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The War in Ukraine Disrupts Agricultural Value Chains, but Trade Policy Measures Can Mitigate the Impacts

Maksym Chepeliev, Maryla Maliszewska, and Maria Filipa Seara e Pereira

Selected presentation for the International Agricultural Trade Research Consortium's (IATRC's) 2022 Annual Meeting: Transforming Global Value Chains, December 11-13, 2022, Clearwater Beach, FL.

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Global Trade Analysis Project



Agricultural Economics
College of Agriculture

The War in Ukraine Disrupts Agricultural Value Chains, but Trade Policy Measures Can Mitigate the Impacts

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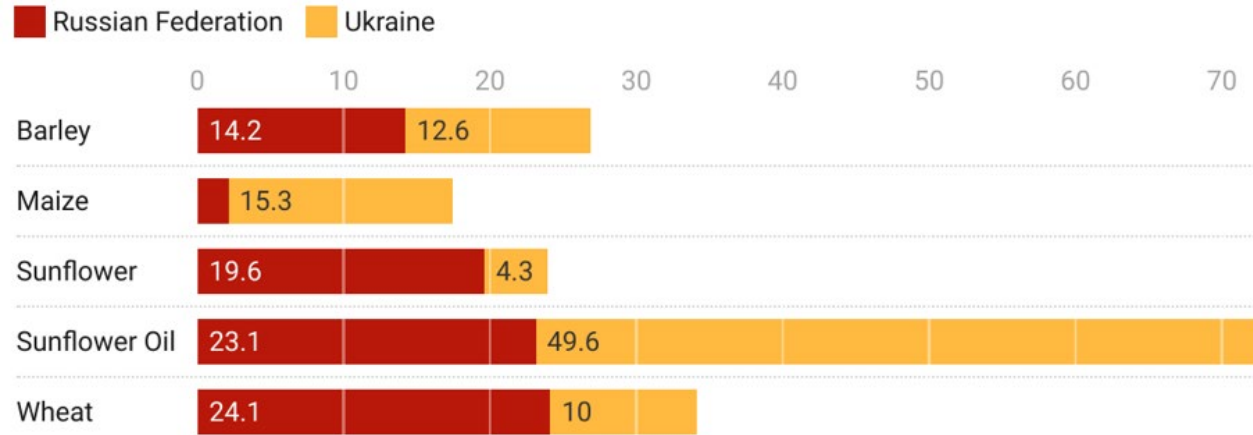
2022 IATRC Annual Meeting
11-13 December, 2022

Outline

- **The importance of Black Sea region and mounting price pressure**
- **The War in Ukraine is disrupting commodity markets**
 - There are winners and losers
- **The impact of war is exacerbated in many other ways**
 - Adverse weather events
 - Energy sanctions on Russia
- **Conclusion**

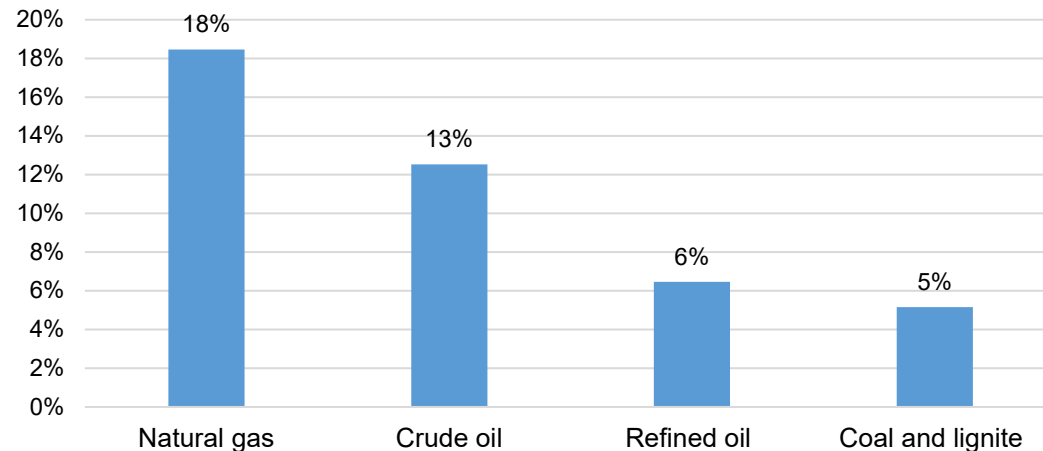
The Black Sea region is an important commodity supplier

Ukraine's and Russia's share of global trade, 2018-2020



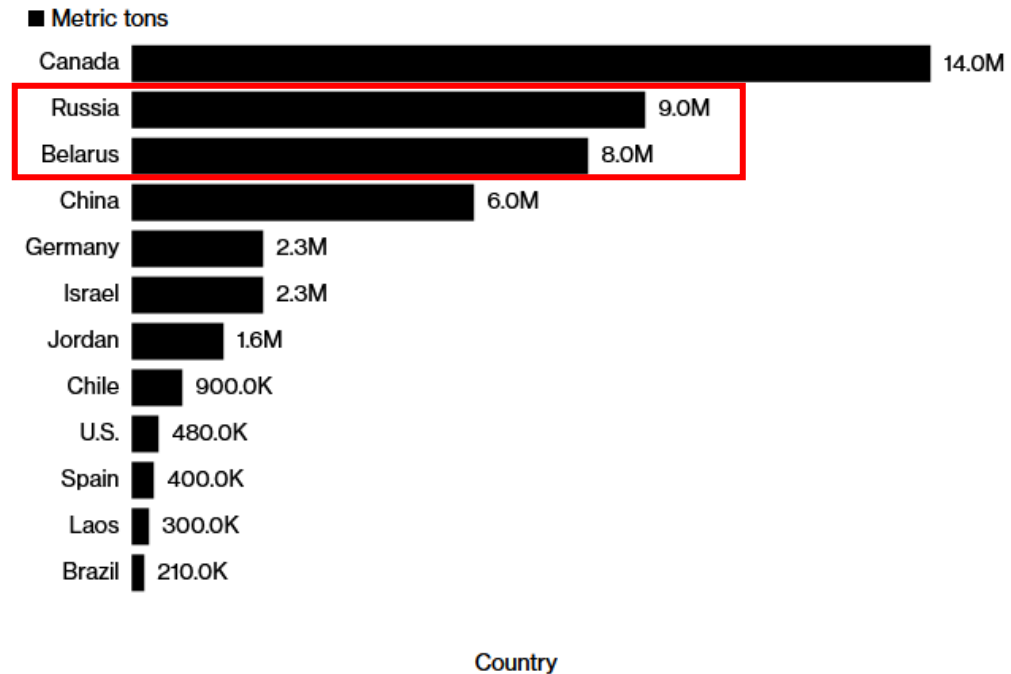
Source: Glauber and Laborde (2022)

Russia's share in global fuel production (2017)



Source: based on <https://energydata.info/>

Top potash fertilizer producers in 2021



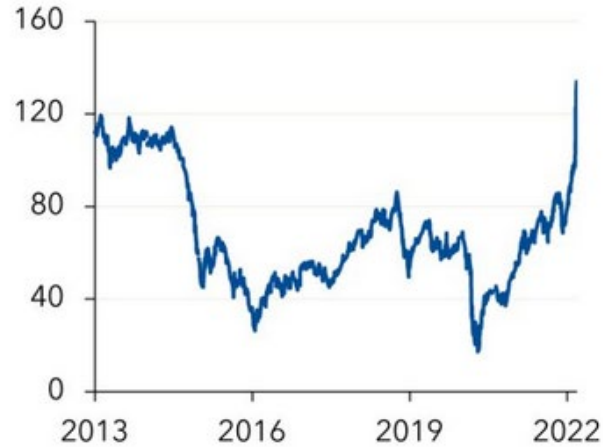
Source: USGS 2022 Mineral Commodity Summary
Note: Volumes are USGS estimates.

