Preferences interact: what consequences for a Schelling scenario?

Title to define

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Abstract

Introduction

- Schelling's model and previous work. Interaction of preferences. Schelling's model Literature update Verweij and Thompson (2006) Paolillo and Lorenz (2018) Diverse dimensions can define individuals and their similarity. Results from Paolillo and Lorenz (2018) Hedström, Bearman, and Bearman (2009), chapter 11, 12
- Why an additional characteristic than ethnicity, literature in residential studies. How it correlates with income/social mobility Esser (2010), transmission of capital south2016neighborhood on life course economic capital transmission
- Update: justification for random utility models, literature in ABM Better define the individual decision process Link with empirical data Klabunde and Willekens (2016) Bruch and Swait (2019)
- Costs
- Research question How would the interaction between β for different dimensions affect Schelling's scenarios? How the effect would change when income is included? And correlation between income and socio-demographic characteristics (value) included?

1 Model and Experiments

The model[1] was built in NetLogo 6.1.0 and extends work by Paolillo and Lorenz (2018). Agents interact on a regular grid 51 times 51 with periodic boundary conditions (torus world). Each node of the grid can host 1 agent or being empty. Agents represents individuals who relocate and are defined by two static and overlapping variables: ethnicity and value orientation. Ethnicity is modeled through color tag. Agents with blue color represent the local population, agents with orange color represent the minority group. Value orientation through shape tag.

We define value orientation as the common membership of agents sharing same beliefs, preferences etc. potentially subject to change and independent of their attributed ethnicity. As such value orientation relates to value homophily compared to ethncity related to ascribed status homophily. Each agent hold a preference for the ethnic composition and the value composition of each neighborhood. Neighborhoods are defined as a Moore distance. At each step, an agent randomly selected compares its current location to a number of alternative ones, calculates utility for each and decides which location they prefer.

- Calculation utility and probability function

To explore what levels of β should not be excluded, I made a specific model "rum_eth.nlogo" (in material), with an uniform β_{ie} for ethnic composition. I run the simulation for 1000 ticks (not 1 tick 1 agent, as in NetLogo asynchronous behavior: all agents run the procedure and then repeat): * monotonic linear function: desired concentration ethnically similar 100% * density == 70% * equal distribution of value orientation in each ethnic group * changing $beta_i e$ at each run $beta_i e \in [0, 100]$

Collected ethnic segregation, here reported for different ticks (Fig: 1)

To test if the effect of β_{ie} for ethnic composition would be different if interacting with β_{iv}

what levels of β should not be excluded, I made a specific model "rum_eth-val.nlogo" (in material), with uniform β_{ie} for ethnic composition and β_{iv} for value composition. I run the simulation for 1000 ticks (not 1 agent 1 tick): * monotonic linear function: desired concentration ethnically similar 100% * density == 70% * equal distribution of value orientation in each ethnic group * changing $beta_i e$ at each run $beta_{ie} \in [0, 100]$ and $beta_{iv} \in [0, 100]$, with condition of $\beta_{ie} \geq \beta_{iv}$

Collected ethnic segregation, here reported at ticks = 1000, and faceted β_{ie} x β_{iv} (Fig: 2)

[1] The model can be found here:https://github.com/RoccoPaolillo/BIGSSS_ResearchDay.git

