Integrationist and Segregationist Preferences for Ethnic and Value Neighborhood Composition

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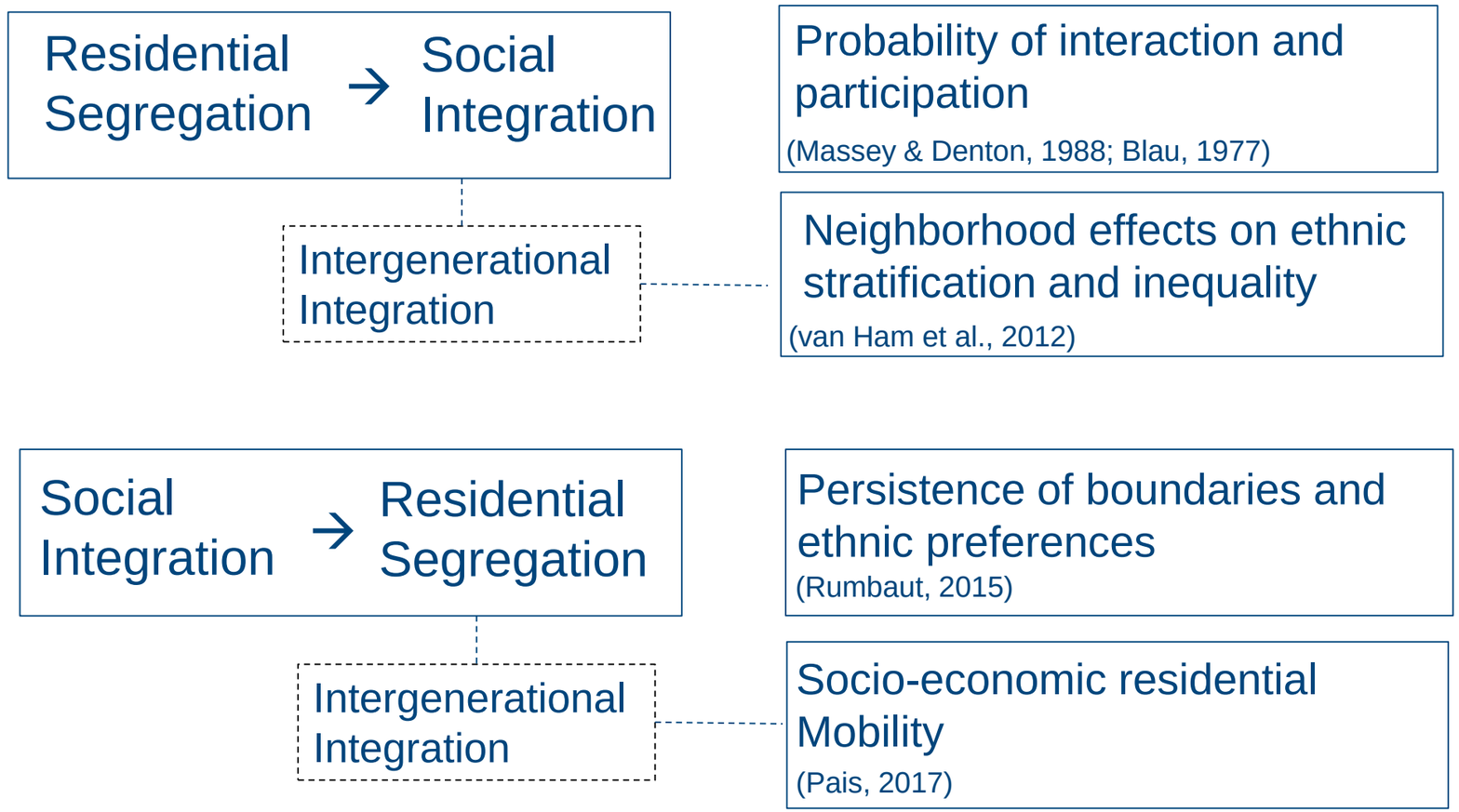
Outline

- **Introduction: topic and project**
- **Previous steps**
- **Current steps**
- **Some Results**
- **Conclusions and Discussion**

Residential Segregation and Integration

Spatial and unequal distribution of people of different groups in a city (Clark, 2015)

- Abundant knowledge from qualitative and quantitative studies
- Still unclear the exact conditions and processes on **how** residential segregation and intergenerational integration are related
  (van Ham et al., 2012)



A Complex Phenomenon

How does residential segregation contribute to the *different* outcomes of immigrant integration?

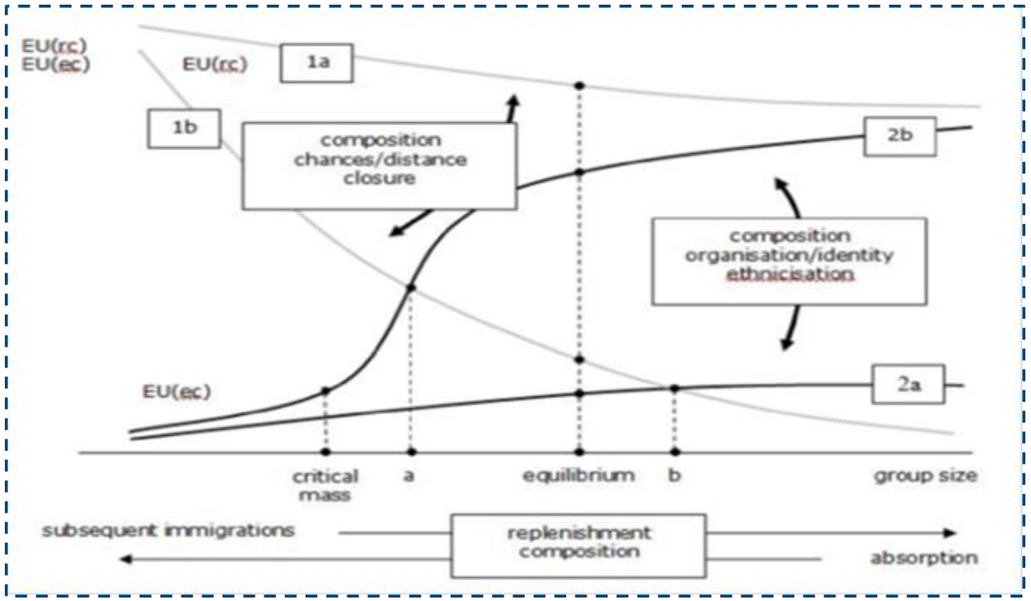
- The whole is more than the sum of its parts → **Complexity perspective**

Complex Phenomenon		**Intergenerational Integration**
results from interaction of social actors	→	locals and ethnic minorities involved
not reducible to single actors	→	contextual and individual dimensions
Inter-dependence (bounded confidence) between stages of the phenomenon	→	Nonlinearity, transmission of capital from one generation to others
Lack of central control	→	non-normative process

