Conclusion

Food Security Dynamics in the US, 2001-2017

Seungmin Lee Christopher B. Barrett John F. Hoddinott

Charles H. Dyson School of Applied Economics & Management, Cornell University

Online Agricultural and Resource Economics Seminar September 8, 2021

Cornell University

< □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □

Lee, Barrett, Hoddinott

Food Security Dynamics in the US

Background

- Food security "access by all people at all times to enough food for an active, healthy life" - is intrinsically important, as recognized in the Universal Declaration of Human Rights and elsewhere.
- Also instrumentally important, as food insecurity has long-lasting negative effects on individuals' well-being - e.g., on health (Gundersen and Ziliak, 2005), academic performance and social skills (Jyoti et al. 2005).
- This is a major issue in the US. In each year since 1995, at least 1 in 10 US households has been food insecure, w/sharp increases during the Great Recession and the COVID pandemic

◆□ ▶ ◆□ ▶ ◆ □ ▶ ◆ □ ▶ ◆ □ ▶

< □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □

Cornell University

Static vs. Dynamic Analysis

- Effective food security policy design and evaluation requires understanding dynamics, not just a (dated) static assessment.
- Just as with anti-poverty policy, assessing whether to intervene, how, and with whom turns on answers to key questions:
 - How many and how long will newly food insecure households likely remain food insecure?
 - Can we identify/target chronic FI separately from transitory FI?

Conclusion

Food Security Studies in the US

- Rely mainly on the Household Food Security Measure (HFSM)
 - USDA's official measure to estimate food security since 1995.
 - The basis for the FIES measure now used globally to assess Sustainable Development Goal 2 ("zero hunger") progress.
 - A discrete, ordinal measure assessed based on the number of questions households affirm to the Household Food Security Survey Module (HFSSM), esp. in the December CPS round.
- Important limitations to the HFSM:
 - No extended, nationally representative household panel data exist → best is Panel Study of Income Dynamics (PSID) w/ >6 obs/hh, in 2 triplets of 3 periods each w/gap from 2003-15.
 - Coarse, ordinal measure limits capacity to study within-category change in FI severity
- No good long-term estimates of US food security dynamics exist

Lee, Barrett, Hoddinott Food Security Dynamics in the US **Cornell University**

Conclusion

Introducing the Probability of Food Security (PFS)

- ► The Probability of Food Security (PFS) = estimated probability that hh food expenditures ≥ minimal cost of healthy diet, per USDA's Thrifty Food Plan (TFP) diet, reported monthly in USDA Cost of Food Reports.
- Adapt an econometric method (Cissé & Barrett, JDE 2018) used to study food security resilience in low-income world.
- Advantages of the PFS
 - Food expenditures data more often available in HH surveys than HFSM \rightarrow can use longer panels
 - Yields a continuous, decomposable measure in the Foster-Greer-Thorbecke (FGT 1984 EMTRA) tradition, enabling deeper study and groupwise decomposition of FI severity.

< □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □

Conclusion

Investigate US Food Security Dynamics Using PFS

- We apply the new PFS measure to investigate household-level food security dynamics in the US from 2001 and 2017 using PSID data.
- Two different approaches to study dynamics:
 - Spells approach to study transitions in food security status between survey waves. Study sequences of state transitions.
 - Permanent approach to decompose food insecurity into chronic and transitory components. Study full period average and period-specific deviations from mean.
- We also apply the PFS measure at sub-group level based on targetable household head characteristics such as gender, race, and educational attainment.

◆□ ▶ ◆□ ▶ ◆ □ ▶ ◆ □ ▶ ◆ □ ▶

Data

- We use Panel Study of Income Dynamics (PSID), a nationally representative hh panel survey, which included HFSM (1999-2003, 2015-2017).
- Tiehen et al. (2019) validated PSID as a credible data source for US food insecurity research.
- ► We use balanced panel ≈ 23,000 obs from ≈ 2,700 hhs over 9 biennial waves (2001-2017) since PSID began standardizing food expenditures aggregates Table

< □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □

Conclusion

PFS Construction (1)