Source: Bloomberg (2022)

Price pressure has been mounting long before the war

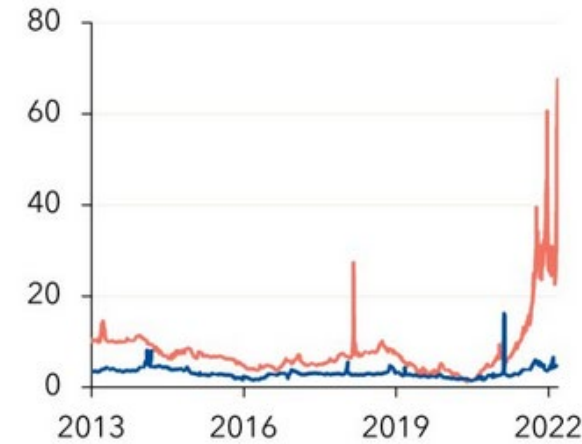
Brent Crude Oil

(\$US/barrel)



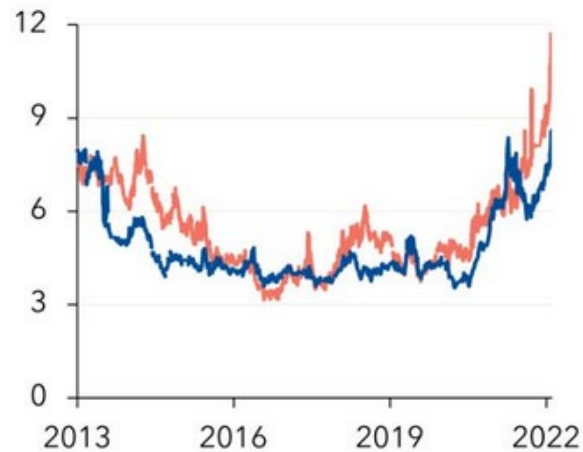
European & US Natural Gas*

(\$US/MMBtu)



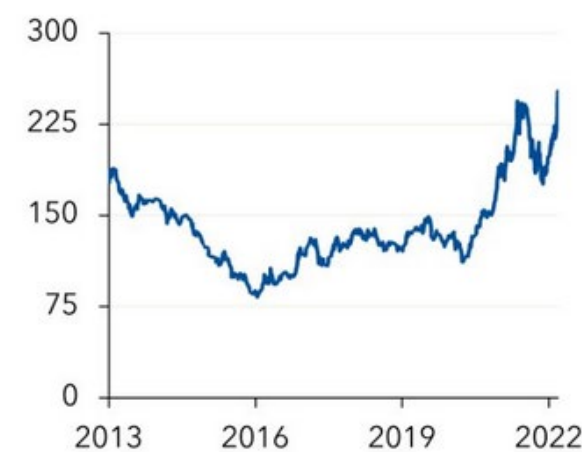
Corn, Wheat

(\$US/bushel)



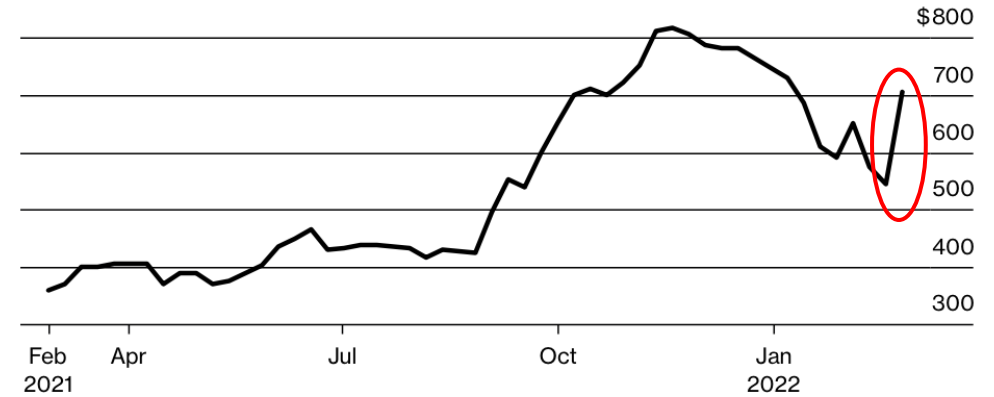
Metals Index**

(2016=100)



New Orleans Urea

Price per short ton



Source: Green Markets, Bloomberg

“Soaring Fertilizer Prices Are About to Increase the Cost of Food,” by Elizabeth Elkin. Bloomberg News (March 1, 2022).

Source: Kammer et al. (2022)

The direct impact of war is exacerbated in many ways

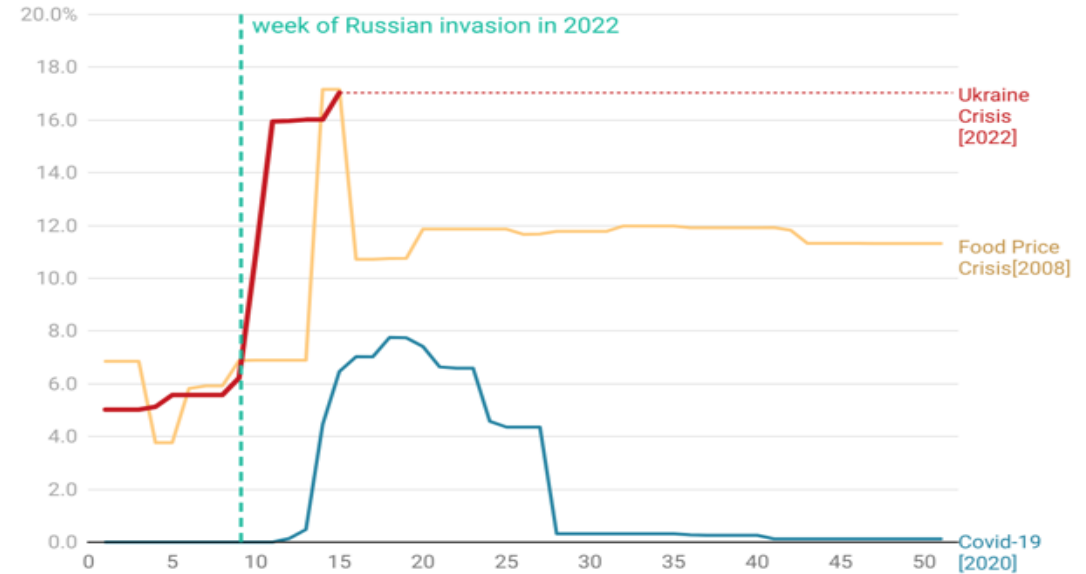
Increasing demand following recovery from the Covid pandemic

- Growing demand for energy, transportation services

Adverse weather events are impacting yields worldwide:

- Devastating floods in South Sudan
- Heat waves in India
- Droughts in North America and Europe (e.g. France)
- Drought stress and heat waves in Brazil (heavy crop losses in the Southern region and part of the Brazilian Midwest)

Evolution of the share of global trade, in calories, impacted by export restrictions



X-axis shows the week of the year. 1= first week of the year. Data extracted from the Export restriction tracker on April 12th 2022.

