



Rising Food Prices and Undernourishment.
A Cross-Country Inquiry
by
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Rising Food Prices and Undernourishment. A Cross-Country Inquiry

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Agricultural Development Economics Division

ESA



Presentation Roadmap

- Use of Household Surveys for Food Security Analysis
- Food security profile of selected countries
- Food price simulation approach
- Food demand: What we know and what we do not.
- Simulation Results
- Determinants of Food insecurity and vulnerability

The use of household surveys for Food Security Analysis

- The survey must include all sources of food: purchased, produced, received as gift or payment, and consumed away from home.
- Must include all relevant items (30-100 depending on diets): underreporting vs. “diary exhaustion”
- Must have an adequate recall period: “telescoping” vs. recall error.
- Actual consumption preferred over acquisition.

Main Methodological Choices

- Dietary threshold. We choose MDER in an effort to minimize Type I statistical error.
 - \leq MDER \rightarrow Undernourished
 - $>$ MDER and \leq ADER \rightarrow Vulnerable*
- Unresolved underlying issues:
 - Intra household distribution of food
 - Observed BMIs vs. potential BMIs
 - Weather

Table 1. Characteristics of Food Modules in the Household Surveys Used

Country	Year	Acquisition / Consumption	Recall Period	Reference Period	Food Items	Sources of Food Included [†]
Bangladesh	2000	Consumption	1 Day [§]	1 Day	135	P; O; GP; A
Guatemala	2000	Acquisition	1 year	1 Month	99	P; O; GP; A
Kenya	2005	Consumption	7 Days	7 Days	157	P; O; GP; A
Malawi	2004	Consumption	7 Days	7 Days	112	P; O; GP; A
Nepal	2003	Consumption	1 Year	Typical Month	65	P; O; GP; A
Tajikistan	2003	Consumption	7 Days	7 Days	32	P; O; GP; A
Vietnam	2002	Acquisition	1 Year	Average Month [‡]	57	P; O; GP; A

Notes: † Sources of food are: Purchased (P); From Own Production (O); Received as Gift or Payment (GP); and Eaten Away From Home (A).

§ Diary method. 119 items are measured daily (4 times in a 2 week period) and 18 less frequently consumed items are measured weekly.

‡ Includes consumption during main annual holidays.

