Commodity Inflation and Monetary Policy

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Overarching Question: To which extent should CBs accommodate imported commodity inflation?

Nominal (fixed) peg: Full accommodation.

Within IT: CBs have a number of choices entailing different degrees of accommodation.

E.g.: Targeting (explicitly or implicitly through the limits of IT bands) "core" (ex-commodities) CPI vs. broad ("headline") CPI.

Aim of the Talk:

Examine the merit of “core” vs. strict “broad” CPI targeting (as well as full accommodation through pegging) from the viewpoint of economy-wide welfare.

We tackle this question on two fronts:

- First , the nature of the price shock according to a broad set of global indicators and historical experience;

- Second, in terms of a SOE DSGE model where food (or a relevant commodity composite) enters consumers’ utility separately – i.e., unlike any other (highly substitutable) good.

Presentation's Road Map

I. Stylized Facts on global commodity prices and IT

II. Literature overview on IT under commodity shocks

III. Proposed model and differences viz others

IV. Welfare assessment

V. Conclusions

I. Six Stylized Facts on Commodity Prices

SF 1: Highly volatile (much emphasized) but also very persistent!

SF2: Highly responsive to world output and particularly i*.

SF3: Food more inflationary than oil.

SF4: Relative to oil and other commodities, food remains cheap.

SF5: Prolonged lower stock-to-user ratios (as now) --> higher z*.

SF 6: Large z* shocks recently associated with IT breaches and weakening of Taylor rules (relative to baseline).

SF 1

Table 1. Commodity Prices: AR(1) Persistence Measures			
	log-levels	HP Gap	Growth Rates
1900-2010			
All Commodity TOT	0.90	0.46	0.04*
Food TOT	0.94	0.45	0.19
Food Prices	0.98	0.54	0.19
Man Prices	1.00	0.63	0.38
1960-2010			
All Commodity TOT	0.88	0.47	0.11*
Food TOT	0.95	0.52	0.21
Food Prices	0.94	0.54	0.23
Oil Prices	0.97	0.40	-0.04*
Man Prices	0.99	0.64	0.41
* Not statistically significant			

SF 2

Table 2: Correlations between Food and Oil Prices and G8 Real GDP (1960-2010)

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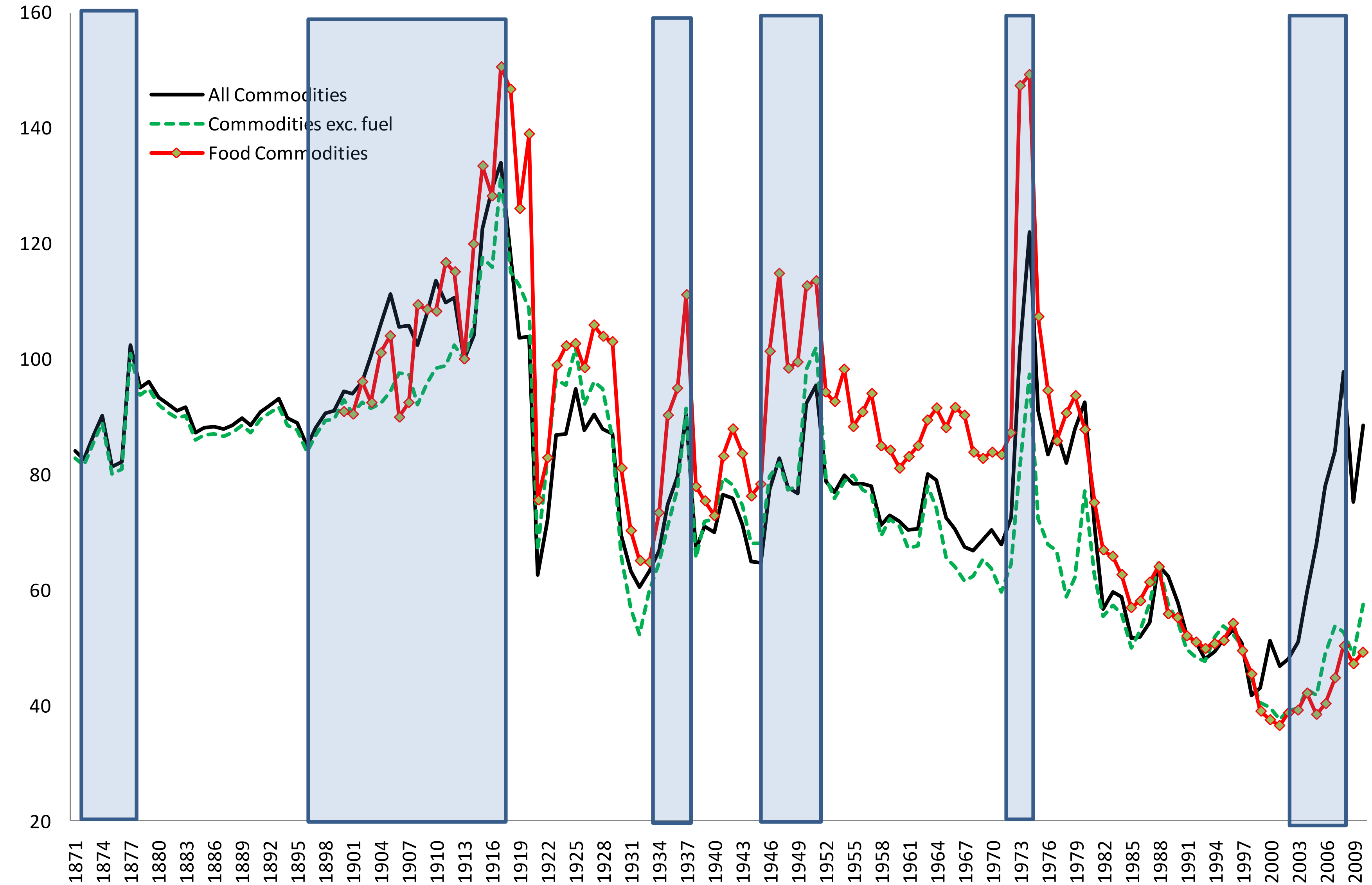
	OILt	OILt-1	FOODt	FOODt-1	YWOt	YWOt-1
OILt	1.00	0.34	0.20	0.46	-0.03	0.22
OILt-1	0.34	1.00	-0.19	0.21	-0.39	-0.05
FOODt	0.20	-0.19	1.00	0.52	0.19	0.24
FOODt-1	0.46	0.21	0.52	1.00	-0.21	0.21
YWOt	-0.03	-0.39	0.19	-0.21	1.00	0.56
YWOt-1	0.22	-0.05	0.24	0.21	0.56	1.00

****

* All variables HP-detrended

Figure 1. World Commodity Terms of Trade (relative to manufacturing prices, 1913=100)



SF2

Table 4. Determinants of Food Prices: OLS Regressions

a) Log-levels

Dependent variable is LOFOOD			
86 observations used for estimation from 1924 to 2009			
Regressor	Coefficient	Standard Error	T-Ratio[Prob]
IRWORLD	-.027272	.0070603	-3.8627[.000]
LOYWO	.15257	.069238	2.2036[.030]
LOUSREER	.80736	.093793	8.6079[.000]
USSTOCKR	-.29089	.056295	-5.1672[.000]
R-Squared	.60199	R-Bar-Squared	.58743
S.E. of Regression	.21263	F-Stat. F(3,82)	41.3417[.000]
DW-statistic	.38255		

