Effects of Trends in Chinese Production, Consumption, and Price Support Policies on World Grain Price Volatility and Food Security

Mario J. Miranda
Joseph W. Glauber
Randall Romero-Aguilar

Objectives

Explore how global commodity price volatility and food security will be affected by changes in Chinese commodity trade and price support policies and trends in Chinese agricultural production and consumption.

Approach

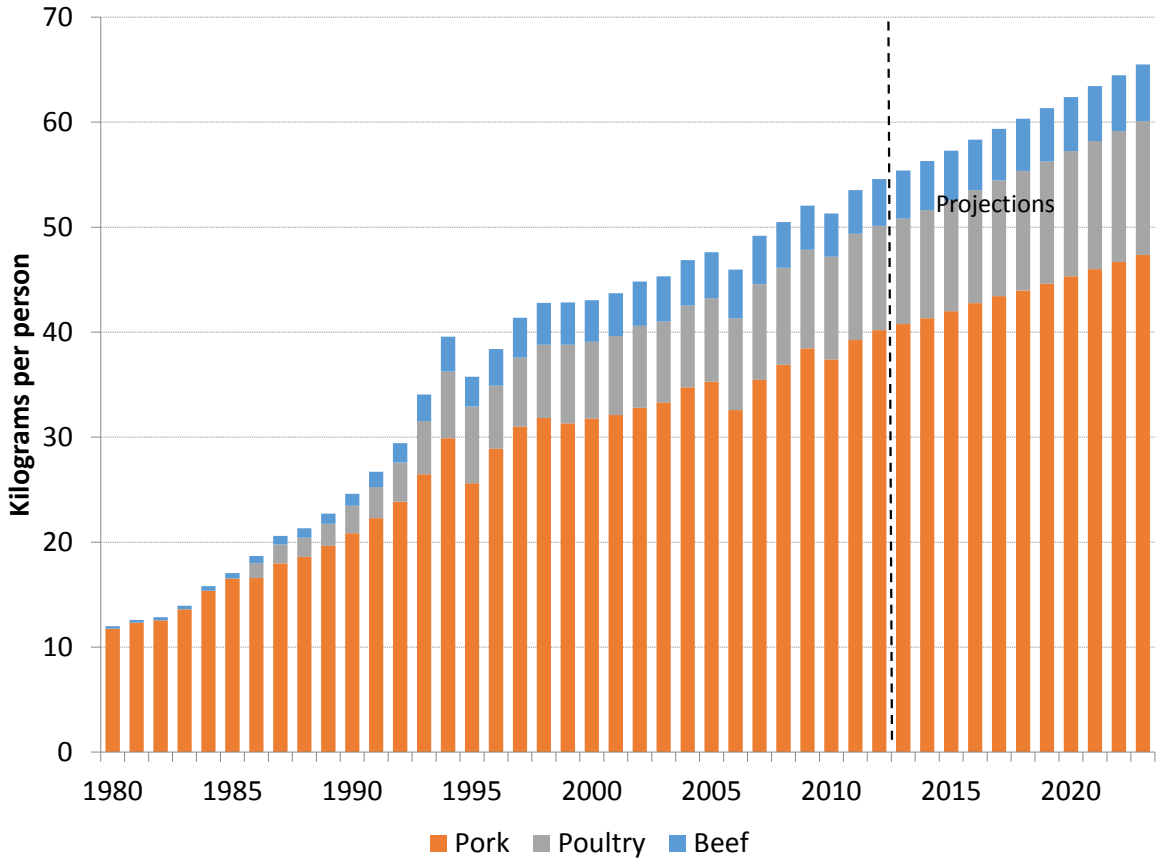
Solve and simulate a stochastic spatial-temporal equilibrium model of the world market for a generic storable food commodity with China as the centerpiece, apply it to corn and wheat.

