Food Prices and Household Welfare: A Pseudo-Panel Approach

Zacharias Ziegelhöfer, UNECA

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Overview

1. Motivation & literature
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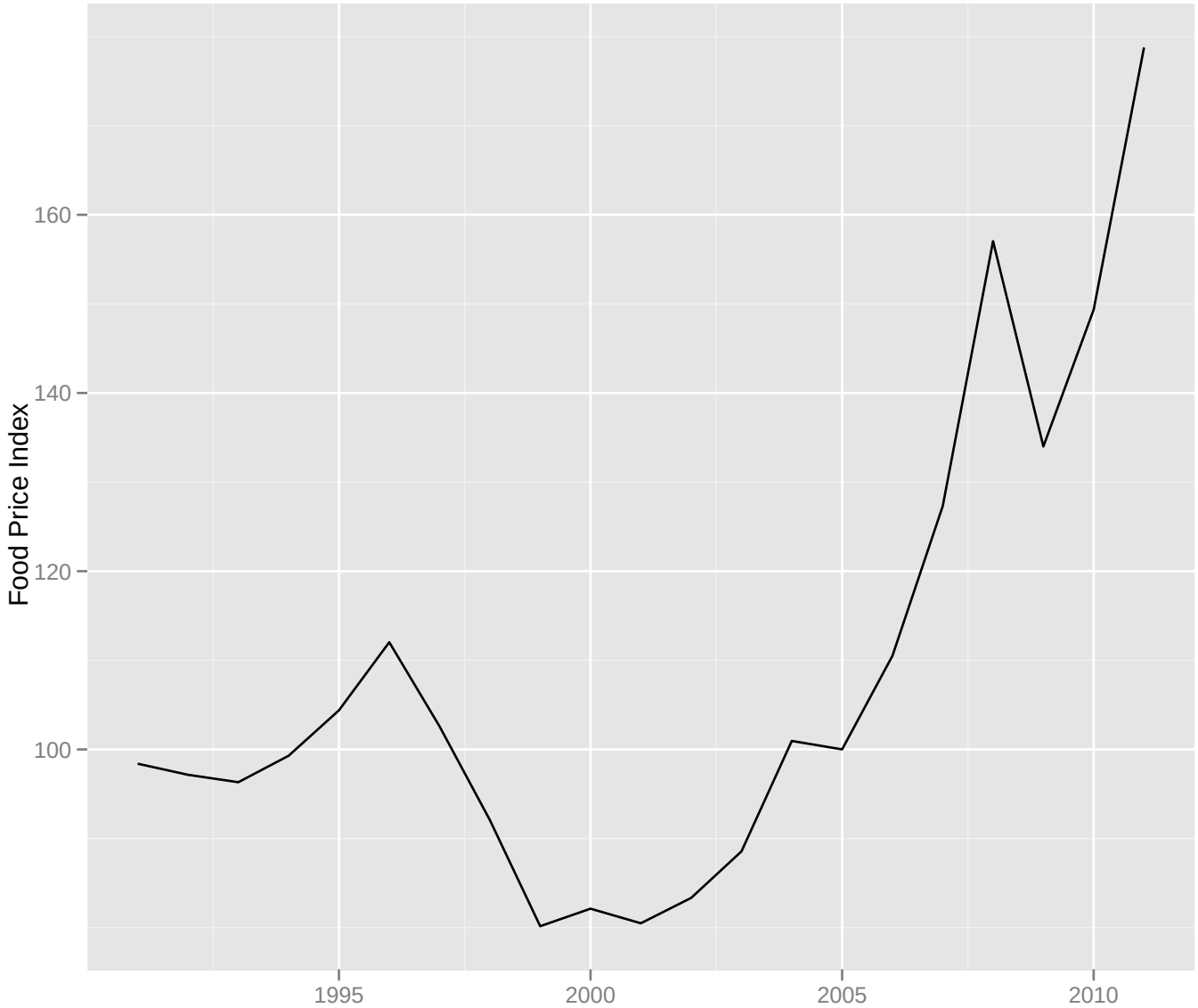
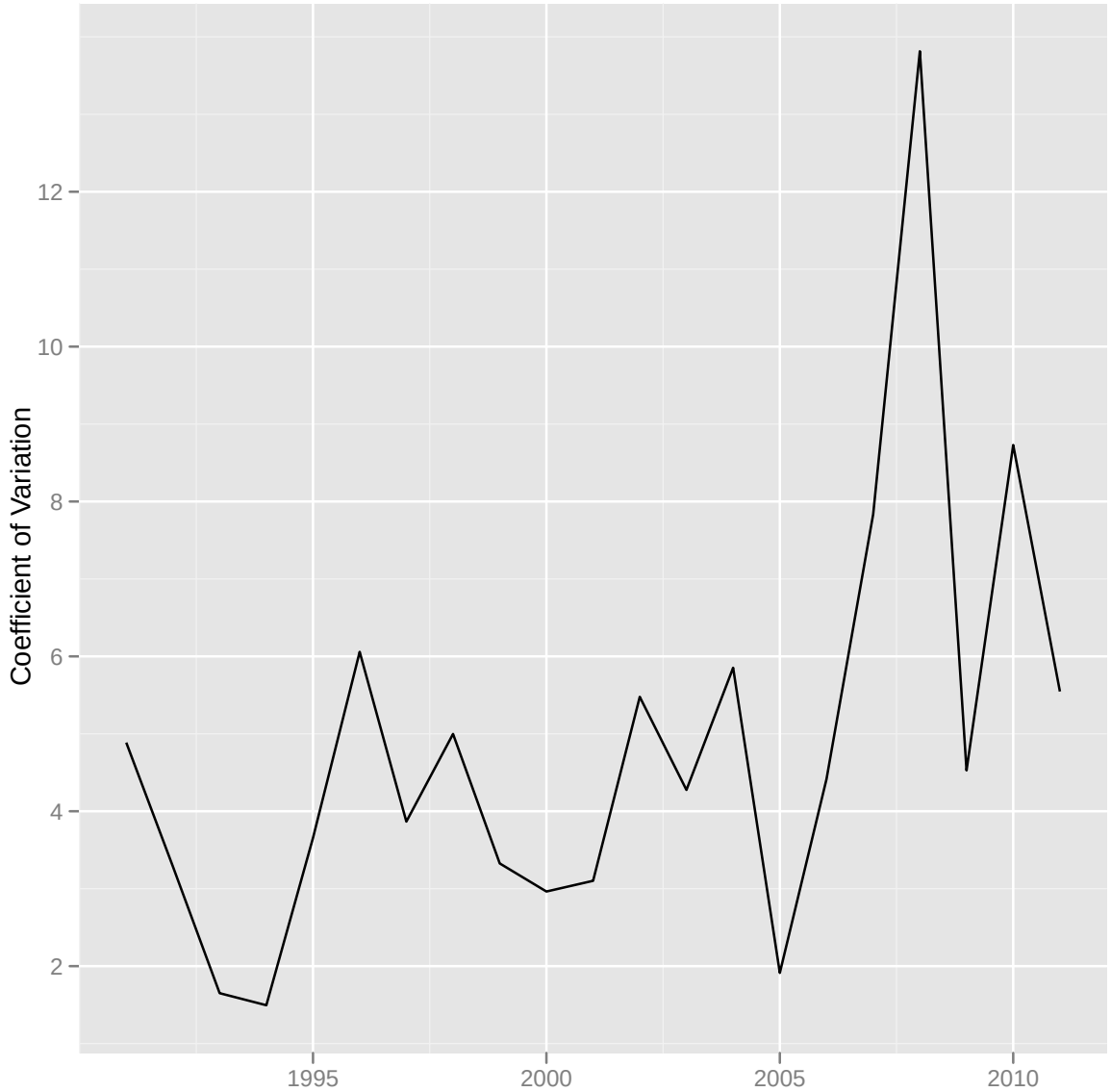
3. Identification: Why Pseudo Panel Approach?
4. From Theory to Practice: Construction of the Pseudo Panel
5. Results
6. Conclusion