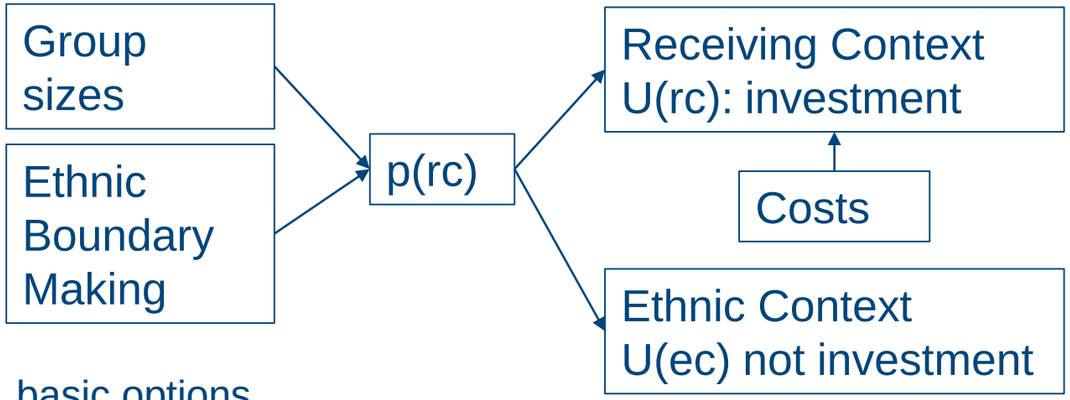
(Gilbert & Troitzsch, 2005; Edmonds & Meyer, 2015)

Esser's Intergenerational Immigrant Integration

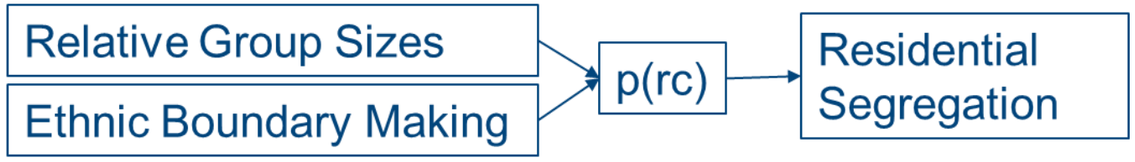
- *Summa* of **rational choice models** perspective on intergenerational migrant integration
- Compare integration to the investment between
  - ***ethnic context option***
  - ***receiving context option***
- Proposes a comprehensive model underlying outcomes of assimilation, ethnic stratification, selective acculturation
- Theoretical speculation, not empirical test



EU(ec) = U(ec) | EU(rc) = p(*rc*)(U(*rc*)-U(*ec*)) – C(*rc*) > 0



basic options



Basic options

Esser (2010)

Agent-based Models

Social sciences deal with phenomena which are **already emerged**
(Epstein & Axtell, 1996)

- Need to manipulate directly the **emergence** of social phenomena
- Address the **processes** and **interactions** of social actors
- Variable-based models (e.g. regression models) can measure emerged phenomena, not build up the **underlying processes**

Agent-based Models



- **Agents → virtual objects**:
- simulate social actors (e.g. households…)
- Are driven by intentions, attitudes and cognitions
- Adapt their behavior as effect of **interaction** with other agents and contextual conditions
- **Parameters → conditions of interaction**

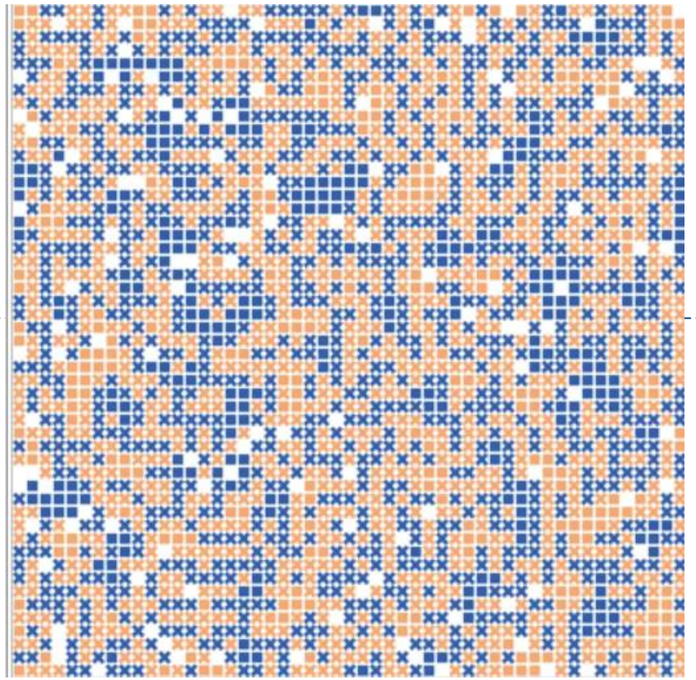
From factors to actors

(Gilbert & Troitzsch, 2005; Edmonds & Meyer, 2015)

Schelling's Model

Density of population

Spatial Segregation

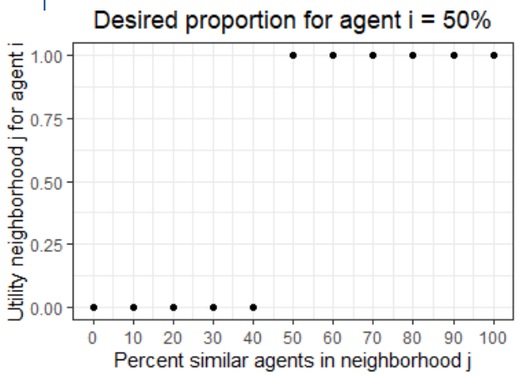


Macro

Micro

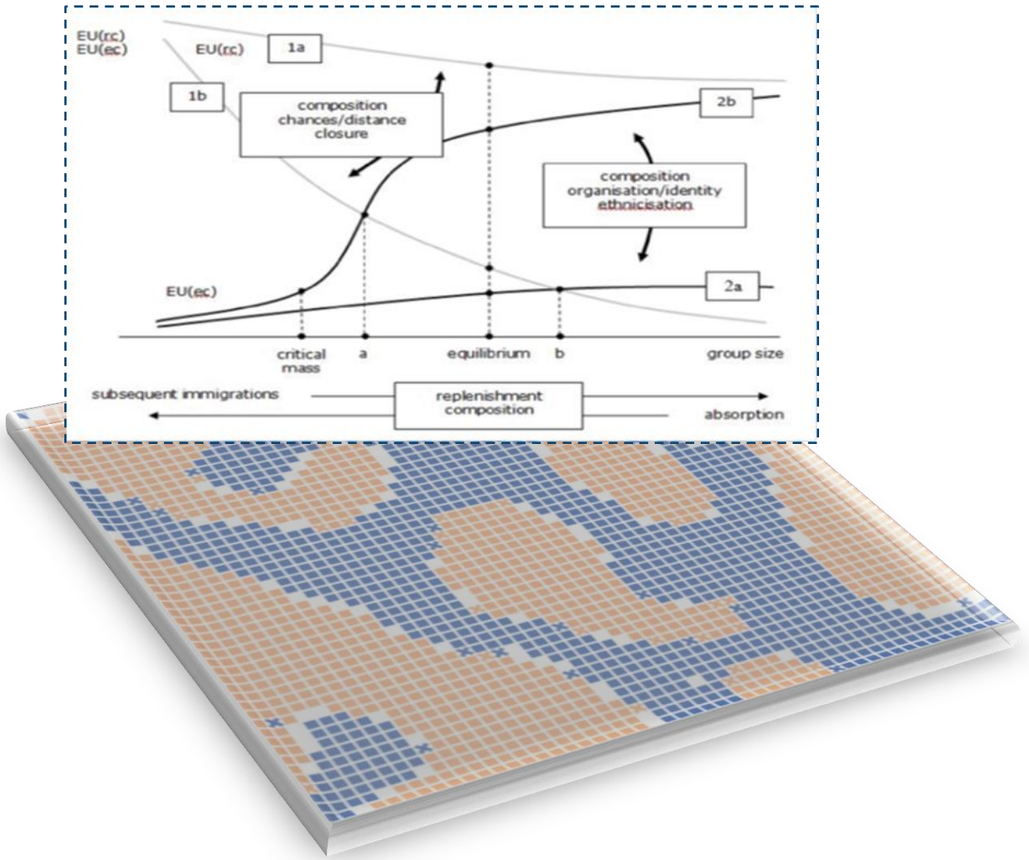
- similarity: twofold, exhaustive and recognizable distinction
  (Schelling 1969, 488; e.g. ethnicity)
- Threshold behavior

