



**AgEcon** SEARCH  
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search  
<http://ageconsearch.umn.edu>  
[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

## **Achieving Climate Change and Environmental Goals without Protectionist Measures: Mission (Im)possible?**

**Fabio Santeramo, Emanuele Ferrari, and Andrea Toreti**

*Selected presentation for the International Agricultural Trade Research Consortium's (IATRC's) 2021 Annual Meeting: Trade and Environmental Policies: Synergies and Rivalries, December 12-14, 2021, San Diego, CA.*

*Copyright 2021 by Fabio Santeramo, Emanuele Ferrari, and Andrea Toreti. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.*

# Achieving Climate Change and Environmental Goals without Protectionist Measures: Mission (Im)possible?

Fabio Santeramo (University of Foggia and European University Institute)

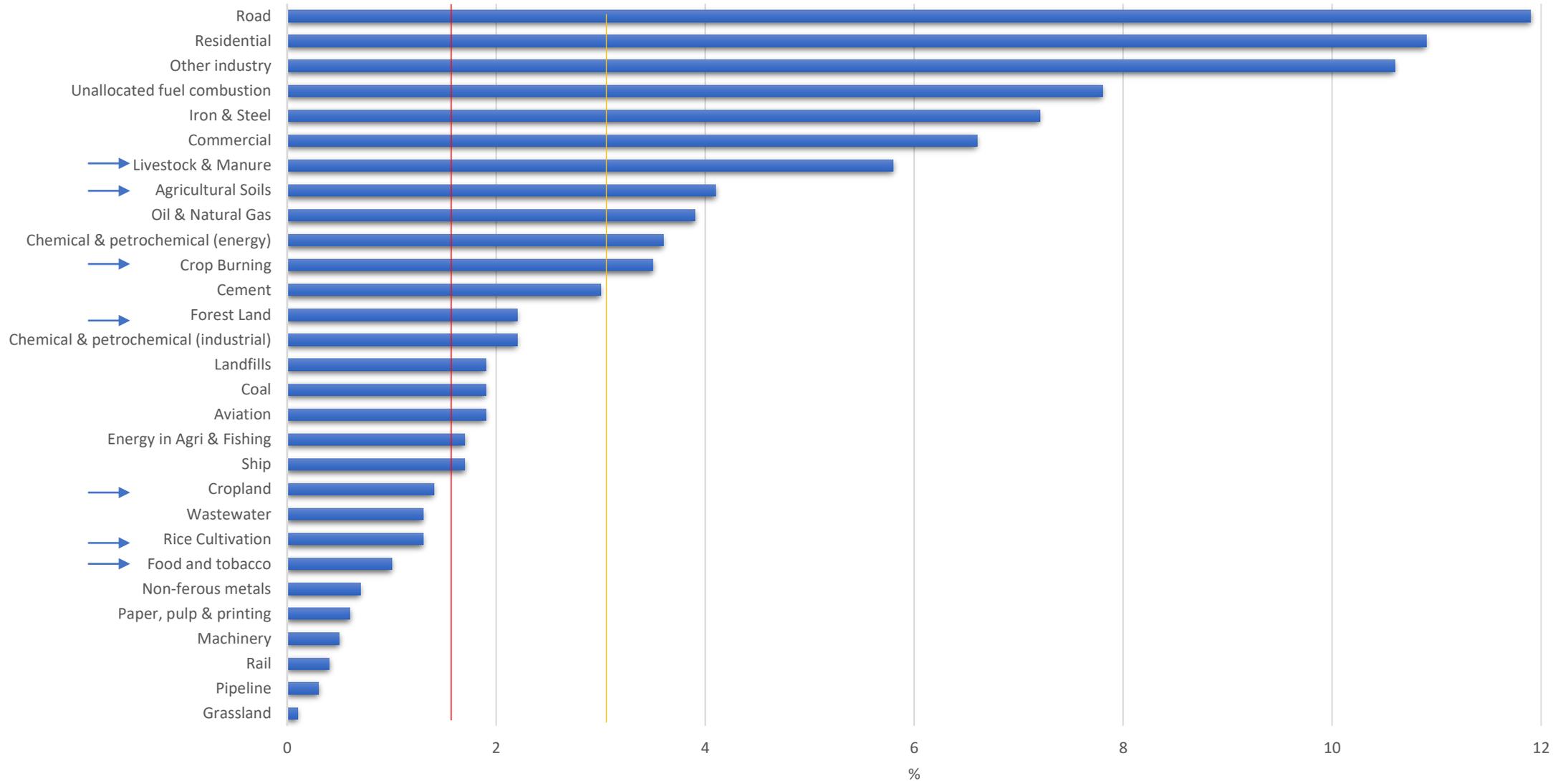
Emanuele Ferrari (Joint Research Centre, EU Commission)