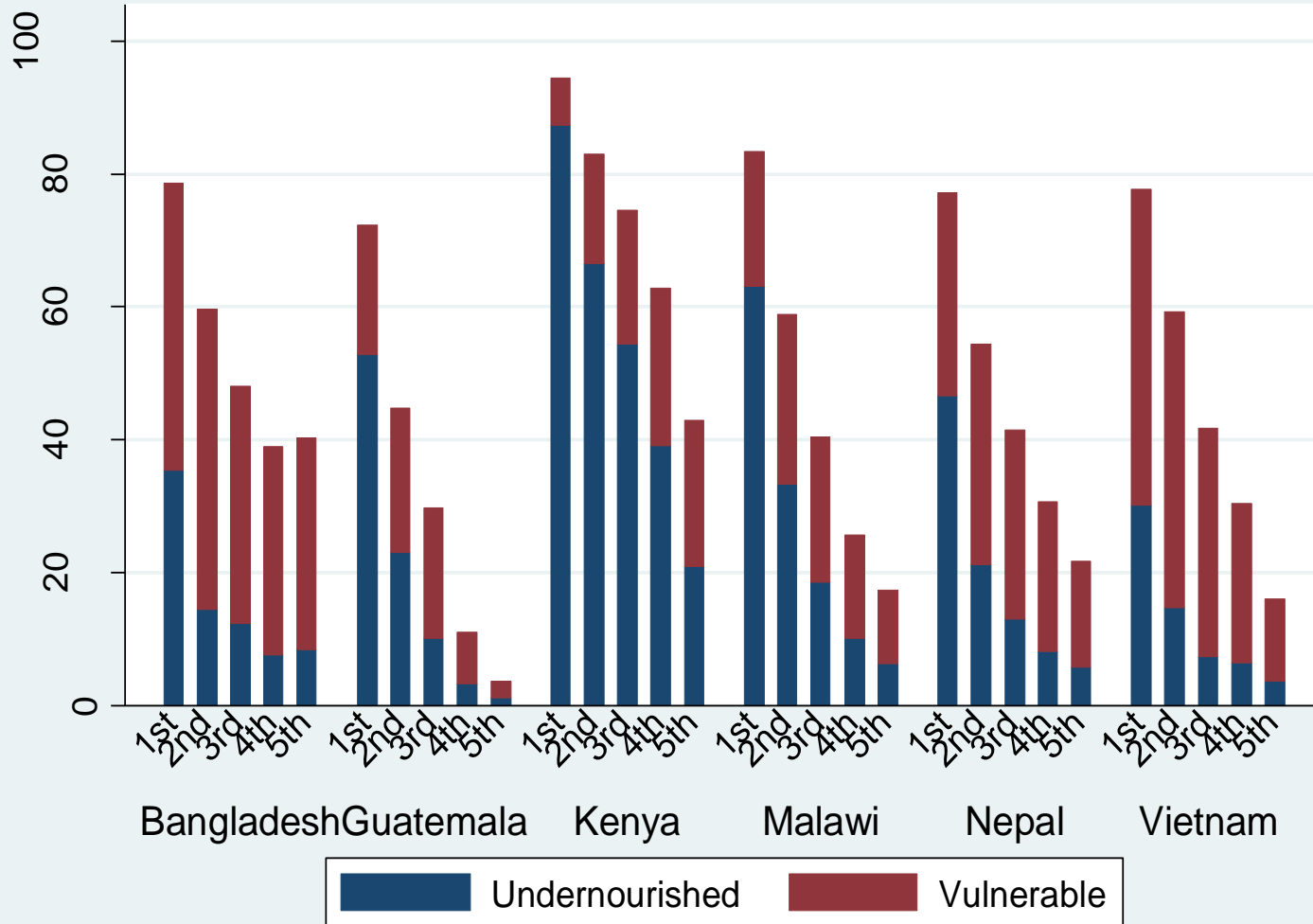
Food Security Profile

Table 4. Poverty and Food Security Indicators.

Country	Year	GDP per capita [†]	Poverty Headcount [‡]	Under- nourishment [‡]	Vulnerability [‡]	Dietary Energy Thresholds [§]	
						MDER	ADER
Bangladesh	2000	901	49.8	15.6	38.2	1,720	2,158
Guatemala	2000	3,966	56.2	18.1	14.2	1,622	2,015
Kenya	2005	1,346	45.8	53.7	17.9	1,728	2,163
Malawi	2004	650	52.4	26.3	19.0	1,678	2,088
Nepal	2003	926	30.8	19.0	26.8	1,702	2,138
Tajikistan	2003	1,402	83.1	16.8	17.0	1,840	2,315
Vietnam	2002	1,780	28.9	12.5	31.5	1,789	2,278

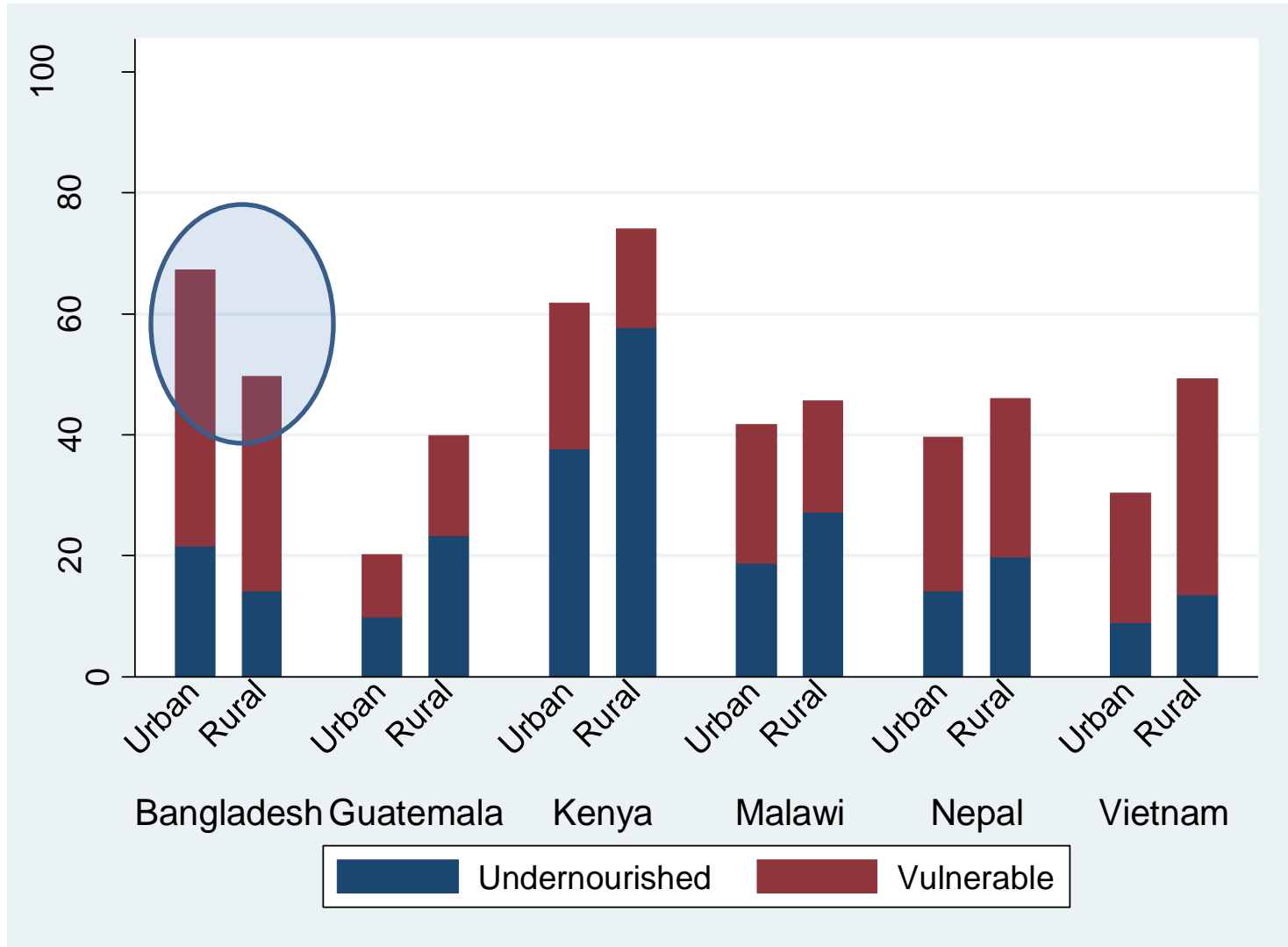
Notes: [†] In per-capita international dollars of 2005. [‡] % of population. ^{*} From World Bank Poverty Assessments using the same surveys this study uses. [§] In kilocalories per capita per day.

