Trade Risk and Food Security

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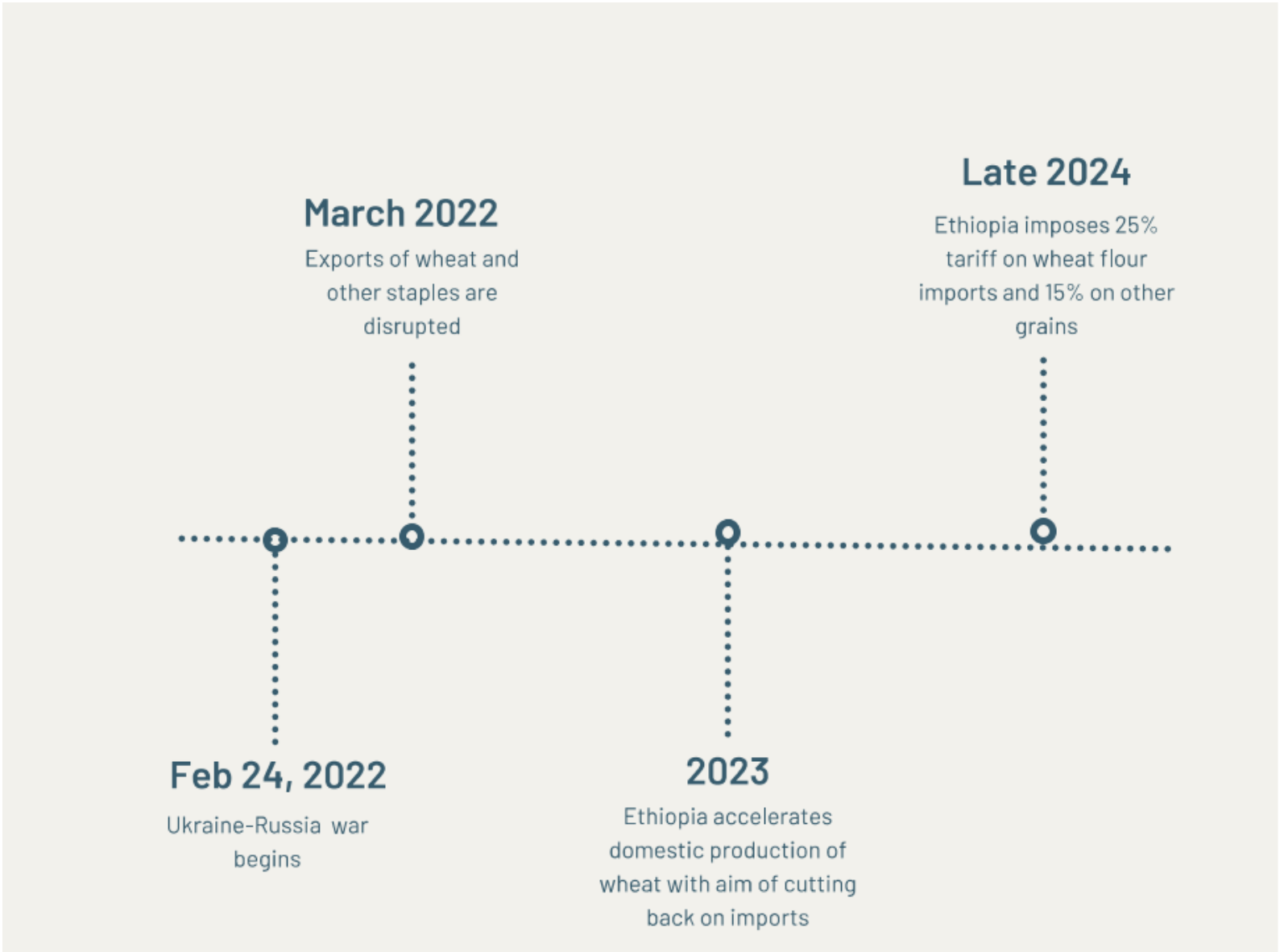
Reliance or Resilience? Food Security in a Risky World



Big Picture

- Large differences in agricultural productivity across countries.
  - Yet, all countries need stable access to food consumption.

- International trade is critical in accessing food, when:
  - countries cannot produce it efficiently at home
  - domestic production is volatile

