people in households

Social networks and membership in organisations, etc. Focus on homophily effects on network formation.

How individuals within different networks influence each other, reinforcing and/or changing existing norms/opinions. Focus on political discussion networks.

Behaviours of individuals, which can then be extracted from the simulation as model results and compared with evidence etc.
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International/internal migration in the voter model

- International immigration/emigration
  - Agents from abroad enter (and leave) the model at every tick
    - This is probabilistic
  - Inflow information (validation) taken from calculations from some BHPS information
    - Backward: Year of arrival of immigrant sample in BHPS 1992
    - Forward: Year of arrival from current data sources + changes in BHPS sample size
  - Also using information derived from the Census for flow information
    - CCSR work on inflow and outflow of ethnic minority groups (2000/2001)
    - Household international in-migration information from 1991 household SAR at national level

- Issues: how to project BHPS data forwards/backwards to simulate known waves of internal migration, taking into account ethnicity and households
International/internal migration in the voter model

• UK-based moving in/out of region
  – Also have ‘native’ agents coming into/out of the model
    • Entry/exit of ‘native’ agents is probabilistic
  – Inflow information (validation) taken from household local in-migration information from 1991 household SAR at national level
    • Also 2001 (on hold)
  – Issues: how to validate the local inflow (and outflow) of agents with official statistics for refined time period, especially if focusing on ethnic minorities and specific areas
Geography in the voter model

• Clustering and moving of agents on the grid
  – Pseudo geography in the sense of some neighbourhood clustering
    • Not current focus
  – Agents settling and moving according to specified homophily preferences (first use random allocation)
    • Ethnicity, education, class, etc., as factors (currently refining)
    • Major source of clustering in model
• Issues: find data that allows to give realistic representation of within-system movement within small locales
  – Focus on minority groups
Next: The Employment Model

- Focussing on occupational attainment
  - Who gets which (type of) job?
  - Who is looking for which (type of) job?

- Modelling an abstract labour market with
  - Potential employees (agents)
    - Age, gender, ethnicity, education, skills, experience...
  - Employers/firms (agents)
    - Ethnicity, possible biases
  - Jobs
    - Education/skills/experience levels
Migration in the Employment Model

- **Immigration**
  - Entering the modelled system
    - From outside the UK: Data from BHPS and IPS
    - From inside the UK: Data from BHPS and UK Census

- **Mobility**
  - Moving house inside the system
    - Internal agent decision, rules based on empirical data (UK Census)

- **Emigration**
  - Leaving the system
    - To somewhere else inside the UK: Data from UK Census; LFS/APS
    - To somewhere outside the UK: Data from ONS TIM; IPS
Geography in the Employment Model

• Space influences:
  – Social networks of agents (neighbours)
  – Opportunities to learn of job offers (local advertisements, local job centre)
  – Decision to apply for a job (ability to commute, ability to move house)
  – Decision where to move to (similar/better neighbourhood)
  – Possibly decision whom to employ (avoid applicants from "bad" neighbourhoods)
Geography in the Employment Model

• Options to model space
  – Abstract
    • Grid: square cells, hexagonal cells...
    • Irregular tesselations: Voronoi diagram...
    • Question of scale: What does a cell comprise?
  – Based on real data
    • Street level, postcodes, wards...
    • Data sources??
Planned approach for the Employment Model

• Start with a more abstract model
  – Selection of job types, skills, education levels
  – Abstract space (grid)
  – But: Demographics close to reality (BHPS, ...)

• Run different scenarios
  – Sensitivity analysis

• Iteratively improve and extend abstract model
  – More (sophisticated) rules for agent behaviour
  – "Real" space?
Concluding remarks

• Migration in SCID models
  – Both, international immigration/emigration and regional moving in/out of the system driven by empirical data (BHPS, ...)
    • New agents do not bring social ties with them (i.e. no extended families/friends taken into account)
    • Leaving agents also leave their social networks
  – Internal moving due to agent decisions (rules based on empirical data)
    • Agents keep (part of) their social networks and add new links

• Geography in SCID models
  – Currently: abstract (grids)
  – Does choice of space representation influence the outcome?
Concluding remarks

• Main arising issue: how to “join” different data, e.g. longitudinal component of BHPS, with attitude change, fertility change, etc. for different groups

• How to link migration with attitudes, demographics
  – Issue of data reliability and ease of validation

• Possible data to examine: NHSCR /PRDS ‘Flag 4’ data, and NINo regs.
  – Suggestions?
We are looking forward to your comments and suggestions.
Any questions? Email us: scid@manchester.ac.uk
Or visit us at www.scid-project.org

THANK YOU!