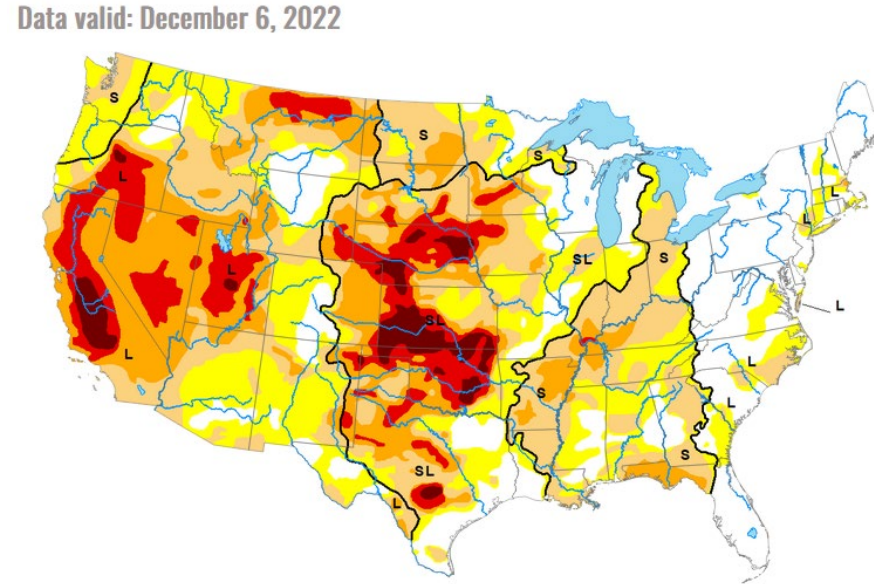
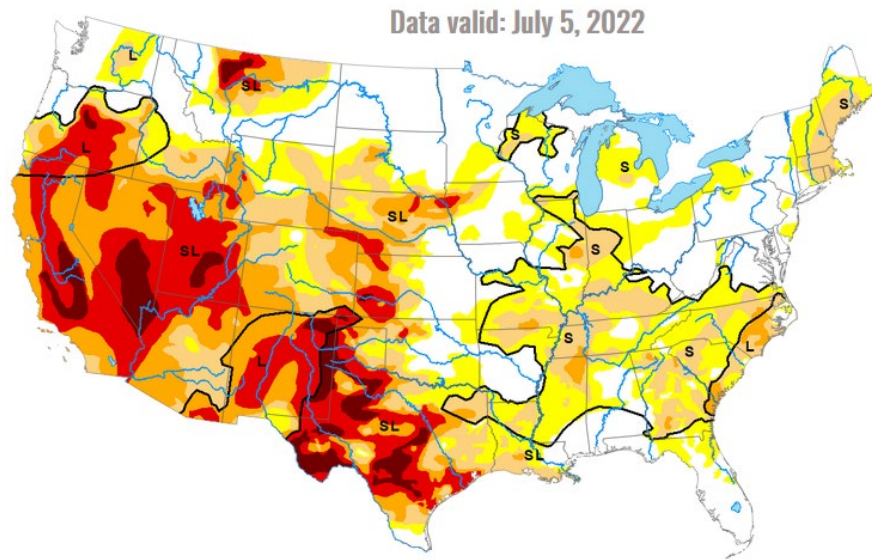
Chart: David Laborde • Source: IFPRI

High fertilizer and energy prices -> impacting agricultural production costs

Food export restrictions put pressure on global food security:

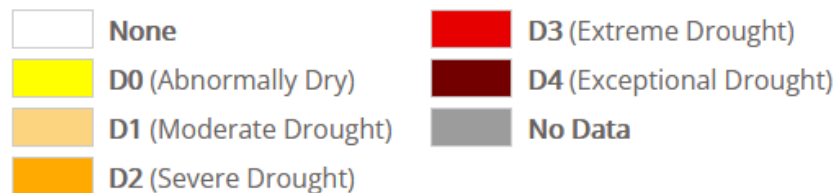
For instance, India announced in May that it is shutting down all grain exports as a domestic food security measure


U.S. Drought Monitor has been showing mounting pressure



Source: <https://droughtmonitor.unl.edu/>

Intensity and Impacts



 - Delineates dominant impacts

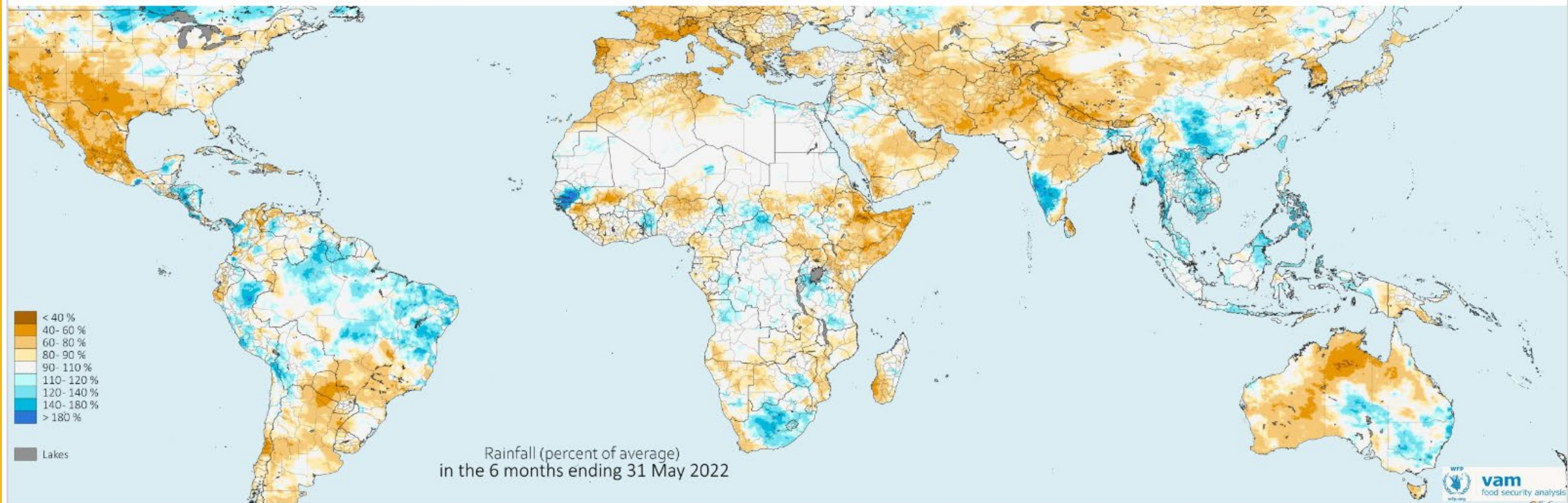
S - Short-term impacts, typically less than 6 months (agriculture, grasslands)

L - Long-term impacts, typically greater than 6 months (hydrology, ecology)

