



# **The erratic evolution of agricultural markets and approaches to dealing with market volatility**

**Alexander Sarris**

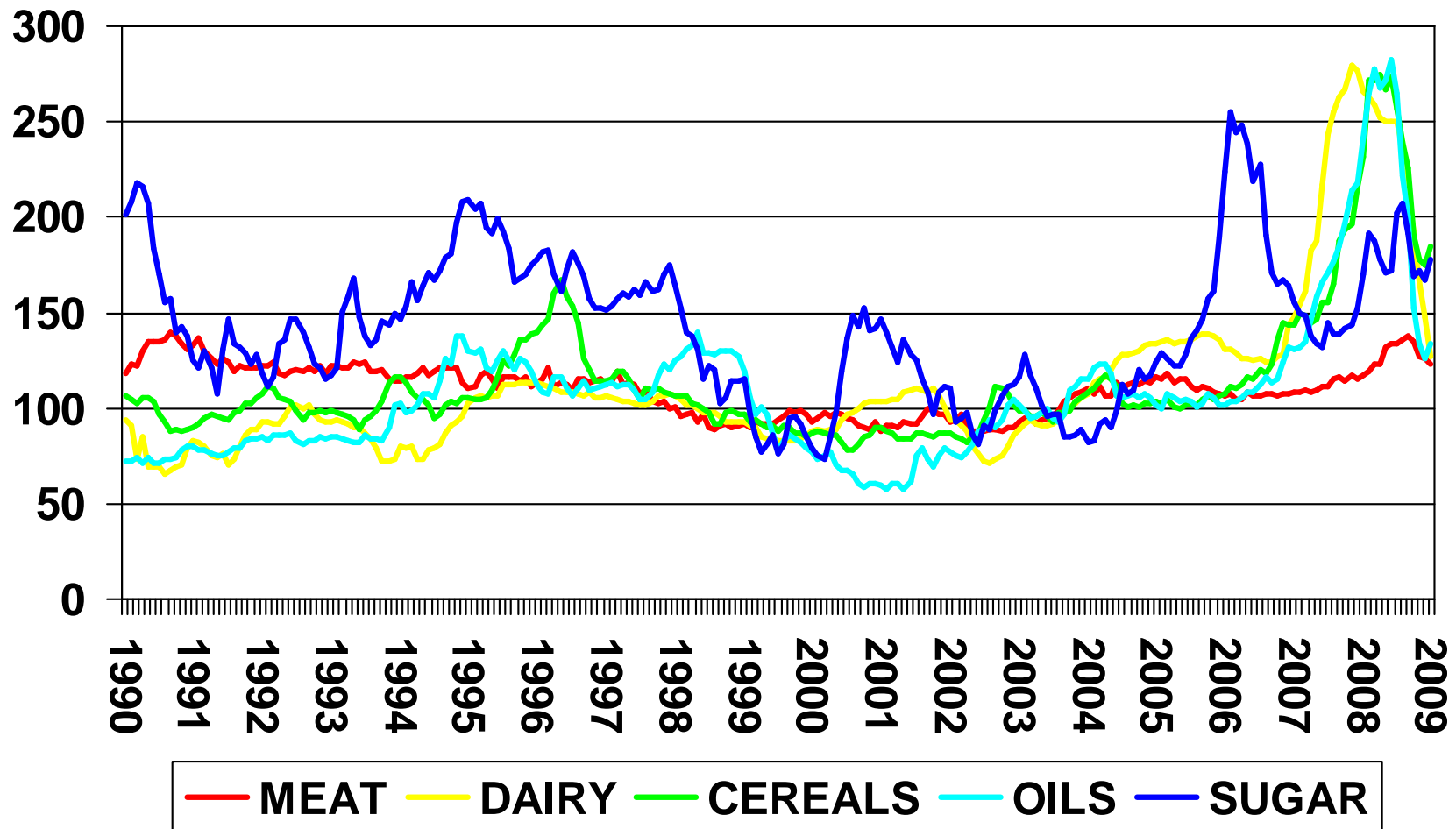
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Nations

Presentation at the FARM Conference on “Prices  
and Market Risks”, Paris November 23, 2009

# Plan of Presentation

- Long term agricultural commodity price developments
- Global food price volatilities
- Factors affecting food commodity market volatility
- Food import risks
- Problems of access to cereal imports
- Ways to manage food import risks
- Hedging food import price risks with futures and options
- A food import financing facility to assure low income food importing countries access to imports in times of crises

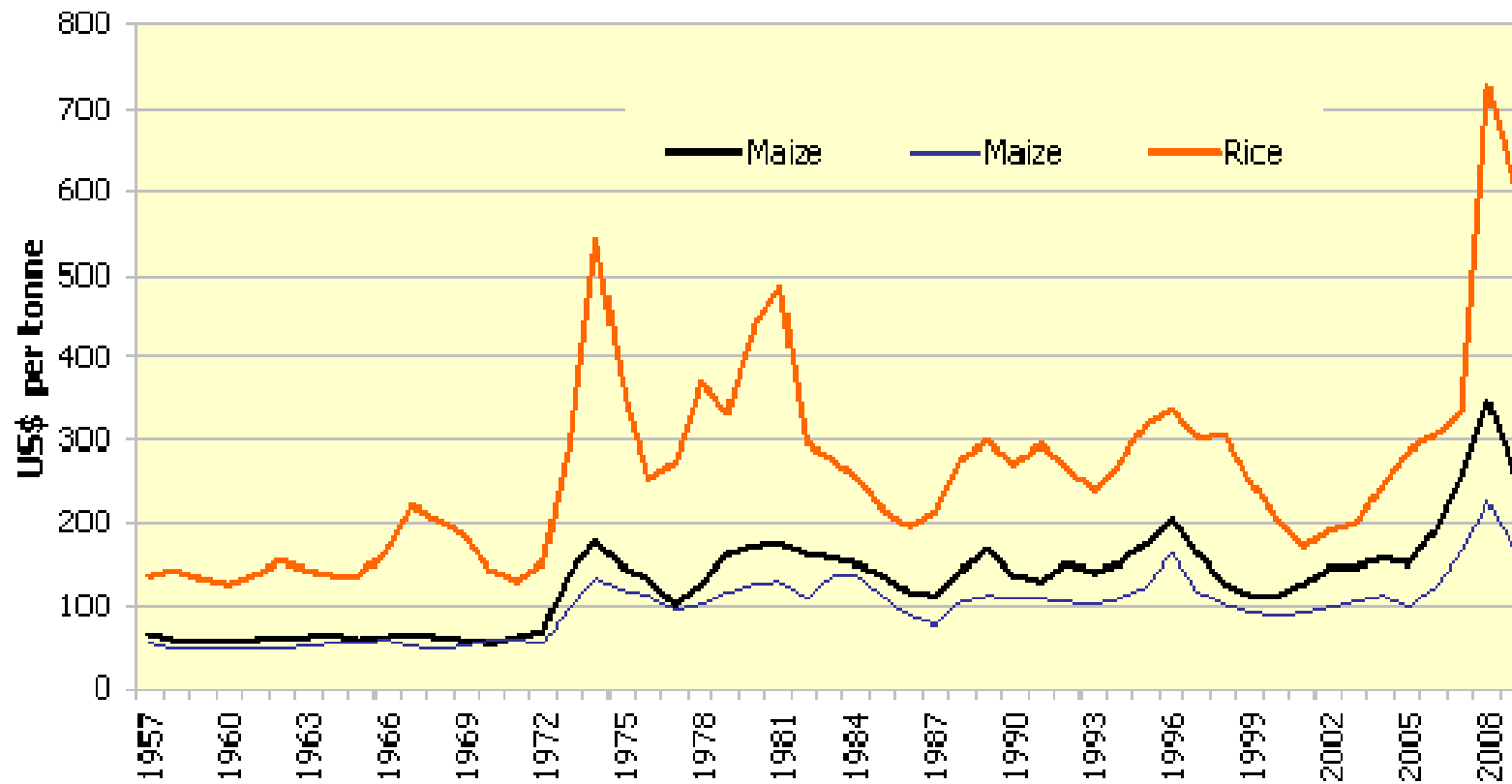
**Almost all basic food commodities have seen their international prices rise significantly over the past two years but they have declined lately  
(Commodity price indices: 2002-2004=100)**



# Nominal international grain prices recently at highest levels since early 1970s

Nominal Prices: Cereal Commodities (1957-2009\*)

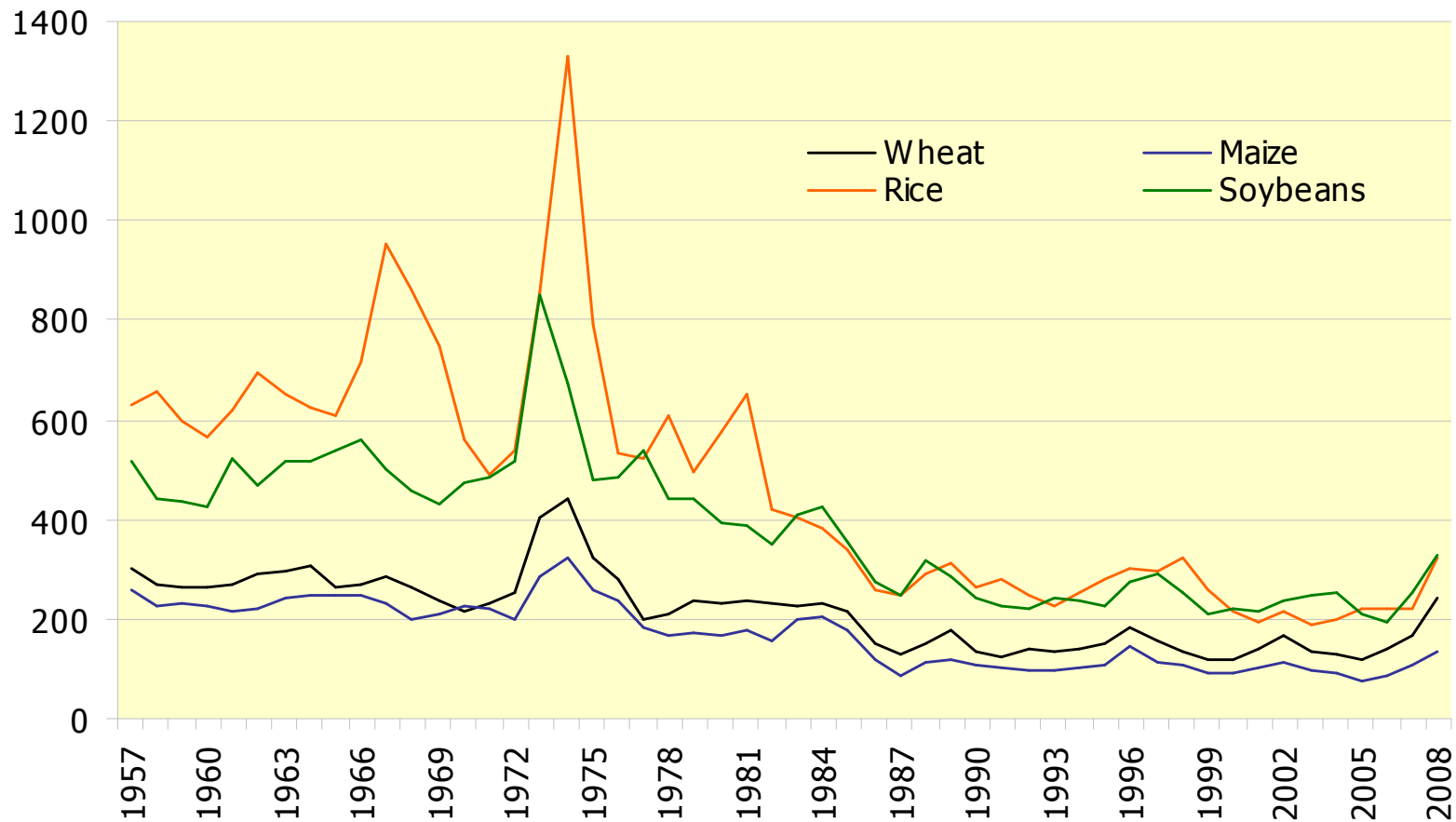
\*Jan-May Av.