Andrea Toreti (EU Commission)

*CP presented at the IATRC Annual Meeting*

12-14 December 2021

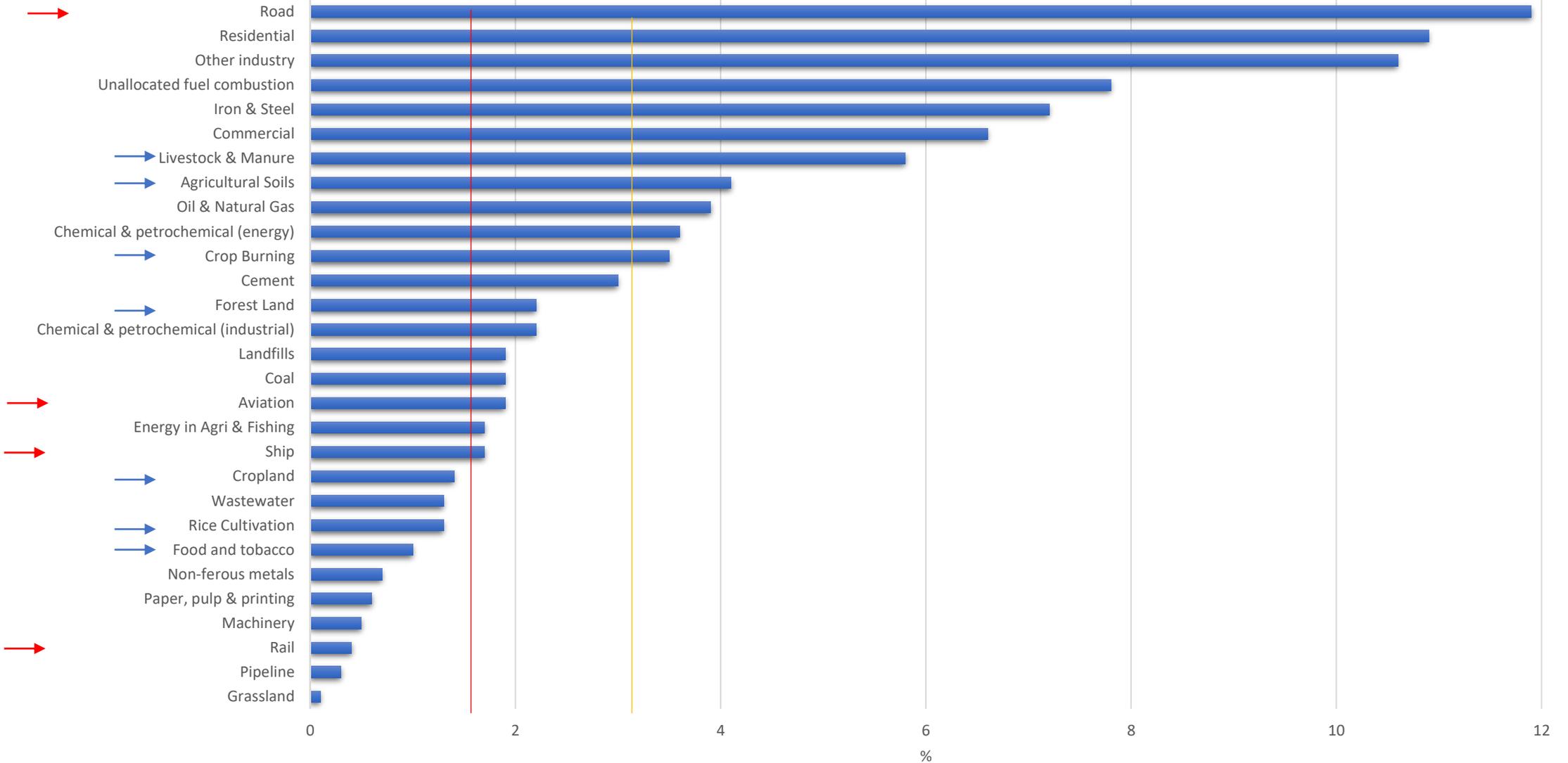
# Share of global greenhouse gas emissions