Agricultural Productivity Differences are *Real*

Canada

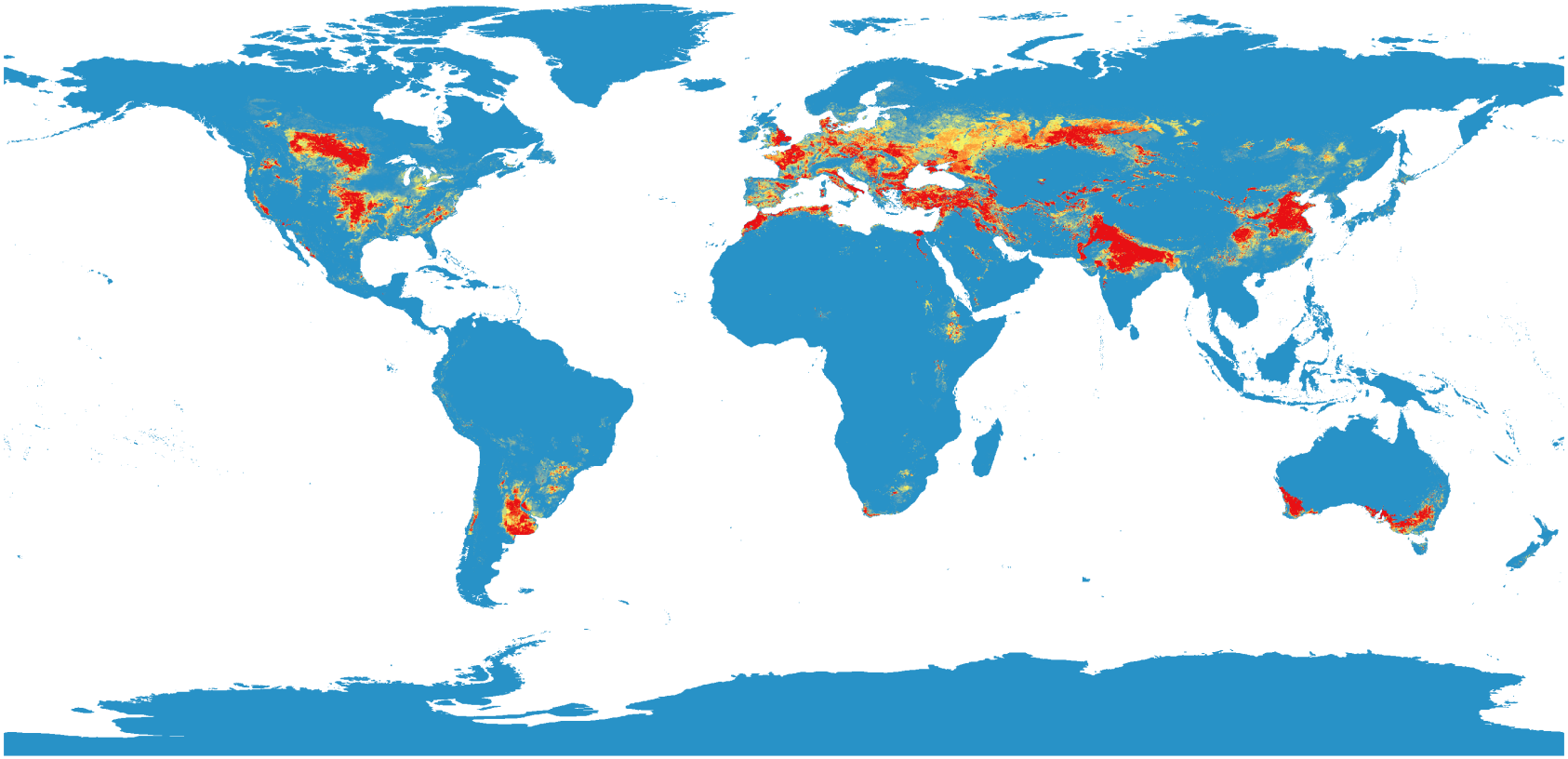
Credit: Statistics Canada

Ethiopia

Credit: Tasso Adamopoulos

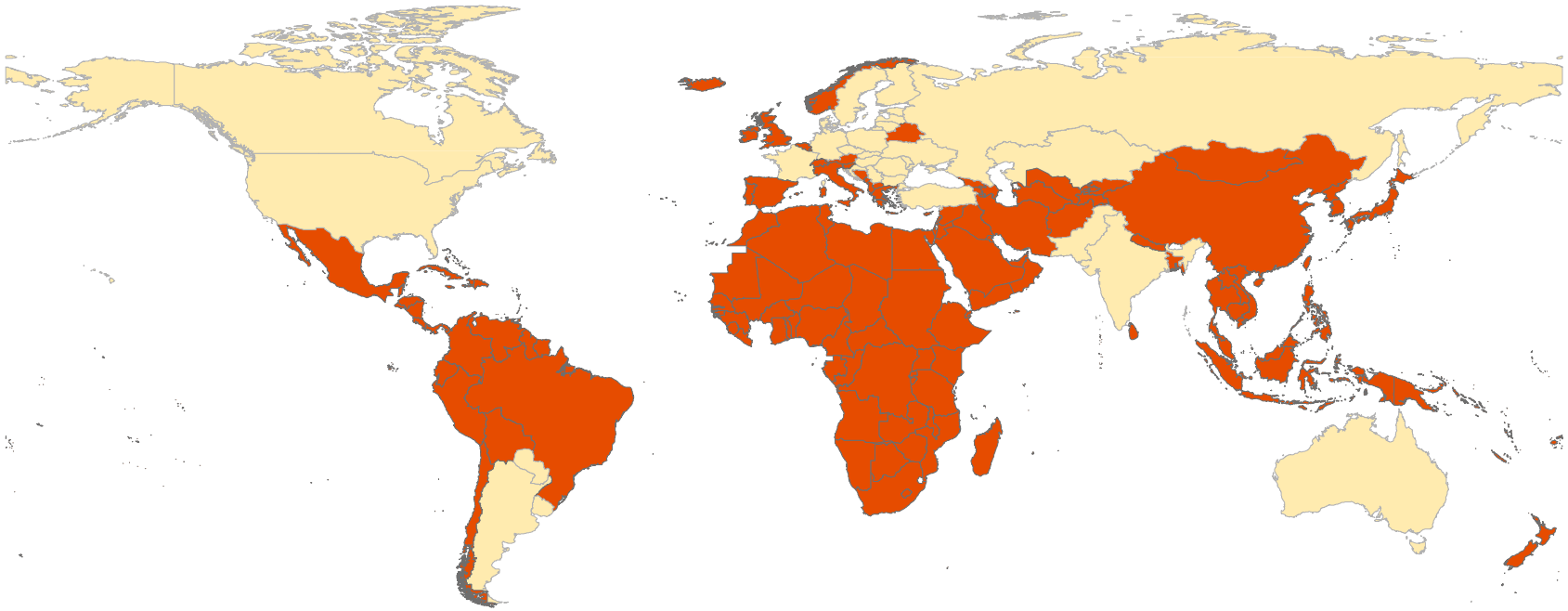
Global Wheat Production

Harvested Land - Wheat, Global Agro-Ecological Zones (GAEZ), FAO.



- Wheat is produced in a handful of places.

Global Wheat Trade



Yellow - Net Exporters; Orange - Net Importers.
Data from Food Balances - Wheat, FAOSTAT, FAO.

- Most countries are net importers of wheat.

Trade-related risks

- Reliance on imports exposes countries to significant *trade risks*:
  - geopolitical risks
  - trade policy uncertainty
  - shipping & insurance cost shocks
  - exporter production shocks
  - supply chain disruptions
  - climate change
- Food crises raise volatility in the import cost of food.
- Trade disruptions can cut-off supply altogether.

