
# Price volatility in agricultural markets: drivers and implications

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*DG Agriculture and Rural Development*
*European Commission*

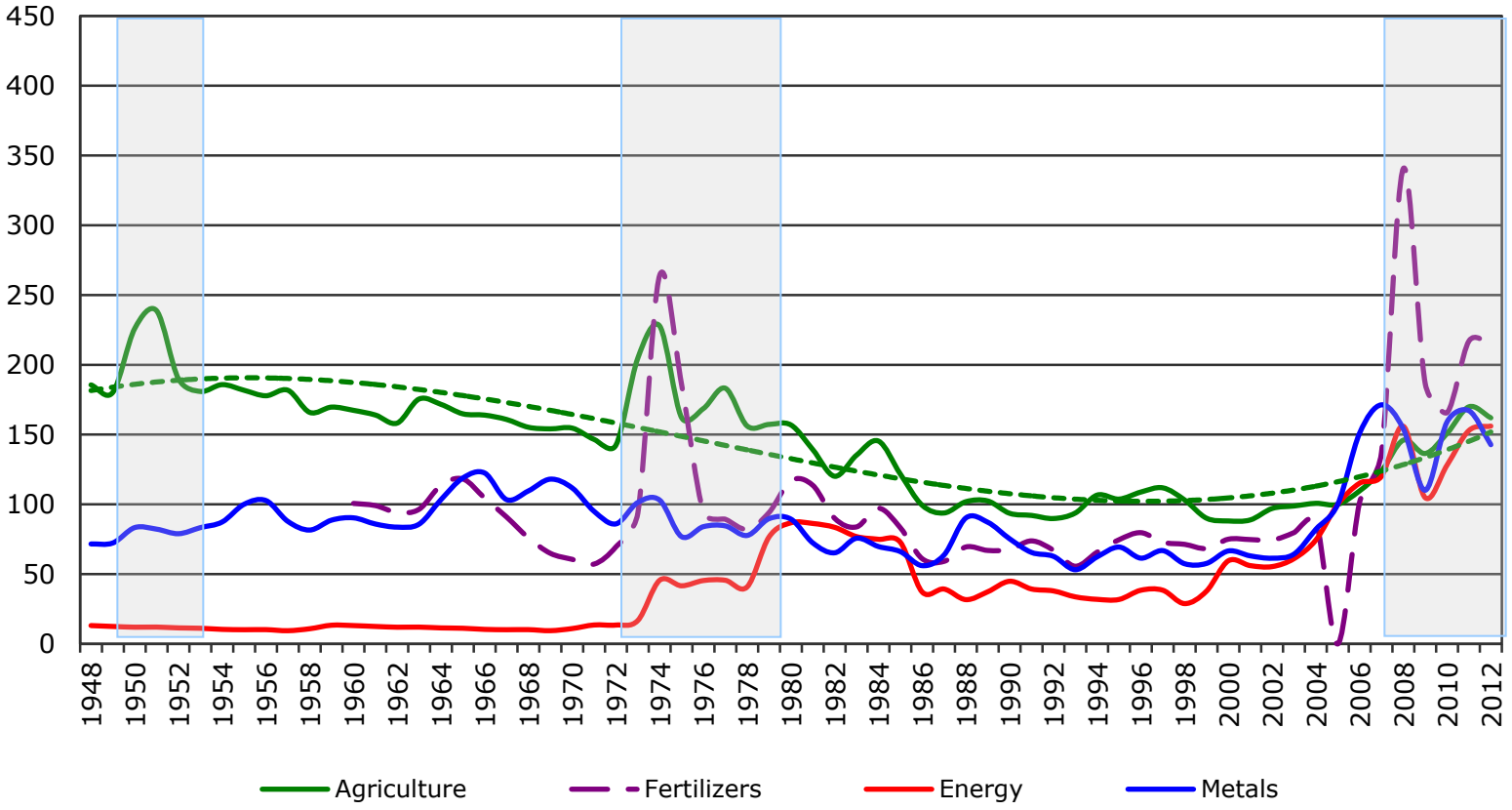
Agriculture and Rural Development

# Outline

1. Driver(s) of price volatility: no "smoking gun"?
2. What people says. What data shows
3. Implications

# Long term commodity price trends

*(World Bank MUV-deflated indices, 2005 = 100)*




*Source: World Bank. Note: 2012 figures are forecasts as of September 2012.*

# While the commodity price boom has been attributed to many factors…

## Common/macro factors

- Economic growth
- Weak dollar
- Fiscal expansion
- Low cost of capital
- Financialisation of commodities

## Sector-specific factors

### *Exogenous to agriculture*

- Energy prices
- Weather
- Food demand
- Biofuels

### *Endogenous to agriculture*

- Policies
- Underinvestment
- Low stocks

# … the "perception" attributes the 2007-2008 agricultural price boom to a selective few

## Common/macro factors

- Economic growth
- Weak dollar
- Fiscal expansion
- Low cost of capital
- **Financialisation of commodities**

## Sector-specific factors

### *Exogenous to agriculture*

- Energy prices
- Weather
- **Food demand**
- **Biofuels**

### *Endogenous to agriculture*

- Policies
- Underinvestment
- **Low stocks**

# Four basic questions to understand high and volatile commodity prices

1. Is price volatility higher than in the past?
2. Is this driven by higher yield variability?
3. Is it due to a sharp increase in food demand?
4. Are agricultural prices more sensitive to stock changes?

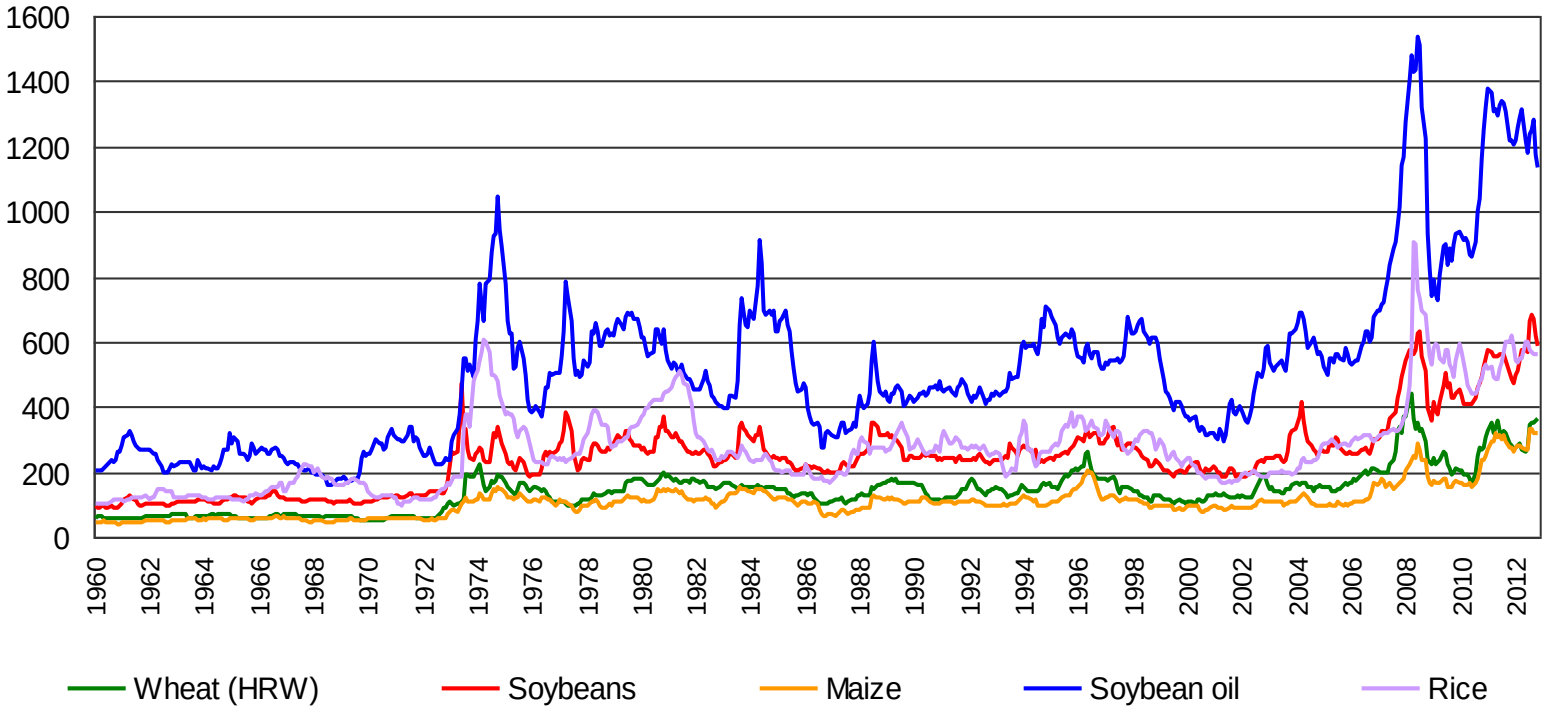
# 1. Is price volatility higher than in the past?

## The analysis over the last 50 years shows:

- Price volatility higher in recent decade for most products, but lower lately
- Exception only for beef, poultry, sugar (higher in the 70s)
- EU price volatility was higher than at world level (CAP reform process of market orientation)

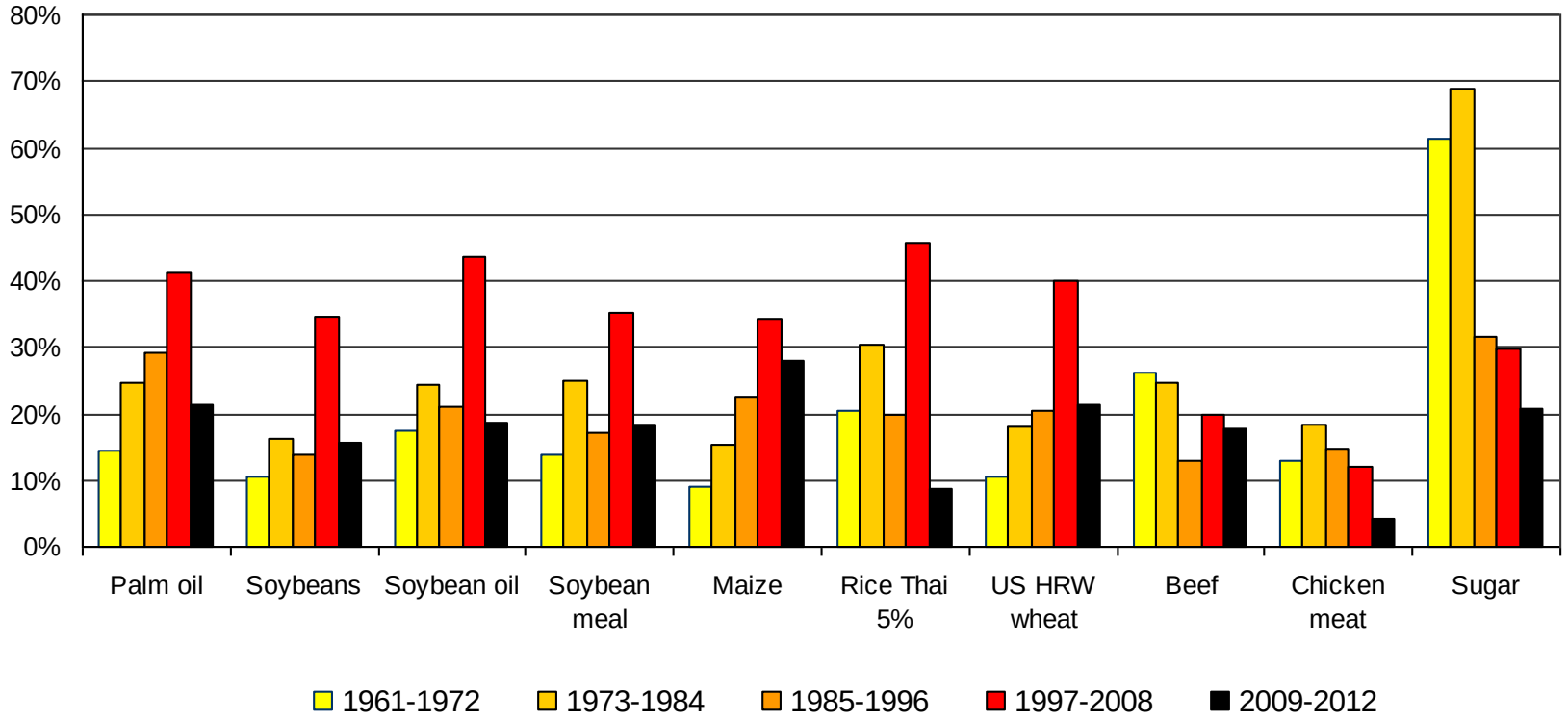
# Long term price developments for key agricultural commodities

