Consumer Heterogeneity and E-Market Concentration: An Agent-Based Approach

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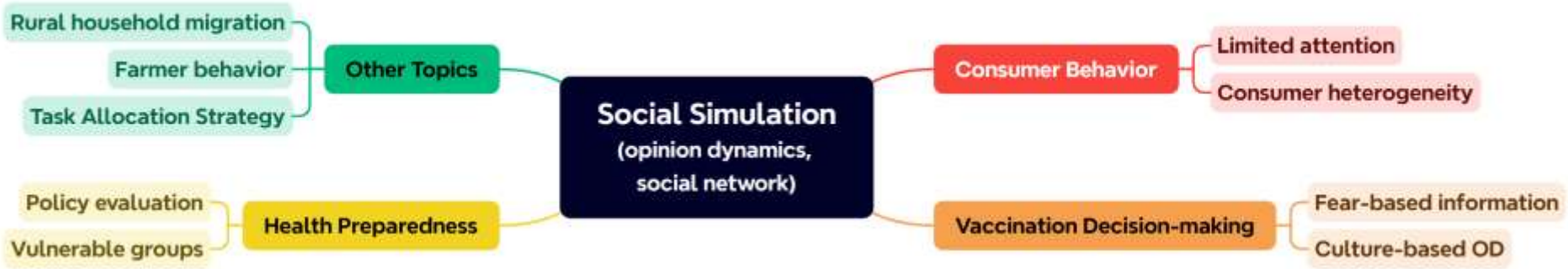
Self-introduction

Work Experience

- **Postdoctoral Researcher (02.2025 -)**
  - University of Groningen, Netherlands
  - EU Project
  - Computational social scientist

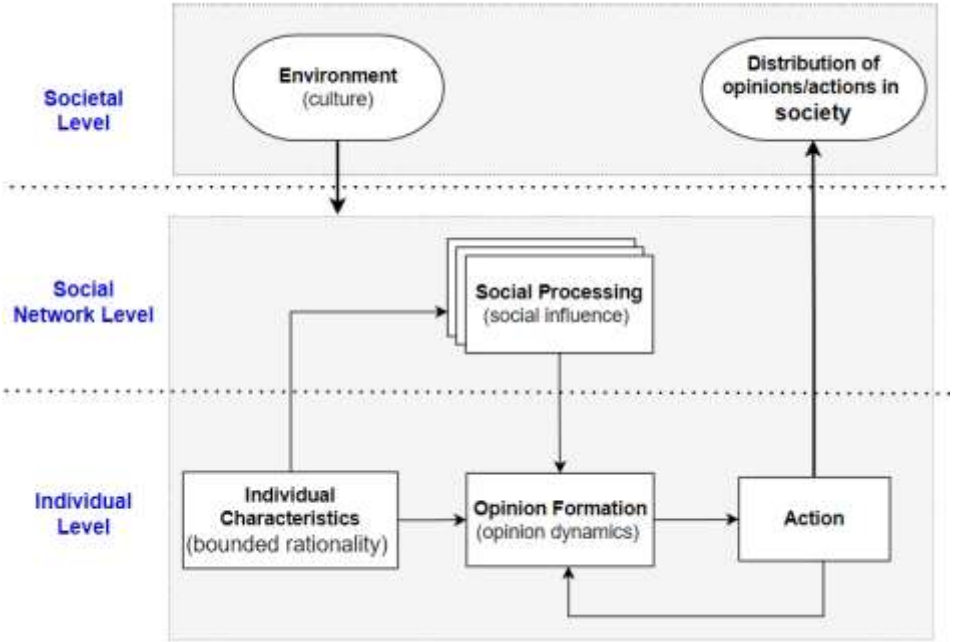
Education

Research background



Research Framework

What collective consequences follow from bounded rationality models of opinion formation in social networks?



Agent-based Modeling (ABM)

"Class of computational model for simulating the actions and interactions of autonomous ***agents*** with a view to assessing their effects on the ***system*** as a whole (Micro-Macro interactions)."

- To unravel social complexity:
  - Interdependent (multiple) individuals; Competing dynamics; Non-linearity ⇒ Unintended consequences: **emergence**
- Computer simulation as a tool to model the micro–macro link.

