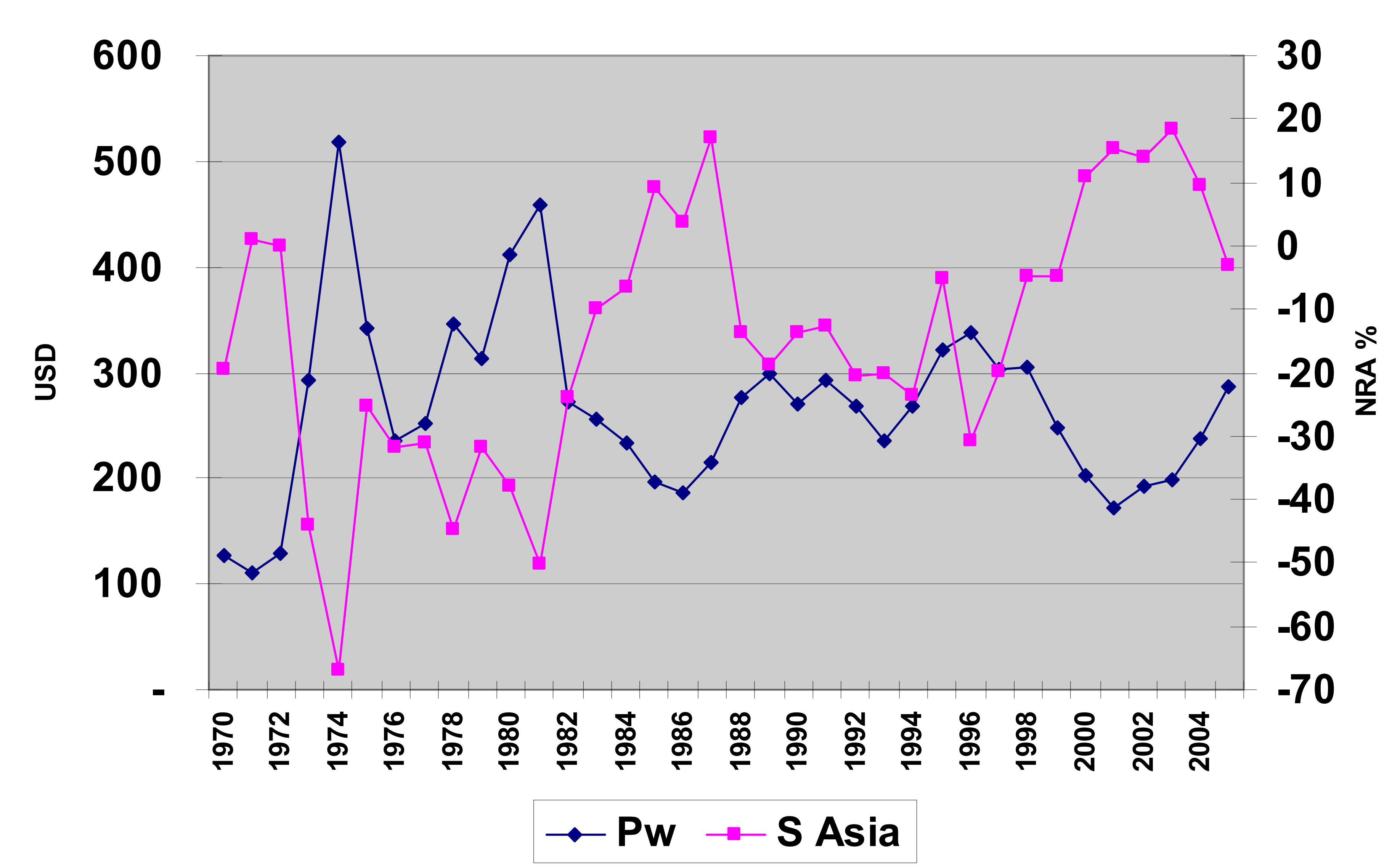
IMPLICATIONS OF PRICE INSULATION FOR GLOBAL FOOD PRICE VOLATILITY

Maros Ivanic & Will Martin
21 March 2013

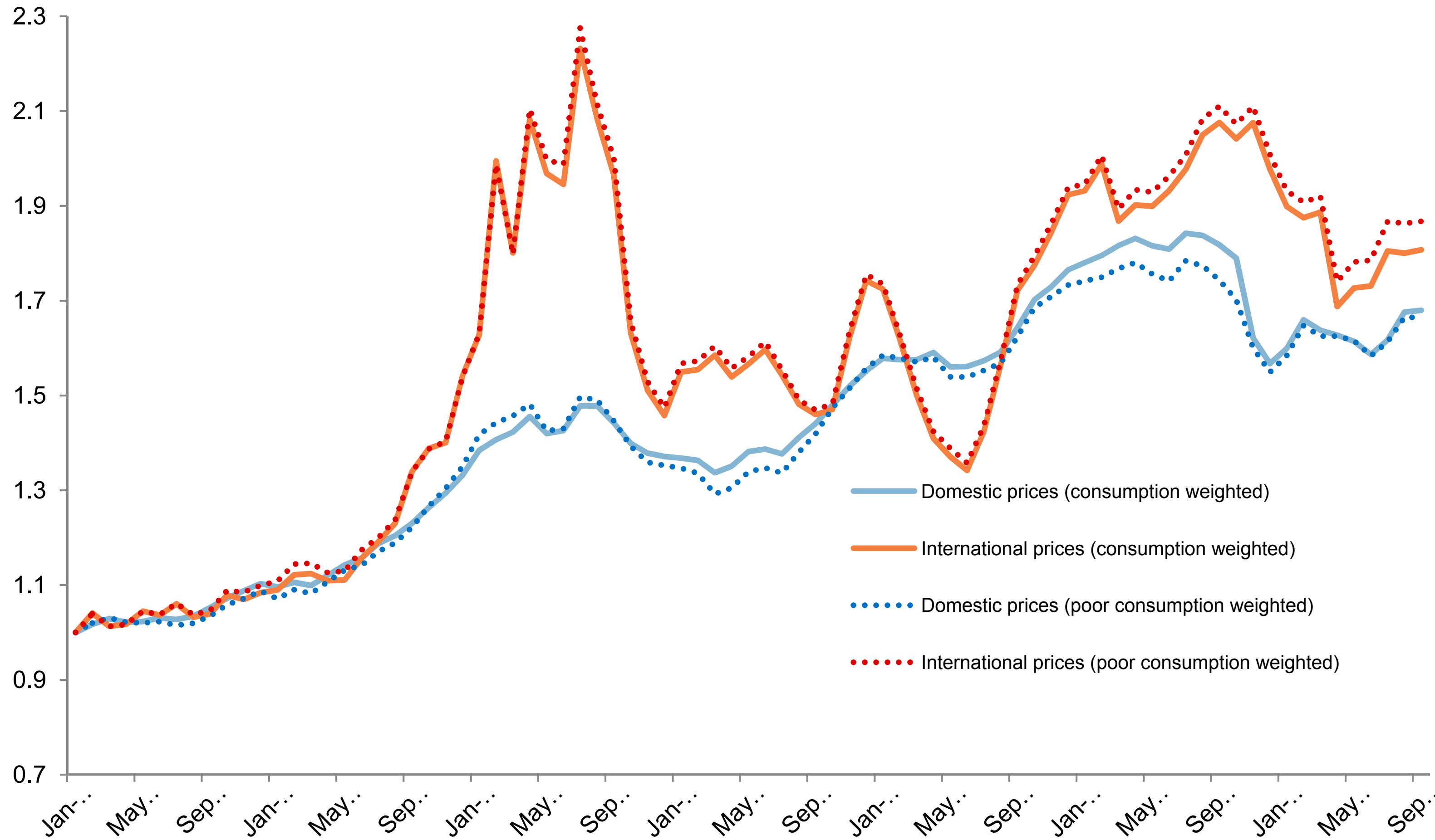
Motivation

- Governments often use trade policies to insulate domestic prices from shocks to world prices
  - Restrict exports or subsidize imports to lower domestic price
  - Raise export subsidies or import duties to raise prices
  - Seems to be more complex inter-temporal behavior
  - A collective action problem
    - A fall in global protection raises world prices
- We explore how government policies impact domestic and global price volatility
  - What happens to the volatility of domestic prices?
  - What happens to global price volatility levels?
    - And time-series properties of world prices relative to models such as the competitive-storage model that doesn’t allow for changing trade policies?

South Asia Rice: Nominal rate of assistance vs World Price: Correlation: -0.754



Countries seem to insulate strongly in the short term– but to follow long term trends



Approach

- We estimate the response of countries' trade policies to global price changes
  - Use the World Bank Database on Distortions to Agricultural Incentives