Food Security Profile



Note: National quintiles based on weighted per capita expenditure

Food Security Profile



Food Price Simulation Methodology

(1)

$$TC = \sum_j c_j \cdot x_j(\mathbf{p}, y)$$

Total Caloric Consumption = SUM (Conversion Factor * Quantity Consumed)

(2)

$$dTC = \sum_j c_j \cdot dx_j(\mathbf{p}, y)$$

(3)

$$dx_j = \frac{\partial x_j(\mathbf{p}, y)}{\partial p_i} \cdot dp_i + \frac{\partial x_j(\mathbf{p}, y)}{\partial y} \cdot \frac{\partial y}{\partial p_i} \cdot dp_i$$

Where Income: $y = \sum_i p_i y_i \Rightarrow \frac{\partial y}{\partial p_i} = y_i$

Food Price Simulation Methodology

$$(3)' \quad \frac{dx_j(\mathbf{p}, y)}{x_j} = \frac{dp_i}{p_i} \cdot [\varepsilon_{ji} + \alpha_i \eta_j]$$

% Change Consumption of (j)	=	% Change price of (i) *	Own or cross- price elasticity	+	share of (i) in income * Income Elasticity of (j)
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$$(4) \quad \frac{dTC}{TC} = \frac{dp_i}{p_i} \sum_j \beta_j \cdot [\varepsilon_{ji} + \alpha_i \eta_j]$$

Where β_j is the share of good (j) in total caloric consumption.

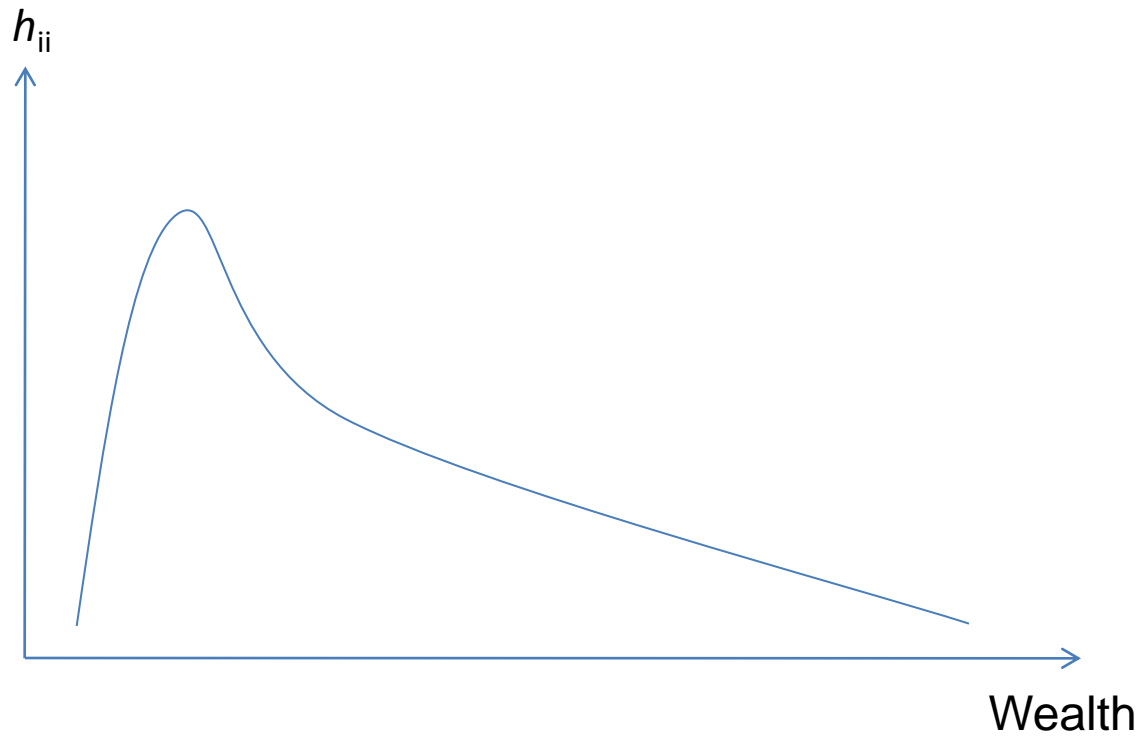
What we do and do not know about Food Demand