*USD/mt in current USD*



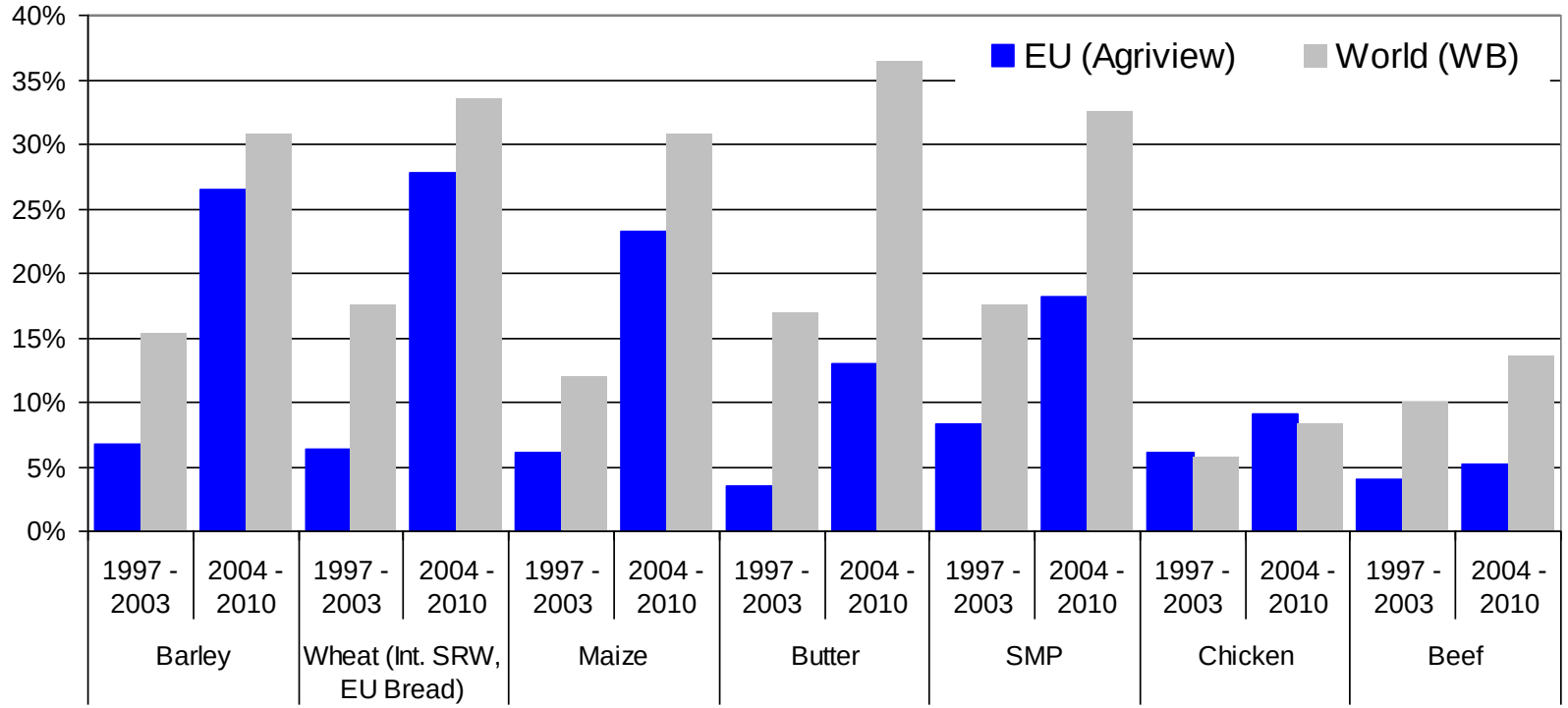

***Source: World Bank***

# Coefficient of variation for selected products, long-term price series




***Source: World Bank***

# Coefficient of variation for comparable products, 1997-2003 vs 2004-2010, EU and World



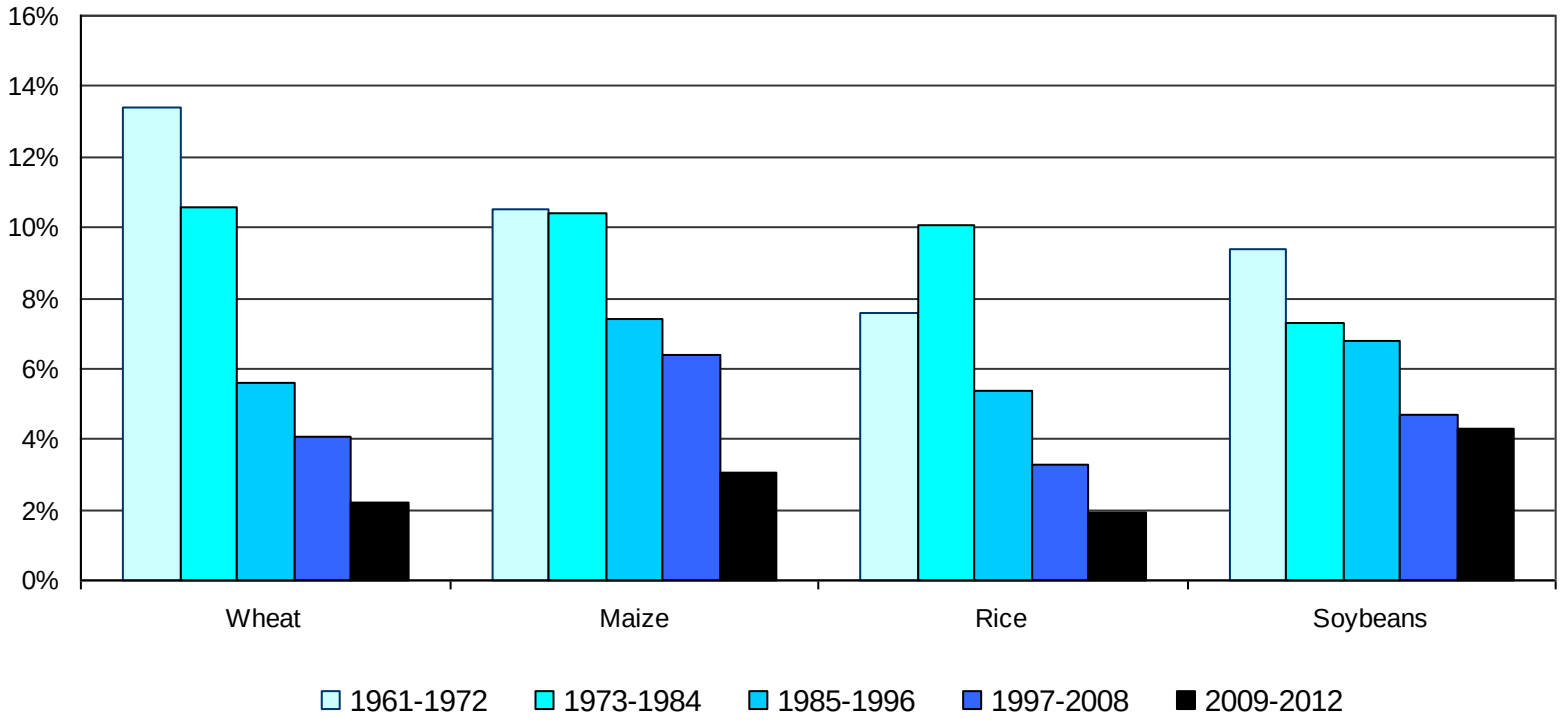

***Sources: Agriview and World Bank***

# 2. Is higher price volatility driven by higher yield variability?

The analysis shows:

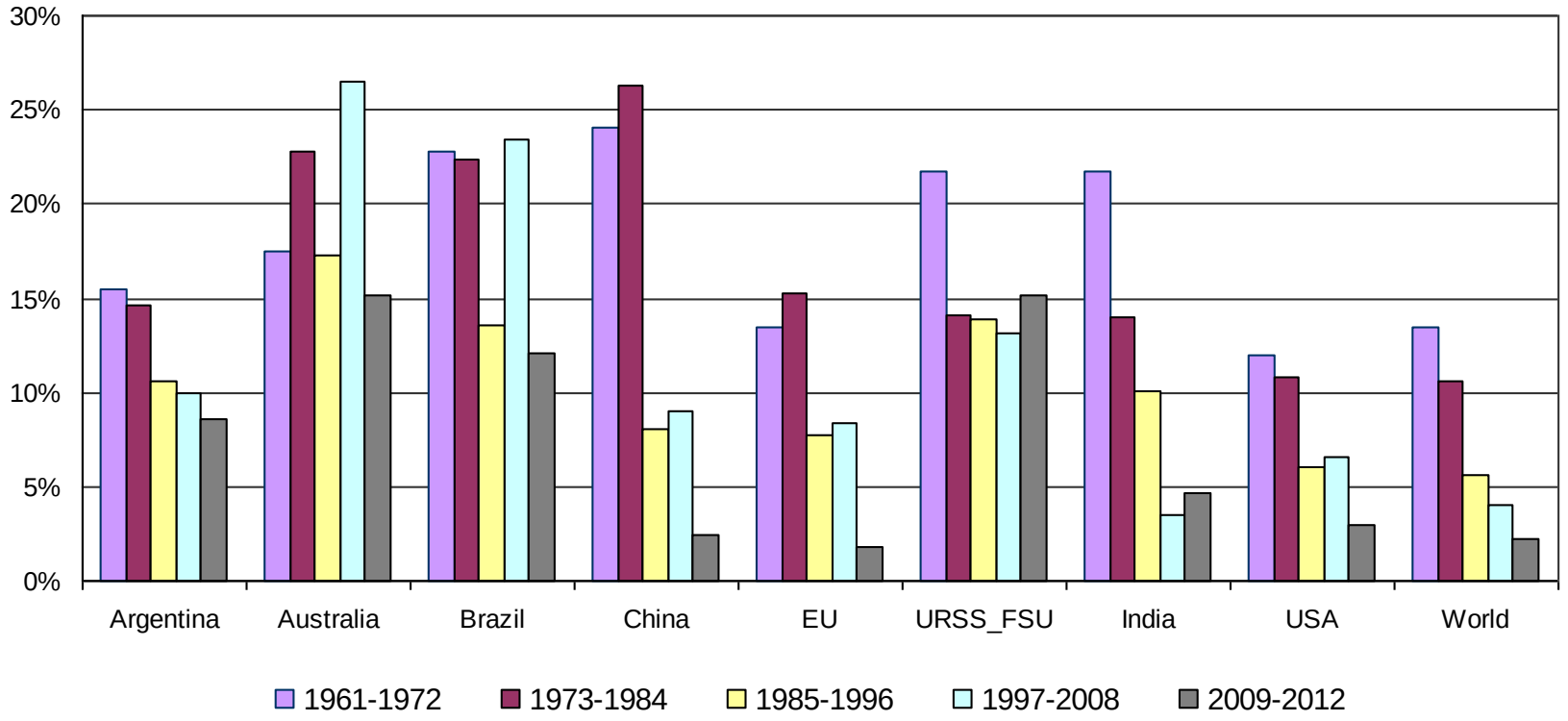
- No straightforward conclusions can be drawn
- Different between countries and commodities