Average share of emissions: 3.4%

Median share of emissions: 1.9%

# Share of global greenhouse gas emissions



Average share of emissions: 3.4%

Median share of emissions: 1.9%

# The (work-in-progress) CP in a nutshell

*Fact:* Growing attention to the role of trade policies in helping to achieve environmental goals in the ag-food sector.

Investigate where **“the problem”** is (i.e. impacts of ag-food on the environment), and how trade may **help addressing** the problem (i.e. how we may lower the global impacts on the environment), through **trade policies** (w/out losing the welfare gains of trade)

Threats: global (re)distribution may be undesirable or inefficient (for production), or detrimental for the environment (carbon leakage, subsidies on dirty productions, “excessive” movements of goods), trade regulations and agreements

# Economics of CC and Trade (of Ag-food products)

1. CC alters comparative advantage (production)  
*yields & land use (well known mechanisms)*
2. Link w/ trade is indirect  
(mediated by production and comparative advantage)
3. Link w/ bilateral trade has not been (fully) investigated, yet

# Climate change and agri-food trade

- **trade** favors food reallocation from surplus to deficit regions (*FAO, 2018*)
- trade as **adaptation strategy: limited** (*Costinot et al, JPE 2016*) vs **crucial** (*Gouel & Laborde, JEEM 2021*)
- trade contributes to distributing climate **welfare impacts** (*Jones & Olken, AER 2010*)
- trade is an adaptation strategy **but also impacted by CC** (*Hsiang, AnnRevResEcon 2016*)
- relevant impacts on **agri-food trade –highly sensitive** (*Mendelsohn & Massetti, REEP 2017*)
- recent discussion in the HB of Ag.Econ, chapter on trade (2021)

# Impacts of climate change on global agri-food trade

Bozzola M.<sup>1</sup>, Lamonaca E.<sup>2</sup>, Santeramo F.G.

<sup>1</sup>Queens University Belfast (UK) and ZHAW Zurich (CH)