  - Consider eight key food commodities: maize, rice, wheat, soybeans, sugar, pork, beef, and poultry
  - Estimate dynamic models for protection rates
- To provide a benchmark, model global volatility of agricultural yields and measure implications for global price volatility
  - Use a CGE model (GTAP)
  - Aggregate to ten regions for computational reasons
  - Apply yield shocks from observed yield covariance matrix (FAO)
  - Model world prices without & with trade policy response

Measuring trade policy responses to changes in global prices

- Begin with an ECM penalizing deviations from Political-Economy equilibrium & changes in domestic prices

$$\Delta\tau_t = \Delta\beta p_t + \alpha\left(\tau_{t\text{-}1} - \pi - \varphi(t-1)\right) + \varepsilon$$

- Transform for linear estimation:

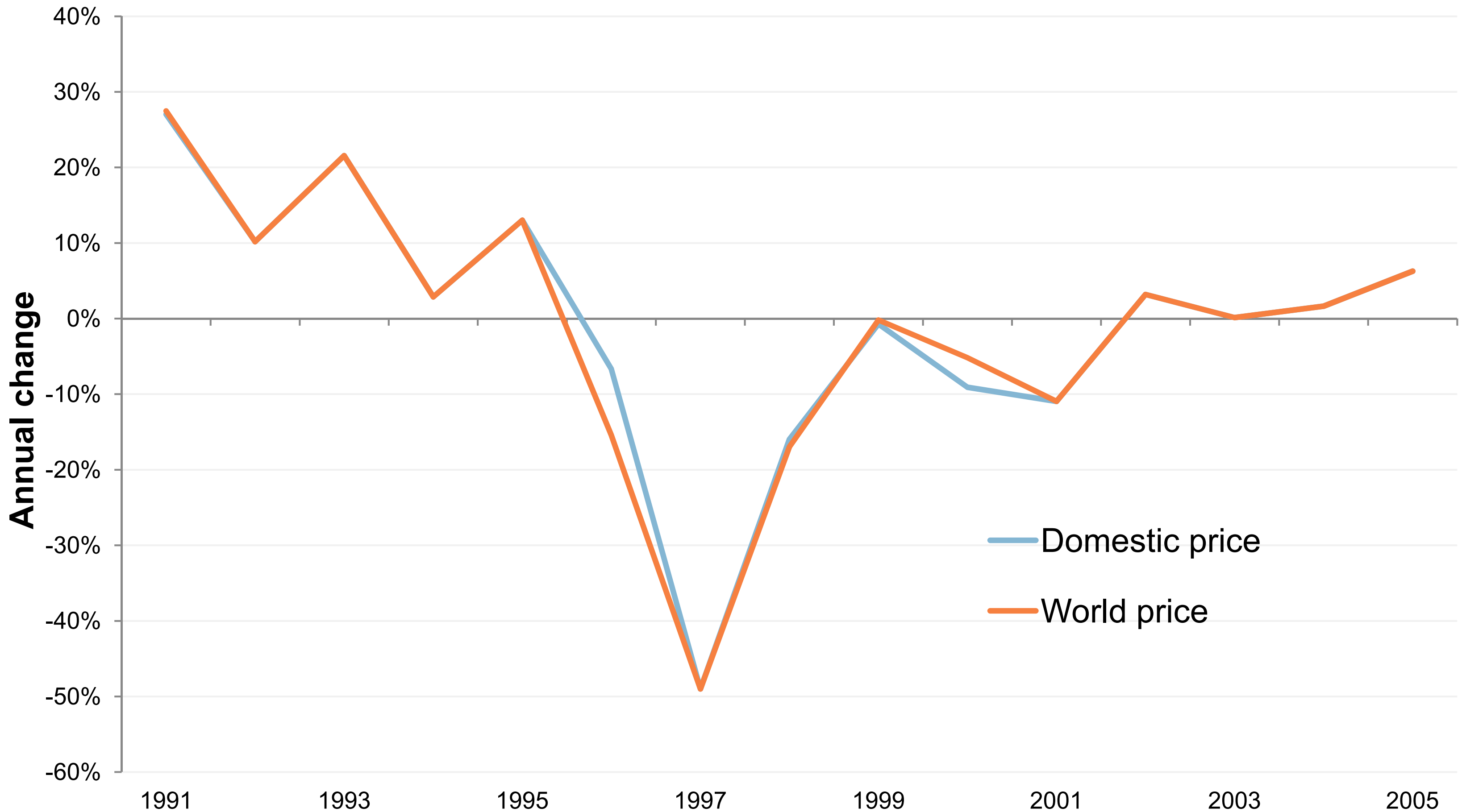
$$\hat{\tau}_t = \alpha\tau_{t\text{-}1} + \beta\hat{p}_t + \gamma t + \delta\hat{a}_t + \theta$$

- Change in protection level **τ** as a function of
  - Political-economy tariff (captured jointly by **θ** and **γ**)
  - Distance from political-economy tariff (captured by **α**)
  - Change in world prices (captured by **β**)
  - Domestic supply shock (captured by **δ**)

