Food and Oil Prices, and their Implications for Rural Poverty

Katsushi Imai

Dept. of Economics & Brooks World Poverty Institute, University of Manchester

Email: katsushi.imai@manchester.ac.uk

http://personalpages.manchester.ac.uk/staff/Katsushi.Imai/

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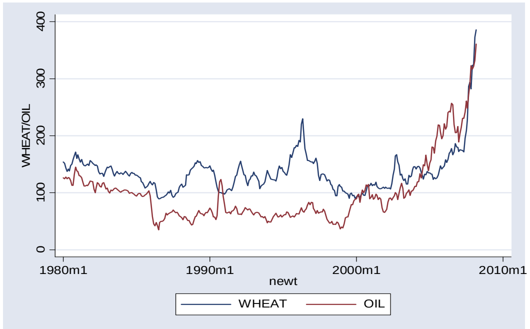
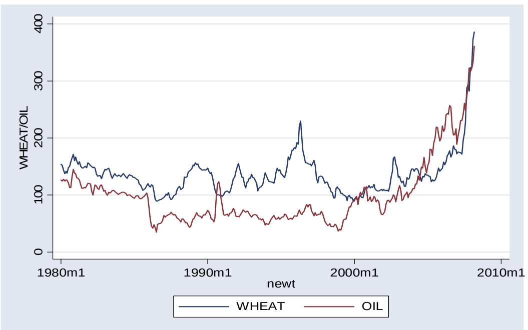
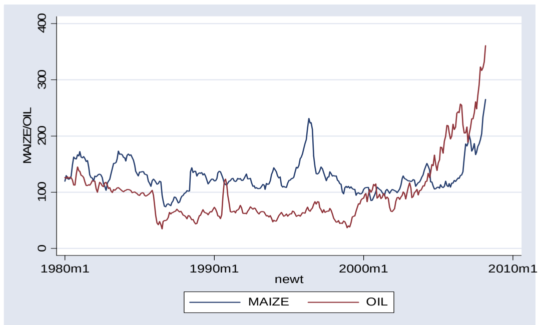
Oil Price and Wheat Price
(Jan1980- Mar2008-Average in 2000=100)



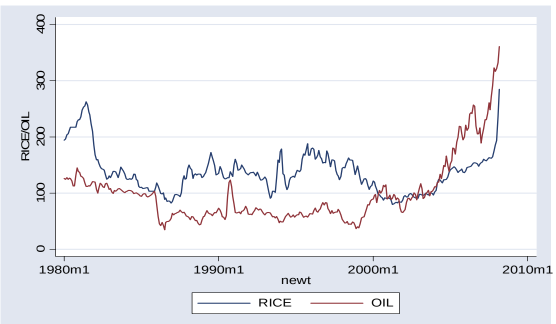
Oil Price and Wheat Price
(Jan1980- Mar2008-Average in 2000=100)

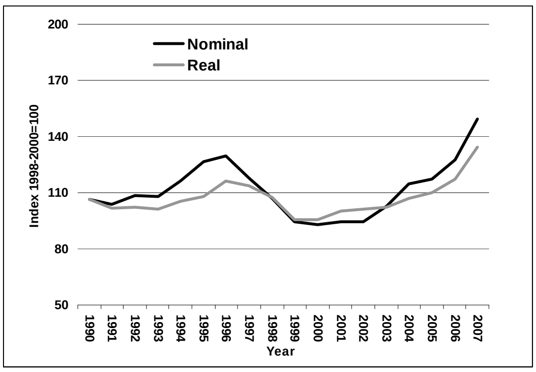


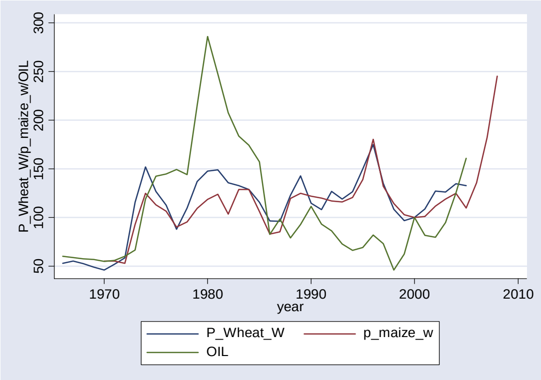
Oil Price and Maize Price
(Jan1980- Mar2008-Average in 2000=100)



Oil Price and Rice Price
(Jan1980- Mar2008-Average in 2000=100)







Summary of the Presentation

1. Backgrounds

2. Data, Methodology and Results

-Focusing on three hypotheses

3. Conclusions with Policy Implications

1. Background

(1) Causes of Oil Price Surges

Demand side: Crude oil demand growth has gone up. (Increased Transportation & Urbanisation in China)

Supply side: Limited fossil fuel.