SL - Short- and long-term impacts

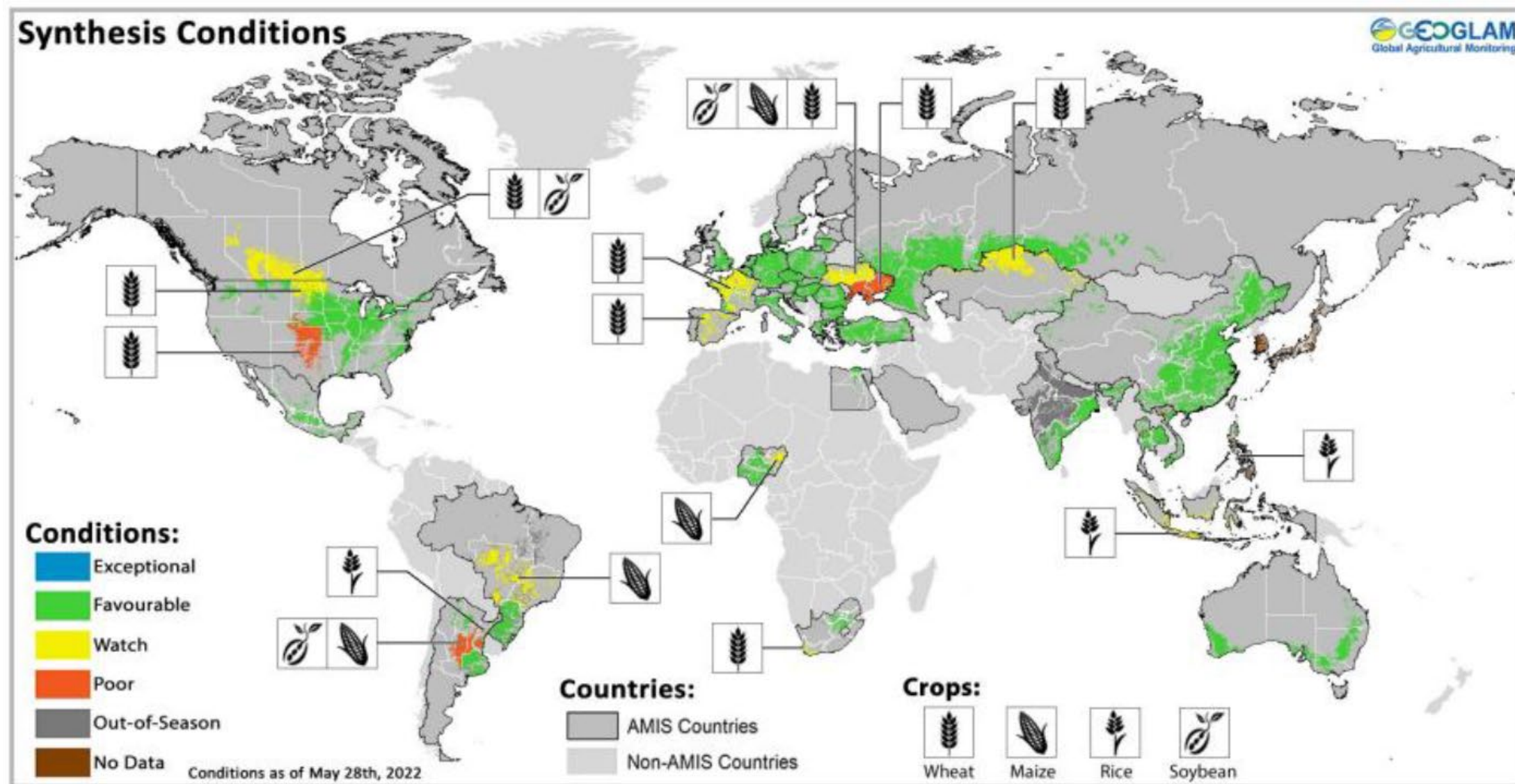
Global drier conditions have been observed

Rainfall (percent of average) in the 6 months ending 31 May 2022



Source: World Food Program <https://reliefweb.int/report/ukraine/global-climate-context-ukraine-war-june-2022>

Adverse weather impacted crop production perspectives



Broader context of the war and potential response policies remain largely unexplored

- **Several earlier studies have explored potential implications of the war:**
 - Adverse impacts for food security - over 47 mln could suffer from acute hunger (WFP, 2022).
 - Countries in the Global South are particularly vulnerable to the agricultural supply chain disruptions (e.g. Glauber et al., 2022; Ali et al., 2022).
 - Importance of interdependencies across countries (Hellegers, 2022).
 - The war has winners and losers (Chepeliev et al., 2022).
 - Specific policy actions can be implemented to ease the adverse impacts of the war (Ben Hassen and El Bilalli, 2022; Osendarp et al., 2022).
- **Focus of this study:**
 - Quantify implications of the war for agricultural trade and value chains.
 - Take into account a broader context of sanctions, climate impacts and trade restrictions.
 - Provide quantitative assessment of the potential policy measures that could mitigate the adverse implications of the war in Ukraine.

ENVISAGE CGE model is used for the assessment

- **Global computable general equilibrium (CGE) model**
 - Static version -> short/mid-term analyzes (van der Mensbrugghe, 2019)
- **Coupled with a GTAP MRIO database**
 - Distinguishes bilateral trade and tariff flows by agents (end-users) (Carrico et al., 2020)
- **Enriched with nutritional module**
 - An approach traces changes in food, calories, fats, proteins and carbohydrates supply along the global value chains (Chepeliev, 2022).
- **Model aggregation: 25 activities and 23 regions.**

Scenario framework

1. **Country-specific agricultural productivity shock:** 35% reduction in supply of crops in Ukraine (USDA, 2022).
2. **Restrictions on exports of crops from India** (PIIE, 2022).
3. **An increase in the price of imported fertilizer: 50% growth** (Baffes and Chian Koh, 2022).
4. **Agricultural productivity shock** due to adverse weather (2%) -> FAO (2022) projected a decline in global cereal output of 1.7% in 2022 (wrt 2021) -> should be further refined.
5. **Economy-wide productivity shock in the Black Sea Region** corresponding to GDP declines.
6. **Restrictions on exports of electronics** to Russia.
7. **Restrictions on imports of metals and chemicals** from Russia and Belarus by the Western European countries (PIIE, 2022).
8. **Restrictions on imports of fossil fuels from Russia** by the US and UK (PIIE, 2022).
9. **Restrictions in the global fossil fuel supply** (15% downward shift) reflecting supply adjustments by the OPEC aimed at limiting supply and price controls (CNBC, 2022).
10. **Restrictions on energy imports by the EU from Russia: 40% reduction in natural gas imports and 90% reduction in petroleum products imports** (Chepeliev et al., 2022b).

Tariff liberalization (elimination of import tariffs on agricultural and food commodities)

Trade facilitation measures (reduction in NTBs, on average range between 12% and 16%)