Background

- World Food Price Crisis in 2007-8 caught many unprepared
- Price of wheat reached a peak of \$440/ton in March 2008
- Price of corn reached \$287/ton in June 2008
- FAO estimates chronically hungry rose by 75 million in 2007

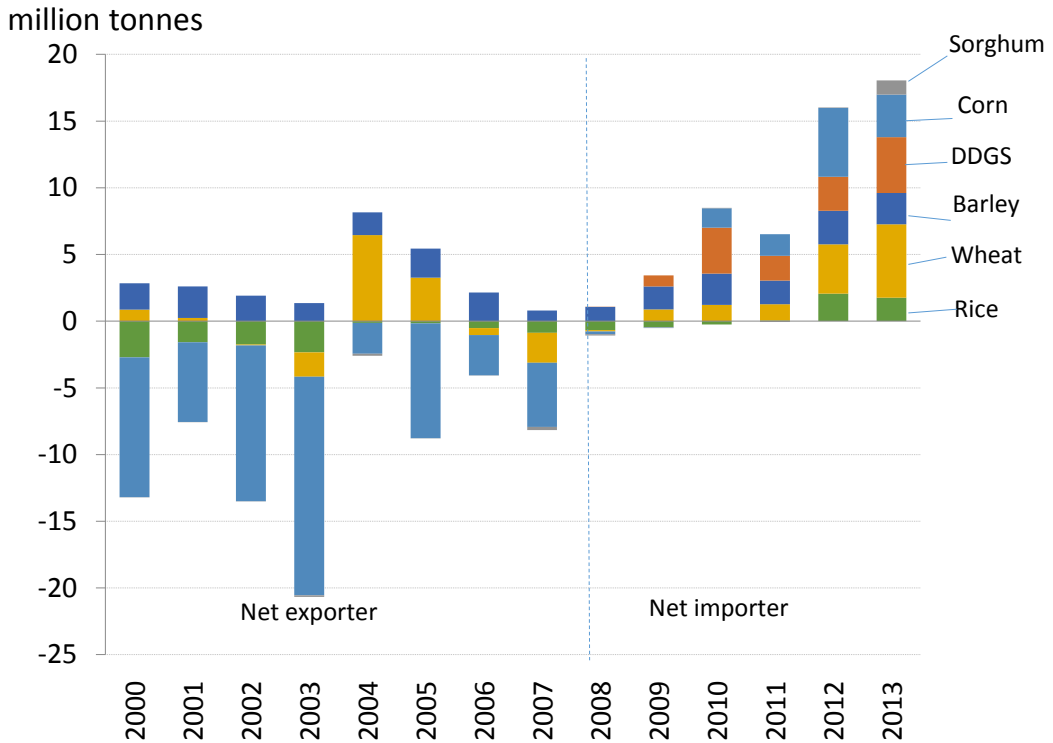
- China, however, maintained relatively stable domestic prices
- Historically, China has been self-sufficient in grains
- Achieved through buffer stocks and trade restrictions
- Stocks proportionately much larger than rest of the world
- Imports and exports a small proportion of China's production
- Pre-2009, wheat-corn imports less than 1% of production

- However, Chinese grain production and consumption have been undergoing major changes in recent years
- Rising living standards, increased urbanization have led to increasing per capita meat consumption
- This has led to increased demand for grains and oilseeds
- China may account for 40% of global trade over coming decade