Some estimated trade policy responses

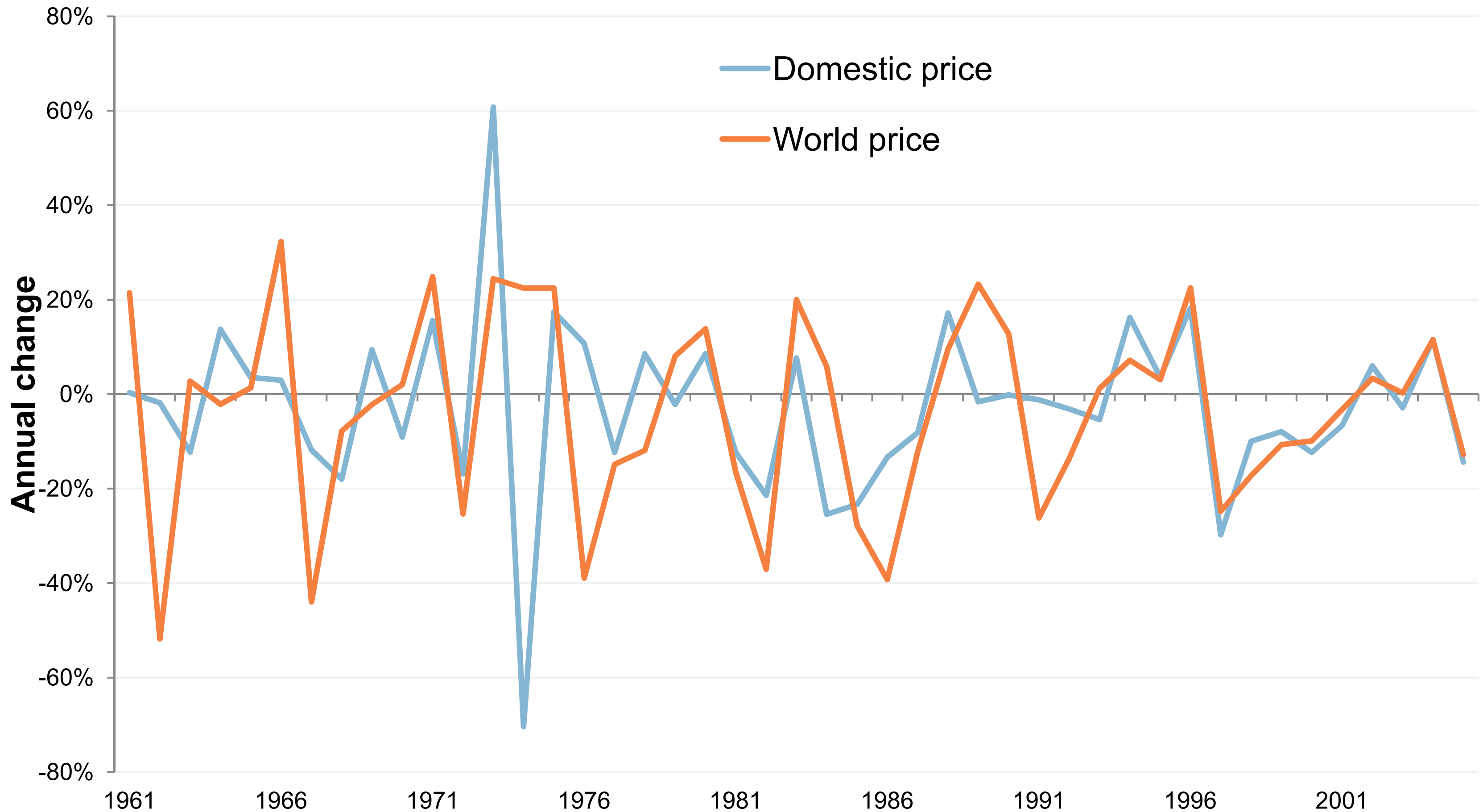
- Poultry in Vietnam
  - Small yet significant response to global price: -0.15***
  - Strong tendency to move to political-economy tariff: -0.61**
- Maize in Chile
  - Larger price insulation: -0.41**
  - Strong tendency to move to political-economy tariff: -0.57***
- Rice in India
  - Very strong price insulation: -0.87***
  - Weak tendency to revert to the political-economy tariff
- Pork in Thailand
  - Nearly perfect insulation: -0.96***
  - Relatively strong tendency to revert to target tariff: -0.43***
  - Noticeable lags in price transmission

Implications of insulation on domestic poultry prices—little insulation



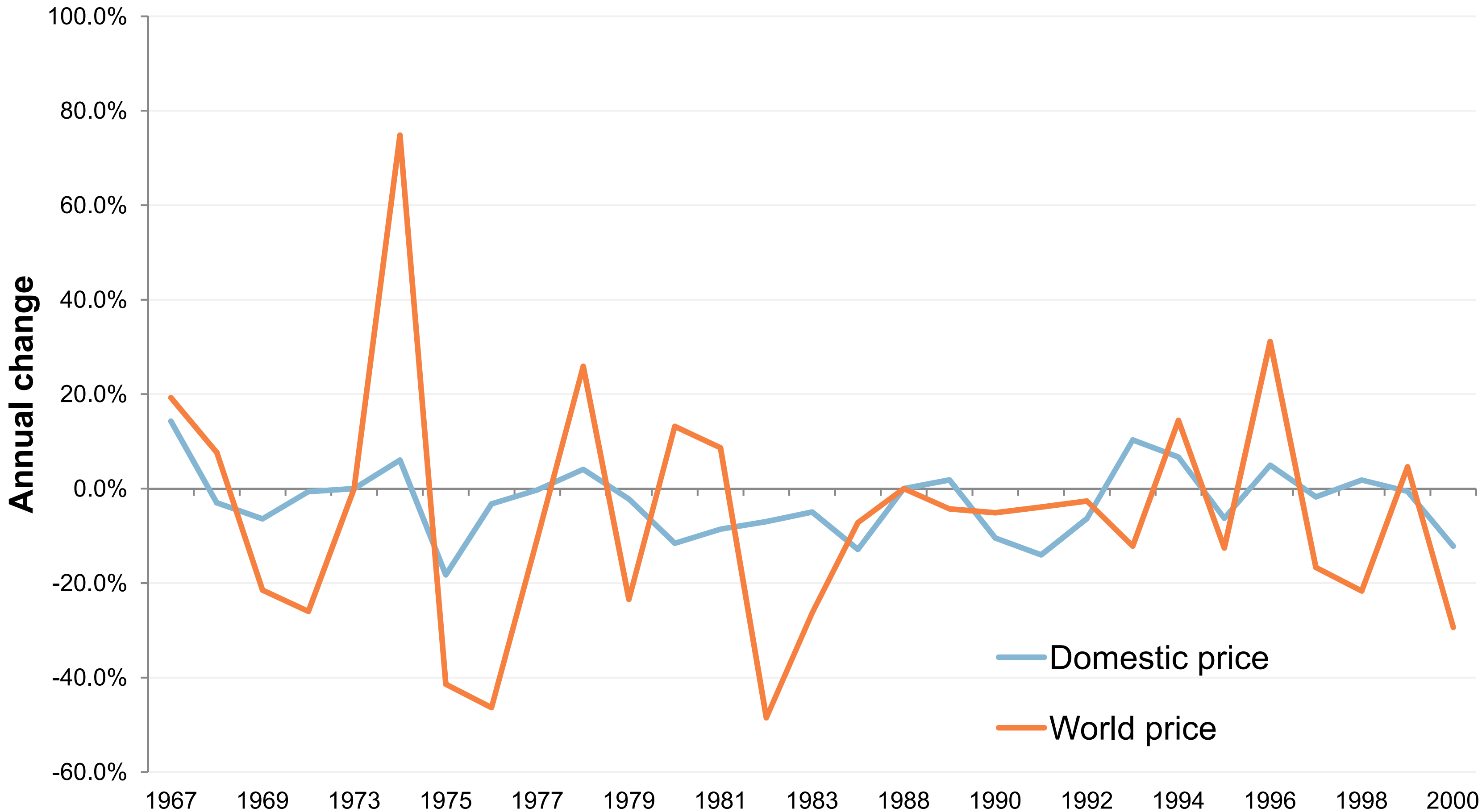
Annual changes in the domestic price of poultry in Vietnam follow closely changes in world prices