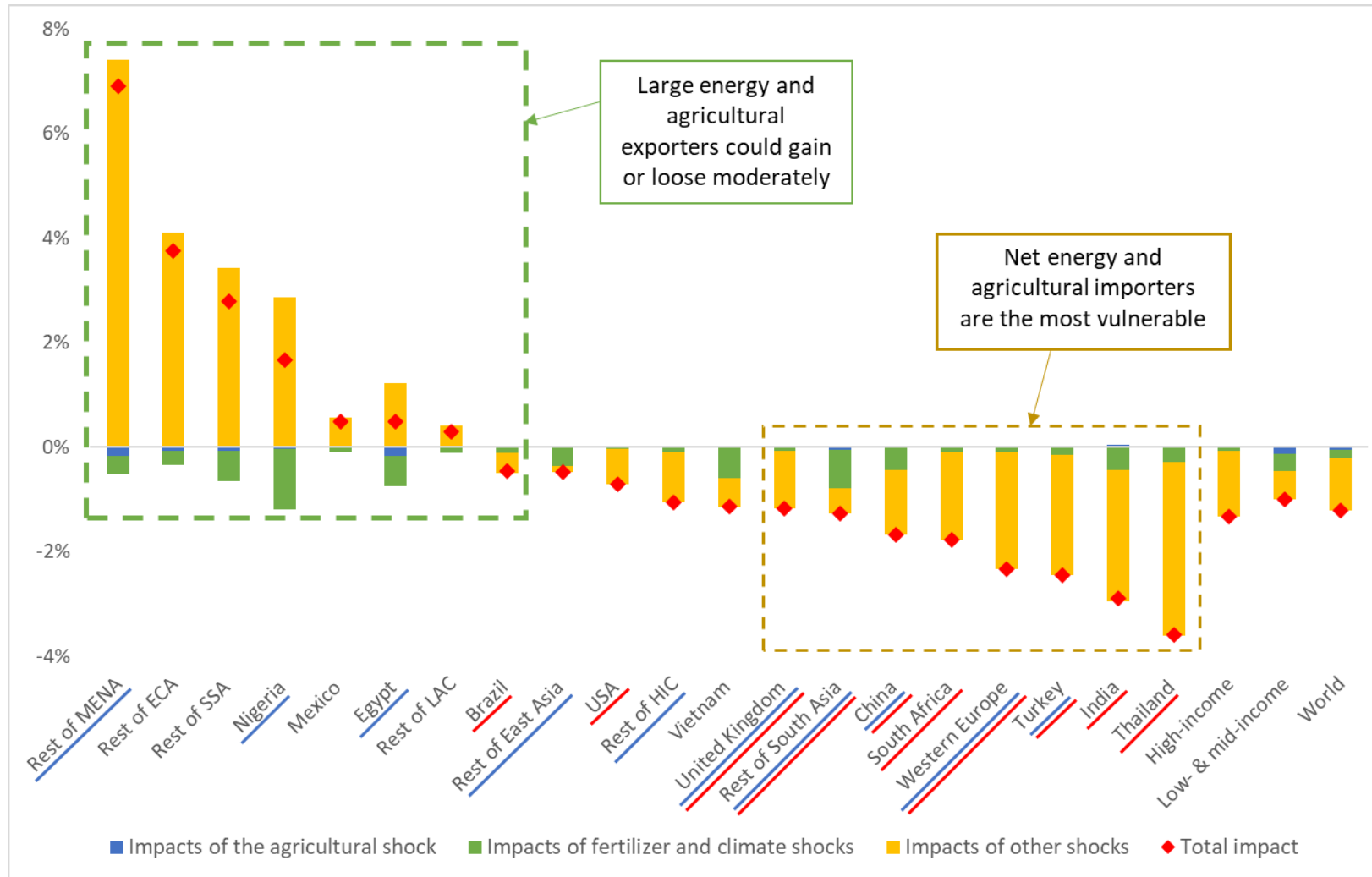
Direct agricultural and food shocks

Weather and fertilizer-related shocks

Energy-related shocks and trade restrictions

GVC-friendly policies

Net agricultural and energy importers are hit hardest



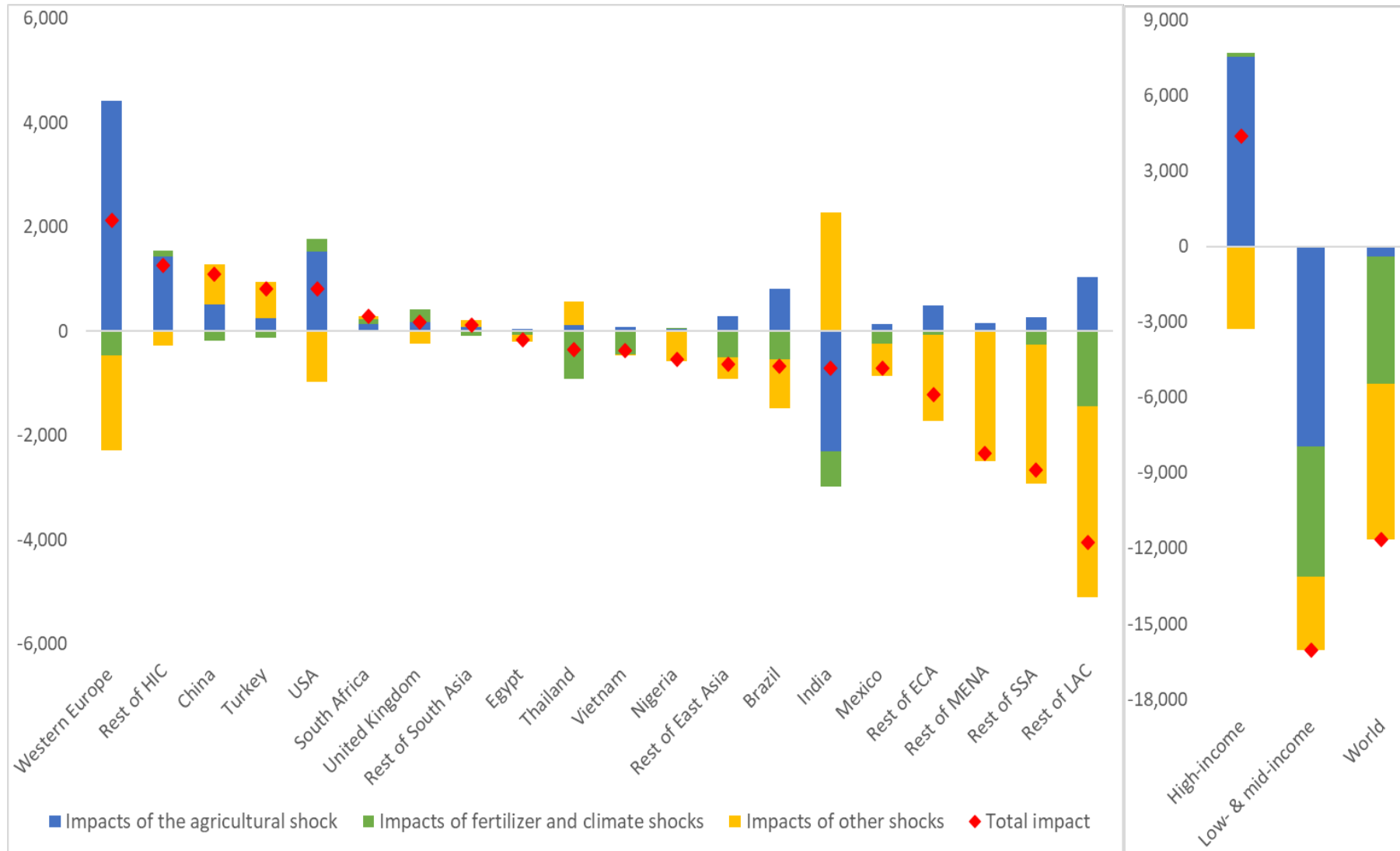
Notes:

- (1) *Agricultural shock*: 35% reduction in crops supply from Ukraine; selected agricultural export restrictions.
- (2) *Fertilizer and climate shock*: 50% increase in price of imported fertilizer; global agricultural productivity shock of 2%.
- (3) *Other shocks*: restrictions on imports of selected commodities from Russia, including metals, chemicals and fossil fuels; EU energy import restrictions; global fossil fuel supply restrictions.

Countries underlined **blue** are net agricultural importers and those underlined **red** are net energy importers.

