The potential contribution of trade in food security

Fousseini TRAORE
International Food Policy Research Institute
Regional Office for West and Central Africa
Dakar, Senegal

WTO Symposium on "The role of trade in the global agri-food system"
Geneva | June 27, 2019

Introduction

- Food security has a lot of dimensions: production, access, utilization…
- For access, trade plays a critical role in linking deficit areas with surplus regions
- More trade is also likely to stabilize domestic markets
- However, the reliance on trade has been questioned in the wake of the 2008 food crisis (restrictions imposed by large food exporters)
- With climate change, major changes are expected in the agricultural sector
  - What are the impacts in terms of food security and welfare?
  - Is there any role for trade?

IFPRI

Outline of the presentation

- Role of trade in stabilizing domestic markets
  - Importance of production correlations
  - Illustration of the stabilization potential with examples from Africa
  - Bottlenecks
- The destabilizing effects of non cooperative trade policies
  - Theoretical aspects
  - Illustration from the 2008 food crisis
- Role of trade in managing food security risks from climate change
  - The likely impact of climate change
  - The role of trade in adaptation to climate change

IFPRI

Role of trade in stabilizing domestic food markets

- Trade can play a significant role in achieving food security
  - By raising the availability of food
  - And the ability of affected people to access food through induced effects on income
  - By stabilizing supply in domestic markets-> low and less volatile prices

- Regional trade is especially relevant
  - Reduced transactions costs, foreign exchange availability, dietary preferences…
  - When regional supply is more stable than domestic supply
  - Greater benefits if weak correlation of national production fluctuations

IFPRI

PRODUCTION INSTABILITY INDEX

- i $[j]$ — *A COUNTRY*
- CV_i — COEFFICIENT OF VARIATION IN THE SERIES OF A COUNTRY'S PRODUCTION QUANTITIES OF A COMMODITY OF INTEREST
- $\overline{R_i^2}$ — ADJUSTED COEFFICIENT OF DETERMINATION OF THE LINEAR TREND MODEL FITTED TO THE SERIES
- TCV_i $[TCV_j]$ — TREND-CORRECTED COEFFICIENT OF VARIATION IN COUNTRY PRODUCTION QUANTITIES
- n — NUMBER OF MEMBER COUNTRIES IN THE REGIONAL GROUPING OF INTEREST
- s_i $[s_j]$ — SHARE OF A COUNTRY IN THE REGION'S OVERALL PRODUCTION OF THE COMMODITY UNDER ANALYSIS
- r_{ij} — COEFFICIENT OF CORRELATION BETWEEN THE SERIES OF CEREAL PRODUCTION QUANTITIES IN COUNTRIES i AND j

- USE A TREND-CORRECTED COEFFICIENT OF VARIATION AS A MEASURE OF PRODUCTION INSTABILITY AT COUNTRY AND REGIONAL LEVELS
- FIRST, CALCULATE A TREND-CORRECTED COEFFICIENT OF VARIATION IN COUNTRY-LEVEL PRODUCTION