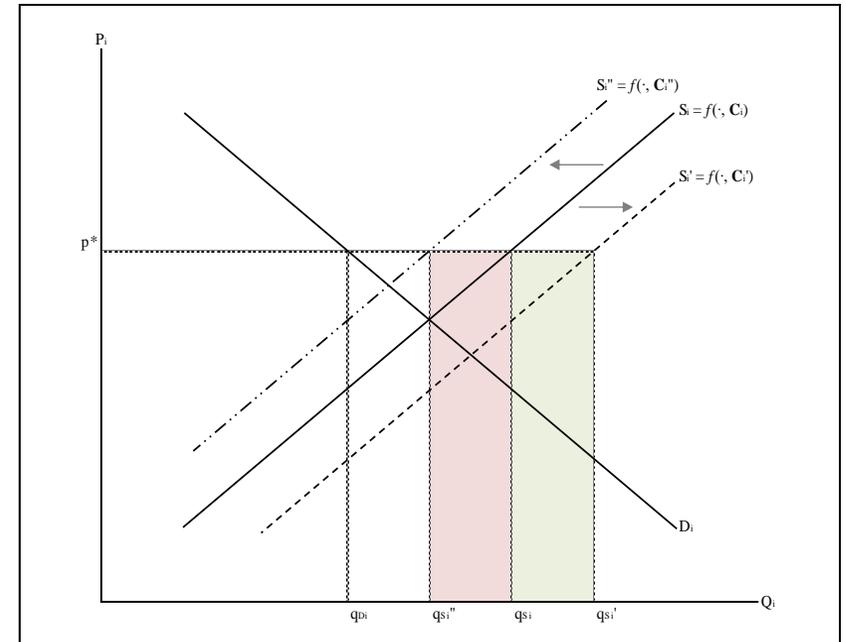
<sup>2</sup>University of Foggia (Italy)

## Changes in country's trade value due to CC

CC shifts  $S_i$  (but leave  $D_i$  unaffected)

Given exogenous  $p^*$  higher(lower) than domestic price

- if CC shifts  $S_i$  rightward, the value of exports increases (green area)
- if CC shifts  $S_i$  leftward, the value of exports decreases (red area)



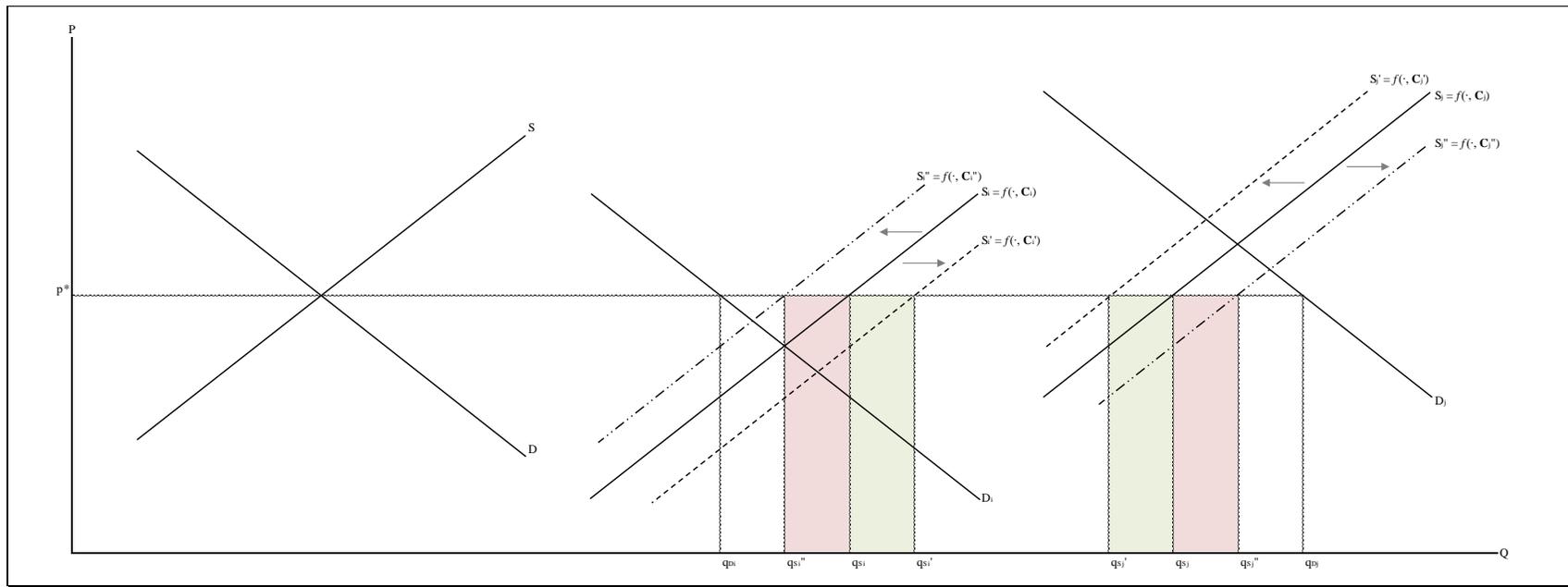
Shifts in country's aggregate agri-food supply due to CC alter trade values