Change in real income in selected countries and regions, percent (decomposed across scenarios)

Impacts of the war are exacerbated by other shocks

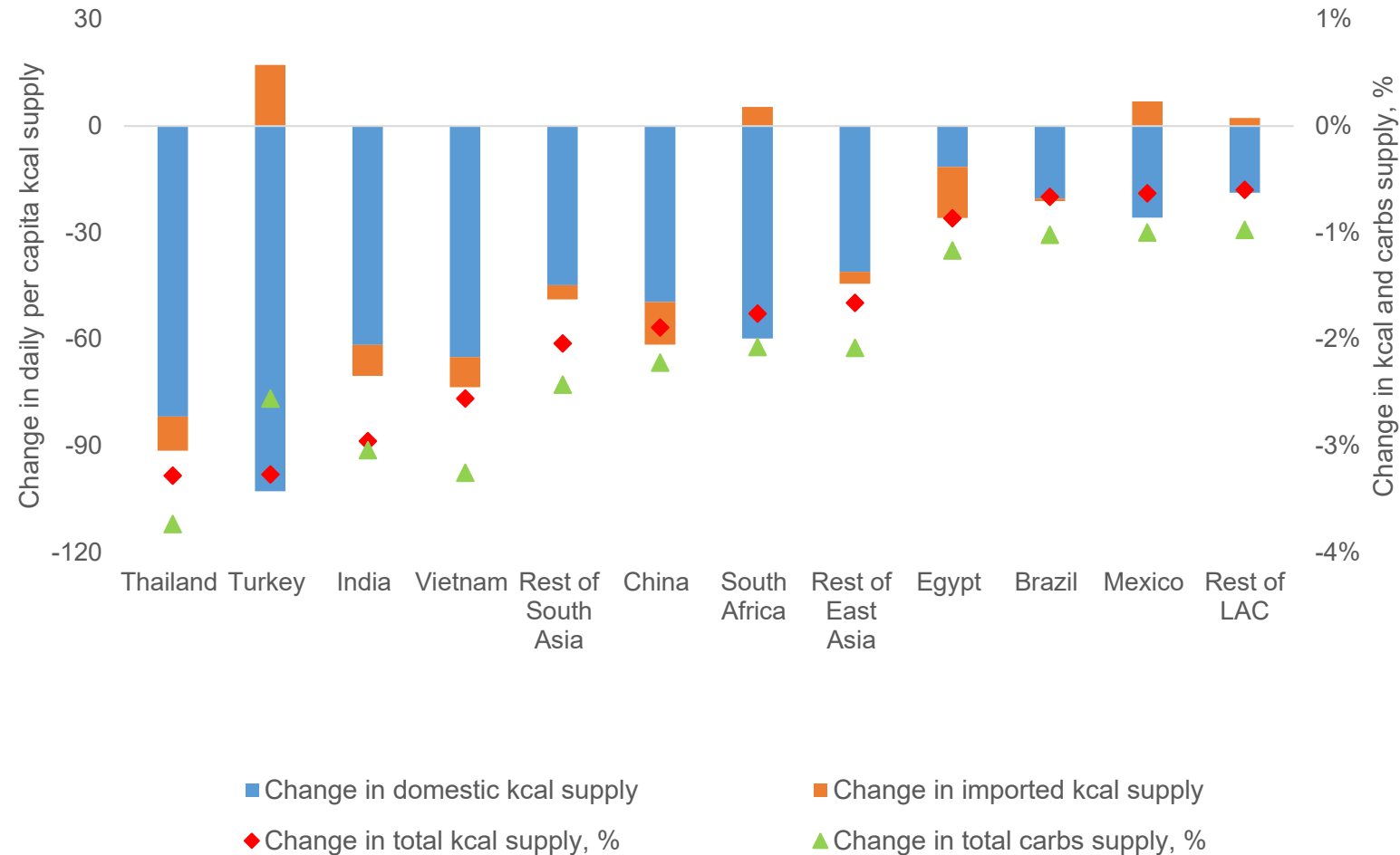


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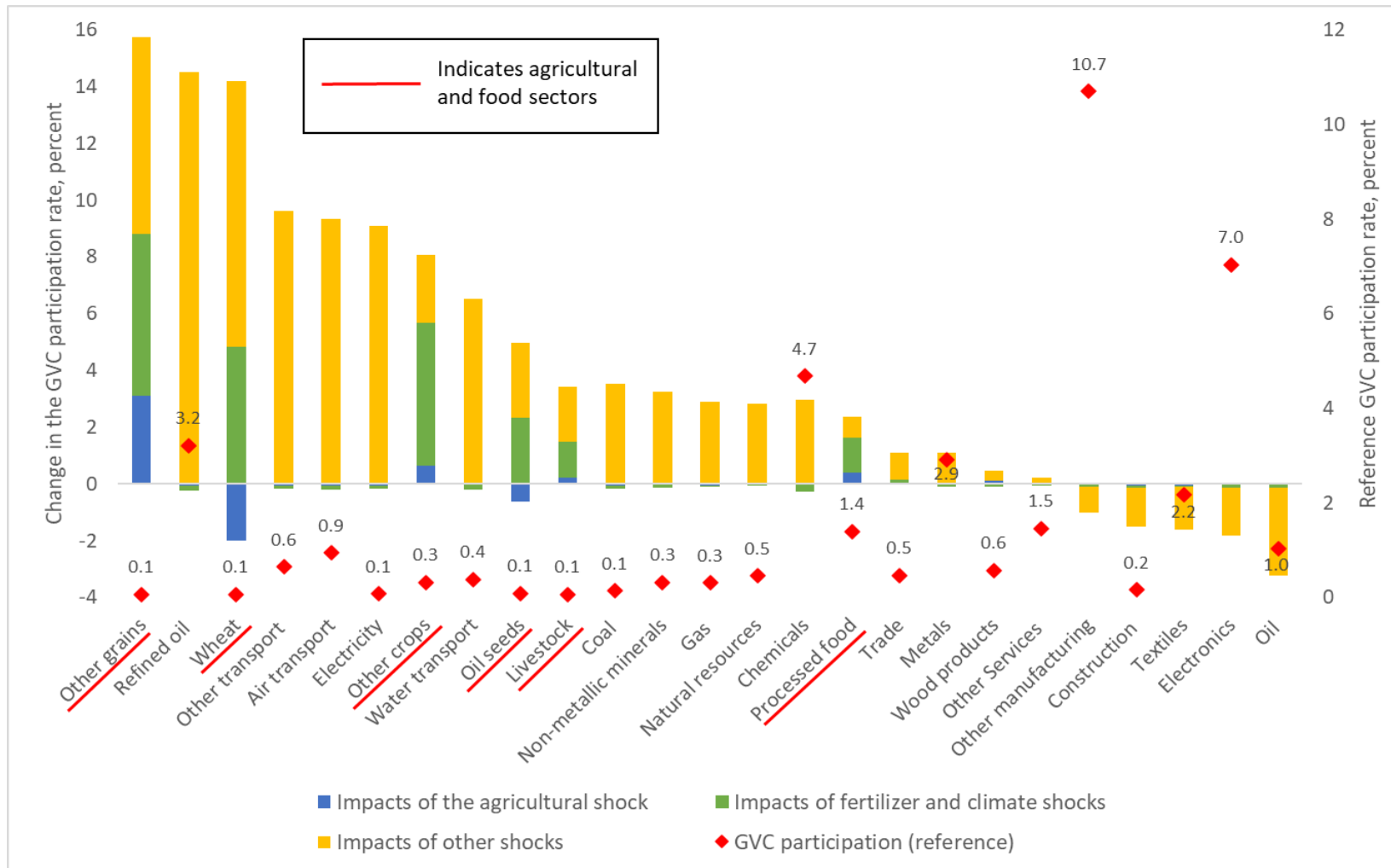
Change in agricultural and food exports across countries and regions, million USD

Reduction in domestic food supply is a key driver of impacts in developing countries



Changes in kcal and carbohydrates supply across most-impacted developing countries and regions under the “UkrWar” scenario (all shocks combined)

Agricultural commodities become more integrated into global values chains (when price effect is accounted for)