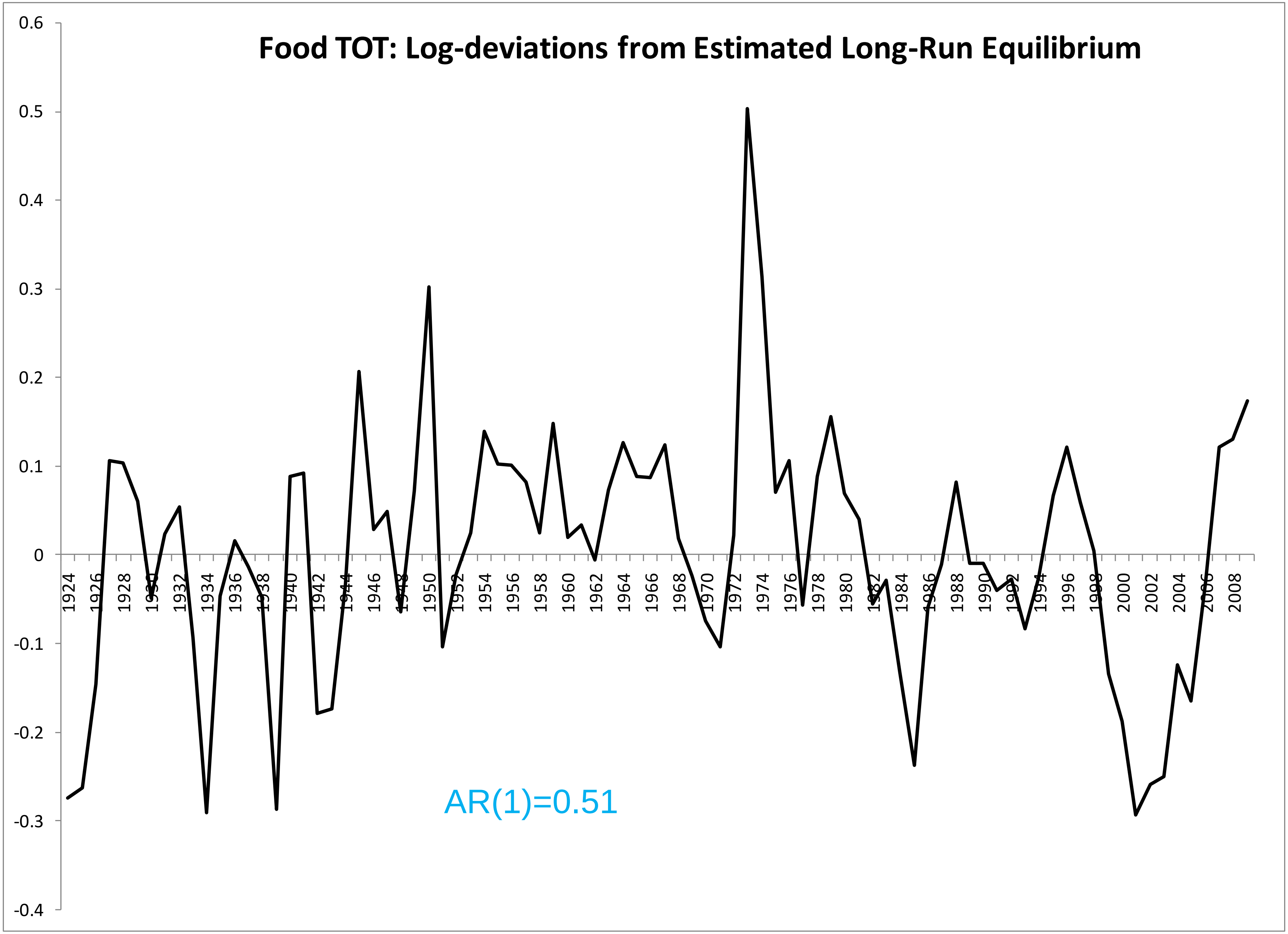
b) Log-levels (with trend and Dwar)

Dependent variable is LOFOOD			
86 observations used for estimation from 1924 to 2009			
Regressor	Coefficient	Standard Error	T-Ratio[Prob]
INPT	-4.7905	1.1685	-4.0997[.000]
IRWORLD	-.050366	.0054662	-9.2140[.000]
LOYWO	1.3157	.16634	7.9098[.000]
LOUSREER	.57537	.12990	4.4293[.000]
USSTOCKR	-.20428	.054826	-3.7259[.000]
DWAR	-.53053	.072415	-7.3263[.000]
TREND	-.044511	.0057085	-7.7973[.000]
R-Squared	.82162	R-Bar-Squared	.80807
S.E. of Regression	.14502	F-Stat. F(6,79)	60.6466[.000]
DW-statistic	.93360		

SF 2

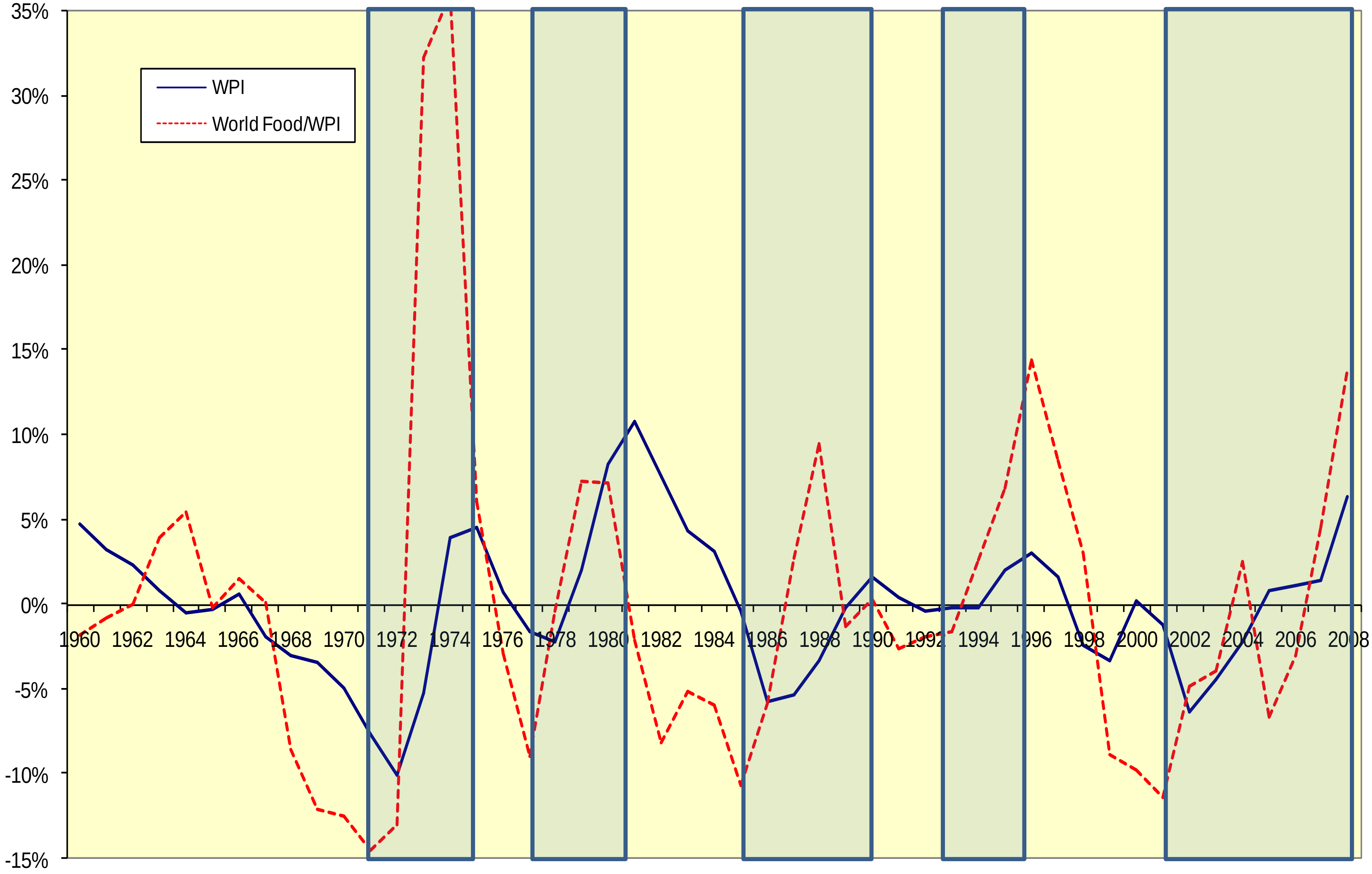
c) Deviations from HP trend

**			
Dependent variable is FOODGAP			
85 observations used for estimation from 1925 to 2009			
**			
Regressor	Coefficient	Standard Error	T-Ratio[Prob]
IRWORLD	-.0071345	.0030910	-2.3081[.024]
YWOGAP	.071909	.21338	.33699[.737]
LOUSREER	-.15980	.078589	-2.0334[.045]
STOCKGAP	.017232	.065785	.26195[.794]
FOODGAP(-1)	.43662	.094170	4.6365[.000]
**			
R-Squared	.35376	R-Bar-Squared	.31286
S.E. of Regression	.092502	F-Stat. F(5,79)	8.6492[.000]
DW-statistic	.5420		
**			


Food TOT: Log-deviations from Estimated Long-Run Equilibrium
AR(1)=0.51
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
1924
1926
1928
1930
1932
1934
1936
1938
1940
1942
1944
1946
1948
1950
1952
1954
1956
1958
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008

SF3

Figure 2. World WPI and World Relative Food Prices
(in deviations from HP-trend)



SF3

Table 1. Correlations between World Inflation Indicators and Food and Oil Prices, 1990-2008
(all series HP detrended)

Contemporary Correlations

	USWPI	World WPI	World CPI	Pfood	Poil
USWPI	1.0000	.83689	.74349	.61911	.72550
World WPI	.83689	1.0000	.66171	.63273	.46531
World CPI	.74349	.66171	1.0000	.55970	.39451
Pfood	.61911	.63273	.55970	1.0000	.17133
Poil	.72550	.46531	.39451	.17133	1.0000