$$TCV_i = CV_i \cdot \sqrt{1 - \overline{R_i^2}}$$

- THEN, DERIVE A REGIONAL INDEX OF PRODUCTION INSTABILITY AS A WEIGHTED AVERAGE OF COUNTRY-LEVEL INSTABILITY MEASURES

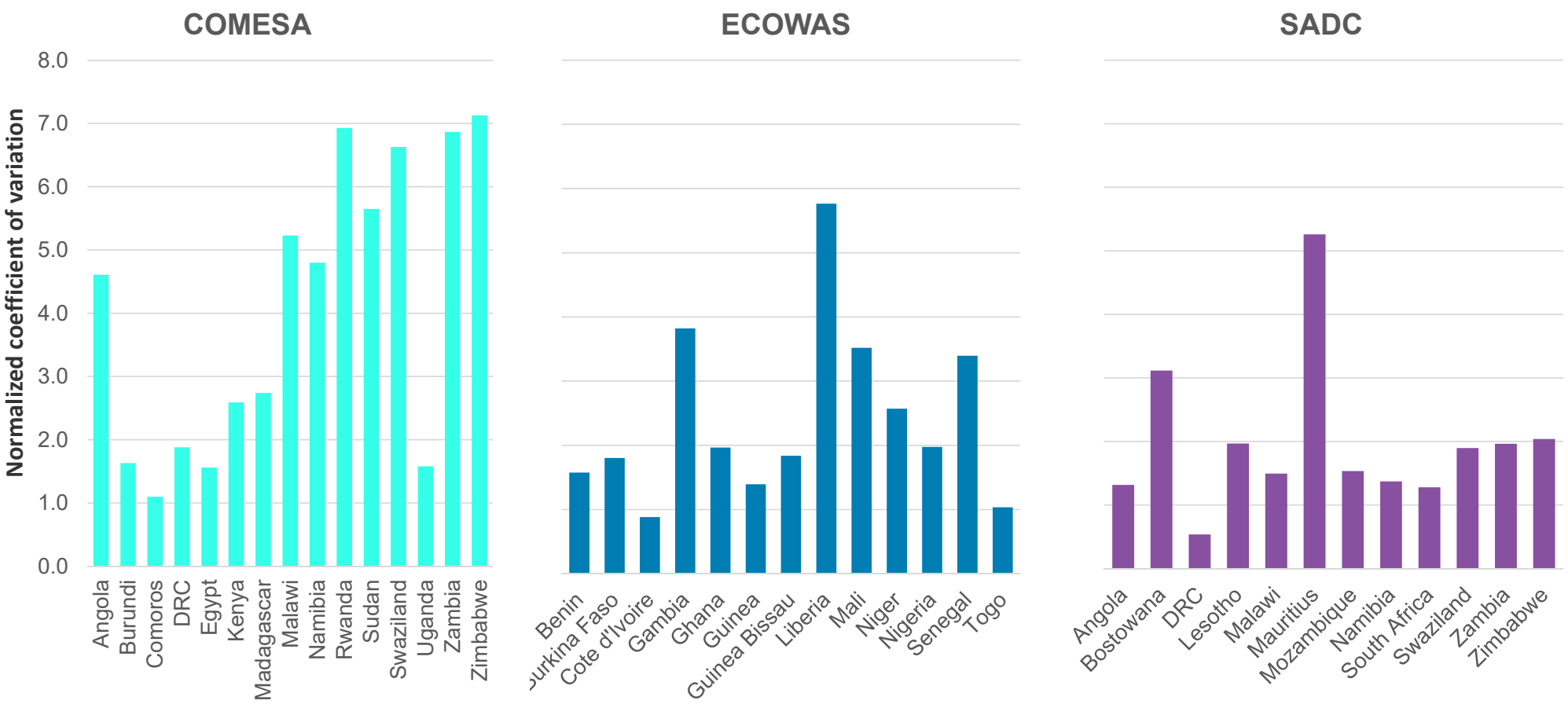
$$TCV_{reg}^2 = \sum_{i}^{n} s_i^2 \cdot TCV_i^2 + 2 \sum_{i<}^{n} \sum_{j}^{n} s_i \cdot s_j \cdot r_{ij} \cdot TCV_i \cdot TCV_j$$

- FINALLY, NORMALIZE PRODUCTION INSTABILITY MEASURE AT COUNTRY LEVEL BY DIVIDING IT BY THE INSTABILITY MEASURE AT THE REGIONAL LEVEL

$$Normalized\ TCV_i = {TCV_i} \Big/ \sqrt{TCV_{reg}^2}$$

IFPRI

CEREAL PRODUCTION INSTABILITY, 1980-2010



Source: Badiane et al. (2014)

CEREAL PRODUCTION INSTABILITY, 1980-2010 (CONT'D)

- For the vast majority of countries, national production volatility is considerably larger than regional level volatility.
  - Exceptions : DRC (SADC), Côte d'Ivoire (ECOWAS), but none in COMESA.
- A relatively low volatility subgroup comprising countries with $TCV_i < 2 * TCV_{reg}$: Burundi, Comoros, DRC, Egypt, and Uganda
- A high volatility subgroup including countries with $TCV_i > 5 * TCV_{reg}$: Malawi, Mauritius, Rwanda, Sudan, Swaziland, Zambia, and Zimbabwe.
- A moderate volatility subgroup including countries with volatility levels between the above two thresholds: Kenya and Madagascar (in COMESA), Botswana and Mauritius (in SADC), and Gambia, Liberia, Mali, and Senegal (in ECOWAS).