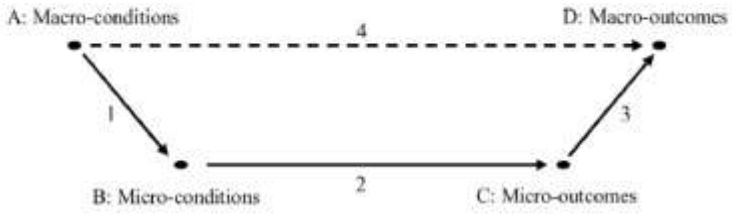


FIGURE 1 Coleman's scheme.

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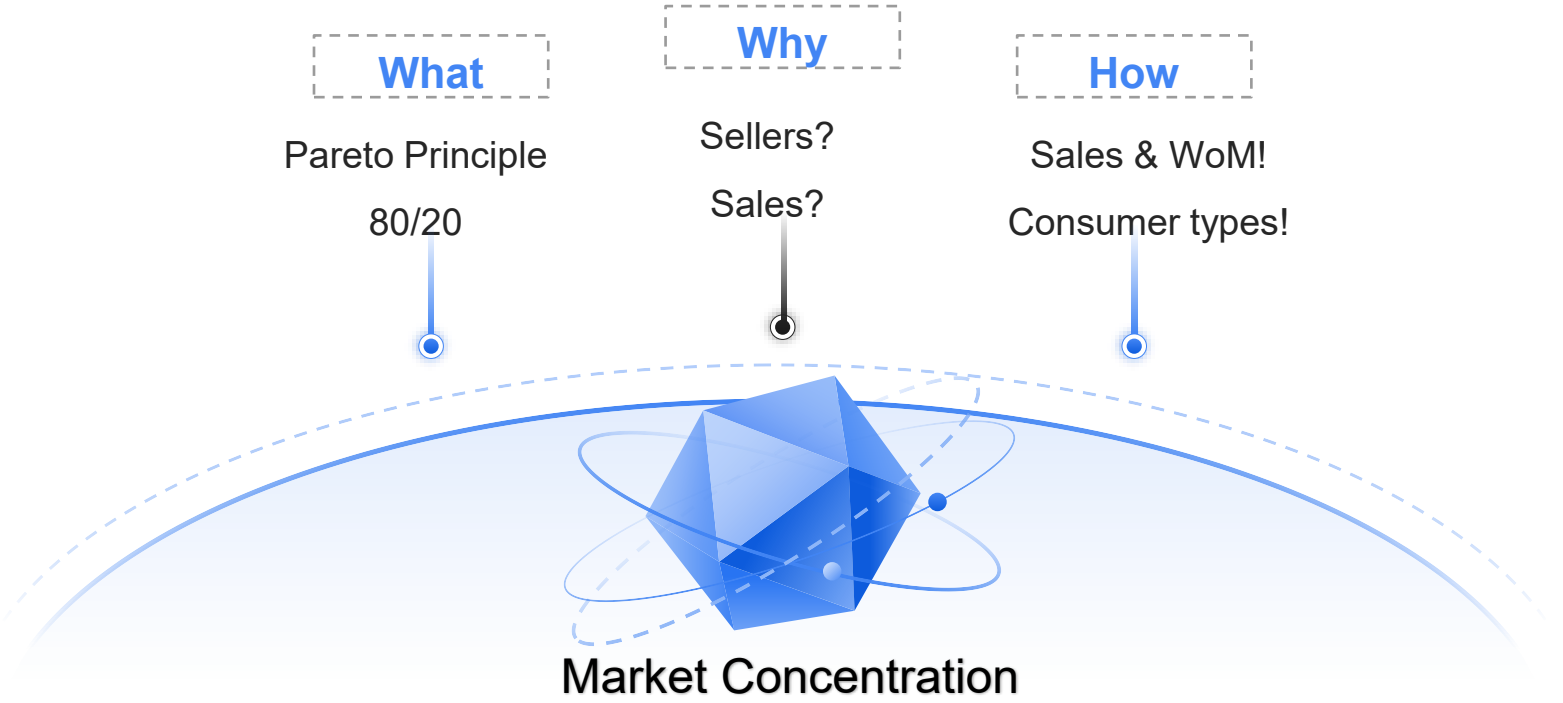