# Impacts of climate change on global agri-food trade

Bozzola M., Lamonaca E., Santeramo F.G.

## Changes in the value of bilateral trade due to CC

- Exogenous  $p^*$ : higher than domestic price in  $i$ ; lower than domestic price in  $j$
- If CC shifts  $S_i$  rightward and shifts  $S_j$  leftward (green areas): bilateral trade increases
- If CC shifts  $S_i$  leftward and shifts  $S_j$  rightward (red areas): bilateral trade decreases



# Main findings

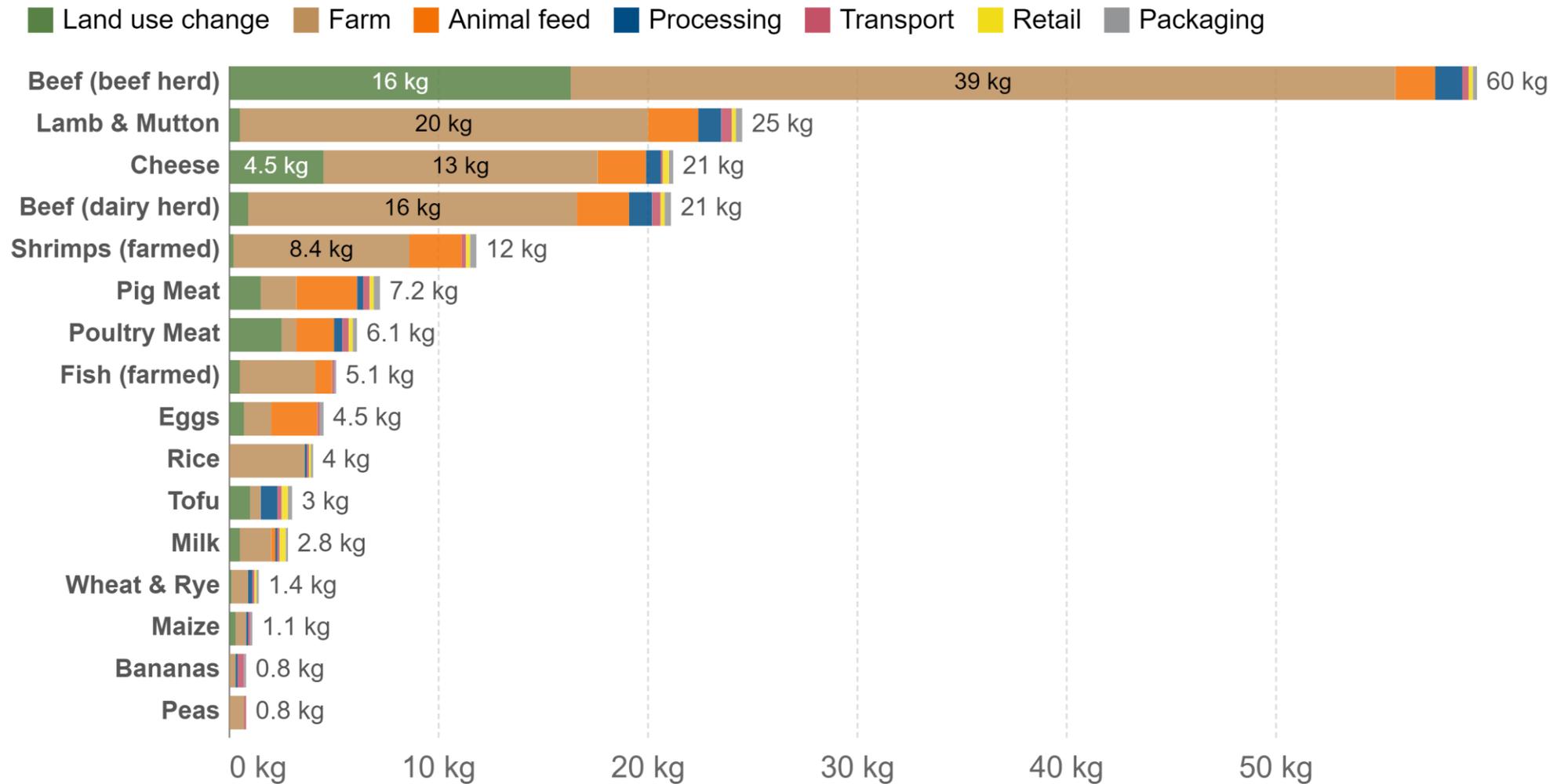
- Higher **temperatures** tend to increase exports
- Larger **differences in CC** tend to be **beneficial** for trade
  