- Engel's law
- Related to Engels law, it is observed that food demand income elasticity falls with wealth.
- Slutsky Equation: $\varepsilon_{ii} = h_{ii} - \alpha_i \cdot \eta_i$
- If both income elasticity, and the food share (α) fall with income $\rightarrow \varepsilon_{ii}$ falls with income if compensated elasticity is constant.
- Timmer (1981) compensated elasticities fall with income.

What we do and do not know about Food Demand

- However it is not uncommon to observe that the poorest groups have lower own-price elasticities (compensated and marshallian) than middle income groups. (Cf. Alderman 1986, Zanias and Gunjal 2008)
- Elasticities from food expenditure surveys overestimate price elasticities (by a lot, Bouis 1994). Time series studies underestimate price elasticities.

Compensated Price Elasticities and Wealth



Elasticities used in this study

- We use elasticities from one cross-country study on food demand, Seale et al. 2003. This provides comparable, “conservative” estimates, while consistent with what is found in the literature.
- We use income elasticities by expenditure deciles in each country and national level price elasticities.

$$\eta_{ji} = \alpha_i + \beta_i \ln(\text{GDP[PPP]/N})_j + u_{ji}$$

	1.45	-0.125	
	(0.03)	(0.0036)	

Cross price elasticities

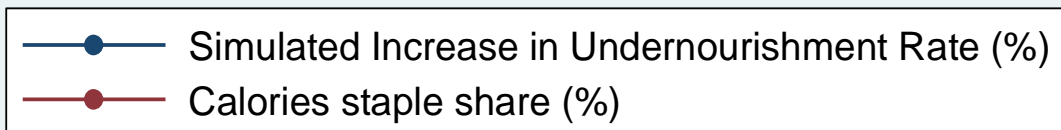
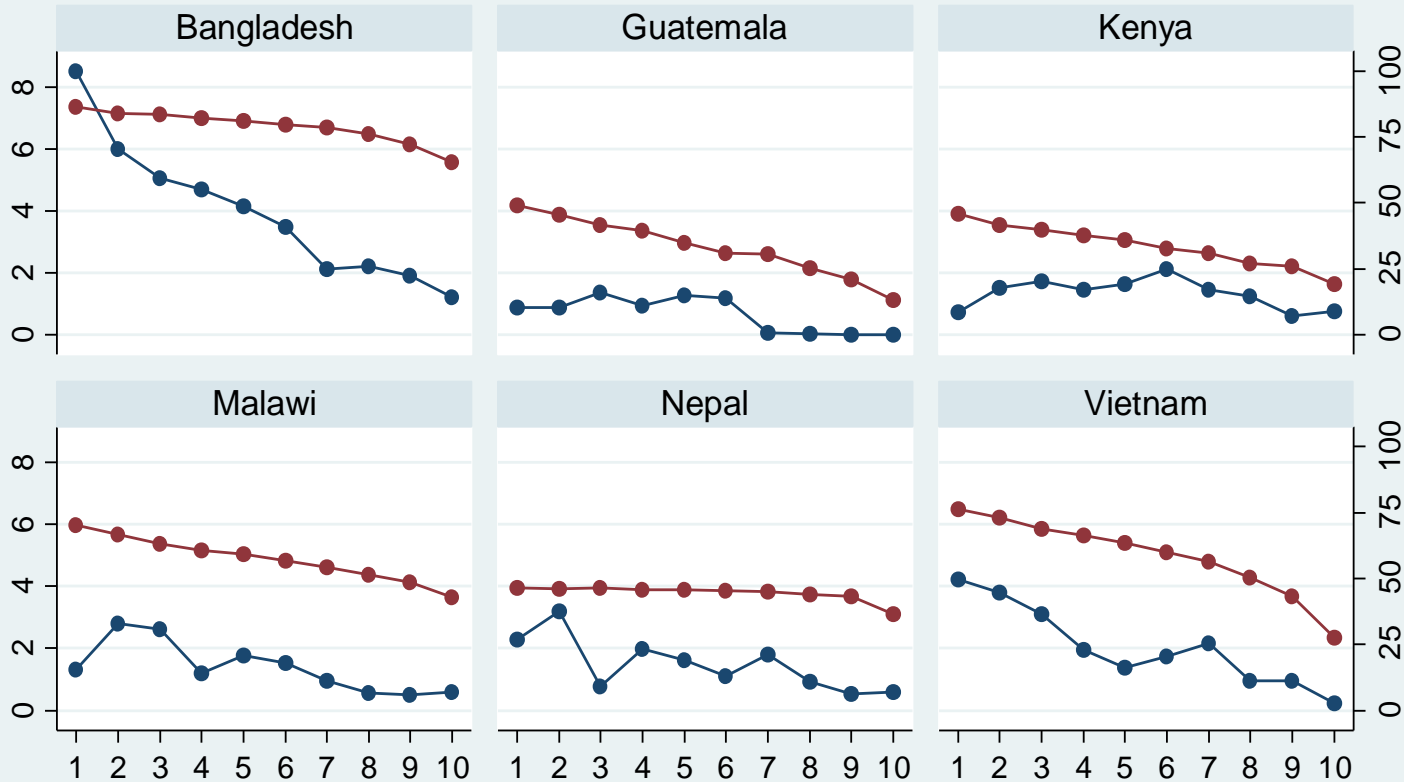
Table 3 Food Expenditure and Demand elasticities in Malawi.