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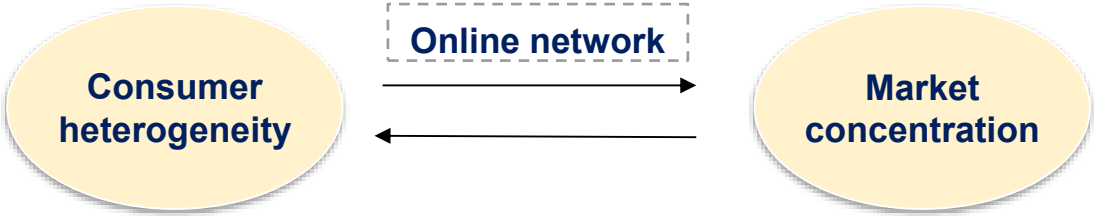
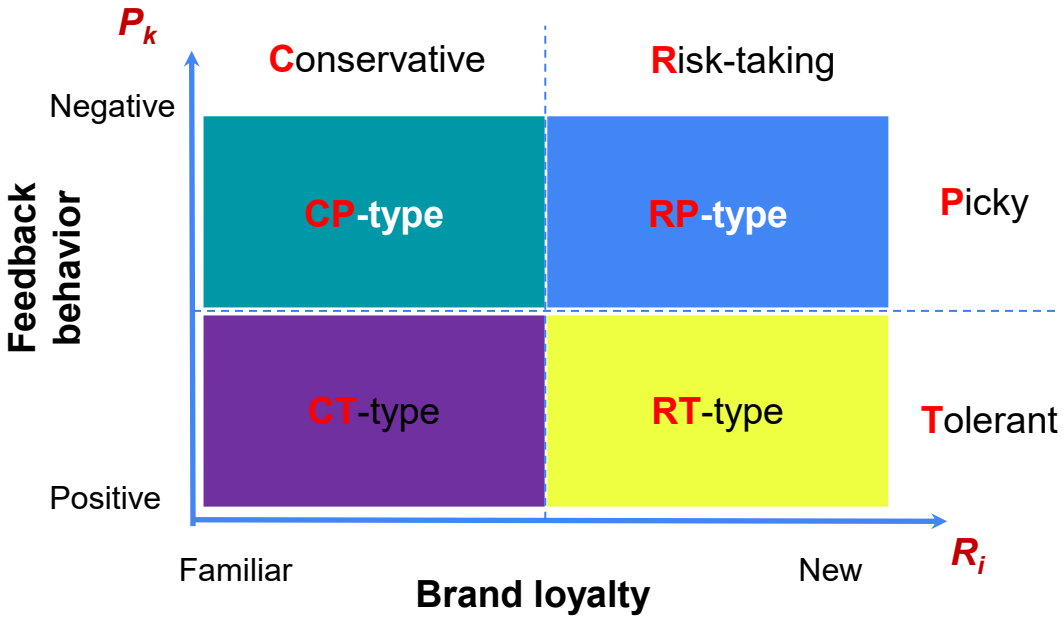
Research questions

- How does the **heterogeneity** and **social influence** of the consumers affect the macro-level outcome of **e-market concentration**?