# Yield variability for 12 years periods - World



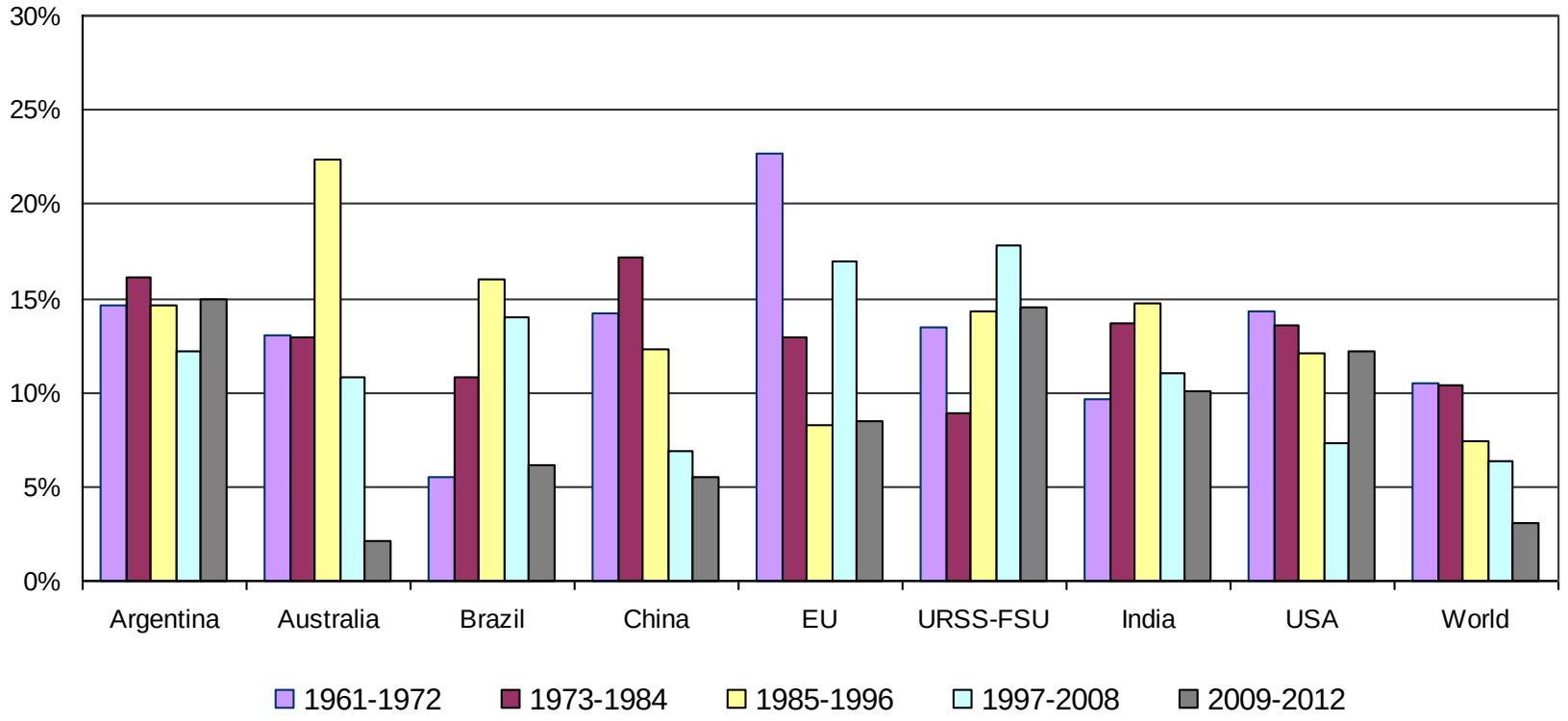

***Sources: USDA, FAO***

# Yield variability for 12 years periods - Wheat



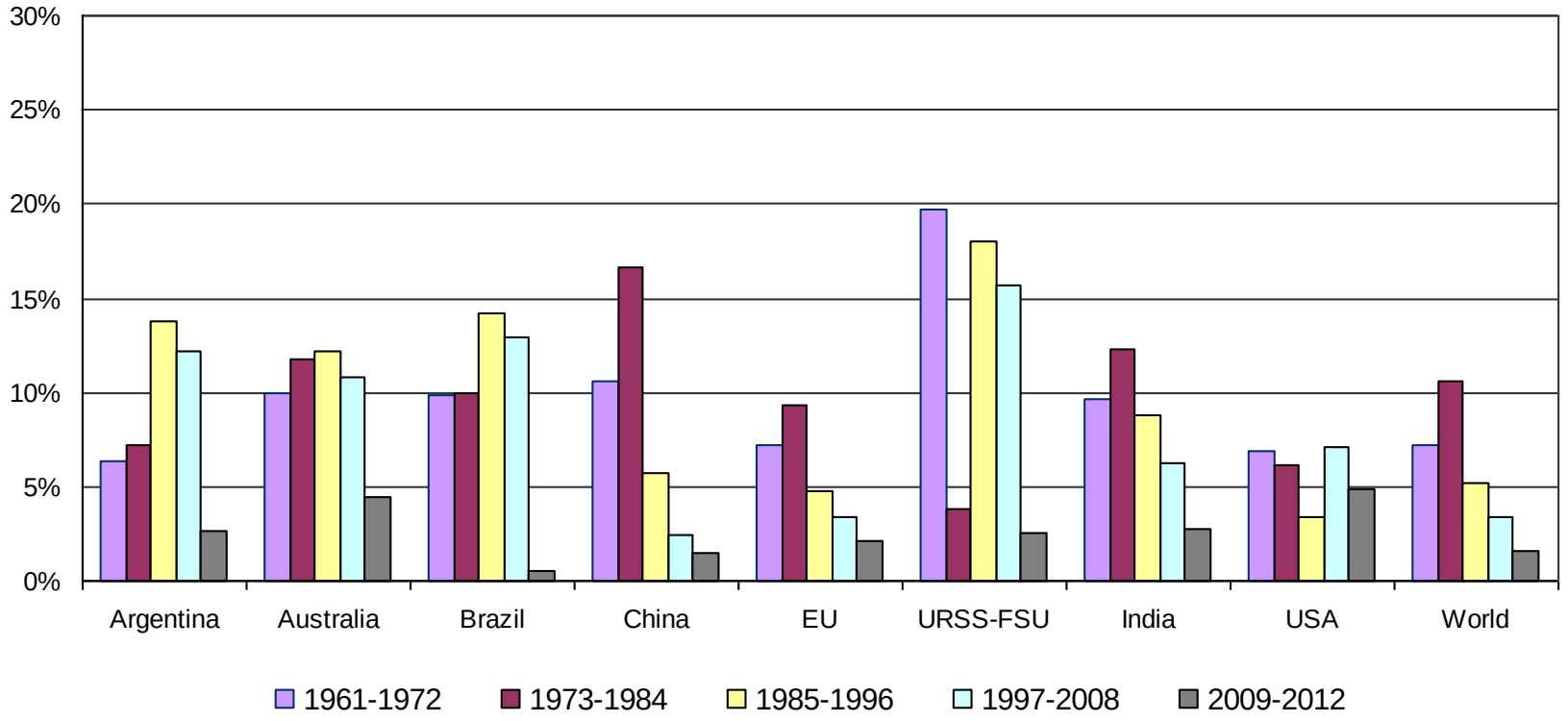

***Sources: USDA, FAO***

# Yield variability for 12 years periods - Maize



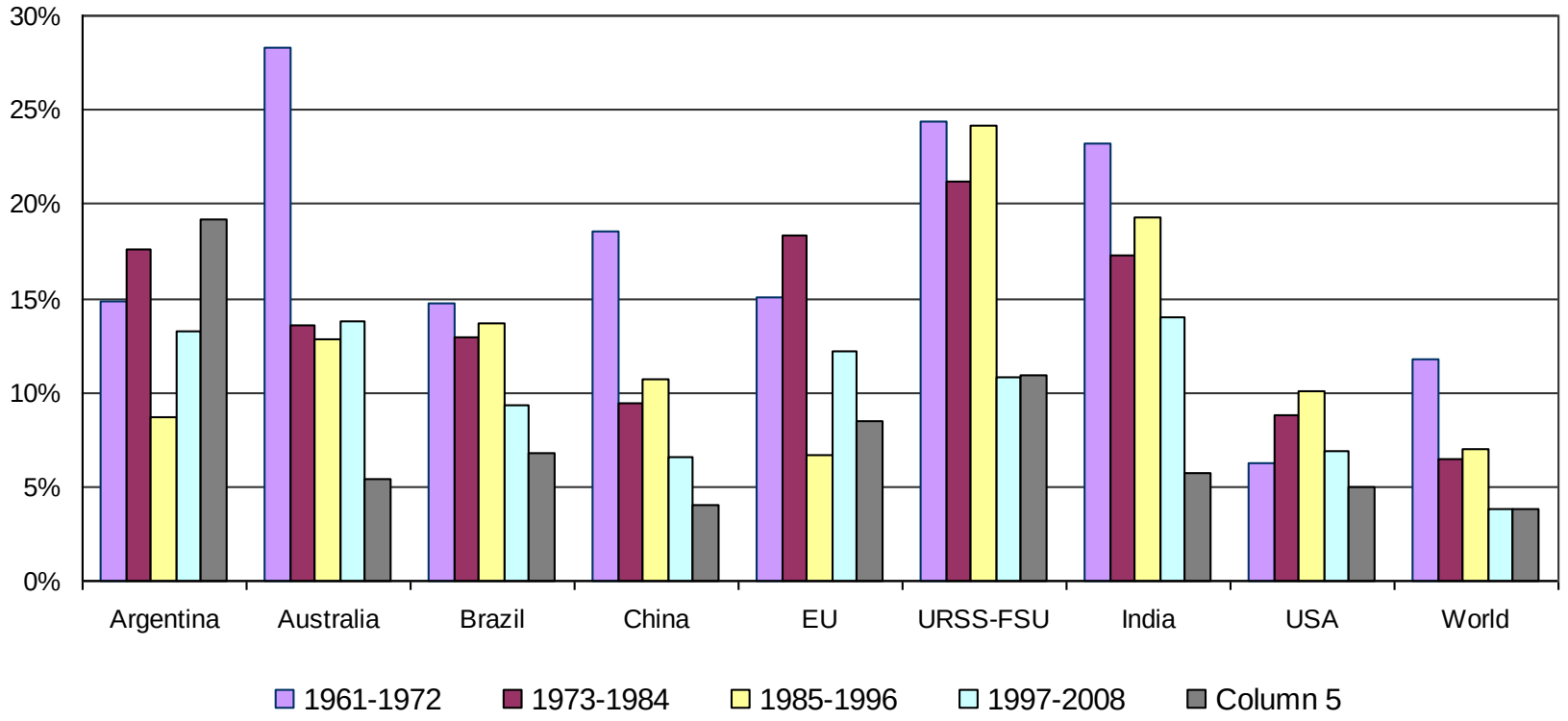

***Sources: USDA, FAO***

# Yield variability for 12 years periods - Rice



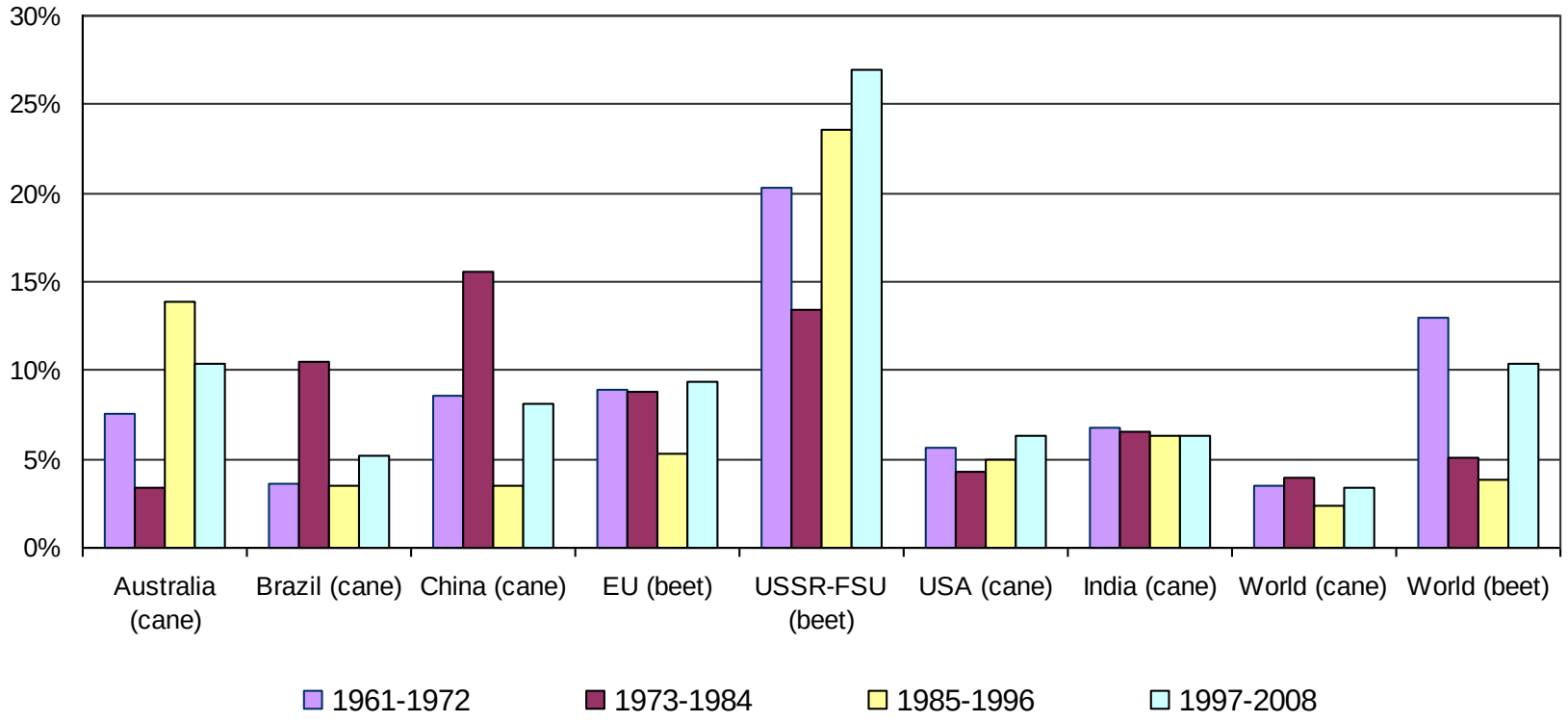

***Sources: USDA, FAO***

# Yield variability for 12 years - Soybeans




***Sources: USDA, FAO***

# Yield variability for 12 years - Sugar



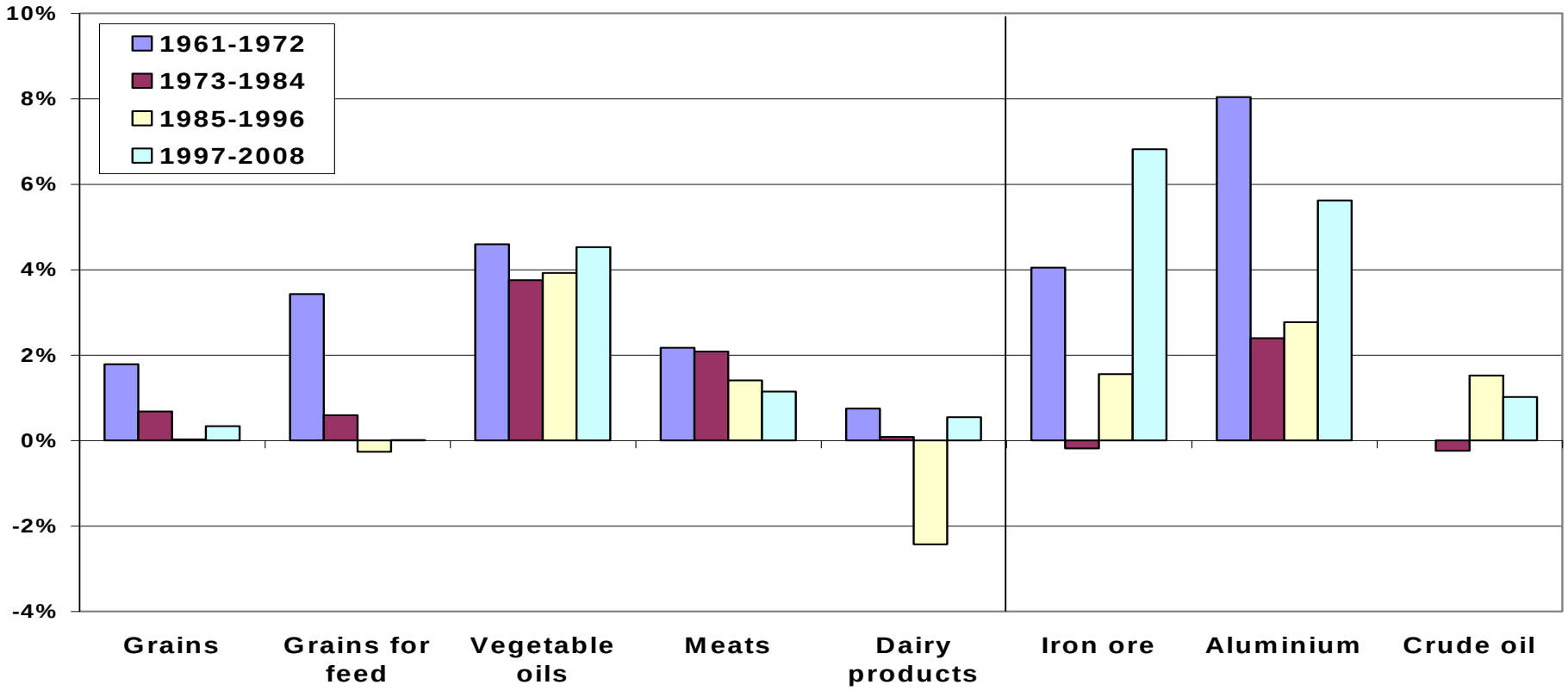

***Sources: USDA, FAO***

# 3. Is higher price volatility driven by sharp increase in food demand?

## The analysis shows:

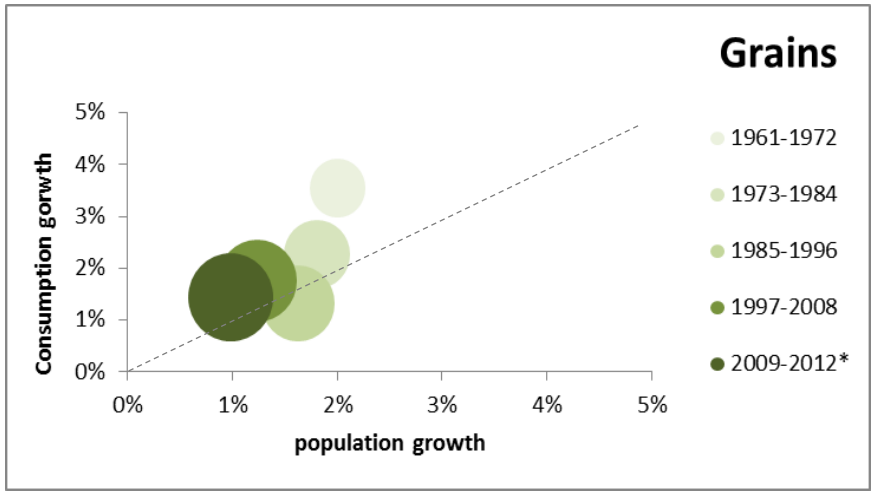