Implications of insulation on domestic maize prices—moderate insulation

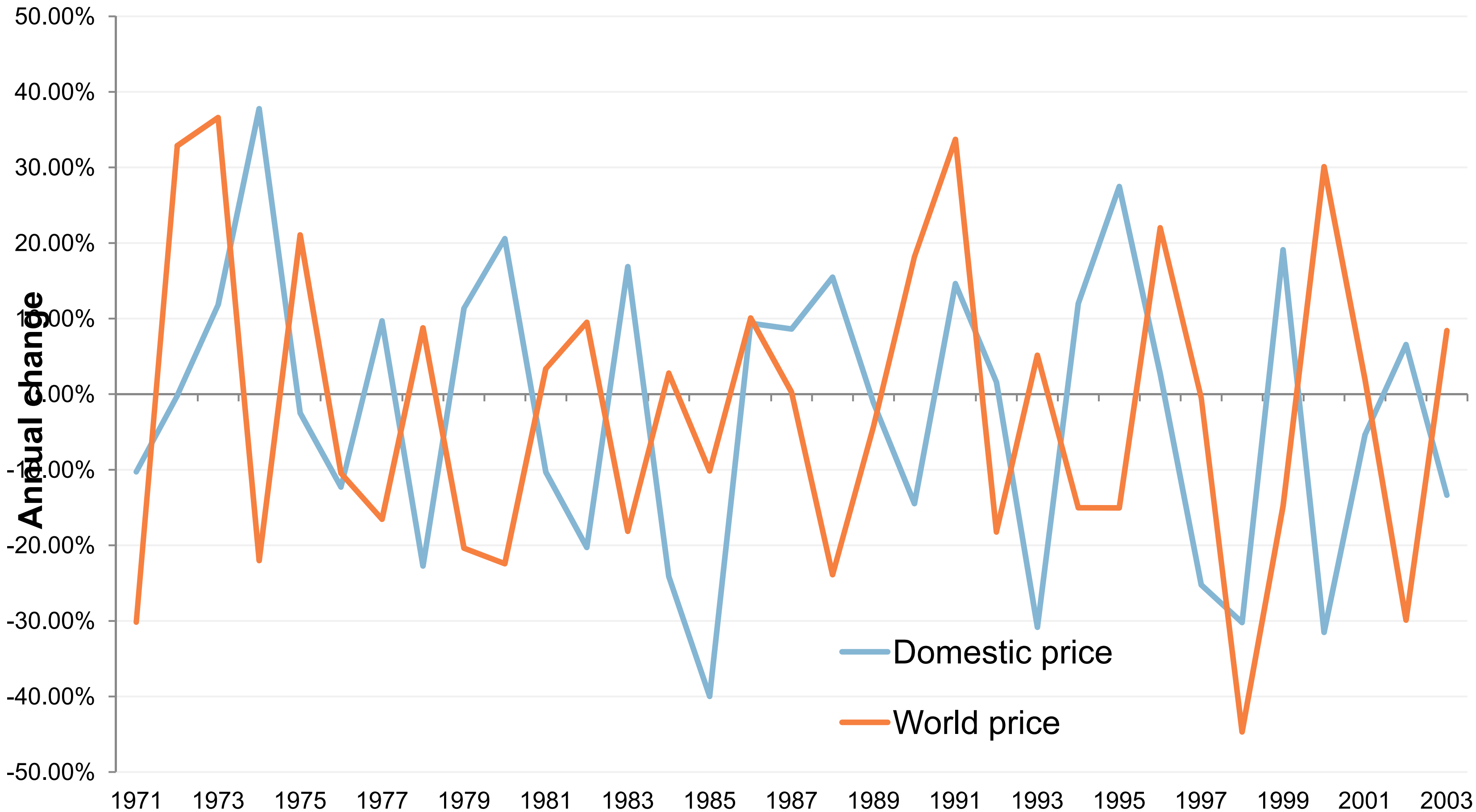


Variation of annual changes in the domestic price of maize in Chile is lower than that of global price