-Volatility has increased (Political factor e.g. Fattouh 2005)

(2) Causes of Food Price Surges

-Supply Side: Decline in Cereal Stock (2004-6)

- Increasing fuel costs (input & transportation)

-Demand Side: Diversification of Diet towards Meat or Milk in India and China

- The emerging biofuels market

Production in World 8 major exporters of food commodities

		2004	2005	2006	2007
Cereals [1]	'000 tonnes	1,038,325	1,001,221	932,527	1,041,992
	% change		-3.6	-6.9	11.7
Oilseeds [2]	'000 tonnes	281,589	293,097	306,387	288,762
	% change		4.1	4.5	-5.8
Meat [3]	'000 tonnes	196,050	203,317	208,057	209,601
	% change		3.7	2.3	0.7
Dairy [4]	'000 tonnes	370,986	378,730	383,840	394,459
	% change		2.1	1.3	2.8
Sugar [5]	'000 tonnes	76,882	93,451	103,101	102,139
	% change		21.6	10.3	-0.9

[1] Includes Argentina, Australia, Canada, EU, India, Pakistan, Thailand and USA. Rice is in milled equivalents.

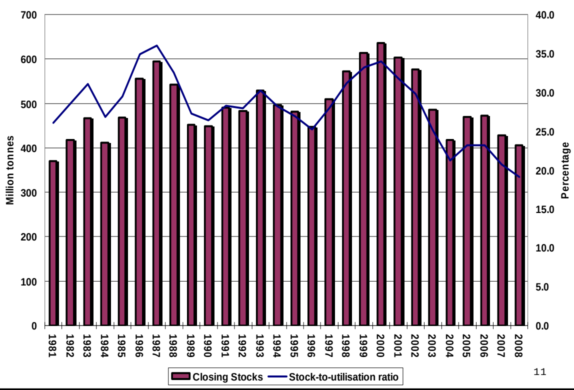
[2] Includes Argentina, Australia, Bangladesh, Canada, China, EU, India, Pakistan, Russian Federation, South Africa, Turkey and USA. The total includes only soybeans, rape seed and suflow er seed production.

[3] Includes Argentina, Australia, Canada, China, EU, India, New Zealand, Uruguay and USA.

[4] Includes Argentina, Australia, Canada, EU, India, New Zealand, Ukraine, and USA. The production is expressed in milk equivalents.

[5] Includes Australia, Brazil, Colombia, Cuba, EU, Guatemala, India, South Africa, Thailand

Global cereal stocks and ratios (FAO, 2008)



(3) Effects of Surge in Oil Prices and Food Prices

(a) Macro levels

-Short term effects

Effects on Trade, Growth and Productivity

-depending on whether the country is a net food importer/ oil importer.

-depending on the country's fragility (e.g. SSA)

(b) Micro levels (distribution) – The poorest in Sub Saharan African or South Asian Countries in both urban and rural areas are likely to be affected.

The poor in rural areas (incl. small farmers) tend to be neglected.

How are the rural poor affected

(e.g. simple simulations by Ivanic and Martin, 2008 (World Bank WPS 4594) or FAO (2008))

Net consumer of food

- agricultural workers (+ ve effects in wages ltd.)
- non-agricultural (unskilled) workers

Net producer of food

- Small-scale farmers (e.g. maize or rice)
- Upward supply response- weak and slow particularly for the poor.
- Productivity gains are concentrated on the rich farmers.

Bangladesh: effect of a 10% increase in the price of rice on welfare (percentages) FAO (2008)

Assumptions – Partial Equilibrium, Shortrun (immediate effcts) based on household models Singh, Squire and Strauss (1986) and Deaton (1989; 1997)

	Per capita expenditure quintiles					
	1	2	3	4	5	All
Rural	-3.19	-2.6	-1.88	-1.64	-1.1	-1.83
Urban	-2.37	-1.9	-1.45	-1.09	-0.71	-1.26
Total	-3.02	-2.33	-1.83	-1.36	-0.94	-1.64

Bangladesh: effect of a 10% increase in the price of rice on welfare by land holdings (percentages) FAO (2008)