- Agricultural products: Demand growth has decreased over the last 50 years for most products and countries (exception veg. oils and dairy products)
- Energy and minerals/metals: Demand growth is on the increase since mid 80s (iron, aluminium) and mid 90s (crude oil)

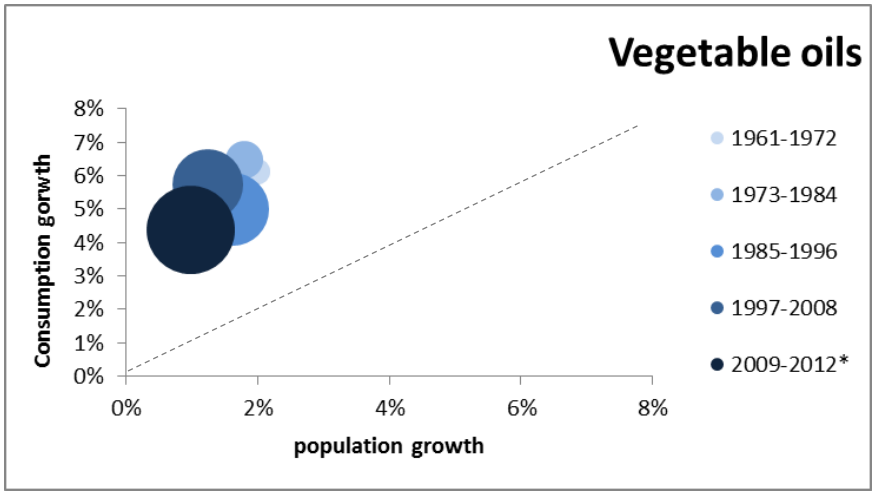
# Growth rates for main agricultural products, crude oil and selected minerals/metals

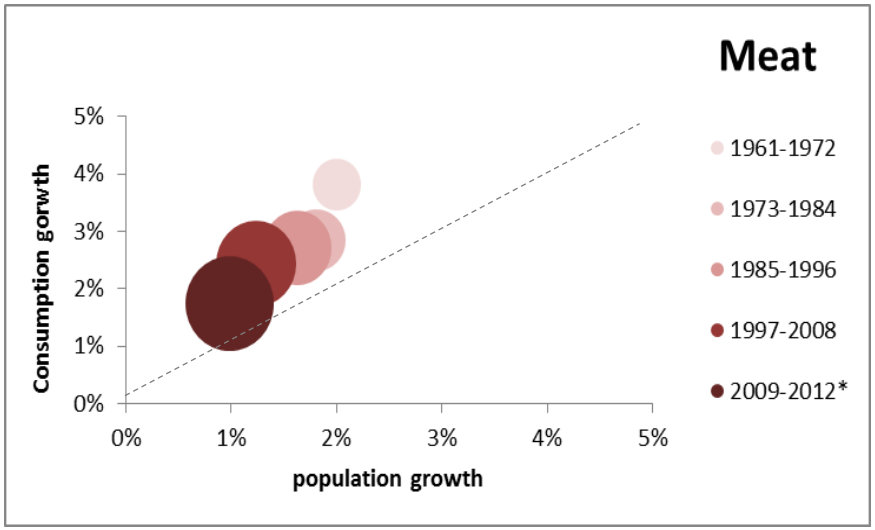


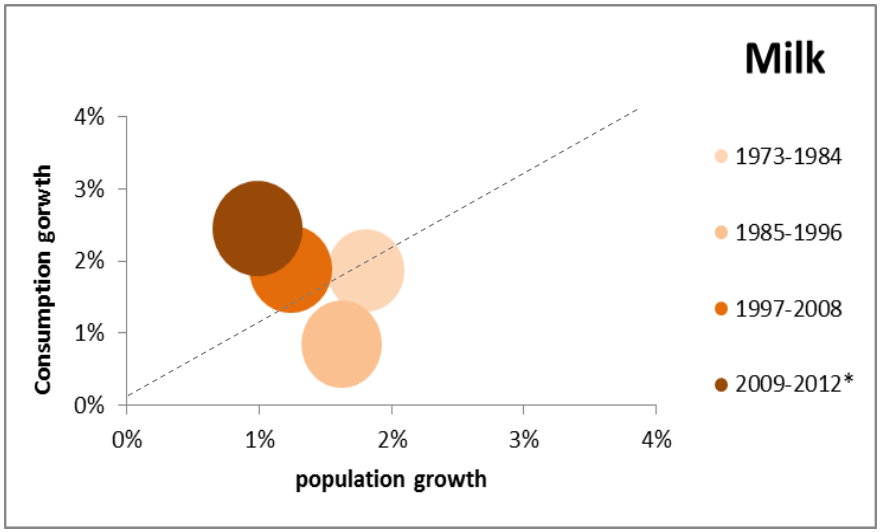

*World per capita demand growth for agricultural commodities, USDA, FAO.*
*World production growth for crude oil (International Energy Agency) and Metals/minerals (U.S. Geological Survey)*