Why this matters

- Food is essential in consumption $\rightarrow$ trade disruptions can be devastating for food security and welfare.
- Trade risk can re-shape the global distribution of production and trade.
- Food security is a key policy objective.
  - UN *Sustainable Development Goals*.
  - Protection of domestic agriculture.
  - Food sovereignty programs.

Question: Is there a reliance-resilience trade-off?

This Paper

1. Document evidence on food security, import reliance, and policies.
    - Micro-evidence from impact of Ukraine-Russia war.

2. Develop a global trade model with risk and food as a necessity.

3. Stress-test global production and trade to an abrupt trade disruption.

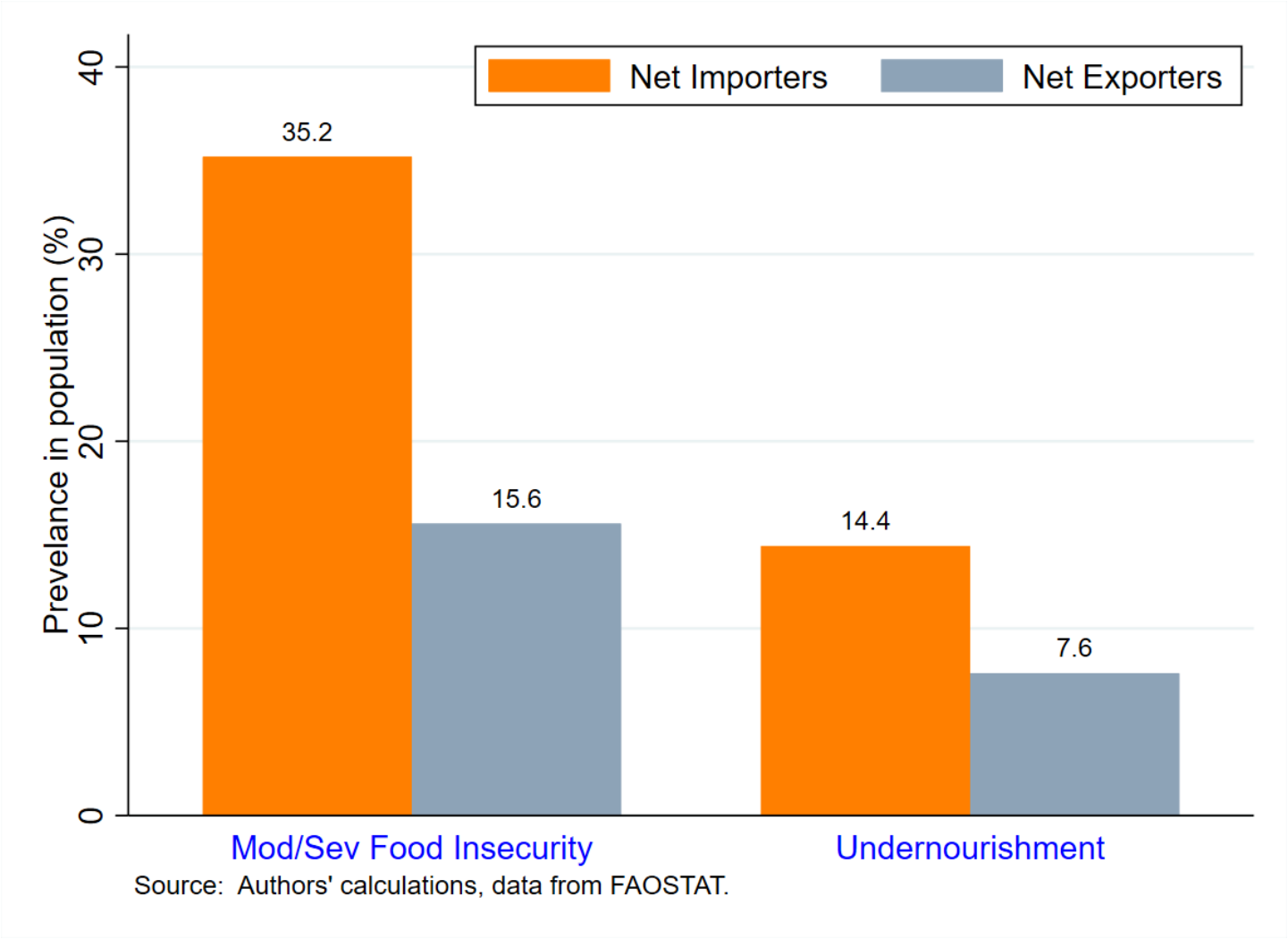
4. Novel resilience motive for policy in mitigating trade risk exposure.
    - Role of agricultural productivity improvements.