# Is there an end of cheap food?

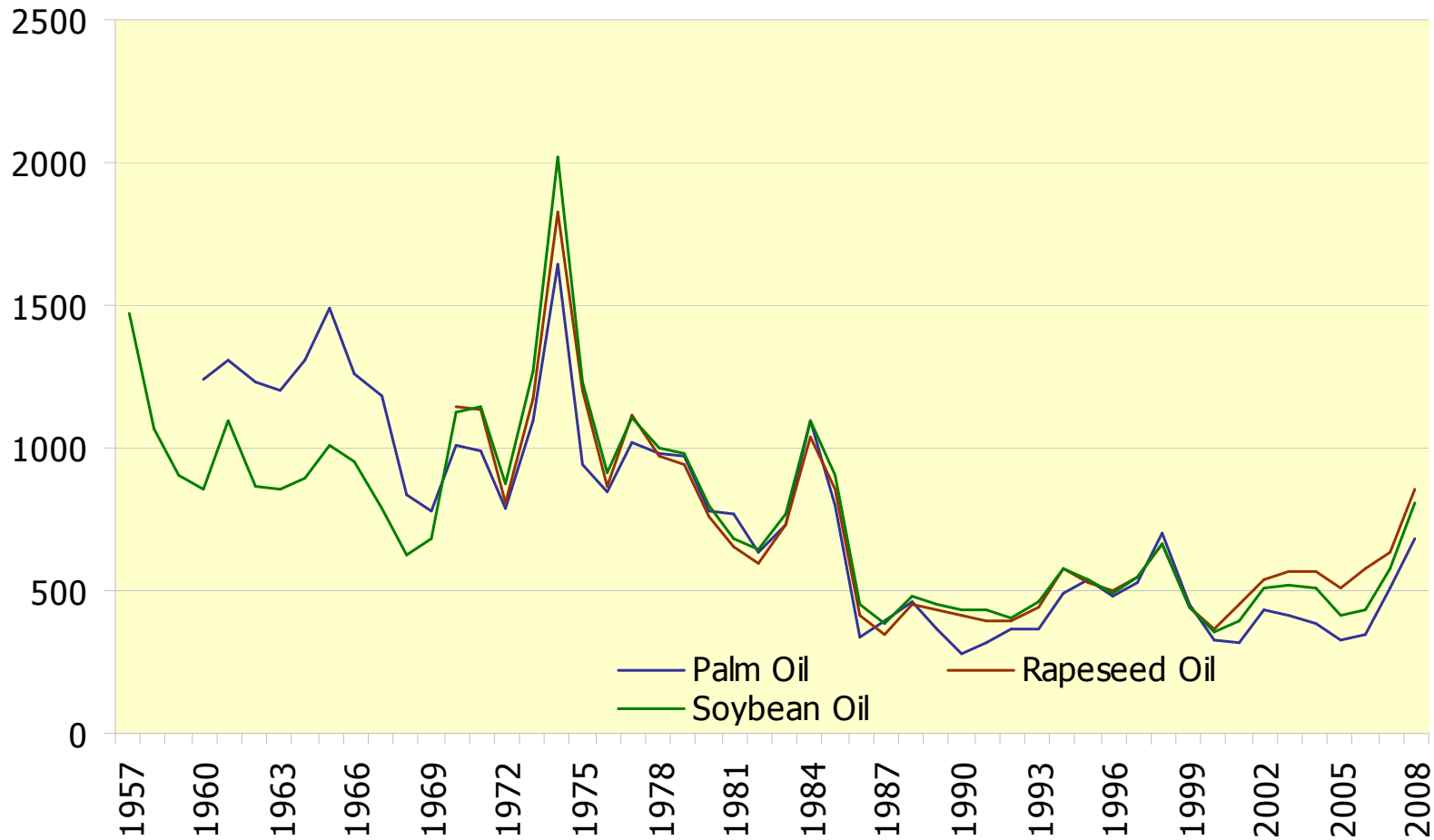
Real prices of bulk food commodities have tended to decrease but since mid 1980s tendency seems to have stopped

Real Prices: Bulk Commodities (1957-2008)



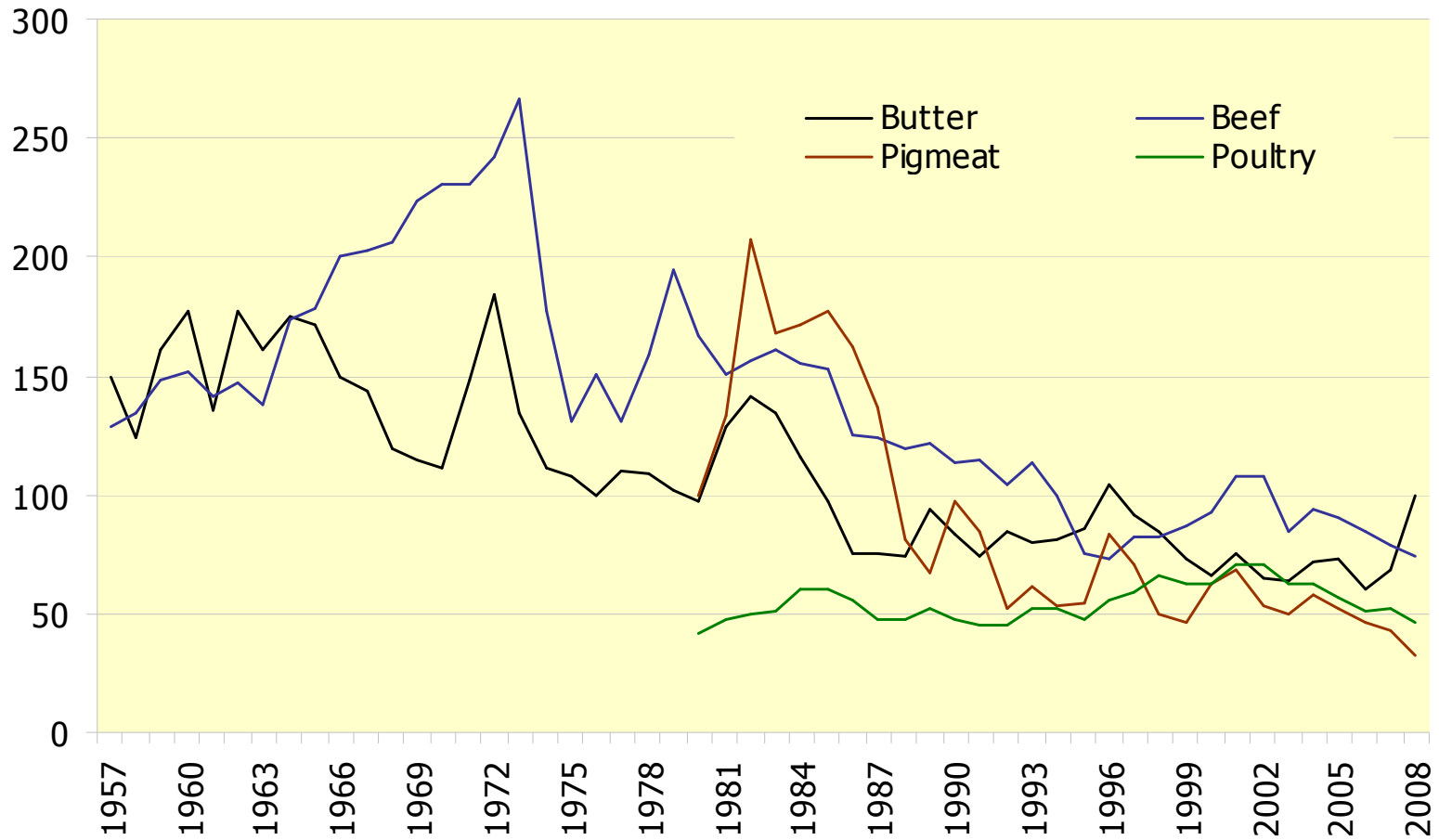
# Real prices of vegetable oils have tended to decrease but since mid 1980s tendency seems to have stopped

Real Prices: Vegetable Oils (1957-2008)



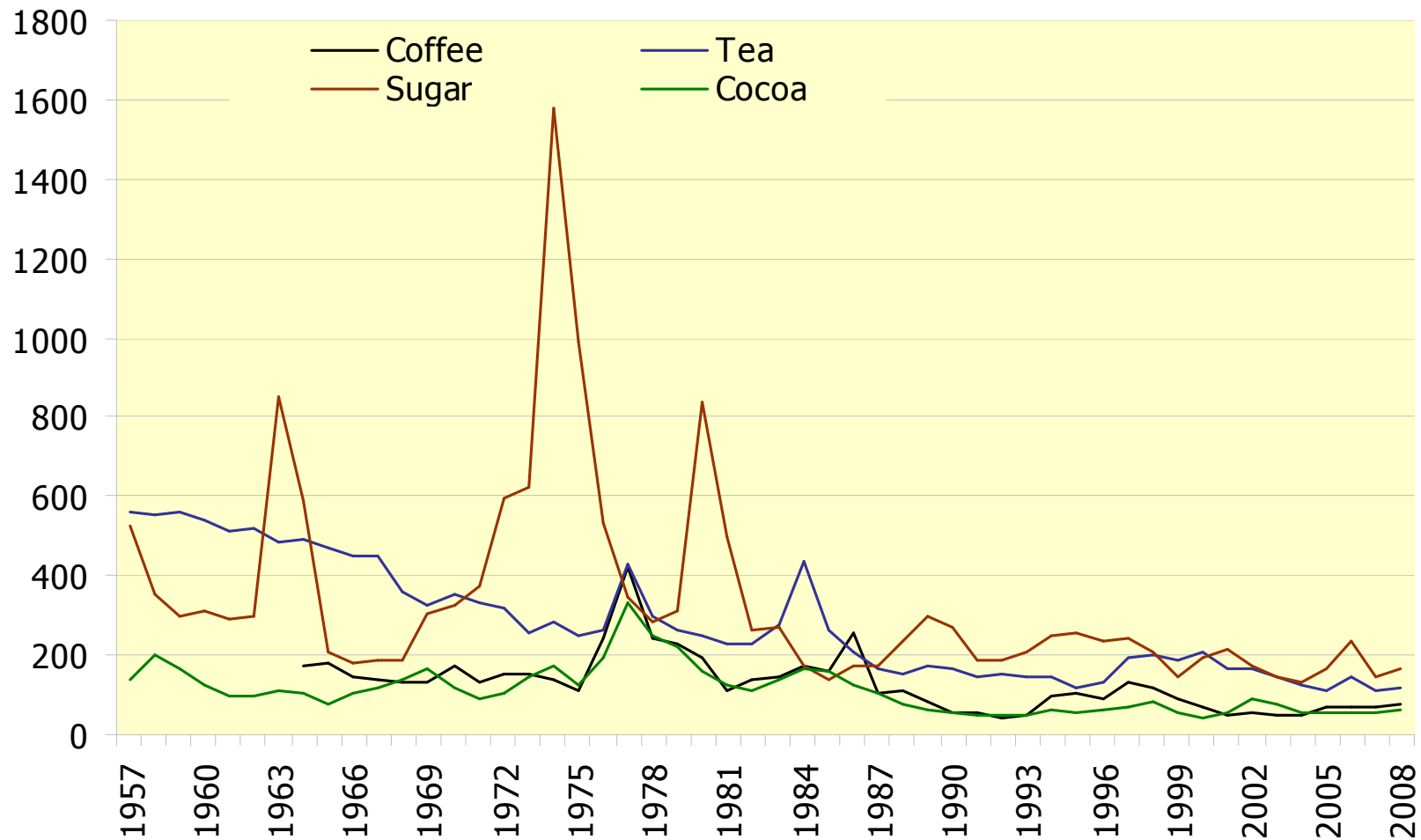
# Real prices of livestock commodities have tended to decrease albeit at slowing pace since mid 1980s

Real Prices: Livestock Commodities (1957-2008)



# Real prices of sugar and beverages have tended to decrease but since mid 1980s tendency seems to have stopped

Real Prices: Sugar & Beverages (1957-2008)



# What determines long term commodity prices?

- Supply of agricultural commodities highly elastic at low wages
- Demand for agricultural commodities quite inelastic
- Opposite case for non-agriculture
- Implication: Differential productivity gains can alter terms of trade between agriculture and non-agriculture

**Declining terms of trade for agricultural commodities has been due to faster rates of total factor productivity growth for agricultural than non-agricultural products**

- Rate of growth of TFP has been faster in agriculture than in non-agriculture
- The rate of growth of TFP in agriculture seems to be higher than that of manufacturing.
- “Globalization” of agricultural research, has contributed to faster TFP growth in agriculture,
- Incidence of productivity advances largely on consumers (through lower prices) and little to producers.
- Has productivity growth slowed down?
- Has productivity growth lagged in LDCs?

**Annual TFP growth in agriculture does not appear to have slowed down for the world. Hence most likely reason for real price leveling must be lower inputs and faster demand growth**

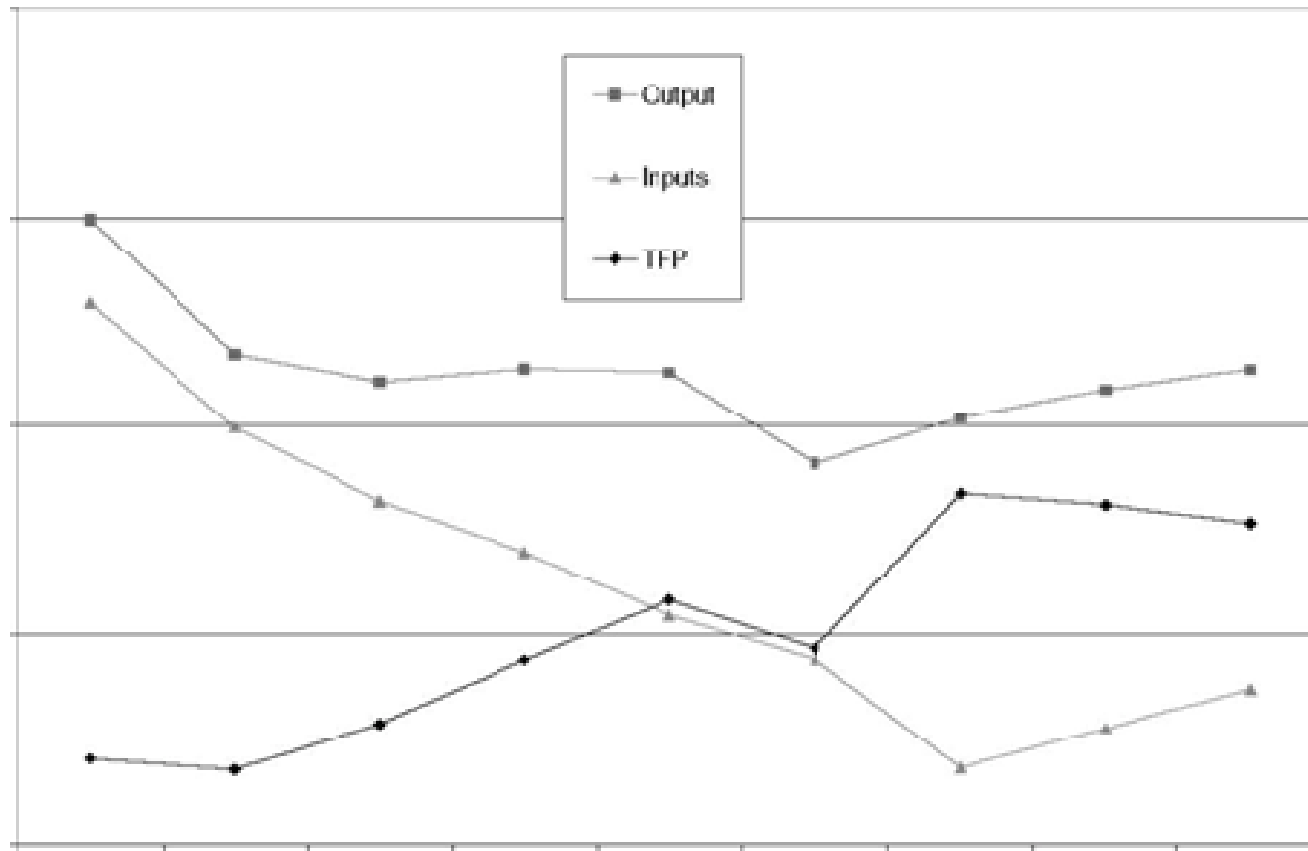
	<b>1970–1979</b>	<b>1980–1989</b>	<b>1990–1999</b>	<b>2000–2006</b>
<b>Developing countries</b>	0.55	1.67	2.31	2.08
<b>Developed countries</b>	1.62	1.48	2.25	1.76
<b>USSR &amp; Eastern Europe</b>	-0.46	0.27	1.59	2.10
<b>World</b>	0.60	0.94	1.60	1.55