- **CC impacts vary across countries** with different economic development
  - (i) Changes in temperature have more marked differentiated impacts for developed and developing exporters
    - Increases in temperature about 11% higher in developed than in developing countries:
      - ✓ agri-food products from developing countries generally better suited to warmer climates
      - ✓ most of net-exporters of agricultural produce (such as most of the developing exporters in our sample) may benefit from climate change (Gouel and Laborde, JEEM 2021)
  - (ii) Differences in CC matter for bilateral trade, and favor developed exporters
    - ✓ Substantial heterogeneity of climate impacts between developed and developing countries: this is consistent with findings of Dell et al. (AEJ 2012)

# Economics of CC and Trade (of Ag-food products)

1. CC alters comparative advantage (production)  
*yields & land use (well known mechanisms)*
2. Link w/ trade is indirect and complex (due to GVC)  
(mediated by production and comparative advantage)
3. Link w/ bilateral trade has not been (fully) investigated, yet  
(and need to take into account monologues or dialogues among countries)

# Food: greenhouse gas emissions across the supply chain

Greenhouse gas emissions are measured in kilograms of carbon dioxide equivalents (kgCO<sub>2</sub>eq) per kilogram of food. This means non-CO<sub>2</sub> greenhouse gases are included and weighted by their relative warming impact.



Source: Poore, J., & Nemecek, T. (2018). Reducing food's environmental impacts through producers and consumers. Science.

Note: Data represents the global median greenhouse gas emissions of food products based on a large meta-analysis of food production covering 38,700 commercially viable farms in 119 countries.

OurWorldInData.org/environmental-impacts-of-food • CC BY

# Who is "the polluter"?

## ...and when is pollution emitted ?

Table 1. Agri-food emissions and global value chain participation for top emitters.

	Emissions		Tot emissions production net of exports		Tot emissions exports	
	(A)	(B)	(A)	(B)	(A)	(B)
BRA	1,201	12	1,123	-2	78	14
CAN	194	9	119	-6	76	15
CHN	802	109	790	101	12	9
EUN	571	142	380	62	191	80
IND	775	24	760	24	15	1
→ IDN	923	7	907	7	16	0
JPN	46	37	45	34	0	3
RUS	181	42	138	36	43	6
← USA	539	142	444	57	95	86

(A) refers to upstream industries (i.e., farm-gate and land use change emissions, production and trade of raw agri-food products, domestic value-added agri-food products in the global value chain); (B) refers to downstream industries (i.e., food processing and packaging emissions, production and trade of processed agri-food products, foreign value-added agri-food products in the global value chain). Million tonnes of CO2 equivalent

Source: elaboration on data from FAOSTAT and WITS.