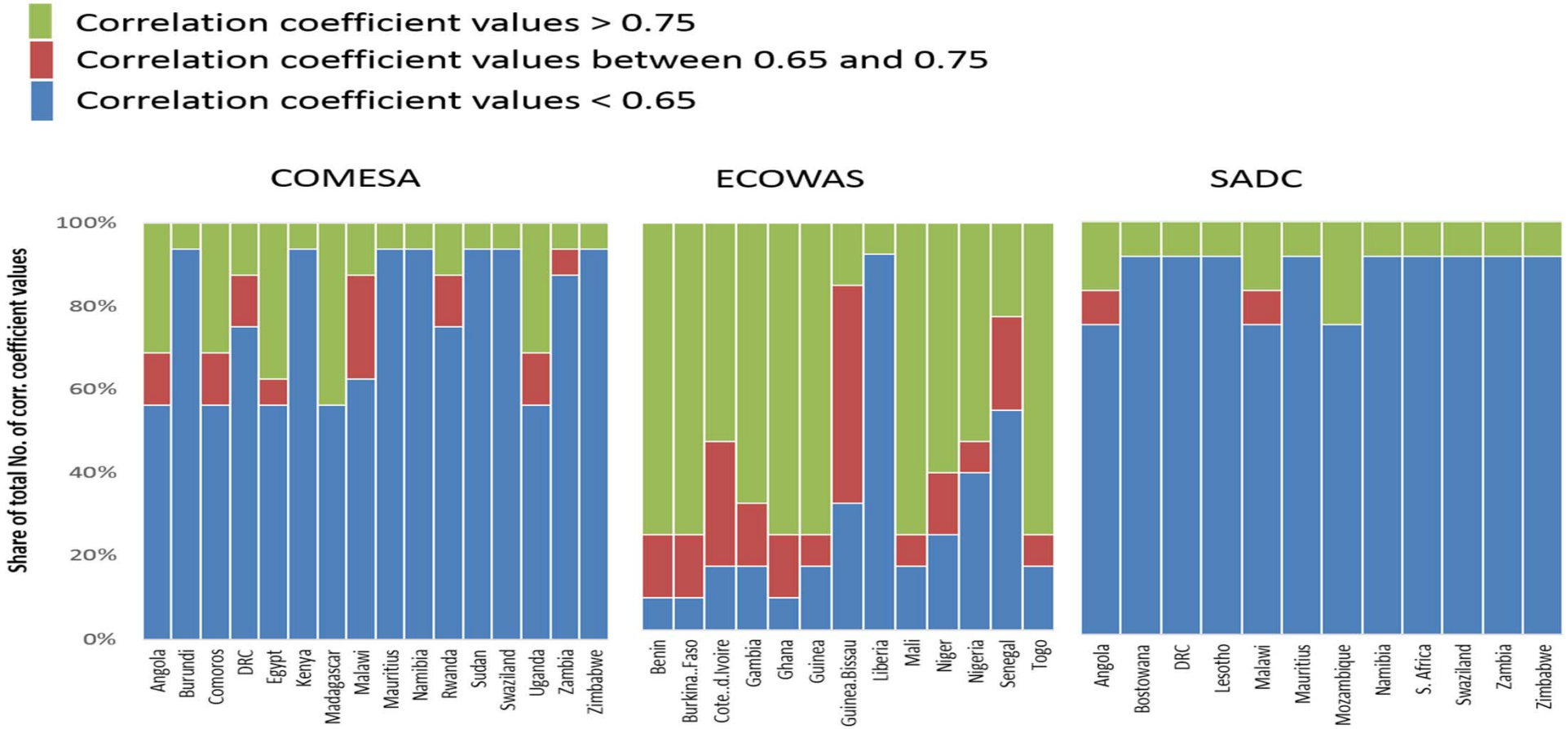
IFPRI

DISTRIBUTION OF CROSS-COUNTRY PRODUCTION CORRELATION COEFFICIENT VALUES

- Pearson's correlation coefficient r_{ij} between the series of production quantities of a country i and that of each of its neighbors j in the region
- For each country i, compute the share of r_{ij} values that falls in the following intervals
  - $r_{ij} < 0.65$ (Weakly correlated production fluctuations in i and j)
  - $0.65 \leq r_{ij} < 0.75$ (Moderately correlated production fluctuations in i and j)
  - $r_{ij} \geq 0.75$ (Strongly correlated production fluctuations in i and j)
- Identify countries with highest concentration of weak production correlation coefficient values.

IFPRI

ILLUSTRATION #2: DISTRIBUTION OF CEREAL PRODUCTION CORRELATION COEFFICIENTS, 1980-2010.