Key Messages

- Trade is essential but risky for food security.
- Import reliance creates vulnerability to disruptions.
- Policy protection can act as insurance, but it is costly.
- Productivity growth can reduce reliance and improve food security.

Import Reliance, Food Security and Policy

Measures of food insecurity by trade status



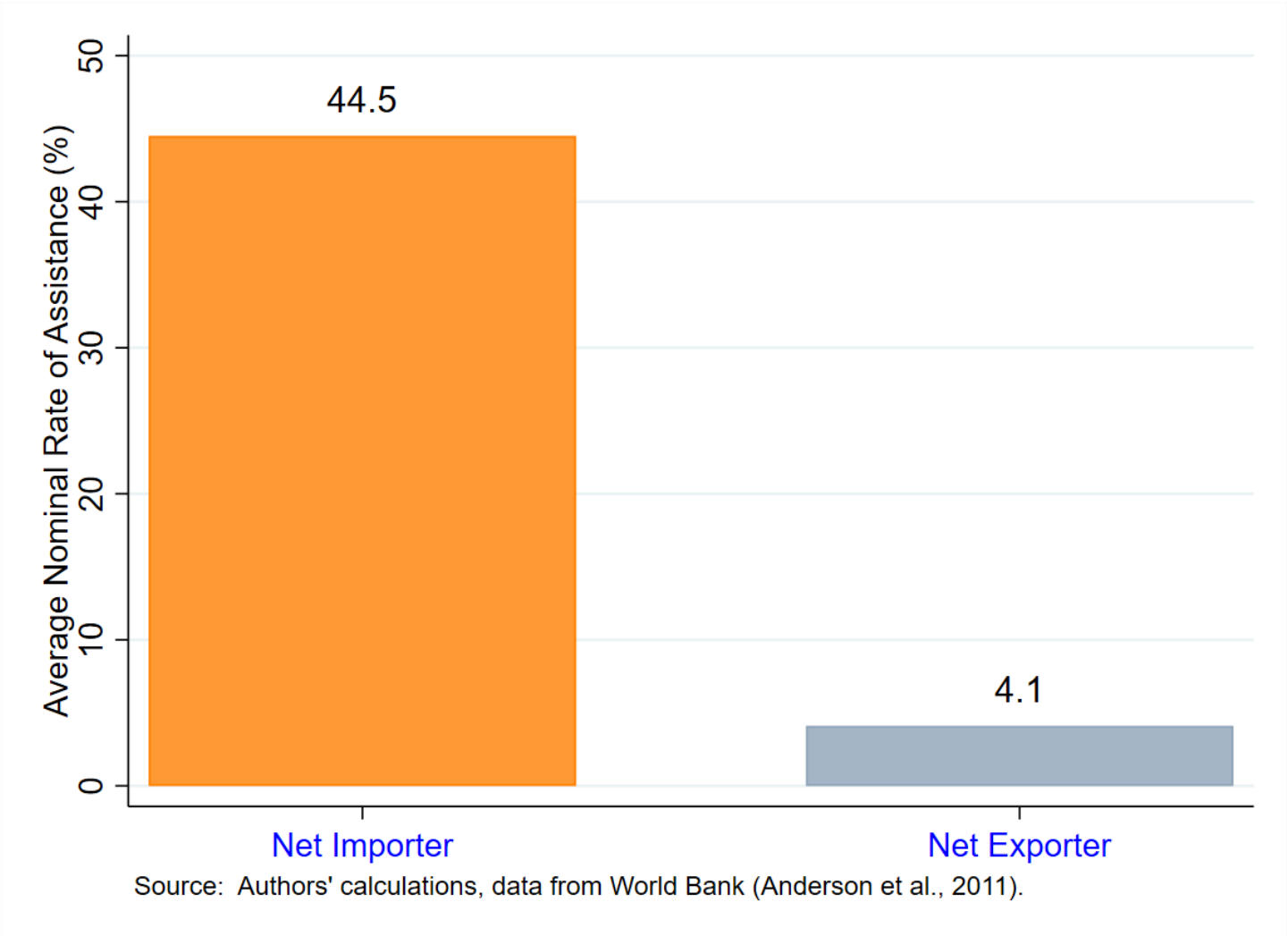
- Net importers have substantially more food insecurity by any metric.

