Forests, weather shocks and food security in developing countries

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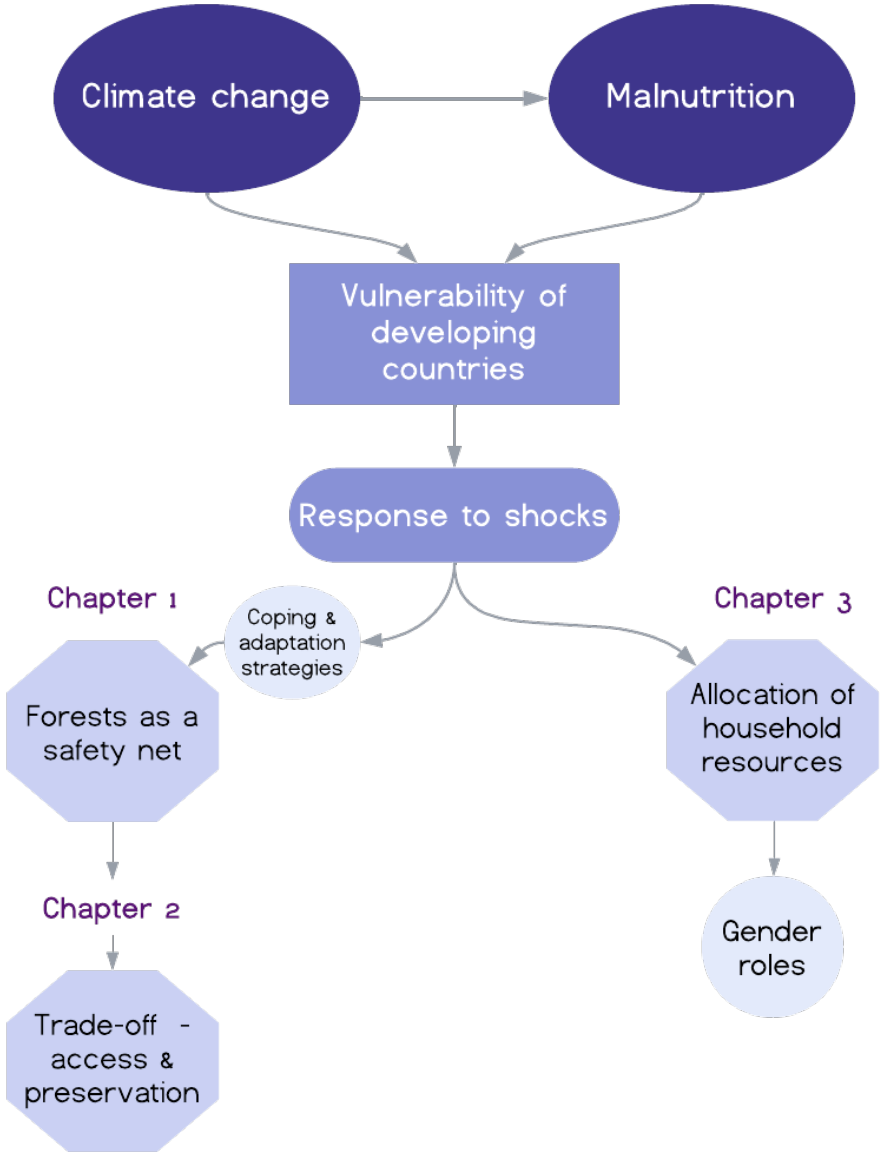
Motivation

- **Climate change:**
  - Linked to the increase in the frequency and intensity of extreme weather events (IPCC,2023)
  - Threatens food security, impacting nutrition, livelihoods, and well-being (FAO, IFAD, UNICEF, WFP & WHO, 2018)

- **Vulnerability of developing countries:**
  - High exposure to elevated temperatures, rainfall variations, and reliance on climate-sensitive sectors (e.g., Ludwig et al., 2007; Mertz et al., 2009; Millner and Dietz, 2015)
  - Limited adaptation and coping capacity (e.g., Mertz et al., 2009; Millner and Dietz, 2015)

This dissertation



General contribution

1. Exploring heterogeneous effects of shocks and livelihood-improving policies according to household level characteristics
2. Focusing on food security and nutrition as primary indicators of well-being
3. Broadening the evidence base on the relationship between forests and human welfare, while coupling forest & household data

Dissertation chapters

- **Chapter 1**: How do forests contribute to food security following a weather shock? Evidence from Malawi
  - Published in *World Development*
- **Chapter 2**: Forest co-management and poverty-environment traps
  - Joint work with Charles Palmer (LSE)
- **Chapter 3**: Women's empowerment, weather shocks, and child nutrition in sub-Saharan Africa
  - Joint work with Philippe Delacote (INRAE & CEC) and Julie Lochard (UPEC)

Chapter 1: How do forests contribute to food security following a weather shock? Evidence from Malawi

Published in *World Development*

Motivation & Research question

- **Motivation:**
  - Limited access of agricultural households to formal insurance mechanisms (e.g., Helgeson et al., 2013)
  - Potential ineffectiveness of informal social capital following a covariate shock (e.g., Wunder et al., 2014)

- **Research question:**

  What is the role of forests as a safety net for food security following a weather shock in light of potential alternative options?