Lagged Correlations

	USWPI	World WPI	World CPI	Pfood	Poil
USWPI	1.0000	.83689	.74349	.44189	.29036
World WPI	.83689	1.0000	.66171	.46337	.27692
World CPI	.74349	.66171	1.0000	.36737	.52542
Pfood(t-1)	.44189	.46337	.36737	1.0000	-.031275
Poil(t-1)	.29036	.27692	.52542	-.031275	1.0000

SF3

Table 3. Granger Causality Tests

A. Food Prices → US WPI

```
*************************************************************************
 Dependent variable is WPIGAP
 List of the variables added to the regression:
 ZGAP(-1)        ZGAP(-2)
 47 observations used for estimation from 1962 to 2008
*************************************************************************
Joint test of zero restrictions on the coefficients of additional
variables:
 Lagrange Multiplier Statistic      CHSQ( 2)=  10.4873[.005]
 Likelihood Ratio Statistic         CHSQ( 2)=  11.8668[.003]
 F Statistic                        F(  2,  42)=   6.0317[.005]
*************************************************************************
```

B. Oil Prices → US WPI

```
*************************************************************************
 Dependent variable is WPIGAP
 List of the variables added to the regression:
 PROILGAP(-1)    PROILGAP(-2)
 47 observations used for estimation from 1962 to 2008
*************************************************************************
 Joint test of zero restrictions on the coefficients of additional
variables:
 Lagrange Multiplier Statistic      CHSQ( 2)=   1.4879[.475]
 Likelihood Ratio Statistic         CHSQ( 2)=   1.5119[.470]
 F Statistic                     F(  2,  42)=   .68653[.509]
*************************************************************************
```

C. Oil → Food

```
*************************************************************************
 Dependent variable is ZGAP
 List of the variables added to the regression:
 PROILGAP(-1)    PROILGAP(-2)
 47 observations used for estimation from 1962 to 2008
*************************************************************************

 Joint test of zero restrictions on the coefficients of additional
variables:
 Lagrange Multiplier Statistic      CHSQ( 2)=   1.1923[.551]
 Likelihood Ratio Statistic         CHSQ( 2)=   1.2077[.547]
 F Statistic                     F(  2,  42)=   .54659[.583]
*************************************************************************
*
```

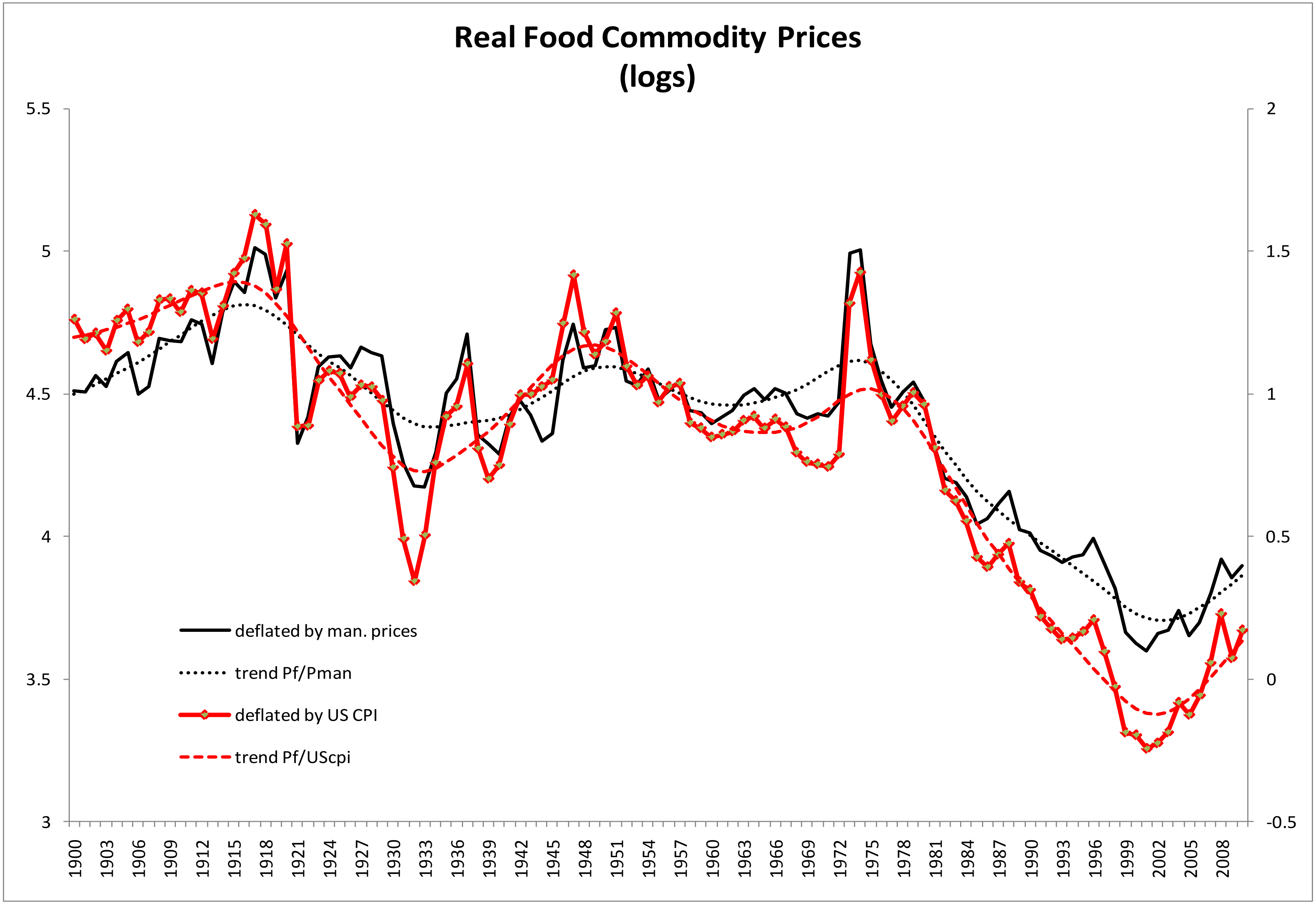
SF3

Table 3 (cont.)

A. Food → Oil

```
*******************************************************************************
 Dependent variable is PROILGAP
 List of the variables added to the regression:
 ZGAP(-1)         ZGAP(-2)
 47 observations used for estimation from 1962 to 2008
*******************************************************************************
 Joint test of zero restrictions on the coefficients of additional
variables:
 Lagrange Multiplier Statistic     CHSQ( 2)=  14.1011[.001]
 Likelihood Ratio Statistic        CHSQ( 2)=  16.7653[.000]
 F Statistic                    F(  2,  42)=   9.0010[.001]
*******************************************************************************
*
```

SF 4


Real Food Commodity Prices
(logs)
5.5
5
4.5
4
3.5
3
2
1.5
1
0.5
0
-0.5
deflated by man. prices
trend Pf/Pman
deflated by US CPI
trend Pf/UScpi
1900
1903
1906
1909
1912
1915
1918
1921
1924
1927
1930
1933
1936
1939
1942
1945
1948
1951
1954
1957
1960
1963
1966
1969
1972
1975
1978
1981
1984
1987
1990
1993
1996
1999
2002
2005
2008