1. Estimate the conditional mean of food expenditure per capita:

$$W_{ijt} = \sum_{\gamma=1}^{3} \pi_{\gamma} W_{ijt-1}^{\gamma} + \Lambda X_{it} + \omega_t + \theta_j + u_{ijt}$$
(1)

▶ *i*, *j*, *t*: household, state, year

W: Annual food expenditure per capita Model

- X: Household characteristics
- ω, θ : Year and state FE
- 2. Estimate the conditional variance of food expenditure:

$$E[\hat{u}_{ijt}^2] = E[\sum_{\gamma=1}^3 \rho_\gamma W_{ijt-1}^\gamma + \Omega X_{it} + \delta_t + \phi_j + \eta_{ijt}]$$
(2)

where \hat{u}_{iit}^2 is the squared residual series from (1).

Lee, Barrett, Hoddinott

< □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □

Cornell University

PFS Construction (2)

- 3. Construct household-period-specific food expenditure CDF(·) assuming $W_{ijt} \sim Gamma\left(\alpha, \beta\right)$ calibrating the parameters by the method of moments $\left(\alpha = \frac{\hat{W}_{ijt}^2}{\hat{\sigma}_{ijt}^2}, \beta = \frac{\hat{\sigma}_{ijt}^2}{\hat{W}_{ijt}}\right)$ where $\hat{\sigma}_{ijt}^2 = E[\hat{u}_{ijt}^2]$.
- 4. Define the PFS as $\hat{\rho}_{ijt} = 1 F\left(X_{ijt}, W_{ijt-1} | \underline{W}_{ijt}\right) \in [0, 1]$ where \underline{W}_{ijt} is the cost of the TFP diet (by period and hh composition).
- 5. HH *i* is food secure in *t* iff $\hat{\rho}_{it} \ge \underline{P_t}$, where we set $\underline{P_t}$ (probability threshold) to match sample-period-specific official FI prevalence from USDA/CPS; P_t in [0.55,0.60].

Conclusion

Household Dynamics - Spells Approach

Use hh-year-specific PFS to study dynamics by 2 different methods **1st Approach**

- Duration of unbroken sequence of HH FI observations.
- Hhs categorized based on FI status in consecutive waves.



- ► FI considered recurrent if persists ≥2 biennial waves
- > Yields spell length distribution, exit rates conditional on FI status.

< □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □

Conclusion 000

< □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □

Cornell University

Household Dynamics - Permanent Approach (1)

2nd Approach

- Based on mean intertemporal PFS (chronic) and deviation from mean (transient)
- Denote total (*TFI_i*) and chronic (*CFI_i*) from the PFS sequence of hh *i* and its chronic component:

$$TFI_{i}(\alpha, PFS_{i1}, ..., PFS_{it}) = \frac{1}{T} \sum_{t=1}^{T} \left(1 - \frac{\min(PFS_{it}, \underline{P_{t}})}{\underline{P_{t}}} \right)^{\alpha} \quad (3)$$

$$CFI_{i}(\alpha, PFS_{i1}, ..., PFS_{it}) = \left(1 - \min\left[1, \frac{\sum_{t=1}^{T} PFS_{it}}{\sum_{t=1}^{T} \underline{P}_{t}}\right]\right)^{\alpha} \quad (4)$$

 α is aversion parameter, as in FGT, permitting severity analysis

Conclusion

Household Dynamics - Permanent Approach (2)

- Households are classified into four categories.
 - 1. Persistently food insecure: $CFI_i > 0$ and $PFS_{it} < P_t \ \forall t$
 - 2. Chronically but not persistently food insecure: $CFI_i > 0$ and $\exists t$ such that $PFS_{it} \ge P_t$
 - 3. Transiently food insecure: $CFI_i = 0$ and $\exists t$ such that $PFS_{it} < \underline{P_t}$.
 - 4. Persistently food secure: $CFI_i = TFI_i = 0$
- Spells and permanent methods do not overlap perfectly households can be categorized as chronically food insecure under the one method but as transiently food insecure under the other.
- Tradeoffs: the permanent approach is less prone to measurement error and data truncation, but it assumes a stationary process.