Do trade disruptions matter for food security at the micro-level?

- Ukraine-Russia war $\rightarrow$ abrupt trade disruption for importers of food staples in Africa.
- Ethiopia application: use geographic variation of exposure prior to war.
- Data: World Bank's *High Frequency Phone Survey, Ethiopia, 2020-2023*.
- Two measures of food insecurity:
  - "ate only few kinds of foods"
  - "ate less than thought they should"
- Finding: significant decline in food security in more exposed districts.

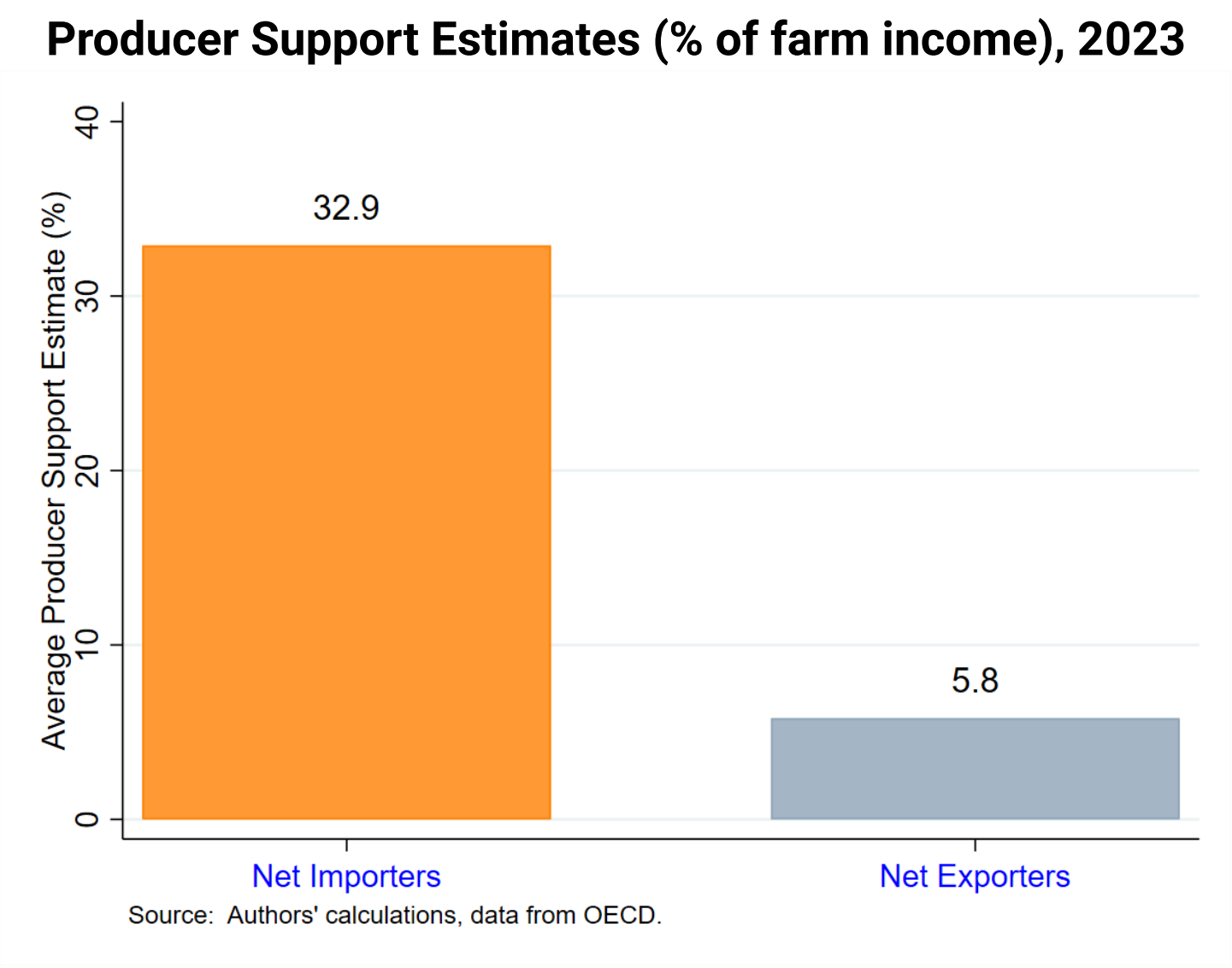
Agricultural Protection: Nominal Rate of Assistance