# World annual growth in consumption/population (%)



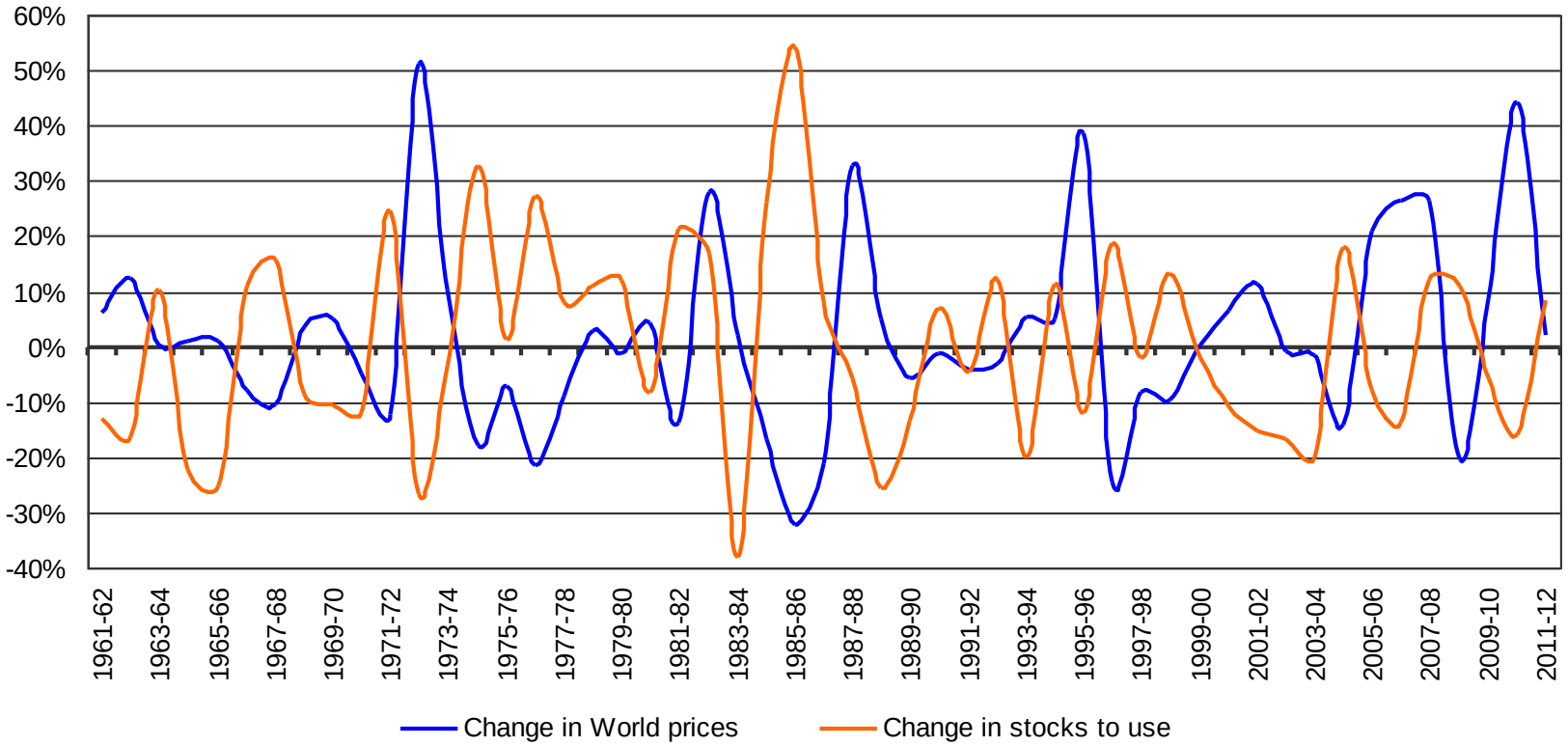

* Based on estimations for 2011-2012. Size of bubbles represents total average consumption over a period. Sources: FAO, USDA

# 4. Are agricultural prices more sensitive to stock changes?

## The analysis shows:

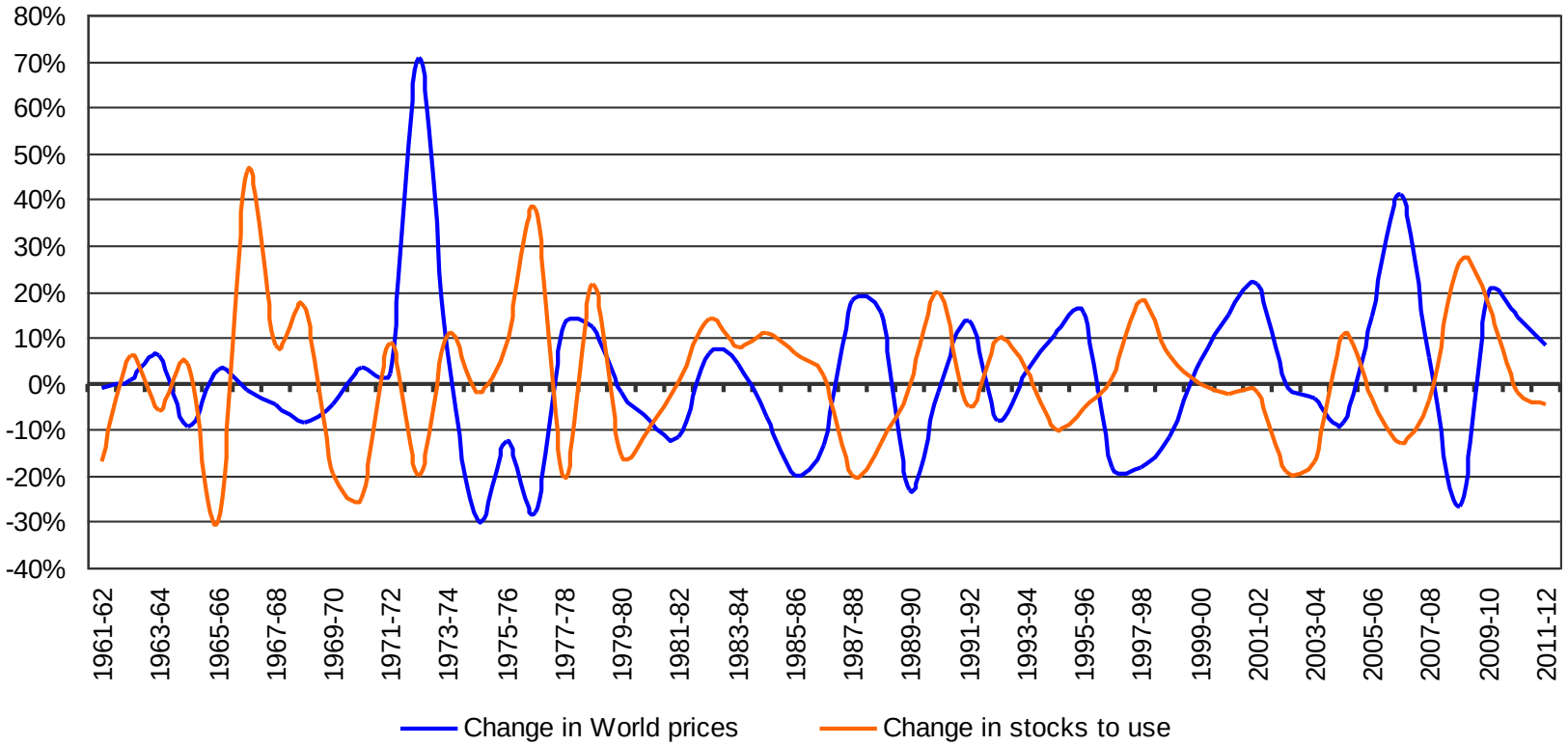
- The relationship between stock-to-use and world prices did not change much over the last 50 years.
- A certain increase in responsiveness can be observed for the main crops (wheat, maize, soybean) in the two past decades.
- Sugar prices on the other hand were more sensitive to stock changes in the 70s and 80s than recently (link with oil price).
- No significant linkage for rice and vegetable oils.