SF 4

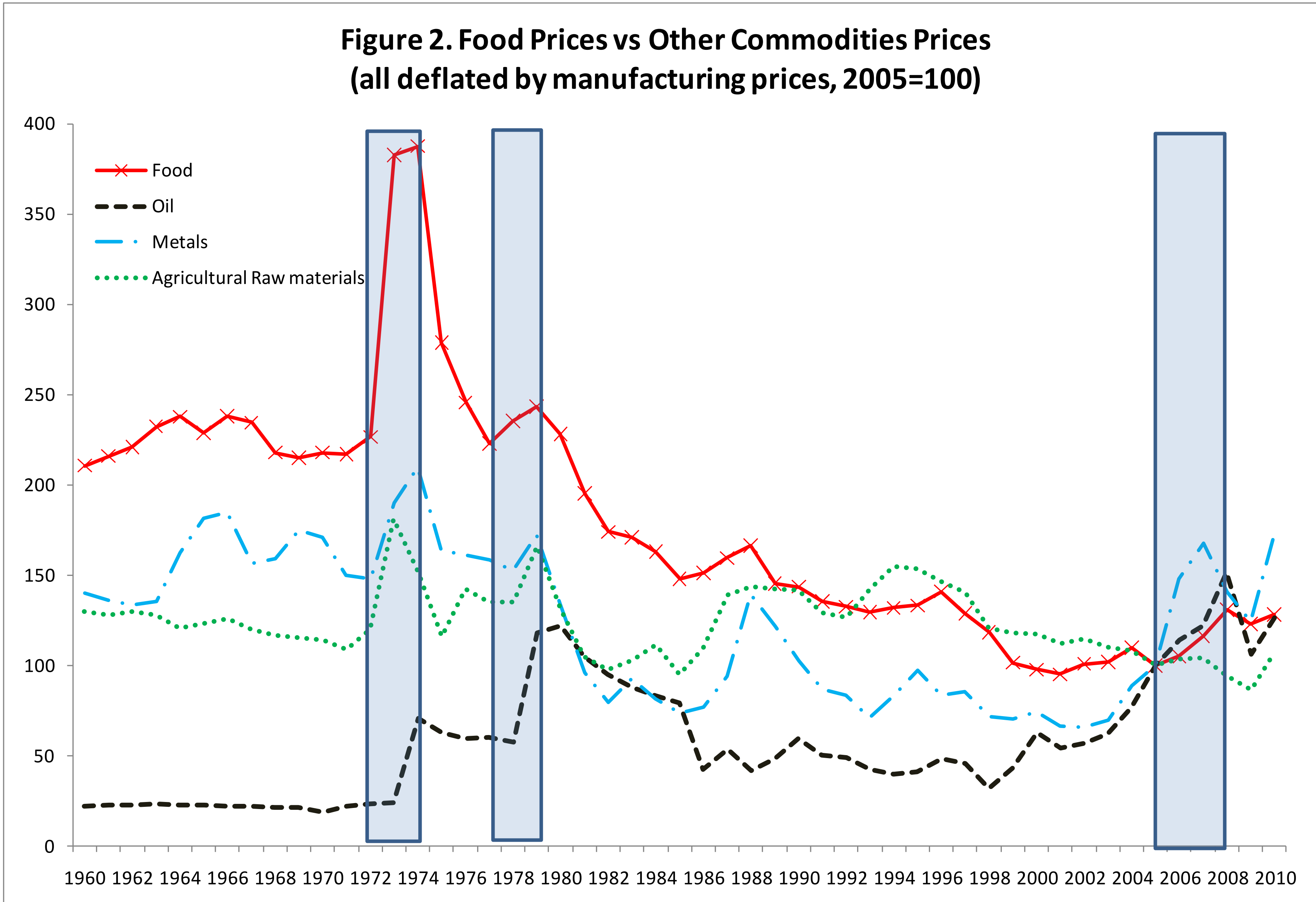


Figure 2. Food Prices vs Other Commodities Prices
(all deflated by manufacturing prices, 2005=100)
Food
Oil
Metals
Agricultural Raw materials
400
350
300
250
200
150
100
50
0
1960 1962 1964 1966 1968 1970 1972 1974 1976 1978 1980 1982 1984 1986 1988 1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010

SF 5

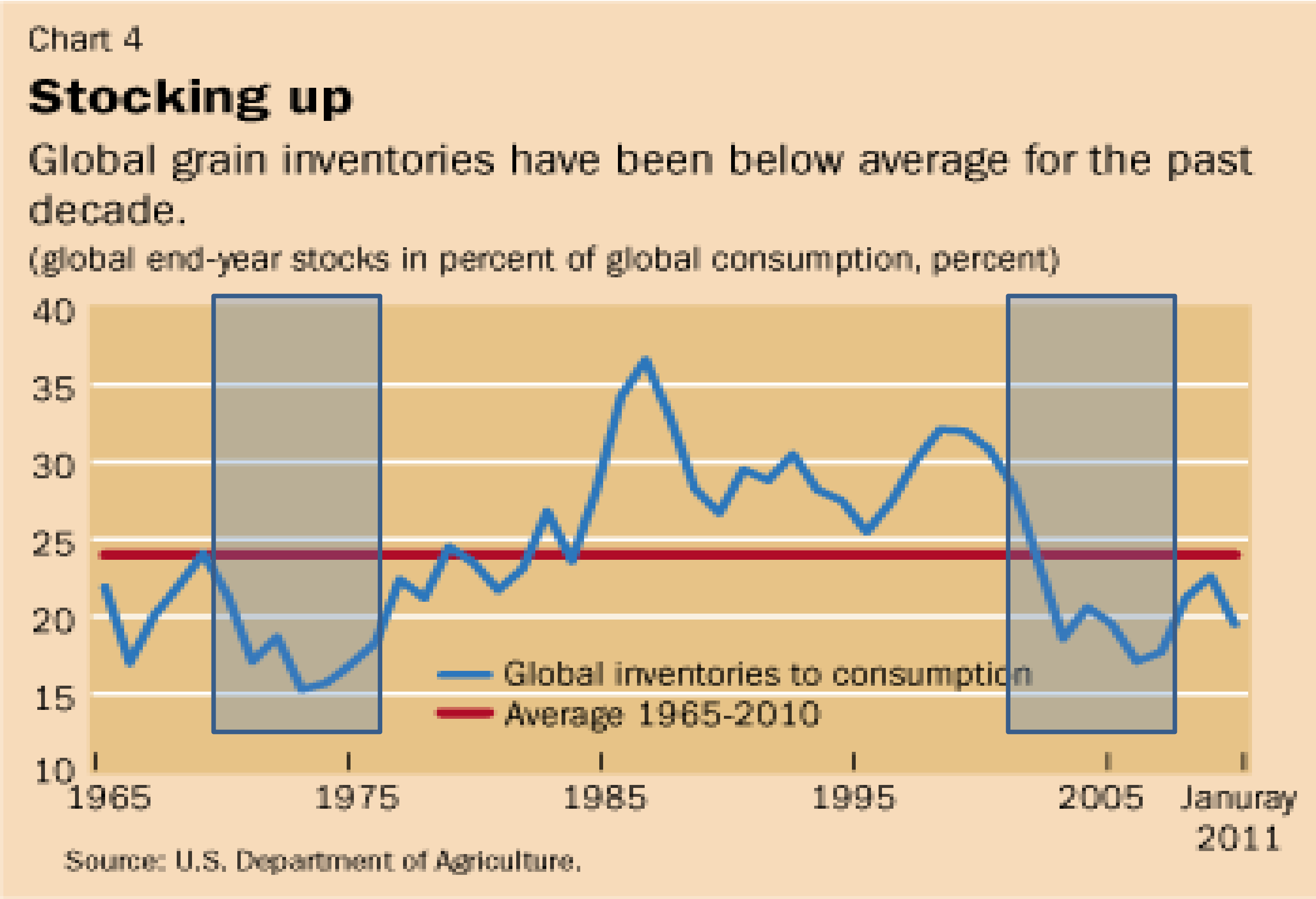


Chart 4
Stocking up
Global grain inventories have been below average for the past decade.
(global end-year stocks in percent of global consumption, percent)
40
35
30
25
20
15
10
Global inventories to consumption
Average 1965-2010
1965
1975
1985
1995
2005
Januray 2011
Source: U.S. Department of Agriculture.

