Russia's Invasion of Ukraine: How Do Partial Equilibrium Bilateral Trade Projections Compare to Realized Market Outcomes?

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The findings & conclusions presented are those of the authors and do not represent any official U.S. Department of Agriculture (USDA) or U.S. Government (USG) determination or policy

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Research Motivation

- Quantitative economic assessments (CGE/PE) have become important inputs to evaluate economic implications of shocks to global food and agricultural markets.

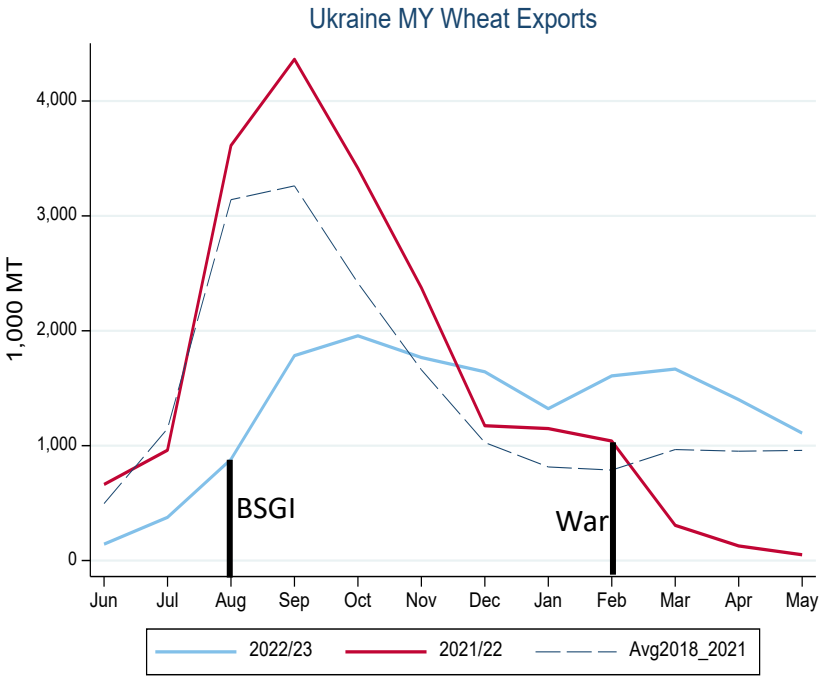
- Partial and general equilibrium models are widely used
  - Generate detailed forecasts of output, expenditure and trade flow changes for key commodity sectors
  - Provide baselines from which to calculate the effects of policy changes.

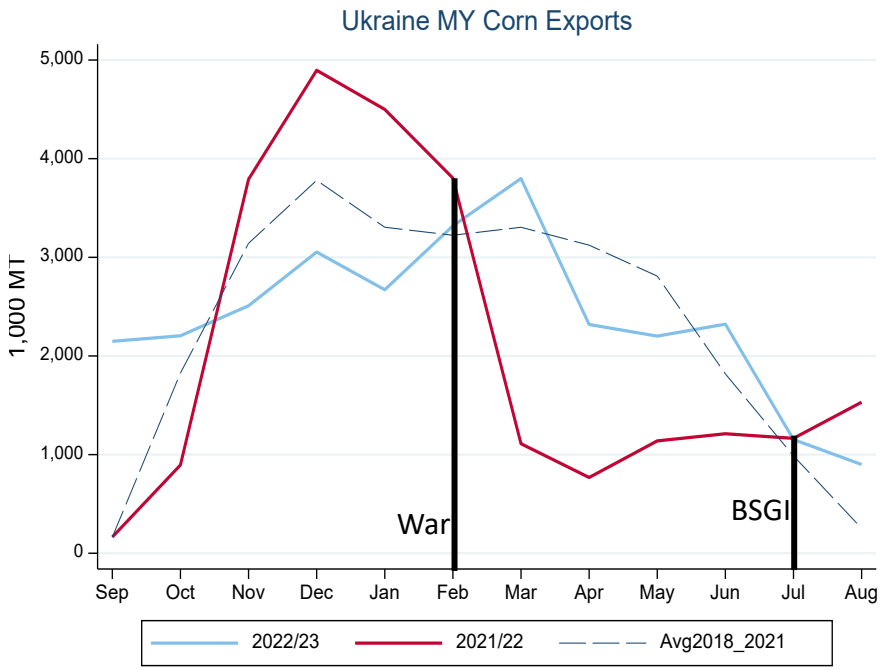
- Demand for quantitative modeling work has increased due to:
  - Geopolitical conflicts
  - Trade disputes
  - Extreme weather events
  - Covid-19 pandemic

- Policymakers often need to understand how market shocks to global food systems may affect crop production, crop input markets, producer returns, export opportunities, consumer prices and food availability/security.

Ukraine Monthly Wheat, Corn, Veg. Oil and Meal Exports

- A lot to unpack….
- Export restrictions unfolded, commodity prices jumped, and the USD appreciated
- Significant trade impact immediately following invasion (Mar-July, 2022)
  - **Wheat – out of season**
  - **Corn - export season winding down**
- Export recovery after BSGI





Source: Authors' calculations from Trade Data Monitor

MY2022/23 Exports: 15.66 MMT

MY2022/23 Exports: 28.6 MMT

Research Objective

How Do Partial Equilibrium Trade Model Projections Compare to Realized Market Outcomes if we calibrate to market fundamentals that existed prior to the conflict and impose MY2022/23 shocks?