	Rural per capita expenditure quintiles					
Land Quintiles	1	2	3	4	5	All
Landless	-3.26	-2.81	-2.28	-2.02	-1.41	-2.33
1	-3.72	-2.59	-2.19	-2.14	-1.66	-2.31
2	-3.1	-2.88	-2.34	-1.66	-1.23	-1.76
3	-1.77	-2.55	-1.61	-1.45	-0.86	-1.44
4	-2.49	-1.33	-1.06	-0.85	-0.74	-0.99
5	-5.09	-2.45	-0.23	-1.09	-0.79	-0.98

Malawi: effect of a 10% increase in the price of maize on welfare (percentages) FAO (2008)

	Per capita expenditure quintiles					
	1	2	3	4	5	All
Rural	-1.23	-0.57	-0.23	-0.02	0.53	-0.17
Urban	-2.56	-1.95	-1.38	-1.19	-0.22	-1.12
Total	-1.26	-0.64	-0.37	-0.23	-0.13	-0.35

Hypothesis A. Whether oil price (or rainfall) affected positively (or negatively) the commodity prices and one commodity price affected another (by co-integration & VAR applied the world as well as India and China),

Hypothesis B. Whether international commodity price fully transmitted to the domestic price (by error correction model for India and China (e.g. Baffes and Gardner 2003; Mundlak and Larson1992),

Hypothesis C. Whether commodity price (or relative oil price) positively (or negatively) affected the domestic supply (by panel data for 10 Asian countries)

2. Data, Methodology and Results

Data for Time Series Analysis

Monthly Data: The IMF Primary Commodity Prices data (Jan 1980-Oct 2007 (or Mar 2008))

Maize- US No. 2, FOB Gulf of Mexico, U.S. price, US$ per metric tone.

Wheat-US No.1 Hard Red Winter, ordinary protein, FOB Gulf of Mexico, US$ per metric tone.

Rice- 5 percent broken milled white rice, Thailand nominal price quote, US$ per metric tone.

Oil (Crude Oil (petroleum), simple average of Dated Brent, West Texas Intermediate, and the Dubai Fateh, US$ per barrel.

Annual Data (1966-2007)
Based on FAO-STAT and UNCTAD commodity price statistics.

Rainfall data
Based on he Tynadall Climate Research Centre at University of East Anglia.

Panel data –
10 Asian countries: Bangladesh, Cambodia, China, India, Indonesia, Nepal, Pakistan, the Philippines, Sri Lanka, and Thailand
Period 1966 to 2005

Methodology- Time Series Analyses
A.Whether oil price and rainfall affected the commodity prices and one commodity price affects another

1.Unit-Root Test: Dickey-Fuller test- GLS regression based Test (Elliot, Rothenberg, and Stock, 1996) for Monthly and Annual Data for Global, India and China (Wheat, Maize, Rice, Vegetable, Fruit, and Oilseeds)

2. Co-integration Test: A vector autoregressive (VAR) model proposed by Johansen (1988, 1991, and 1992) and Johansen and Juselius (1990). E.g.,

$$\left(p^{o}{}_{t} - p^{m}{}_{t}\right) \sim I(0)$$

to see whether oil price and maize price is co-integrated. Each pair is denoted by the vector form.

$$X_{t} = \Pi_{1} X_{t-1} + \ldots + \Pi_{k} X_{t-k} + \varepsilon_{t} \quad (1)$$

where t = 1, …, T. Then taking the first difference

$$\Delta X_{t} = \sum_{i=1}^{k-1} \Gamma_{i} \Delta X_{t-i} + \Pi X_{t-1} + \varepsilon_{t} \quad (2)$$

where $\Pi = -\left(I - \Pi_{1} - \ldots - \Pi_{k}\right)$ with i = I, …, k-1 and

$$\Pi = -\left(I - \Pi_{1} - \ldots - \Pi_{k}\right)$$

Johansen's cointegration is to test the null hypothesis that the number of rank (r) of Π is greater than 0 and smaller than n, the number of stochastic endogenous variables (in this case, 2).

3. Vector Autoregressions and Impulse Functions as well as Granger Causality Tests are carried out.

NB - Toda and Yamamoto (1995): Even if the process is integrated or cointegrated of an arbitrary order in VAR, a lag-selection procedure by estimating ($k+ d_{max}$)th-order VAR where k is determined as a lag length determined by AIC or SIC, for example, is feasible, and d_{max} is the maximal order of integration

Unit-root test (monthly-World)