Implications of insulation on domestic prices—strong insulation: India rice



Implications of insulation on domestic pork prices—strong insulation with lags

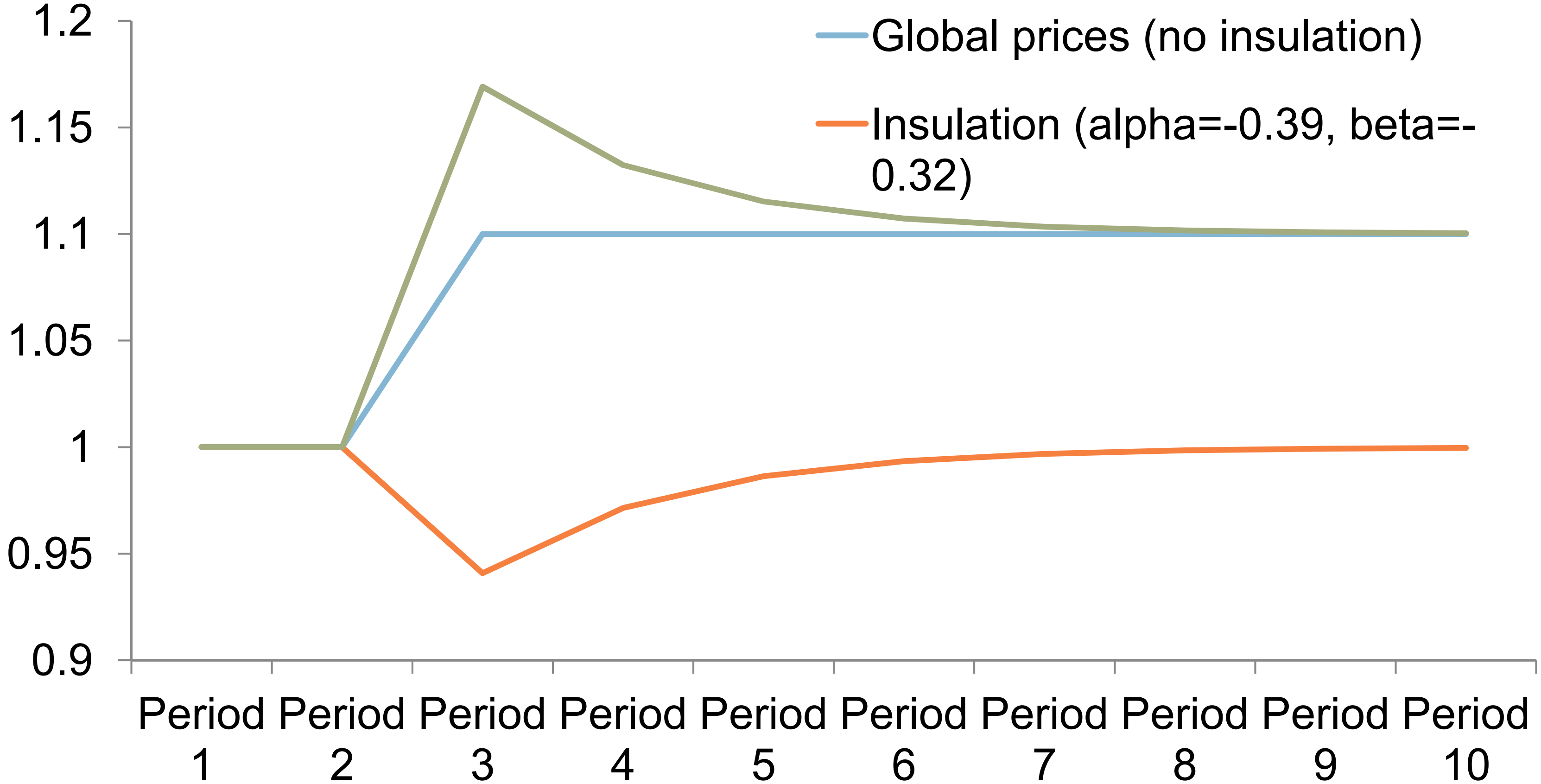


Annual changes in the domestic price of pork in Thailand are dampened and delayed from world price changes

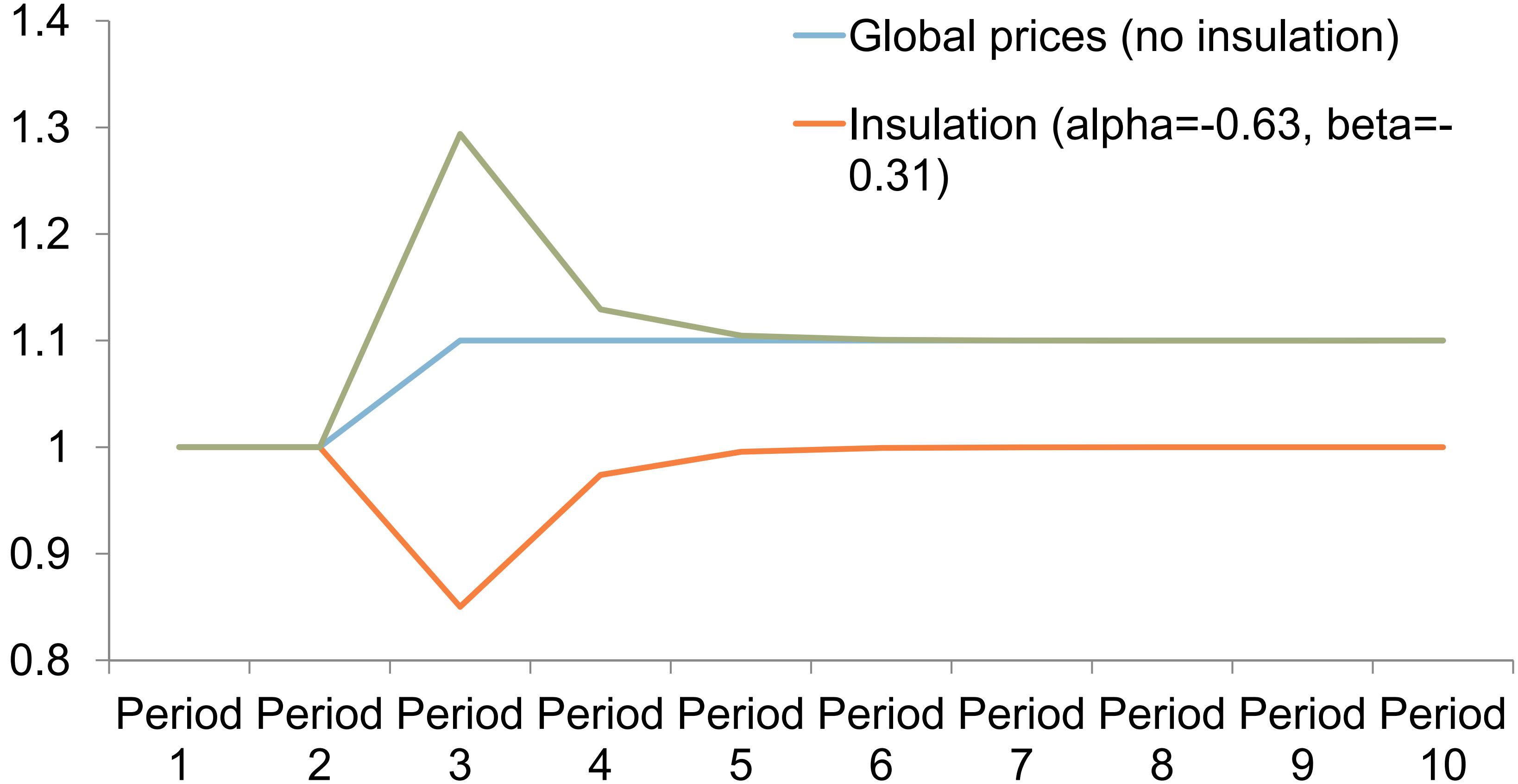
Global coefficient estimates

	Tariff correction parameter- α	Insulation parameter - β
Beef	-0.39	-0.50
Maize	-0.34	-0.33
Pork	-0.40	-0.50
Poultry	-0.58	-0.40
Rice	-0.51	-0.56
Soybean	-0.40	-0.26
Sugar	-0.31	-0.63
Wheat	-0.32	-0.39