Random relocation



Adapted from Coleman (1994), idea André Grow

Schelling-Esser Model



Goal of the project

- Blend Esser's dynamic of intergenerational integration with Schelling's residential segregation dynamics
- Use of agent-based models to catch the emergence of intergenerational integration as Esser proposes contributing to its formalization

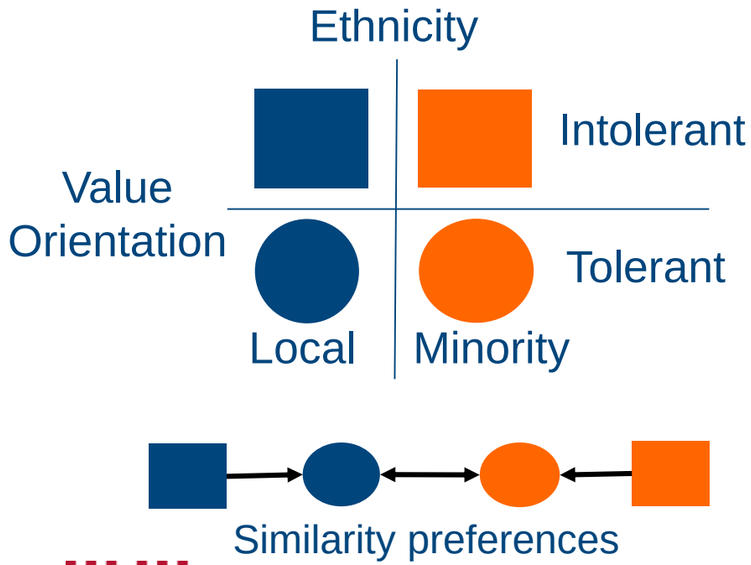
Relative Group Size
Ethnic Boundary Making
→ p(rc) →
Residential Segregation

Basic options

Previous Steps

Schelling (1969, 488)
- similarity: twofold, exhaustive and recognizable distinction

Schelling (1971)
- Lower interest for relative group sizes



Ethnic Boundary Making (Wimmer, 2007; 2013; Esser, 2010)
- Symbolic boundaries distinguishing “us” and “them”
- Constructivist, subjective and interactive definitions of similarity and inclusion

Structural conditions for interaction (Blau, 1977; Esser, 2010)

Value orientation of agents:
- opinions, attitudes internal to individuals subject to change (McPherson, 2001);
- benchmarks of expected behavior from ingroup (Wimmer, 2013);
- focus on **tolerance toward diversity**

Intolerant agents: **ethnic homophily** (color, Schelling)
Tolerant agents: **value homophily** (shape, extension)
- threshold behavior
- independent of the other dimension

Paolillo, R., & Lorenz, J. (2018). How different homophily preferences mitigate and spur ethnic and value segregation: Schelling's model extended. Advances in Complex Systems, 21(06n07), 26-42.

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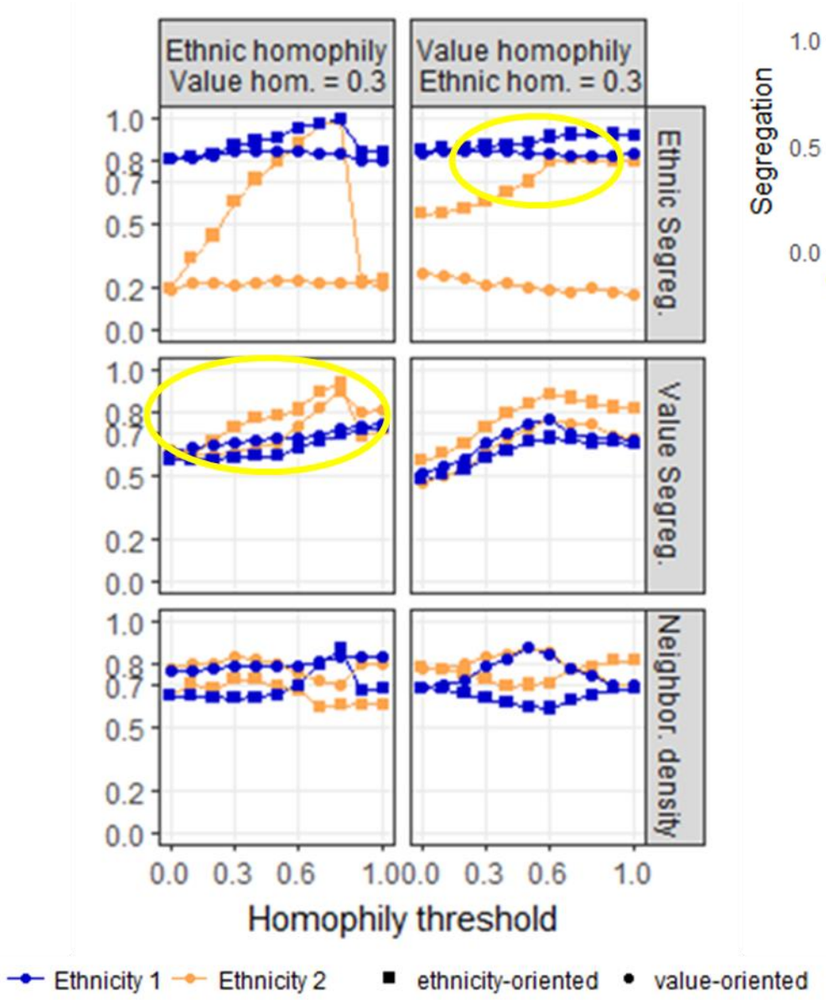
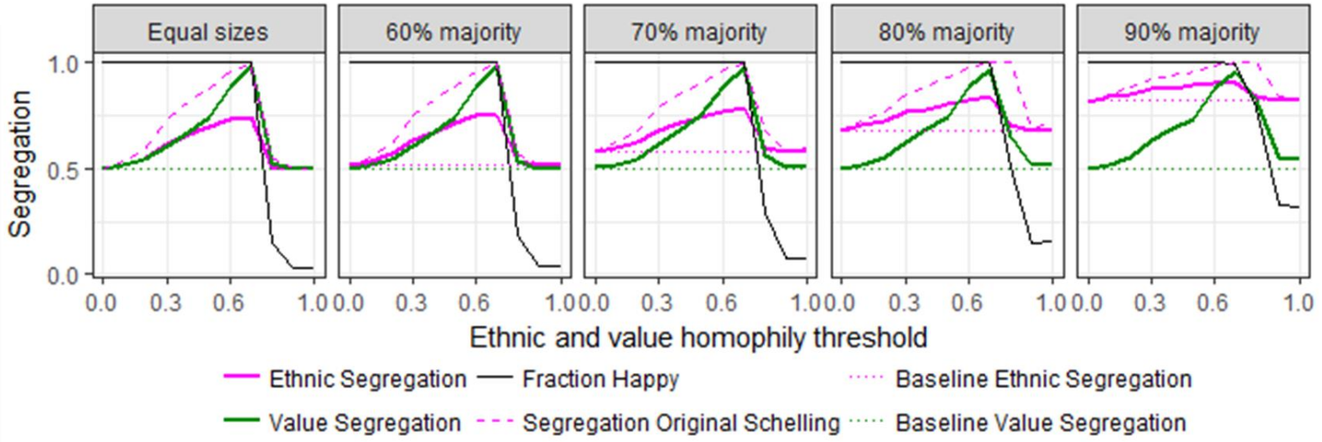
Previous Steps