SF 6

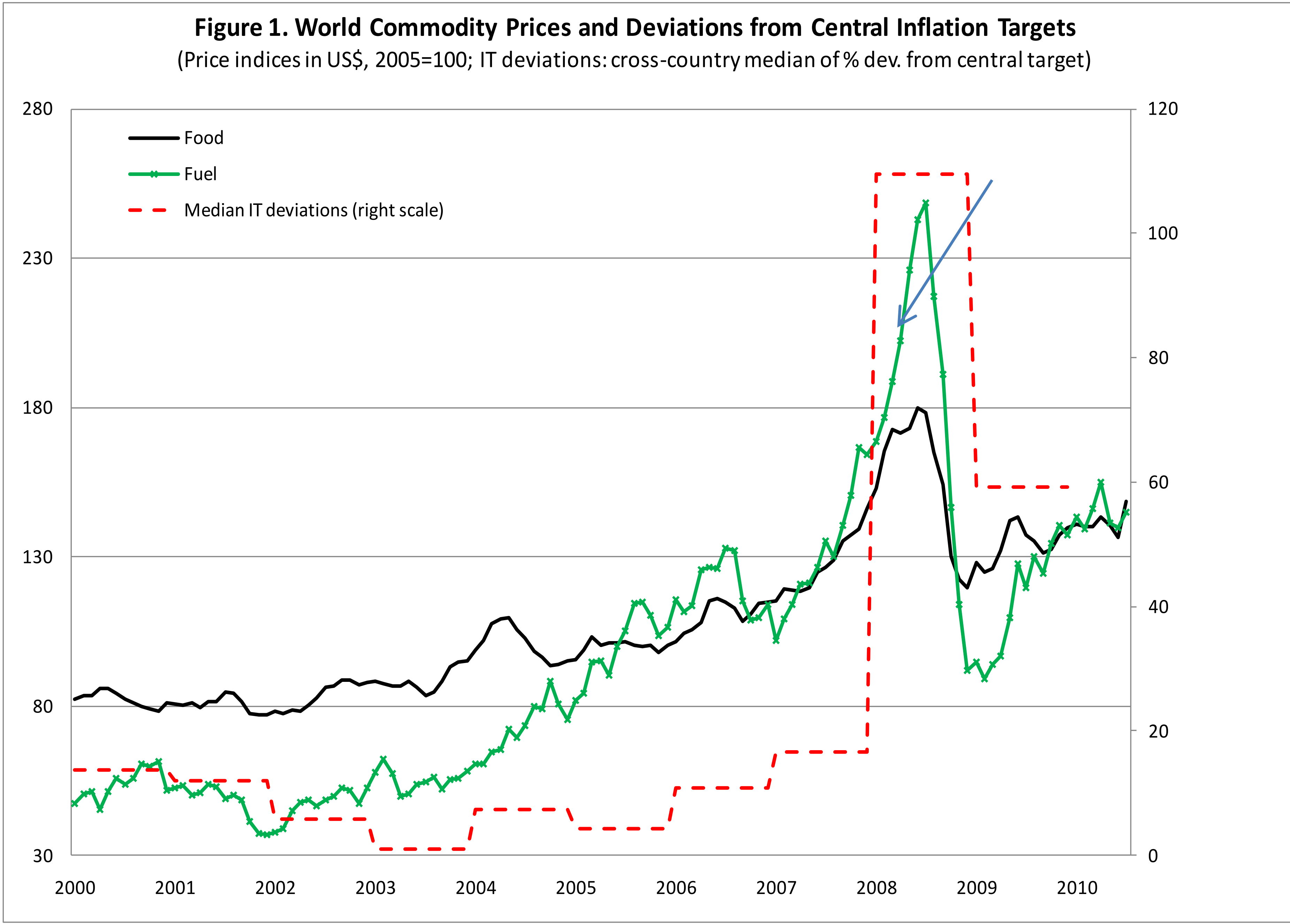


Figure 1. World Commodity Prices and Deviations from Central Inflation Targets
(Price indices in US$, 2005=100; IT deviations: cross-country median of % dev. from central target)
Food
Fuel
Median IT deviations (right scale)
280
230
180
130
80
30
120
100
80
60
40
20
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010

Table 2. Descriptive Taylor Rule Estimates
(t-ratios in brackets)

Coefficients on:	i(t-1)	ygap	CPI infl	D07-08*CPI inf
1) Australia:	0.9	0.33	0.12	**-0.06**
(1994q3-2010q2)	(19.72)	(3.41)	(4.15)	**(-0.71)**
2) Canada:	0.91	0.26	0.05	**-0.19**
(1995q1-2010q2)	(26.40)	(2.86)	(1.51)	**(-1.77)***
3) Euro Area:	0.91	0.23	0.20	**-0.22**
(1999q1-2010q2)	(17.10)	(2.01)	(2.91)	**(-1.73)***
4) New Zealand:	0.83	0.32	0.23	**0.13**
(1993q1-2010q2)	(13.20)	(2.67)	(3.55)	**(0.79)**
5) UK:	0.93	0.17	0.09	**-0.09**
(1992q1-2010q2)	(26.63)	(1.80)	(3.76)	**(-1.23)**
6) Switzerland:	0.8	0.23	0.13	**-0.22**
(1996q1-2010q1)	(10.4)	(1.87)	(2.18)	**(-1.68)***
7) Brazil	0.66	0.25	0.32	**-0.11**
(1999q2-2010q1)	(11.93)	(1.08)	(4.89)	**(-1.08)**
8) Chile:	0.86	0.25	0.19	**-0.10**
(2000q1-2010q2)	(11.56)	(1.93)	(3.29)	**(-1.12)**
9) Czech Rep.:	0.82	0.01	0.12	**-0.09**
(1998q1-2010q2)	(38.7)	(0.15)	(6.63)	**(-2.17)****
10) Mexico:	0.76	0.39	0.15	**-0.13**
(1999q1-2010q2)	(14.64)	(1.90)	(1.46)	**(-0.51)**
11) South Africa:	0.85	0.72	0.14	**-0.12**
(2001q1-2010q2)	(23.3)	(6.18)	(5.96)	**(-3.11)****
12) Thailand:	0.97	0.08	0.04	**-0.06**
(2000q1-2010q2)	(18.0)	(1.91)	(1.77)	**(-1.66)***

II. What to Target: Previous Work

Closed economy DSGEs: Stabilize PPI (or core CPI), as it reproduces flex-price allocation under price stickiness (Goodfriend and King, 2001).

Open economy DSGEs : Not so straightforward because of OE imperfections (TOT externality, incomplete world capital markets, pricing to market).

Yet, a main result is that PPI targeting is often optimal even then (Kollman, 2002; Gali and Monacelli, 2005; Bergin et al, 2007)

Policy Implications of this literature:

CBs should be less hawkish about (accommodate) imported food price inflation, up to when inflationary pressures percolate through domestic sticky price sectors (manufacturing and services).

Such a "dovish" approach is recommendable even if food shocks are domestic rather than imported. This is because commodity sectors are typically flex-price and hence pricing is much less inertial (Aoki, 2001)!

Here we show this is not the case: broad CPI is typically welfare superior!

We obtain this result in the canonical model once:

- Commodities like food be a distinctive good in utility [large weight in consumption basket and basically non-substitutable, ε~(0.1, 0.4)].
- The SOE faces imported relative price commodity shocks which are as large and as persistent as in real world data.
- Food has a much higher weight in domestic CPI than in main trading partners. Very important because of RER!
- A variety of plausible elasticities and functional forms for U(C,N).

All the rest remains the same as in the cannonical model!

Table 5. Food Expenditure Shares in National Consumption Baskets

Austria	15.5%		Latvia	40.4%
Belgium	16.1%		Lithuania	45.5%
Bulgaria	43.4%		Luxemburg	13.6%
Chile	18.9%		Malta	34.2%
Cyprus	26.4%		Mexico	32.7%
Czech Republic	24.2%		Netherlands	11.9%
Denmark	14.0%		Panama	34.9%
Estonia	30.8%		Poland	30.4%
Finland	15.6%		Portugal	22.2%
France	15.1%		Romania	58.7%
Germany	15.6%		Slovakia	33.3%
Greece	21.3%		Slovenia	22.9%
Hungary	29.4%		Spain	25.4%
Ireland	18.0%		Sweden	12.1%
Italy	28.3%		United Kingdom	12.9%
Overall Median	**23.6%**			
Overall Mean	**25.5%**			
EM Median	**32.7%**			
EM Mean	**33.7%**			
Advanced Median	**15.5%**			
Advanced Mean	**16.3%**			

III. Model

$$U_t = \frac{C_t^{1-\sigma}}{\varsigma(1-\sigma)} - \int_0^1 \frac{N_t(j)^{1+\varphi}}{1+\varphi} dj$$

$$C_t = \left[(1-\alpha)^{1/\eta} C_{ht}^{(\eta-1)/\eta} + \alpha^{1/\eta} C_{ft}^{(\eta-1)/\eta} \right]^{\eta/(\eta-1)}$$

$$P_t = \left[(1-\alpha) P_{ht}^{1-\eta} + \alpha P_{ft}^{1-\eta} \right]^{1/(1-\eta)} \qquad (1)$$

$$P_{ft} = S_t P_{ft}^{*}$$

where η is low and α is openness.

Other Building Blocks from (now) canonical SOE DSGE model (cf. Gali and Monacelli, 2005 and others):

Production: $Y_t(j) = A_t N_t(j)$

Euler Eq.: $$\frac{1}{1+i_t} = \beta E_t\left[\left(\frac{C_{t+1}}{C_t}\right)^{-\sigma}\frac{P_t}{P_{t+1}}\right] \qquad (2)$$

Asset markets: $$\frac{1}{1+i_t^*} = \beta E_t\left[\left(\frac{C_{t+1}^*}{C_t^*}\right)^{-\sigma}\frac{P_t^*}{P_{t+1}^*}\right]$$

$$\frac{E(S_{t+1}/S_t)}{1+i_t} = \frac{1}{1+i_t^*} \qquad \text{(UIP)}$$

Hence: $$C_t = \kappa C_t^* X_t^{1/\sigma}$$

where $$X_t = S_t P_t^* / P_t \qquad (3)$$

and $$Z_t^* = P_{f_t}^* / P_t^*$$

Importantly, X may move in opposite directions with TOT:

$$x_t = (1-\alpha) q_t - z_t^*$$

Domestic goods market clearing:

$$Y_{ht} = (1-\alpha)\left(\frac{P_{ht}}{P_t}\right)^{-\eta} C_t + \phi X_t^{\gamma} \left(\frac{P_{ht}}{P_t}\right)^{-\gamma} C_t^* \qquad (4)$$

Friction 2: Calvo Pricing.

$$P_{ht} = \left[\int_0^1 P_t(j)^{1-\varepsilon} dj \right]^{1/(1-\varepsilon)}$$

$$P_{ht} = \left[(1-\theta)\bar{P}_t^{1-\varepsilon} + \theta P_{h,t-1}^{1-\varepsilon} \right]^{1/(1-\varepsilon)} \qquad (5)$$

Friction 3 : TOT Externality.