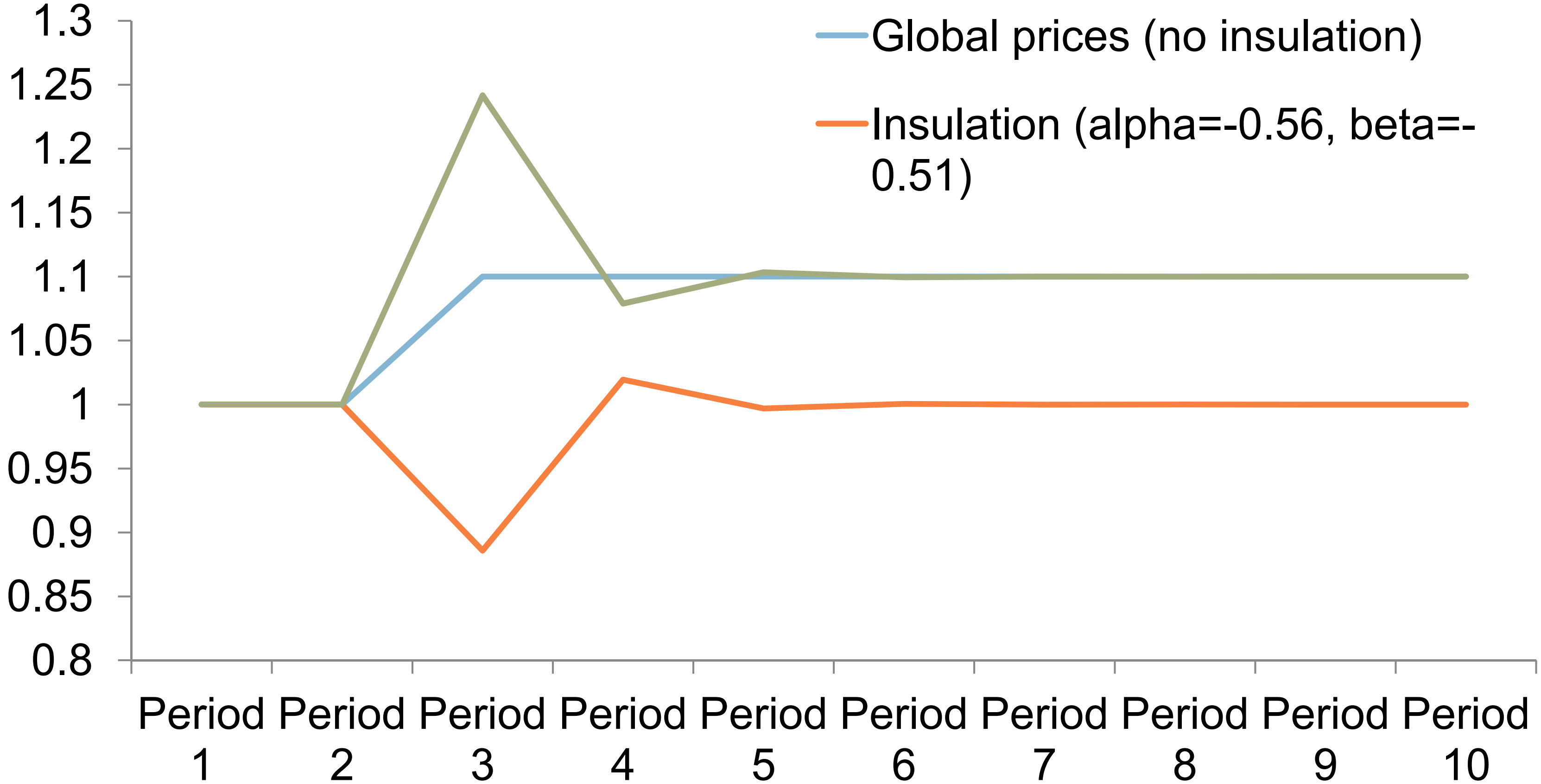
Implications of insulating behavior for global prices—average values for wheat



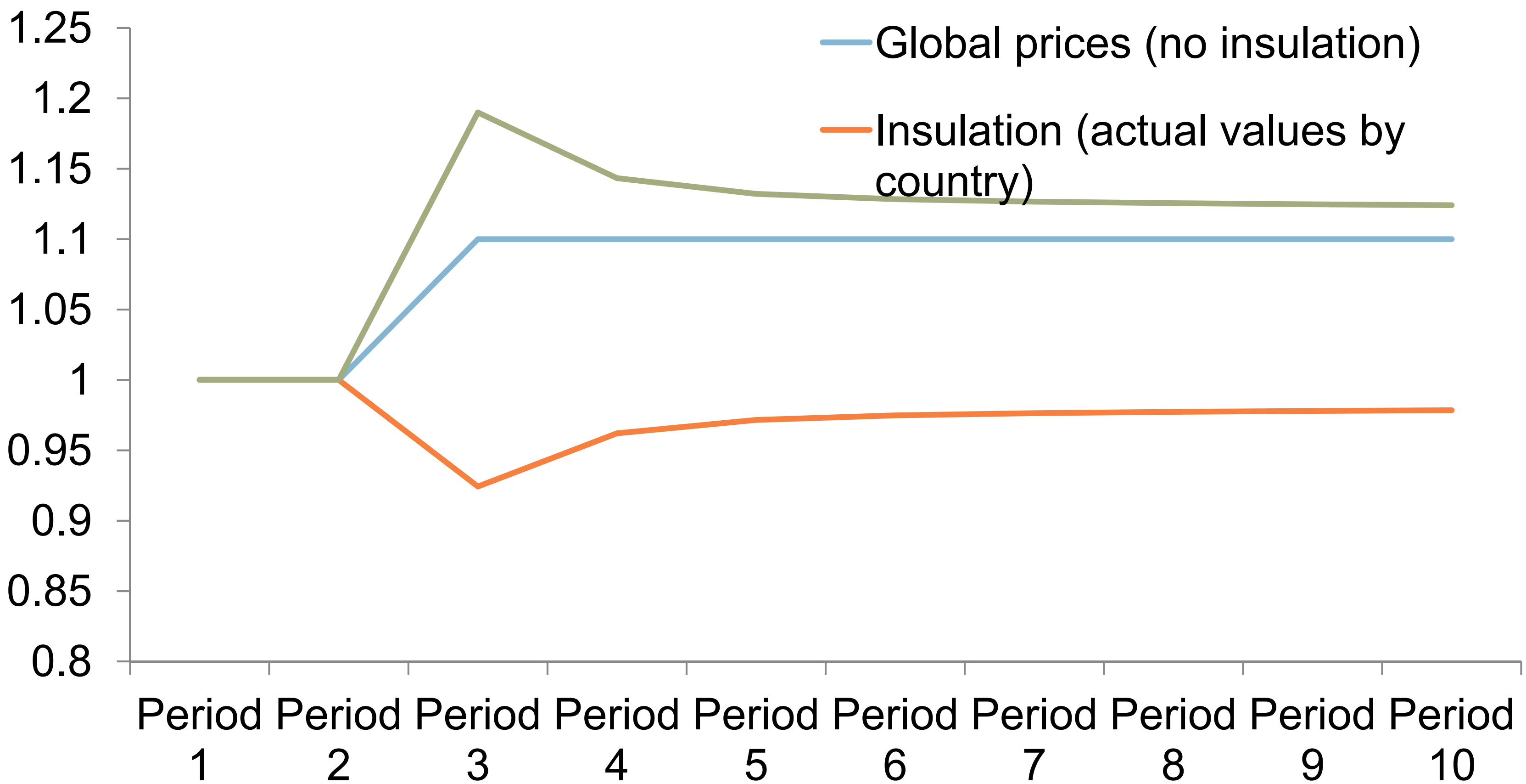
Implication of insulating behavior for global prices—average values for sugar