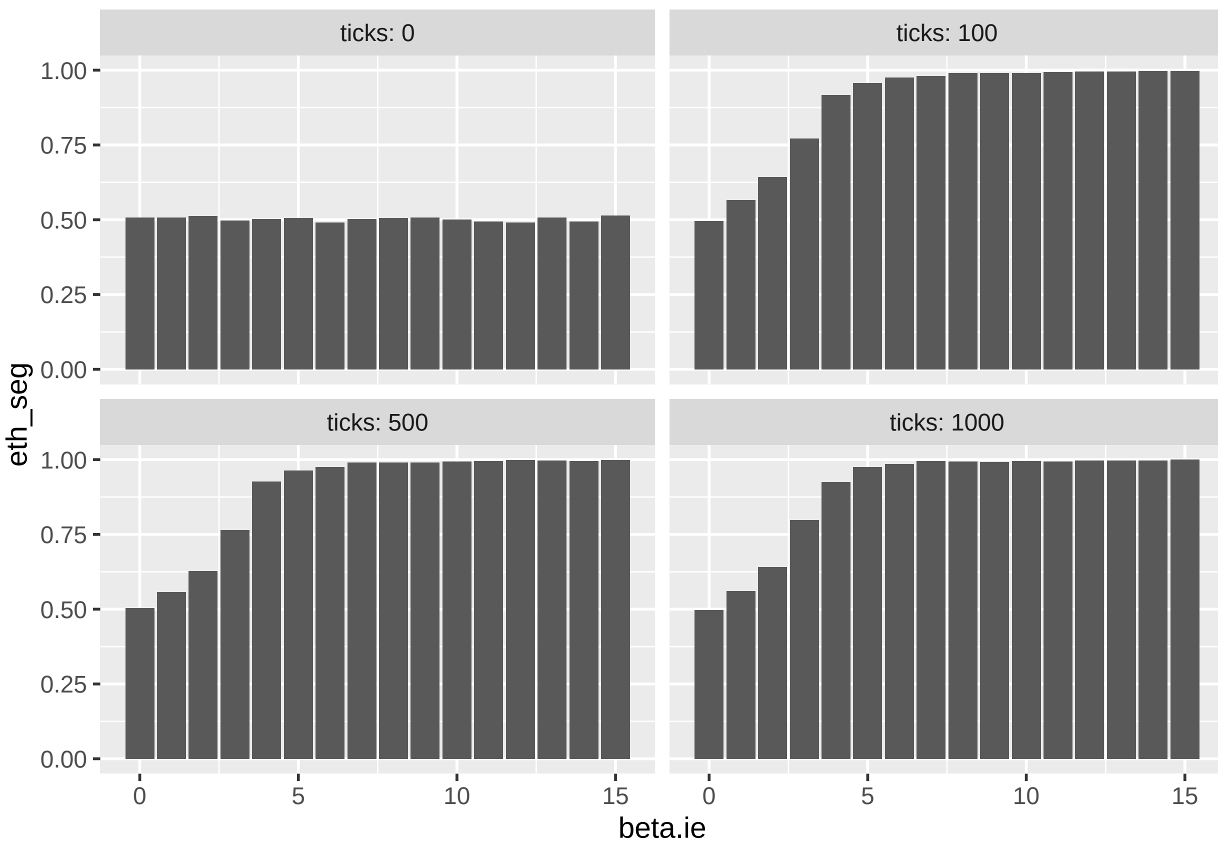

Figure 1: Comparison of ethnic segregation for one beta-ethnic, not interaction. Used one-beta.csv from simulation rum-eth.nlogo