VT-OCE Linked Livestock-Crop Model Summary

- Recursive-dynamic, PE, bilateral trade simulation model calibrated to international long-run (10-year) projections (OECD-FAO, ERS/USDA)
- Explicit breakout of bilateral trade flows and trade policy "matched" to respect import and export totals in baseline (baseline does not contain bilateral trade projections)
- Model allows us to evaluate changes in bilateral trade policies/shocks not considered in baseline
- Simulates (recursive-dynamic) market level impacts & scenario analyses
  - Today: OECD-FAO 2022-2030 using 2021 initial equilibrium

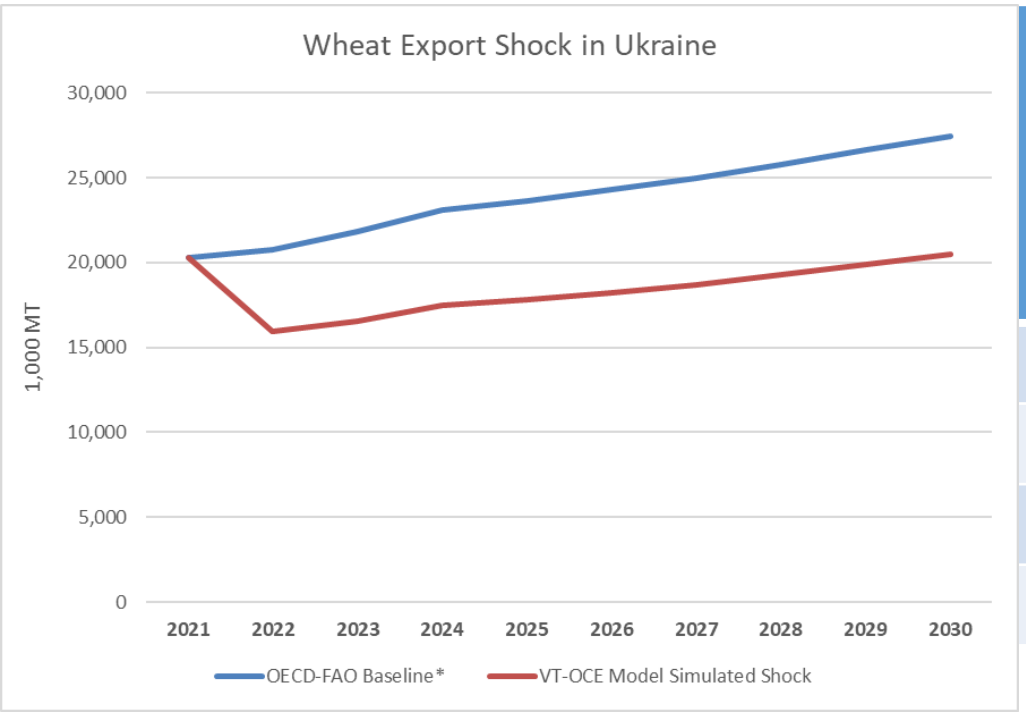
Product, Country & Time Coverage

- 3 livestock activities + Other livestock
  - Beef, Pork, Poultry
- 7 cropping and feed grain activities
  - Corn, Soybeans, Wheat, Rice, Sorghum, Barley, Cotton
- Related Processing activities:
  - Soybean meal and oil (fixed proportions from soybeans)
  - Industrial use – ethanol, HFCS
- 26 regions
  - 20 individual countries, 6 aggregate regions

Overview of Simulation Setup

1. Develop initial equilibrium (2021)
2. Forecast Simulation – Calibrate model to 10-year projections, including population and real GDP growth, adjustments to "match" baseline
3. Policy Simulation – Implementation of chosen policy scenario
4. Policy Results = Difference between forecast and policy simulations

Export and Production Shocks



Commodity	Activity	Modified OECD/FAO Baseline (No War) 2022/23	Observed (War-impacted) 2022/23 MY	2022/23 Shock
Corn	Production	38,395	28,601	-26%
Corn	Exports	31,638	25,289	-20%
Wheat	Production	28,928	20,000	-31%
Wheat	Exports	20,323	15,656	-23%

Export Prices

	Wheat		Corn	
	Simulated	Observed	Simulated	Observed
UKR-World*	7%		5%	
US	1.20%	7%	0.90%	-5%
Australia	1.90%	2%	3.80%	----
Argentina	1.21%	16%	1.11%	-4%
EU	1.40%	-2%	1.90%	----
India	1.30%	----	0.70%	----
Canada	1.20%	-8%	1.18%	----
Brazil	1.70%	----	1.50%	-8%
Price change in Ukraine		Wheat: -12.2% Est. wheat fob price: -21%		Corn: -10.2% Avg. Corn fob price: -16%

Source: Agricensus (spot *fob* prices)

Export Prices

	Wheat		Corn	
	Simulated	Observed	Simulated	Observed
UKR-World*	7%		5%	
US	1.20%	13%	0.90%	2%
Australia	1.90%	13%	3.80%	--
Argentina	1.21%	15%	1.11%	8%
EU	1.40%	10%	1.90%	6%
India	1.30%	7%	0.70%	-2%
Canada	1.20%	4%	1.18%	-13%
Brazil	1.70%	----	1.50%	9%
Price change in Ukraine		Wheat: -12.2% Est. wheat fob price (EUV): -19%		Corn: -10.2% Avg. Corn FOB price (EUV): -17%

Author's calculations from TDM

Bilateral Trade Projections