

Towards A Dynamic Longitudinal Model of Longer-term Mobility Decisions: Framework and First Empirical Tests



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Background

Background

Model for Long-term decisions is Discrete-choice model based on utility maximisation theory (Salvini and Miller, 2005; Waddell et al., 2003)

But

- decisions regarding car ownership and residential location (Pinjari, et al, 2007) and work and residential location (Waddell et al, 2006) are interdependent.
- longer-term mobility decisions are path dependent.

Current Dynamic Researches

- **Hazard models** to examine the impact of duration on the occurrence of events (e.g., Feijten and Mulder, 2002; Beige and Axhausen, 2006).
- Waerden, Borgers and Timmermans (2003a, 2003b) argued that activity-travel repertoires evolve into a state of disequilibrium due to **critical incidents** and **key lifecycle events** and therefore requirement for studying the dynamics.
- Verhoeven et al. (2005, 2006) suggested to represent the **interdependencies**.
- Habib et al. (2006) suggested the concept of **stress**.
- Han et al. (2007, 2008) used **aspiration level, influenced by the social network**.

A major shortcoming

- Independent and static. (Ettema and Timmermans, 2006; Ettema et al., 2007).
- Cross-sectional approach. (e.g., Bina and Kockelman, 2006; Waddell et al., 2006; Pinjari et al., 2007).

Object of this paper

To build a comprehensive framework that incorporates the dynamism and interdependency

To demonstrate how the framework can be applied in the context of predictive modelling.

Conceptual Framework

We account for the effect that decisions taken on different points in time may be related to each other in that one decision defines the options for a later decision or either anticipates some future decision (e.g. Cao and Mokhtarian, 2005). Figure 1

One important element of this framework is that discrepancies between the household's aspirations and actual situation (stressors) can be dealt with by different strategies. Figure 2