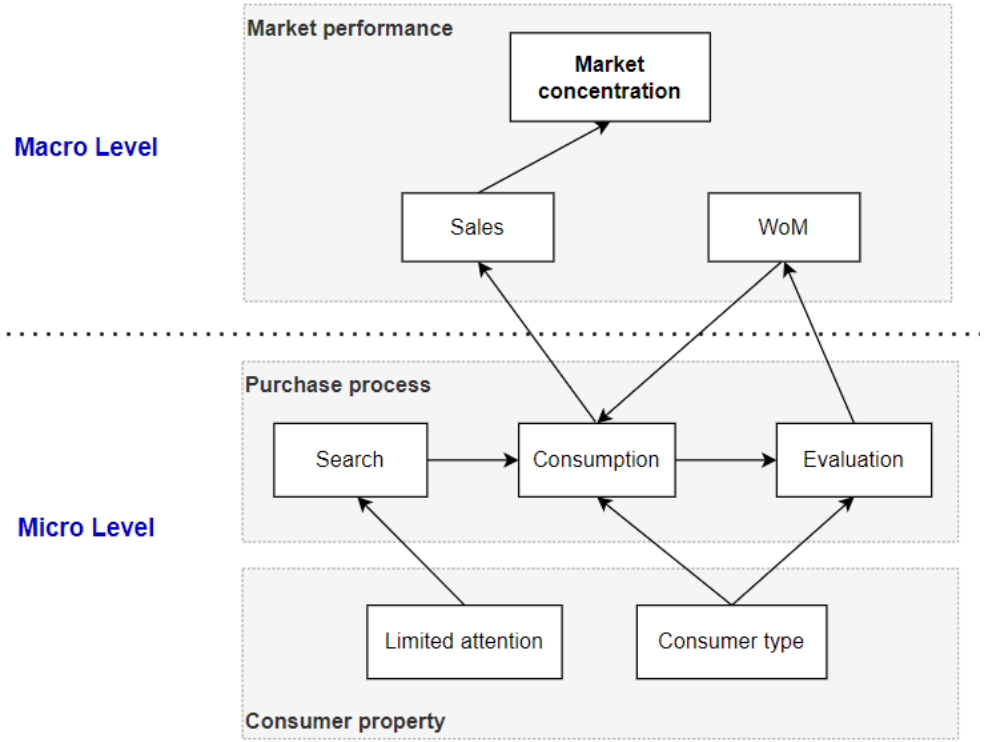
- Particularly, how and under which conditions e-market concentration can occur in the situation of **identical products**?



Different types of consumers



Simulating social behaviors_*How the model works?*



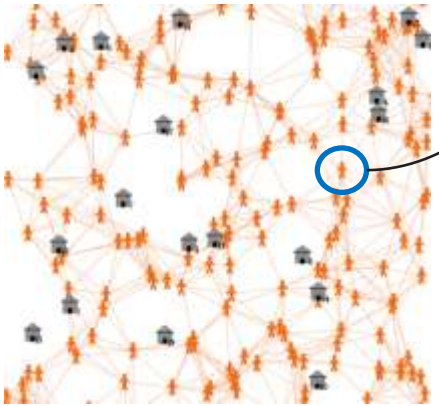
Online networks

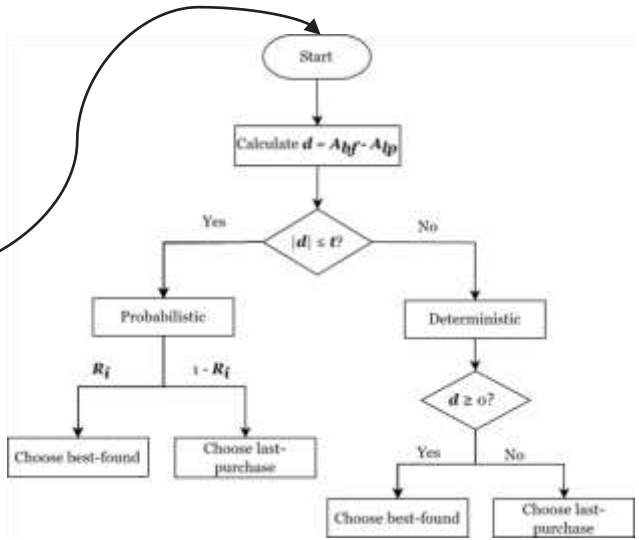
Sellers: identical products; **Consumers**: different types

- *Consumer-consumer* implicit networks via online *WoM* and *sales*.

