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The Relative Importance of Global Agricultural Subsidies and Tariffs, Revisited

Erwin Corong

Selected presentation for the International Agricultural Trade Research Consortium's (IATRC's) 2023 Annual Meeting: The Future of (Ag-) Trade and Trade Governance in Times of Economic Sanctions and Declining Multilateralism, December 10-12, 2023, Clearwater Beach, FL.

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Global Trade Analysis Project

The Relative Importance of Global Agricultural Subsidies and Tariffs, Revisited

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Based on joint work with
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2023 IATRC Meeting
Clearwater Beach, Florida, USA (10-12 December 2023)



Presentation Outline

1. Background and context
2. Agricultural domestic subsidies
3. GTAP Data Base and Model
4. Model simulation results (Anderson, K., E. Corong, A. Strutt, E. Valenzuela (2023). The Relative Importance of Global Agricultural Subsidies and Tariffs, Revisited. World Trade Review, Vol 22.)
5. Summary and future directions

BACKGROUND AND CONTEXT

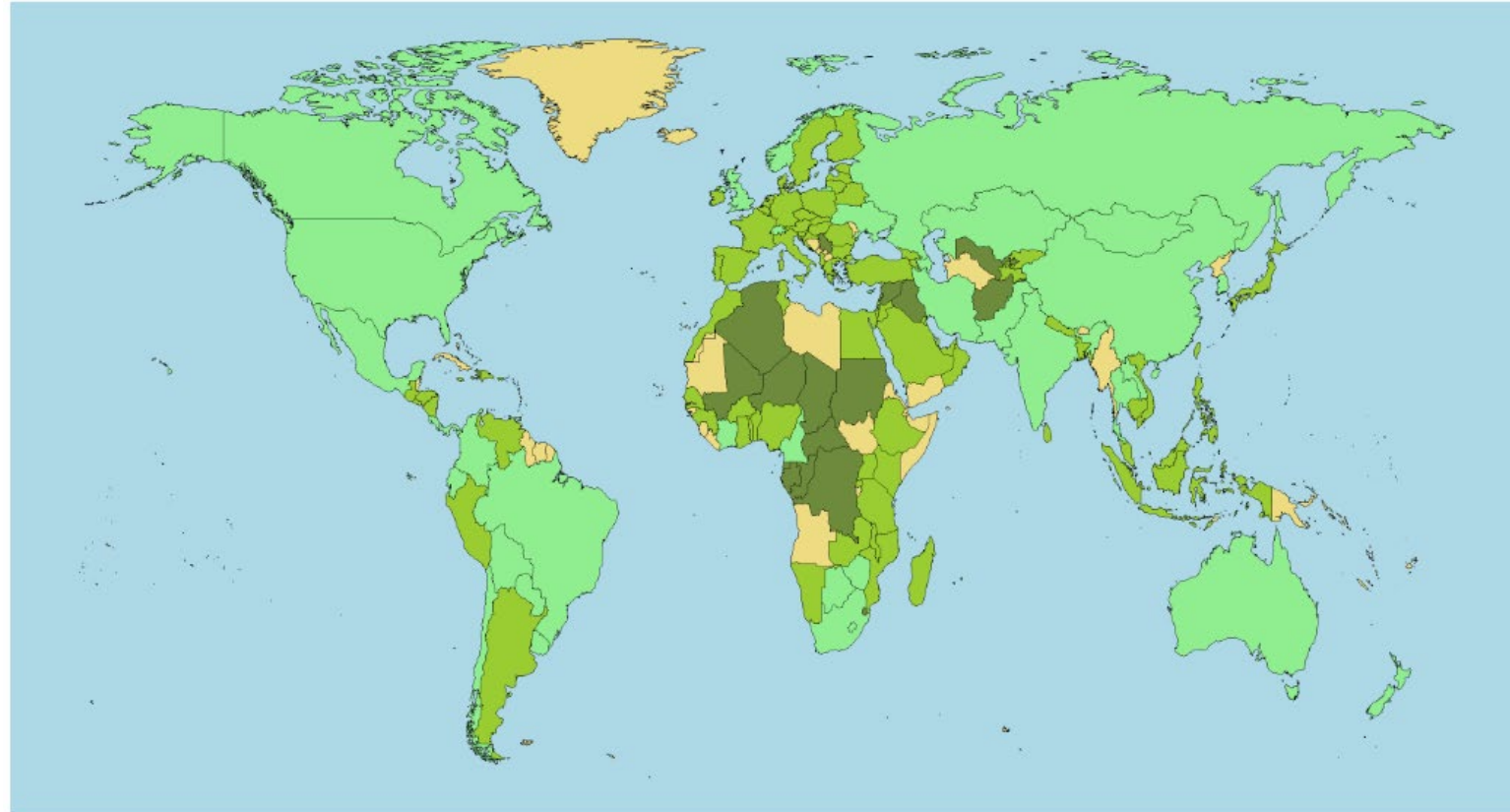
- **The economic effects of domestic agricultural subsidies differ by country and by commodity**
 - CGE modelling can capture the impacts within and between countries
- **Develop an augmented version of the standard GTAP version 7 model (Corong et al., 2017) called GTAP-DS**
 - Better equipped to examine the impacts of removing domestic agricultural subsidies
- **GTAP Data Base (Aguiar et al., 2022) with 2017 base year**

Contributions

- **Three main contributions:**

- 1. Modify the current net tax specification in the GTAP model**
 - Split subsidy and tax wedges, avoiding the problem of taxes and subsidies being combined
- 2. Recalibrate some domestic support in the GTAP Data Base to better target OECD data**
- 3. Compare 2017 estimates with those in 2001 by Anderson and Martin (2005)**

GTAP version 11 data (Regional Coverage)



■ New IOT ■ Updated IOT ■ Existing IOT ■ IOT part of regional aggregates

GTAP DB v11

- **141 countries + 19 composite regions**
 - 39 countries with updated IOTs
 - 20 new countries mainly from Middle East and Central Africa

Source: Aguiar, A., M. Chepeliev, E. Corong, and D. van der Mensbrugge (2022). "The GTAP Data Base Version 11".
Journal of Global Economic Analysis 7:2.