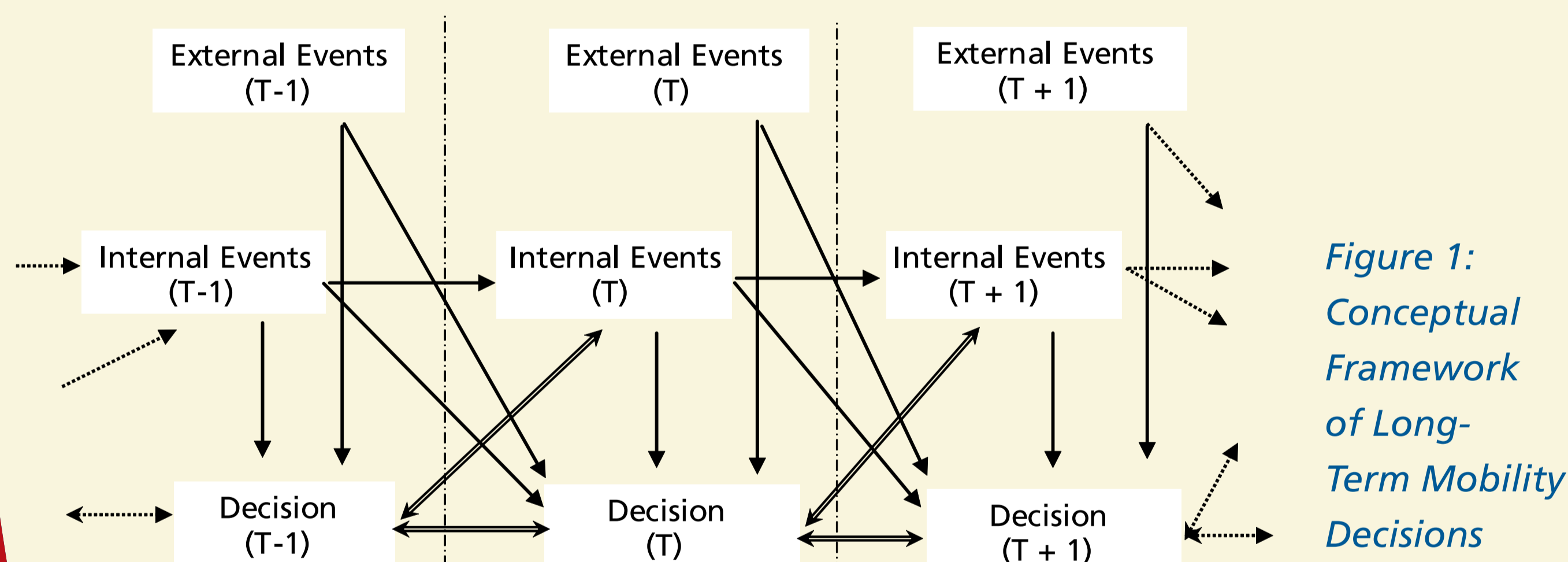


Figure 1: Conceptual Framework of Long-Term Mobility Decisions

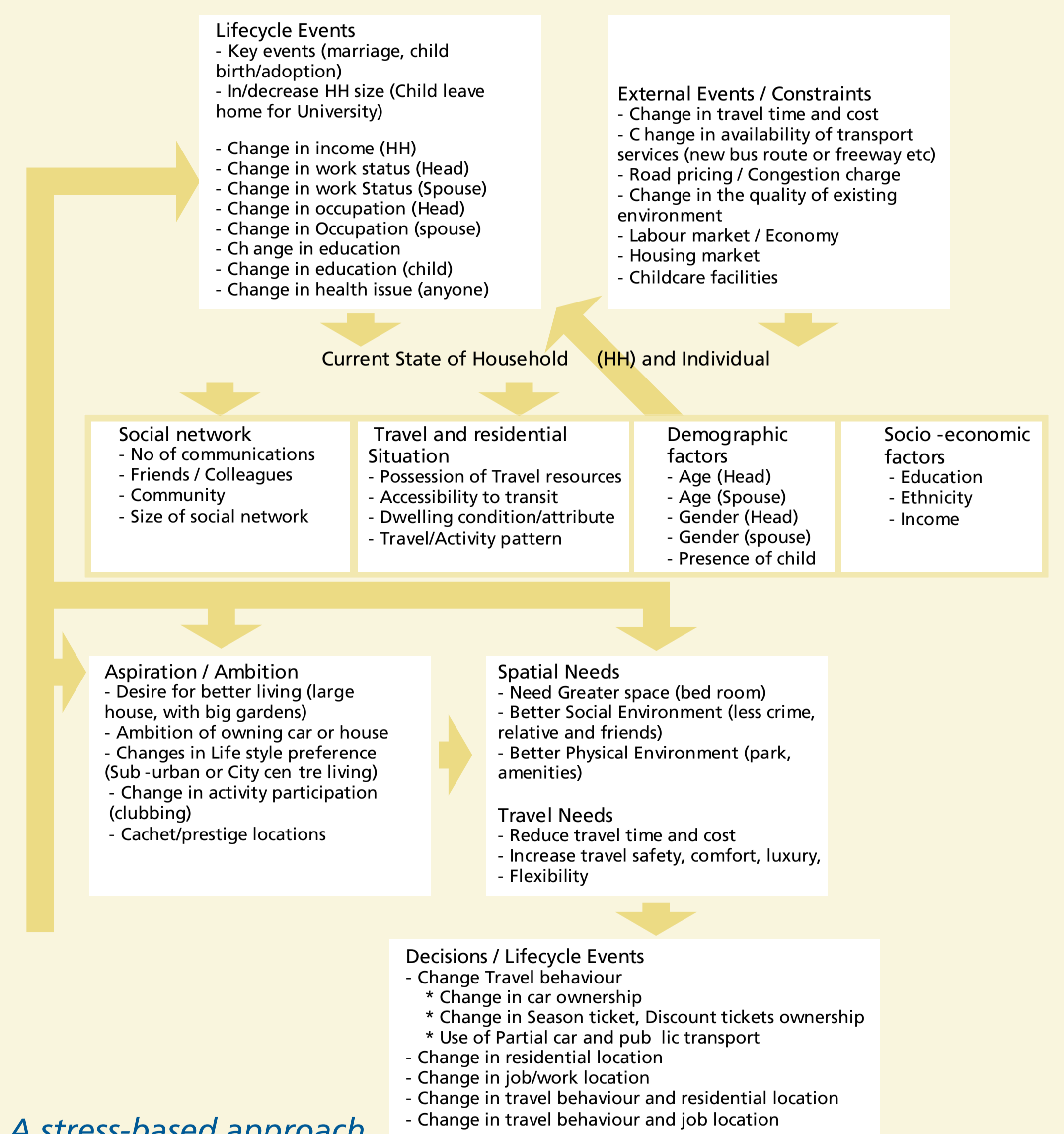


Figure 2: A stress-based approach

Implementation

Methodology

a) test empirically whether the assumed relationships are supported by observed longitudinal longer-term decisions

Bayesian Belief Network

- Flexible in determining relationships (between dimensions and over time) and not define relevant relationships a priori.
- able to deal with concepts, such as in our model 'stress'.