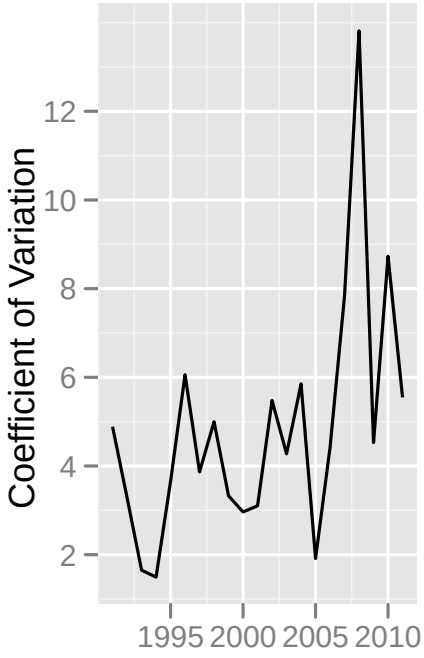

Food Price Index
160
140
120
100
1995
2000
2005
2010

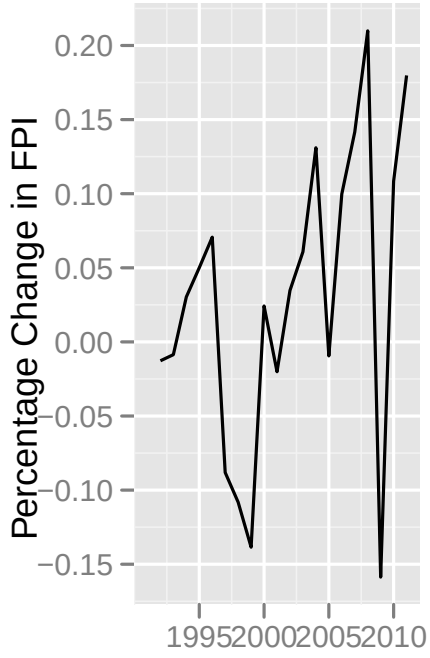
Literature

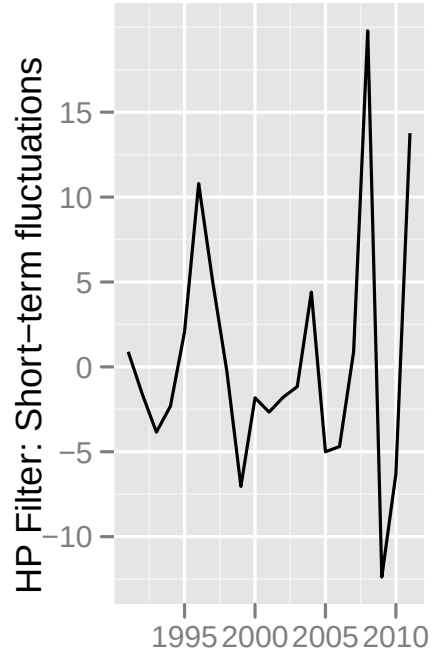
Microeconomic literature on **household-level consequences**

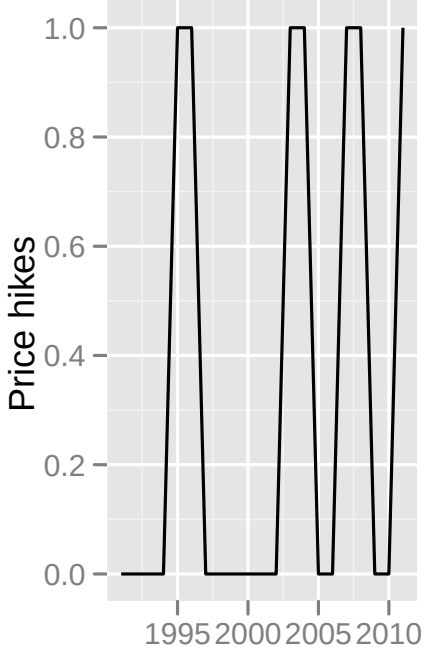
1. **Prediction of household-level consequences** [Deaton, 1989, Barrett and Dorosh, 1996, Zezza et al., 2008, Ivanic and Martin, 2008, Wodon et al., 2008, Aksoy and Isik-Dikmelik, 2008]
2. **Empirical analyses of specific time and regional contexts** [Block et al., 2004, Waters et al., 2004, Sulaiman et al., 2009, Ahmed, 1993, De Brauw, 2011, Wood et al., 2012]

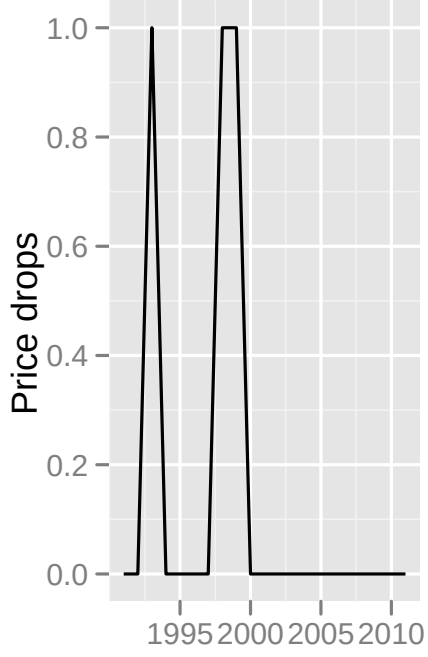

Coefficient of Variation
12
10
8
6
4
2
1995
2000
2005
2010

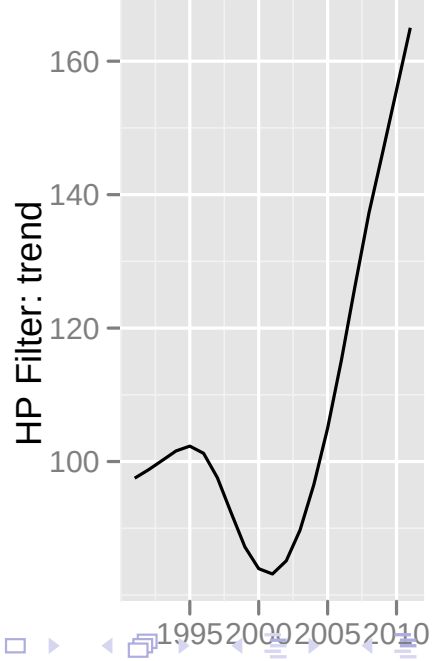

Coefficient of Variation
12
10
8
6
4
2
1995 2000 2005 2010


Percentage Change in FPI
0.20
0.15
0.10
0.05
0.00
−0.05
−0.10
−0.15
1995 2000 2005 2010


HP Filter: Short−term fluctuations
15
10
5
0
−5
−10
1995 2000 2005 2010


Price hikes
1.0
0.8
0.6
0.4
0.2
0.0
1995 2000 2005 2010


Price drops
1.0
0.8
0.6
0.4
0.2
0.0
1995 2000 2005 2010


HP Filter: trend
160
140
120
100
1995 2000 2005 2010

Contribution of this paper

By taking a **pseudo panel approach**, this paper

- **broadens the regional and time scope** of analysis (500,000 observations from 38 countries over a period of 20 years),
- **decomposes food price variation** in short-term movements (month-to-month volatility, annual percentage change in prices), medium term movements (fluctuations around a trend) and long-term swings (trend, episodes of price hikes and decreases), and
- **combines macro and micro level determinants** of household welfare and child health.