Food Group	Household Expenditure ^{†1}	Total Budget Shares ¹ (%)	Prices ¹	Elasticities ²		Elasticities With Respect to Cereals ³	
				Own-price	Income	Hicksian	Marshallian
Cereals/ Bread	75.12	10.39	0.606	-0.479	0.592	-0.418	-0.479
Meat	1.82	0.25	1.607	-0.670	0.828	0.042	-0.046
Fish	0.49	0.07	0.978	-0.801	0.991	0.050	-0.055
Dairy	4.17	0.58	0.930	-0.748	0.925	0.047	-0.052
Oils/Fats	0.97	0.13	0.868	-0.490	0.606	0.031	-0.034
Fruits/Vegetables	8.83	1.22	2.883	-0.551	0.681	0.035	-0.038
Other Food	72.07	9.97	1.031	-0.667	0.825	0.042	-0.046
Beverages/Tobacco	16.44	2.27	1.859	-1.243	1.538	0.078	-0.086

Sources: 1. Authors' calculations using basic heading PPP data from the 2005 round of the World Bank ICP project. 2. Seale et al. 3. Authors' calculations.

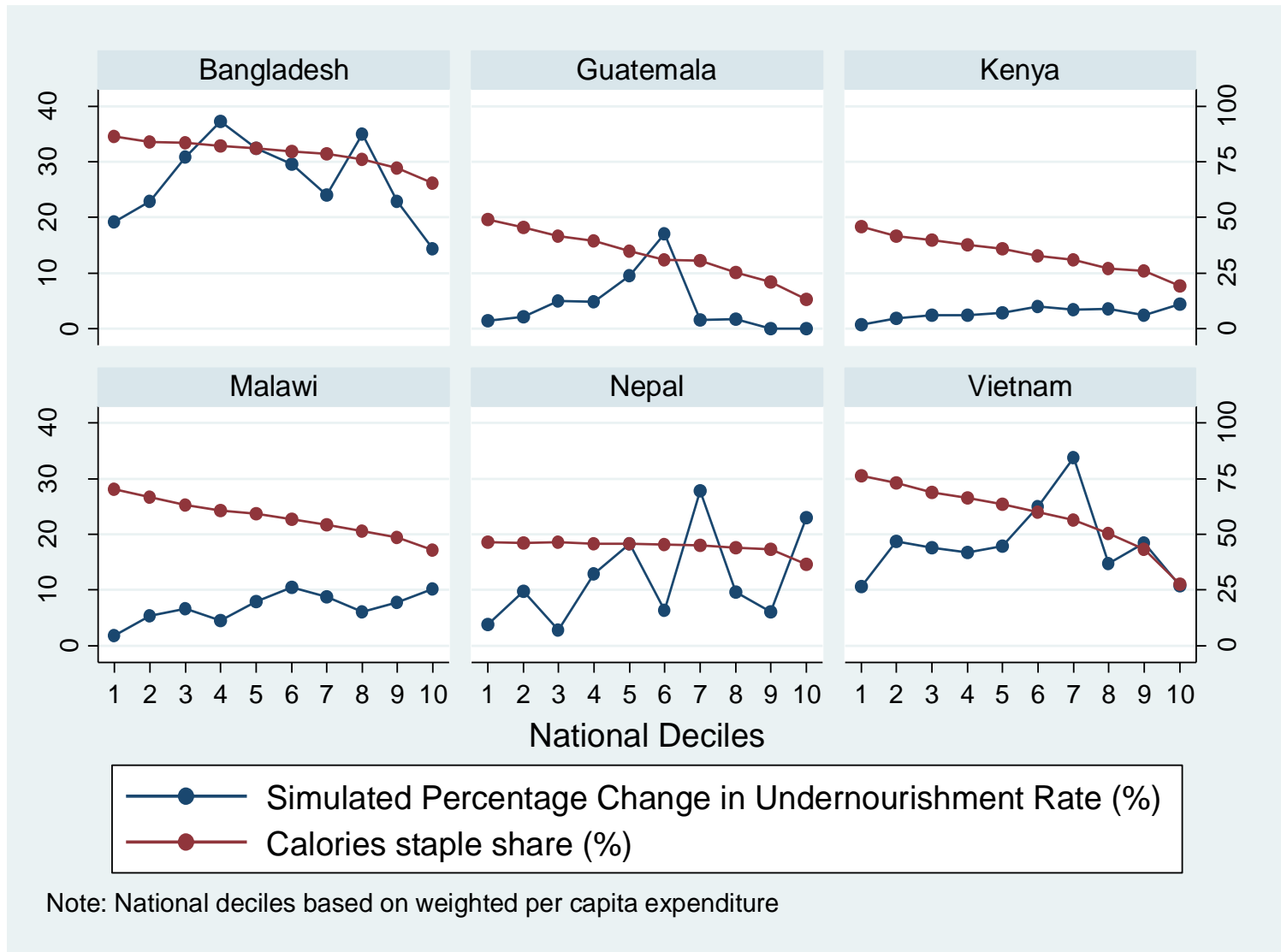
Notes: † In per-capita international dollars of 2005 per annum.