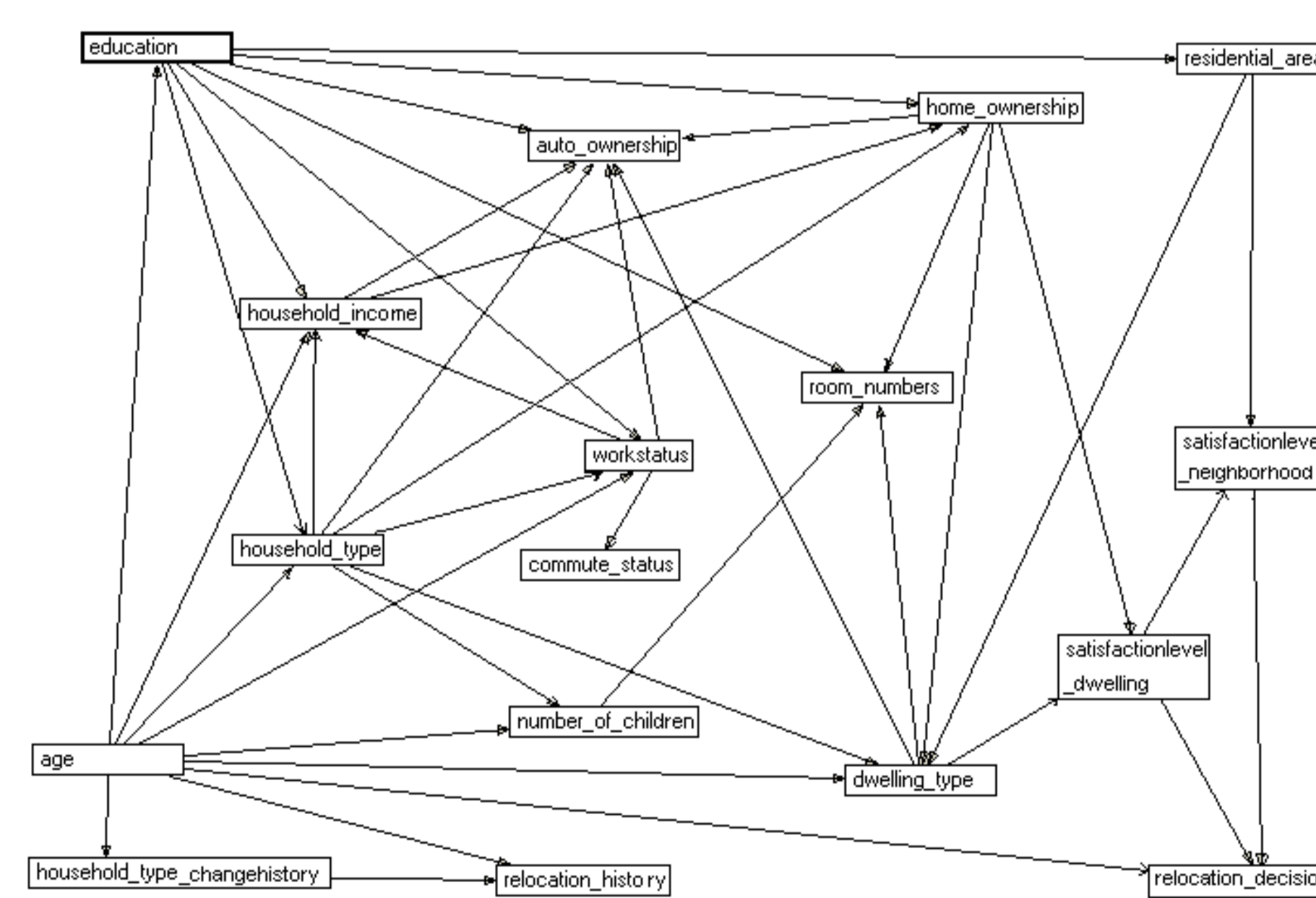
Data description

As a new approach, it required many factors to be observed which are absent in presently available datasets.

Still the WBO provides an attractive test case. It includes *Network learning with causal-relationship between events, current state and decision.*

- information of many interrelated longer-term mobility dimensions of different points in time
- information about satisfaction

Of the households in the remaining dataset (usable subsample of 40,133 households.) about 17% changed residential location in the past two years and about 18% of the households intend to move within the next two years.



The way forward...

This study contributes to the state-of-the art by treating dynamics and interdependencies in an integrated way.

The current study admittedly only gives a limited impression of the dynamics in longer-term decision making.

Future work will focus on improving insights in this area in various ways.

- Most importantly, more appropriate data needs to be collected
- More rigorous conceptualization of aspiration and stress.