  product attractiveness: $A = W_m * WoM + (1 - W_m) * S \ , \ W_m \in [0, 1]$

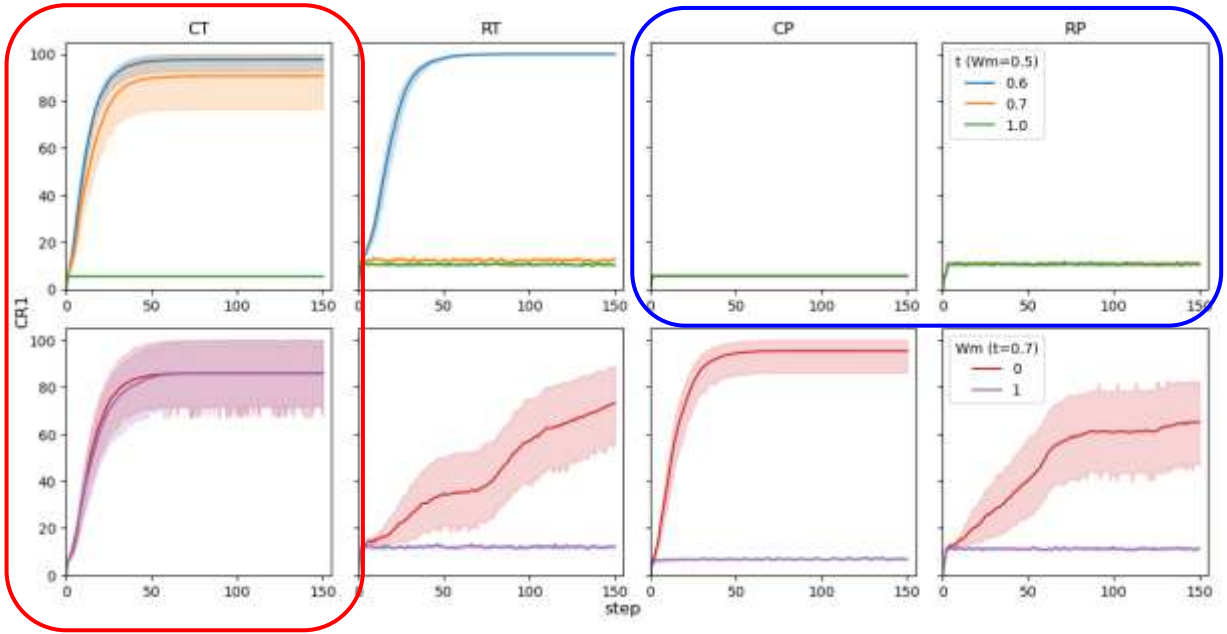
- *Consumers-sellers* post-purchase network





Experiment 1: Extreme-type consumer markets

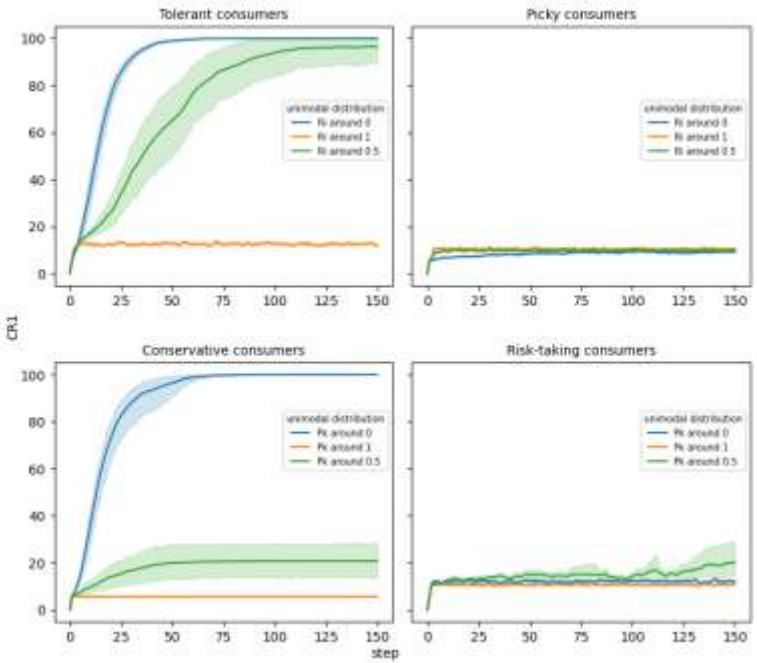
- **Homogeneous markets can experience different/high concentration.**
- **The higher the consumers' pickiness tendency (Pk), the more it hinders concentration**: Products with higher sales receive more negative ratings.