Nominal Rate of Assistance by Product-Country, Avg. 2000–2011



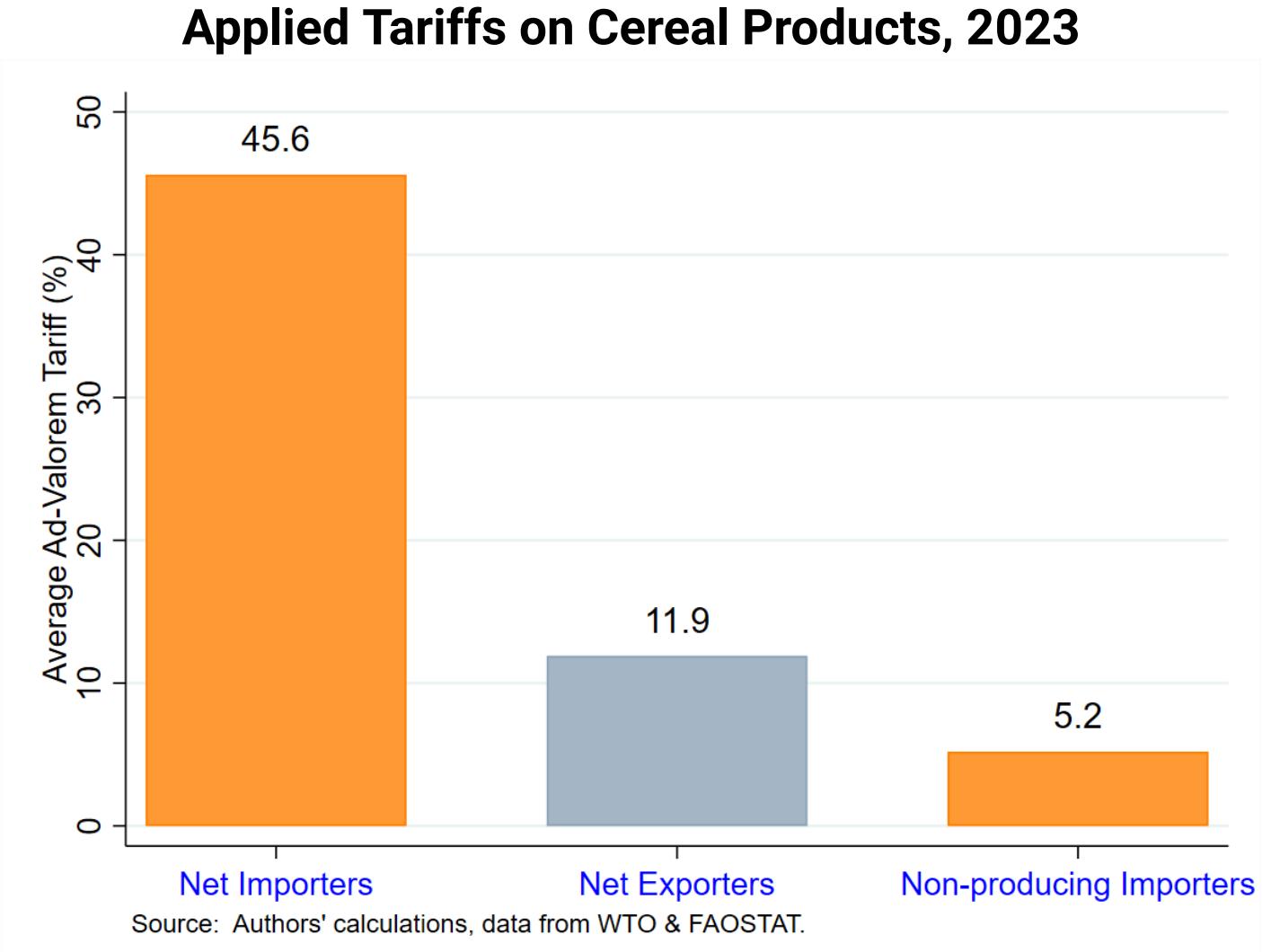
- Import-competing agricultural products much more protected.

Agricultural Protection: Producer Support Estimates



- Net importers of food systematically protect agriculture.

Agricultural Protection: Tariffs on Cereals



- Cereal importers impose higher tariffs on cereals, unless they cannot produce them domestically.

Model of Trade Risk

Framework

Ingredients:

- Global model of international trade with multiple goods.
- Food is a necessity for consumers.
- Import decisions subject to trade risk $\rightarrow$ trade can be disrupted.

Importers face a **risk-return trade-off** when sourcing food internationally:

- balance cost against the risk of losing access
- diversification towards lower risk imports $\rightarrow$ “friend-shoring”
- when possible, shift to domestic production $\rightarrow$ “re-shoring”

Optimal Policies

- Mis-alignment between public-private risk assessment.
- Policy interventions to mitigate exposure to international trade risk.
- Focus on wide-spread unilateral policies of food importers:
  1. Subsidies to domestic farmers.
  2. Tariff on food imports.
- Optimal policy chosen to maximize expected consumer welfare.
- Novel Resilience motive: design policy to *insure* domestic consumers against abrupt import disruptions.