# Yearly changes in stocks to use and prices
# Maize



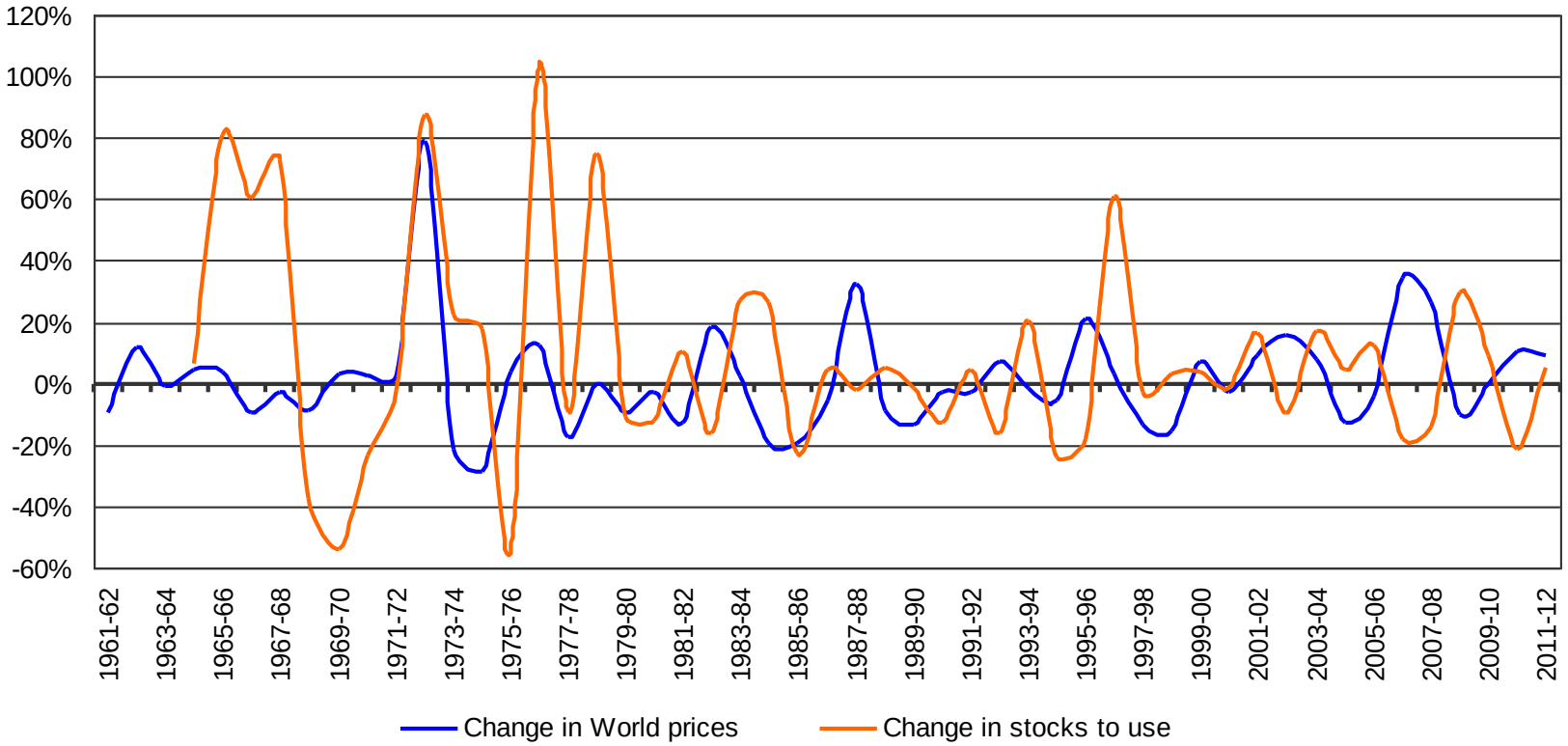

***Source: World Bank, USDA***

# Yearly changes in stocks to use and prices Wheat



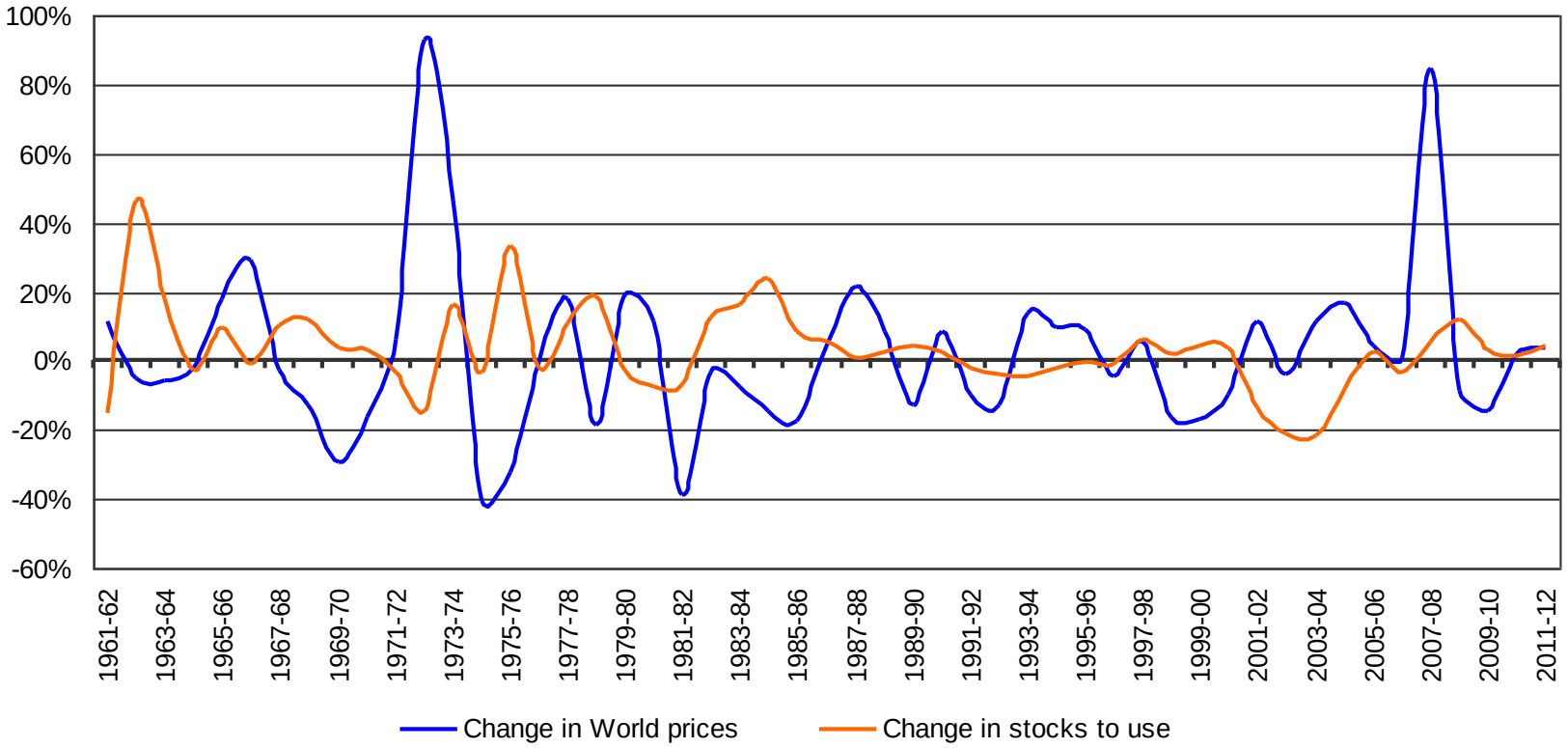

***Source: World Bank, USDA***

# Yearly changes in stocks to use and prices Soybeans



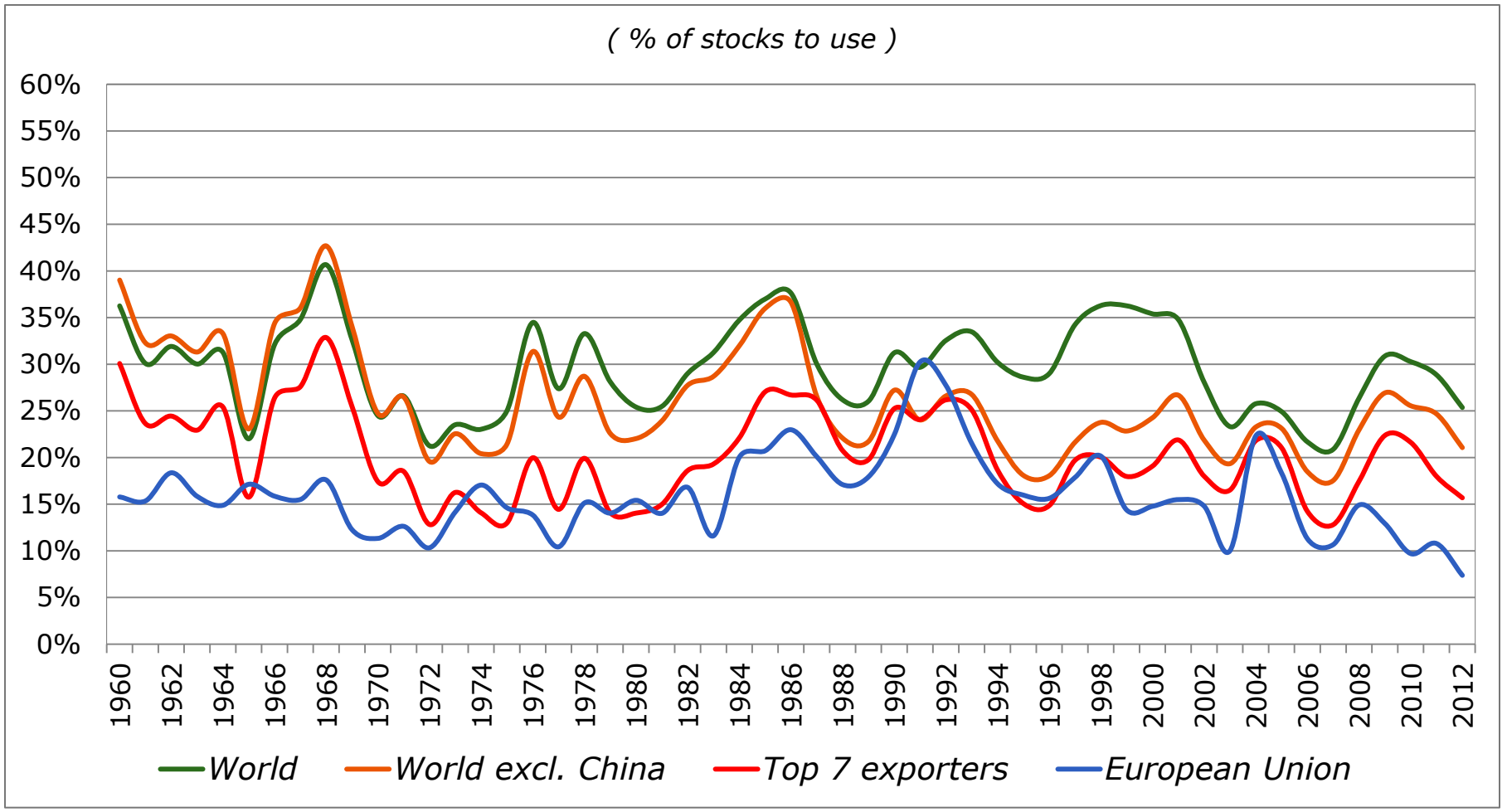

***Source: World Bank, USDA***

# Yearly changes in stocks to use and prices
## Rice



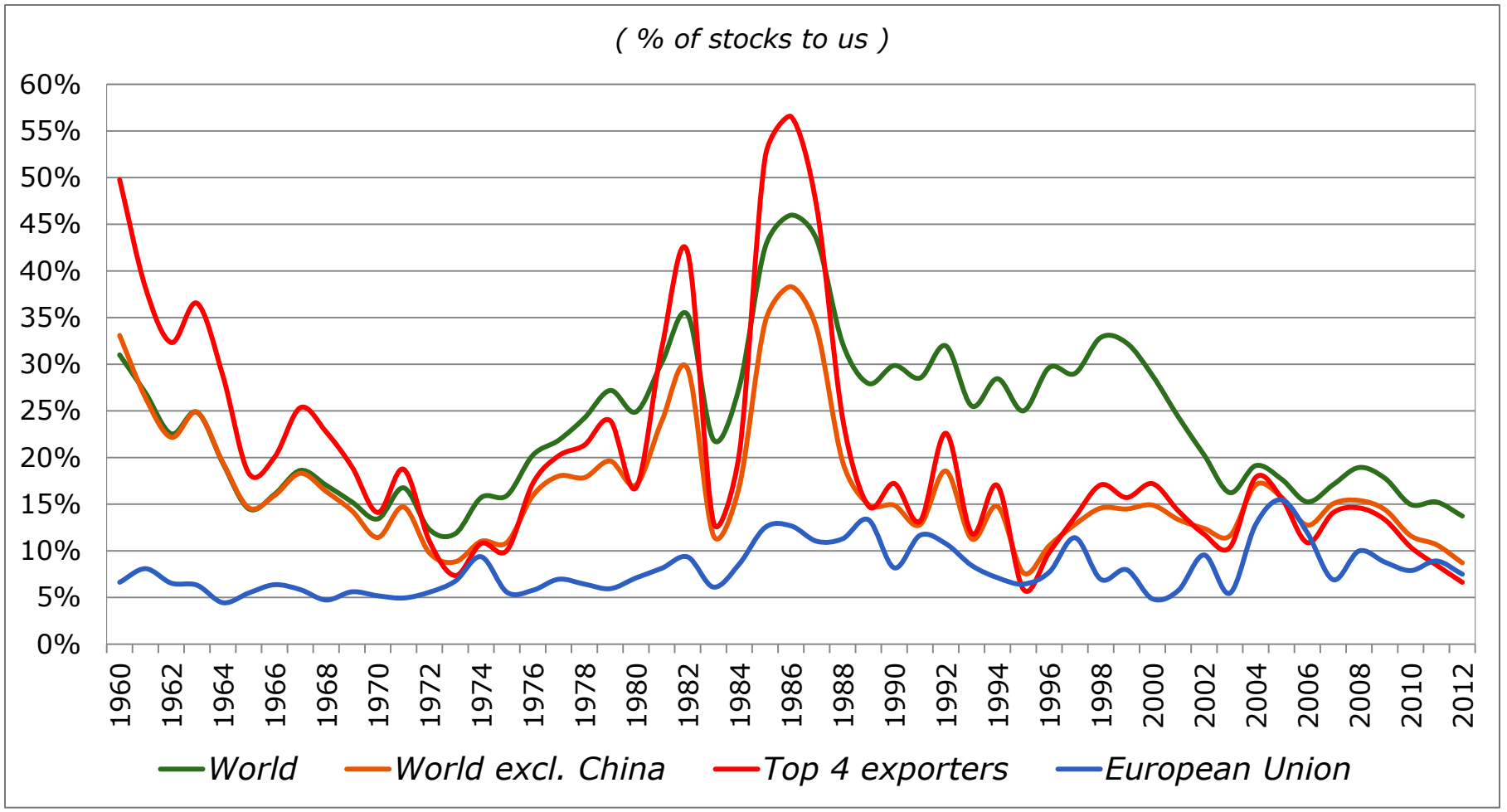

***Source: World Bank, USDA***

# Evolution of stock-to-use ratio - wheat




*Sources: USDA for stocks and use, World Bank for prices (nominal prices)*

# Evolution of stock-to-use ratio - maize

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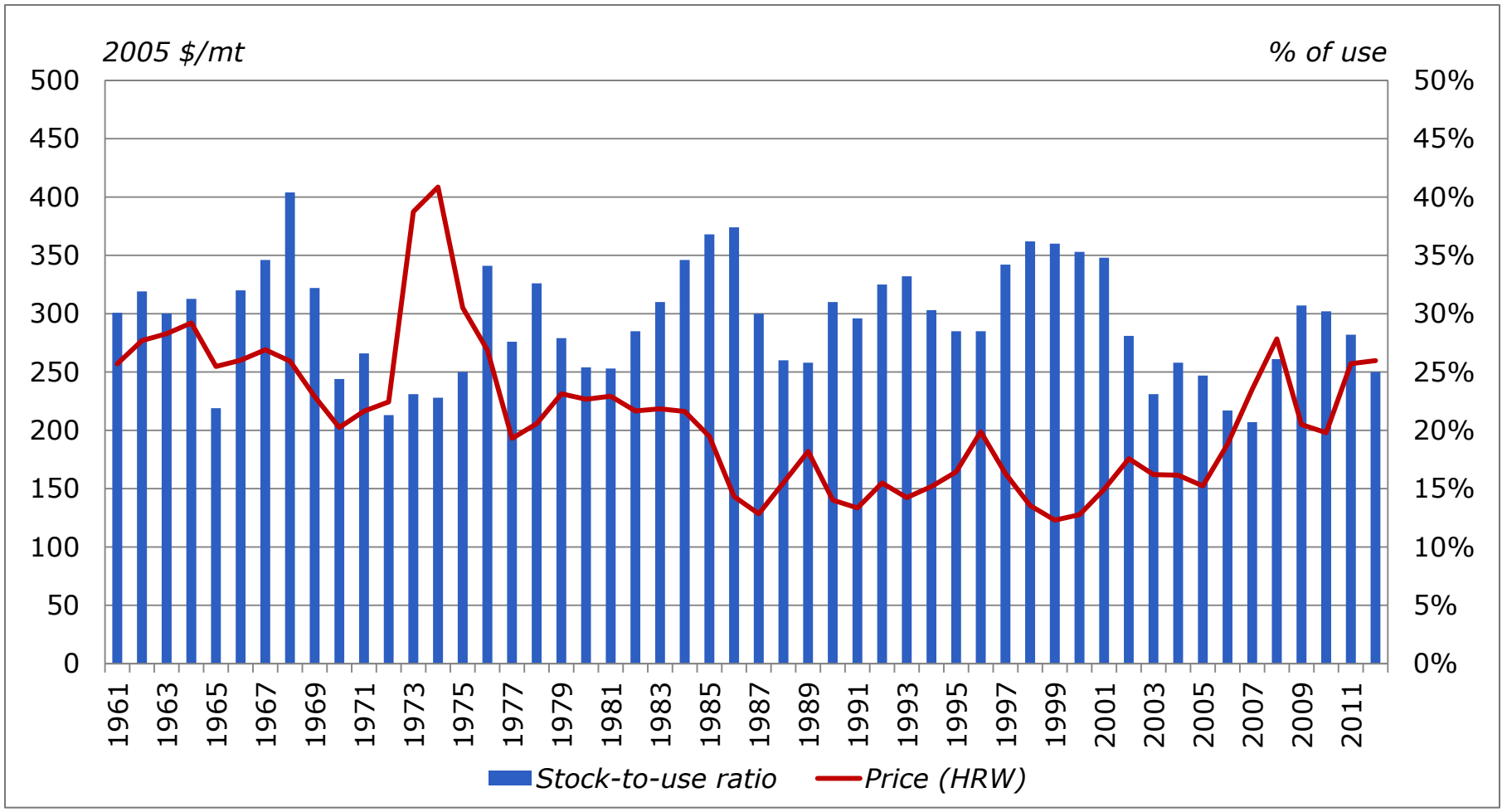
# Evolution of stock-to-use ratio - wheat

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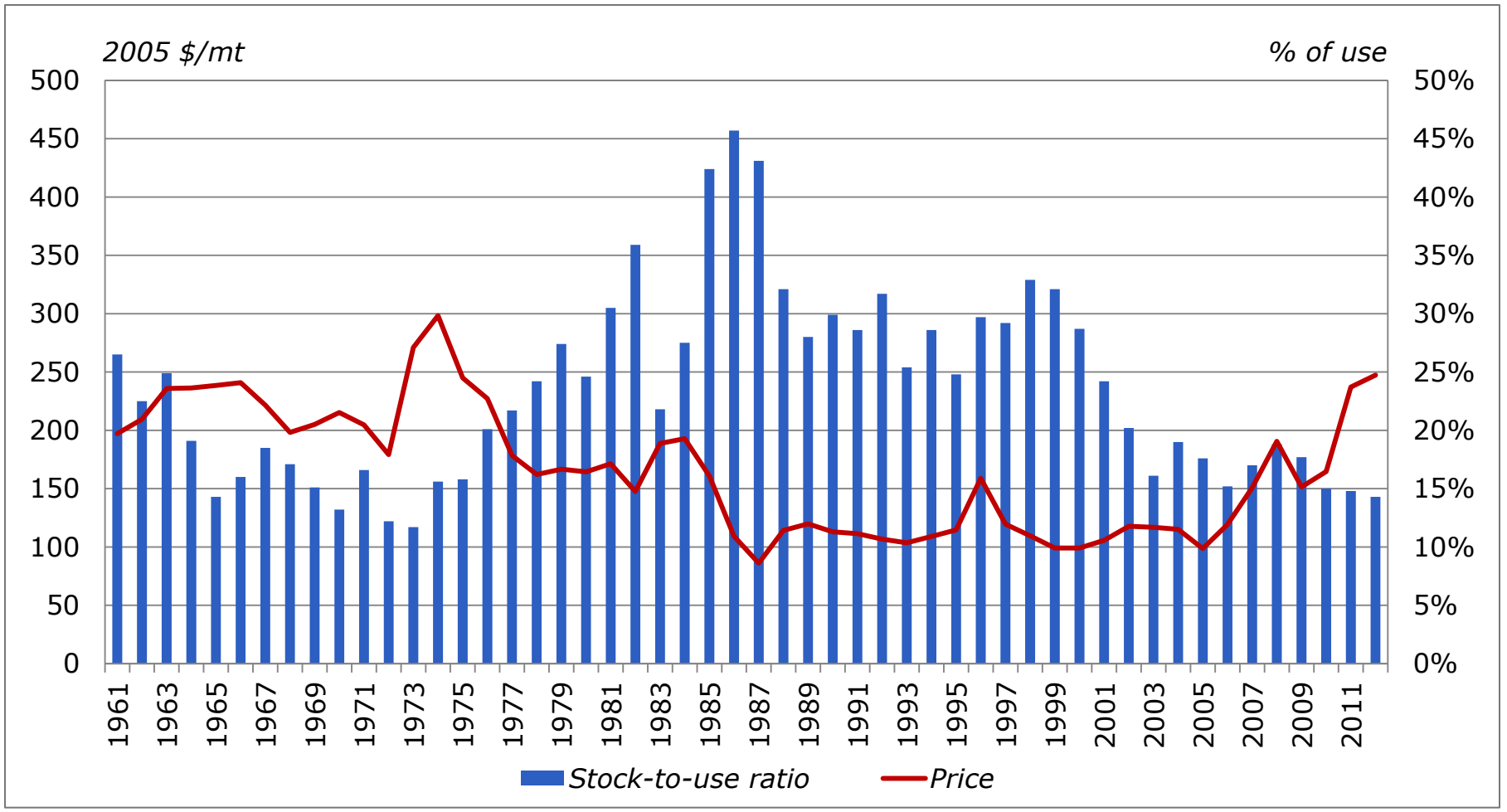
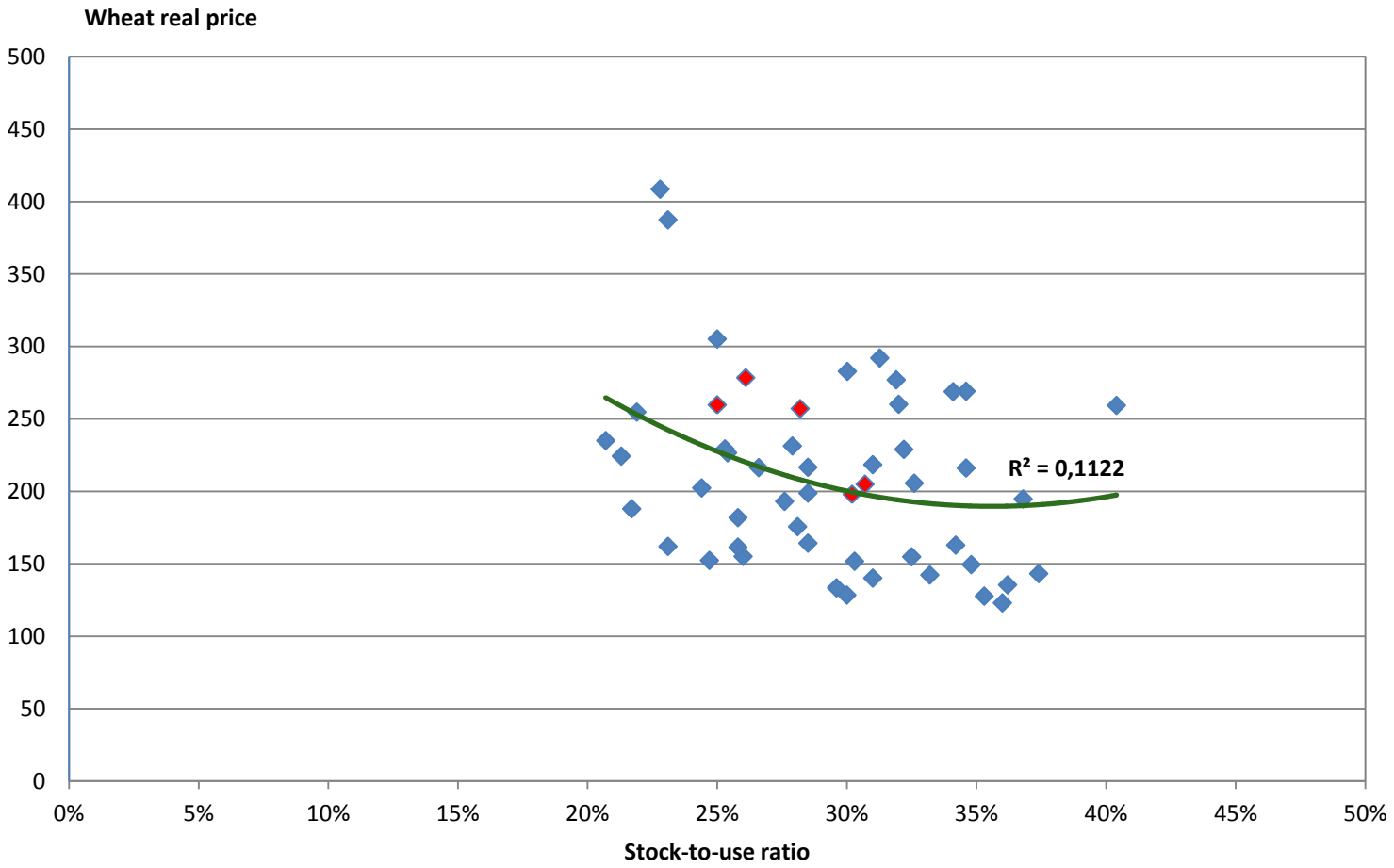



*Sources: USDA for stocks and use, World Bank for prices (nominal prices)*

# The debate on the role of stocks

- **The inverse relationship between price and stocks is clear**
  - but attempts to regulate it have failed for more than a century
  - stock building when prices are high is counterproductive
  - "fixed rules" triggering stock-holding easily invite speculation
- **The level of stocks is a reflection of a problem**
  - yet it implies very little about the causality of price levels
  - the slow-down in productivity seems to be the real problem
  - research/innovation, sustainability and investment hold the key
- **"Non-linearity" was used as an explanation for grain prices**
  - facts indicate that the grain price-stock relationship is rather stable
  - "non-linearity" claims that very low stocks triggered very high prices…
  - …but this would also imply that high stocks have low price impact (!)