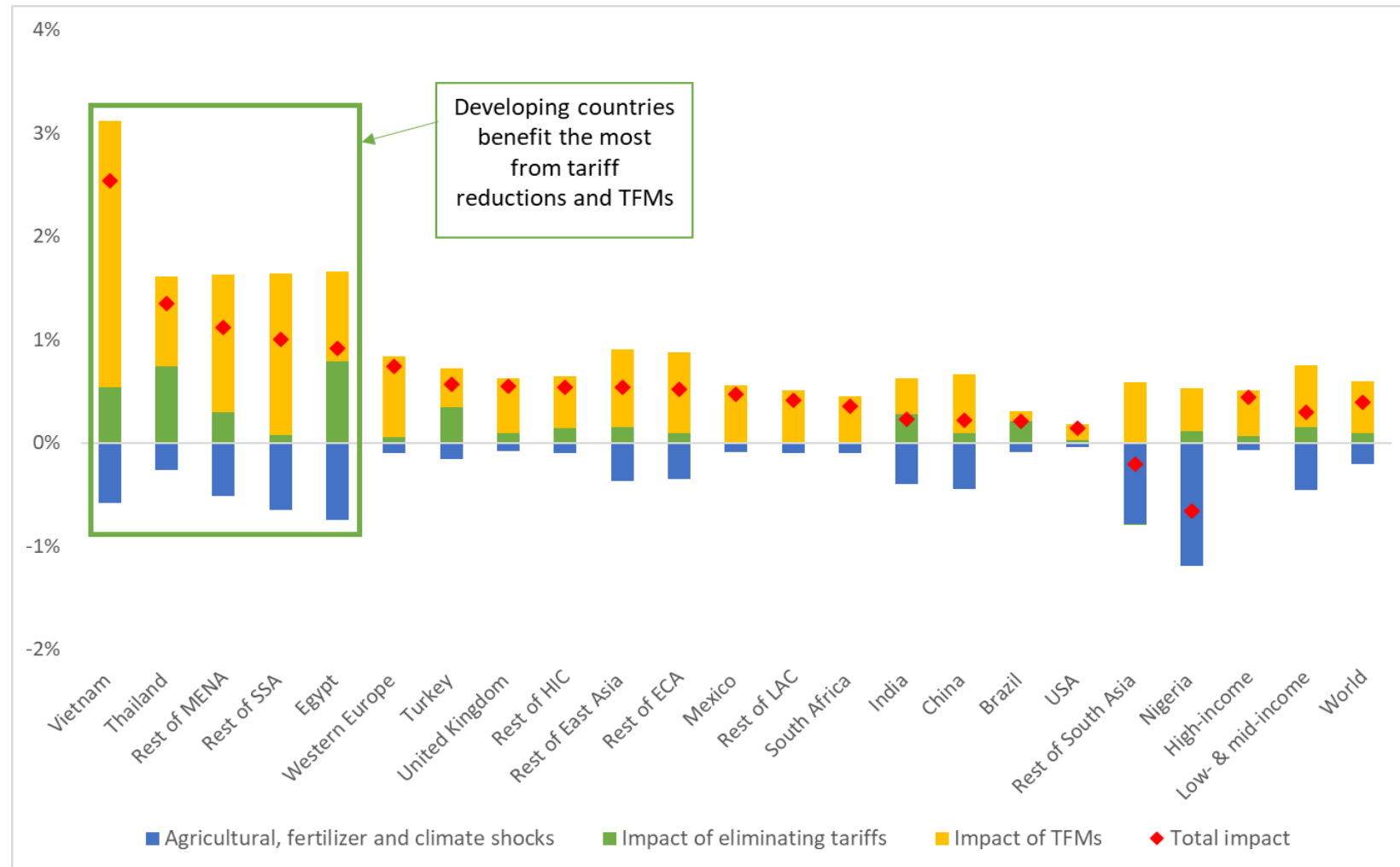


Notes:

- GVC participation is estimated as a sum of forward and backward GVC participation rates (measured as a share of global exports).
- Forward GVC participation = Domestic value added embodied in third country exports (percent of exports).
- Backward GVC participation = imported inputs in exports (percent of exports).
- Percent changes are measured relative to the reference level of the GVC participation rate.

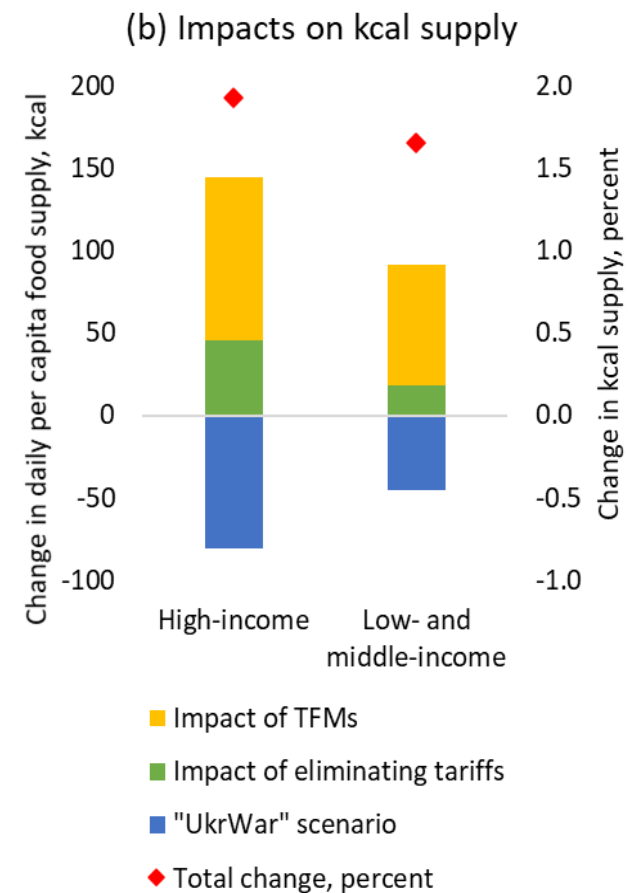
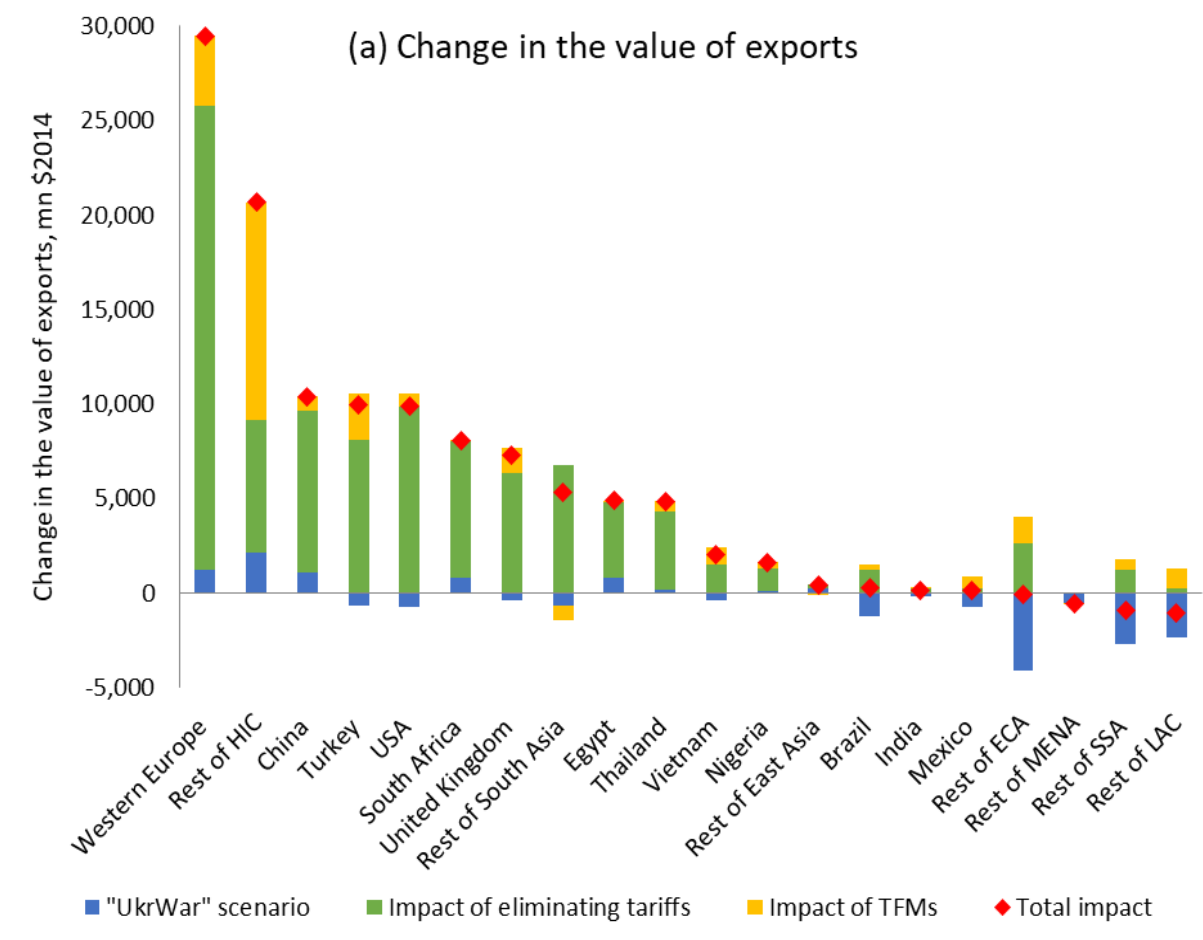
Change in global average GVC participation rate across sectors and a reference level of GVC participation, percent