Implications of insulating behavior for global prices—average values for rice



Implication of insulating behavior on global prices—actual values for rice



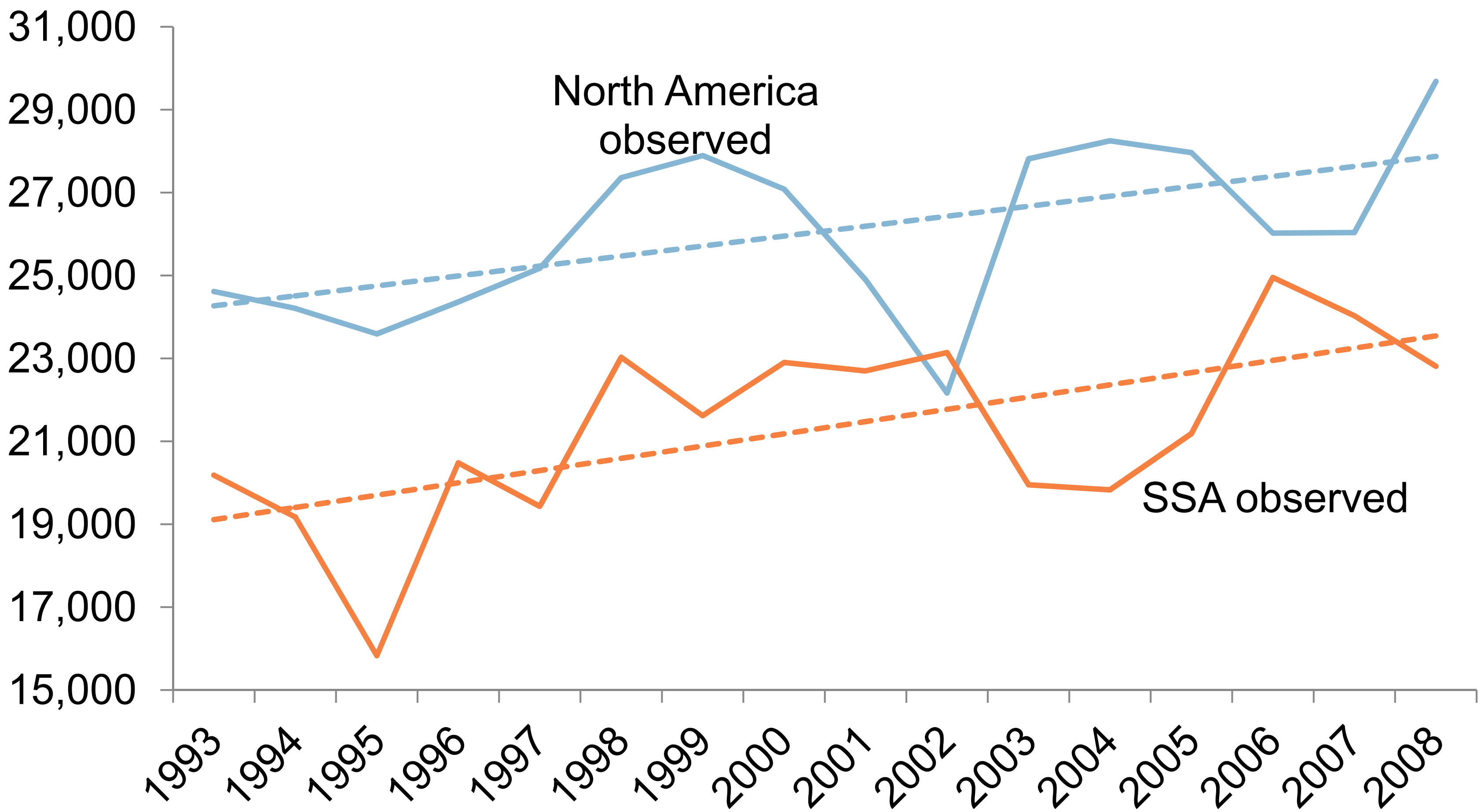
Simulating impacts on volatility

- Use the standard GTAP model
  - Aggregated to ten main regions
  - Focus on maize, rice, wheat, soybeans, sugar, beef, pork and poultry
- Model stochastic nature of global yields
  - Monte Carlo with 1,000 runs
- Two scenarios
  - Trade protection fixed
  - Trade protection endogenous (import duty/export tax a function of world price)

Implementing global yield shocks

- Yields obtained from the FAO data for ten regions and eight commodities
  - Period 1993–2009
  - We define volatility as divergence from linear trend
- We measure observed
  - Yield variance of each commodity in the region (80 entries)
  - Yield covariances across regions and commodities, e.g. relationship between yield of wheat in Southeast Asia and beef in Sub-Saharan Africa etc (3,160 entries)

Yield volatility—wheat in North America and Sub-Saharan Africa



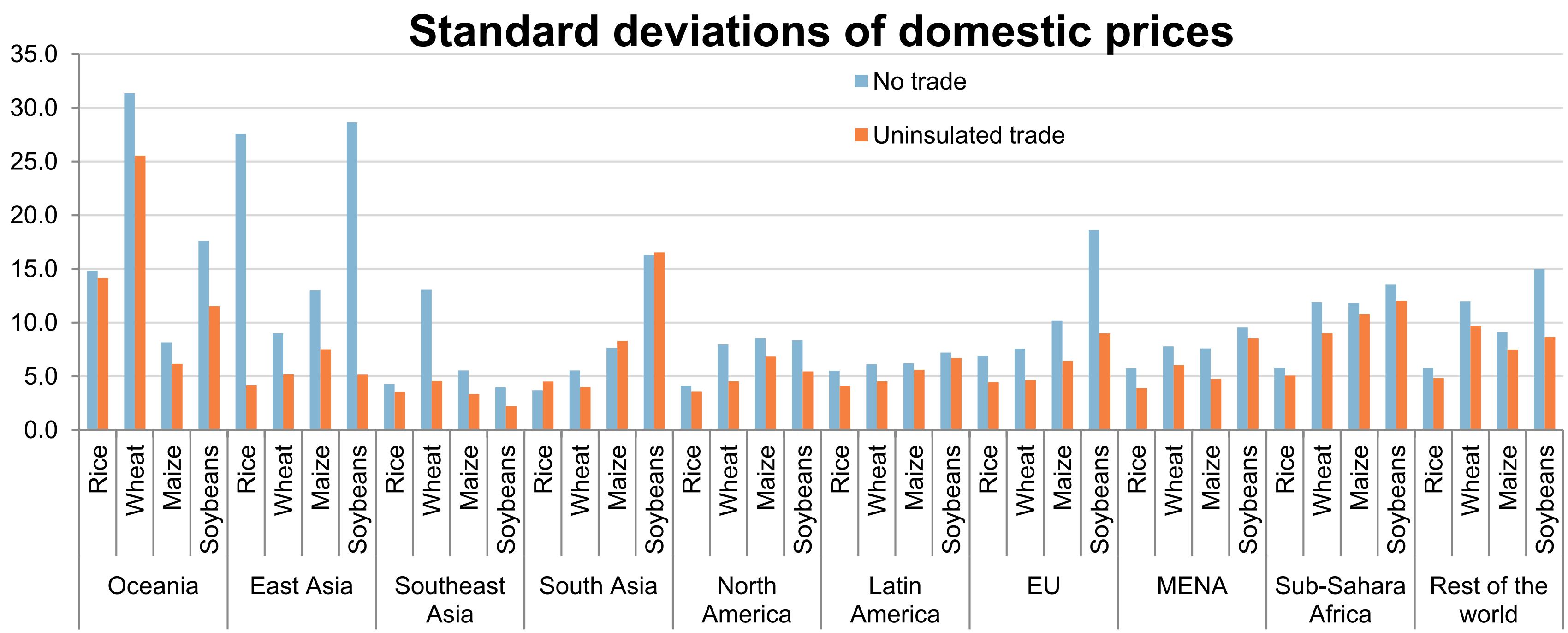
Observed yield variances (% points)