◆□ ▶ ◆□ ▶ ◆ □ ▶ ◆ □ ▶ ◆ □ ▶

Groupwise Aggregation

Aggregate PFS over hhs to generate group-specific estimates.

$$FGT_t(\alpha, PFS_{1t}, ..., PFS_{Nt}) = \frac{1}{N} \sum_{i=1}^{N} \left(1 - \frac{\min(PFS_{it}, \underline{P_t})}{\underline{P_t}} \right)^{\alpha}$$
(5)

- We generate three indices headcount ratio (HCR), food insecurity gap (FIG) and squared food insecurity gap (SFIG) for α = 0, 1, 2, respectively.
- Decompose into groupwise measures based on race, gender and educational attainment of hh head.

< □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □

Validation of PFS

- PFS is strongly and positively correlated with the re-scaled USDA measure
 - ▶ Spearman's rank correlation/Kendall's τ are 0.31/0.25
 - Stronger association at lower range Reg Fit Dist
- There exists broad consistency of associational patterns between the two measures and household attributes.
 - Most covariates have the same sign estimates, with their directions conforming with the existing literature
- PFS provides a complement to the USDA official food security measure, useful especially for the study of dynamics.

◆□ ▶ ◆□ ▶ ◆ □ ▶ ◆ □ ▶ ◆ □ ▶

Conclusion 000

Spells Distribution and Conditional Persistence

Survey waves	Proportion	Conditional Persistence
(Years duration)		(Std.Error)
1 (1-4)	0.57	0.45 (0.02)
2 (3-6)	0.17	0.64 (0.03)
3 (5-8)	0.09	0.67 (0.04)
4 (7-10)	0.05	0.75 (0.05)
5 (9-12)	0.03	0.77 (0.04)
6 (11-14)	0.03	0.83 (0.05)
7 (13-16)	0.02	0.84 (0.05)
8 (15-18)	0.02	0.78 (0.05)
9 (17+)	0.03	

More than half of food insecurity spells (0.57) are transitory

Conditional persistence increases with spell length, i.e., the longer hhs remain food insecure, the less likely they exit.

イロト イヨト イヨト イヨト

Conclusion

Spell Length Conditional on the Start Year



 Business cycle manifest in food security ... Transience lowest (47.3%) in 2007, highest (66.3%) in 2013.

Lee, Barrett, Hoddinott Food Security Dynamics in the US ▶ 三| ᆿ ∽ ᠿ Cornell University

イロト イヨト イヨト イヨト

Conclusion 000

Transition in Food Security Status

N	Persistence*	Entry*
2,522	0.61	0.05
2,548	0.60	0.05
2,548	0.59	0.05
2,527	0.72	0.08
2,628	0.60	0.07
2,615	0.61	0.06
2,607	0.53	0.06
2,602	0.51	0.06
16,100	0.53	0.04
4,497	0.65	0.13
13,896	0.55	0.05
6,701	0.67	0.14
2,927	0.67	0.18
7,181	0.60	0.09
5,167	0.54	0.05
6,322	0.52	0.03
	N 2,522 2,548 2,548 2,527 2,628 2,615 2,607 2,602 16,100 4,497 13,896 6,701 2,927 7,181 5,167 6,322	N Persistence* 2,522 0.61 2,548 0.60 2,548 0.59 2,527 0.72 2,628 0.60 2,615 0.61 2,602 0.51 16,100 0.53 4,497 0.65 13,896 0.55 6,701 0.67 7,181 0.60 5,167 0.54 6,322 0.52

 Entry and persistence both higher during Great Recession and among hhs w/female, non-white, or poorly educated heads

Lee, Barrett, Hoddinott

Cornell University

Empirical Strateg

Results

Conclusion

Persistence and Entry by Year



Prevalence, entry, persistence peak during Great Recession

▶ 클|ᆿ ∽९... Cornell University

イロト イヨト イヨト イヨト

Conclusion

Persistence and Entry by Demographic Group



- Share of newly food insecure hhs increased 40% during Great Recession, o/w 41% was hhs whose head is female without a college education (representing just 10% of pop).
- Most FI groups also most persistent, so stable entry rate around Great Recession

