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sustainable solutions for ending hunger and poverty

Climate Change, External Shocks and Food Security in Central Asia

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Outline

- Background on climate change
- Climate change and food security
 - IFPRI's global impact model
- Global food crisis and macro-level food security in Central Asia
- Impact of global food crisis on domestic food prices
- Conclusion

Climate Change: What is the Evidence?

- Warming of the global climate is unequivocal (IPCC)
 - Carbon dioxide concentrations in the atmosphere are rising, as are temperatures
- Central Asian countries have all seen increase in temperatures over the past few decades (Perelet, 2007)
 - Uzbekistan by 0.29°C, Kazakhstan by 0.26°C, Turkmenistan by 0.18°C, Tajikistan by 0.10°C
- Average temperatures are projected to rise in the region in future

Climate Change and Food Security

- Plausible link between climate change and global food crisis (Krugman 2011, Tomas, 2011)
- The increased frequency of natural disasters have impacted global food availability significantly
 - Price effects from weather-related crop damage was greater than expected in 2010 and will continue through 2011 crop season (IMF 2011)
- Rising food prices are likely to affect food security at both macro and household levels
- Research is needed on linkages between climate change, global food crisis, and domestic food security

IFPRI's Global Impact Model (Nelson et al. 2010)

- Can world's farmers meet growing demand for food as uncertain climate future adds to food security challenges from growing population with higher incomes?
- Scenarios and policy options
 - Baseline, pessimistic, optimistic
- Exogenous variables
 - Population, GDP, GDP per capita, intrinsic productivity and area growth rates
- Projections on
 - Demand, production, net trade, and yields by commodity (wheat, rice, etc.), child malnourishment and per capita calorie intake

IFPRI's Global Impact Model (cont.)

- Model predicts that climate change can have serious negative impact on food security in Central Asia (Nelson, et al., 2010)
 - Declining crop, especially cereal yields
 - Water stress is projected to increase
 - Potential imbalances between production and demand
 - Worsening of malnutrition, especially among rural poor
- Climate change will affect everybody but everybody is not equally vulnerable
- Need for effective actions and policies to mitigate possible negative impacts of climate change

Global food crisis and macro level food security

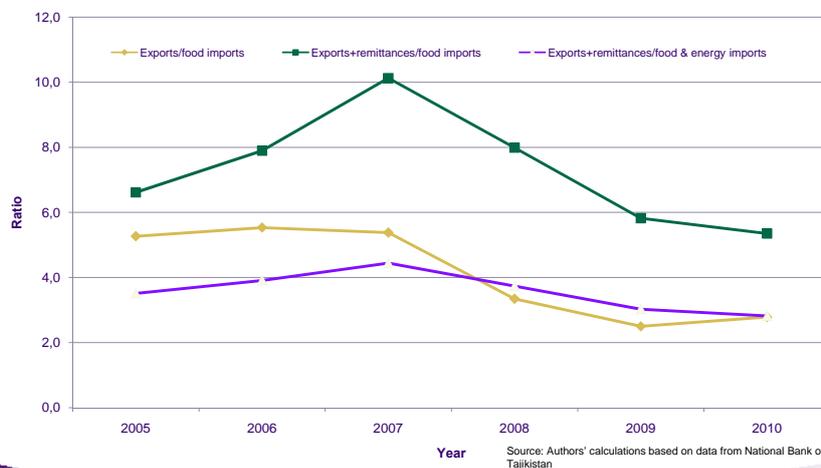
- Traditional indicator of country's capacity to finance its food imports: ratio of total exports to food imports (Bonilla et al. 2002; Yu et al. 2009; Breisinger et al. 2010)
- Modified indicators:
 - Ratio of total foreign exchange earnings from exports and remittances to food imports
 - Ratio of total foreign exchange earnings from exports and remittances to food and energy imports