	DF-GLS Test				
	With trend			Without trend	
	Test Statistics [a, f]		Lags[g]	Test Statistics [a, f]		Lags[g]
Monthly Price- Levels						
Maize	-3.454	*	1	-3.331		1
log (Maize)	-3.365	*	1	-3.299		1
Wheat	-1.211		1	-1.064		1
log (Wheat)	-1.681		1	-1.621		1
Rice	-2.29		1	-1.498		1
log (Rice)	-2.296		1	-1.363		2
Oil	-0.212		1	0.003		1
log (Oil)	-1.297		1	-1.297		1
Monthly Price- First Difference						
DMaize	-5.862	**	2	-2.41	*	6
Dlog (Maize)	-6.087	**	2	-3.947	**	2
D.Wheat	-9.88	**	1	-8.748	**	1
Dlog (Wheat)	-10.548	**	1	-9.476	**	1
DRice	-11.68	**	1	-11.27	**	1
D.log (Rice)	-12.162	**	1	-11.946	**	1
DOil	-12.024	**	1	-11.628	**	1
Dlog (Oil)	-12.202	**	1	-11.667	**	1

Unit-root tests (annual) –World

	World (Annual)							
	DF-GLS Test							
	With Trend				Without Trend			
	Test Statistics [a, b]		Lags [c]		Test Statistics [a, b]		Lags [c]	
I. Price -Levels								
log (P_Wheat)	-3.022		1	I(1)	-1.781		1	I(1)
log (P_Maize)	-1.964		1	NA	-1.771		1	I(1)
log (P_Rice)	-3.463	*	1	I(0)	-2.841	*	1	I(0)
log (P_Fruit)	-1.912		1	I(1)	-0.271		1	I(1)
log (P_Vegetable)	-2.919		1	I(1)	-1.164		2	I(1)
log (P_Oilseeds)	-							
log (P_Oil)	-1.800		1	I(1)	-0.456		1	I(1)
Price- First Differences								
Dlog (P_Wheat)	-6.886	**	1		-6.806	**	1	
Dlog (P_Maize)	-2.557		1		-2.492	**	1	
Dlog (P_Rice)	-5.982	**	1		-4.786	**	1	
Dlog (P_Fruit)	-5.078	**	1		-5.599	**	1	
Dlog (P_Vegetable)	-8.211	**	1		-7.739	**	1	
Dlog (P_Oilseeds)	-							
Dlog (P_Oil)	-4.071	**	1		-4.129	**	1	
Dlog (Rainfall)	-5.535	**	1		-4.129	**	1	

Unit-root tests (annual) –India

	With Trend: Test Statistics [a, b]		Lags [c]		Without Trend: Test Statistics [a, b]		Lags [c]	
India (Annual) — DF-GLS Test								
I. Price -Levels								
log (P_Wheat)	-2.631		1	I(1)	-1.143		2	NA
log (P_Maize)	-3.339	*	1	I(0)	-3.753	**	1	I(0)
log (P_Rice)	-1.724		1	I(1)	-1.371		1	I(1)
log (P_Fruit)	-2.229		1	I(1)	-0.157		1	I(1)
log (P_Vegetable)	-1.570		1	I(1)	-0.281		1	I(1)
log (P_Oilseeds)	-1.962		1	I(1)	-1.712		1	I(1)
log (P_Oil)	-							
Price- First Differences								
Dlog (P_Wheat)	-5.633	**	1		-0.632		6	
Dlog (P_Maize)	-5.476	**	1		-2.424	*	2	
Dlog (P_Rice)	-5.809	**	1		-5.413	**	1	
Dlog (P_Fruit)	-3.287	*	1		-2.231	*	1	
Dlog (P_Vegetable)	-3.509	*	1		-3.294	*	1	
Dlog (P_Oilseeds)	-4.229	**	1		-3.777	**	1	
Dlog (P_Oil)	-							
Dlog (Rainfall)	-5.338	**	1		-3.492	**	1	

Unit-root tests (annual) –China

	With Trend: Test Statistics [a, b]		Lags [c]		Without Trend: Test Statistics [a, b]		Lags [c]	
China (Annual) — DF-GLS Test								
I. Price -Levels								
log (P_Wheat)	-2.121		1	I(1)	-1.803		1	I(1)
log (P_Maize)	-1.356		1	I(1)	-1.183		1	I(1)
log (P_Rice)	-1.617		1	I(1)	-1.148		1	I(1)
log (P_Fruit)	-1.452		1	I(1)	-0.873		1	I(1)
log (P_Vegetable)	-1.532		1	I(1)	-0.959		1	I(1)
log (P_Oilseeds)	-1.544		1	I(1)	-0.997		1	I(1)
log (P_Oil)	-							
Price- First Differences								
Dlog (P_Wheat)	-3.800	**	1		-3.744	**	1	
Dlog (P_Maize)	-4.328	**	1		-4.211	**	1	
Dlog (P_Rice)	-4.508	**	1		-4.336	**	0	
Dlog (P_Fruit)	-4.463	**	1		-3.987	**	1	
Dlog (P_Vegetable)	-4.304	**	1		-4.197	**	1	
Dlog (P_Oilseeds)	-4.138	**	1		-4.079	**	1	
Dlog (P_Oil)	-							
Dlog (Rainfall)	-4.265	**	1		-2.879		1	

Johansen Cointegration test Results

Most of the series (oil price series, commodity prices) are co-integrated with each other for both monthly and annual data.