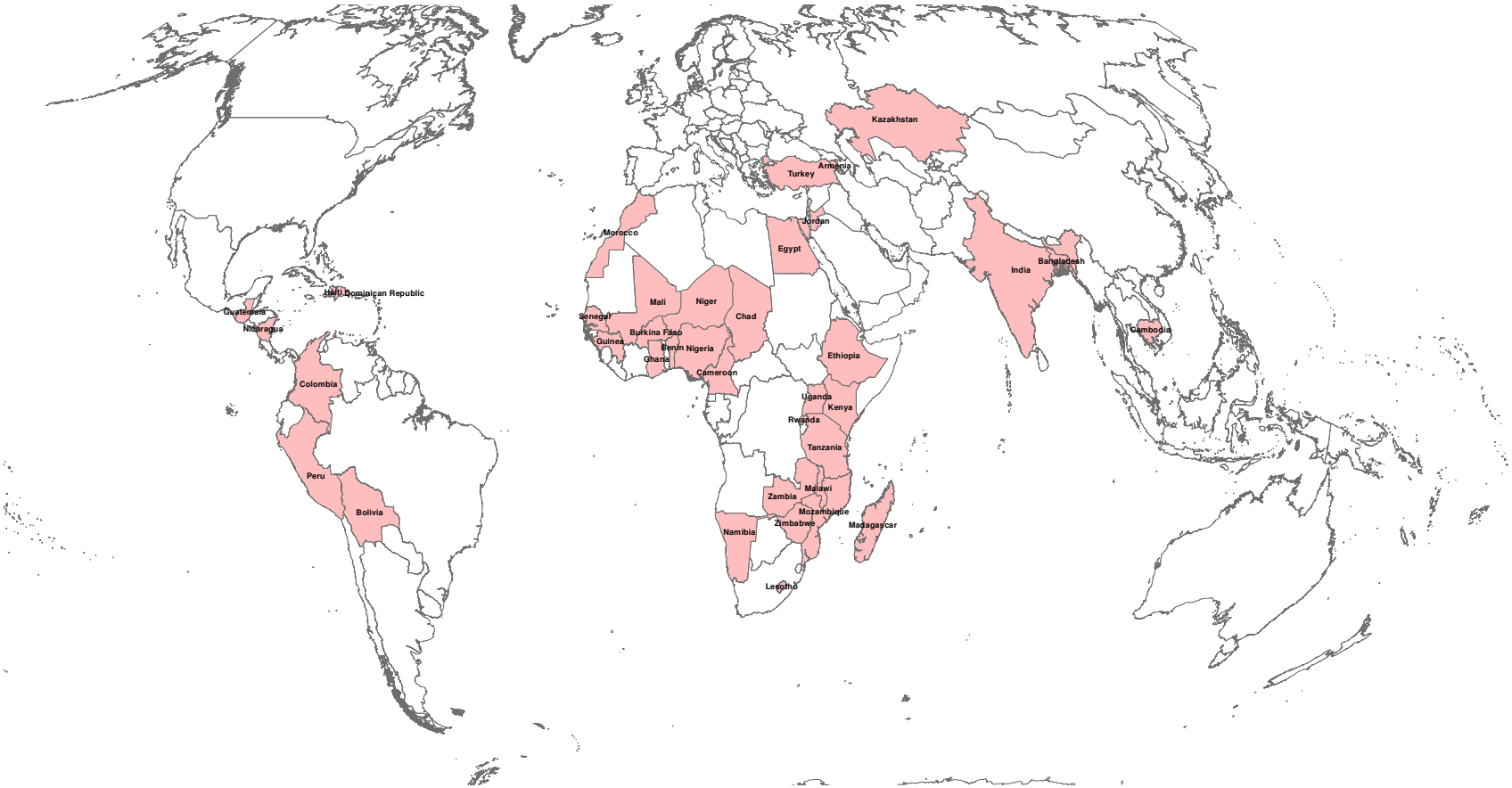
The data

Data combined from three sources:

- Demographic and Health Surveys (DHS): Household-level information on socio-economic characteristics
- International Monetary Fund: Global Food Price Index (nominal)
- World Bank: GDP per capita, Global Food Price Index (nominal and real, used as robustness check)

$\Rightarrow$ information on 497,178 individuals, 38 countries, 1991 to 2011.

Countries in sample



Descriptives on pooled cross sections

var	min.	1st qu.	median	mean	s.d.	3rd qu.	max.
WAZ	-4.998	-2.139	-1.19	-1.199	1.43	-0.2759	4.994
Food Price Index	80.15	88.56	100.9	108.9	26.06	112	178.8
Coefficient of Variation	1.495	3.284	4.415	5.153	3.03	5.853	13.81
HP Filter	-24.35	-19.28	-12.33	-3.85	17.13	10.55	32.79
HP Trend	84.98	99.43	111	112.7	16.86	122.8	146
Positive Price Spikes	0	0	0	0.3176	0.47	1	1
Negative Price Spikes	0	0	1	0.5361	0.5	1	1
Improved Water Supply	0	0	1	0.6712	0.47	1	1
Improved Sanitation	0	0	0	0.351	0.48	1	1
Wealth Index	-1.982	-1.603	-0.4299	0.04063	1.82	1.607	4.476
Agricultural self-employment	0	0	0	0.5021	0.76	1	2
Agricultural employment	0	0	0	0.1773	0.46	0	2
Maternal Education in years	0	0	4	4.606	4.62	8	23
Paternal Education in years	0	0	5	5.791	5	10	26
GDP per capita	4.627	5.664	6.199	6.365	0.92	7.297	8.427
Birthyear	1941	1967	1974	1973	8.44	1980	1996
Advanced WS technology	0	0	0	0.4383	0.5	1	1
Basic WS technology	0	0	0	0.4025	0.49	1	1
Urban	0	0	0	0.3412	0.47	1	1
Year	1991	1999	2003	2002	5.38	2006	2011
Nr. of repeated cross sections	2	3	4	4.135	1.53	5	7

The model

$$\begin{aligned} \text{WAZ}_{int} = \beta_0 + \beta_1 \text{FPI}_t + \beta_2 \text{ improved water supply}_{int} + \beta_3 \text{ improved sanitation}_{int} \\ + \beta_4 \text{ maternal education}_{int} + \beta_5 \text{ paternal education}_{int} \\ + \beta_6 \text{ agr. employment}_{int} + \beta_7 \text{ agr. self-employment}_{int} \\ + \beta_8 \text{ urban}_{int} + \beta_9 \text{ wealth}_{int} + \beta_{10} \text{ GDP}_{nt} + \beta_{11} t_t + \alpha_i + \epsilon \end{aligned} \tag{1}$$

Pseudo panel approach

- Pseudo Panel: a cohort FE model based on repeated cross sections – **following cohorts instead of individuals over time**
- cohorts are defined according to a **time-invariant characteristic** (e.g. birthyear)
- empirical cohort means are consistent but **error-ridden estimates of the true mean**
- Deaton [1985] suggested an **errors-in-variables estimator** to correct for sampling error.
- **rich body of theoretical literature** evolved on how to estimate pseudo panels [Dagenais and Dagenais, 1997, Devereux, 2007a, Dolores Collado, 1997, Inoue, 2008, Lewbel, 1997, McKenzie, 2004, Moffitt, 1993, Verbeek and Nijman, 1992, Verbeek, 2008] but **few empirical applications**
- More and more repeated cross-sections based on standardized questionnaires become available (LSMS, DHS, MICS, national census)