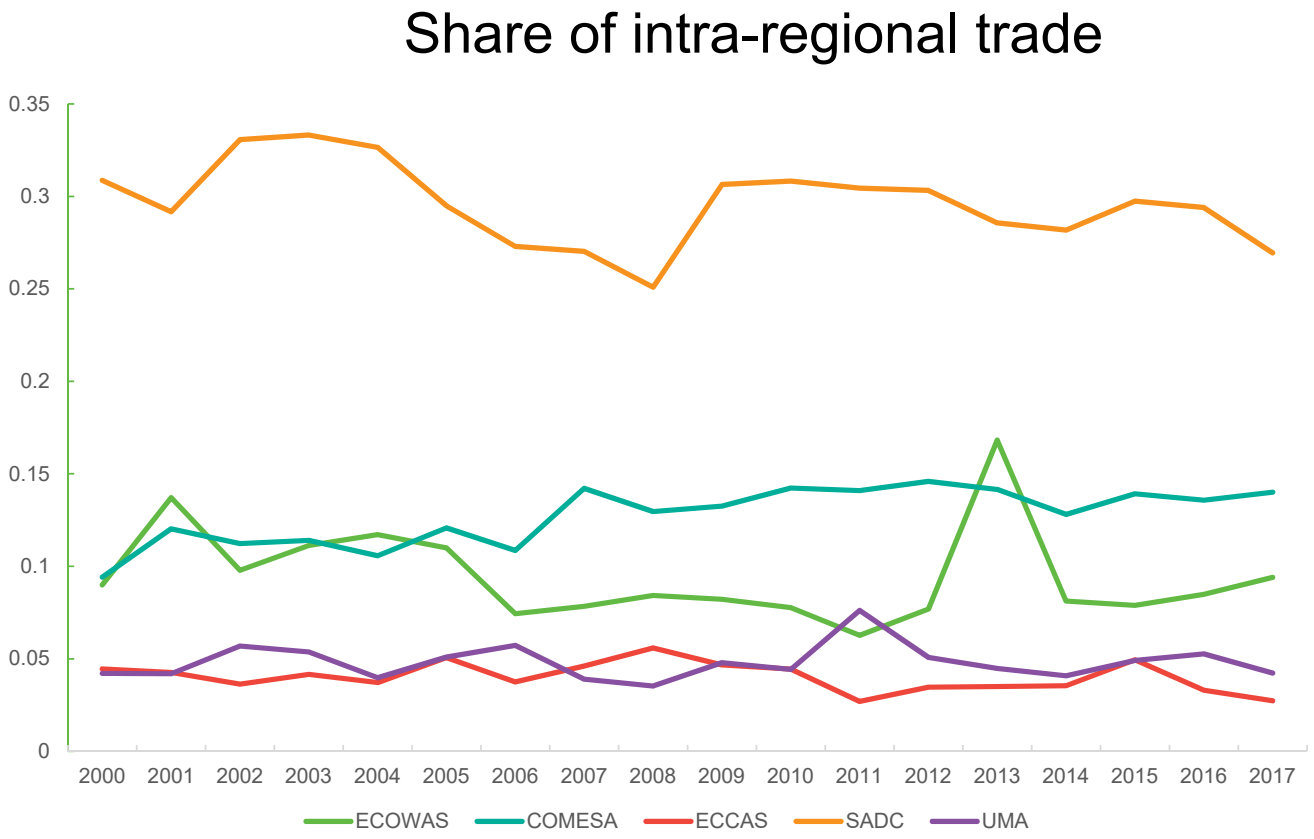
IFPRI

DISTRIBUTION OF CEREAL PRODUCTION CORRELATION COEFFICIENTS, 1980-2010 (CONT'D)

- SADC countries have the highest concentration of weakly correlated country production levels. Only three countries have less than 80 % share of correlation coefficients below 0.65.
- COMESA countries follow with at least 60 % of the correlation coefficients for any given country below 0.65.
- ECOWAS countries tend to fluctuate more together than the other two regions, as shown by the high share of coefficients above 0.75.
- Countries with moderate to high volatility and weak correlation would benefit the most from increased regional trade in terms of greater stability of domestic supplies.
  - Kenya, Malawi, Mauritius, Rwanda, Sudan, Swaziland, Zambia, and Zimbabwe (COMESA)
  - Botswana and Mauritius (SADC)