Data & Methods

- **Data**
  - World Bank's Living Standards Measurement Study - Integrated Surveys on Agriculture (LSMS-ISA) for Malawi
    - Three survey rounds: 2010, 2013, and 2016
  - Multiscalar drought index - Standardized Precipitation and Evapostranspiration Index (SPEI)
  - % forest cover - NASA's Vegetation Continuous Fields (VCF)
- **Methods**
  - Linear model with high dimensional fixed effects
  - Heterogeneity analysis according to alternative insurance options

Results

- Forests represent an effective safety net for food security in the aftermath of a weather shock in Malawi
  - ... not only when no other alternatives are available
  - ... when considering both moderate and severe weather shocks
  - ... especially following a dry spell

- **Main implications:**

  - Dual challenge $\rightarrow$ Maintain forest access to vulnerable communities while promoting the sustainable management of forest resources

Chapter 2: Forest co-management and poverty-environment traps

Joint work with Charles Palmer

Motivation & Research question

- **Motivation:**
  - Over 1 billion people worldwide derive direct & indirect benefits from forests (Angelsen and Wunder, 2003; Angelsen et al. 2014; Wunder et al., 2014)
  - Widely adopted policy since the 1990's: **forest co-management**
    - ... but to date, mixed evidence on its effects on both poverty alleviation & forest outcomes (e.g., Angelsen and Jumbe, 2006; Gelo and Koch, 2014; Mazunda and Shively, 2015)

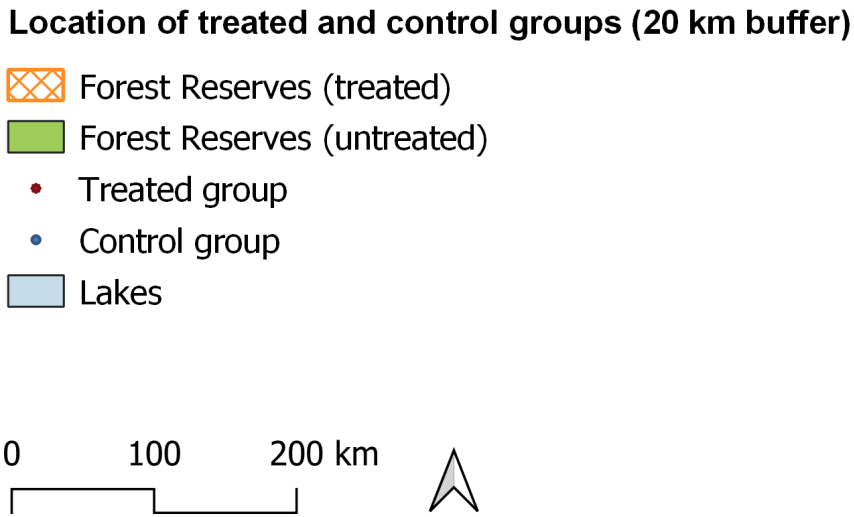
- **Research question:**

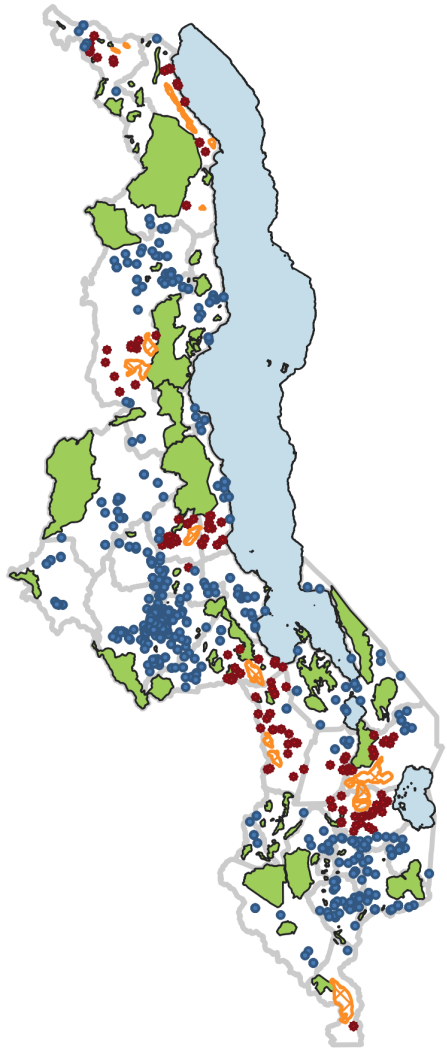
> To what extent did Malawi's national-scale co-management scheme reach its conservation & poverty goals at household scale?