Source: Fuglie, 2008

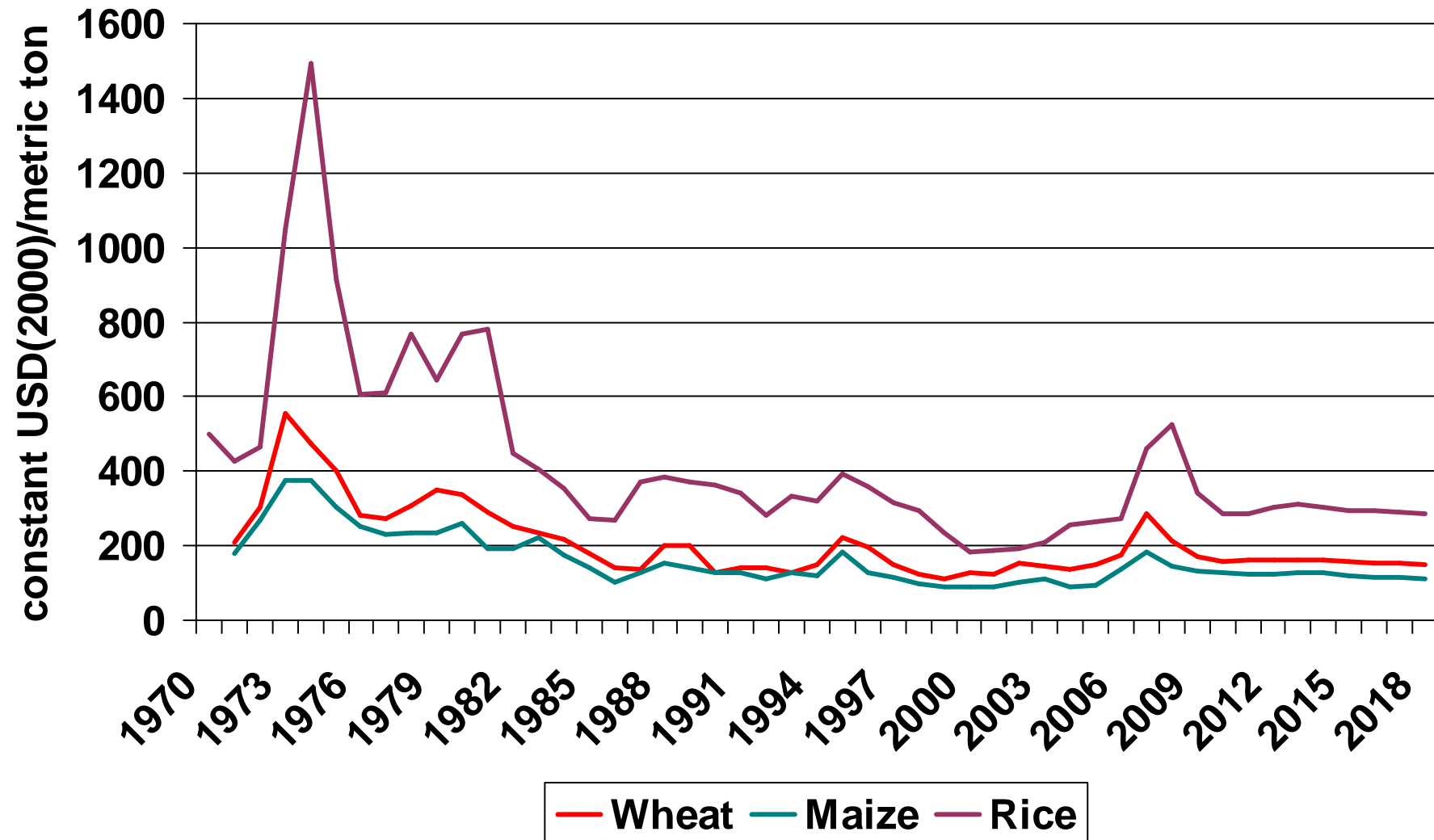
# Agricultural productivity developments for the world

## Source: Fuglie (2008)

Average annual growth rate by period (%)	Output index	Input index	TFP index	Output per worker	Output per hectare	Grain yield (t/ha)
1970–1989	2.24	1.36	0.87	1.25	1.96	2.29
1990–2006	2.06	0.50	1.56	1.51	1.95	1.35

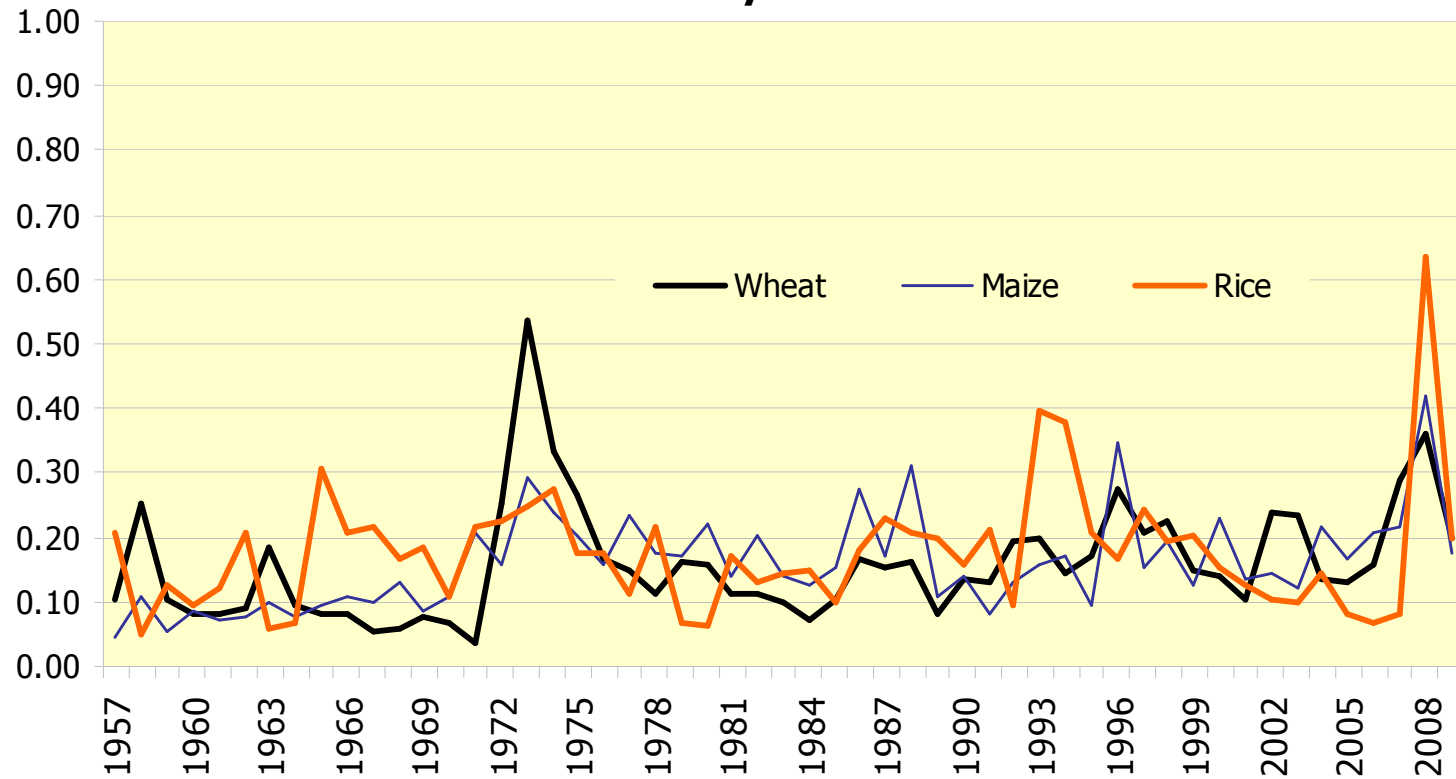


# Medium term projections. Real cereal prices: Leveling of prices appears to continue



# Grain price volatility does not seem to have increased over time for cereals

**Nominal Annualised Historic Volatility: Cereal Commodities (1957-2009\*)**  
**\*Jan-May Av.**



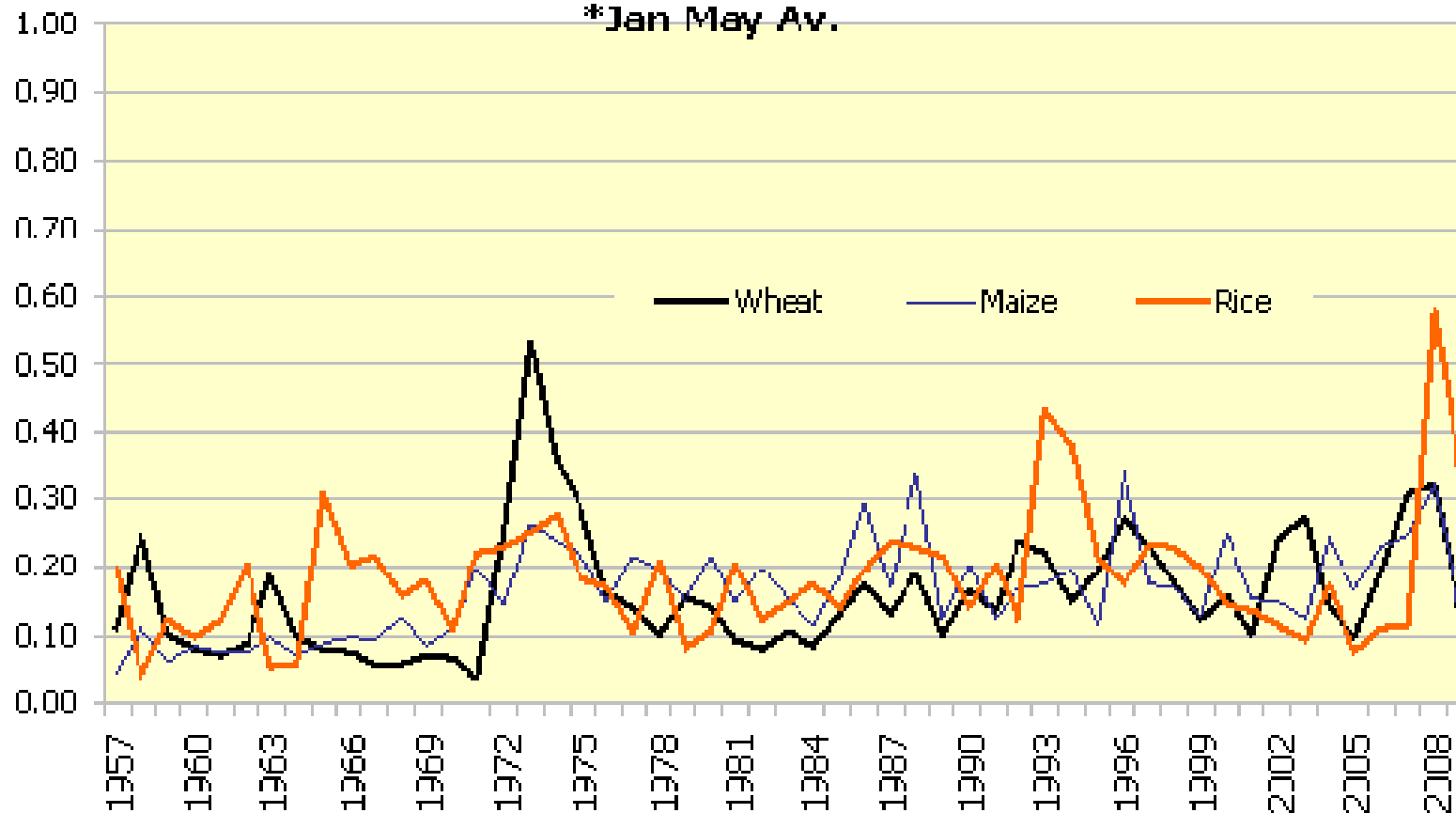
# Grain price volatility does not seem to have increased over time

<b>Historic annualized volatility of international grain prices</b>			
	<b>Wheat</b>	<b>Maize</b>	<b>Rice</b>
<b>Average 1957-69</b>	10.4%	8.8%	15.4%
<b>Average 1970-79</b>	20.8%	19.4%	18.3%
<b>Average 1980-89</b>	12.3%	18.5%	15.7%
<b>Average 1990-99</b>	9.6%	8.9%	12.1%
<b>Average 2000-09</b>	11.2%	13.5%	11.6%