Identification strategy

Starting point, the true model:

$$y_{ht} = x_{ht}\beta + \alpha_h + \epsilon_{ht} \tag{2}$$

Aggregated by cohort means:

$$\bar{y_{ct}} = \bar{x_{ct}}\beta + \bar{\alpha_{ct}} + \epsilon_{ct} \tag{3}$$

Cohort-population version

$$y^*_{ct} = x^*_{ct}\beta + \alpha_{ct} + \epsilon_{ct} \tag{4}$$

Deaton (1985) assumes (stacked observations to single index t):

$$\begin{pmatrix} \bar{y}_t \\ \bar{x}_t \end{pmatrix} = N \begin{pmatrix} y^*_t; & \sigma_{00} & \sigma' \\ x^*_t; & \sigma & \Sigma \end{pmatrix} \tag{5}$$

We can estimate above equation by approximating $\bar{\alpha_{ct}}$ with $\bar{\alpha}_c$ (i.e. by including cohort dummies). In small samples, this estimator is biased due to $\text{cov}(\bar{\alpha}_{ct} - \alpha_c, \bar{x}_{ct}) \neq 0$ [Devereux, 2007b, p. 840].

Asymptotics

No worries:

$$N \to \infty, \text{with C fixed, so that} n_c \to \infty \tag{6}$$

Need to deal with measurement error:

$$N \to \infty, \text{with C} \to \infty, \text{ so that } n_c \text{ fixed} \tag{7}$$

Errors-in-variables estimators

Deaton (1985) estimator:

$$\tilde{\beta} = (M_{xx} - S)^{-1}(m_{xy} - s) \tag{8}$$

whereby M_{xx} and m_{xy} are the respective sample moments and cross product matrices, S and s are the sample counterparts of Σ and σ.

Verbeek-Nijman (1992) estimator:

$$\tilde{\beta} = (M_{xx} - \tau S)^{-1}(m_{xy} - \tau s) \tag{9}$$

whereby $\tau = (P - 1)/P$.

What estimator to pick?

- Ordinary Least Squares on pooled cross sections
- Cohort Fixed Effects model (Efficient Wald)
- Deaton (1985) Errors-In-Variables model
- Verbeek-Nijman (1992) Errors-In-Variables model (small P)

$\rightarrow$ Two MC experiments to inform decision:

- Small sample case: Availablity of 4 rounds of DHS data for one country (10,000 obs.)
- Large sample case: Pooling of all available DHS data (500,000 obs.)

Evidence from Monte Carlo simulations [contd.]

- Even when 500,000 observations are available, a cohort FE estimator can still be biased by up to 43 per cent while the Verbeek-Nijman estimator is approximately unbiased.
- OLS on the pooled cross sections is always biased, any of the other estimators should be preferred.
- **Trade-off** in cohort definition: Minimizing **measurement error** (large cohorts) vs. **efficiency** (many cohorts)
- Once, a **minimum cohort size** is achieved ($n_c > 50$), the **Verbeek-Nijman estimator** becomes **more efficient with increasing number of cohorts**

Construction of pseudo panel

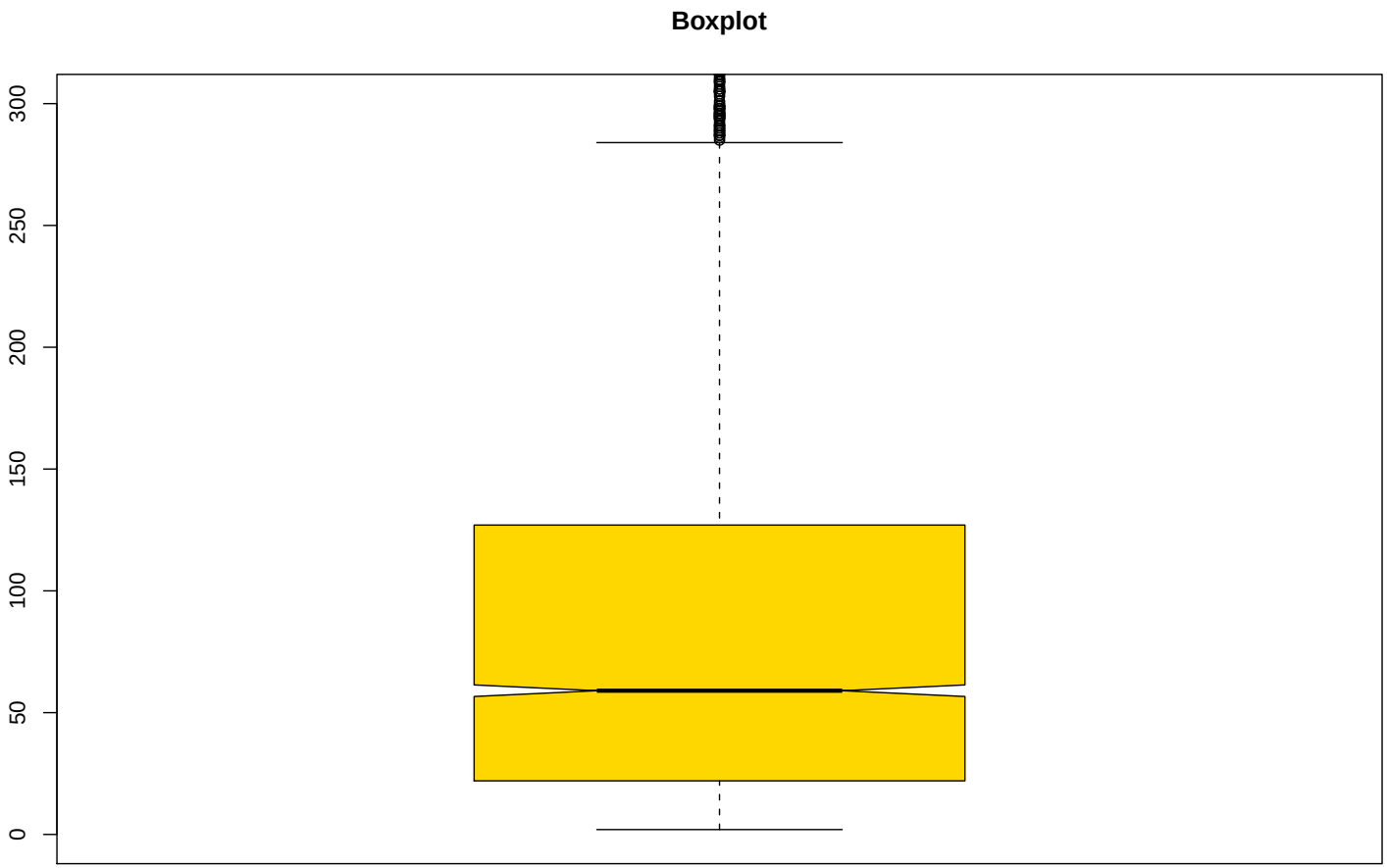
Considerations

- Time-invariant characteristic
- Identification requires sufficient within-cohort variation
- Trade-off between minimizing sampling error (large cohorts) and efficiency (many cohorts)