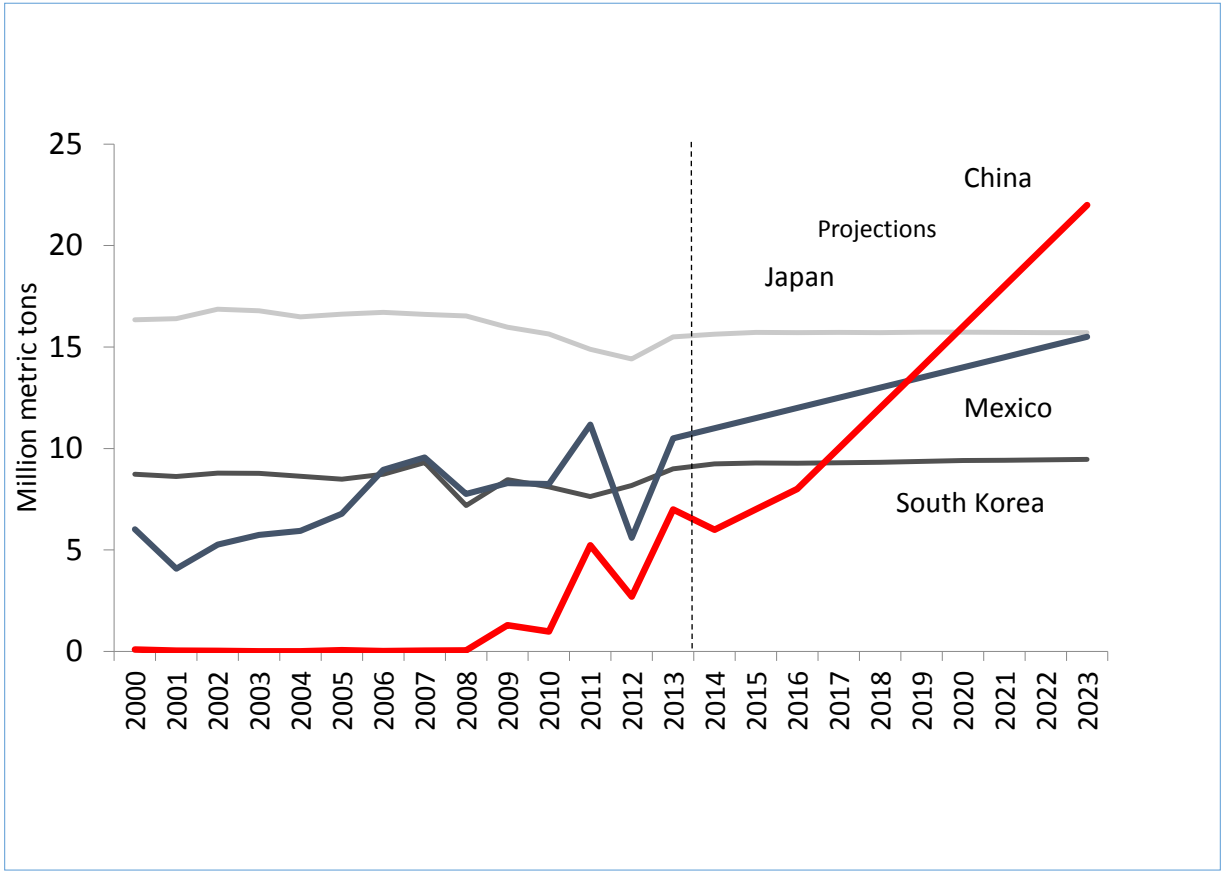
Source: USDA-ERS *China in the Next Decade: Rising Meat Demand and Growing Imports of Feed*

Figure : China Per Capita Meat Consumption



Source: USDA-ERS *China in the Next Decade: Rising Meat Demand and Growing Imports of Feed*

Figure : China's Net Imports of Grains



Source: USDA

Figure : Chinese Corn Imports

- Chinese agricultural support policies have also undergone major changes in recent years
- Starting in 2004, after decades of taxing agricultural production, China began to subsidize agriculture production
- Subsidies reached 9% of value of agricultural output in 2012
- Between 2008-2013, corn-wheat price supports rose 60-70%
- Increases have not kept pace with rising production costs
- Placed pressure to raise price supports further

- Chinese government's 5-year plan for 2011-15 called for continued increases in support prices
- Support levels approaching those of developed countries
- Inviting increased WTO scrutiny of Chinese ag policies
- China's domestic prices rising above world levels
- This has attracted a surge in imports
- U.S. major beneficiary, exports to China tripled 2007-12