Sticky Prices and Imperfect substitution among non-food varieties across countries allow:

$$\frac{P_{ht}}{S_t P_t^*} \neq 1$$

Taylor rule: $$i_t = \rho + \phi_y \tilde{y}_t + \phi_\pi \pi_t + v_t \qquad (6)$$

i_t

(or a peg rule: $i = i^*$, with $p_t^* = \rho^p p_{t-1}^* + v_t^p$)

then equations (1)-(6) plus the monetary policy rule solve for:

$$C, X, (P_h/P), Y_h, (\bar{P}/P_h), \Pi_h$$

Log-Linearized Solution: Key equations

NKPC: $$\pi_{ht} = \beta E_t \pi_{h,t+1} + \lambda mc_t$$

But where $$mc_t = \varphi(y_t - y_{ht}^n) + (q_t - q_t^n)$$

So, a rise in world food prices (z*) raises costs, ceteris paribus!

Further, natural or trend output will depend on z*:

$$y_{ht}^n = \frac{1}{(\varphi+\Theta)}(-\mu - (\sigma - \Theta)c_t^* + \Theta[\omega\alpha(\eta - 1/\sigma)]z_t^* + \upsilon - \log\varsigma - \sigma\log\kappa + (1+\varphi)a_t)$$

Only when $\eta = 1/\sigma$, y becomes like a closed economy output!

However, in an open economy with international asset trading will never be isomorphic to the closed one even if all intra and intertemporal elasticities are identical ($\eta = \gamma = 1/\sigma$).

Proof:

i) $q_t^n = \frac{\Theta[1+\varphi(\frac{\omega}{\sigma}+(1-\omega)\gamma)]}{(\varphi+\Theta)} z_t^* = z_t^*$ when η=(1/σ)=1.

ii) since output will not move and $\Theta(y_t - y_{ht}^n) = (q_t - q_t^n)$, it must be that $q_t^n = q_t$

iii) from RER definition ($x_t = (1-\alpha)q_t - z_t^*$), RER will move (appreciate if z* shock positive).

iv) from risk sharing ($c_t = c_t^* + \frac{1}{\sigma}x_t$), home consumption will move (unless c* moves to exactly offset).

So, full isomorphism only if var(z*) = 0!

As RER and TOT can move in opposite directions, the impact of TOT change on output is ambiguous:

$$y_{h_t} = y_t^* + \left[\frac{1}{\Theta} - (1-\alpha)\phi \right] q_t + \phi x_t$$

If Q and X move together, then Y will typically move in the same direction: a depreciation is expansionary. As seen above, this is the case when Z*=1 (like in all previous work)

Otherwise, Q and RER (X) can move in different directions, in which case the effect of a TOT shift on output is ambiguous and will depend on the policy rule, since different policy rules will have a distinct impact on X and q.

Again, this does not feature in previous work and may be empirically very important ,as illustrated by IRs below.

IV. Welfare

As mentioned, the model closes with specification of the processes of shocks and a monetary policy rule:

PPI, CPI:
$$i_t = \rho + \phi_y \tilde{y}_t + \phi_\pi \pi_t + v_t$$

PEG:
$$i = i^*$$
$$p_t^* = \rho^p p_{t-1}^* + v_t^p$$

We consider 3 shocks:

$$\upsilon_t = \rho_\upsilon \upsilon_{t-1} + \varepsilon_t^\upsilon$$
$$a_t = \rho_a a_{t-1} + \varepsilon_t^a$$
$$z_t^* = \rho_z z_{t-1}^* + \varepsilon_t^z \quad \textit{(New!)}$$

Also note the differences between PPI and CPI Taylor rules:

PPI: $$i_t = \phi_y \tilde{y}_t + \phi_\pi \pi_{ht}$$

CPI: $$i_t = \phi_y \tilde{y}_t + \phi_\pi \pi_t$$

$$= \phi_y \tilde{y}_t + \phi_\pi \pi_{ht} + \phi_\pi \alpha \Delta q_t$$

$$= \phi_y (1 + \alpha\Theta) \tilde{y}_t - \alpha \phi_\pi \Theta \tilde{y}_{t-1} + \phi_\pi \pi_{ht} + \phi_\pi \alpha \Delta q_t^n$$

Also note for future reference, recall that UIP holds:

$$i_t = E_t[\sigma \Delta c_{t+1} + \pi_{t+1}]$$

$$i_t = E_t[\sigma \Delta c_{t+1}^* + \Delta x_{t+1} + \pi_{t+1}]$$

$$\therefore \boxed{i_t - i_t^* = E_t[\Delta s_{t+1}]}$$

Figure 3: Impulse Responses of a 100% increase in world food prices with sigma = 2 and eta = [0.25, 0.5, 0.5, 2] and gamma = 1 with PPI

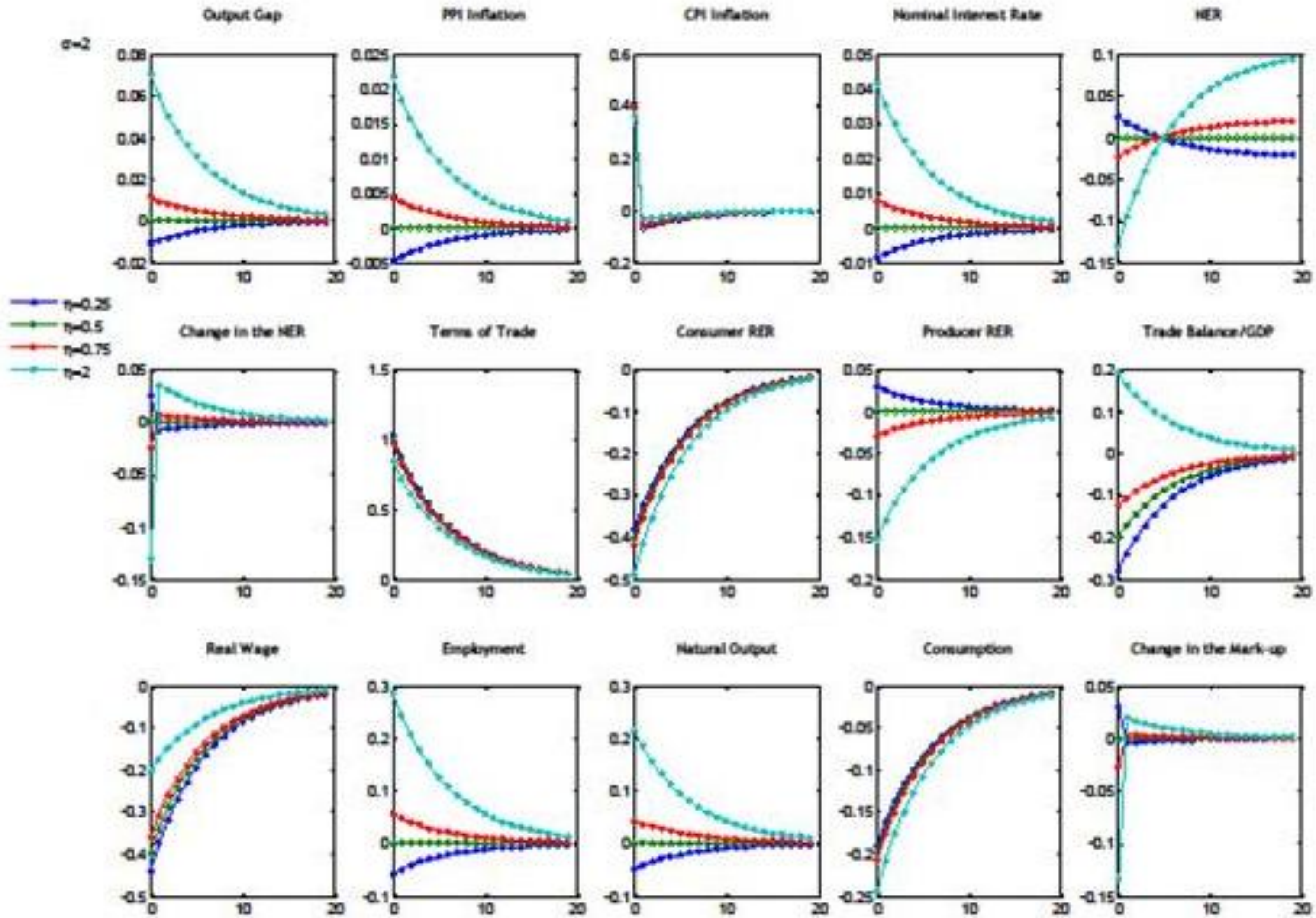
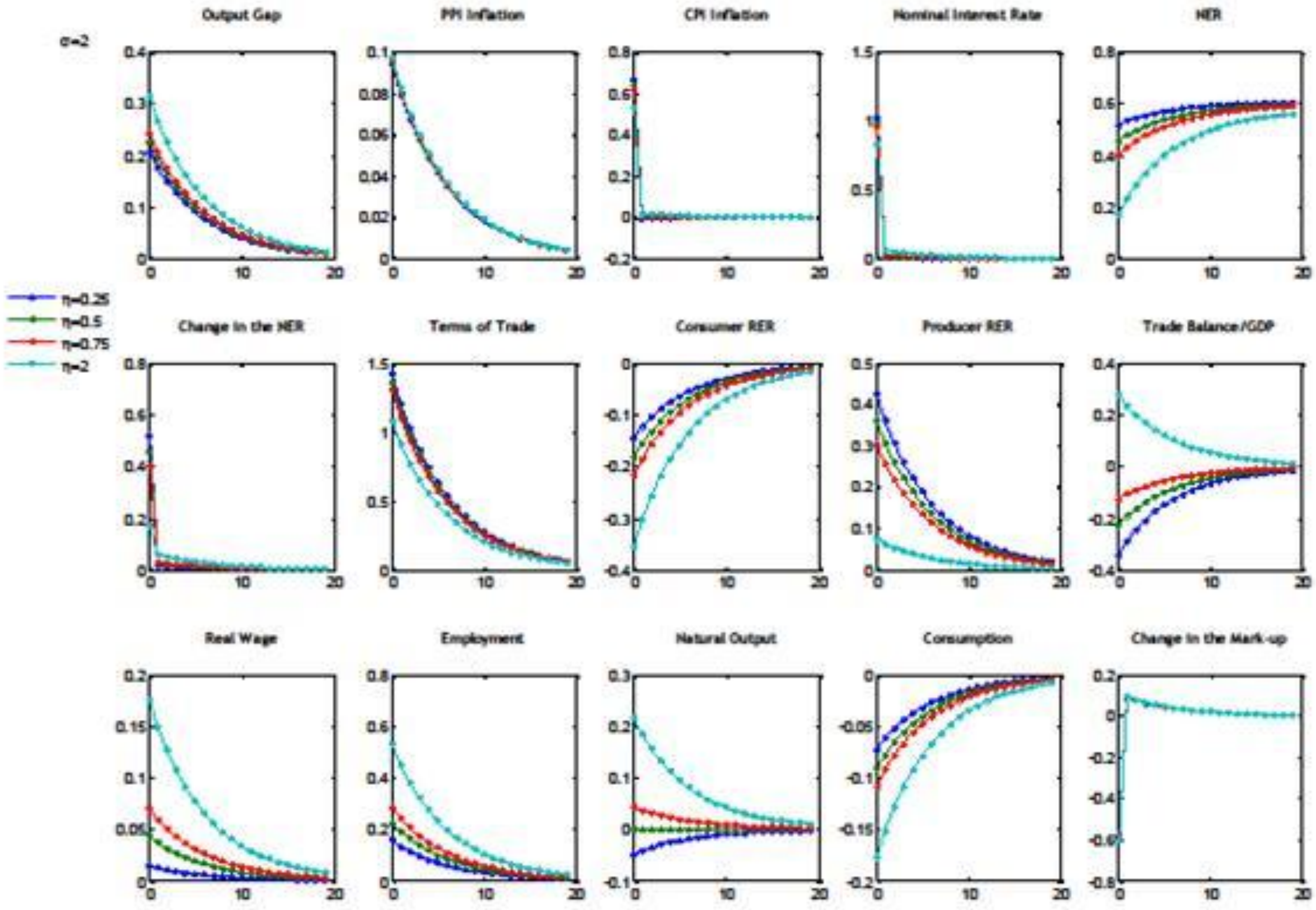


