The Bartlett School of Construction and Project Management

The Use of Agent-Based Modelling in Modelling Migration

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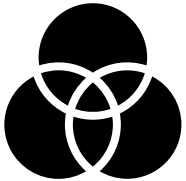
Background

- To understand migration and policy implications

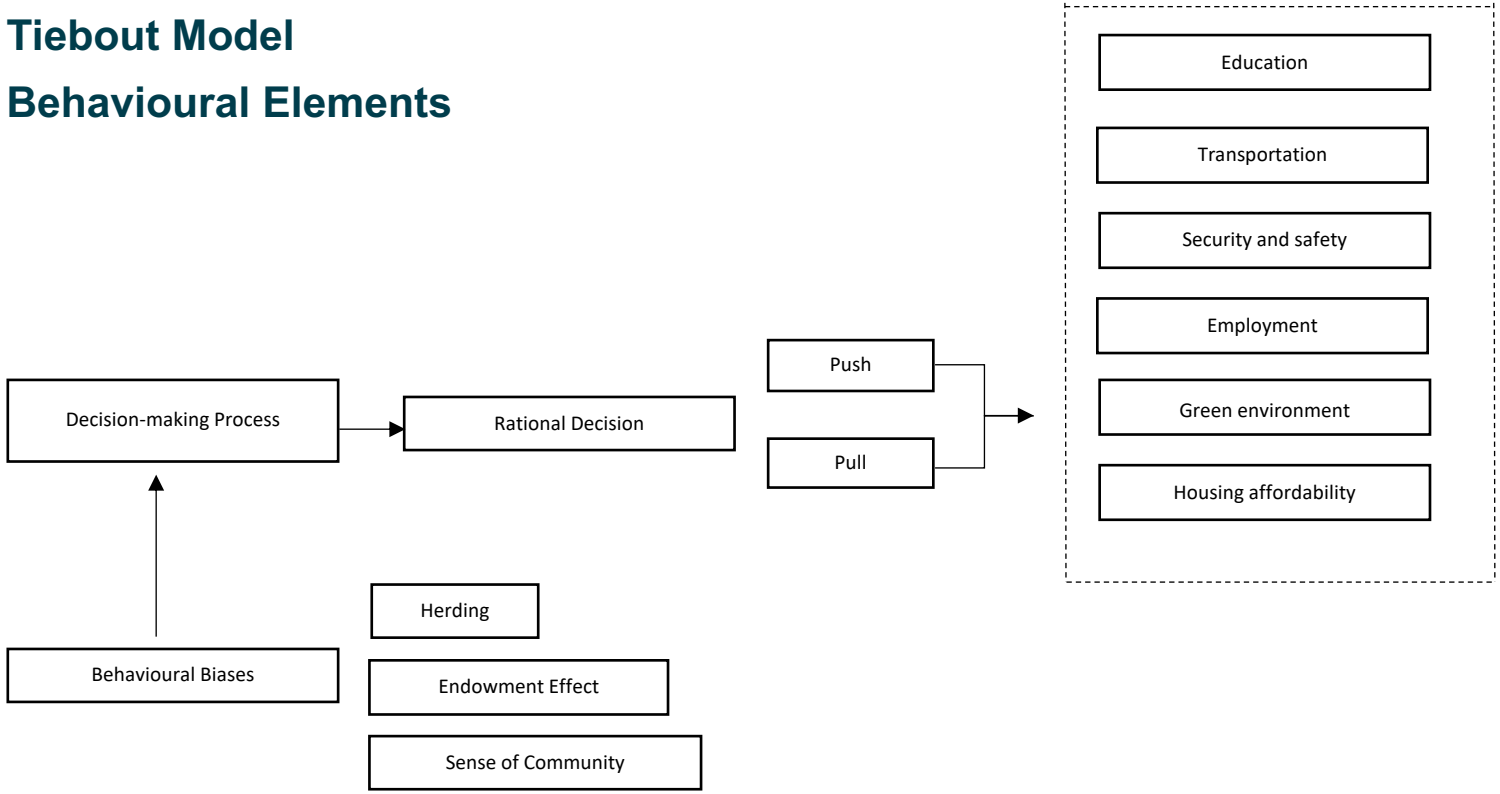
- To incorporate big data and economic theories

- To adopt a multi-disciplinary approach



Theoretical Framework

- **Tiebout Model**
- **Behavioural Elements**



Methodology – General ABM

In general, an agent-based model includes (Heppenstall et al., 2011):

1) A number of **agents**, who operate within the same or different pre-set behavioural rules;
2) The **behavioural rules** derived from literature studies and relevant theories, where the rules can be rational, heuristic or randomised;
3) The **learning and adaptation** of agents towards the environment
4) An **interactive relation** between agents
5) A **non-agent environment** which include the initial settings and /or the background process

Heppenstall, A.J., Crooks, A.T., See, L.M. and Batty, M. eds., 2011. *Agent-based models of geographical systems*. Springer Science & Business Media.

Methodology – General ABM

The rating of a given borough *k* for an agent *i* is:

$$R_i^k = \alpha_i U_i^k + \beta_i I_i^k$$

Expected utility based on independent assessment

Social information

Methodology – Data Collection

- **Agent characteristics:** Income, education qualification, ethnicity, religious belief

- **Environment/Neighbourhood characteristics:** Transportation accessibility, environment score, crime rate, housing affordability, job density, education quality

Results

2012

Legend

Equal ranges	Low (>=)	(<) High
1	0.0	1.0
2	1.0	26.0
3	26.0	51.0
4	51.0	101.0
5	101.0	201.0

Results

2013

Legend

Equal ranges	Low (>=)	(<) High
1	0.0	1.0
2	1.0	26.0
3	26.0	51.0
4	51.0	101.0
5	101.0	201.0

Results

2014

Legend

Equal ranges	Low (>=)	(<) High
1	0.0	1.0
2	1.0	26.0
3	26.0	51.0
4	51.0	101.0
5	101.0	201.0

Results

2015

Legend

Equal ranges	Low (>=)	(<) High
1	0.0	1.0
2	1.0	26.0
3	26.0	51.0
4	51.0	101.0
5	101.0	201.0

Results

2016

Legend

Equal ranges	Low (>=)	(<) High
1	0.0	1.0
2	1.0	26.0
3	26.0	51.0
4	51.0	101.0
5	101.0	201.0

Results

2017

Legend

Equal ranges	Low (>=)	(<) High
1	0.0	1.0
2	1.0	26.0
3	26.0	51.0
4	51.0	101.0
5	101.0	201.0

Challenges

1. **Data.** Incorporation of empirical data in the modelling process can be premature
2. **Validation.** Inconsistency between the intended model and the programmed model
3. **Assumptions.** Heavily dependent on assumptions and potential issues of over-fitting