Weak evidence for the market efficiency hypothesis.

Exceptions

- Monthly data (rice-oil : not-cointegrated)
- Annual data (fruit-oil or wheat-oil - not-cointegrated)

World- Monthly Data, VAR, Impulse Response Functions, and Granger Causality Tests

Monthly Data-

-VAR- (Lagged) Oil Prices do not have significant impact on commodity prices.

-There is a strong link between monthly wheat and maize prices.

('Wheat to Maize' is stronger).

-Granger Causality Tests- Oil significantly causes wheat.

-Rice Granger causes oil prices.

Impulse Response Function -from Oil to Wheat (monthly data)

Impulse Var.	Response Var.		
Oil Price	Wheat Price		
Step	**IRF**	**Higher**	**Lower**
0	0	0	0
1	-0.013501	-0.079216	0.052214
2	0.039312	-0.063903	0.142527
3	0.090225	-0.033803	0.214253
4	0.130149	-3.90E-05	0.260337
5	0.159066	0.027665	0.290466
6	0.179677	0.047766	0.311587
7	0.19557	0.061813	0.329327

World -Annual Data, Each commodity prices + oil price + rainfall

	log(P_Wheat)			log(rainfall)			log(Oil)		
log(P_Wheat)	Coef.	z value		Coef.	z value		Coef.	z value	
L1	0.85	(5.44)	**	0.00	(0.04)		0.27	(1.10)	
L2	-0.43	(-3.23)	**	-0.04	(-1.23)		-0.43	(-2.05)	*
log(rainfall)									
L1	-0.18	(-0.25)		-0.03	(-0.17)		2.84	(2.45)	*
L2	-1.99	(-2.81)	**	-0.38	(-2.20)	*	-0.70	(-0.63)	
log(Oil)									
L1	0.12	(1.05)		0.05	(1.62)		0.92	(5.06)	**
L2	-0.07	(-0.62)		-0.04	(-1.53)		-0.04	(-0.22)	
Constant	17.97	(2.53)		10.19	(5.84)		-14.00	(-1.27)	
Obs	29			29			29		
RMSE	0.138704			0.033972			0.2156		
R-sq	0.6645			0.2482			0.8365		
chi^2	57.44506			9.576059			148.3926		
P>chi2	0			0.1437			0.0000		

Impulse Response Function -from Oil to Wheat (annual data)

Impulse Var.	Response Var.		
Rainfall	Wheat Price		
Step	IRF	Higher	Lower
0	0	0	0
1	-0.183881	-1.642	1.27424
2	-1.78813	-3.46758	-0.10868
3	-1.32075	-2.70633	0.064825
4	0.067407	-1.05822	1.19304
5	0.710188	-0.31601	1.73639
6	0.489913	-0.30288	1.2827
7	0.063409	-0.59934	0.726155

- Rainfall has a negative effect on wheat price, but the negative effect of rainfall fades away gradually.
- Rainfall and maize price are strongly correlated. The former Granger causes the latter.

-Rainfall has a positive effect on oil price with one year lag (also Granger causes).

- Oil price has a positive effect on rice price with one year lag. The positive effect weakens gradually.

India – VAR for oil and commodity prices

- VAR for oil prices and various commodity prices
- Oil price has positive and significant effects on prices of wheat, rice, fruit and vegetable. The former Granger causes the latter, but *not* vice versa.
- Agricultural commodity prices are interlinked (e.g. Wheat and Rice)