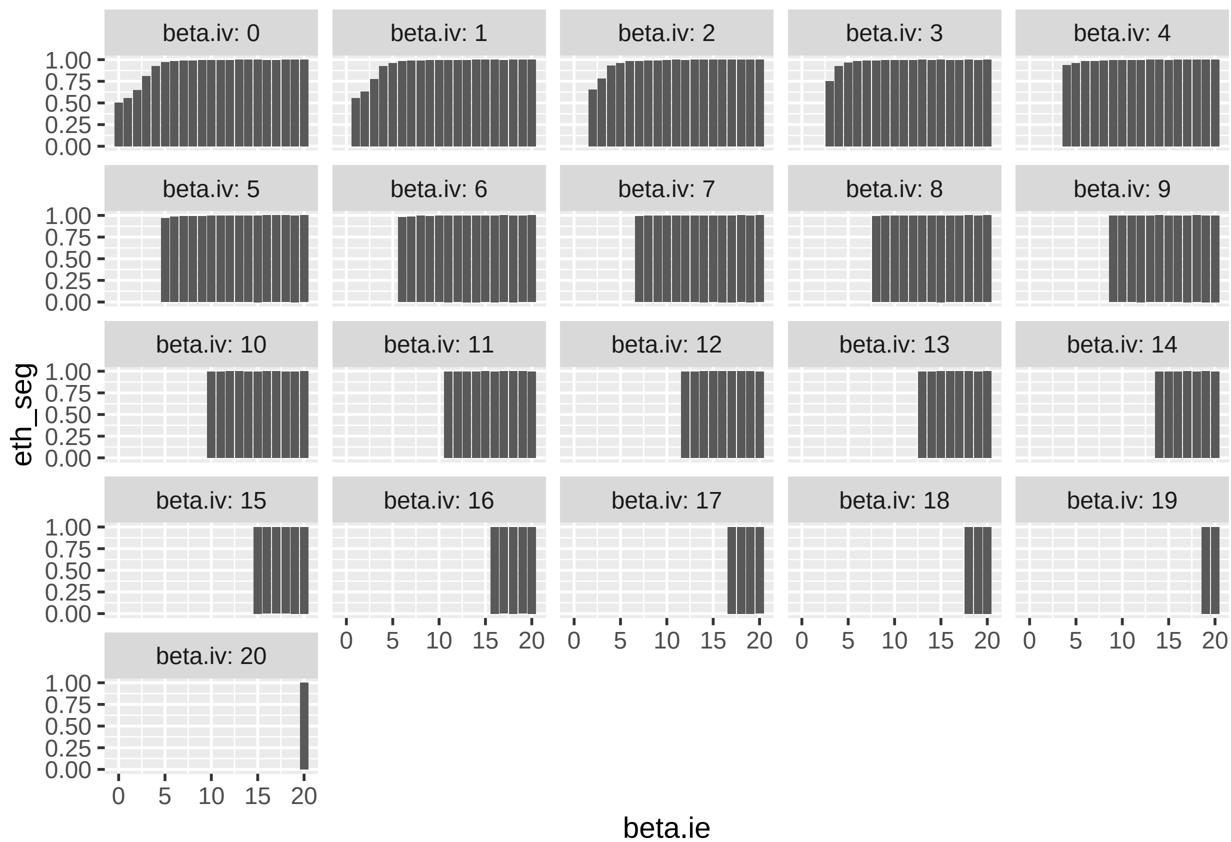

Figure 2: Comparison of ethnic segregation for interaction beta-ethnic and beta-value. Used diff_10.csv from simulation rum_eth-val.nlogo

2 APPENDIX, Functions used in the simulations

2.1 Derivate probability being tolerant/not tolerant from income

Already in the model, income follows beta distribution. Tolerance is one possible implementation, the main point is a cross-ethnic category that might depend on the income distribution (Fig: 3)

$$P = \frac{1}{(1 + \exp(-\lambda \times (i - 0.5)))}$$

where:
i: income
$i - 0.5$: considering income follows beta distribution $i \in [0, 1]$. The higher income is than 0.5, the higher the probability the agent is tolerant
λ: parameter of randomness on the derivation tolerance from income

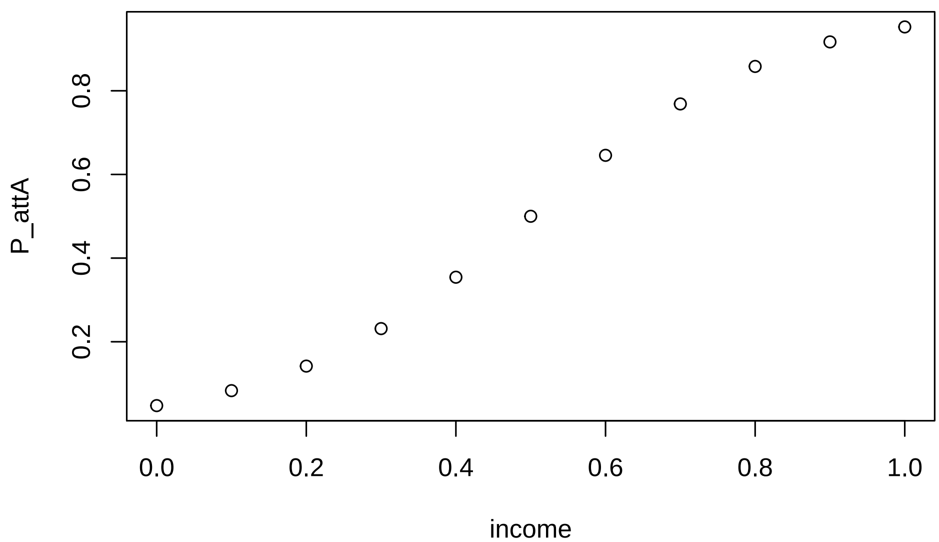

Figure 3: Probability of binary cross-category (tolerant/not tolerant) from the distribution of income

2.2 Economic Utility related to price

Utility for the agent to select the most advantageous option (Fig: 4). I figured it out so that income will have an indirect effect on costs of relocation. Role within the agent to rank the options (preferring the cheapest one), but also between agents: given the same price for a location, utility will be higher for agents who have higher income, since they can afford higher costs.