  - Gambia, Liberia, Mali, and Senegal (ECOWAS).

IFPRI

Yet intra-African trade of ag. products is low



Source: COMTRADE and author's calculations

IFPRI

Why?

- Many barriers exist (Bouet et al, 2018)
  - Intra-African tariffs -> highest in the world (8.62%)
  - Intra-continental tariffs on ag products: -> 2nd highest in the world (15.23%)
- Even in RECs with official liberalization, barriers are present
- Example in ECOWAS

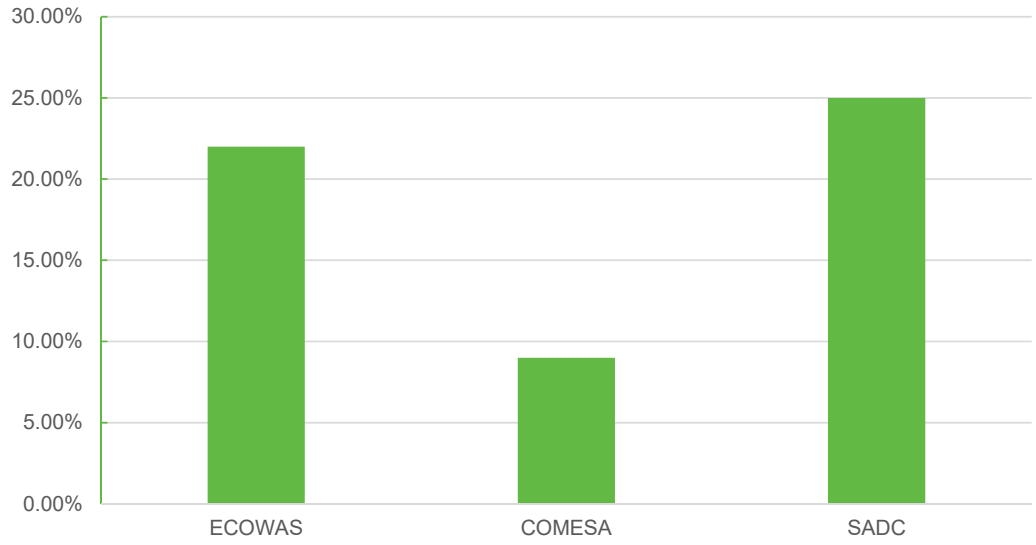
Commodity	Corridor	Countries	Distance (km)	Checkpoints (per 100 km)	Illegal payments (USD/100 km)
Maize	Bouake-Niamey	CIV-NER	1,371	3	18
Livestock	Ouaga-Accra	BFA-MLI	1,004	5	18
Rice	Bamako-Kouri	MALI-BFA	165	6	115
Millet/Sorghum	Koutiala-Dakar	MLI-SEN	1,722	4	41
Livestock	Kati-Dakar	MLI-SEN	1,350	4	26
Colanuts	Abidjan-Lagos	CIV-NGA	1,043	9	384

Source: CILSS (2018)

IFPRI

What is the impact of these barriers?