	log(P_Wheat)		log(P_Rice)		log(P_Fruit)		log(P_vegetable)		log(P_Oil)	
	Coef.	z value	Coef.	z value	Coef.	z value	Coef.	z value	Coef.	z value
log(P_Wheat)										
L1	0.00	(-0.01)	-0.60	(-2.51)*	-0.49	(-2.60)**	0.59	(1.17)	-0.36	(-0.73)
L2	-0.37	(-1.91)+	-0.74	(-3.02)**	-0.03	(-0.18)	-0.93	(-1.80)+	0.12	(0.24)
log(P_Rice)										
L1	0.27	(2.10)*	0.89	(5.51)**	0.20	(1.56)	0.07	(0.21)	1.29	(3.86)**
L2	-0.01	(-0.05)	-0.01	(-0.06)	-0.35	(-2.45)*	0.39	(1.01)	-1.27	(-3.38)**
log(P_fruit)										
L1	0.18	(1.29)	-0.11	(-0.63)	0.76	(5.32)**	-0.43	(-1.14)	-0.22	(-0.60)
L2	0.05	(0.30)	0.27	(1.28)	0.05	(0.29)	0.46	(1.03)	-0.19	(-0.43)
log(P_vegetable)										
L1	-0.01	(-0.23)	-0.04	(-0.59)	0.03	(0.56)	0.72	(4.82)**	0.04	(0.25)
L2	0.05	(1.01)	0.10	(1.44)	0.11	(1.98)*	0.20	(1.39)	0.16	(1.15)
log(P_Oil)										
L1	0.13	(2.13)*	0.09	(1.18)	0.13	(2.08)*	0.35	(2.15)*	0.92	(5.70)**
L2	0.03	(0.49)	0.17	(2.40)*	0.02	(0.27)	-0.37	(-2.47)*	-0.09	(-0.61)
_cons	3.70	(4.40)	5.35	(4.98)	3.22	(3.81)	-0.23	(-0.10)	2.79	(1.25)

India VAR for commodity price and rainfall

- -Rainfall has small and gradually declining negative effects on wheat price.
- -Oil price Granger causes maize price but not vice versa.
- -Rainfall Granger causes oil price but not vice versa
- -Rainfall Granger causes fruit price.

China -VAR for Agricultural Commodity Prices

- The difference from the results for India
- Crude oil price has little impact on various agricultural commodity prices.
- Rather, vegetable price is a leading indicator that predicts other prices.
- (e.g. Vegetable price Granger causes the prices of rice and fruit, but not vice versa).
- IRF shows a positive and declining effect of vegetable price and wheat price on other prices.
- -The inter-linkages among different commodity prices are weak.

	log(P_Wheat)		log(P_Rice)		log(P_Fruit)		log(P_vegetable)		log(P_Oil)	
	Coef.	z value	Coef.	z value	Coef.	z value	Coef.	z value	Coef.	z value
log(P_Wheat)										
L1	0.88	(5.27) **	0.09	(0.53)	0.30	(1.36)	-0.03	(-0.20)	0.28	(1.35)
L2	-0.10	(-0.57)	-0.03	(-0.18)	-0.29	(-1.25)	0.04	(0.30)	-0.11	(-0.53)
log(P_Rice)										
L1	-0.11	(-0.56)	0.48	(2.49) *	0.10	(0.38)	-0.02	(-0.15)	0.23	(0.90)
L2	0.19	(1.01)	0.08	(0.42)	0.19	(0.75)	-0.03	(-0.22)	0.03	(0.11)
log(P_fruit)										
L1	0.09	(0.63)	-0.15	(-1.07)	0.36	(1.90) +	0.01	(0.13)	-0.06	(-0.34)
L2	-0.30	(-2.05) *	0.25	(1.76) +	0.27	(1.42)	0.02	(0.18)	-0.28	(-1.54)
log(P_vegetable)										
L1	0.56	(1.96) +	0.98	(3.56) **	0.82	(2.18) *	1.19	(5.54) **	0.63	(1.76) +
L2	-0.55	(-1.85) +	-0.71	(-2.45) *	-0.97	(-2.45) *	-0.24	(-1.04)	-0.44	(-1.17)
log(P_Oil)										
L1	0.03	(0.27)	-0.20	(-1.58)	-0.10	(-0.57)	0.01	(0.12)	0.77	(4.77) **
L2	0.02	(0.22)	0.16	(1.42)	0.16	(1.09)	-0.05	(-0.59)	0.02	(0.11)
_cons	1.45	(3.00)	0.36	(0.77)	0.64	(1.00)	0.39	(1.07)	-0.62	(-1.02)

China- rainfall, oil, and each commodity price

- Wheat price Granger causes oil price.
- Significant causality is ***not*** found in the Granger tests in the direction from rainfall or oil to commodity prices
- Rainfall affects negatively wheat, maize, rice, fruit prices with one and/or two year lag. This is reflected in the numerical and graphical representations of the IRF.

