The Matching-Hypothesis Re-Examined Once More: Does the Structure of the Partner Market Matter?

Model Description V1 – September 2021

This document describes the implementation of the simulation model presented in Grow (2021), following the ODD+D standard (Müller et al. 2013). The model has been implemented in NetLogo 6.1.1 (Wilensky 1999), but my description is intended to be independent of any specific modelling language. Auxiliary variables and procedures that were needed to implement the model in NetLogo are therefore not described here. I assume that readers are familiar with the theoretical and empirical principles that I describe in Grow (2021), and I refer readers to this exposition where appropriate.

1 Overview

1.1 Purpose

The model assesses social mechanisms that may be involved in generating empirically observed patterns of assortative mating in physical attractiveness in heterosexual unions. In particular, the model re-implements and extends the partner-search model proposed by Kalick and Hamilton (1986), to allow for differences in the attractiveness distributions in the populations of men and women. A detailed description is provided in Grow (2021).

1.2 Entities, state variables, and scales

Individuals are the focal entities and represent men and women who are looking for a partner. Each individual i can be described by the state variables sex (S_i, with the states male or female), attractiveness (A_i, which can take any decimal value in the range [1,10]), and their relationship status (R_i, with the states single or union). Next to this, there are links that represent relationships between agents. Links can either represent dates (in which case they are coloured grey) or unions (in which case they are coloured green). These links are auxiliary entities that facilitate implementing the model in NetLogo and they are therefore not considered further in this description.

There are seven run-time settable parameters: the numbers of male and female individuals (*number_agents_per_sex*, which can take any non-negative integer value) that are created at the beginning of a given simulation run; the preference that should be applied during partner search (*preferences*, with the states attractiveness, matching, and mixed); the parameter *input*, which determines whether agents' attractiveness values should be taken from a uniform distribution or sex-specific normal distributions; the parameters of the sex-specific normal distributions (*mean_A_men*/*sd_A_men* and *mean_A_women*/*sd_A_women*, which provide the means and standard deviations of the distributions for men and women, respectively);.

1.3 Processes overview and scheduling

After a given simulation runs has been initialized, the following submodels are run in the same order in each iteration; each submodel is explained in Sect. 3 below:

1. *do_match_singles*
2. *do_calculate_decision_probabilities*
3. *do_union_decisions*
4. *do_unmatch_singles*
5. *do_update_plot*

At the end of each iteration, the model checks whether all agents are married, or 50 iterations have been conducted. If either condition is met, the model stops running.

2 Design concepts

2.1 Theoretical and empirical principles

The theoretical and empirical principles are described in detail in Grow (2021).

2.2 Individual decision-making

In each iteration of the simulation process, men and women who are looking for a partner date a member of the opposite sex who is also looking for a partner. During each date, the agents need to decide whether they want to marry/form a union with the respective other.

2.3 Learning

Individuals learn about the physical attractiveness of potential partners during each date. However, they forget about these potential partners after each date. Also, they adjust their aspirations for a partner based on how long they have been looking for one without success.

2.4 Individual sensing

Individuals know about the physical attractiveness of the other agents they meet.

2.5 Individual prediction

Individuals do not predict.

2.6 Interaction

Interactions take place between opposite-sex members and concern the formation of dates that can lead to marriage/union formation.

2.7 Collectives

There are no collectives in the model.

2.8 Heterogeneity

Apart from generic variation in individuals' state variables, there are no differences between them.

2.9 Stochasticity

Three model aspects are subject to stochasticity. First, individuals are assigned their physical attractiveness probabilistically. Second, men and women who are looking for a partner are randomly paired for dates. Third, men and women who are dating may decide to marry. These latter decisions are discussed below.

2.10 Observation

The model tracks the attractiveness of the individuals in the unions that form and how large the correlation of their attractiveness is. Additionally, it tracks the share of single agents.

3 Details

3.1 Implementation details

The model code can be obtained from https://github.com/MPIDR/MatchingOnceMore.

3.2 Initialization

Upon initialization, men and women are created. In this process, all agents are assigned their sex (S_i) and physical attractiveness (A_i). Initially, all agents are single.

3.3 Input data

There are no input data.

3.4 Submodels

3.4.1 do_match_singles

All agents who are single are randomly matched with one opposite-sex member (who also is single) for a date.

3.4.2 do_calculate_decision_probabilities

Within each date, the two agents calculate the probability that they are willing to form a union with the respective other. The functions that underlie these calculations are described in Grow (2021). Note that the probabilities for all three preferences (attractiveness, matching, and mixed) are calculated; the relevant probability is then selected, given that value of the parameter *preferences*.

3.4.3 do_union_decisions

In each date, both agents independently draw a random number from a uniform distribution in the range [0,1) and compare this value with the probability calculated and chosen in the submodel *do_calculate_decision_probabilities*. If the randomly drawn number is smaller than the probability, the focal agent becomes willing to form a union with the respective other. If both are willing, they form a union, and their relationship statuses are set to union. After this, they are not available for dates anymore.

3.4.4 do_unmatch_singles

Dates that did not lead to marriage are broken up, so that their members are available for new dates.

3.4.5 do_update_plot

The plots that show the outcome measures in real time are update.

References

Grow, A., Van Bavel, J., De Coninck, D., Puschmann, P., & Van de Putte, B. (2021). The Matching-Hypothesis Re-Examined Once More: Does the Structure of the Partner Market Matter? In *Neurotic Doubt and Sacred Curiosity: Essays in Honour of Koen Matthijs* (pp. 273–286). Leuven: Centre for Sociological Research, Faculty of Social Sciences, KU Leuven.

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Müller, B., Bohn, F., Dreßler, G., Groeneveld, J., Klassert, C., Martin, R., et al. (2013). Describing human decisions in agent-based models - ODD + D, an extension of the ODD protocol. *Environmental Modelling & Software*, *48*, 37–48.

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