Figure 4: Impulse Responses of a 100% increase in world food prices with sigma = 2 and eta = [0.25, 0.5, 0.5, 2] and gamma= 1 with CPI rule



We show in the paper:

$$U_t = U + E\sum_{t=0}^{\infty}\beta^t\{\frac{C^{1-\sigma}}{\varsigma}(c_t + \frac{1-\sigma}{2}c_t^2) - N^{1+\varphi}[y_{ht} - a_t + \frac{1+\varphi}{2}y_{ht}^2 - (1+\varphi)a_t y_{ht} + \frac{1+\varphi}{2}a_t^2 + \Theta\pi_{ht}^2]\}$$

where:

$$U = \frac{1}{(1-\beta)}\left(\frac{C^{1-\sigma}}{\varsigma(1-\sigma)} - \frac{N^{1+\varphi}}{(1+\varphi)}\right)$$

The presence of linear terms requires us to use numerical methods to obtain the solution (Smitt-Ghroe-Uribe algorithm)

This welfare function implies:

- As the closed economy setting, welfare decreases on var(π_h) and var(n).

- But here welfare will **decrease** on the volatility of consumption and hence on var (RER).

- But welfare will also rise on the level of consumption and decline on labor effort; recalling that Y=AN ➔ welfare will rise in c-y;

- To the extent that a more appreciated RER rises c-y, there is then an incentive for the national planner to exploit the TOT externality.

- Further (formally shown in the paper), there is a key interaction between level and volatility: lower var(RER) will be associated with a more appreciated RER.

- So, if a policy rule (like CPI targeting) better stabilizes RER in the face of z* shocks, it will stabilize domestic consumption, appreciate the RER on average.

- In turn, a more appreciated RER will allow the country to explore its TOT externality and raise C/Y.

- But the same rule may not do as well viz others (e.g. PPI targeting or PEG) in stabilizing inflation and consumption if productivity or monetary shocks are overwhelming.

So, the jury is out: ranking superiority will depend on the importance of z* shocks relative to others!

Table 6: Welfare Comparisons with Baseline Calibration

$\phi_\pi = 1.5, \rho_\nu = 0.6, \sigma_v = 0.6\% \phi_y = 0.0, \rho_z = 0.85,$

$\rho_a = 0.7, \sigma_a = 1.2\%, \phi = 0.25, \gamma = 1, \varphi = 1, \sigma_z = 5\%, \omega = 0.75$

Domestic Inflation-CPI Inflation

$\sigma \setminus \eta$	0.25	0.5	0.75	1	2
0.5	-0.2165	-0.2166	-0.2146	-0.2106	-0.1801
0.75	-0.0222	-0.0102	0.0052	0.0235	0.1153
1	0.0068	0.0232	0.043	0.0656	0.1729
2	0.061	0.0859	0.114	0.1443	0.2784
4	0.0955	0.1256	0.1585	0.1934	0.3422

CPI Inflation -PEG

$\sigma \setminus \eta$	0.25	0.5	0.75	1	2
0.5	0.2107	0.2218	0.2285	0.2315	0.2142
0.75	0.025	0.0135	-0.0021	-0.0210	-0.1184
1	-0.0069	-0.0236	-0.0442	-0.0679	-0.183
2	-0.0673	-0.0937	-0.1236	-0.1565	-0.3046
4	-0.1062	-0.1386	-0.1745	-0.2130	-0.3817

Domestic Inflation-PEG

$\sigma \setminus \eta$	0.25	0.5	0.75	1	2
0.5	-0.0057	0.0052	0.014	0.0209	0.0341
0.75	0.0028	0.0033	0.0031	0.0025	-0.0031
1	-0.0002	-0.0004	-0.0011	-0.0023	-0.01
2	-0.0063	-0.0077	-0.0097	-0.0122	-0.0262
4	-0.0107	-0.013	-0.016	-0.0196	-0.0395

Dominance relative to SS

$\sigma \setminus \eta$	0.25	0.5	0.75	1	2
0.5	1	3	3	3	3
0.75	3	3	2	2	2
1	2	2	2	2	2
2	2	2	2	2	2
4	2	2	2	2	2

Table 7: Welfare Comparisons with Low Variance of Food Prices

$\phi_\pi = 1.5, \rho_\nu = 0.6, \sigma_v = 0.6\%, \rho_a = 0.7, \sigma_a = 1.2\%$

$\phi_y = 0.0, \rho_z = 0.85, \phi = 0.25, \gamma = 1, \varphi = 1, \sigma_z = 0.01\%, \omega = 0.75$

Domestic Inflation-CPI Inflation

$\sigma \backslash \eta$	0.25	0.5	0.75	1	2
0.5	-0.008	-0.0076	-0.0072	-0.0067	-0.0049
0.75	-0.0028	-0.0027	-0.0026	-0.0024	-0.0012
1	-0.0025	-0.0025	-0.0024	-0.0023	-0.0011
2	-0.0026	-0.0027	-0.0027	-0.0026	-0.0015
4	-0.003	-0.0031	-0.0032	-0.0032	-0.0021

CPI Inflation -PEG

$\sigma \backslash \eta$	0.25	0.5	0.75	1	2
0.5	0.0507	0.0498	0.0489	0.0477	0.0426
0.75	0.0093	0.008	0.0067	0.0052	-0.0013
1	0.0043	0.0029	0.0015	0	-0.0068
2	-0.0035	-0.005	-0.0067	-0.0083	-0.0154
4	-0.0077	-0.0094	-0.0111	-0.0127	-0.02