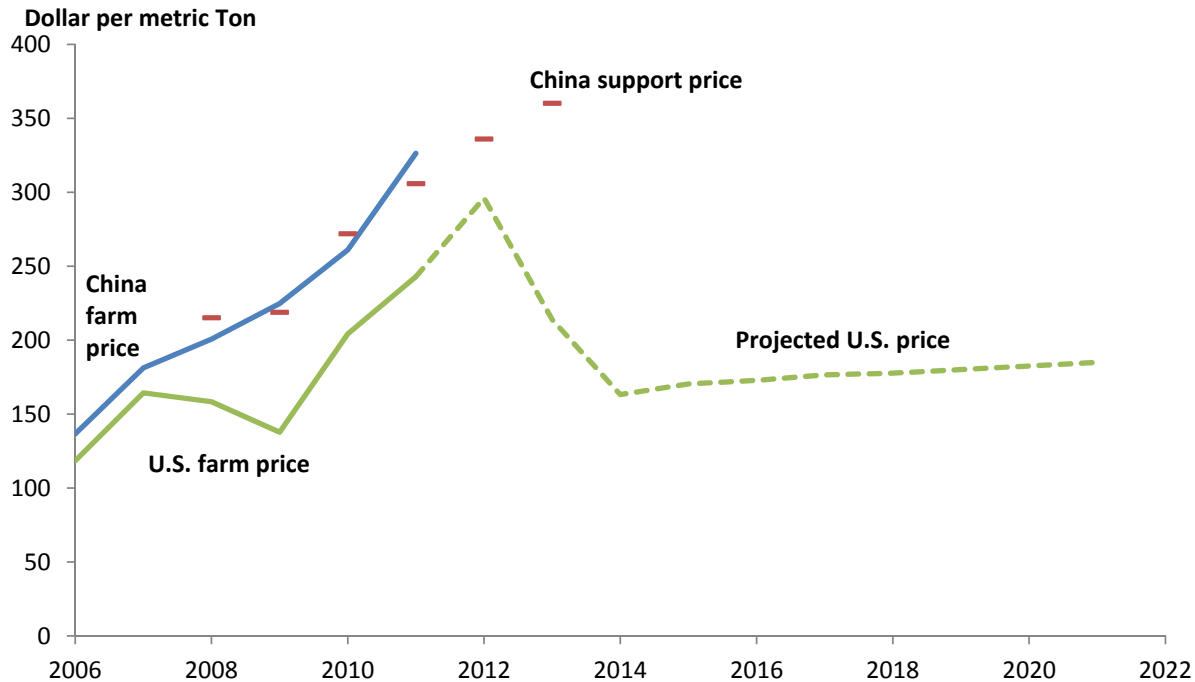


Figure : China Corn Prices and Price Supports

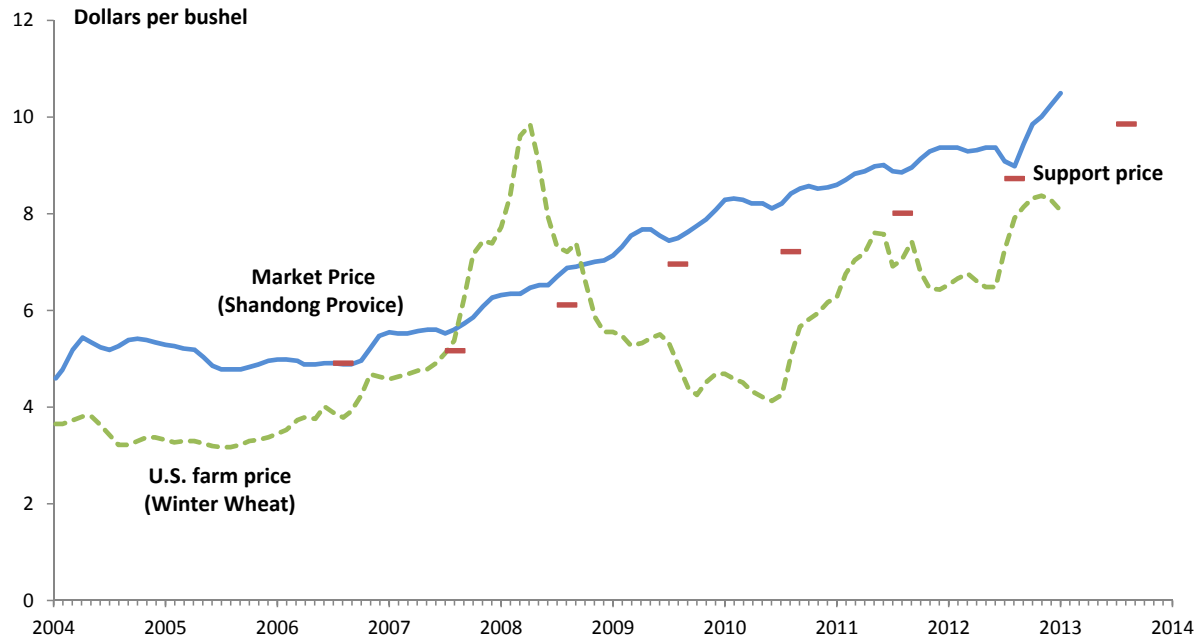


Figure : China Wheat Prices and Price Supports

China - Questions of Interest

- What will be in impact of
  - Chinese rising demand for grain
  - Chinese price support programs
  - Chinese global market integration

  on
  - Chinese imports and exports
  - Variability of world prices
- Is China's buffer stock policy sustainable?
- If not, what happens in the long run?

World Grain Market Model

- At OSU, developing a 4-region, 2-commodity stochastic spatial-temporal equilibrium model of world grain markets
- Used to explore impact of trade and price support policies on global trade and price stability
- Model lacks closed-form solution, solved using Chebychev polynomial projection methods
- Experimenting with incomplete polynomial bases, Lobatto nodal structures, ergodic set methods

- Work presented today based on subset of larger model
- Two regions: China and Rest of World (ROW)
- Spatial equilibrium enforced through trade
- Competitive storage in ROW enforces intertemporal world price equilibrium
- Government storage in China undertaken by buffer stock authority at fixed support price
- Planned production responds to price expectations

Simulation Experiment Design

- Factorial design
- Autarky versus free trade
- Limited and unlimited buffer stock capacity
- No, low, high price supports in China
- Current and 20% increase in demand in China

Main Findings

- A 20% increase in China's demand for corn will