50 % population: circle tolerant

- Introduction of value-oriented agents decreased ethnic segregation
- Value-oriented agents formed more dense neighborhoods
- **Spillover effect** for ethnicity-oriented agents:
  - value oriented formed ethnically mixed neighborhoods
  - ethnically mixed tolerant neighborhoods became more attractive to ethnicity-oriented because higher chance to find co-ethnics
  - Ethnicity-oriented in the minority condition were more sensible to the spillover effect

(Paolillo & Lorenz, 2018)

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Current steps

Attribute value and ethnic preferences to all agents → Explore the interplay of preferences

Define **utility = desirability** function of behavior → Formalize a consitstent rational decision

Alternative to threshold behavior → More fine-grained and less drastic segregation scenarios (Bruch & Mare, 2009)

- **Discrete choice models**

Utility of options (e.g. neighborhoods) depends on their characteristics and how they are assessed by people preferences (McFadden 2001)

- **Random Utility Models** (Hess & al, 2018)

$$P = \beta U + \epsilon$$

P = probability to select option

β $[0,\infty)$ parameter of determinism; coefficient of regression; the higher, the more U influenced the choice

U = difference in options' observed characteristics and how they are assessed

ϵ = **unknown** characteristics that influence the choice not due to U

- Rooted in rational theory and utility maximization (Esser 2010)
- Calibration of agent-based models from relocation choice
- Sort out differences due to people's characteristics

- **Attribute utility to neighborhoods**
- **Probability to relocate**

https://github.com/RoccoPaolillo/BIGSSS_ResearchDay.git

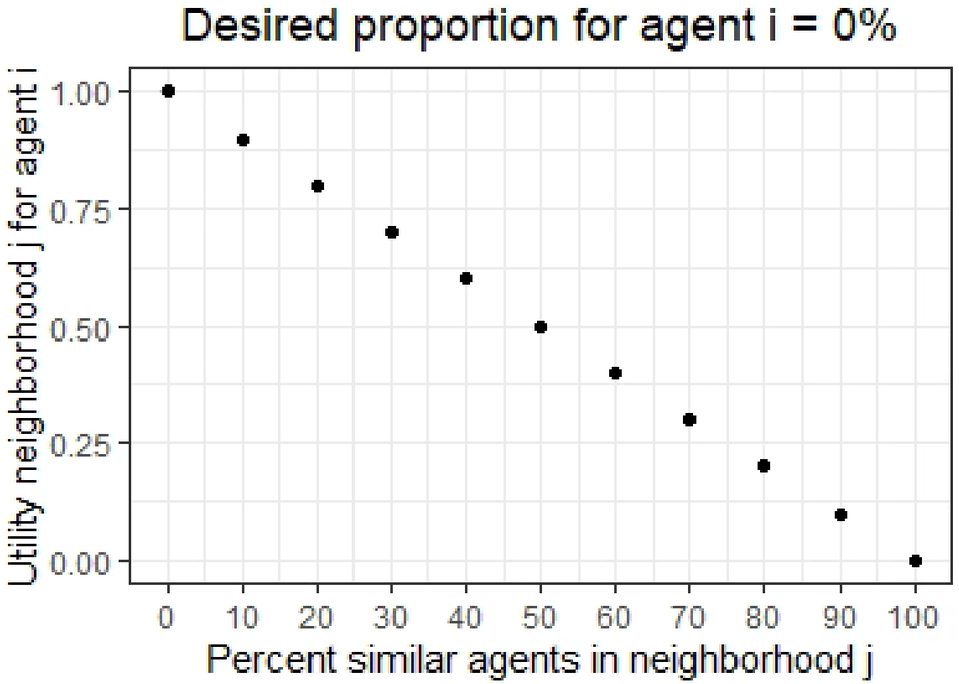
Utility

- **sigle-peaked function**
(Zhang, 2011, Bruch & Mare, 2009)

$$U = \begin{cases} \dfrac{x}{n \times i_e}, & if\ x \leq n \times i_e \\ i_e + \dfrac{\left(1 - \frac{x}{n}\right) \times (1 - i_e)}{1 - i_e}, & if\ x > n \times i_e \end{cases}$$

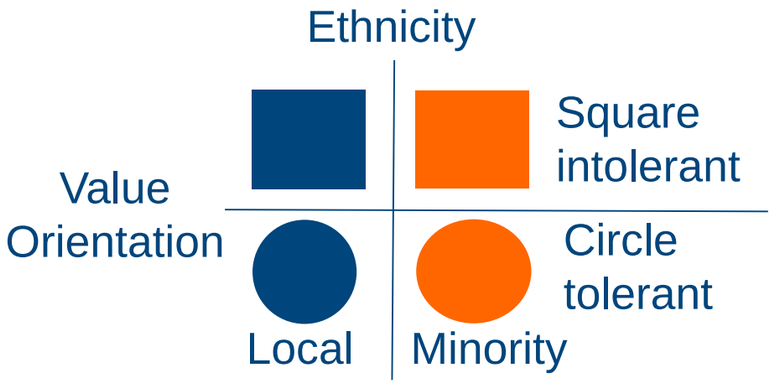
where:

- U: utility of a neighborhood
- x: number of similar agents in the neighborhood
- n: total number of agents in the neighborhood
- ie: desired proportion of similar ones



- **Value Utility** : U_v similar: same shape
- **Ethnic similarity**: U_e similar: same color

Agent-based model: theoretical model



Distribution according to **value orientation:**

- Desired ethnic compostion $\boldsymbol{U_e}$ Determinism for ethnic utility $\boldsymbol{\beta_e}$
- Desired value composition $\boldsymbol{U_V}$ Determinism for value utility $\boldsymbol{\beta_v}$

At each step, a random agent compares its current location with an alternative location and makes a choice to stay or leave

$$P_{alternative} = U_{alternative} - U_{current}$$

$$P_{al} = \frac{exp^{(\beta_e U_e^{al} + \beta_v U_v^{al})}}{\sum exp^{(\beta_e U_e^{k} + \beta_v U_v^{k})}}$$

McFadden (1974) conditional logit:

- Identical and independent distribution of random term ε (exponential function: Gumbel extreme value distribution)
- **not always** the best option is chosen

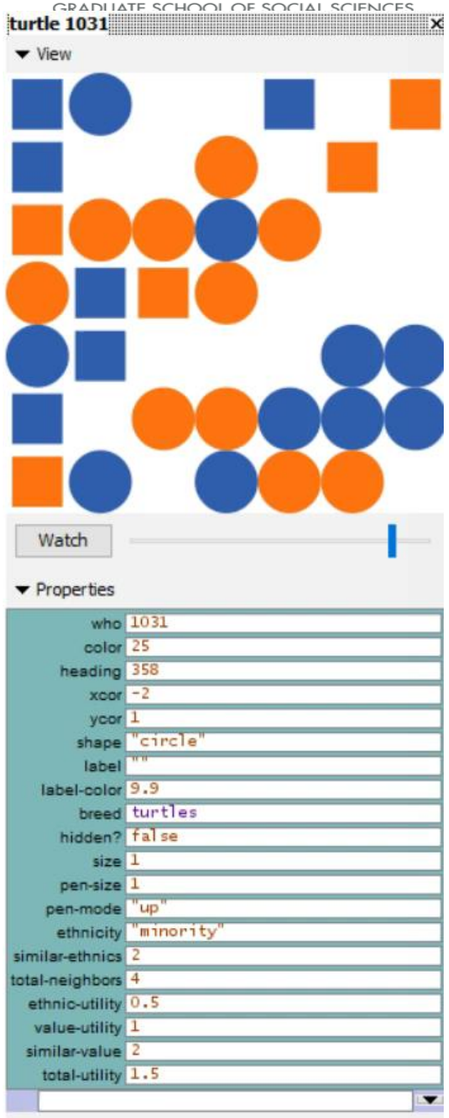
$$P_{al} = \frac{1}{1 + exp^{((\beta_e U_e^{cr} + \beta_v U_v^{cr}) - (\beta_e U_e^{al} + \beta_v U_v^{al}))}}$$