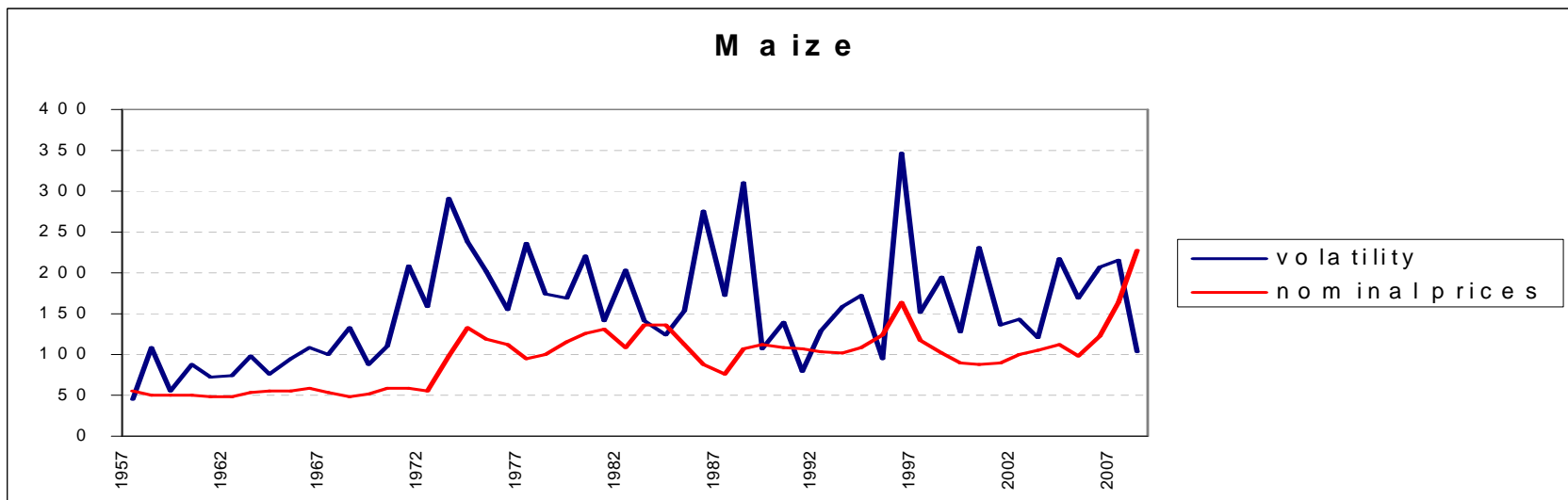
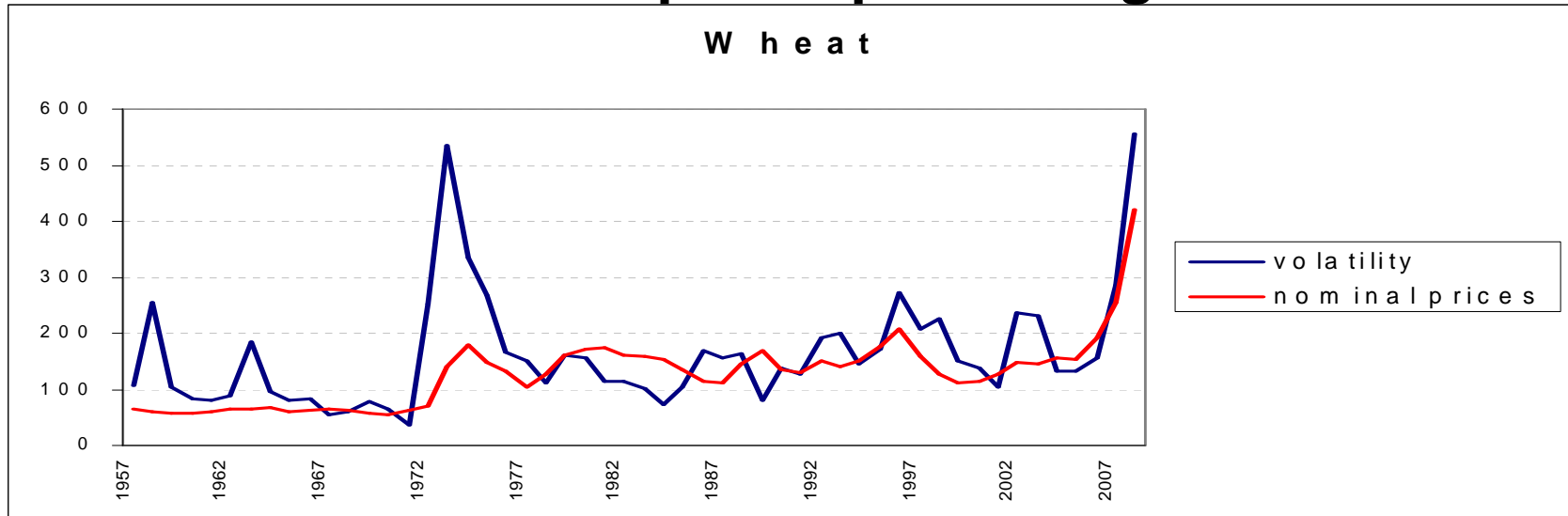
# Volatility of real cereals prices not different than that of nominal prices

Real Annualised Historic Volatility: Cereal Commodities (1957-2009\*)

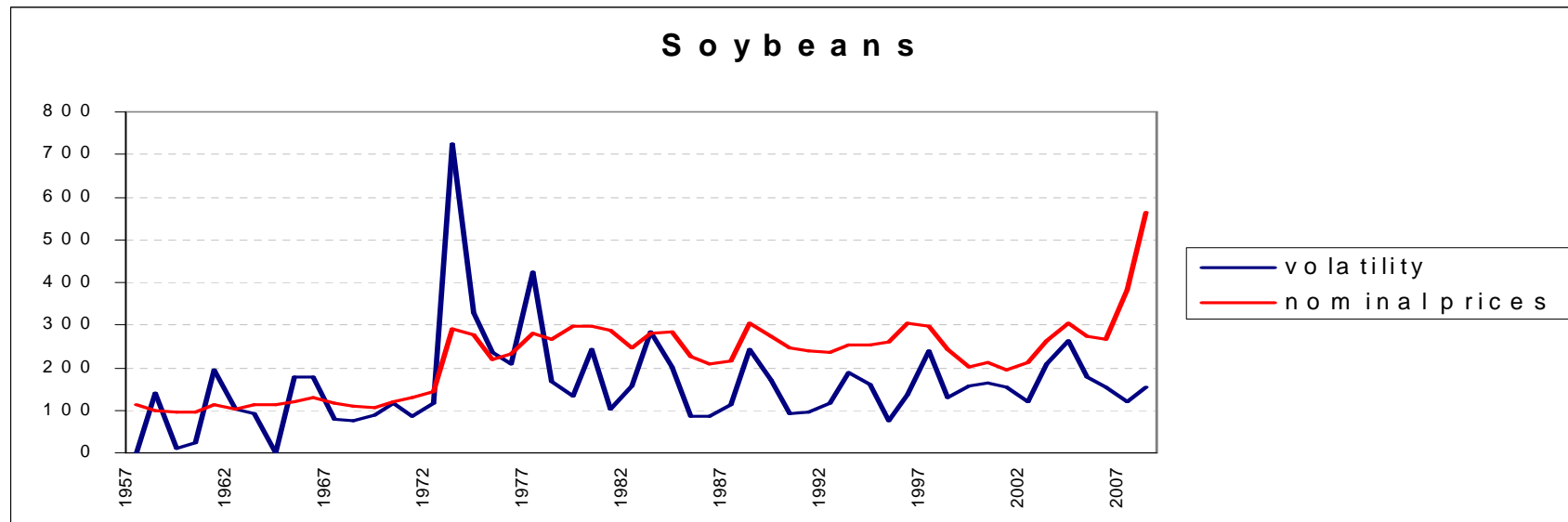
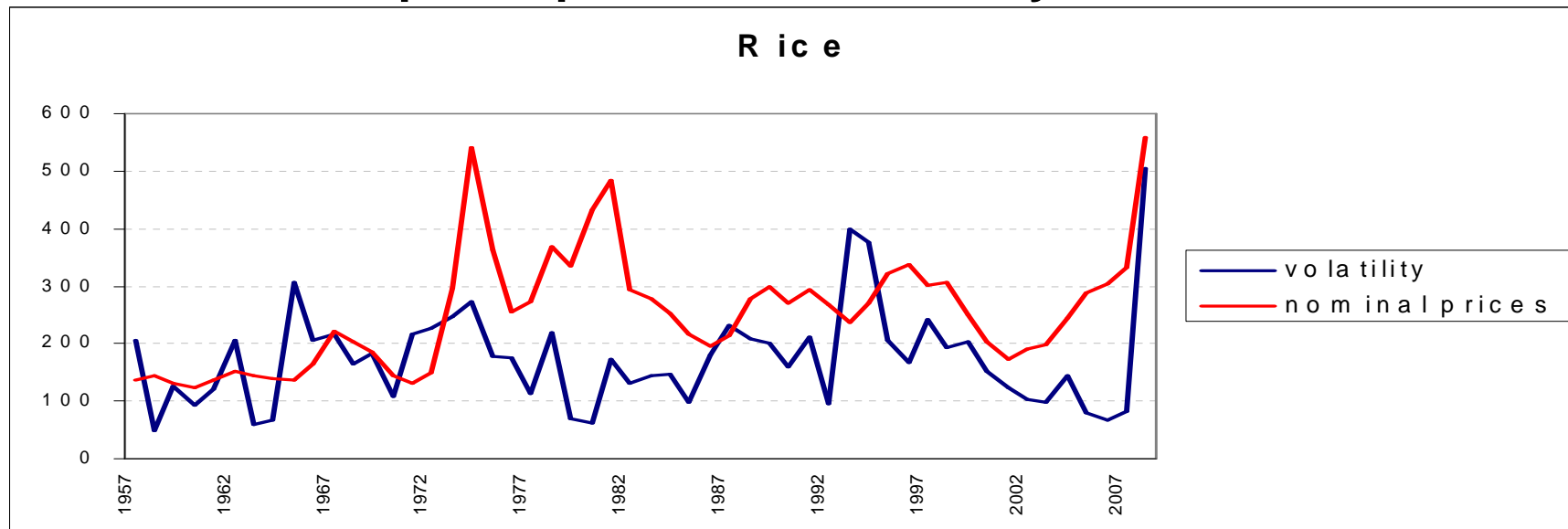
\*Jan-May Av.



# Historic volatilities of international prices seem to increase with price spikes for grains



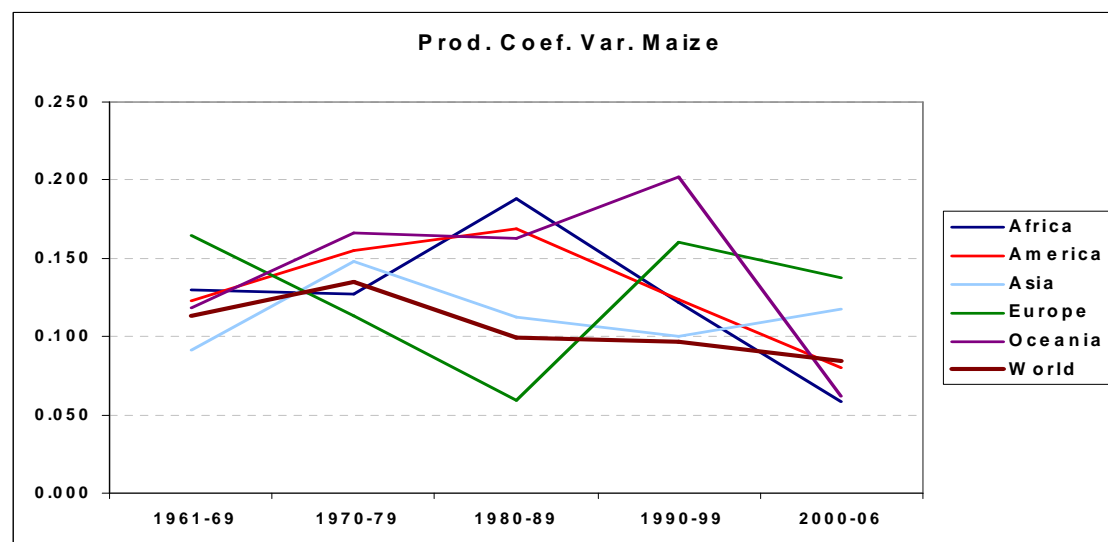
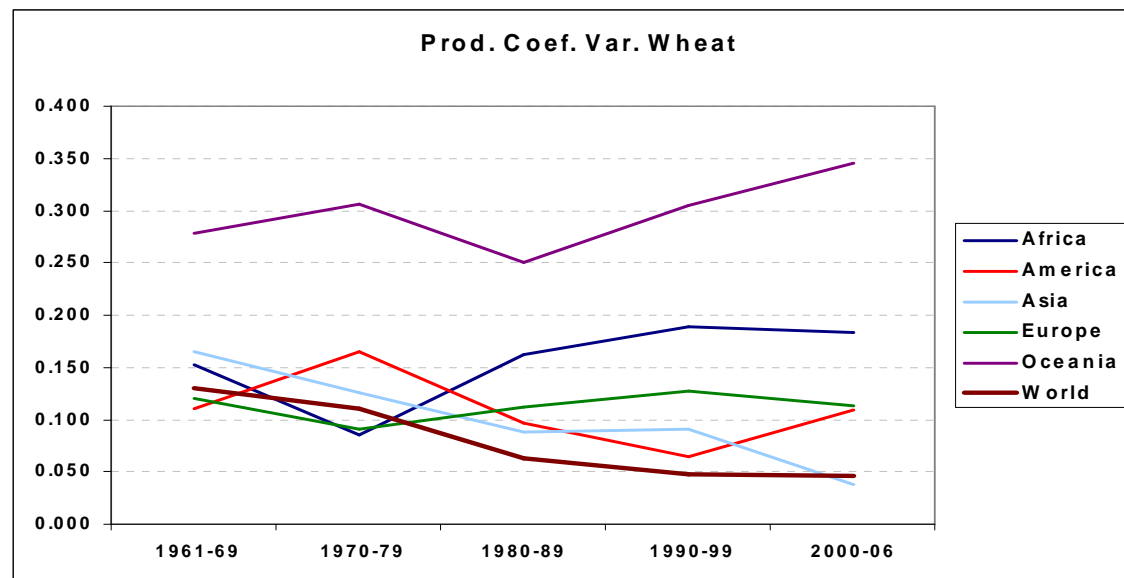
# Historic volatilities of international prices seem to increase with price spikes for rice and soybeans