I DOG

Conclusion

Chronic Food Insecurity - Permanent Approach

		(1)	(2)	(3)	(4)	(5)	(6)	(7)
	N	TFI	CFI	(CFI/TFI)	Ch	ronic FI	Transient FI	Never FI
					Persistent	Not persistent		
Total	23,301	0.126	0.091	0.726	0.014	0.077	0.244	0.665
Gender								
Male	18,176	0.086	0.049	0.574	0.006	0.044	0.228	0.723
Female	5,125	0.266	0.240	0.900	0.044	0.196	0.299	0.461
Race								
White	15,692	0.095	0.058	0.609	0.008	0.050	0.231	0.711
Non-White	7,609	0.307	0.288	0.940	0.053	0.236	0.318	0.394
Education								
Less than HS	2,687	0.363	0.322	0.888	0.088	0.234	0.403	0.275
High school	8,430	0.161	0.115	0.713	0.011	0.103	0.318	0.567
Some college	5,680	0.091	0.062	0.684	0.007	0.055	0.217	0.721
College	6,504	0.055	0.029	0.525	0.003	0.026	0.150	0.821

- 2/3 hhs overall never food insecure. But most hhs w/female, non-White, or no HS heads experience food insecurity in ≥ 1 year.
- Among hhs that suffer FI, 73% of FI experience is chronic.
- Most vulnerable (highest TFI) groups have much higher CFI/TFI (90-95%)

◆□ ▶ ◆□ ▶ ◆ □ ▶ ◆ □ ▶ ◆ □ ▶

Conclusion 000

Decomposing Variation in TFI/CFI

Are there mainly food insecure people or food insecure places?

	TFI		(CFI
	R^2	%	R^2	%
Region	0.032	0.058	0.022	0.052
Education	0.055	0.098	0.038	0.090
Age	0.005	0.010	0.003	0.008
Gender	0.052	0.092	0.048	0.114
Race	0.083	0.147	0.049	0.115
Marital status	0.029	0.052	0.023	0.054
ln(income per capita)	0.143	0.255	0.101	0.238
Food Assistance (SNAP, WIC, etc.)	0.096	0.171	0.090	0.212
Others	0.063	0.112	0.049	0.115
Total	0.559	0.996	0.424	0.996

Regional fixed effects capture merely 5-6% of variation.

• Hh income and food assistance program participation capture \approx 1/2 of variation ... budget constraints the best FI predictors.

= 900

Empirical Strategy

Results 000000000000 Conclusion 000

Groupwise Food Insecurity Prevalence and Severity



 Vast groupwise gaps - HCR/SFIG of most FI groups (POC, women, no high school education) is 15/33 x that of most FS group (white, men, college grads).

HCR and SFIG strongly, positively correlated, but higher HCR does not imply higher SFIG. E - O O O

Lee, Barrett, Hoddinott Cornell University
Food Security Dynamics in the US

Food Insecurity by Group and Year



HCR surge from 2007-9 mostly driven by white-headed hhs (pprox 86% of the increase).

- The proportional increase during GR as well as post-GR recovery was much greater in severity (SFIG) than in prevalence.
- The most FI hhs comprise 4% of sample but account for a plurality of the increase in severity during the Great Recession (27%) and 11% of the recovery between 2013 to 2017.

Lee, Barrett, Hoddinott Food Security Dynamics in the US **Cornell University**

Pre-, During and Post-Great Recession FI By Group

2003	2011	2017
0.54	0.58	0.49
0.29	0.30	0.28
0.25	0.33	0.33
0.11	0.15	0.14
0.32	0.42	0.28
0.10	0.15	0.07
0.13	0.12	0.11
0.02	0.07	0.04
0.11	0.15	0.12
	2003 0.54 0.29 0.25 0.11 0.32 0.10 0.13 0.02 0.11	2003 2011 0.54 0.58 0.29 0.30 0.25 0.33 0.11 0.15 0.32 0.42 0.10 0.15 0.13 0.12 0.02 0.07 0.11 0.15

- The most FI groups in 2003 became less food insecure in 2017 relative to 2003 - while remaining the most FI - while the most FS in 2003 became less food secure in 2017
- Households with higher educational attainment were more likely to become food insecure during the GR but also quickly recovered

Summary

- More than half of food insecurity episodes are short-term, just a single biennial PSID wave.
- ► FI persistence + (-) correlated with spell length (business cycle).
- 2/3 of households never experience food insecurity, but nearly 3/4 of the food insecurity experience is chronic.
- Household budget constraints are the best food insecurity predictors, w/ modest spatial variation
- Race/Gender/Educational correlation w/income results in huge groupwise differences in FI, both in prevalence and in severity.