# Stock-to-use / price relation: wheat

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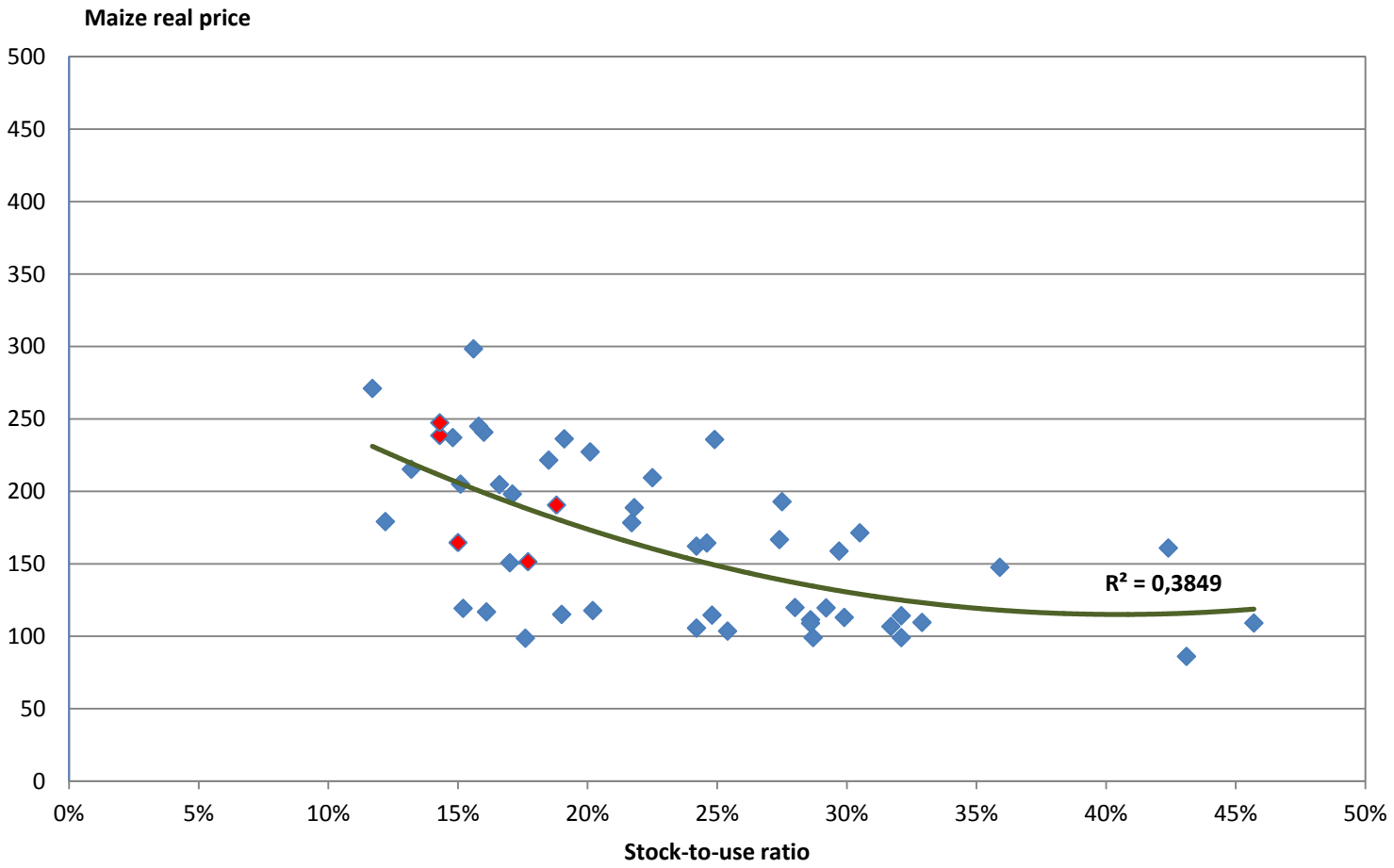
# Stock-to-use / price relation: maize




Sources: USDA for stocks and use, World Bank for prices (nominal prices)

# What matters most for what prices?

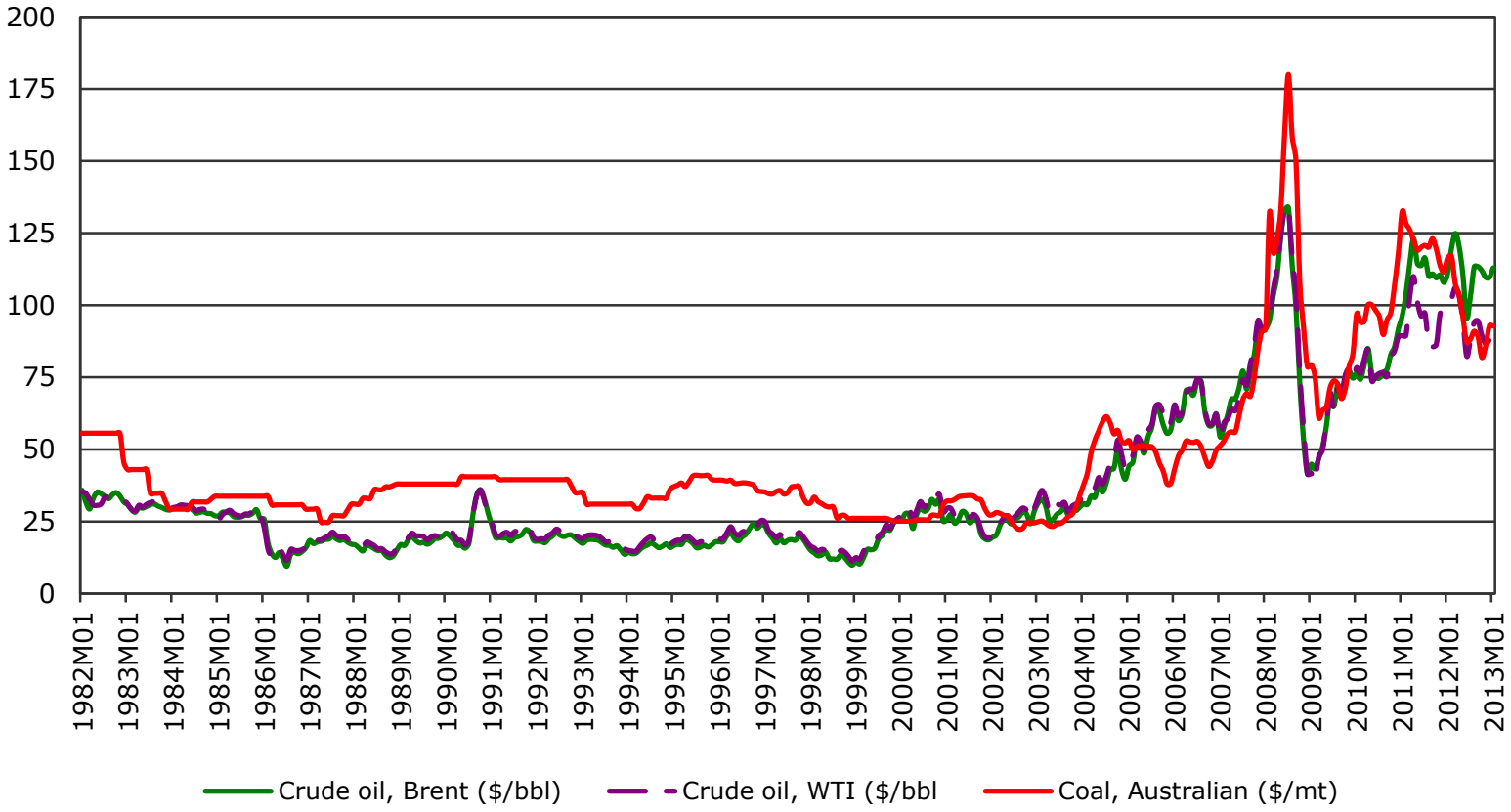
*Contribution of each variable to price changes from 2000-05 to 2006-10, percent*

| | Maize | Wheat | Rice | Soybeans | Palm oil |
|---|---|---|---|---|---|
| S/U ratio | 12.0 | 14.4 | 0.9 | -2.4 | 1.3 |
| Oil price | 32.6 | 41.4 | 27.2 | 57.0 | 58.2 |
| Exchange rate | -0.1 | 11.5 | 25.4 | 19.9 | 11.9 |
| Interest rate | 0.5 | -0.5 | -2.0 | 0.6 | 0.3 |
| GDP | 0.4 | 0.4 | 1.2 | -0.4 | -0.3 |
| Inflation | 13.6 | 1.7 | -8.4 | -0.2 | 0.7 |
| Trend | -0.3 | -0.1 | -0.1 | -0.2 | -0.3 |
| **SUM (of the above)** | **58.7** | **68.8** | **44.2** | **74.3** | **71.8** |
| Residual | 41.3 | 31.2 | 55.8 | 25.7 | 28.2 |
| **ALL (SUM + Residual)** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

Source: World Bank Global Economic Prospects January 2012 – Commodity Annex

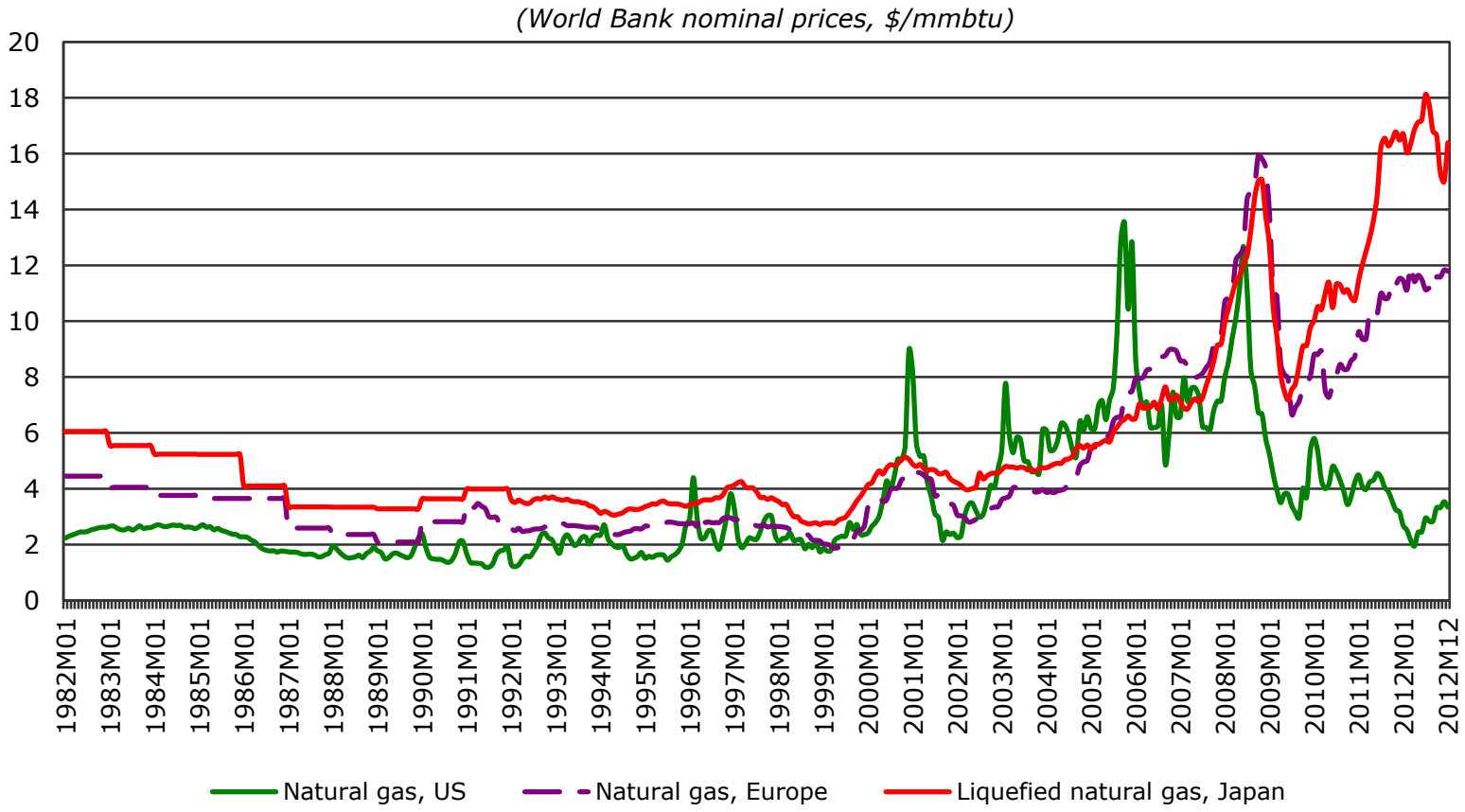
# Long term energy price trends

*(World Bank nominal prices)*




*Source: World Bank.*

# Long term gas price trends




*Source: World Bank. Note: 2012 figures are forecasts as of September 2012.*

# Ongoing research: are there distortions?

Spot market

Futures market

Options

**Convergence close to maturity**

- **High frequency volatility estimation**
- **Historical vs risk neutral measure for put&call pricing**

# Implications

- Higher prices for agricultural commodities will not necessarily result in higher income for farmers, especially if their margins are squeezed by increased costs
- With higher output prices expected, there is less and less scope for "traditional" intervention tools, such as price support
- Excessive price volatility affects profitability and hinders investments in the agricultural sector
- Ad-hoc policy intervention in agriculture to address volatility may be questionable if volatility is "imported" from outside agriculture