	Variance	Minimum	Maximum
Beef	7.9	EU (0.9)	East Asia (20.5)
Maize	35.5	Southeast Asia (3)	SSA (67.1)
Pork	10.3	South Asia (0)	MENA (67.6)
Poultry	9.9	North America (1)	Rest of world (41)
Rice	25.9	Southeast Asia (2.8)	Oceania (167.2)
Soybeans	95.9	South East Asia (3.9)	Oceania (205.9)
Sugar	33.7	Latin America (2.9)	Oceania (89.4)
Wheat	95.7	South Asia (11.6)	Oceania (585.3)

Yields are often related

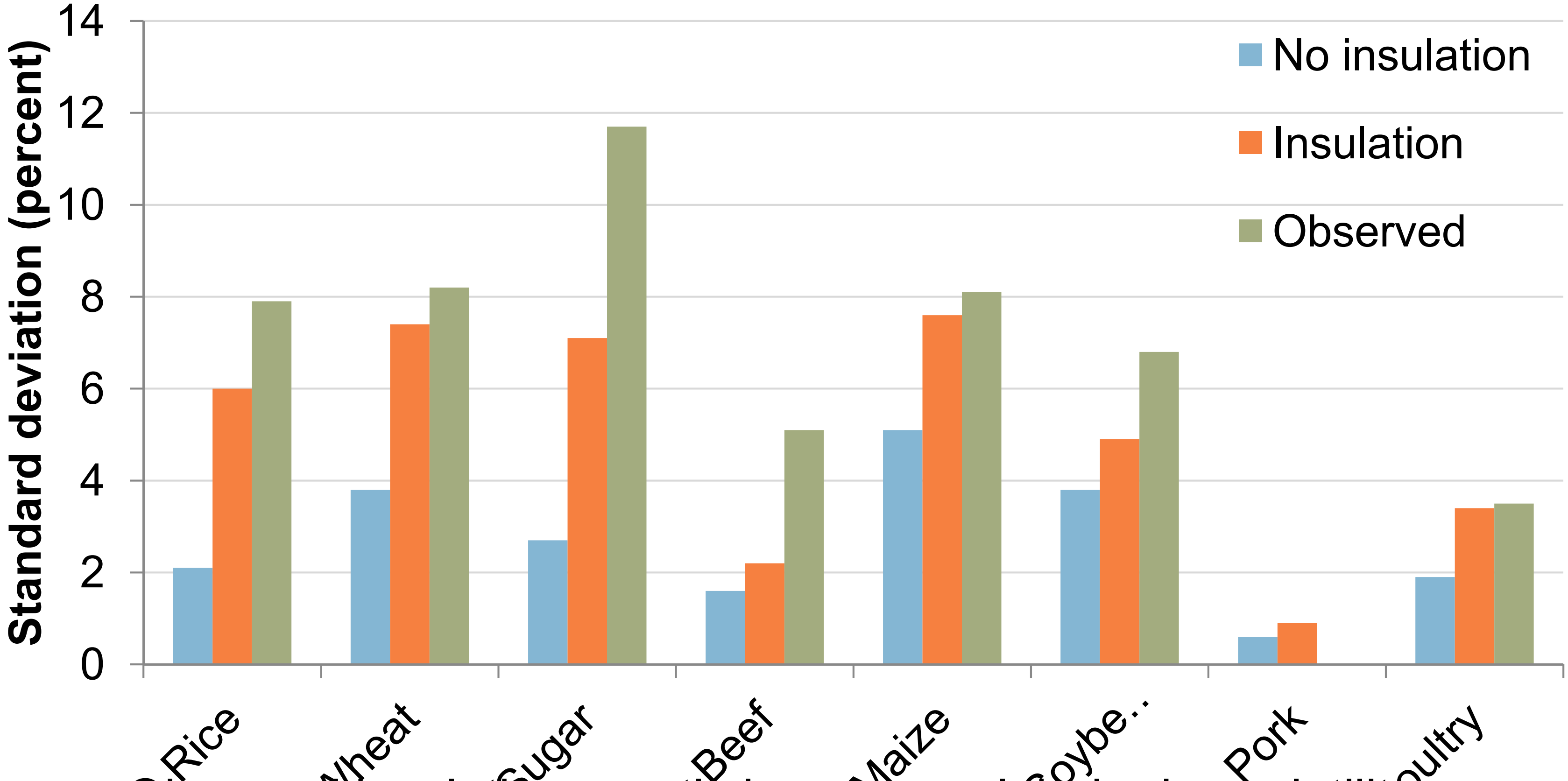
- Across regions
  - Wheat yields in Oceania & Southeast Asia are highly and negatively correlated (-114.9 percent)
  - Wheat yields between Oceania & North America are highly & positively correlated (99.9 percent)
- Across commodities and regions
  - Soybeans in South Asia and Pork in MENA are negatively correlated (-65.3 percent)
  - Wheat in Southeast Asia and soybeans in MENA are positively correlated (48.9 percent)
- But trade-induced diversification still reduces price volatility

Global trade helps reduce price volatility



- Allowing trade greatly reduces domestic price volatility relative to autarchy
  - Global output volatility less than individual countries (diversification)
  - Smaller & more volatile regions benefit most strongly

Insulation raises global price volatility



- Observed insulation greatly increases global price volatility
- It can explain most of the observed volatility beyond yield volatility

Conclusions

- Governments around the world use trade policy to insulate their domestic food prices from global prices
  - Some insulate fully, some partly; all revert to political-economy target protection over time
- This behavior raises global volatility of food prices
  - Also fundamentally changes the time-series properties of the data
- Because insulation exports volatility elsewhere, when everyone does it, no one benefits
  - Countries that insulate most aggressively may export volatility to neighbors
  - Challenge to find ways to deal with this collective action problem
    - And to use more effective policies, such as social safety nets