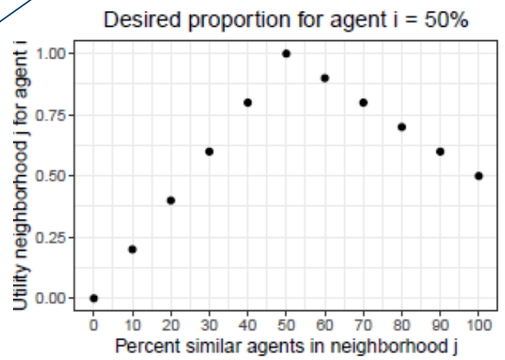
Train (2009): binary decision logit

- P_{al}: probability to relocate to alternative
- $\beta_e U_e^{cr} + \beta_v U_v^{cr}$: systemic utility for current location
- $\beta_e U_e^{al} + \beta_v U_v^{al}$: systemic utility for current

Agent-based model: simulation code

Micro



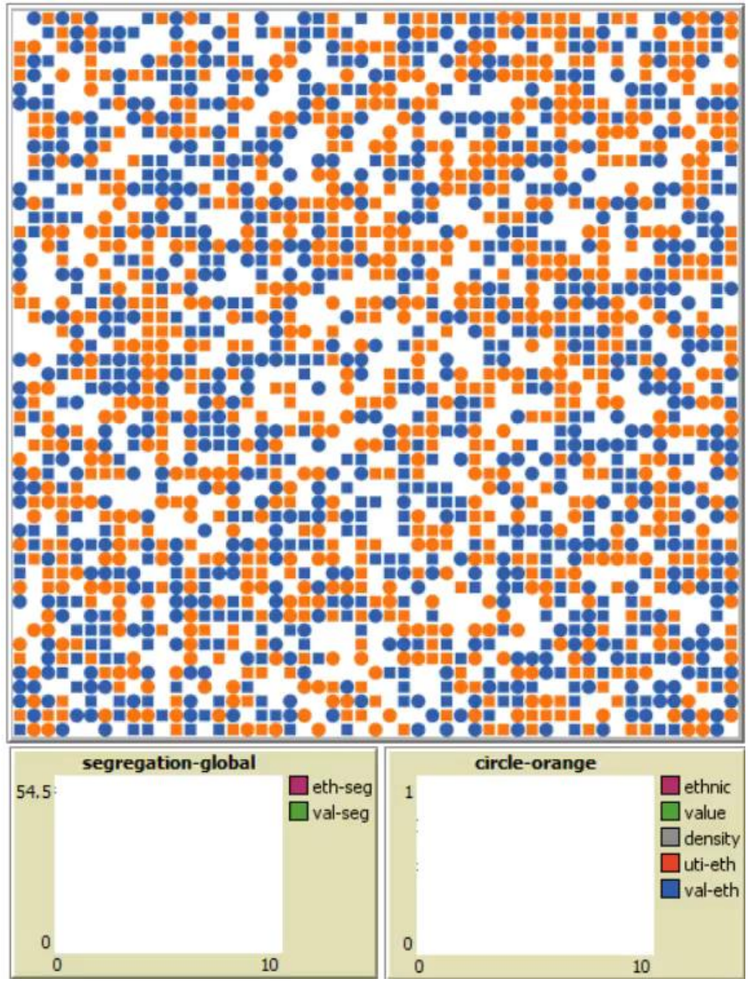


$$U = \begin{cases} \dfrac{x}{n \times i_e}, & if\ x \le n \times i_e \\ i_e + \dfrac{\left(1 - \dfrac{x}{n}\right) \times (1 - i_e)}{1 - i_e}, & if\ x > n \times i_e \end{cases}$$

```
report ( ifelse-value (b = 0) [0]
 [ifelse-value (a = (b * c)) [1]
  [ifelse-value (a < (b * c))
   [precision (a / (b * c)) 3
    ][ precision
  (c + (((1 - (a / b)) * (1 - c)) / (1 - c))) 3]
  ]])]
```

$$P = \frac{1}{1 + exp^{((\beta_e U_e^{cr} + \beta_v U_v^{cr}) - (\beta_e U_e^{al} + \beta_v U_v^{al}))}}$$

```
set proba (1 / (1 + exp((( beta-ie * [uti-eth] of patch-here)
        + (beta-iv * [uti-val] of patch-here))
  - (( beta-ie * [uti-eth] of alternative)
        + (beta-iv * [uti-val] of alternative)))))
if random-float 1 < proba [move-to alternative]
```



Macro

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Experiments

Static agent variable	Range	
Ethnicity (*color*)	Blue, Orange	
Value orientation (*shape*)	Square, Circle	
Population parameters	**Range**	**Experiments**
Population density	0.5–0.99	0.7
Fraction of majority ethnicity (blue)	0.5–1	0.5; 0.8
Fraction of circle blue ethnicity	0–1	0.5
Fraction of circle orange ethnicity	0–1	0.5
Parameters for relocation choice, square	**Range**	**Experiments**
Desired ethnic concentration	[0,1]	$0, 0.3, 0.5, 0.7, 1$
Desired value concentration	[0,1]	$0, 0.3, 0.5, 0.7, 1$
Beta ethnic utility	[0,100]	55
Beta value utility	[0,100]	55
Parameters for relocation choice, circle	**Range**	**Experiments**
Desired ethnic concentration	[0,1]	$0, 0.3, 0.5, 0.7, 1$
Desired value concentration	[0,1]	$0, 0.3, 0.5, 0.7, 1$
Beta ethnic utility	[0,100]	55
Beta value utility	[0,100]	55
Global output measures	**Computation**	**Range**
Ethnic segregation Θ^{E}	same color neighborhood proportion	$0, \overset{+0.1}{\ldots}, 1$
Value segregation Θ^{V}	same shape neighborhood proportion	$0, \overset{+0.1}{\ldots}, 1$

Ethnic Segregation neighborhood j

$$\frac{N(same\ color)_j}{\sum(agents)_j}$$

Value Segregation neighborhood j

$$\frac{N(same\ shape)_j}{\sum(agents)_j}$$

Ethnic group size:

Equal size vs Majority-minority

Determinism in relocation choice:

high: $\beta = 55$

Steps each run: 1000

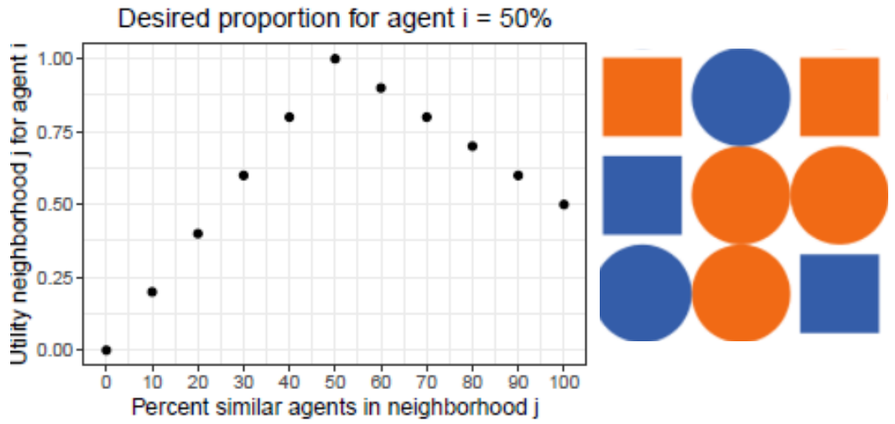
1.250 conditions x 5 repetitions = 6250 runs %>% summarize(mean)

Results

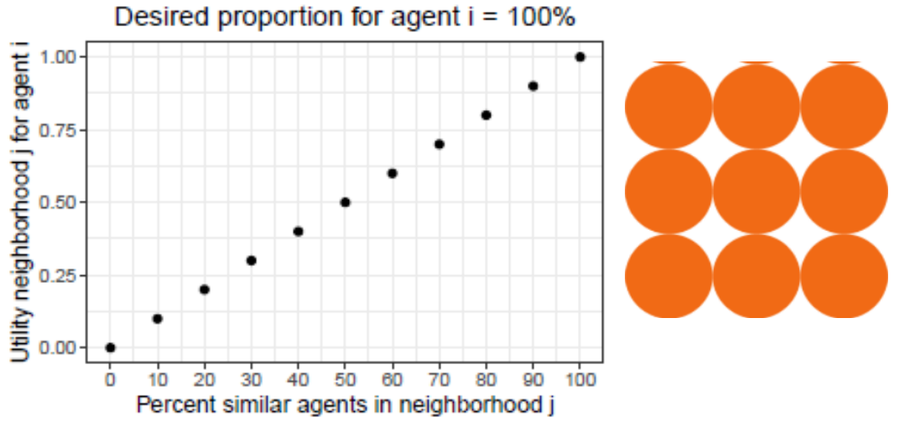
ethnic preference circle

value preferences square

Integrationist Preferences



Segregationist Preferences



value preferences circle

ethnic preference square

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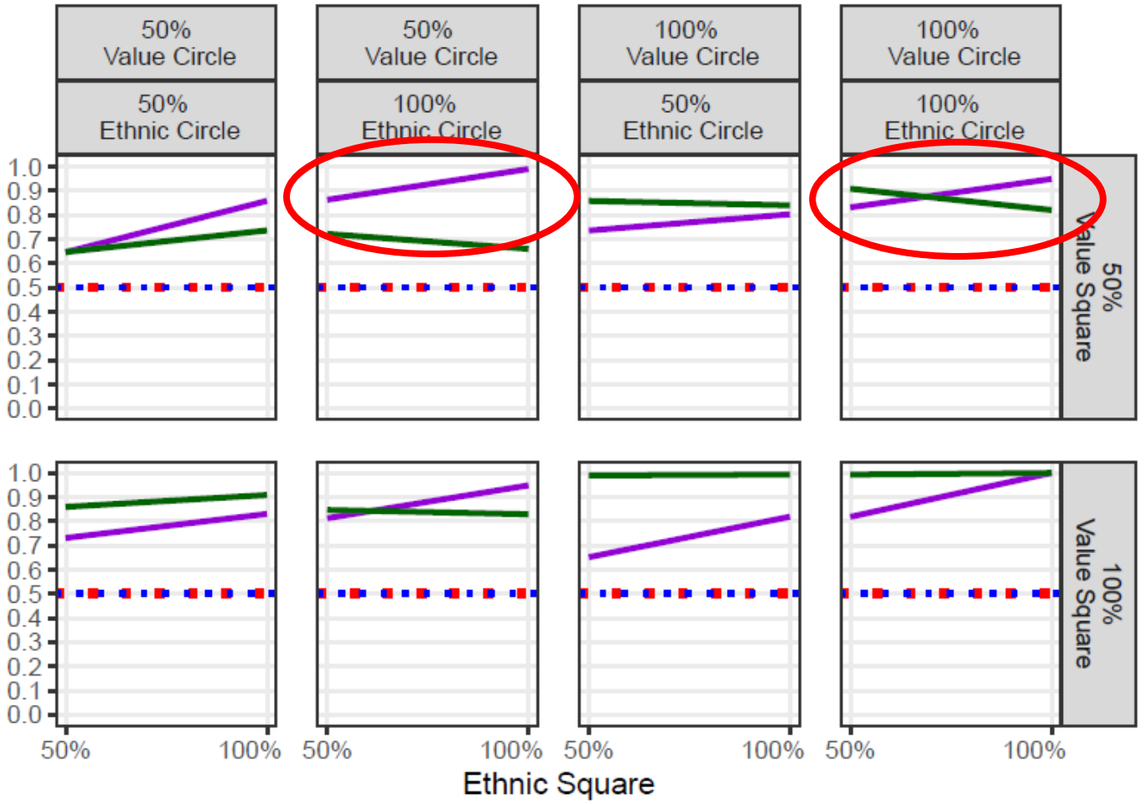
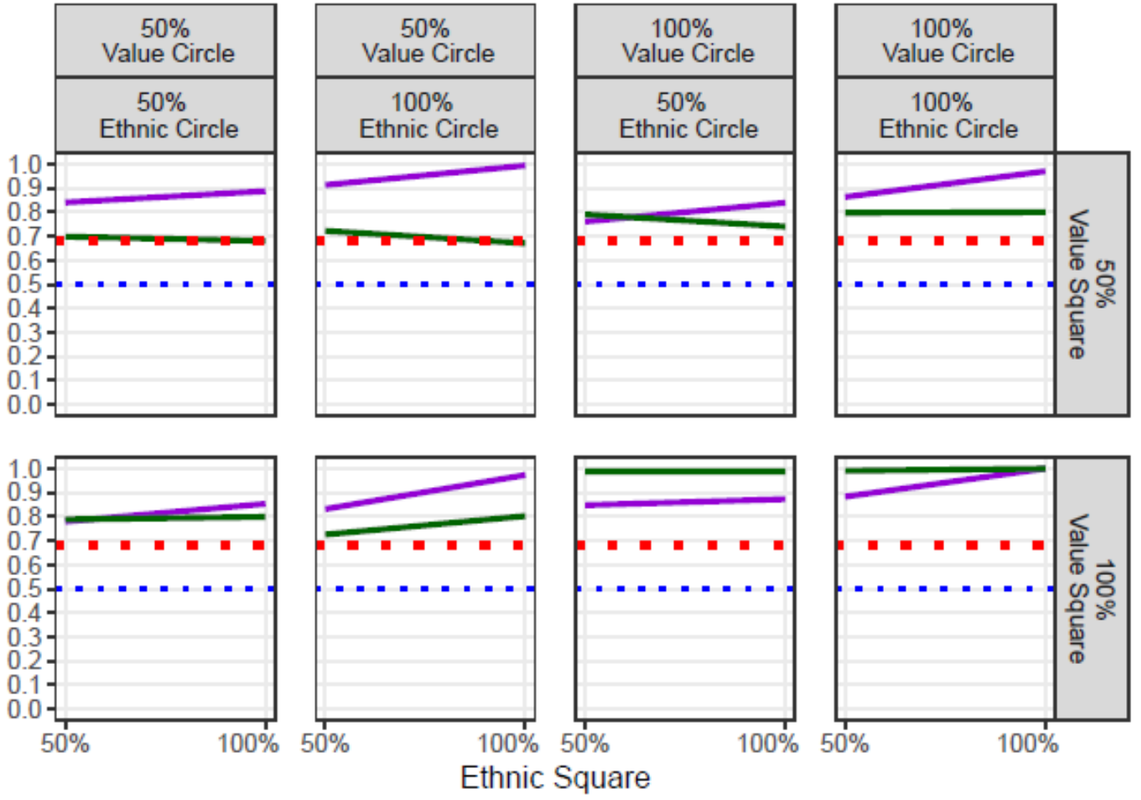
Results: global segregation