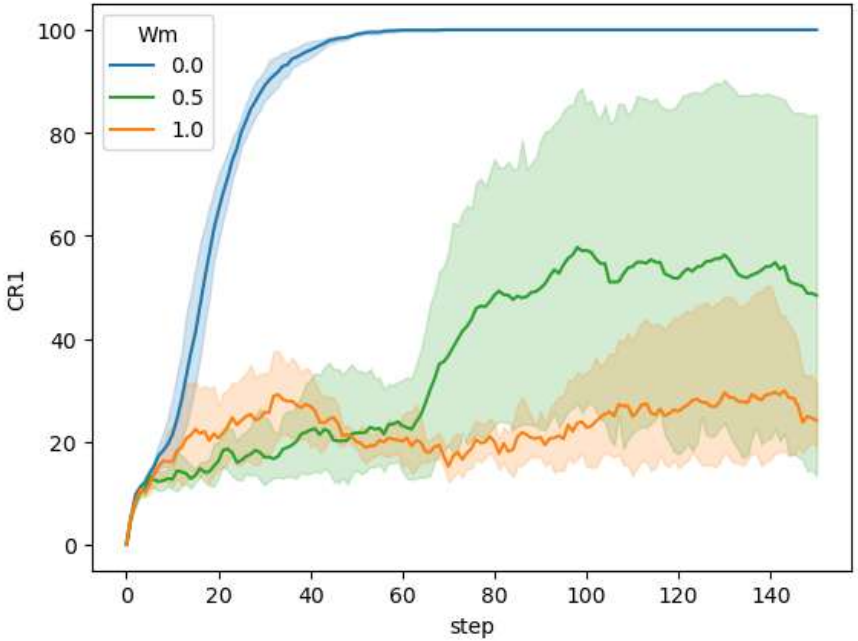
Evolution of market concentration (CR1) with different t and Wm.

Experiment 2: markets with two types of consumers

The higher the pickiness (P_k), the more it hinders market concentration.



Experiment 3: markets with heterogeneous consumers



*Evolution of market concentration in the **four-type** consumer markets. CR1 averaged across 20 repetitions*

Conclusion

1. To explain the market concentration from the perspective of consumers, especially consumer heterogeneity.

2. Traditional economic research rarely examines market structure from the perspective of social influence and opinion dynamics.

3. The more conservative consumers are, the more concentrated and stable the market becomes, while risk-taking consumers create a more diverse and volatile market.

4. A high market share can be self-reinforcing or self-undermining, depending on whether consumers are tolerant or picky.

5. The value of a product is defined by consumers.

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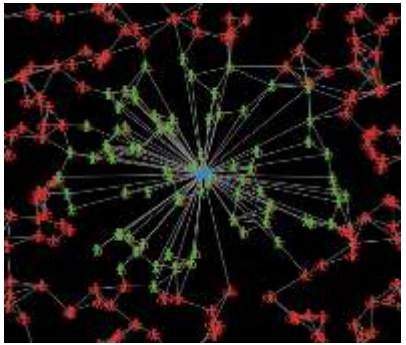
Empirical ABM

Literature review to identify vulnerability, needs and barriers to compliance

Survey study to validate the findings in European countries

Interviews with vulnerable people and institutional actors



Computer simulation to understand complex social dynamics

PREPSHIELD

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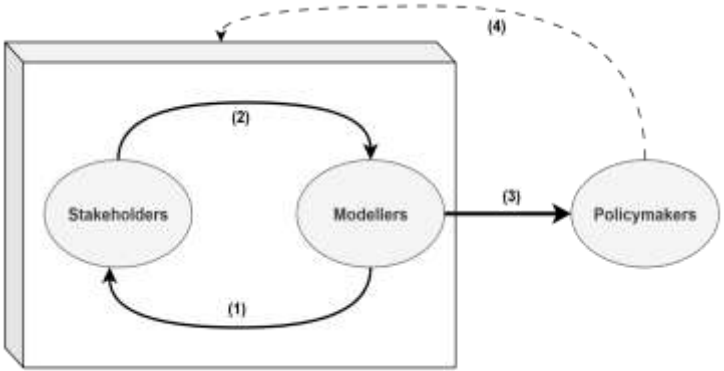
Future Work

- **Expanding ABM in Interdisciplinary Research**
  - To address complex social, economic, and managerial challenges in different contexts.
- **Participatory Modeling**
  - To integrate stakeholders and enhance model relevance and impact.
- **Integrating LLMs with ABM**
  - To model human reasoning, communication, and adaptive behavior in richer ways.



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