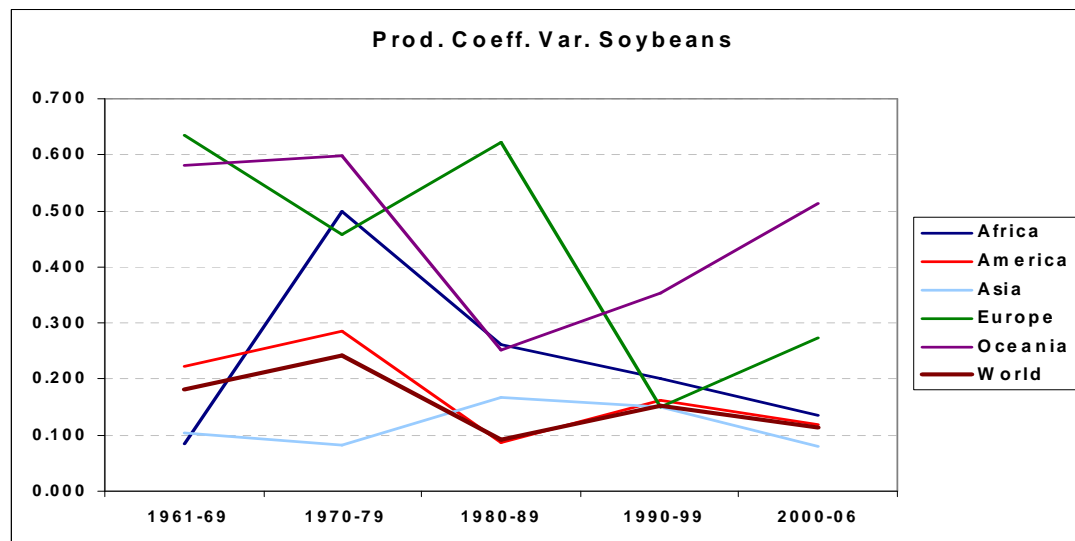
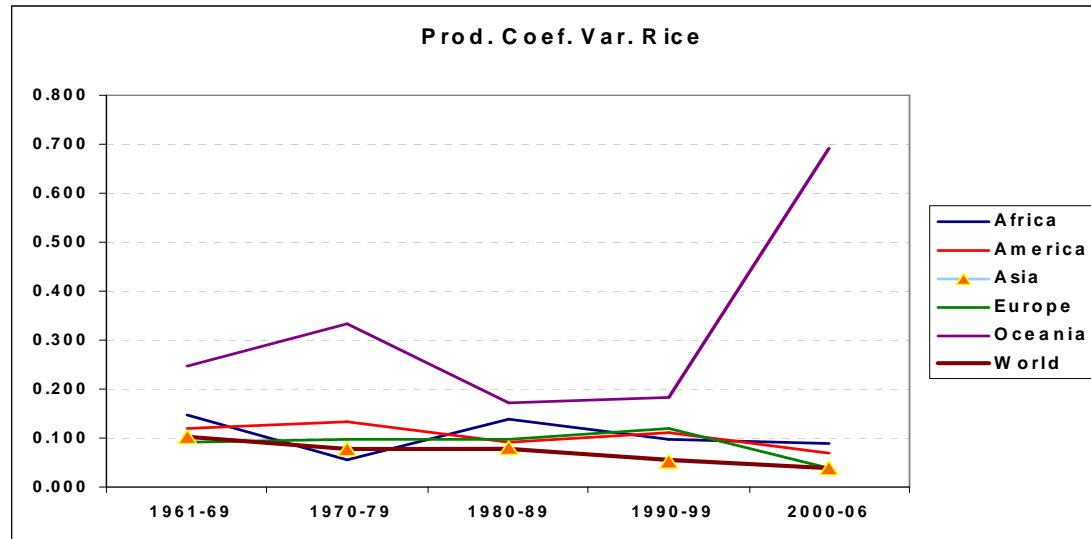
# **Factors affecting current and future price volatility**

- Production variability and trends
- Stocks
- Financial speculation
- Exchange rates
- Oil prices and biofuel production
- Trade policies and price transmission
- Other factors