Quantitative Analysis

Estimation Strategy

- Estimate model w/o risk to sectoral patterns of production and trade.
- Implementation:
  - 3 sectors: **a**griculture, **m**anufacturing, **s**ervices
  - 71 countries: population $\geq$ 1 mil.
  - Data: OECD's TiVA; UN's FAOSTAT & ICP; World Bank's WDI
- Match for each country:
  - **Bilateral trade flows**: by sector.
  - **Domestic sectoral structure**: production; expenditure shares; rel prices.
  - **Size**: population; GDP per capita.
- Stress-test global economy to a 10% chance of a trade disruption.

Average Effects of Trade Risk by Food Import Status

- $\downarrow$ trade $\rightarrow$ self-insurance mechanism.
- $\uparrow$ domestic agricultural production for food importers.
- $\uparrow$ food insecurity $\rightarrow \downarrow$ welfare.

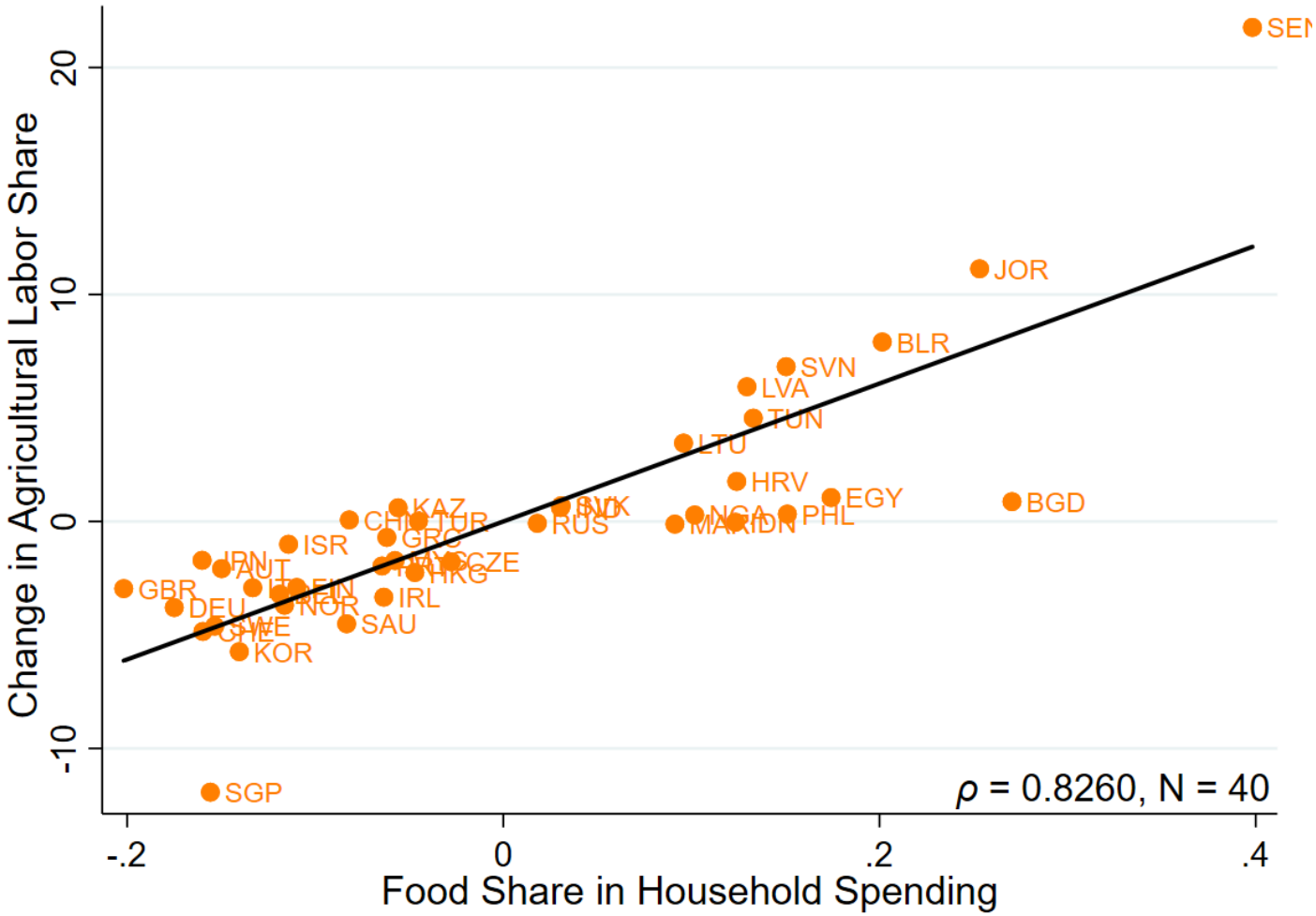
Implications for development and structural change

- Trade risk more detrimental for poor food importers
  $\rightarrow$ self-insure more.