Results of Food Price Simulations



Note: National deciles based on weighted per capita expenditure

Results of Food Price Simulations



Results of Food Price Simulations

- In general the highest increase in undernourishment is observed in the poorest urban quintiles (5/6 countries).
- The correlation between welfare levels and increase in undernourishments is not as clear.

Undernourishment outcome depends chiefly on:

- Dietary patterns: the relative importance of the staple in total dietary energy (negatively correlated with welfare).
- The distribution of staple-farm income (not correlated with welfare).
- The concentration of individuals around the dietary threshold (not correlated with welfare).

Results of Food Price Simulations

- A rapid appraisal of the vulnerability of a country to higher staple prices can be done by looking at:
 - Dietary dependence on the staple (Food balance sheets).
 - Distribution of farm income (agricultural census or household-farm survey)

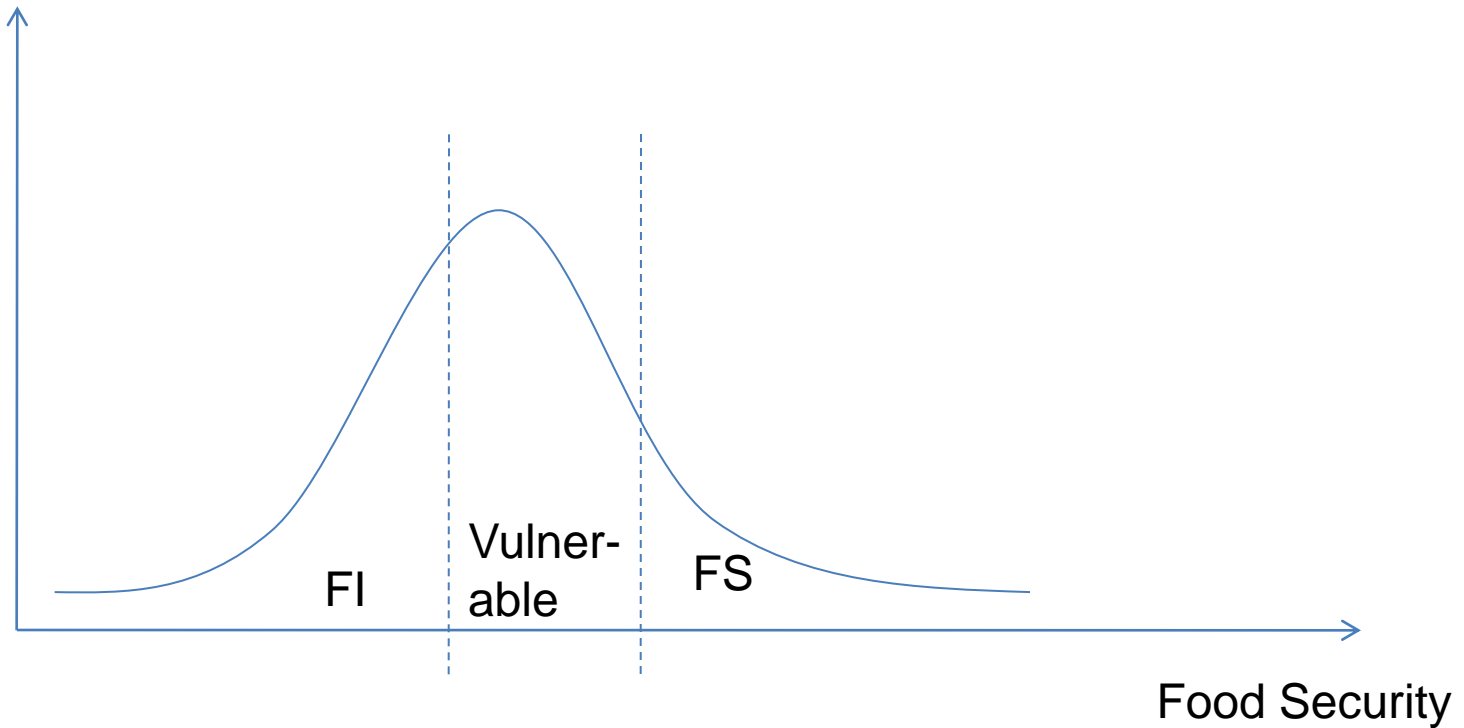
Determinants of FS and Vulnerability

- For each country we estimate an ordered logit/probit equation:
- $\Pr(\text{FS}=j) = f(\text{demographics, wealth, infrastructure, agriculture, other controls})$.