# Stylized facts: echo, for ag-food sector, the results of Copeland et al. (2021)

# 1: Industries more exposed to **trade** are **dirtier**

# 2: Different types of pollution are correlated

# 3: **Upstream** industries are **dirtier**

# 4: **Less productive** industries and countries are **dirtier**

# 5: Emission intensities are heterogeneous across countries and industries

# 6: Most emissions growth comes from developing countries

# 7: **Trade** accounts for a **sixth to a fifth** of pollution emissions

# 8: Developed countries are **outsourcing** pollution

# 9: **Technique and composition** account for a larger share of changes in emissions

# Stylized facts: echo, for ag-food sector, the results of Copeland et al. (2021)

# 1: Industries more exposed to **trade** are **dirtier** (less trade?)

# 2: Different types of pollution are correlated

# 3: **Upstream** industries are **dirtier**

# 4: **Less productive** industries and countries are **dirtier** (more technology? and less trade?)

# 5: Emission intensities are heterogeneous across countries and industries

# 6: Most emissions growth comes from developing countries

# 7: Trade accounts for a **sixth to a fifth** of pollution emissions

# 8: Developed countries are **outsourcing** pollution (less trade?)

# 9: **Technique and composition** account for a larger share of changes in emissions (less trade?)

# Stylized facts on AfGVC:

upstream and downstream production, trade and regulations

*# 10: Downstream industries more valuable*

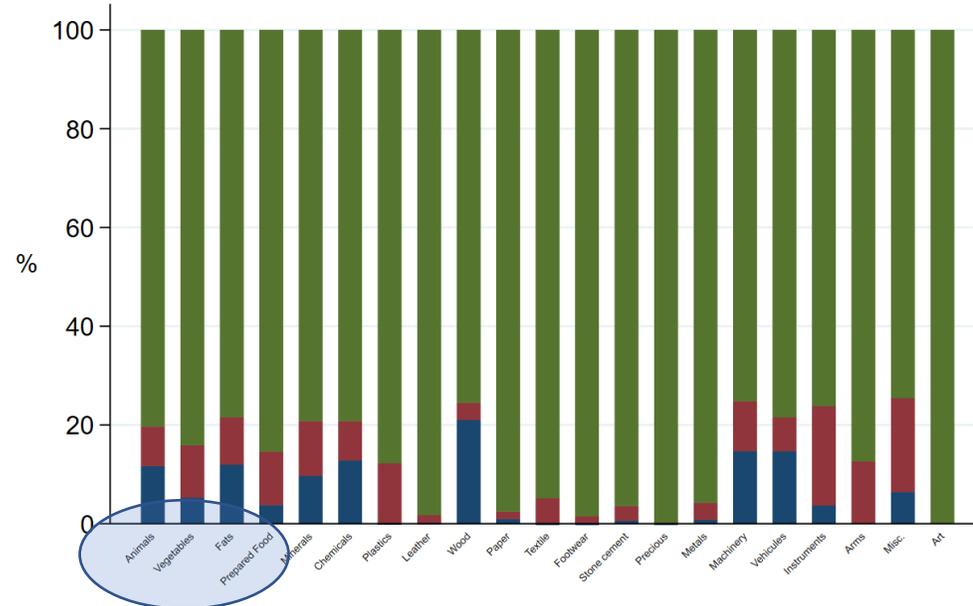
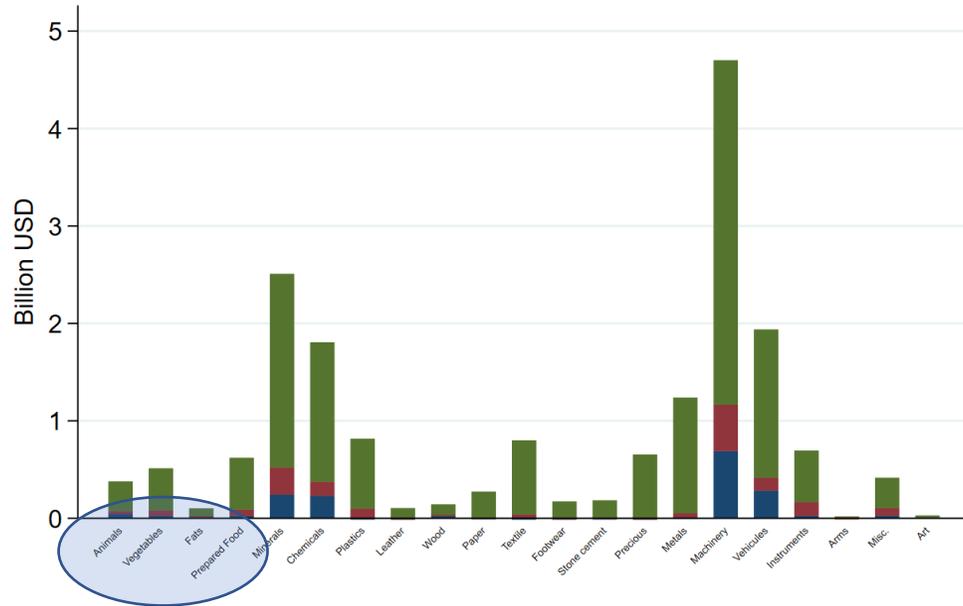
*# 11: Upstream industries benefit of domestic support and downstream industries more exposed to import tariffs*