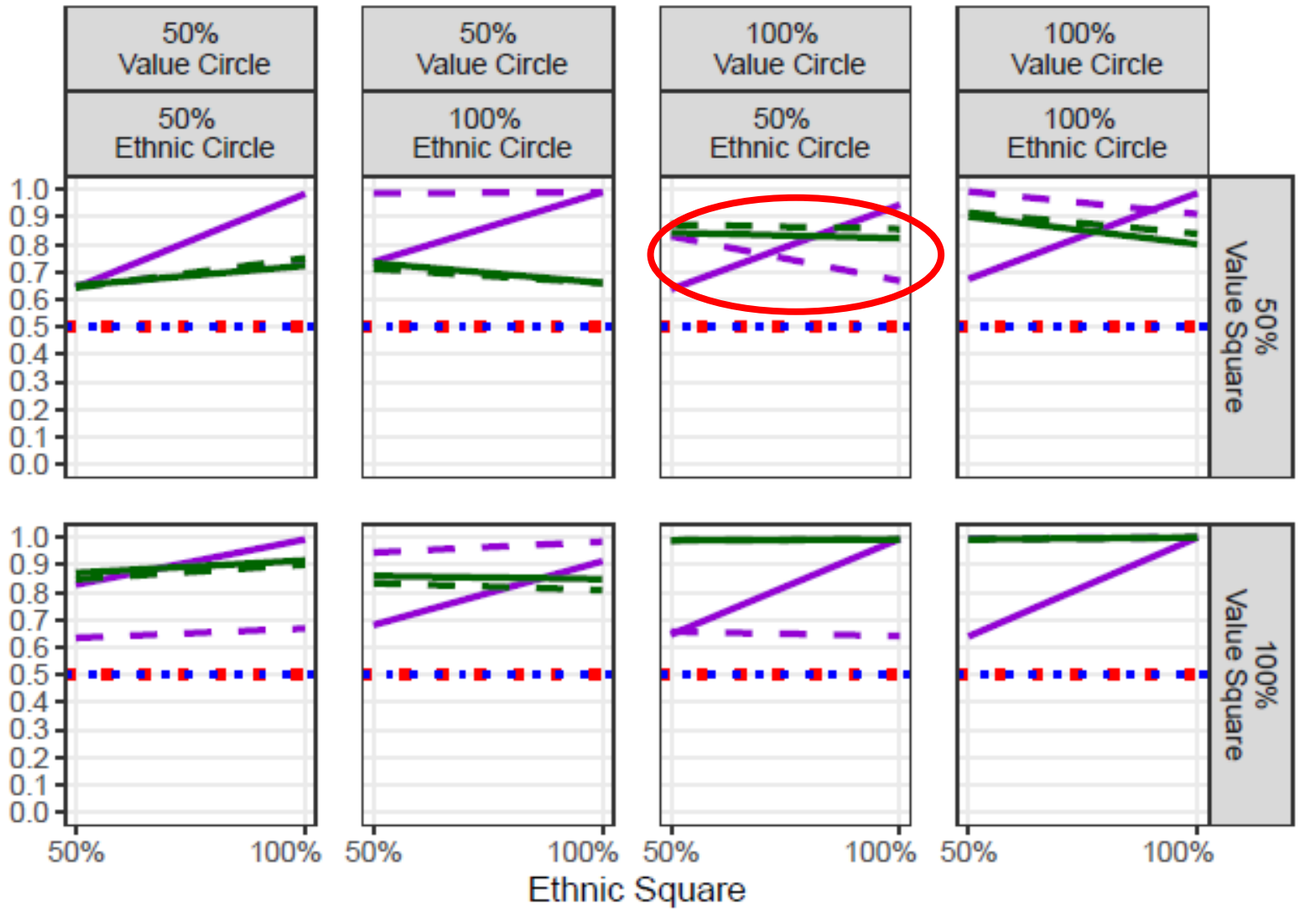
Equal group sizes

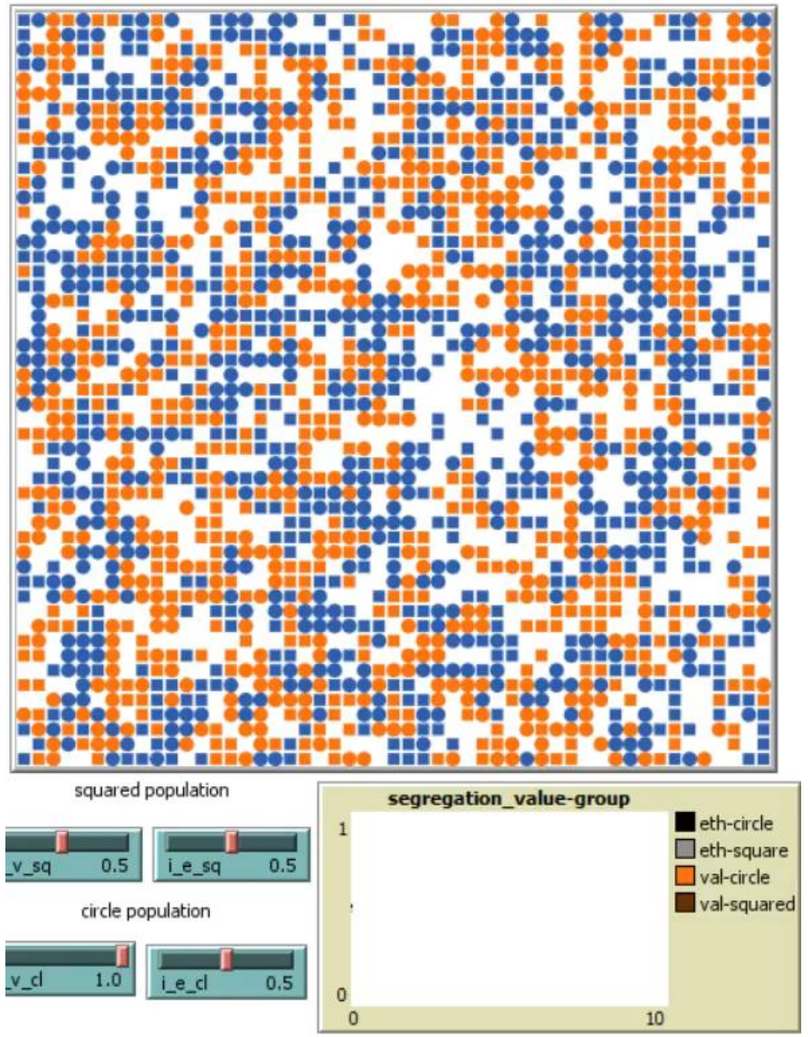


Majority-minority

Ethnic Segregation
Value Segregation
baseline ethnic segregation
baseline value segregation:

Results: circle value vs square value





Equal group sizes

Ethnic Segregation — Value Segregation — Square — Circle

baseline ethnic segregation: baseline value segregation:

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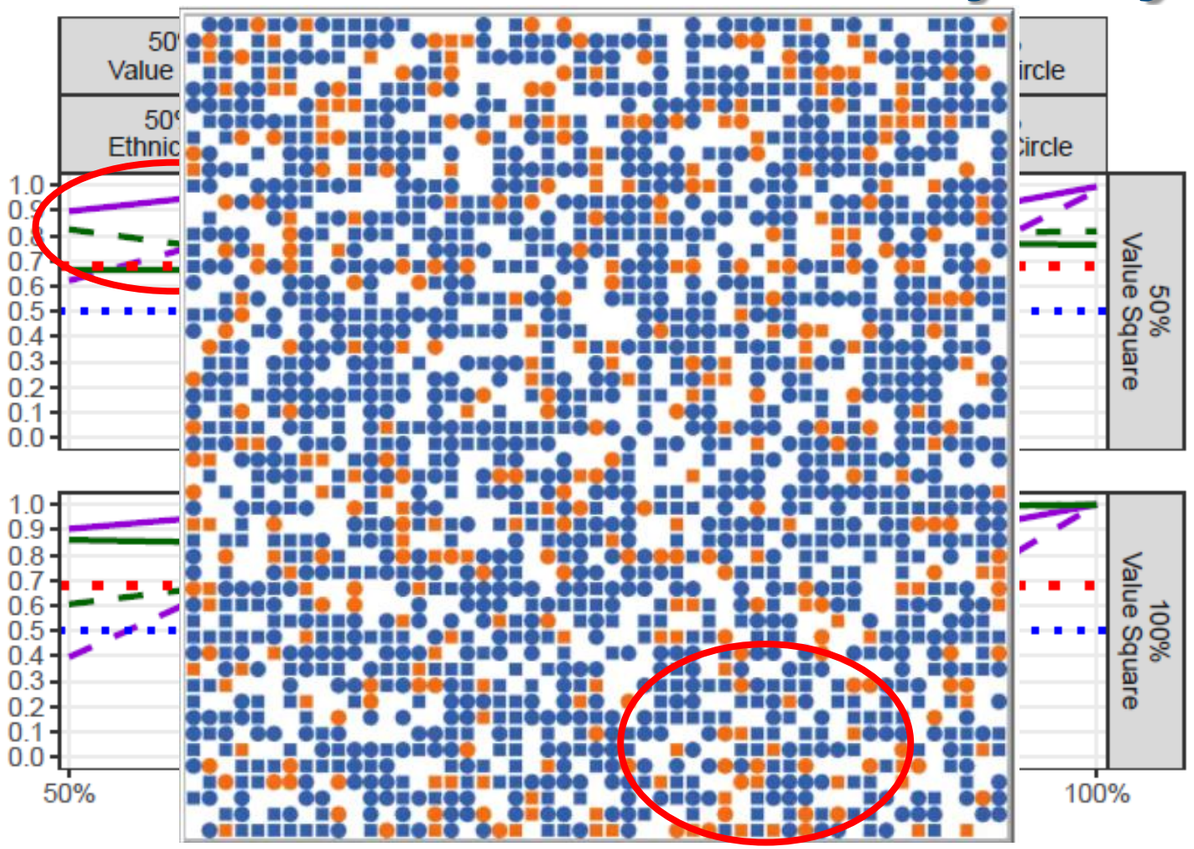
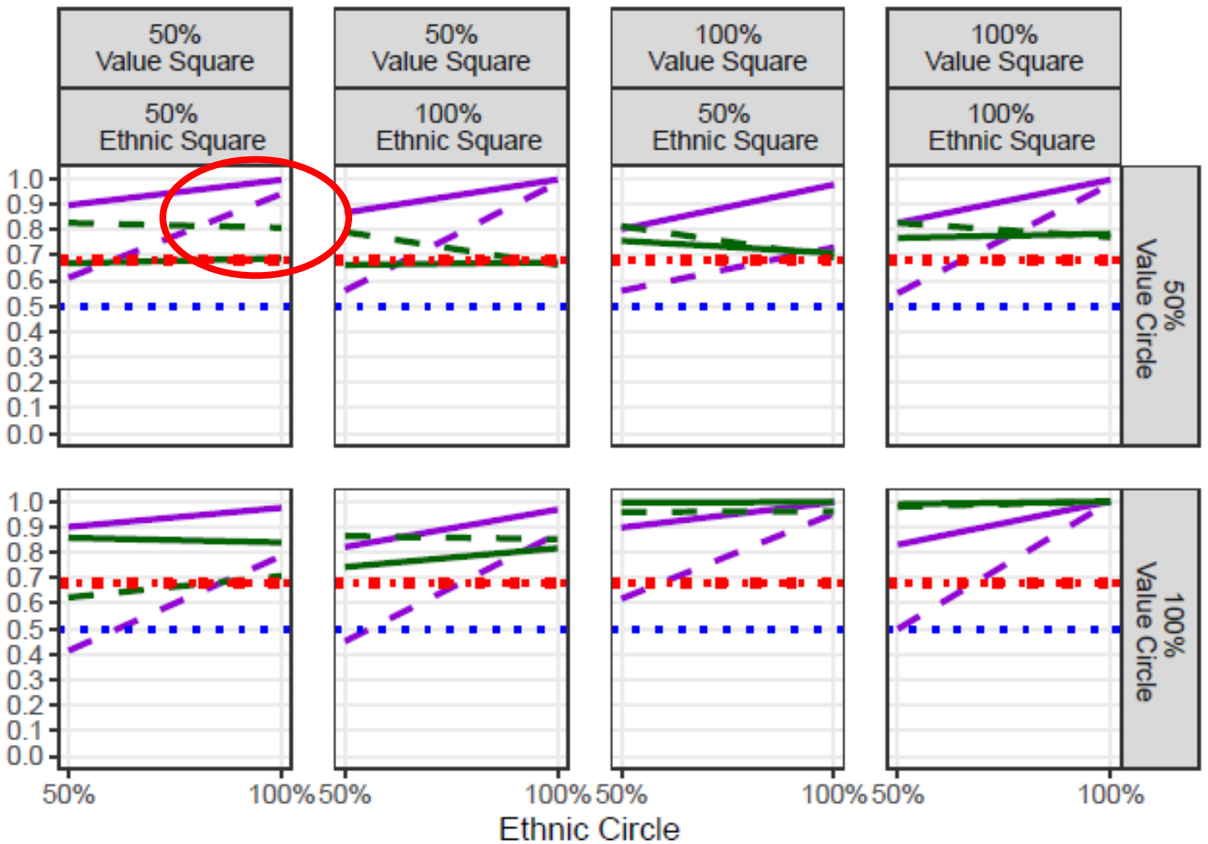
Results: circle value vs square value: majority-minority condition





Majority Square Minority Square

Majority Circle Minority Circle

Ethnic Segregation Value Segregation

baseline ethnic segregation baseline value segregation:

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Conclusion

- Even all integrationist preferences for more than one dimension cause segregation, due to interaction of people maximizing their preferences in limited spatial resources
- The interaction between preferences for value composition and ethnic composition is not linear:
  - interaction of preferences **within group**
  - interaction of preferences of **different groups**
  - interaction with **structural conditions** and resource to segregate

- Need of more detailed observations and planned experiments

  - Implementation of discrete choice can let explore more complex scenarios of segregation and interplay of preferences and interaction with:
    - costs of relocation
    - change of preferences between generations

  - Estimate parameters preferences from relocation choice in survey

Thank you for your attention

Feedback, questions?

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