Hypothesis B. Whether international commodity price affected the domestic price

Mundlak and Larson (1992) simply estimated

$$p^d_t = \alpha + \beta p^w_t + \varepsilon_t \qquad (3)$$

$$H_0 : \alpha + 1 = \beta = 1$$

Suppose $\beta = 1$, (3) becomes

$$(p^d_t - p^w_t) \sim I(0)$$

Attractive, but price are not stationary…. By adding lags,

$$p^d_t = \alpha + \beta_1 p^w_t + \beta_2 p^d_{t-1} + \beta_3 p^w_{t-1} + e_t$$

Suppose $\beta_3 = 1 - \beta_1 - \beta_2 \equiv \beta$ this could be written as:

$$(p^d_t - p^d_{t-1}) = \alpha + \gamma(p^w_{t-1} - p^d_{t-1}) + \beta(p^w_t - p^w_{t-1}) + e_t$$

Let *k* be the extent of adjustment which takes place in *n* periods where the current period is defined as *n* =0 and the next period is *n* =1.

$$k = 1 - (1-\beta)(1-\gamma)^n$$

India

	Constant (t value)	Adjustment Coefficent (t value)	Short-run Effect (t value)	3 years Adjustment
India				
log(Wheat)	0.511	**0.140**	**0.229**	**0.510**
	(1.95).	**(2.14)***	**(2.42)***	
log(Maize)	0.028	**0.099**	**0.246**	**0.448**
	(0.88).	**(0.76).**	**(1.40).**	
log(Rice)	0.021	**0.189**	**0.293**	**0.623**
	(1.18).	**(2.34)***	**(4.00)****	
log(Fruit)	0.089	**0.152**	**0.132**	**0.471**
	(2.30).	**(1.86)+**	**(1.08).**	
log(Vegetable)	0.024	**0.130**	**-0.242**	**0.181**
	(0.61).	**(2.72)****	**(-1.54).**	

China

		Constant (t value)	Adjustment Coefficent (t value)	Short-run Effect (t value)	3 years Adjustment
China					
	log(Wheat)	0.003	**0.035**	**0.505**	**0.555**
		(0.08).	**(0.61).**	**(3.42)****	
	log(Maize)	-0.034	**0.396**	**0.505**	**0.891**
		(-1.06).	**(3.00)****	**(3.32)****	
	log(Rice)	0.010	**0.200**	**0.295**	**0.640**
		(0.34).	**(3.22)****	**(2.62)***	
	log(Fruit)	0.045	**0.392**	**0.353**	**0.855**
		(1.15).	**(2.73)****	**(1.16).**	
	log(Vegetable)	-0.029	**0.157**	**0.191**	**0.516**
		(-0.84).	**(2.04)***	**(2.21)***	

Findings

- The extent of adjustment of domestic to global prices in the short to the medium-run is generally larger in China than in India.
- Larger adjustment is found for wheat, maize and rice prices than for fruits and vegetables in India.
- The adjustment is the weakest for vegetables in both India and China.

- While most of the domestic commodity prices co-move with global prices, the transmission is in general incomplete (e.g. due to distortionary government policies, - subsidies for domestic agricultural commodities and failure to exploit spatial arbitrage).
- The potential benefits to farmers and a larger supply response are likely to be restricted.

Growth of Food Trade and Infrastructure Development in China and India

India	Food Export (current 109US$)	Food Import (current 109US$)	Rail lines (total route-km)	Roads (total network-km)	% of paved roads in total roads
1992	3.18	0.9	62486	2021441	51.9
2002	6.06	3.27	63140	3383344	47.4
Average annual growth rate (%)	6.45	12.90	0.10	5.15	-0.91
China	**Food Export (current 109US$)**	**Food Import (current 109US$)**	**Rail lines (total route-km)**	**Roads (total network-km)**	**% of paved roads in total roads**
1992	9.62	3.94	53566	1265916	NA
2002	16.1	10.4	59530	1765222	78.3
Average annual growth rate (%)	5.15	9.71	1.06	3.32	NA

Hypothesis C. Whether commodity price (or relative oil price) positively (or negatively) affected the domestic supply

We use panel data for 10 Asian countries (1966-2005).

$$\log Y^{j}{}_{it} = \beta_0 + \beta_1 \log P^{j}{}_{it} | + \beta_2 \log P^{j}{}_{it-1} + \beta_3 \log\left(\frac{P^{oil}{}_{t}}{P^{j}{}_{it}}\right) + \beta_4 \log R_{it} + \lambda^{j}{}_{i} + e^{j}{}_{it}$$

where Y^j_{it} : Yield per hectare (for commodity *j*, country *i* in year *t*).
P^j_{it} : Producer price,
P^{oil}_t : Oil price,
R_{it} : Annual rainfall.