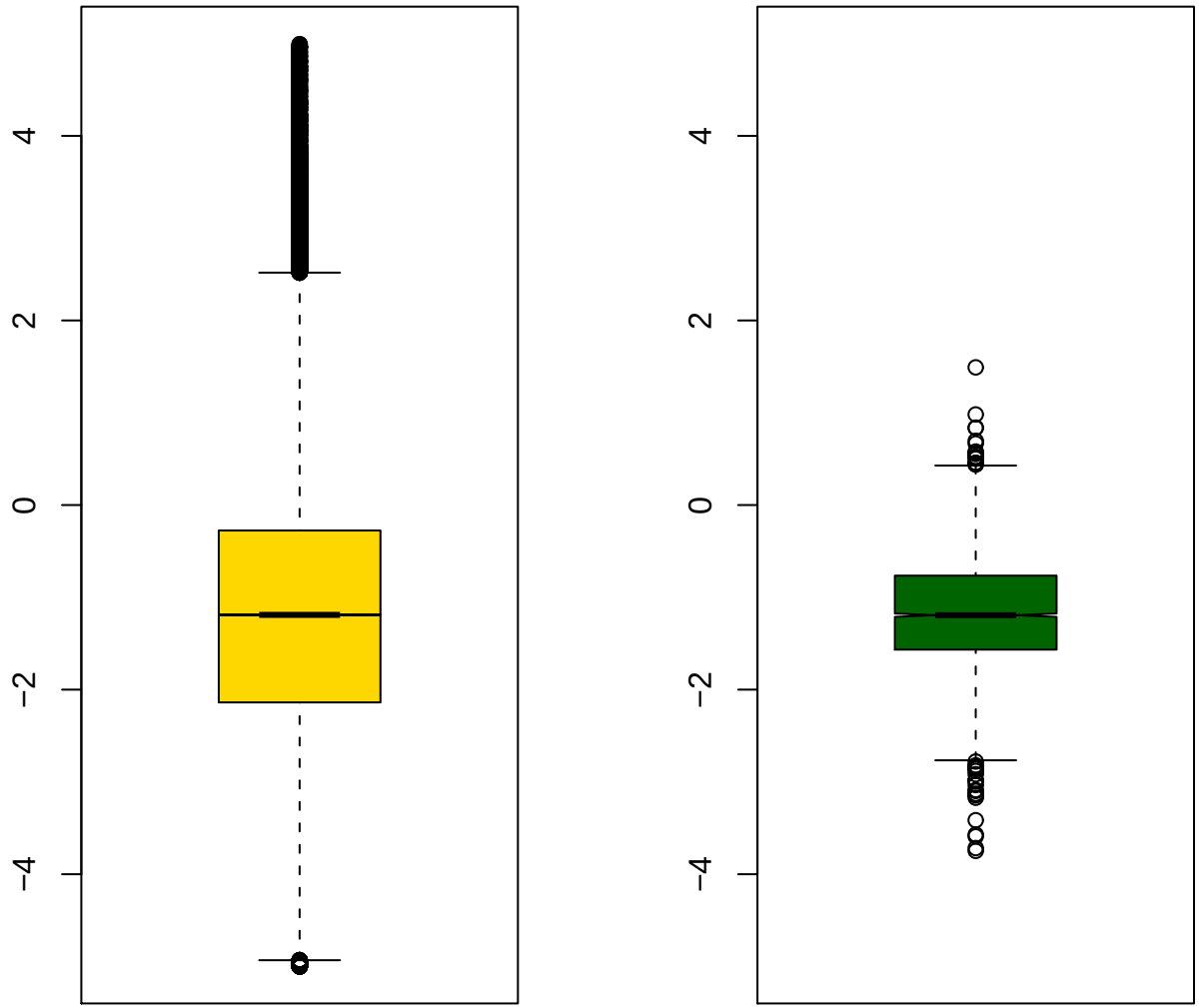
Choice of cohort definition

- Cohorts defined based on **country** and **mother-birthyear**
- Unevenly spaced such that the **density per cohort is** ≥ 5 **per cent** of observations of the particular country.
- Cohort size was chosen based on results of Monte Carlo simulation.

Distribution of individuals per cohort



Boxplots of WAZ in pooled cross section and pseudo panel



Descriptives on pseudo panel

var	category	mean	sd	min	max	obs
WAZ	overall	-1.185996	.5878711	-3.746827	1.491392	4877
	between		.5167161			
	within		.2910611			
Food Price Index	overall	106.8596	24.89675	80.155	178.7767	4877
	between		13.03136			
	within		21.94121			
Coefficient of Variation	overall	4.768126	2.538498	1.49506	13.81379	4877
	between		1.193424			
	within		2.298097			
HP Filter	overall	-3.130735	16.57992	-24.35143	32.78971	4877
	between		7.030722			
	within		15.37772			
HP Trend	overall	109.9903	17.43812	84.9836	145.987	4877
	between		11.03645			
	within		14.2634			
Positive Price Spikes	overall	.3485749	.476568	0	1	4877
	between		.2253137			
	within		.4312511			
Negative Price Spikes	overall	.469961	.499148	0	1	4877
	between		.2300496			
	within		.4576065			
Improved Water Supply	overall	.6505856	.2751901	0	1	4877
	between		.2329793			
	within		.1479309			

var	category	mean	sd	min	max	obs
Improved Sanitation	overall	.2986093	.2900178	0	1	4877
	between		.2465699			
	within		.1552093			
Wealth Index	overall	-.1366592	1.202888	-1.981978	4.045067	4877
	between		1.149518			
	within		.4199605			
Agricultural self-employment	overall	.6035726	.5231049	0	2	4877
	between		.4547426			
	within		.2768729			
Agricultural employment	overall	.138643	.2516125	0	1.75	4877
	between		.2217056			
	within		.1583674			
Maternal education in years	overall	4.194395	2.674733	0	17	4877
	between		2.612799			
	within		1.051026			
Paternal education in years	overall	5.263555	2.712438	0	17	4877
	between		2.557027			
	within		1.164584			
GDP per capita	overall	6.339473	.9180239	4.62691	8.42714	4877
	between		.9105023			
	within		.1336797			
Advanced WS technology	overall	.4358446	.310822	0	1	4877
	between		.2687987			
	within		.1524367			
Basic WS technology	overall	.3800726	.2877998	0	1	4877
	between		.2266409			
	within		.163868			
Urban	overall	.3340761	.2310969	0	1	4877
	between		.1852801			
	within		.14223			

Results: EIV Model (1)

	(1)
	FPI
Price Index	-0.00077
	(0.00013)**
Impr. ws.	-0.039
	(0.021)*
Impr. san.	0.13
	(0.021)**
Agr. empl.	-0.11
	(0.024)**
Agr. self-empl.	-0.14
	(0.017)**
Wealth	0.059
	(0.016)**
Female educ.	0.015
	(0.0062)**
Urban	0.065
	(0.042)
Male educ.	0.024
	(0.0057)**
GDP	0.095
	(0.031)**
Time trend	0.0065
	(9e-04)**
Observations	4877

Dependent variable: Weight-for-age z-score. Standard errors in parentheses.
* $p < 0.05$, ** $p < 0.01$
Verbeek-Nijman (1993) estimator, min. density per cohort: 0.005

Economic significance: EIV Model (1)

FPI	Observed values	Maternal education (years)	Child underweight (in %)
Food price index	Δ 82 to 149 (2000 to 2010)	- 3.5	+ 1.5

Results: EIV Model (2)

	(1)	(2)
	FPI	CoV
Price Index	-0.00077	-0.0039
	(0.00013)**	(0.0011)**
Impr. ws.	-0.039	-0.042
	(0.021)*	(0.021)*
Impr. san.	0.13	0.12
	(0.021)**	(0.021)**
Agr. empl.	-0.11	-0.087
	(0.024)**	(0.025)**
Agr. self-empl.	-0.14	-0.13
	(0.017)**	(0.016)**
Wealth	0.059	0.062
	(0.016)**	(0.016)**
Female educ.	0.015	0.016
	(0.0062)**	(0.0063)**
Urban	0.065	0.077
	(0.042)	(0.042)*
Male educ.	0.024	0.022
	(0.0057)**	(0.0057)**
GDP	0.095	0.07
	(0.031)**	(0.031)**
Time trend	0.0065	0.0059
	(9e-04)**	(0.00089)**
Observations	4877	4877