Macro-level food security is an issue

| | GNI per capita, \$ PPP (2009) | Food Supply (kcal/capita/day, 2007) | Total Exports /food imports (2005-2008) | Global hunger index, % (2010) | Prevalence of undernourishment in population, % (2005- 2007) |
|-------------------------------|----------------------------------|---|---|-------------------------------------|---|
| Central Asia and the Caucasus | | | | | |
| Armenia | 5410 | 2280 | 5.5 | 9.8 | 22 |
| Azerbaijan | 9020 | 2961 | 32.3 | 7.7 | - |
| Georgia | 4700 | 2859 | 4.7 | 5.8 | - |
| Kazakhstan | 10320 | 3490 | 32.5 | <5 | - |
| Kyrgyzstan | 2200 | 2644 | 6.3 | <5 | 10 |
| Tajikistan | 1950 | 2118 | 4.9 | 15.8 | 30 |
| Turkmenistan | 6980 | 2731 | 70.6 | 6.3 | 6 |
| Uzbekistan | 2910 | 2581 | 17.3 | 7.1 | 11 |

Source: World Bank (2011), FAO (2011) & authors' calculations

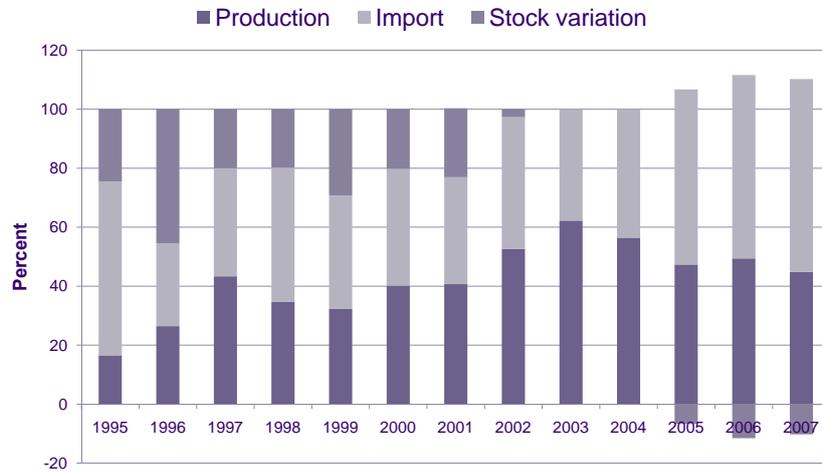
Deteriorating Macro-level Food Security: Evidence from Tajikistan (2005-2010)



Is there price transmission from global markets to domestic markets in the region?

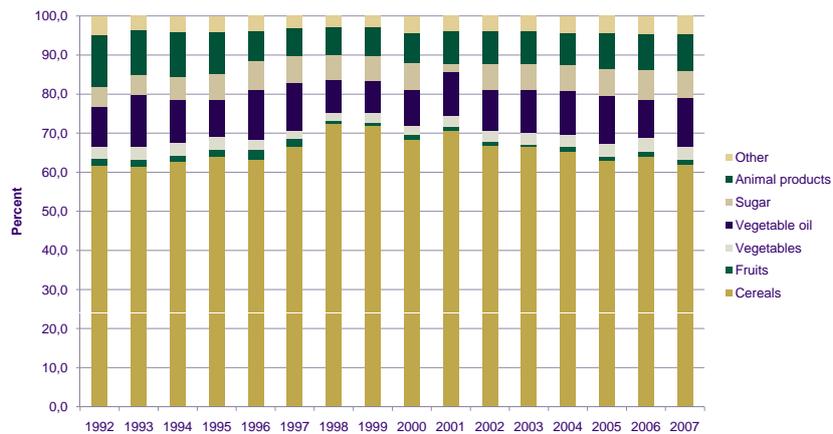
- We focus on the relationship between international wheat prices and domestic food prices in Tajikistan
- International wheat prices data from IMF
- Wheat prices in Kazakhstan and Russia
- Three step analysis
 - Graphical representation
 - Co-integration analysis
 - Price transmission – moving-average first-difference model

