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Global food security and food riots

An agent-based modelling approach

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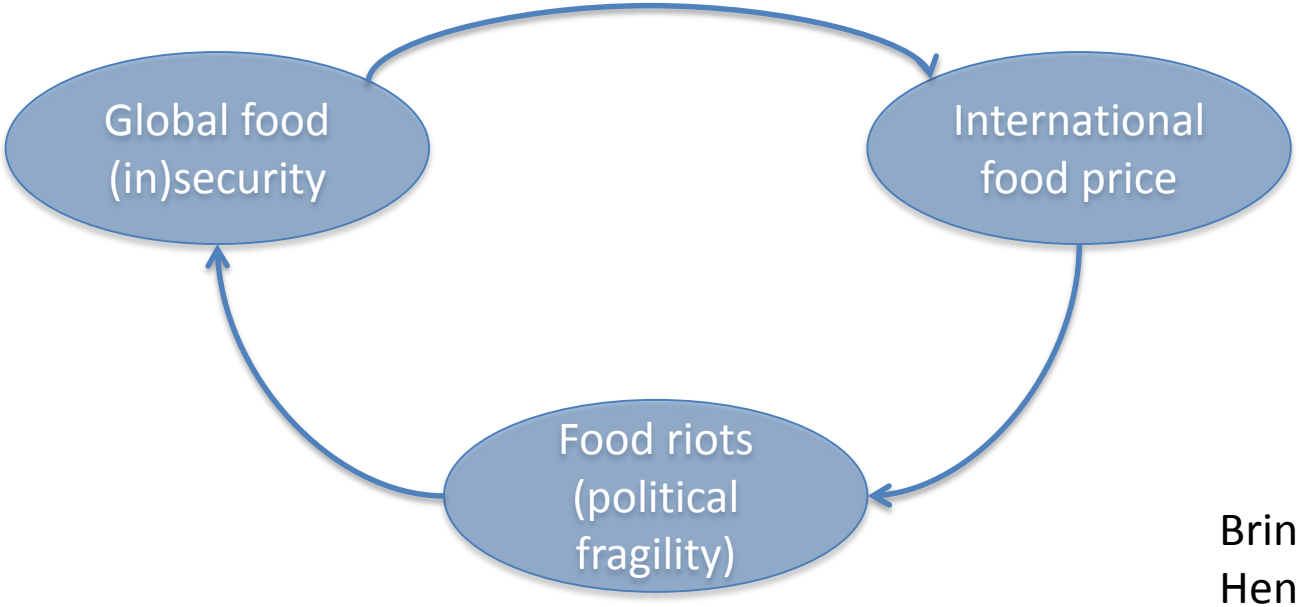
The vicious cycle between food (in)security, price and conflict



Brinkman, Hendrix 2011

Characteristics of the Dawe Global Security Model

- Aim

Investigate interrelationships between the scarcity of food, international food price, international trade of food and food riots

- Why Agent-Based Modelling?

Because ABM widely acknowledged as the best instrument to simulate socio-ecological systems (Gilbert 2008)

- Characteristics of the Dawe Global Security Model
  - Data-led approach, empirically grounded
  - Short-term forecasts for food riots (5 years)
  - Countries as agents (213 countries)
- How will the model be used?