Dependent variable: Weight-for-age z-score. Standard errors in parentheses.
* $p < 0.05$, ** $p < 0.01$
Verbeek-Nijman (1993) estimator, min. density per cohort: 0.005

Economic significance: EIV Model (2)

FPI	Observed values	Maternal education (years)	Child underweight (in %)
Food price index	Δ 82 to 149 (2000 to 2010)	- 3.5	+ 1.5
CoV	median 4.7, max. 13.8	-1.1, -3.6	+ 0.7, + 2.2

Results: EIV Model (3)

	(1)	(2)	(3)
	FPI	CoV	PChange
Price Index	-0.00077	-0.0039	-0.13
	(0.00013)**	(0.0011)**	(0.036)**
Impr. ws.	-0.039	-0.042	-0.049
	(0.021)*	(0.021)*	(0.021)**
Impr. san.	0.13	0.12	0.12
	(0.021)**	(0.021)**	(0.021)**
Agr. empl.	-0.11	-0.087	-0.1
	(0.024)**	(0.025)**	(0.024)**
Agr. self-empl.	-0.14	-0.13	-0.13
	(0.017)**	(0.016)**	(0.016)**
Wealth	0.059	0.062	0.058
	(0.016)**	(0.016)**	(0.016)**
Female educ.	0.015	0.016	0.016
	(0.0062)**	(0.0063)**	(0.0063)**
Urban	0.065	0.077	0.095
	(0.042)	(0.042)*	(0.042)**
Male educ.	0.024	0.022	0.021
	(0.0057)**	(0.0057)**	(0.0057)**
GDP	0.095	0.07	0.054
	(0.031)**	(0.031)**	(0.03)*
Time trend	0.0065	0.0059	0.0064
	(9e-04)**	(0.00089)**	(0.00093)**
Observations	4877	4877	4770

Dependent variable: Weight-for-age z-score. Standard errors in parentheses.
* $p < 0.05$, ** $p < 0.01$
Verbeek-Nijman (1993) estimator, min. density per cohort: 0.005

Economic significance: EIV Model (3)

FPI	Observed values	Maternal education (years)	Child underweight (in %)
Food price index	Δ 82 to 149 (2000 to 2010)	- 3.5	+ 1.5
CoV	median 4.7, max. 13.8	-1.1, -3.6	+ 0.7, + 2.2
Change in FPI (in %)	median +6 %, max.+20 %	- 0.5, -1.8	+ 0.2, + 0.7

Results: EIV Model (4)

	(1) FPI	(2) CoV	(3) PChange	(4) HP Filter
Price Index	-0.00077	-0.0039	-0.13	-6e-04
	(0.00013)**	(0.0011)**	(0.036)**	(0.00039)
Impr. ws.	-0.039	-0.042	-0.049	-0.046
	(0.021)*	(0.021)*	(0.021)**	(0.021)**
Impr. san.	0.13	0.12	0.12	0.13
	(0.021)**	(0.021)**	(0.021)**	(0.021)**
Agr. empl.	-0.11	-0.087	-0.1	-0.097
	(0.024)**	(0.025)**	(0.024)**	(0.025)**
Agr. self-empl.	-0.14	-0.13	-0.13	-0.13
	(0.017)**	(0.016)**	(0.016)**	(0.016)**
Wealth	0.059	0.062	0.058	0.062
	(0.016)**	(0.016)**	(0.016)**	(0.016)**
Female educ.	0.015	0.016	0.016	0.015
	(0.0062)**	(0.0063)**	(0.0063)**	(0.0063)**
Urban	0.065	0.077	0.095	0.081
	(0.042)	(0.042)*	(0.042)**	(0.042)*
Male educ.	0.024	0.022	0.021	0.02
	(0.0057)**	(0.0057)**	(0.0057)**	(0.0057)**
GDP	0.095	0.07	0.054	0.048
	(0.031)**	(0.031)**	(0.03)*	(0.03)
Time trend	0.0065	0.0059	0.0064	0.0052
	(9e-04)**	(0.00089)**	(0.00093)**	(0.00087)**
Observations	4877	4877	4770	4877

Dependent variable: Weight-for-age z-score. Standard errors in parentheses.
* $p < 0.05$, ** $p < 0.01$
Verbeek-Nijman (1993) estimator, min. density per cohort: 0.005

Economic significance: EIV Model (4)

FPI	Observed values	Maternal education (years)	Child underweight (in %)
Food price index	Δ 82 to 149 (2000 to 2010)	- 3.5	+ 1.5
CoV	median 4.7, max. 13.8	-1.1, -3.6	+ 0.7, + 2.2
Change in FPI (in %)	median +6 %, max.+20 %	- 0.5, -1.8	+ 0.2, + 0.7
HP Filter	median -1.61, max.+ 19.79	not significant	0, + 0.6

Results: EIV Model (5)

	(1) FPI	(2) CoV	(3) PChange	(4) HP Filter	(5) HP Trend
Price Index	-0.00077	-0.0039	-0.13	-6e-04	-0.001
	(0.00013)**	(0.0011)**	(0.036)**	(0.00039)	(0.00016)**
Impr. ws.	-0.039	-0.042	-0.049	-0.046	-0.035
	(0.021)*	(0.021)*	(0.021)**	(0.021)**	(0.021)
Impr. san.	0.13	0.12	0.12	0.13	0.14
	(0.021)**	(0.021)**	(0.021)**	(0.021)**	(0.021)**
Agr. empl.	-0.11	-0.087	-0.1	-0.097	-0.12
	(0.024)**	(0.025)**	(0.024)**	(0.025)**	(0.024)**
Agr. self-empl.	-0.14	-0.13	-0.13	-0.13	-0.15
	(0.017)**	(0.016)**	(0.016)**	(0.016)**	(0.017)**
Wealth	0.059	0.062	0.058	0.062	0.056
	(0.016)**	(0.016)**	(0.016)**	(0.016)**	(0.016)**
Female educ.	0.015	0.016	0.016	0.015	0.013
	(0.0062)**	(0.0063)**	(0.0063)**	(0.0063)**	(0.0062)**
Urban	0.065	0.077	0.095	0.081	0.062
	(0.042)	(0.042)*	(0.042)**	(0.042)*	(0.042)
Male educ.	0.024	0.022	0.021	0.02	0.025
	(0.0057)**	(0.0057)**	(0.0057)**	(0.0057)**	(0.0057)**
GDP	0.095	0.07	0.054	0.048	0.1
	(0.031)**	(0.031)**	(0.03)*	(0.03)	(0.031)**
Time trend	0.0065	0.0059	0.0064	0.0052	0.0071
	(9e-04)**	(0.00089)**	(0.00093)**	(0.00087)**	(0.00091)**
Observations	4877	4877	4770	4877	4877

Dependent variable: Weight-for-age z-score. Standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$

Verbeek-Nijman (1993) estimator, min. density per cohort: 0.005

Economic significance: EIV Model (5)

FPI	Observed values	Maternal education (years)	Child underweight (in %)
Food price index	Δ 82 to 149 (2000 to 2010)	- 3.5	+ 1.5
CoV	median 4.7, max. 13.8	-1.1, -3.6	+ 0.7, + 2.2
Change in FPI (in %)	median +6 %, max.+20 %	- 0.5, -1.8	+ 0.2, + 0.7
HP Filter	median -1.61, max.+ 19.79	not significant	0, + 0.6
HP Trend	Δ 83 to 156 (2000 to 2010)	- 4.8	+ 2.1