# Production does not seem to have become more variable for wheat and maize

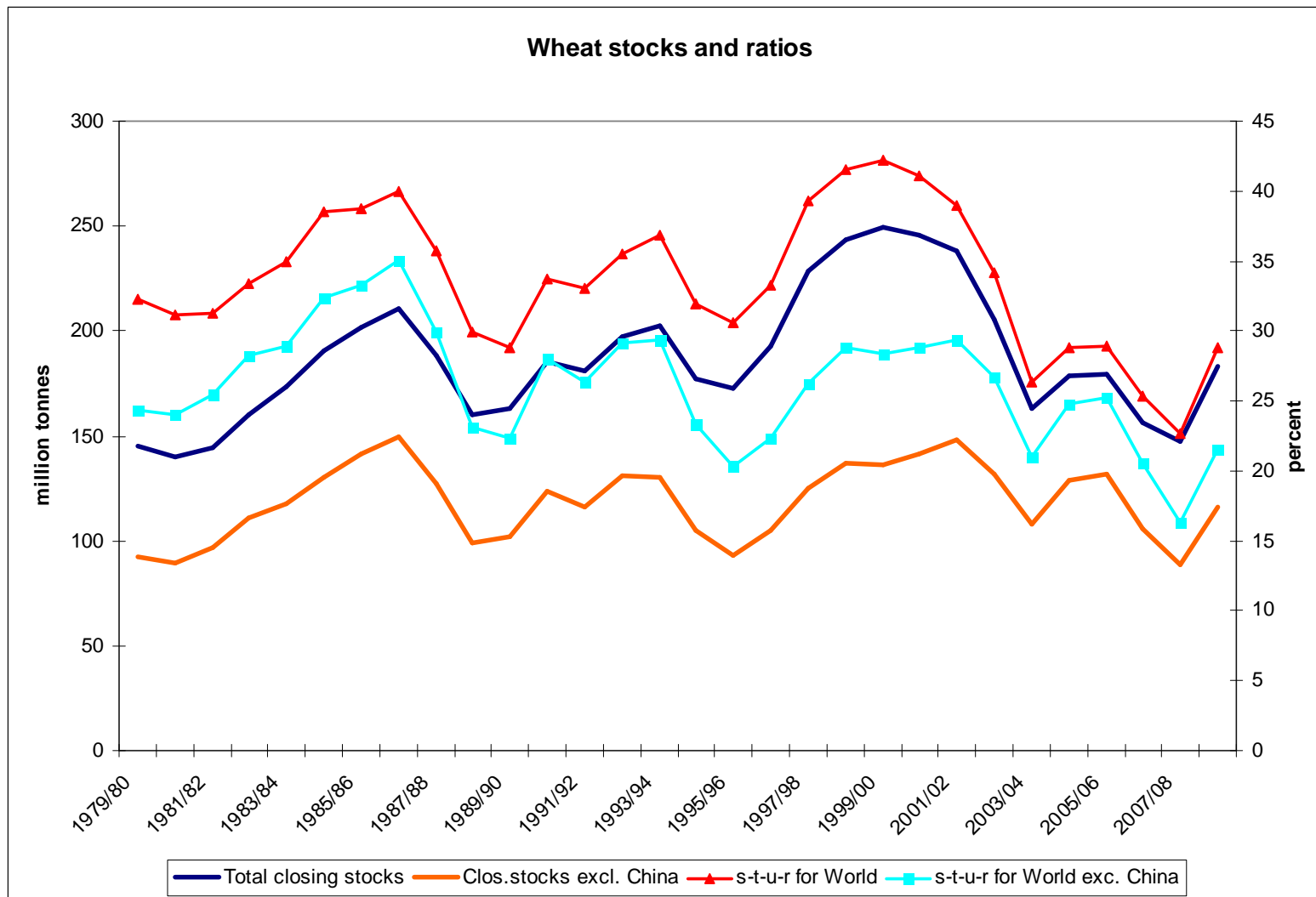


# Production does not seem to have become more variable for rice and soybeans

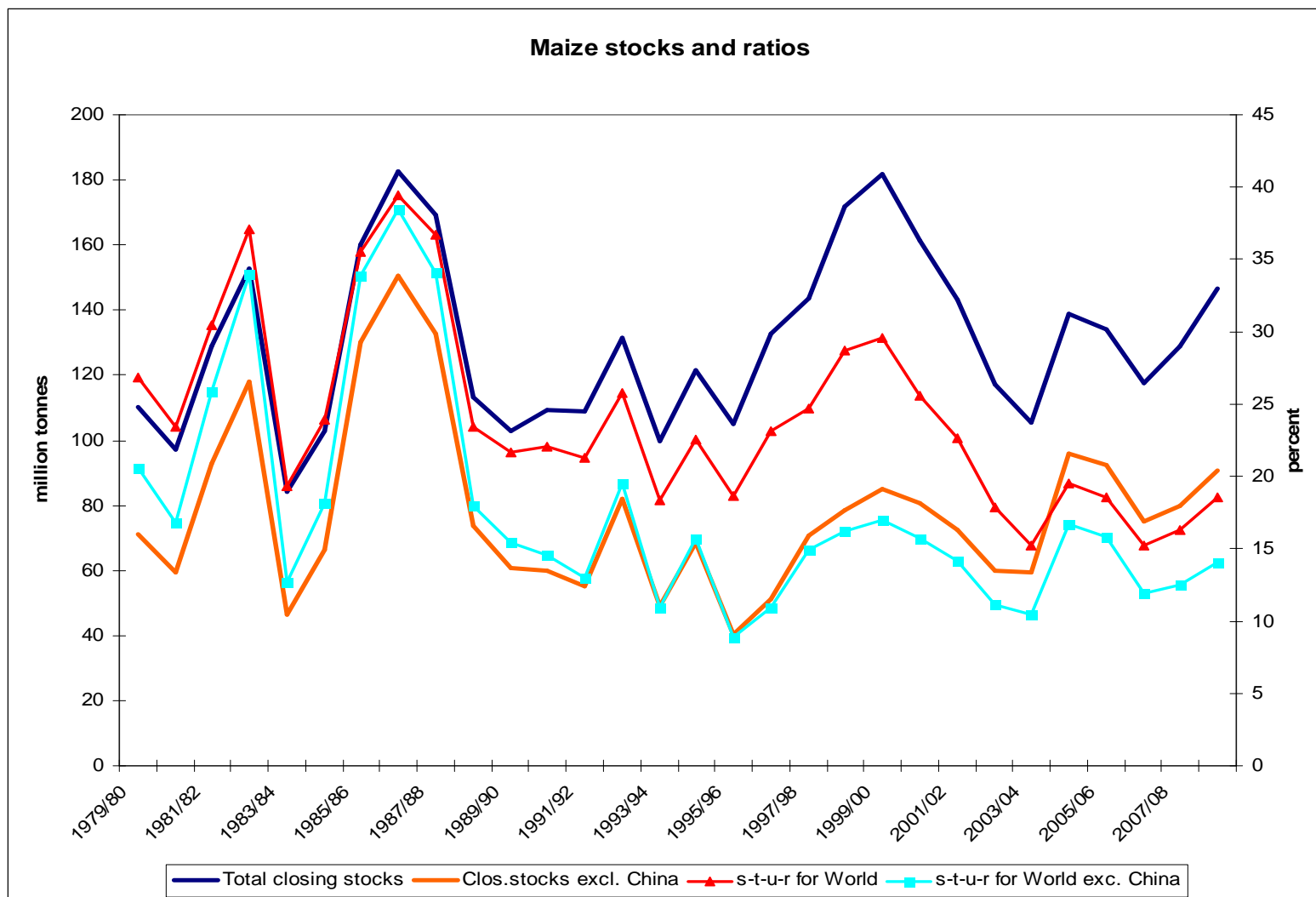


# Global ending stocks of wheat and stock to utilization ratios for the whole world and for the world without

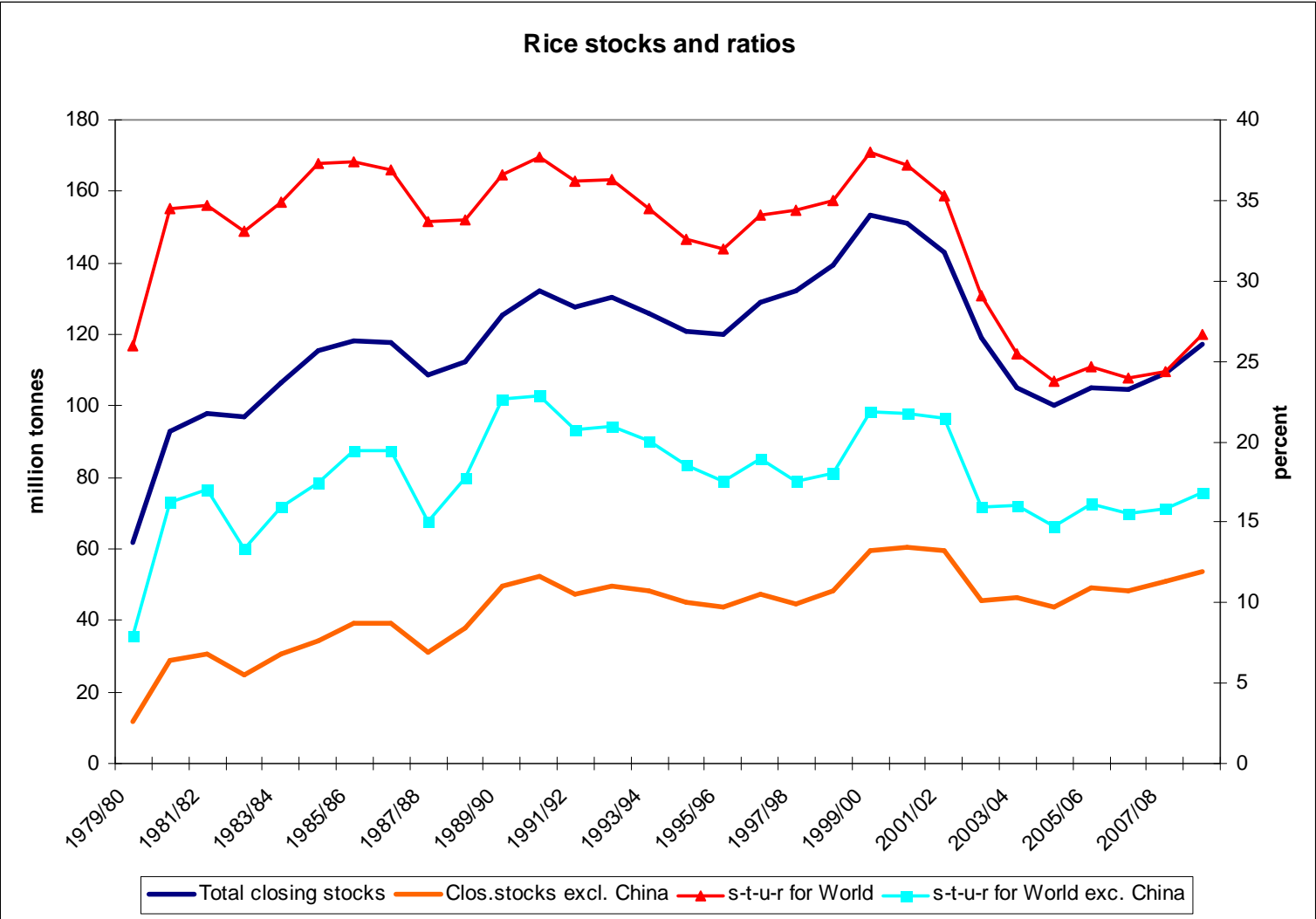
## China



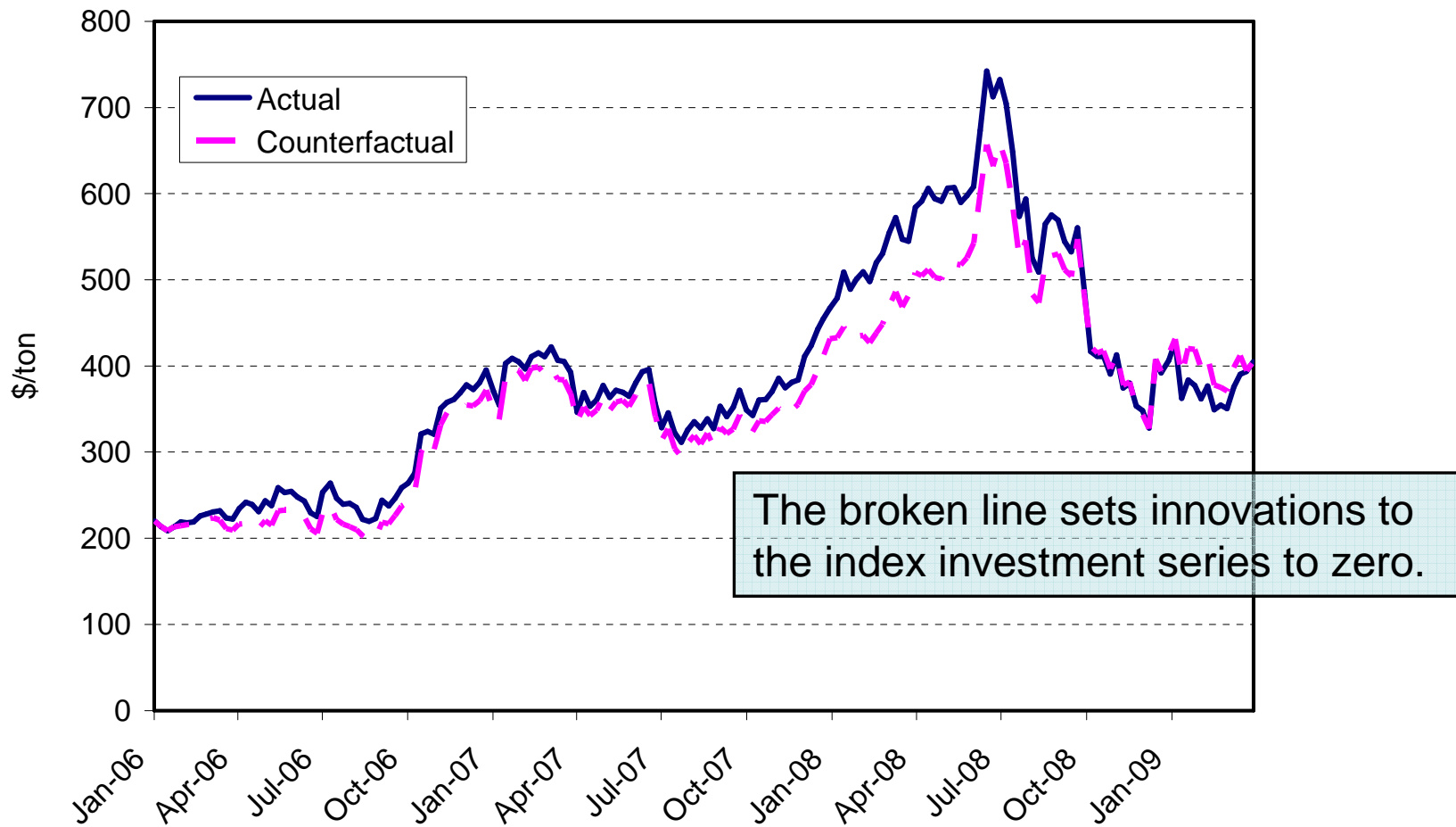
# Global ending stocks of maize and stock to utilization ratios for the whole world and for the world without China



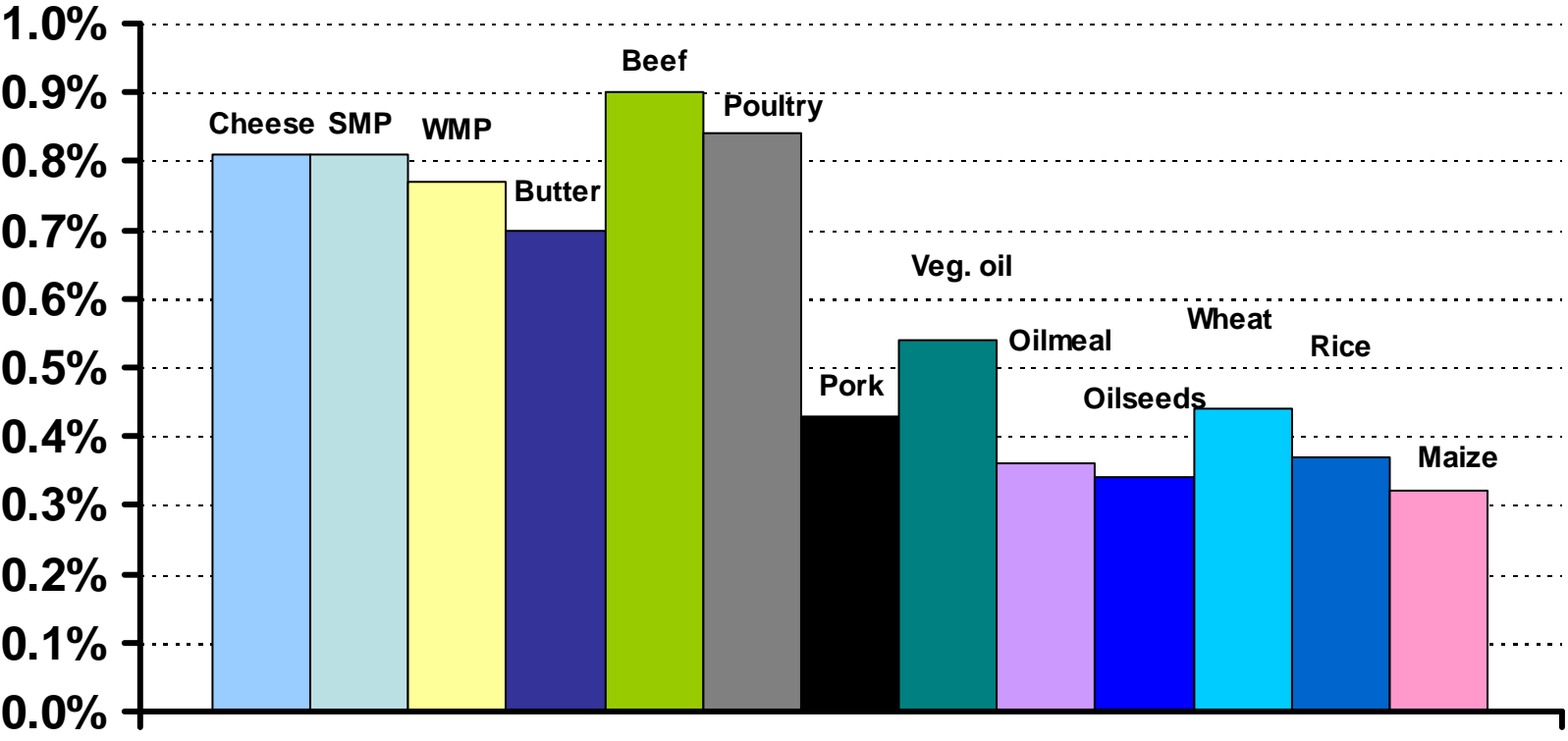
# Global ending stocks of rice and stock to utilization ratios for the whole world and for the world without China



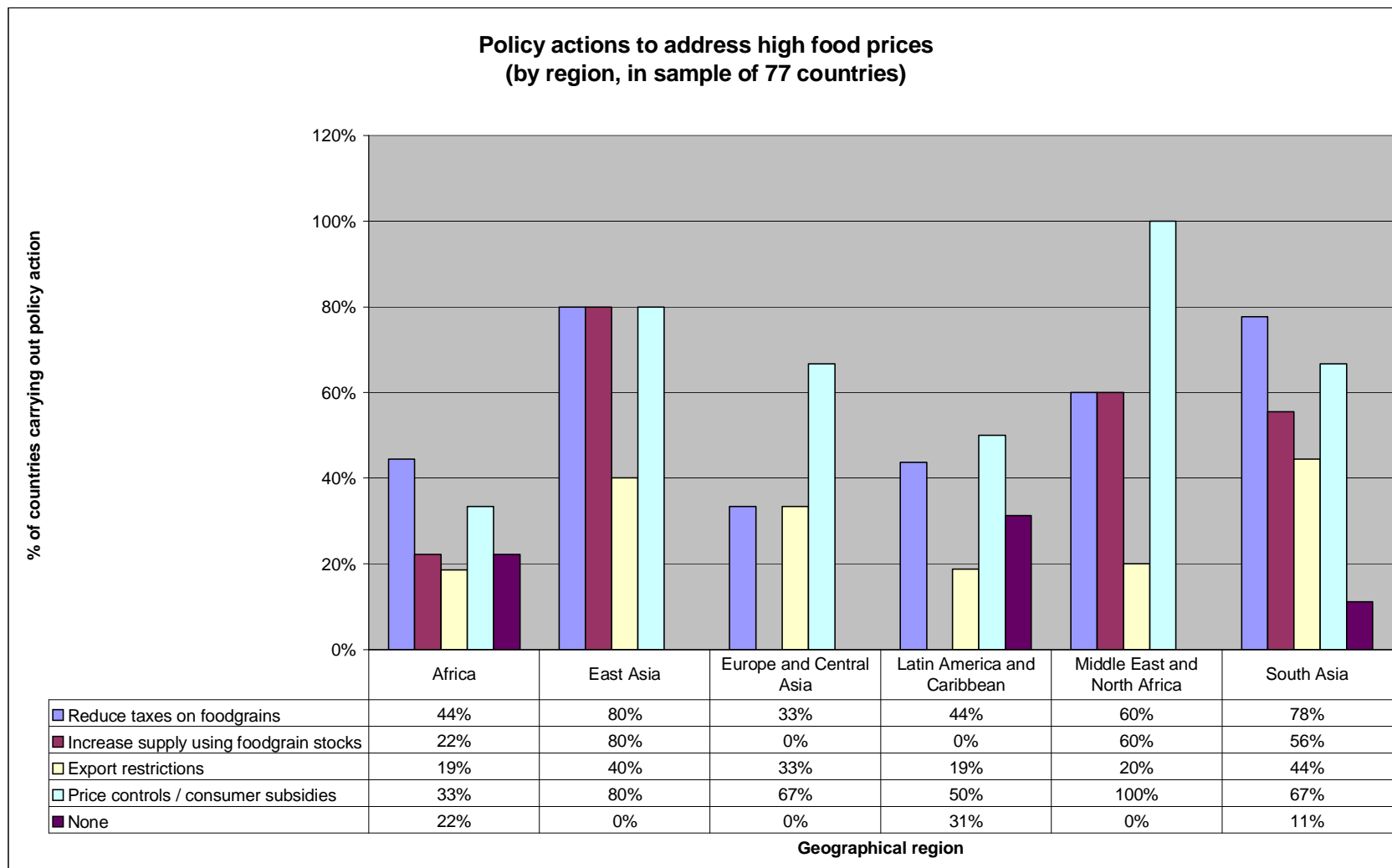
# Speculation. Actual and counterfactual corn futures prices with and without index funds (source Gilbert 2009)