- Using a multimarket model (EMM), Badiane and Odjo (2014) found that a removal of all cross-border trade barriers in Africa would yield an increase in intra-regional trade of agricultural products by:



Source: Badiane and Odjo, 2014

IFPRI

Caveats

- Informal/non recorded flows are important

Intra-ECOWAS maize exports in 2016 in 1,000USD

	Burkina	Ghana	Mali	Niger
CILSS (1)	7579.98	1079.85	5038.72	13746.43
COMTRADE (2)	59.68	848.16	36.61	3029.63
Ratio (1)/(2)	127	1.27	138	4.54

Source: COMTRADE and CILSS

- Indicators such as intra-regional trade shares suffer from biases (Lapadre & Luchetti, 2009; Bouet et al, 2018; Traore et al., 2019)
  - Lack of benchmark
  - Absence of theoretical framework
  - Influenced by size of countries and geographic fragmentation

IFPRI

Negative impacts of Non cooperative trade policies

- Trade can contribute to reducing food insecurity by increasing food availability
  - But also increases countries' exposure to global shocks
  - With significant negative impacts on world prices
- 2008 food crisis
  - Large food suppliers implemented export restrictions, not to manipulate terms of trade per se, but to protect domestic consumers (to guarantee availability and low and stable prices)
  - Examples: Wheat in Russia, Rice in India…
  - Combined with reduction of import tariffs in large importing countries -> increasing world prices
  - Small net importing countries are the most affected: no terms of trade gain and cost in terms of public revenue

IFPRI

Illustration with the MIRAGE model (Bouet & Laborde, 2012)

- Global dynamic CGE model with 24 countries/regions and 23 sectors (13 ag. sectors)
- Includes net exporters and net importers of ag products
- Simulate a demand shock -> 10% increase in (world) wheat price (Base)
- Two scenarios implemented
  - S1: export taxes by net wheat exporters, such that the real domestic price of wheat is constant (S1)
  - S2: S1 + reduction in import duties in net importing countries
- World price of wheat increase by (base is reference) 17% under S1 and 41% under S2
- Welfare in West Africa decrease by -0.10% under S1 and -0.20% under S2