Test possible consequences of production shocks in terms of food riots

Key components of the Dawe Global Security Model

- Food production and consumption

-> regression trend-lines based on FAO data for 1995 – 2011

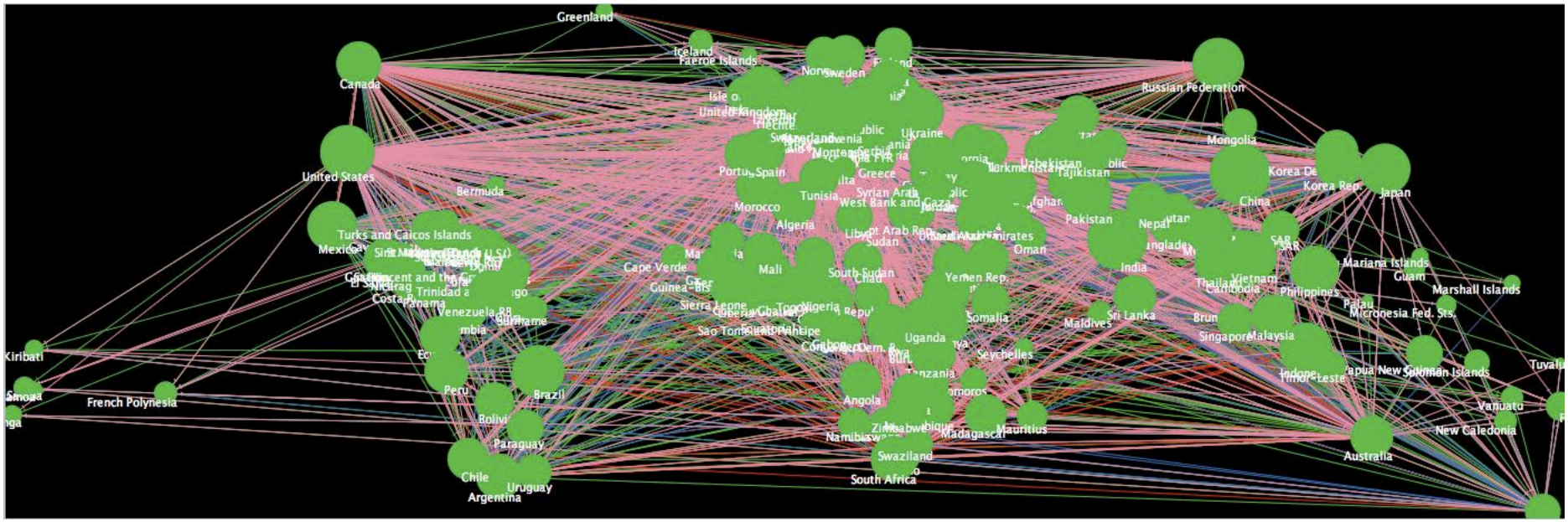
- International trade of food

-> real links between countries based on UN Comtrade database

- International Price of food (FAO Food Price Index)
- National political fragility (food riots)

International trade of food

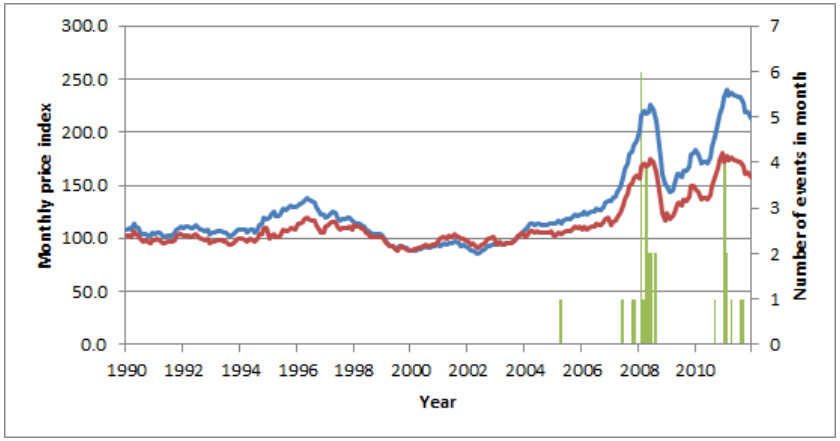
Based on real links between countries, data from UN Comtrade database

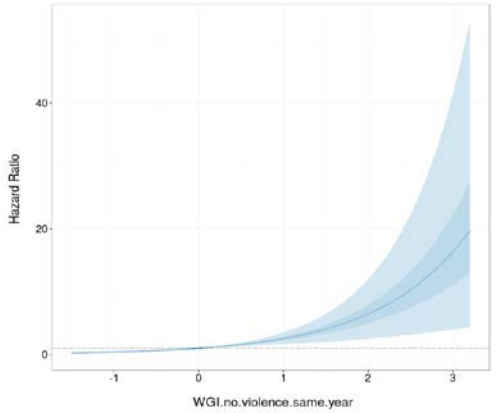


International price and food riots (update from Natalini et al. 2015)

- Clear positive relationship between FAO Food Price Index and occurrence of food riots
- Scarcity of food does not seem to have a significant effect on the occurrence of food riots
- Food riots are more likely to happen in countries that are already politically fragile (high WGI)
- Food riots more likely to happen when