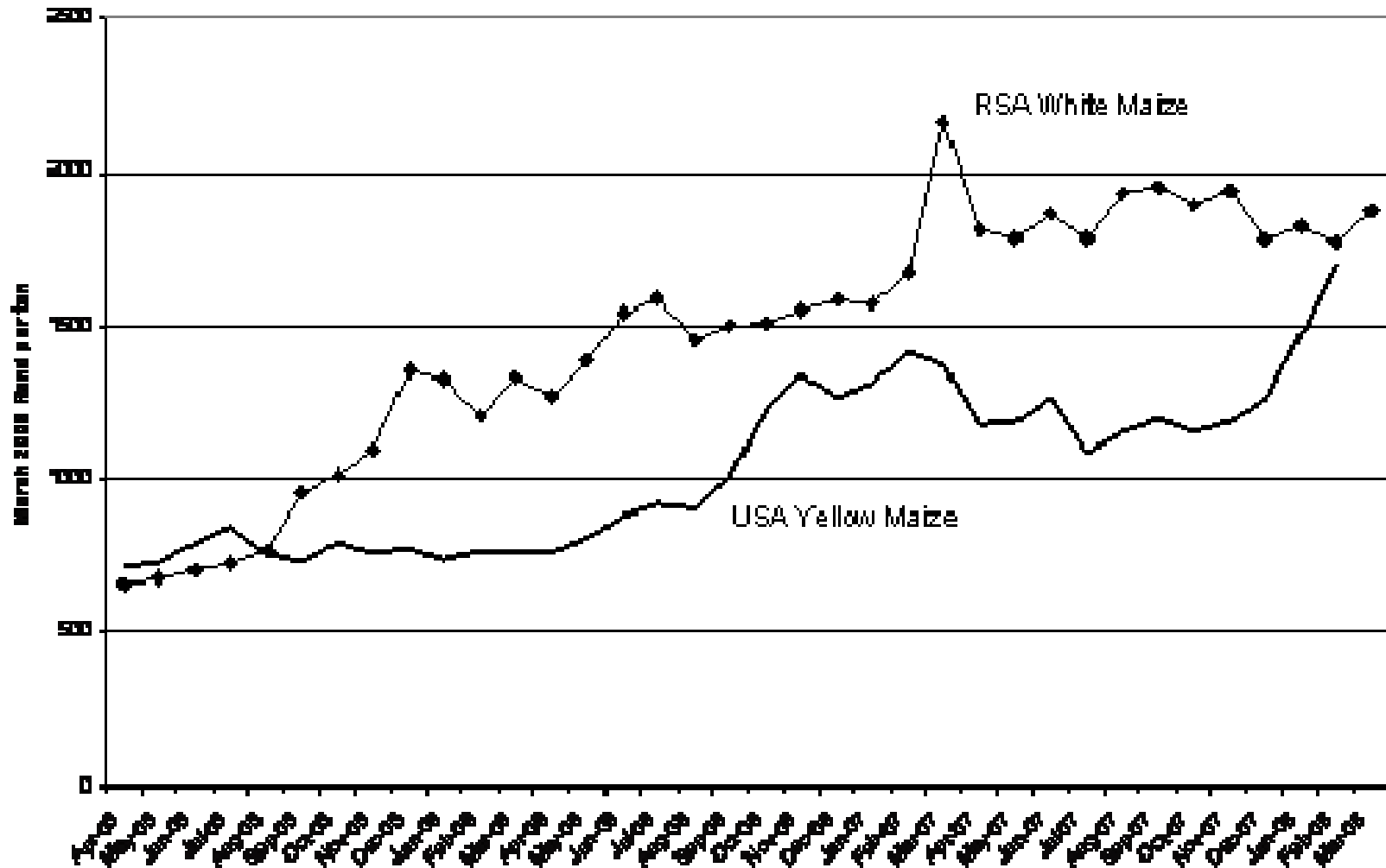
# Impact on commodity prices of a 1 % USD depreciation against all currencies



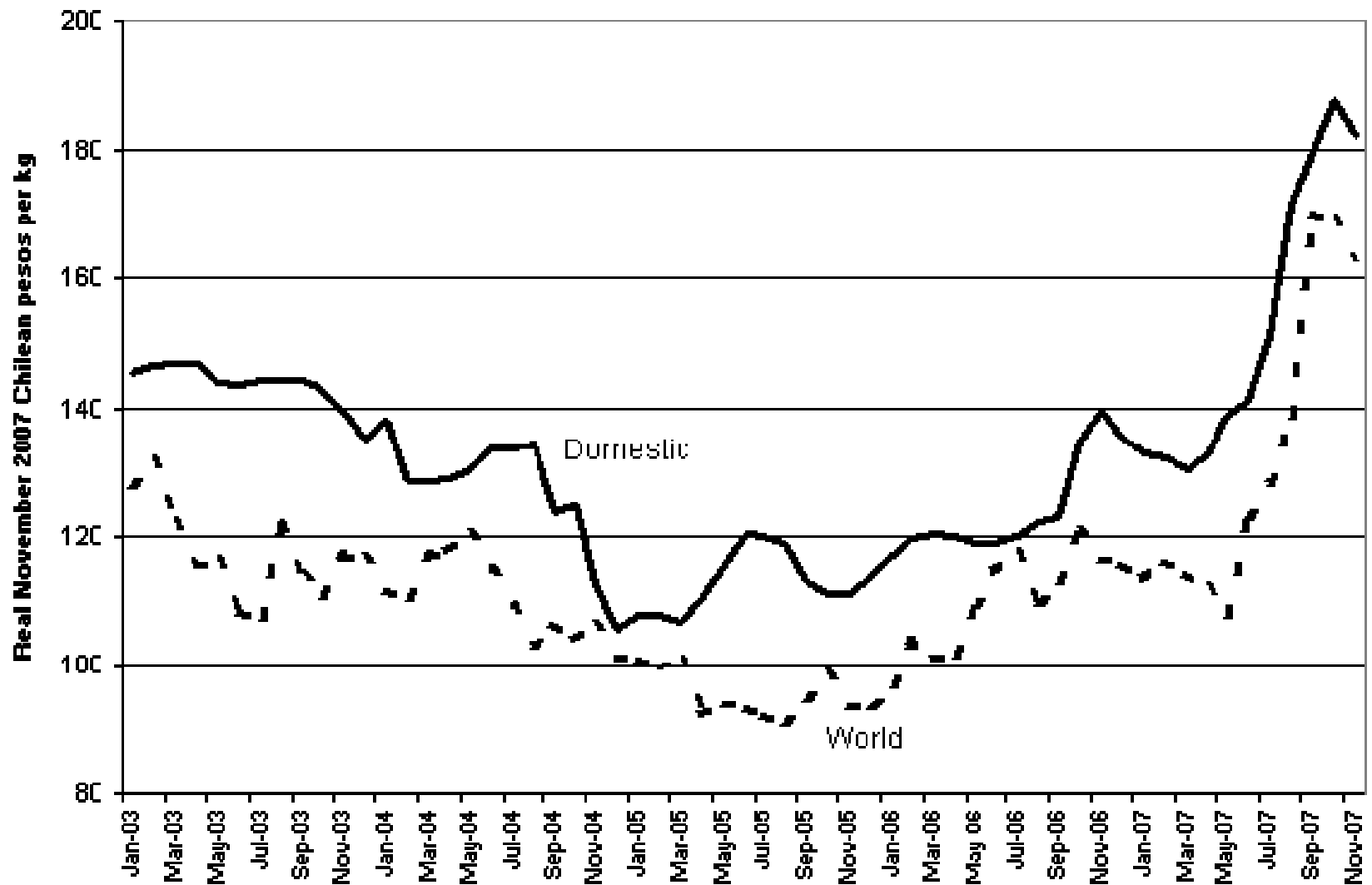
# Policy actions adopted by a sample of 77 developing countries to deal with high international food commodity prices



**Price transmission. Prices US yellow maize in USA and white maize in the Republic of South Africa (real Republic of South Africa rand)**



# Price transmission. Chile domestic wholesale and world wheat prices, inflation adjusted, 2003 to 2007



## **Main factors that will affect medium term agricultural commodity prices and price volatility (new factors in blue)**

- Developments in total incomes and consumption
- Stocks and stock replenishment rates
- Shocks to production
- Petroleum prices
- Biofuel policies and technology prospects
- Developments in exchange rates
- Developments in financial markets and speculative fund positions
- New investments in agricultural production
- Country policies vis a vis domestic markets
- **Overall: New factors are likely to dominate. Considerable uncertainty and likely volatility**
- Implications for agri-food trade. International markets may become less reliable sources of food, but may offer new opportunities for growth exports of developing countries

# New challenges for the international agricultural trading system

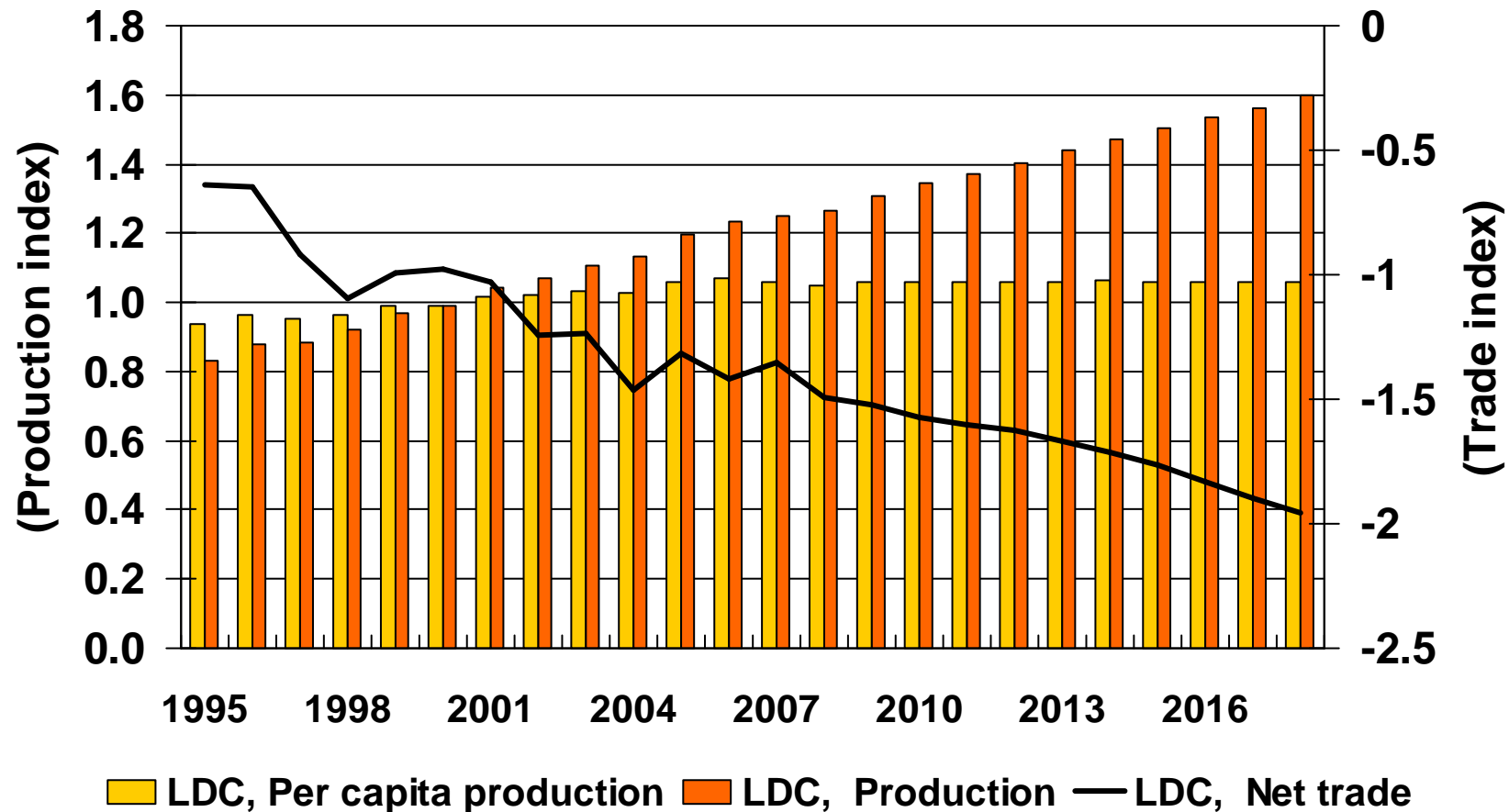
- Recent food crisis created mistrust of the international trading system and moves to promote food self sufficiency
- Many middle and high income NFIDCs started thinking about investments in food production in other countries with contractual commitments to buy back products. This is likely to change world trade patterns for agricultural products.
- There will be a growing need for medium and long term supply arrangements with main exporters
- To promote developments along agricultural comparative advantage, need to create system to assure net food importing countries (both developing and higher income) that their physical import supplies can be guaranteed through imports
- Will need to create system to manage increased price volatilities
- Will need system to ensure low income food deficit countries appropriate finance to import in times of high food prices
- Freer trade has increased concentration. Need to define competition rules for international agrifood trade
- Lower protection has seen increase in application of standards (especially private ones). Will need system to regulate the proliferation of such standards

## Cereal import dependence 2007-9 (number of countries with percentage share of imports to total domestic supply in given range)

	0-10	10-20	20-50	50-75	75-100	Total No of countries in group
<b>HIC</b>	5		3	6	22	36
<b>LDC</b>	16	6	12	9	6	49
<b>LIC</b>	18	6	16	8	1	49
<b>MIC</b>	16	6	28	14	20	84
<b>OIL EXPORTERS</b>	3	1	6	1	4	15
<b>SIDS</b>		1	4	6	31	42
<b>Total No of countries</b>	58	20	69	44	84	275