- The shift to domestic production is larger for countries with high food expenditure shares.

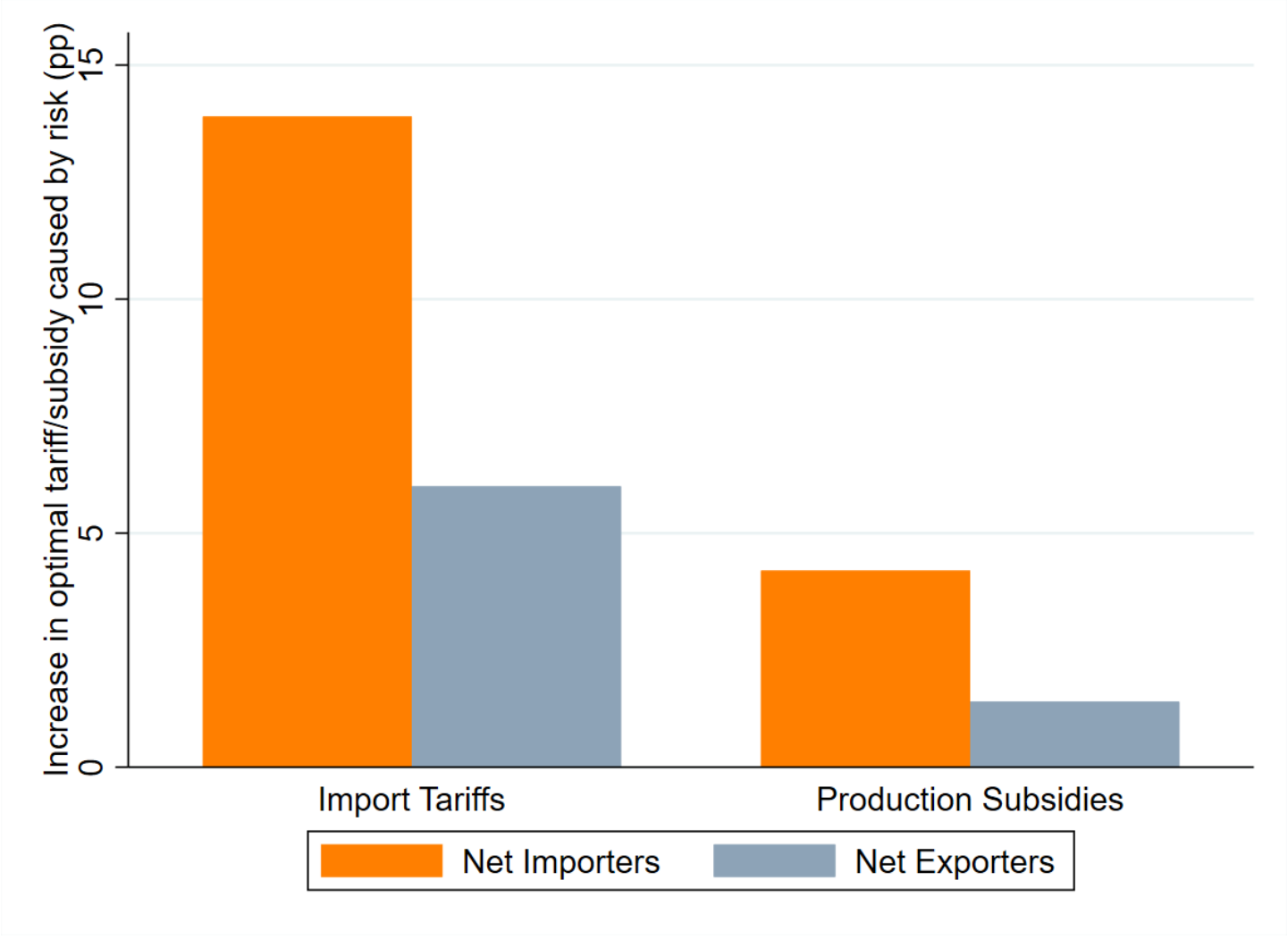
- Trade risk slows structural transformation by shifting activity toward subsistence agriculture.

Change in agricultural employment share - importers



- With risk, importers with high food expenditure shares raise domestic agricultural production more.

Optimal policy responses to risk



- Consistent with the data, under trade risk importers protect more.

Agricultural Productivity Improvements

- In practice, policymakers protect agriculture to achieve food security.
- Can increases in agricultural productivity relax the need for protection?
- We find that boosting productivity:
  - Improves food security.
  - Raises domestic production share of agricultural expenditure.
  - Reduces reliance on food imports.

Conclusions

Take-away

- Trade risk can significantly impact,
  - food security and welfare
  - trade flows and sectoral production structure
  - the pace of structural change
  - policy choices
- Protection in food-importing countries may operate as a costly *insurance* device.
- Productivity improvements can circumvent the need to protect.
- Perspective:
  - Trade risk relevant for other critical goods: energy, critical minerals, medical supplies, fertilizers, and other key inputs.
  - Trade risk can limit the gains from international trade.