Results: EIV Model (6)

	(1) FPI	(2) CoV	(3) PChange	(4) HP Filter	(5) HP Trend	(6) Price Hike
Price Index	-0.00077	-0.0039	-0.13	-6e-04	-0.001	-0.053
	(0.00013)**	(0.0011)**	(0.036)**	(0.00039)	(0.00016)**	(0.0058)**
Impr. ws.	-0.039	-0.042	-0.049	-0.046	-0.035	-0.07
	(0.021)*	(0.021)*	(0.021)**	(0.021)**	(0.021)	(0.021)**
Impr. san.	0.13	0.12	0.12	0.13	0.14	0.091
	(0.021)**	(0.021)**	(0.021)**	(0.021)**	(0.021)**	(0.021)**
Agr. empl.	-0.11	-0.087	-0.1	-0.097	-0.12	-0.1
	(0.024)**	(0.025)**	(0.024)**	(0.025)**	(0.024)**	(0.024)**
Agr. self-empl.	-0.14	-0.13	-0.13	-0.13	-0.15	-0.13
	(0.017)**	(0.016)**	(0.016)**	(0.016)**	(0.017)**	(0.016)**
Wealth	0.059	0.062	0.058	0.062	0.056	0.057
	(0.016)**	(0.016)**	(0.016)**	(0.016)**	(0.016)**	(0.016)**
Female educ.	0.015	0.016	0.016	0.015	0.013	0.017
	(0.0062)**	(0.0063)**	(0.0063)**	(0.0063)**	(0.0062)**	(0.0062)**
Urban	0.065	0.077	0.095	0.081	0.062	0.12
	(0.042)	(0.042)*	(0.042)**	(0.042)*	(0.042)	(0.042)**
Male educ.	0.024	0.022	0.021	0.02	0.025	0.017
	(0.0057)**	(0.0057)**	(0.0057)**	(0.0057)**	(0.0057)**	(0.0057)**
GDP	0.095	0.07	0.054	0.048	0.1	0.058
	(0.031)**	(0.031)**	(0.03)*	(0.03)	(0.031)**	(0.03)**
Time trend	0.0065	0.0059	0.0064	0.0052	0.0071	0.0065
	(9e-04)**	(0.00089)**	(0.00093)**	(0.00087)**	(0.00091)**	(0.00087)**
Observations	4877	4877	4770	4877	4877	4877

Dependent variable: Weight-for-age z-score. Standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$

Verbeek-Nijman (1993) estimator, min. density per cohort: 0.005

Economic significance: EIV Model (6)

FPI	Observed values	Maternal education (years)	Child underweight (in %)
Food price index	Δ 82 to 149 (2000 to 2010)	- 3.5	+ 1.5
CoV	median 4.7, max. 13.8	-1.1, -3.6	+ 0.7, + 2.2
Change in FPI (in %)	median +6 %, max.+20 %	- 0.5, -1.8	+ 0.2, + 0.7
HP Filter	median -1.61, max.+ 19.79	not significant	0, + 0.6
HP Trend	Δ 83 to 156 (2000 to 2010)	- 4.8	+ 2.1
Price hikes	1 (true), 0 (false)	- 3.5	+ 1.0

Results: EIV Model (7)

	(1) FPI	(2) CoV	(3) PChange	(4) HP Filter	(5) HP Trend	(6) Price Hike	(7) Price Drop
Price Index	-0.00077	-0.0039	-0.13	-6e-04	-0.001	-0.053	0.0094
	(0.00013)**	(0.0011)**	(0.036)**	(0.00039)	(0.00016)**	(0.0058)**	(0.011)
Impr. ws.	-0.039	-0.042	-0.049	-0.046	-0.035	-0.07	-0.046
	(0.021)*	(0.021)*	(0.021)**	(0.021)**	(0.021)	(0.021)**	(0.022)**
Impr. san.	0.13	0.12	0.12	0.13	0.14	0.091	0.13
	(0.021)**	(0.021)**	(0.021)**	(0.021)**	(0.021)**	(0.021)**	(0.021)**
Agr. empl.	-0.11	-0.087	-0.1	-0.097	-0.12	-0.1	-0.1
	(0.024)**	(0.025)**	(0.024)**	(0.025)**	(0.024)**	(0.024)**	(0.025)**
Agr. self-empl.	-0.14	-0.13	-0.13	-0.13	-0.15	-0.13	-0.13
	(0.017)**	(0.016)**	(0.016)**	(0.016)**	(0.017)**	(0.016)**	(0.016)**
Wealth	0.059	0.062	0.058	0.062	0.056	0.057	0.059
	(0.016)**	(0.016)**	(0.016)**	(0.016)**	(0.016)**	(0.016)**	(0.016)**
Female educ.	0.015	0.016	0.016	0.015	0.013	0.017	0.015
	(0.0062)**	(0.0063)**	(0.0063)**	(0.0063)**	(0.0062)**	(0.0062)**	(0.0063)**
Urban	0.065	0.077	0.095	0.081	0.062	0.12	0.087
	(0.042)	(0.042)*	(0.042)**	(0.042)*	(0.042)	(0.042)**	(0.042)**
Male educ.	0.024	0.022	0.021	0.02	0.025	0.017	0.021
	(0.0057)**	(0.0057)**	(0.0057)**	(0.0057)**	(0.0057)**	(0.0057)**	(0.0057)**
GDP	0.095	0.07	0.054	0.048	0.1	0.058	0.036
	(0.031)**	(0.031)**	(0.03)*	(0.03)	(0.031)**	(0.03)**	(0.03)
Time trend	0.0065	0.0059	0.0064	0.0052	0.0071	0.0065	0.0054
	(9e-04)**	(0.00089)**	(0.00093)**	(0.00087)**	(0.00091)**	(0.00087)**	(0.00091)**
Observations	4877	4877	4770	4877	4877	4877	4877

Dependent variable: Weight-for-age z-score. Standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$

Verbeek-Nijman (1993) estimator, min. density per cohort: 0.005

Economic significance: EIV Model (7)

FPI	Observed values	Maternal education (years)	Child underweight (in %)
Food price index	Δ 82 to 149 (2000 to 2010)	- 3.5	+ 1.5
CoV	median 4.7, max. 13.8	-1.1, -3.6	+ 0.7, + 2.2
Change in FPI (in %)	median +6 %, max.+20 %	- 0.5, -1.8	+ 0.2, + 0.7
HP Filter	median -1.61, max.+ 19.79	not significant	0, + 0.6
HP Trend	Δ 83 to 156 (2000 to 2010)	- 4.8	+ 2.1
Price hikes	1 (true), 0 (false)	- 3.5	+ 1.0
Price drops	1 (true), 0 (false)	not significant	not significant

What do we take from this? (1/2)

- Negative effects are transmitted through short term-movements in prices (volatility, period-to-period changes) as well as permanent price shocks (trend, episodes of sustained price increases)
- Mixed evidence on HP Filter and whether sustained price drops can provide relief
- Effects are economically significant when set in relation to the effects of maternal education and impacts on child malnutrition

What do we take from this? (2/2)

Increase in underweight children due to...