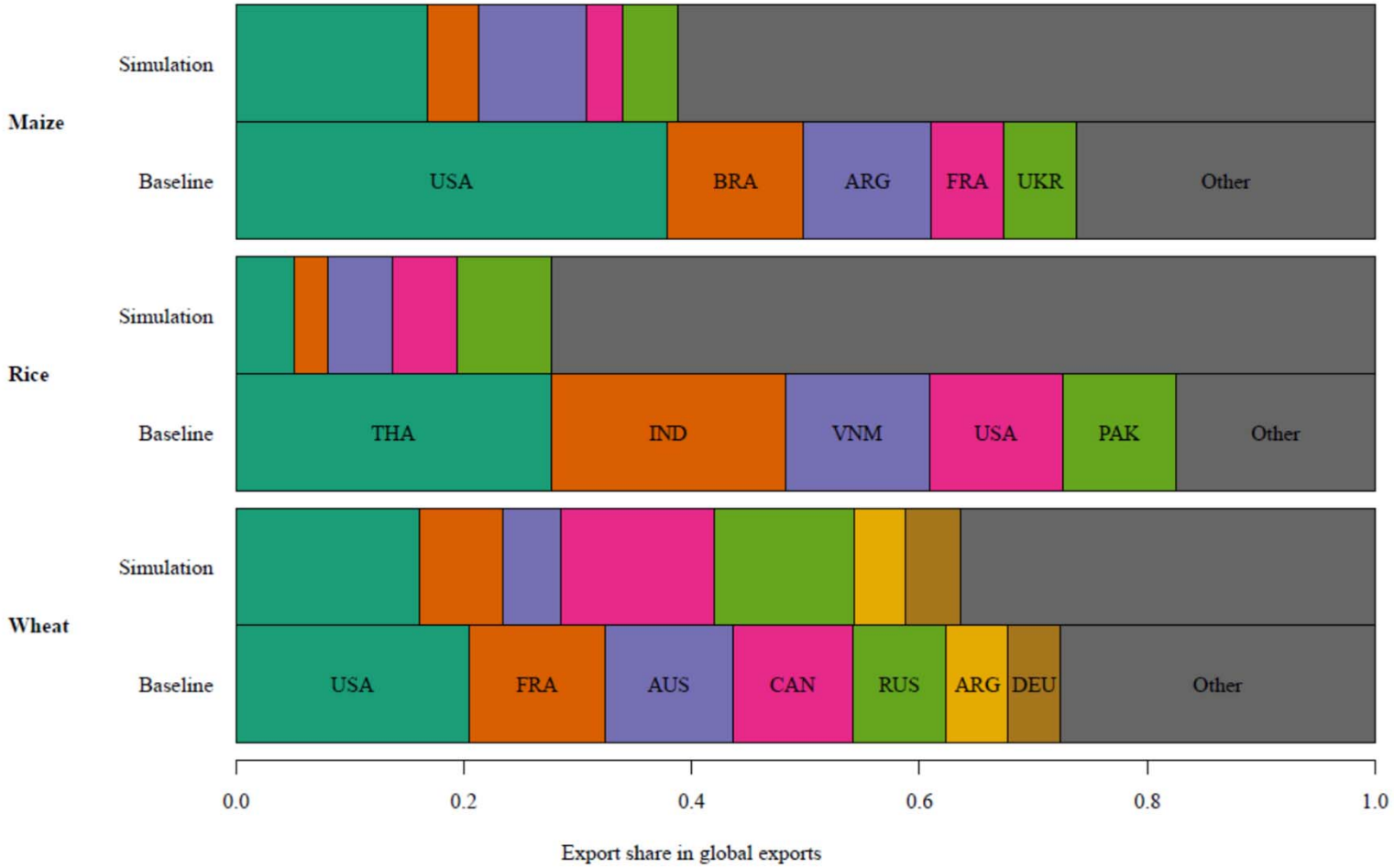
IFPRI

The impact of climate change (CC)

- CC is expected to impact food insecurity around the world (Parry et al., 2004; Nelson et al., 2009; Baldos & Hertel, 2015)
- Changes in temperature and precipitation -> yield changes -> comparative advantage and production changes with price increases and more volatility
- Redistribution of exports shares with changing comparative advantages
- CC will also cause more extreme events

IFPRI

Changes in export shares with CC (yields changes)



Source: Gouel & Laborde (2018)

What role for trade in adaptation to climate change (CC)?

- Trade has a potential to dampen the negative impact -> delivering goods to areas with declining productivity and reduce price volatility
- Baldos & Hertel (2015): the impact of CC on malnutrition in SSA could be reduced by 25% if world markets are fully integrated
- Gouel & Laborde (2018) challenging Costinot et al (2016): world welfare (Equivalent variation) is reduced by 1.36% without trade adjustment and by 0.58% with trade adjustment (resp. -16.35% and -0.63% for Sub-Saharan Africa).

IFPRI

Conclusion

- Trade is a double-edge sword for food security:
  - It increases the availability and diversity of food items
  - It can increase the resilience of domestic food markets to supply and price shocks
  - But non cooperative trade policies in periods of food crisis exacerbate the negative impacts for small net importing countries
  - Need more cooperation at the global level
- Climate change will induce major changes in the agricultural sector
- Uncertainties remain about the food security impacts
- However, consensus on the fact that more trade integration is needed to mitigate the negative outcomes

IFPRI