Università
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Modeling Consumer Behavior in a Simulated Market

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Data Science for Management

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Contents

1 Introduction

This document outlines the NetLogo simulation of consumer behavior in a simplified market, where two types of products are sold: a high-quality, expensive product (Product A) and a low-quality, cheaper product (Product B). The aim of the project is to analyze how consumers respond to price discrimination and imitation mechanisms under different conditions.

2 What is it?

The project simulates a market with two types of products (A and B) and multiple consumers of different wealth classes. The goal is to study how consumers behave in response to:

- Price discrimination based on previous purchase history (fidelity card system).
- Social imitation mechanisms, where buyers mimic the behavior of other buyers.

Consumers are classified into three wealth levels (low, middle, and high), and their preferences and purchasing behavior are influenced by these mechanisms.

3 How it works

The simulation is built using NetLogo, and it works by following these key steps:

- **Setup Phase**: Buyers and sellers are created. Buyers are divided into wealth classes and initialized with different probabilities to match and product preferences.
- **Simulation Run**: Buyers move around the environment and attempt to match with sellers. A match occurs if the buyer's probability to match is greater than 0.5 and they are within a specified radius of a seller.
- **Fidelity Cards**: After making three purchases, buyers receive a fidelity card, which triggers the price discrimination mechanism.
- **Imitation Mechanisms**: Buyers can imitate nearby buyers' preferences and probabilities to match, leading to potential shifts in consumer behavior over time.

4 How to use it

- **Setup the Model**: Use the "setup" button to initialize the model. It will create buyers and sellers and assign random positions to them.
- **Run the Simulation**: Press the "go" button to start the simulation. This will move buyers around and allow them to match with sellers.
- **Experiment with Mechanisms**:
  - The "imitating mechanism" button enables buyers to copy nearby buyers' preferences and probabilities.

  - The "discriminating price policy" button activates the fidelity card system, offering discounts on products that the buyers don't normally buy.

- **Control Parameters**: Use sliders to adjust the number of buyers and sellers, the matching radius, and the levels of imitation and persuasion for products A and B.

5 Things to notice

- **Wealth Classes**: Buyers from different wealth classes (low, middle, high) exhibit different product preferences. For example, low-class buyers prefer cheaper products (Product B), while high-class buyers prefer more expensive products (Product A).

- **Imitation Effects**: When imitation is active, buyers begin to adjust their preferences and probabilities to match based on the behavior of nearby buyers. This can significantly change the consumption patterns in the market.

- **Price Policy**: The discriminating price policy encourages consumers to switch products they normally wouldn't buy due to price differences. This effect is particularly noticeable in lower-class buyers.

6 Things to try

- Experiment with different levels of imitation to see how fast preferences spread through the population.

- Test various levels of discount persuasion for Product A and B and observe how much it influences purchasing decisions.

- Run the simulation for an extended number of ticks to observe long-term trends in consumer behavior.

7 Extending the Model

There are several ways to extend this model:

- **Incorporating Actual Prices**: Currently, prices are latent variables. Introducing visible price data would allow for more detailed analysis.

- **Introducing More Products**: Adding more than two product types could simulate a more complex market.

- **Learning Mechanisms**: Incorporate machine learning techniques that allow buyers to learn from past experiences, adjusting their preferences based on success or failure in previous transactions.

- **Advertising or Promotion Strategies**: Introduce promotional strategies and observe their influence on consumer behavior.

8 Key Attributes and Variables

8.1 Buyers' Attributes

- **Probability to Match**: Determines the likelihood that a buyer will match with a seller.
- **Preferences for Product A and B**: Buyers have preferences for either Product A or B, and this influences their purchasing decisions.
- **Fidelity Card**: After three purchases, buyers receive a fidelity card that applies discounts to products they usually do not buy.

8.2 Global Variables

- **Total Matches**: Tracks the total number of successful transactions.
- **Matches for Product A/B**: Counts the number of purchases for Product A and Product B.

8.3 Procedural Attributes

- **Move and Match Procedure**: Governs how buyers move and match with sellers.
- **Get Fidelity Card Procedure**: Assigns fidelity cards to buyers after three purchases.
- **Imitating Mechanism Procedure**: Activates the imitation process, where buyers adjust their preferences based on nearby buyers.
- **Discriminating Price Policy Procedure**: Applies the discount mechanism when fidelity cards are used.

9 Conclusion

This model offers a robust simulation of consumer behavior in a simplified market, allowing users to explore the effects of price discrimination and imitation on purchasing behavior. By adjusting various sliders and activating different mechanisms, users can experiment with different market conditions and observe how consumer choices evolve.