Without Rainfall

		Maize		Wheat		Rice	
		Coef.	t value	Coef.	t value	Coef.	t value
Random	$\log(\text{price})_{it}$	-0.10	(-1.24)	-0.11	(-0.93)	-0.09	(-1.45)
Effects	$\log(\text{price})_{it-1}$	0.28	(4.14) **	0.30	(2.66) **	0.30	(5.51) **
Model	$\log(P_{oil}/P_{commo}$	-0.13	(-3.70) **	0.05	(0.99)	-0.14	(-6.06) **
	$\log(\text{rainfall})_{it}$	-	-	-	-	-	-
	Constant	6.34	(31.67)	6.43	(16.99)	6.57	(39.61)
Number of Observations		390		209		390	
Number of Countries		10		6		10	
Period covered		1966-2005		1966-2005		1966-2005	

Without Rainfall

		Fruit		Vegetable		Oilseeds	
		Coef.	t value	Coef.	t value	Coef.	t value
Random	$\log(price)_{it}$	-0.03	(-0.45)	-0.06	(-1.55)	0.20	(1.65) +
Effects	$\log(price)_{it-1}$	0.00	(0.04)	0.13	(3.76) **	0.10	(0.91)
Model	$\log(P_{oil}/P_{commc}$	-0.09	(-2.56) *	-0.06	(-3.55) **	0.10	(1.81) +
	$\log(rainfall)_{it}$	-	-	-	-	-	-
	Constant	8.87	(40.3)	8.60	(63.57)	5.38	(8.1)
Number of Observations		331		390		220	
Number of Countries		10		10		7	
Period covered		1966-2005		1966-2005		1966-2005	

Findings

-1 % increase in own price increase results in 0.28-0.30 % of per hectare yield increase with one year lag for maize, wheat, and rice.

-The response is weaker for fruits and vegetables.

-On the other hand, the yield response in the current period is stronger for oilseeds.

-Oil price seems to have a negative effect on yields of most of the commodities.

Bardhan and Bardhan (2003)
-When the relative cereal price is high, more is marketed as less is consumed.

Krishna (1995)

$c = b\ E_{MQ}$ (2)

where c denotes price elasticity of market supply, b refers to price elasticity of output and E_{MQ} is the output elasticity of market supply. The output elasticity of market supply of wheat was high, ranging from 1.04 to 1.6.

-If output increases in response to a price increase, sales are likely to increase more than proportionately for different sizes of land holders (Krishna)

- High foodgrain prices may help dampen the continuing surge, given a growing demand.

4. Conclusions

- ***Hypothesis A. Whether oil price (or rainfall) affected positively (or negatively) the commodity prices and one commodity price affected another ----Yes.***
- Robust evidence confirming comovements of different food prices.
- Prices (e.g. wheat, rice, fruit, vegetable and oilseeds) are strongly interlinked globally.
- Oil price has a significant positive impact on agricultural commodity prices globally for India but not for India.

- China -vegetable price leads other prices.
- Rainfall has a negative impact on wheat price (World and India).
- Rainfall affects negatively wheat, maize, rice, fruit prices in China.

Hypothesis B. Whether international commodity price affected the domestic price

Yes, but…

- The extent of adjustment of domestic to global prices in the short to the medium-run is generally larger in China than in India.
- Larger adjustment is found for wheat, maize and rice prices than for fruits and vegetables in India.

Hypothesis C. Whether commodity price (or relative oil price) positively (or negatively) affected the domestic supply Yes.

- 1 % increase in own price increase results in 0.28-0.30 % of per hectare yield increase with one year lag for maize, wheat, and rice.
- The response is weaker for fruits and vegetables.
- The yield response in the current period is stronger for oilseeds.

Countries	Reduce or eliminate tariffs	Increase export levies	Quotas
Bangladesh	Reduced tariffs of **rice** and **wheat** imports by 5%		
Brazil	Considering removal of tariffs on **wheat**		
China		Introduced export levies on **wheat**, **buckwheat**, **barley** and **oats** by 10 % Increased those on **wheat flour and starch, maize, sorghum, millet** and **soybeans**	Introduced export quotas on **flour made of wheat, maize** and **rice**

Countries	Reduce or eliminate tariffs	Increase export levies	Quotas
India	Eliminated tariffs on wheat and wheat flour		
Indonesia	Eliminated tariffs on wheat and soybeans		
Pakistan			Imposed levies on exports of wheat and wheat flour

4. Conclusions (cont.)

-Protection of the rural poor is crucial.

-To promote smallholders, technical change and easier access to credit and insurances are important.

-However, the desperate policy responses in the form of price and quantity restrictions may have a negative impact on small-holders in the long run given the positive impact of price on production and on market supply.