Developing countries and regions benefit the most from tariff reductions and trade facilitation measures



Change in real income in selected countries and regions following and implementation of trade policies, percent

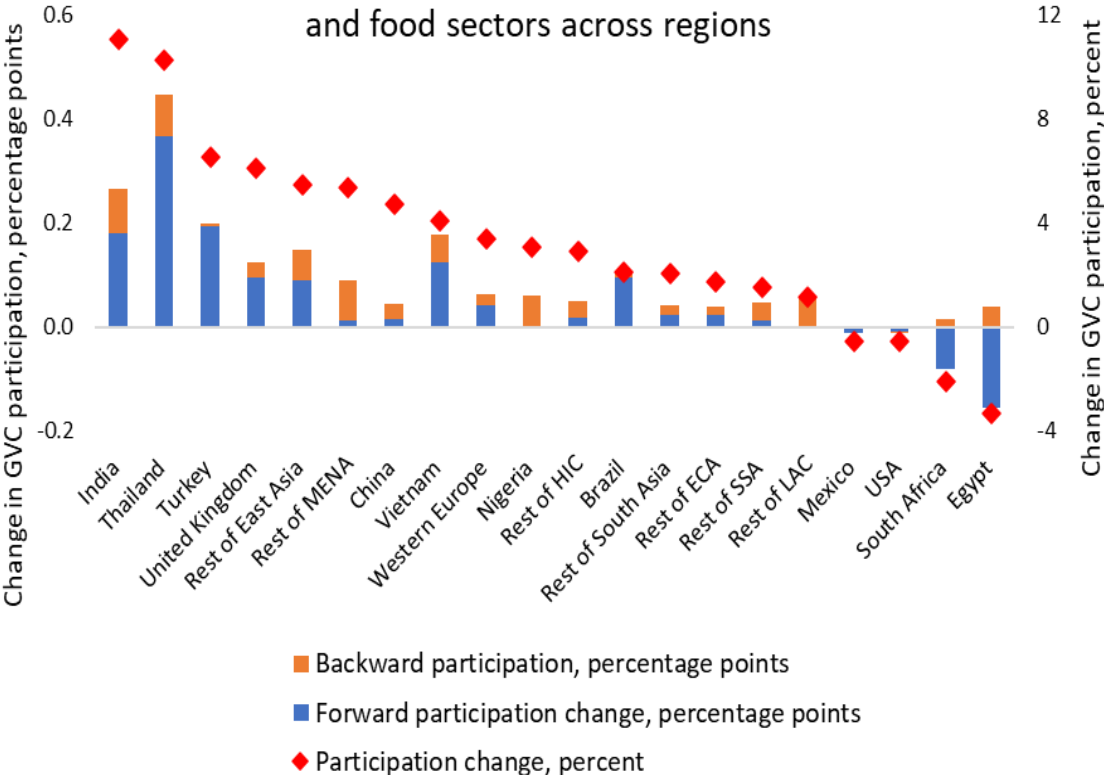
GVC-friendly policies increase food availability



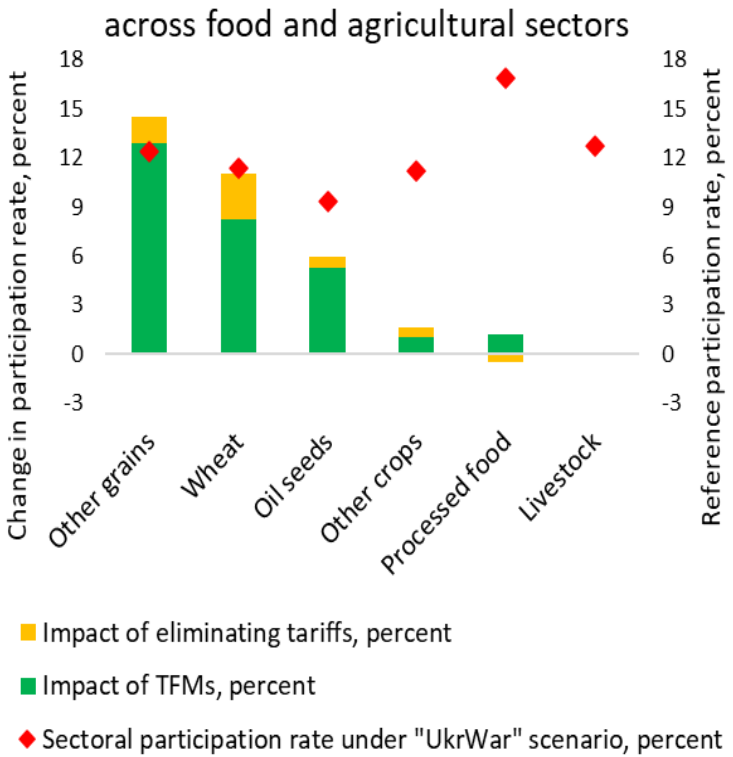
Impacts of trade policies on the value of exports (panel a) and caloric food supply (panel b)

GVC-friendly policies also boost countries' integration into agricultural and food value chains

(a) GVC participation metrics for the aggregate of agricultural and food sectors across regions



(b) Global GVC participation metrics across food and agricultural sectors



Impacts on agricultural and food GVCs following an implementation of trade policies

Notes: Panel (a) reports changes in forward and backward participation rates across countries and regions. Changes are reported in percentage points and percent change relative to the reference participation rate under the “UkrWar” scenario. GVC participation is measured as a share of global exports of all goods and services. Panel (b) provides estimates of changes in global GVC participation rates across agricultural and food sectors. GVC participation is measured as a share of country’s sectoral exports.

Conclusions and policy implications

- **It is important to consider a broad context of the ongoing policies and market distortions**
 - Indirect impacts are of a higher magnitude than direct implications.
 - War in Ukraine is putting disproportionate pressure on low-income households in developing countries (targeted support measures might be needed).
 - Agricultural trade restrictions should be avoided.
- **Trade facilitation and tariff reduction measures could help to improve food security**
 - If implemented, such measures could fully outweigh implications of the war in Ukraine and that of a broader disruptions
 - Such measures can increase food availability, benefit incomes and boost integration of agricultural commodities into global value chains



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Thank you!

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