  - divert 2.7% of ROW corn production to China
  - raise world price and volatility by 10%
- A 20% increase in China's demand for wheat will
  - divert to 2.2% of ROW wheat production to China
  - raise world price level and volatility by 8% and 6%, respectively

Grain Price Support - Baseline Demand

- Consider corn price support 6% above historical market average, baseline demand
- If ability to defend unlimited, world price level would rise 8%, world price volatility would fall 4%, and Chinese corn imports would reach 2.8% of global production
- If buffer stock capacity capped, price levels and global trade would not be affected in long run, but world price volatility would fall 4%
- Similar results in the case of wheat

Grain Price Support - Increased Demand

- Consider corn price support 6% above historical market average, 20% increase in demand
- If ability to defend unlimited, world price level would rise 9%, Chinese price level would rise 17%, world price volatility would increase 4%, and Chinese corn imports would reach 2.7% of global production
- If buffer stock capacity capped, world price level would rise 14%, Chinese price level would rise 26%, world price volatility would increase 4%, and Chinese corn imports would reach 4.1% of global production
- Similar results in the case of wheat

Extensions for Future Work

- Explicitly model USA in addition to China and ROW
- Allow for distinct release price
- Account for private storage in China
- Model USA policy interventions more fully
- Explore trade restrictions more fully
- Model multiple commodities