◆□ ▶ ◆□ ▶ ◆ □ ▶ ◆ □ ▶ ◆ □ ▶

Future Research

Important limitations to this study:

- We excluded:
 - recent immigrant populations
 - hhs whose heads changed, although reasons for changes e.g., divorce, death - may be correlated w/ hh FS status.
 - new households that split from original households.
- Do not take PFS back to start of PSID (1968)
- No causal estimates of the effects of safety net programs (e.g., SNAP, WIC) on FS dynamics

A nice agenda for future research!

Cornell University

< □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □

Conclusion

Thank you

Questions and/or comments are highly appreciated.

- Seungmin Lee (sl3235@cornell.edu)
- Chris Barrett (cbb2@cornell.edu)
- John Hoddinott (jfh246@cornell.edu)

Lee, Barrett, Hoddinott Food Security Dynamics in the US **Cornell University**

< □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □

Summary Statistics

Back

	Total		SR	С	SE	0
	mean	sd	mean	sd	mean	sd
Household Head						
Age	56.04	13.69	56.26	12.24	53.06	24.03
Race			\frown			
White	0.86	0.35	0.92	0.24	0.01	0.21
Non-White	0.14	0.35	0.08	0.24	0.99	0.21
Married	0.62	0.48	0.64	0.42	0.31	0.91
Female	0.22	0.41	0.20	0.35	0.50	0.98
Highest educational degree						
Less than high school	0.08	0.26	0.07	0.22	0.20	0.78
High school	0.31	0.46	0.30	0.41	0.39	0.96
Some college	0.25	0.43	0.25	0.38	0.27	0.87
College	0.37	0.48	0.38	0.43	0.14	0.68
Employed	0.66	0.47	0.66	0.42	0.58	0.97
Disabled	0.19	0.39	0.18	0.34	0.23	0.83
Mental problem	0.08	0.26	0.08	0.23	0.07	0.50
Household	00.50	00.47	10.07	07.07	C 1 1 -	05.40
Income per capita	39.58	30.47	40.87	27.36	21.4/	35.40
Food expenditure per capita	3.65	2.07	3.72	1.85	2./1	3.36
Family size	2.30	1.27	2.30	1.12	2.31	2.82
% of children	0.11	0.20	0.11	0.18	0.16	0.48
Food Assistance	0.05	0.00		0.40		0.00
SNAP/food stamp	0.05	0.22	0.04	0.18	0.22	0.82
Child meal	0.05	0.21	0.03	0.16	0.19	0.77
N	23,4	403	17,2	68	6,1	35

Lee, Barrett, Hoddinott

Food Security Dynamics in the US

Cornell University

◆□ > < @ > < E > < E > < E = < 0 < 0</p>

Model Selection

Back

	(1)	(2)	(3)	(4)	(5)
Variables	W _{ijt}	W _{ijt}	W _{ijt}	W _{ijt}	W_{ijt}
W_{iit-1}	131.8***	246.7***	278.3***	248.0***	75.82
5	(3.29)	(9.73)	(23.21)	(50.69)	(90.31)
W_{iit-1}^2		-11.93***	-19.28***	-7.347	93.03**
		(0.81)	(4.41)	(16.35)	(42.37)
W_{iit-1}^3			0.469*	-1.250	-25.29***
ijt i			(0.26)	(2.11)	(8.92)
W_{iit-1}^4				0.0802	2.560***
ijt i				(0.09)	(0.85)
W_{iit-1}^{5}					-0.0911***
iji-1					(0.03)
Controls	Y	Y	Y	Y	Y
Fixed Effects	Y	Y	Y	Y	Y
AIC	99.83	99.74	99.74	99.74	99.73