$$U_{ec} = \frac{i - p}{i}$$

where:
i: income
p: price of potential relocation

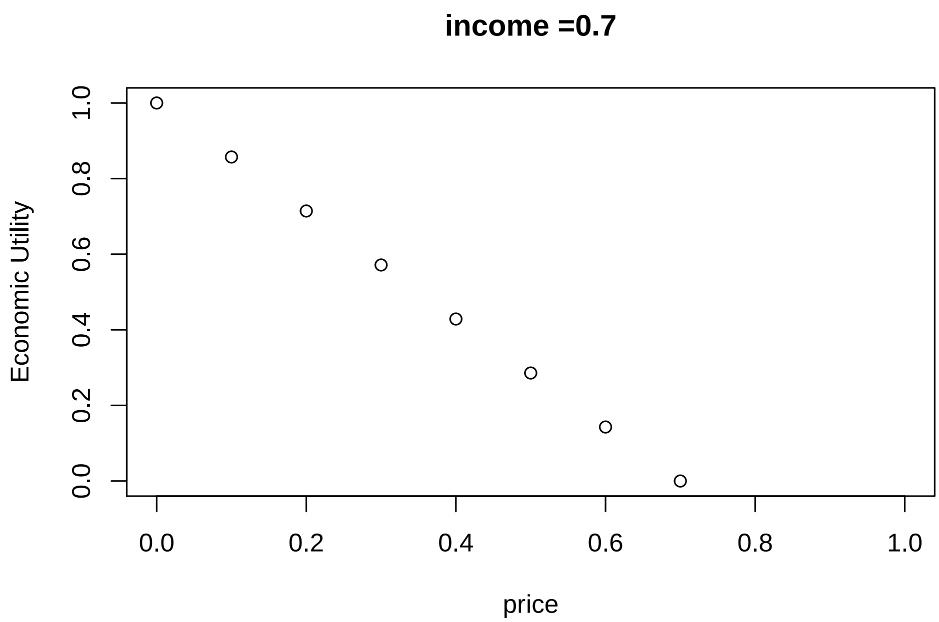

Figure 4: Cost formation

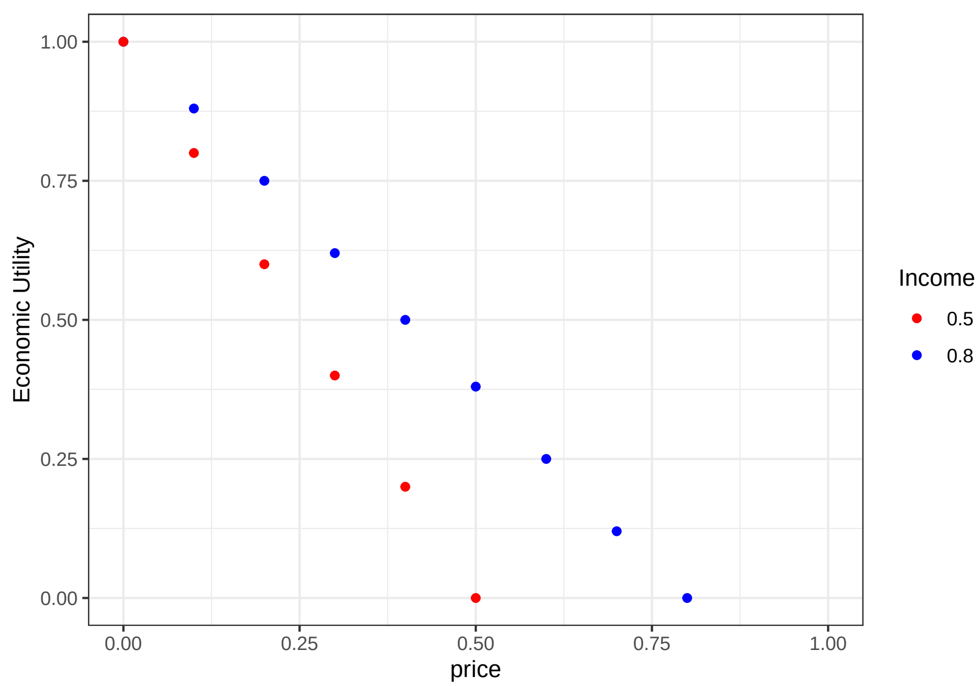

Figure 5: Cost formation

PRICE: num. neighbors/8 * mean(income) of neighbors

3 Results

References

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