GEORG-AUGUST-UNIVERSITÄT GÖTTINGEN IN PUBLICA COMMODA SEIT 1737

GRK 2654
Sustainable Food Systems

Farmers resilience using a food system approach: Conceptualization and empirical application

M. Squarcina, J. Hänsch, F. M. Montoya Cepeda, M. S. Pallauf, B. Paz, J. Stehl, J. Wehner, M. Wollni

University of Göttingen

Introduction

- **Definition**

  Measures of development resilience:
  - Ex-ante capacity → RIMA-II by FAO (2016)
  - Normative condition (Barrett and Constas (2014); Cissé and Barrett (2018))
  - Return to equilibrium

- **Literature gaps**
  - Low predictive accuracy (Upton et al., 2022)
  - No external validity ((Barrett et al., 2021)
  - Only focus on one outcome per time

- **Aim**

  To propose an integrative measure of resilience, using a food system approach, that can be empirically tested.

- **Contributions**
  1. Integration of the two approaches existing in the literature into a unique conceptual framework
  2. Food system perspective
  3. Empirically testable model
  4. Flexibility and adaptability

Highlights

- **2 combined approaches**: resilience as capacity + normative condition
- **Empirically** testable
- Use of **Machine Learning**
- **3 dimensions of food system**: economic, environmental, nutrition
- **Final dataset**: 16,233 observations & 337 variables

Data

Country	Survey	Years	Panel sample size
Malawi	Integrated HH Panel Survey	2010, 2013, 2016	1,344
Tanzania	National Panel Survey	2008, 2010, 2012	2,651
Nigeria	General HH Survey	2012, 2015, 2018	1,416

Selection Criteria:
- Panel data
- 3+ rounds of data
- Harmonized set of variables
- HH coordinates

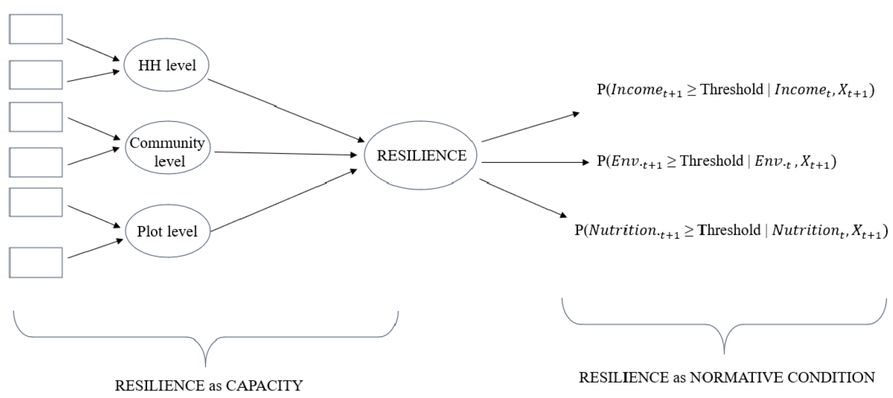
Data sources:
- LSMS data by WB
- RuLIS indicators by FAO
- Georeferenced data

Methodology

- Unit of analysis: farming households
- 3 Levels: household, community, plot
- 3 Outcomes:
  - Economic profitability: per capita income
  - Environmental sustainability: soil workability
  - Adequate nutrition: healthy dietary diversity score

Model

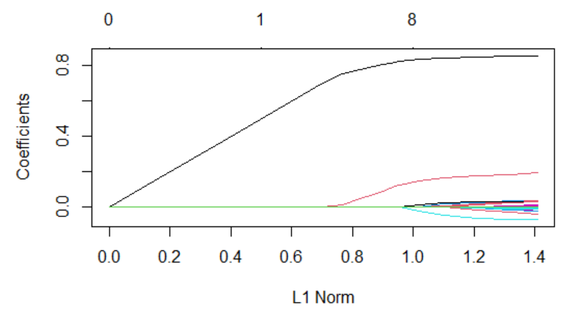
Figure 1: Path diagram



Source: Authors' elaboration.

Steps:

1. LASSO regression → to select variables



Regularization term for LASSO on the environmental outcome

1. Computation of $P(y_{t+1} \geq Treshold | y_t, X_{t+1})$ → based on Cissé and Barrett (2018)
2. Computation of resilience measure → using PCA and MIMCS (following RIMA-II)

Next steps

➢ Finalization of dataset:

Include
- Other countries (Uganda, Burkina Faso, Ethiopia)
- Other rounds of data
- Other variables:
  - Distances
  - Market Prices
  - Governance indicators
  - ACLED data on conflicts

➢ Analysis:
- Run again LASSO
- Compute Probability (Step 2)
- Compute Resilience (Step 3)

➢ Validation:
- Check predictability
- Check over different shocks

Contact information

Margherita Squarcina, Post-doctoral Researcher
RTG 2654 "Sustainable Food Systems", Department of Agricultural Economics and Rural Development - Georg-August-University Göttingen
Email: margherita.squarcina@uni-goettingen.de | Address: Heinrich-Düker-Weg 12, 37073 Göttingen