(children ages 0-5 in 38 countries studied)

100'000 children (age 0-5)

Price volatility

(max. coefficient of variation)

6.1 million

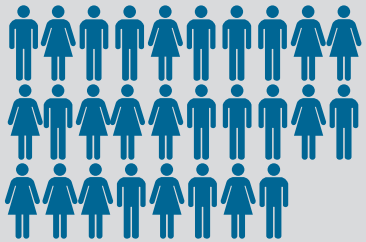
Price Spike

(max. change from one year to next)

1.9 million

Price Hike

(2 or more subsequent increases)



2.8 million

Price Trend

(from 2000 to 2010)

5.8 million

Robustness

Results are widely robust to

- changes in **cohort definition**
- using other commodity price indices (IMF's nominal FPI, WB's nominal and real FPI)
- changing dependent variable to **underweight / severe underweight**
- changes in **WSS definition**

Results are...

- different to Ordinary Least Squares (different signs of coefficients)
- similar to Efficient Wald results (same signs of FPI coefficients but different magnitude of effect)

Conclusion

- Previous empirical analyses focused on the effect of high prices in particular time and regional contexts
- This paper decomposes the variation in food prices and extends the time and regional scope

Results

- Impact is economically significant (effect size corresponds to several years of maternal education)
- Short-term and long-term movements in prices have negative effect on household welfare
- Not only high prices are of concern but also volatility

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S.A. Block, L. Kiess, P. Webb, S. Kosen, R. Moench-Pfanner, M.W. Bloem, and C. Peter Timmer. Macro shocks and micro outcomes: child nutrition during indonesiaâs crisis. *Economics & Human Biology*, 2(1):21–44, 2004.

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Results: Ordinary Least Squares

	(1) FPI	(2) CoV	(3) HP Filter	(4) HP Trend	(5) Price Hike	(6) Price Drop	(7) PChange
Food Price	-0.000419**	0.0116**	0.00436**	-0.00145**	0.0401**	0.0578**	-0.336**
	(0.0000958)	(0.000737)	(0.000264)	(0.000116)	(0.00402)	(0.00767)	(0.0283)
Impr. ws.	-0.0424**	-0.0403**	-0.0421**	-0.0420**	-0.0427**	-0.0440**	-0.0439**
	(0.00468)	(0.00468)	(0.00467)	(0.00468)	(0.00468)	(0.00468)	(0.00471)
Impr. san.	0.0193**	0.0218**	0.0208**	0.0222**	0.0228**	0.0194**	0.0125*
	(0.00519)	(0.00519)	(0.00519)	(0.00520)	(0.00521)	(0.00519)	(0.00523)
Agr. empl.	-0.107**	-0.111**	-0.109**	-0.107**	-0.106**	-0.107**	-0.106**
	(0.00457)	(0.00458)	(0.00458)	(0.00457)	(0.00457)	(0.00457)	(0.00463)
Agr. self-empl.	0.0627**	0.0629**	0.0651**	0.0624**	0.0635**	0.0643**	0.0634**
	(0.00313)	(0.00312)	(0.00313)	(0.00313)	(0.00313)	(0.00313)	(0.00315)
Wealth	0.124**	0.125**	0.125**	0.123**	0.125**	0.125**	0.125**
	(0.00172)	(0.00171)	(0.00171)	(0.00172)	(0.00171)	(0.00171)	(0.00173)
Female educ.	0.0265**	0.0261**	0.0261**	0.0266**	0.0263**	0.0263**	0.0263**
	(0.000616)	(0.000615)	(0.000615)	(0.000615)	(0.000615)	(0.000615)	(0.000620)
Urban	0.0411**	0.0411**	0.0433**	0.0415**	0.0417**	0.0414**	0.0405**
	(0.00508)	(0.00508)	(0.00508)	(0.00508)	(0.00508)	(0.00508)	(0.00512)
Male educ.	0.0168**	0.0164**	0.0166**	0.0168**	0.0167**	0.0168**	0.0168**
	(0.000552)	(0.000552)	(0.000552)	(0.000552)	(0.000552)	(0.000552)	(0.000556)
GDP	0.194**	0.190**	0.192**	0.196**	0.192**	0.193**	0.195**
	(0.00252)	(0.00251)	(0.00251)	(0.00251)	(0.00251)	(0.00251)	(0.00253)
Time trend	-0.00843**	-0.0130**	-0.0103**	-0.00550**	-0.0104**	-0.00897**	-0.00611**
	(0.000464)	(0.000417)	(0.000363)	(0.000493)	(0.000367)	(0.000374)	(0.000471)
Constant	-2.514**	-2.533**	-2.520**	-2.452**	-2.535**	-2.545**	-2.570**
	(0.0178)	(0.0170)	(0.0171)	(0.0183)	(0.0170)	(0.0171)	(0.0173)
Observations	497839	497839	497839	497839	497839	497839	489965

Dependent variable: Weight-for-age z-score. Standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$

OLS estimation

Results: Efficient Wald / Fixed Effects Estimator

	(1) FPI	(2) CoV	(3) HP Filter	(4) HP Trend	(5) Price Hike	(6) Price Drop	(7) PChange
Food Price	-0.00170**	-0.00905**	-0.000972	-0.00230**	-0.0176	-0.0362*	-0.0729
	(0.000275)	(0.00241)	(0.000791)	(0.000331)	(0.0115)	(0.0184)	(0.0654)
Impr. ws.	0.0367	0.0284	0.0187	0.0408	0.0170	0.0210	0.00383
	(0.0358)	(0.0359)	(0.0358)	(0.0358)	(0.0358)	(0.0359)	(0.0361)
Impr. san.	0.138**	0.110**	0.107**	0.152**	0.102**	0.0987**	0.104**
	(0.0367)	(0.0365)	(0.0366)	(0.0369)	(0.0368)	(0.0369)	(0.0369)
Agr. empl.	-0.138**	-0.109**	-0.123**	-0.148**	-0.125**	-0.122**	-0.120**
	(0.0384)	(0.0388)	(0.0386)	(0.0384)	(0.0386)	(0.0386)	(0.0392)
Agr. self. empl.	-0.171**	-0.151**	-0.151**	-0.176**	-0.149**	-0.151**	-0.151**
	(0.0251)	(0.0249)	(0.0250)	(0.0251)	(0.0250)	(0.0250)	(0.0252)
Wealth	0.0887**	0.0949**	0.0939**	0.0874**	0.0927**	0.0967**	0.0890**
	(0.0188)	(0.0188)	(0.0188)	(0.0187)	(0.0189)	(0.0189)	(0.0191)
Female educ.	0.0240**	0.0236**	0.0236**	0.0239**	0.0234**	0.0242**	0.0264**
	(0.00716)	(0.00719)	(0.00720)	(0.00715)	(0.00720)	(0.00721)	(0.00733)
Urban	0.00785	0.0164	0.0160	0.000377	0.0236	-0.000821	0.0317
	(0.0497)	(0.0499)	(0.0500)	(0.0497)	(0.0504)	(0.0505)	(0.0510)
Male educ.	0.00133	-0.0000827	-0.000821	0.00218	-0.000841	-0.000263	-0.00293
	(0.00647)	(0.00649)	(0.00650)	(0.00647)	(0.00650)	(0.00650)	(0.00660)
GDP	0.0655	0.0403	0.00873	0.0769	0.00900	0.0175	-0.0169
	(0.0517)	(0.0518)	(0.0511)	(0.0517)	(0.0511)	(0.0514)	(0.0520)
Time trend	0.00809**	0.00616**	0.00461**	0.00912**	0.00499**	0.00371*	0.00530**
	(0.00152)	(0.00148)	(0.00142)	(0.00155)	(0.00145)	(0.00147)	(0.00157)
Observations	4877	4877	4877	4877	4877	4877	4770

Dependent variable: Weight-for-age z-score. Standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$

FE estimation