Domestic Inflation-PEG

$\sigma \backslash \eta$	0.25	0.5	0.75	1	2
0.5	0.0427	0.0422	0.0417	0.041	0.0377
0.75	0.0065	0.0053	0.0041	0.0028	-0.0025
1	0.0018	0.0004	-0.0009	-0.0023	-0.008
2	-0.0061	-0.0077	-0.0093	-0.0109	-0.017
4	-0.0107	-0.0125	-0.0142	-0.0159	-0.0221

Dominance relative to SS

$\sigma \backslash \eta$	0.25	0.5	0.75	1	2
0.5	3	3	3	3	3
0.75	3	3	3	3	1
1	3	3	1	1	1
2	1	1	1	1	1
4	1	1	1	1	1

Table 8: Model statistics Under Simulated Random Shocks

(SS with Balance Trade and ω=0.75)

	σ=4; η=0.25; γ=1			σ=4; η=0.25; γ=1			σ=4; η=0.25; γ=1		σ=4; η=0.25; γ=1		
	PPI rule Shocks to z_{t}	CPI rule Shocks to z_{t}	PEG ule Shocks to z_{t}	PPI rule Shocks to a_{t}	CPI rule Shocks to a_{t}	PEG rule Shocks to a_{t}	PPI rule Shocks to v_{t}	CPI rule Shocks to v_{t}	To all Shocks	To all Shocks	To all Shocks
Standard deviations (in %)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Domestic Output	0.000	0.936	0.945	0.269	0.315	0.313	0.424	0.497	0.501	1.101	0.887
Consumption	0.606	0.584	0.292	0.115	0.135	0.134	0.182	0.213	0.642	0.634	0.725
CPI-based Real Exchange rate	2.420	2.328	1.164	0.461	0.539	0.537	0.726	0.851	2.562	2.525	2.898
Home Good Price/CPI	2.432	2.684	2.940	0.154	0.180	0.179	0.242	0.284	2.448	2.704	2.471
Domestic Inflation	0.000	0.540	0.213	0.224	0.192	0.142	0.088	0.132	0.241	0.593	0.398
Means in % of SS deviation											
Domestic Output	0.000	-0.194	-0.033	-0.048	-0.039	-0.031	-0.013	-0.022	-0.061	-0.254	0.005
Consumption	-0.008	-0.097	-0.034	-0.021	-0.017	-0.013	-0.006	-0.010	-0.035	-0.124	-0.008
CPI-based Real Exchange rate	-0.008	-0.368	-0.129	-0.082	-0.067	-0.053	-0.023	-0.039	-0.113	-0.472	0.000
Home Good Price/CPI	0.067	-0.027	0.088	-0.027	-0.022	-0.017	-0.007	-0.012	0.033	-0.061	0.069
Domestic Inflation	0.000	-0.014	0.000	0.001	0.001	0.000	-0.005	-0.005	-0.004	-0.018	0.002
Consumption/Output ratio	**99.99**	**100.10**	**100.00**	**100.03**	**100.02**	**100.02**	**100.01**	**100.01**	**100.03**	**100.13**	**99.99**

Table 15: Welfare Comparisons with Taylor Rule with Moderate Reaction to Output Gap

$\phi_\pi = 1.5, \rho_\nu = 0.6, \sigma_v = 0.6\%, \rho_a = 0.7, \sigma_a = 1.2\%$

$\phi_y = 0.125, \rho_z = 0.85, \phi = 0.25, \gamma = 1, \varphi = 1, \sigma_z = 5\%, \omega = 0.75$

Domestic Inflation-CPI Inflation

Gaps smaller!

$\sigma \backslash \eta$	0.25	0.5	0.75	1	2
0.5	-0.1187	-0.1146	-0.1102	-0.1226	-0.0867
0.75	-0.0197	-0.0139	-0.0068	0.0046	0.0384
1	-0.0035	0.0045	0.0137	0.0238	0.0679
2	0.0311	0.0439	0.0577	0.0564	0.1288
4	0.0574	0.0736	0.0904	0.0749	0.171

CPI Inflation -PEG

$\sigma \backslash \eta$	0.25	0.5	0.75	1	2
0.5	0.0193	0.038	0.0523	0.0776	0.0789
0.75	0.0194	0.0181	0.0144	0.0058	-0.0189
1	0.0074	0.0028	-0.0038	-0.0121	-0.0457
2	-0.0244	-0.0351	-0.0471	-0.0435	-0.1046
4	-0.0515	-0.0661	-0.0815	-0.0615	-0.1487

Domestic Inflation-PEG

$\sigma \backslash \eta$	0.25	0.5	0.75	1	2
0.5	-0.0994	-0.0766	-0.0579	-0.0450	-0.0078
0.75	-0.0003	0.0042	0.0076	0.0104	0.0195
1	0.0039	0.0073	0.0099	0.012	0.0222
2	0.0067	0.0088	0.0106	0.0129	0.0242
4	0.006	0.0075	0.009	0.0134	0.0223

Dominance relative to SS

More PPIs!

$\sigma \backslash \eta$	0.25	0.5	0.75	1	2
0.5	1	1	1	1	1
0.75	1	3	3	3	2
1	3	3	2	2	2
2	2	2	2	2	2
4	2	2	2	2	2

Table 20: Welfare Comparisons with Lower Food Import Share

$\phi_\pi = 1.5, \rho_\nu = 0.6, \sigma_\nu = 0.6\%, \rho_a = 0.85, \sigma_a = 1.2\%$

$\phi_y = 0.0, \rho_z = 0.85, \phi = 0.1, \gamma = 1, \varphi = 1, \sigma_z = 5\%, \omega = 0.9$

$\sigma_p = 1.3\%, \rho_p = 0.99$

Domestic Inflation-CPI Inflation

$\sigma \backslash \eta$	0.25	0.5	0.75	1	2
0.5	-0.0394	-0.0392	-0.039	-0.0379	-0.0363
0.75	-0.0063	-0.0063	-0.0058	-0.0062	0.0025
1	-0.0034	-0.003	-0.0021	-0.0027	0.0091
2	0.0011	0.0024	0.0044	0.0030	0.0219
4	0.0037	0.0057	0.0084	0.0063	0.0301

CPI Inflation -PEG

$\sigma \backslash \eta$	0.25	0.5	0.75	1	2
0.5	-0.0982	-0.0933	-0.089	-0.0736	-0.0734
0.75	-0.0199	-0.0165	-0.0138	-0.0047	-0.006
1	-0.0111	-0.0082	-0.006	0.0005	-0.0007
2	0.0006	0.0024	0.0036	0.0031	0.0032
4	0.0052	0.0063	0.0067	– 0.0001	0.002

Domestic Inflation-PEG

$\sigma \backslash \eta$	0.25	0.5	0.75	1	2
0.5	-0.1376	-0.1326	-0.128	-0.1115	-0.1097
0.75	-0.0262	-0.0228	-0.0196	-0.0109	-0.0035
1	-0.0145	-0.0112	-0.0081	-0.0022	0.0085
2	0.0017	0.0049	0.008	0.0061	0.0251
4	0.009	0.012	0.0152	0.0062	0.0321

Dominance relative to SS

More PPIs!

$\sigma \backslash \eta$	0.25	0.5	0.75	1	2
0.5	1	1	1	1	1
0.75	1	1	1	1	2
1	1	1	1	1	2
2	3	3	3	3	3
4	3	3	3	2	3

V. Conclusions

Food prices are highly persistent and have long been a main source of global inflationary/deflationary pressures.

Recent experience (2007-08) and now suggest that IT CBs have a hard time in meeting central targets.

But this is also because of some weakening of Taylor rules relative to baseline (normatively speaking).

These imported price pressures unlikely to abate for quite some time, as i* remain low, world growth picking up, and the US dollar depreciating in real terms.

Previous studies advocating accommodation through core CPI targeting.

Yet, they did not consider the peculiar role of food in utility, nor large differences in CPI baskets inducing RER volatility, nor the relative magnitude of z* shocks viz others.

When this is done, broad CPI targeting often wins out welfare-wise.

Intuition of our results:

Given large z* shocks, broad CPI targeting emerge as a "compromise" between mitigating some of the sticky price distortion, stabilize the CPI-based RER and hence consumption, and allow exploitation of TOT externality.

Hence CPI targeting will be the more welfare-dominant, the larger var(z*) shocks, the higher the coefficient of risk aversion in consumption (lower inter-temporal substitution), and the greater the disutility of labor.

Bottom-line: ***leniency toward imported food price inflation not optimal in most cases!***

3 things to like about this result:

- Avoids ad-hoc and non-transparent ways of purging CPI and identifying core inflation.
- Mitigates some of the regressive distributional implications of PPI targeting.
- If applied by all central banks, it would eliminate the externality problem associated with PPI targeting and hence help keep global inflationary pressures at bay.