  FAO FPI > 140

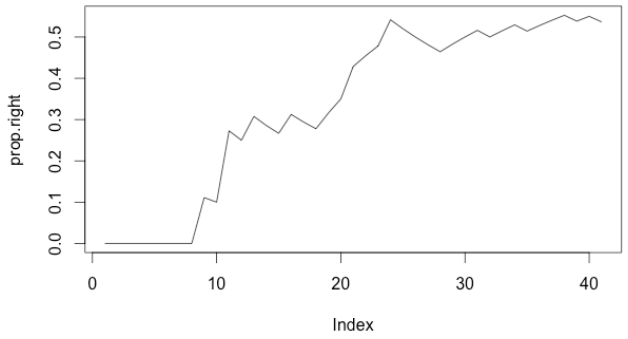




Global Food Security and Food Riots – An agent-based modelling approach
Natalini, Davide; Bravo, Giangiacomo; Jones, Aled; Phillips, Alexander

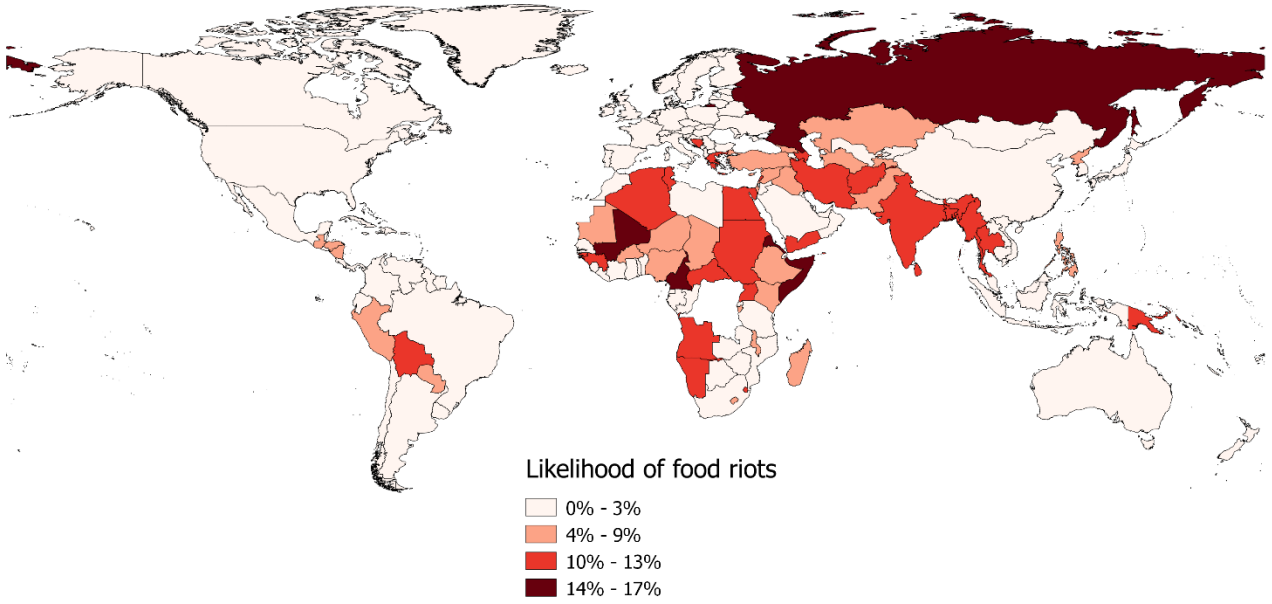
Validation of the model

- Validation on prices 2005 – 2013
  - the model recreates the prices (above/below the threshold) correctly
- Validation on food riots 2005 – 2013
  - Food riots per year
    - overestimation when FAO FPI < 140 (6% vs 2%)
    - underestimation when FAO FPI > 140 (17% vs 18%)
  - National food riots



2016 Forecast – El Niño Scenario

- Implementation based on the production shock scenario created by Lloyd's (2015)



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Further developments of the Dawe Global Security Model

- Introduction of fuel riots and interaction with food riots
- At the moment Agent-based modelling potential not fully exploited
- Introduction of national behaviours for production/consumption of natural resources
- Scenario testing

References

-Brinkman, H. and Hendrix, C.S., 2011. Food Insecurity and Violent Conflict: Causes, Consequences, and Addressing the Challenges. *World Food Prgramme*

-Gilbert, N., 2008. *Agent-based models.* Los Angeles: Sage Publications

-Lloyd's, 2015. *Food System Shock - The Insurance Impacts of acute disruption to global food supply.* London: Lloyd's

-Natalini, Jones and Bravo (2015) Quantitative Assessment of Political Fragility Indices and Food Prices as Indicators of Food Riots in Countries. *Sustainability*, 7, 4360-4385