Data & Methods

- **Data**
  - World Bank's LSMS-ISA for Malawi
    - Four survey rounds: 2010, 2013, 2016, and 2019
  - Forest Reserves data from Malawi's Forestry Department
  - Global Forest Change dataset by Hansen et al. (2013)
- **Methods**
  - Difference-in-differences combined with a Propensity Score Matching (PSM)
  - **Treated**: Households living in the vicinity of Forest Reserves under co-management
  - **Control**: Households living in the vicinity of Forest Reserves that are *not* under co-management

Location of treated and control group





Results

- Overall, poverty, measured via non-food expenditures, food security & assets, increases with co-management
  - ... but with little evidence of an impact on forest outcomes
  - ... effects especially concentrated among households with limited labor alternatives & a dependence on natural resources

- **Main implications:**

  Careful consideration of the:

  - Potential heterogeneous impacts of PFM according to the level of dependence on natural resources
  - Influence of the configuration of forest rights prior to PFM

Chapter 3: Women's empowerment, weather shocks, and child nutrition in sub-Saharan Africa

Joint work with Philippe Delacote & Julie Lochard

Motivation & Research question

- **Motivation:**
  - One-third of all children worldwide are at significant risk of heat-wave exposure (Rees, 2021)
  - Evidence of important influence of maternal education in protecting child nutrition in the event of shocks (e.g., Dimitrova and Muttarak, 2020)

- **Research question:**

  To what extent can increased levels of women's empowerment mitigate the negative impacts of heat on child nutrition?

Data & Methods

- **Data**
  - IPUMS-DHS data, children record
  - Across 25 countries in SSA
  - From 2000 to 2019
- **Methods**
  - Linear model with fixed effects
  - Unconditional quantile regression
  - Simple model of child nutrition and gender inequality at the household level

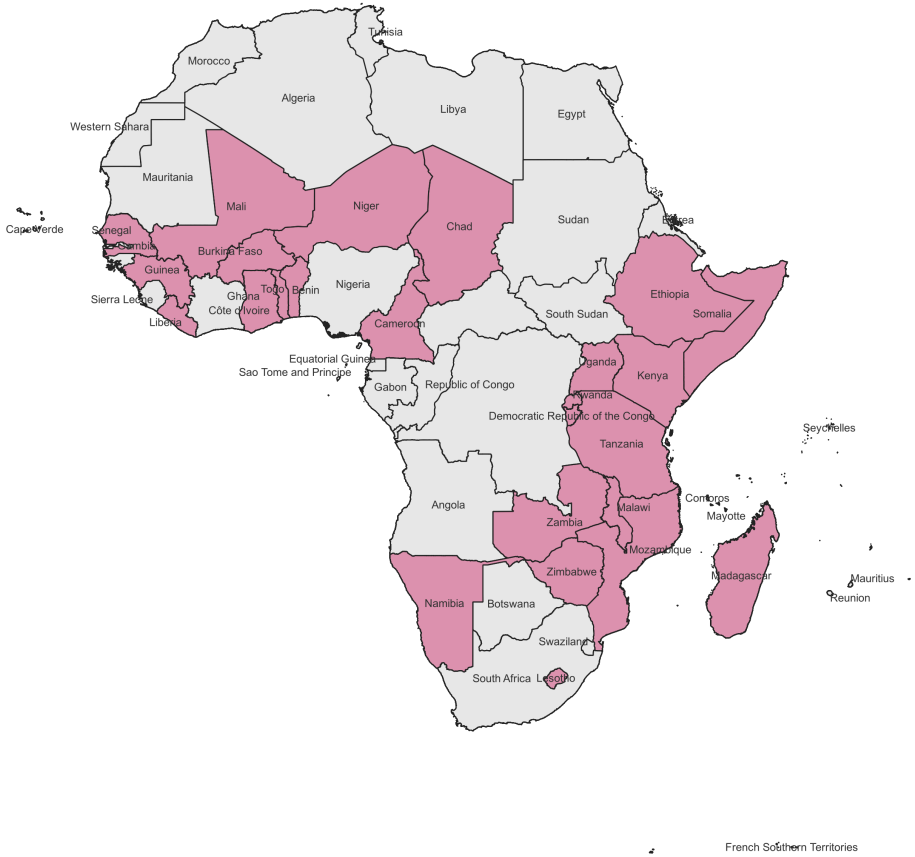


Figure 1: Areas of study

Results

- Recent heat exposure increases children's likelihood of suffering from malnutrition.
  - ... however, higher levels of decision making among women mitigate this effect
  - ... this mitigating role is especially pronounced among the most vulnerable children

- **Main implications:**
  - Need for nutrition interventions aimed at mitigating both the immediate & long-term impacts of climate change on children
  - Co-benefits of reaching more balanced gender roles

General conclusion

- Findings advocate for reflections on co-benefits within policy frameworks
- Role of policies & programs in addressing the unique needs of specific population sub-groups
- **Research perspectives**
  - How do past climate-related shocks affect forests' long-term capacity to provide a natural insurance?
  - Distinction between deforestation & forest degradation to more precisely measure impacts of natural resource dependence
  - Influence of the social, cultural, economic and political context on nutrition in the context of climate change

Thank you