*# 12: Developed economies tend to lead trade agreements and to include non-trade policy objectives such as environmental protection*

RTAs			RTAs co-signatories and PTAs beneficiaries									PTAs	
In force	Announced	Signatories	CAN	JPN	EUN	USA	RUS	IDN	IND	BRA	CHN	Providers	Scheme and countries
14	1	CAN										CAN	2 schemes 122 countries
18	2	JPN	in force AG, EP					beneficiary	beneficiary			JPN	1 scheme 132 countries
46	10	EUN	in force AG, EP	in force AG, EP				beneficiary	beneficiary		beneficiary	EUN	2 schemes 94 countries
14	1	USA	in force AG, EP		announced			beneficiary		beneficiary		USA	5 schemes 180 countries
12	2	RUS						beneficiary	beneficiary	beneficiary	beneficiary	RUS	1 scheme 153 countries
12	2	IDN		in force AG, EP	announced							IDN	
17	4	IND		in force AG, EP	announced			in force AG				IND	1 scheme 48 countries
9	2	BRA	announced					in force AG	in force AG			BRA	
16	3	CHN						in force AG	accession AG			CHN	1 scheme 42 countries

# On the Trade Effects of Environmentally Related Technical Measures (w/C. Emlinger and E. Lamonaca)

Notes: Environmental TBT in blue, other TBT in red, no TBT in green



Main takeaway: TBT tend to hinder trade, but TBT covering environmental issues are pro-trade

# (Ag) Trade-related policies

## National policies

### Subsidies

Domestic support

Export subsidies

## Trade policies

### Agreements

PTA

RTA

### Pricing policies

MFN tariffs

Bilateral Tariffs

### NTMs (focus on technical)

Multi

Bilateral

# The (work-in-progress) CP in a nutshell

Not all countries are contributing in the same way

Necessity to deepen the analyses on the prod-exp-(imp-process.-exp)-? chain

Need smartly integrated GVC

(possibly equally valid) instruments have different effect on trade

# Achieving Climate Change and Environmental Goals without Protectionist Measures: Mission (Im)possible?

Fabio Santeramo (University of Foggia and European University Institute)

Emanuele Ferrari (Joint Research Centre, EU Commission)

Andrea Toreti (EU Commission)

*CP presented at the IATRC Annual Meeting*

12-14 December 2021