# Food import dependence of developing countries will grow.

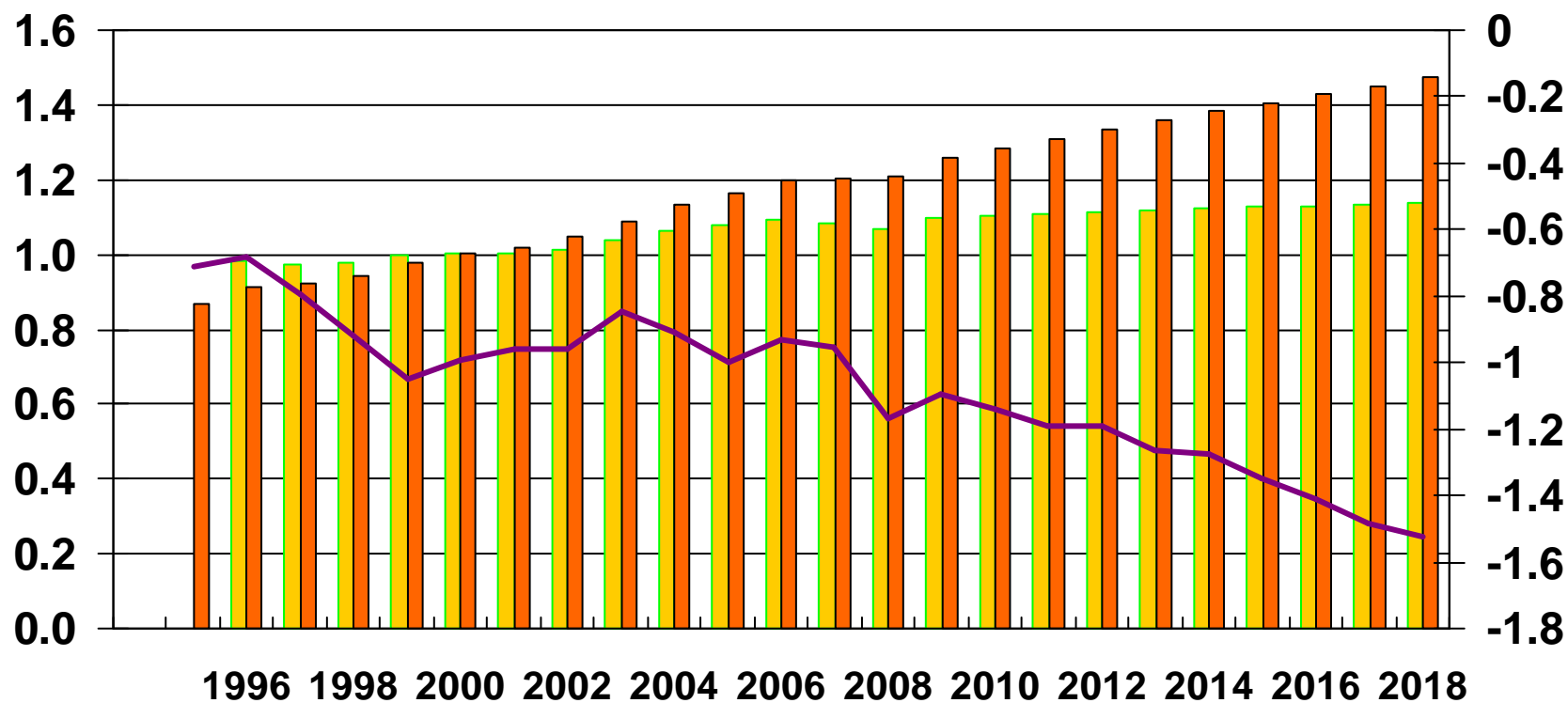
## Agricultural production and trade LDC Countries (Base 1999-2001 =1)



# Agricultural production and trade

## Other Developing (non-LDC, non-BRIC)

(Base 1999-2001 = 1)



■ Other Developing, Per capita production 
 ■ Other Developing, Production 
 — Other Developing, Net trade

# **Problems of access to grain imports may become more acute**

- High grain prices induced speculative purchasing and hoarding by many agents, including importing countries.
- Many middle and high income regular net food importing countries, apart from higher food import bills, faced risks of lack of adequate supplies
- Many of these countries have low capacity for domestic production albeit capacity to finance imports
- Low income countries faced both rationing out of global supplies by richer countries as well as higher costs
- To achieve global and equitable food security need system to assure supplies to both types of countries

# Four ways to manage food import risks

- **avoiding or reducing the risk** altogether (by altering domestic production, higher degree of staple food self sufficiency)
- **change the fundamentals of supply and demand**, by manipulating directly the markets that create those risks (through for instance buffer stocks for global price stabilization)
- **transfer some of the risk to a third party for a fee**. This is the standard approach to insurance
- **do none of the above** and just cope
- Basic problem is **market unpredictability**

# Should physical, public, globally managed grain reserves be developed?

**Answer: Most likely no**

- **Why:**
- Three main challenges in maintaining strategic reserves:
  - **determination of optimum stocks is politically loaded**
  - Predicting supply and demand and where the potential shortfalls in the market may be can be extremely difficult
  - Reserves are dependent on transparent and accountable governance
  - **level of costs / losses**
  - Reserves cost money and stocks must be rotated regularly
  - The countries that most need reserves are generally those least able to afford the costs and oversight necessary for maintaining them
  - The private sector is better financed, better informed, and politically powerful, putting them in a much better position to compete
  - **uncertainties that strategic reserves can bring about in the market place.**
  - Reserves distort markets and mismanagement and corruption can exacerbate hunger rather than alleviate it

# Should we reform commodity exchanges by:

- limiting the volume of speculation relative to hedging through regulation;
- making delivery on contracts or portions of contracts compulsory;
- imposing additional capital deposit requirements on futures transactions.
- Answer: probably NO –
- Speculation is a symptom not a cause of spikes, and has not altered market fundamentals albeit has enhanced spikes. This is true irrespective of exchanges or not

## **External insurance systems available in developed countries but not in DCs**

- Government subsidized insurance
- Futures and options markets
- OTC risk management products
- International compensatory finance mechanisms (e.g IMF food facility) ex-post and do not deal with immediate problem
- In developed countries much more predictability of agricultural prices because of policies (e.g minimum prices)

# Assuring adequate grain supplies for world markets

- Promote “**production reserves**” instead of commodity reserves
- In several OECD countries policies have been instituted to set-aside land.
- Such policies are largely “decoupled”, namely non-trade distorting, hence acceptable from a WTO perspective.
- Relevant policies, could include apart from support for land set asides, support for technology and farm human capital skills, incentives to maintain set-aside land in environmentally sustainable condition, etc.
- Productive land set-aside could be brought into physical production in high income countries within 6-10 months (the recent supply response is evidence to that)

## **Appropriate policies for assuring grain market access by middle and high income net grain importing countries**

- Investments in food production in other countries with commitments to buy back products
- Medium and long term arrangements with main exporters
- Managing import risks through derivative instruments reinsured in international reinsurance market

# **A proposal to ensure food imports in low income countries net grain importing countries through a dedicated Food Import Financing Facility**

**The major problem faced by LDCs  
and NFIDCs during periods of food  
import needs in excess of normal  
commercial imports, is import  
financing for both private as well as  
parastatal entities**

# Basic rationale and concept of a FIFF

- **Purpose**: To allow LDCs and NFIDCs to finance commercial food imports in periods of excess import bills
- **Problem to be dealt with**: Credit and financing exposure ceilings from developed country financing institutions to LDCs and NFIDCs
- **Concept**: Provide additional finance for commercial food imports in excess of normal commercial food imports. In other words increase risk bearing capacity of financial institutions financing food imports
- **How**: By inducing increases in credit ceilings and country exposures under specific conditions, via a credible mechanism of intermediation

# The basic structure of the Food Import Financing Facility (FIFF)

- Ex-ante (i.e. before onset of marketing year) availability of extra finance, based on estimates of excess food import bills
- Financing, or guarantees for finance above normal credit line ceilings, availed at normal commercial terms. No subsidies, no conditionalities
- Excess finance made available to financial institutions of eligible LDCs and NFIDCs (not directly to governments or traders). Domestic financial institutions will deal with local food import traders.
- FIFF would interpose itself between financial institutions in food exporting countries and financial institutions in eligible food importing countries.
- FIFF will supplement and augment the existing export financing mechanisms in developed food exporting countries.

# Trigger conditions

- High international food prices
- Domestic production shortfalls
- Excess food import finance possibility made known and available on basis of estimates of excess food import bills, in advance of marketing year
- Estimates of excess food import bills will be based on estimates of international prices, domestic production, and imports, by reliable credible institutions.

# Advantages of FIFF

- No need for new international institution. Facility can operate as part of existing IFI
- Ex-ante mechanism, not ex-post
- No conditionalities for finance
- Low interest rates, due to lower cost of intermediation
- Risk pooling of food import risks across many LDCs and NFIDCs
- Specialized knowledge of food import finance and relevant risk management
- Low interest rates of excess food import finance
- Considerable leveraging of funds (with small yearly costs total finance extended can be many times that)
- Multilateral export credit guarantee mechanism for food exports.
- Low risks due to sophisticated risk management, hence low cost (a small share of total financing extended)
- Could be adapted and extended to serve more purposes, such as a special concessionary window

# Can staple food commodity imports be hedged with futures and options. Case of wheat in the Chicago CME

- Bulk of global wheat imports is obtained from the US, Australia, and Argentina
- Consider US Gulf price as an indicative price for all wheat imports
- Gulf and near futures Chicago prices are cointegrated, and adjustment to short term shocks is quite fast
- Simulations involve buying futures or call options  $k$  months in advance of the actual order, and selling them when the actual physical transaction for wheat imports is concluded
- Assumed that agent buys futures  $k$  months in advance of date when need to contract the actual delivery.
- Contract date assumed to be one month before the needed monthly physical delivery of import
- For call options strike price is parameterized as  $(1+\alpha)$  times the futures price observed in month  $t$  for the contract expiring at or in the nearest month after the period  $t+k$ , when the actual transaction will be made

**Average unanticipated prediction errors of cash and futures prices, coefficients of variation of cash and futures prices, and standard deviations of percentage prediction errors of cash and**

**futures prices for wheat in CME/CBOT over 1985-2008**

		1985-1 to 2005-12	2006-1 to 2008-12	1985-1 to 2008-12
		<b>Wheat</b>		
Average Gulf price (USD/ton)		143.3	257.6	157.6
$(P_t - E_{t-k}(P_t)) / \text{Average price}$ (percent)	k=2	-1.1	1.5	-0.7
	k=4	-1.2	1.6	-0.9
	k=6	-1.0	4.2	-0.3
$(F_t - F_{t-k,t}) / \text{Average price}$ (percent)	k=2	-0.3	0.9	-0.2
	k=4	-1.3	1.0	-1.0
	k=6	-1.9	3.5	-1.2
CV of Gulf price (percent)		18.9	30.3	33.7
CV of CBOT near futures price		17.1	32.2	31.8
Stdev of $(P_t - E_{t-k}(P_t)) / \text{Average price}$ (percent)	k=2	8.3	16.1	9.6
	k=4	10.9	22.6	13.0
	k=6	13.3	26.0	15.6
Stdev $[F_t - (F_{t-k,t})] / \text{Average price}$ (percent)	k=2	8.0	16.2	9.4
	k=4	10.4	22.6	12.6
	k=6	12.9	25.6	15.2

## Normalized coefficients of variation of wheat import bills k=2 months in advance

	Without hedging			Hedging with futures only			Hedging with Options only		
	1985-1 to 2005-12	2006-1 to 2008-12	1985-1 to 2008-12	1985-1 to 2005-12	2006-1 to 2008-12	1985-1 to 2008-12	1985-1 to 2005-12	2006-1 to 2008-12	1985-1 to 2008-12
<b>Bangladesh</b>	10.0	21.1	16.4	6.1	6.3	6.8	7.6	12.7	10.7
<b>China, Mainland</b>	11.1	20.3	11.9	7.2	12.6	7.9	6.9	13.5	7.4
<b>Egypt</b>	9.4	21.5	15.5	5.8	6.6	6.5	6.4	13.1	10.0
<b>India</b>	24.3	27.7	41.3	19.5	29.7	42.0	20.7	25.5	37.4
<b>Indonesia</b>	10.9	18.7	17.0	6.6	7.1	7.9	7.7	11.6	11.2
<b>Mozambique</b>	9.4	15.0	14.9	7.2	8.0	9.1	8.1	9.8	10.5
<b>Nicaragua</b>	13.8	23.6	18.8	8.3	8.2	8.7	9.5	9.1	9.8
<b>Pakistan</b>	14.9	48.2	30.6	7.2	9.6	8.2	9.0	29.9	19.4
<b>Philippines</b>	10.0	18.4	14.7	6.2	6.8	7.0	7.6	11.6	10.1
<b>Sudan</b>	10.3	19.1	16.0	7.6	6.9	8.0	8.1	12.1	11.0
<b>Tanzania</b>	11.8	26.8	33.8	10.7	8.3	13.4	11.6	17.0	22.7

# Conclusions and policy implications

- Managing food import risks rather than trying to change global market fundamentals seems to be most viable way to ensure food import supplies
- Global or national stockholding arrangements are inefficient and will not achieve much
- Reforming existing commodity exchanges is not likely to change fundamentals of commodity markets
- Futures prices in well organized commodity exchanges are good predictors of subsequent global spot prices
- Futures markets can provide a good hedging medium for cereal import trade.
- Considerable unpredictability reduction can be obtained by using either futures or options, even in times of crises, with reasonable cost.
- To increase reliability of global food import markets, need better contract enforcement mechanisms
- A Food Import financing Facility (FIFF) of the type proposed here could go some way to make global food import markets more reliable, and hence avoid policies which may eventually create more global distortions