Lee, Barrett, Hoddinott

Food Security Dynamics in the US

Cornell University

ショック 単則 スポットポット 白マ

0000000

Cut-off PFS

Back



Lee, Barrett, Hoddinott

Food Security Dynamics in the US

▶ 重⊫ ∽へへ Cornell University

Regression of the PFS on USDA measure

Back

	(1)	(2)	(3)	(4)
	HFSM	HFSM	HFSM	HFSM
PFS	0.158***	0.265***	0.162***	0.236**
	(0.02)	(0.09)	(0.02)	(0.09)
PFS ²		-0.0746		-0.0520
		(0.06)		(0.06)
Fixed Effects	N	Ν	Y	Y
Ν	10,378	10,378	10,378	10,378
R^2	0.062	0.062	0.081	0.082

Cornell University

◆□ > < @ > < E > < E > < E = < 0 < 0</p>

Lee, Barrett, Hoddinott

Food Security Dynamics in the US

Scatterplot and Fitted Line

Back



Lee, Barrett, Hoddinott

Cornell University

三日 のへの

Food Security Dynamics in the US

Distribution of Food Security Measures

Back



PFS has smoother distribution

Lee, Barrett, Hoddinott Food Security Dynamics in the US ▶ 클|ᆿ ∽९... Cornell University

(日)

Association with Household Attributes

Back

	(1)	(2)	(2)	(4)
	(1)	(2)	(3)	(4)
	HFSM [†]	PFS	HFSM	PFS
	b/se	b/se	b/se	b/se
Age	-0.001 (0.00)	0.008*** (0.00)	-0.001 (0.00)	0.006*** (0.00)
Age ² /1000	0.019*** (0.01)	-0.069*** (0.01)	0.018*** (0.01)	-0.053*** (0.02)
Non-White	-0.006 (0.01)	-0.055*** (0.01)	-0.005 (0.01)	-0.064*** (0.01)
Married	0.008 (0.01)	0.043*** (0.01)	0.008 (0.01)	0.087*** (0.01)
Female	-0.008 (0.01)	-0.061*** (0.01)	-0.009 (0.01)	-0.087*** (0.01)
In(income per capita)	0.024*** (0.01)	0.094*** (0.00)	0.025*** (0.01)	0.102*** (0.01)
Disabled	-0.039*** (0.01)	-0.029*** (0.01)	-0.038*** (0.01)	-0.018 (0.02)
Mental problem	-0.040*** (0.01)	0.001 (0.01)	-0.041*** (0.01)	0.022 (0.02)
Employed	0.007 (0.01)	-0.006 (0.01)	0.007 (0.01)	0.015 (0.01)
Family size	0.003 (0.00)	-0.047*** (0.00)	0.003 (0.00)	-0.071*** (0.01)
% of children	0.043*** (0.01)	0.105*** (0.01)	0.043*** (0.01)	0.194*** (0.03)
Less than high school	-0.023** (0.01)	-0.024*** (0.01)	-0.022** (0.01)	-0.036 (0.02)
Some college	0.002 (0.01)	0.035*** (0.01)	0.002 (0.01)	0.047*** (0.01)
College	-0.001 (0.01)	0.040*** (0.01)	0.000 (0.01)	0.025** (0.01)
Food stamp/SNAP	-0.103*** (0.02)	-0.059*** (0.01)	-0.100*** (0.02)	-0.176*** (0.03)
Child meal	-0.028* (0.01)	-0.022** (0.01)	-0.027** (0.01)	-0.126*** (0.03)
Change in status	Y	Y	Y	Y
Wave FE	Y	Y	Y	Y
Region FE	N	N	Y	Y
N	10,378	10,378	10,378	10,378
R ²	0.211	0.516	0.219	0.302

Lee, Barrett, Hoddinott

Cornell University

Food Security Dynamics in the US

Spatial Variation of TFI/CFI

Back



Midwestern states exhibits significantly higher TFI/CFI

<ロ ▶ < 部 ▶ < 臣 ▶ < 臣 ▶ 王 ⊃ Q @ Cornell University

Lee, Barrett, Hoddinott

Food Security Dynamics in the US