- $j=\{0,1,2\}=\{\text{Food Insecure, Vulnerable}^*, \text{Food Secure}\}$
- Demographics: Age of head (linear and squared), household size, share children < 15, share old >60, female head, average education.

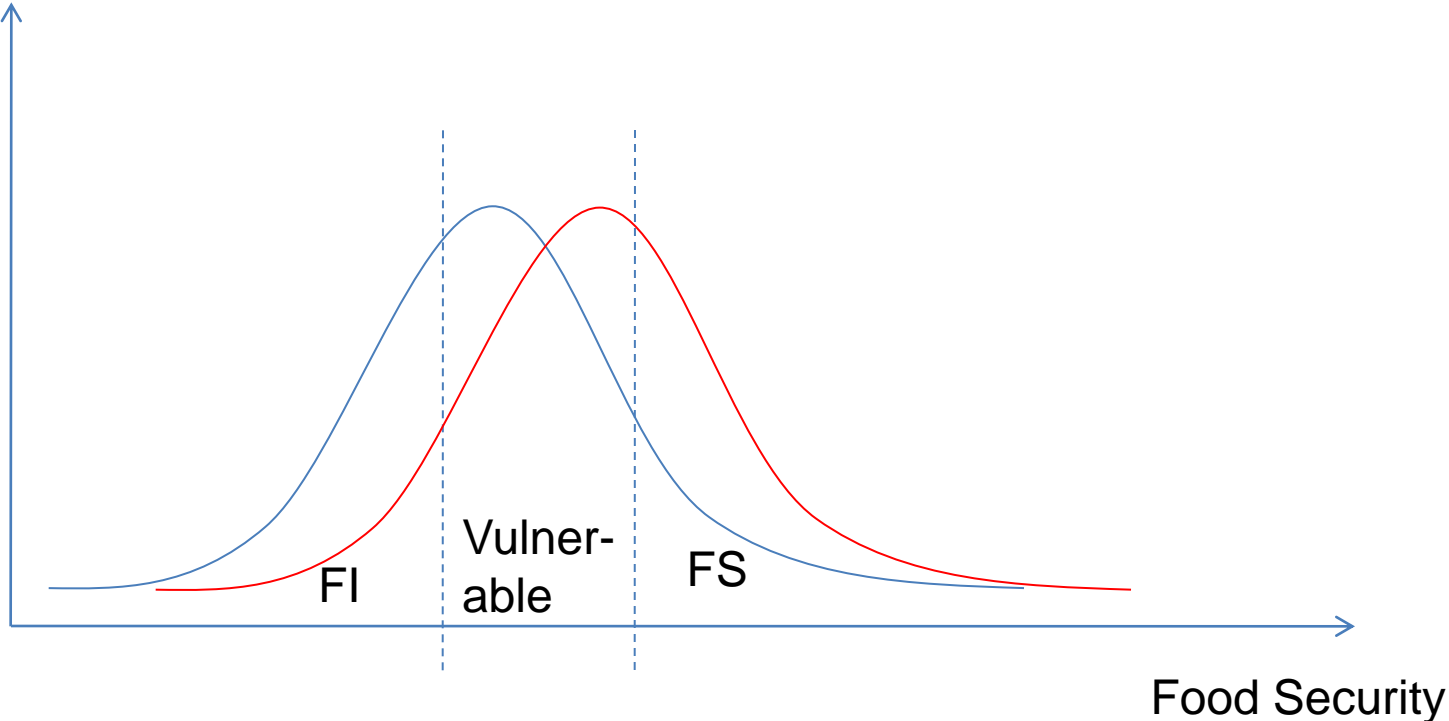
Determinants of FS and Vulnerability

- Wealth: predicted per capita expenditures
- Infrastructure: access to infrastructure index, distance to variables.
- Agriculture: Operated land, an index of agricultural assets, livestock holdings.
- Other: rural dummy, administrative unit dummies, language, and other country-specific controls

Determinants of FS and Vulnerability



Determinants of FS and Vulnerability



Determinants of FS and Vulnerability

Household Characteristics by Food Security Status

	<i>Undernourished</i>	<i>Not undernourished</i>	<i>Vulnerable</i>	<i>Food Secure</i>
Head of hh age	4/3	2/1	6/1	0/0
HH size	6/6	0/0	6/6	0/0
Share 15	6/6	0/0	4/3	2/2
Share 60	0/0	6/6	0/0	6/4
Head of hh female	2/2	4/3	0/0	6/5
Average education	0/0	6/6	1/1	5/5
Infrastructure index	0/0	6/6	1/0	5/5
Rural hh	5/5	1/1	5/5	1/1

Notes: First number indicates that variable of interest is larger for category, the second number indicates that this difference is statistically significant.