Domestic cereal (wheat) consumption highly dependent on imports

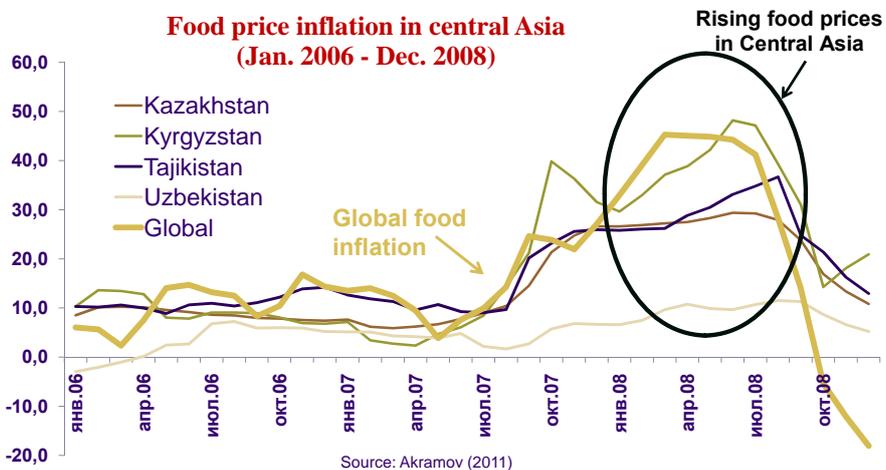


Cereals are the main source of calorie intake

Composition of calorie intake in Tajikistan, 1992-2007



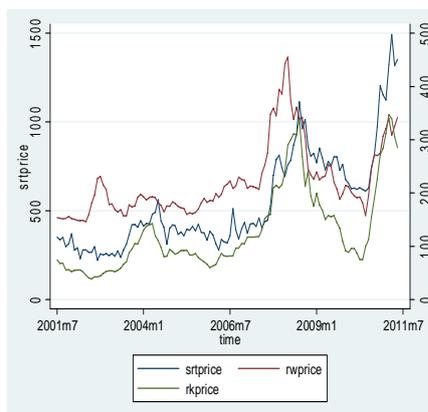
Food prices in Central Asia rise with global prices



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Evidence on co-integration

- A brief look at the graphs tells us
 - they are not stationary
 - maybe moving together, e.g. directions & cycles are similar
- Dickey-Fuller and Phillips-Perron tests for unit root show that they are not stationary
 - All series are co-integrated degree of one
- Johansen test for co-integration and VEC show strong evidence of co-integration relationship between domestic wheat prices in Tajikistan and Kyrgyzstan and wheat prices in Kazakhstan and international wheat prices



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Evidence on food price transmission: Tajikistan

| | CPI | Food | Wheat | Wheat flour | Bread |
|----------------|--------------------|--------------------|--------------------|--------------------|---------------------|
| drwprice | | | | | |
| L1 | -0.000 (0.013) | 0.003 (0.018) | 0.456 (0.158)** | 0.058 (0.052) | 0.029 (0.036) |
| L2 | 0.028 (0.013)** | 0.046 (0.018)** | 0.038 (0.158) | 0.169 (0.053)** | 0.035 (0.035) |
| FD | 0.147 (0.189) | 0.309 (0.227) | 0.601 (2.289) | 0.698 (0.764) | -0.123 (0.515) |
| FD*drwprice | 0.054 (0.026)** | 0.077 (0.037)** | 0.685 (0.322)** | 0.385 (0.105)** | 0.224 (0.071)*** |
| Exchange rate | 0.049 (0.072) | 0.045 (0.101) | -0.240 (0.891) | -0.488 (0.290) | -0.307 (0.196) |
| R=squared | 0.25 | 0.28 | 0.17 | 0.37 | 0.25 |
| N | 106 | 106 | 106 | 106 | 106 |
| F-stat | 2.87 | 3.29 | 1.81 | 5.06 | 2.78 |
| p-value | 0.027 | 0.0008 | 0.0614 | 0.0000 | 0.0036 |
| Number of lags | 7 | 7 | 7 | 7 | 7 |

Conclusion

- Climate change may have a negative impact on food availability and security in the region
- Potential link between climate change and global food crisis
- Global food crisis has impact on both food security and domestic food prices
- Need for future research on effective actions and policies to mitigate negative impacts of climate change and external shocks

Thank you