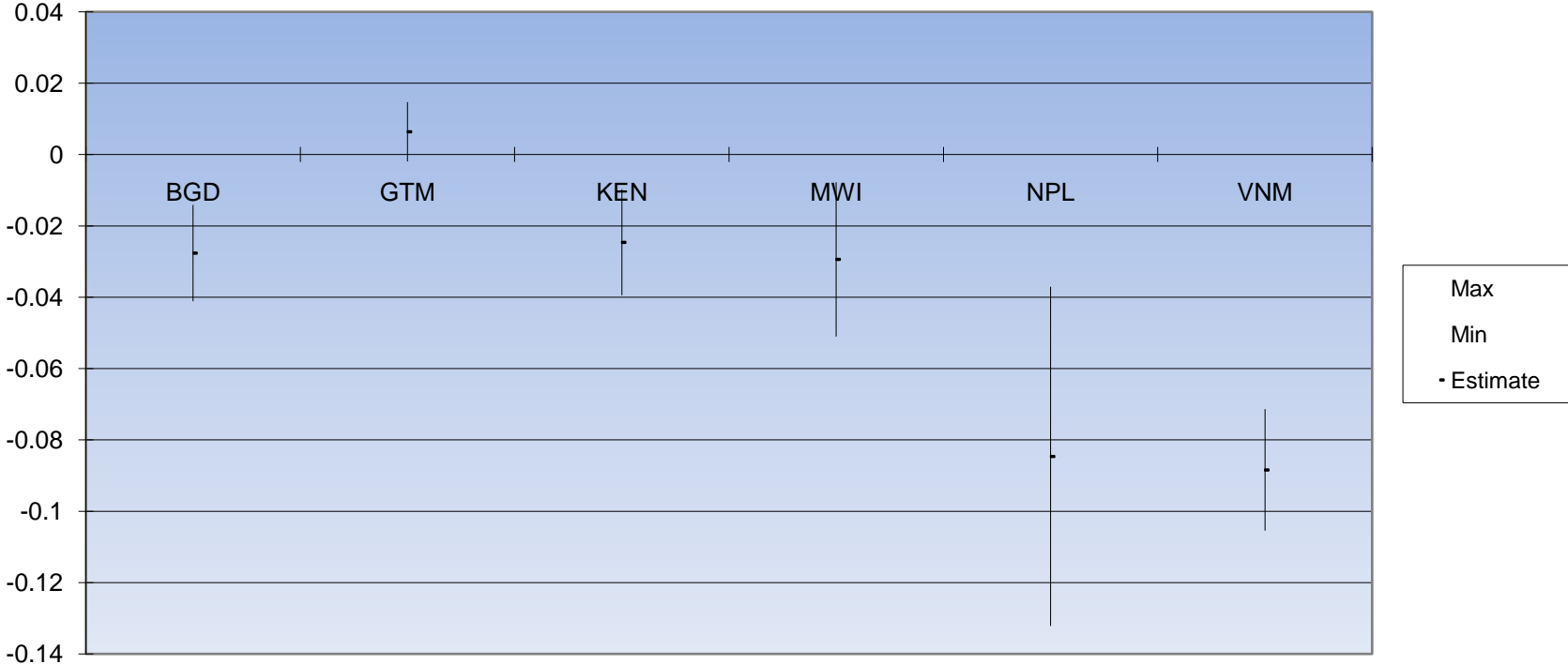
Determinants of FS and Vulnerability

Main Demographic Characteristics Elasticities

	<i>Food Insecure</i>		<i>Vulnerable</i>	
	(+)	(-)	(+)	(-)
Age of Head	GTM, KEN, MWI, VNM		GTM, KEN, MWI, VNM	
Household Size	BGD, GTM, KEN, MWI, NPL, VNM		BGD, GTM, KEN, MWI, NPL, VNM	
Share <15		BGD, GTM, KEN, MWI, NPL, VNM		BGD, GTM, KEN, MWI, NPL, VNM
Share >60		BGD, MWI, NPL, VNM		BGD, MWI, NPL, VNM
Female Head	NPL	KEN, VNM	NPL	KEN, VNM
Average Education	BGD, KEN, VNM	MWI, NPL	BGD, KEN, VNM	MWI, NPL

Determinants of FS and Vulnerability

Operated Land Elasticity for Food Insecure Group



Closing Remarks

- These food security indicators for seven countries organized in the RIGA database open an important window.
- Please learn more and download accompanying working paper @

www.fao.org/es/esa

www.fao.org/es/esa/riga