GTAP Data Base Release History

Release	Released	Regions	Sectors	Reference Years
GTAP 1	1993	15	37	1990
GTAP 2	1994	24	37	1992
GTAP 3	1996	30	37	1992
GTAP 4	1998	45	50	1995
GTAP 5	2001	66	57	1997
GTAP 6	2005	87	57	2001
GTAP 7	2008	113	57	2004
GTAP 8	2012	134	57	2004, 2007
GTAP 9	2016	140	57	2004, 2007, 2011
GTAP 10	2019	141	65	2004, 2007, 2011, 2014
GTAP 11	2023	160	65 (76, 96)	2004, 2007, 2011, 2014, 2017
GTAP 12	2024/25	170 (TBD)	65 (76, 100+)	2004, 2007, 2011, 2014, 2017, 2019

Standard Sectoral coverage (65 sectors)

Paddy rice	Coal	Wood products	Electrical eqpt.	Communication
Wheat	Oil	Pulp, paper etc.	Other mach. & eqpt.	Financial services
Other cereals	Gas	Refined oil etc.	Other manu.	Insurance
Vegetables & fruits	Other minerals	Pharmaceuticals	Electricity	Real estate
Oil seeds	Red meat	Other chemicals	Gas distribution	Other bus. services
Sugar cane & beet	White meat	Rubber & plastics	Water	Recreation etc.
Plant-based fibers	Vegetable oils	Other mineral prod.	Construction	Public Admin.
Other crops	Dairy products	Ferrous metals	W & R trade	Education
Beef etc.	Processed rice	Other metals	Hotels, rests. etc.	Health
Poultry, pork, etc.	Refined sugar	Metal products	Warehousing etc.	Dwellings
Raw milk	Other food	Mot. vehicles & parts	Land transport	
Wool etc.	Beverages & tobacco	Other trp. eqpt.	Sea transport	
Forestry	Textiles	Electronic eqpt.	Air transport	
Fishing	Clothing			
	Leather products			

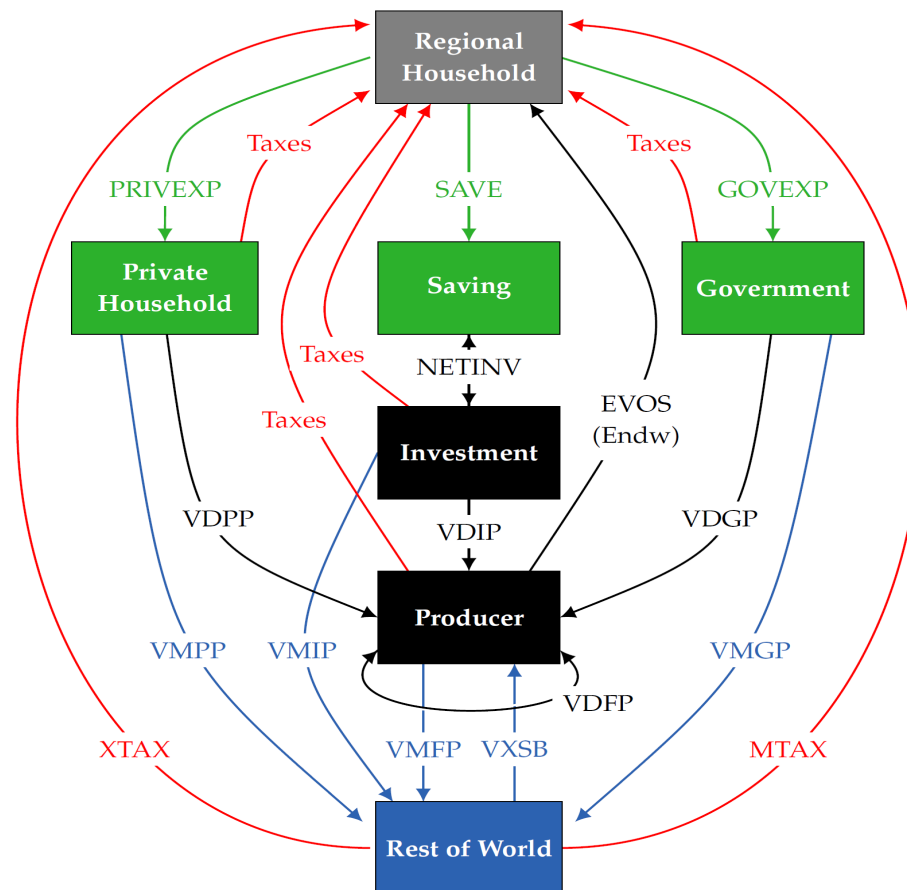
OECD PSE Data in the GTAP Data Base

- The GTAP Data Base includes domestic support from the OECD for 12 sectors and 28 regions (1 EU region but disaggregated for GTAP by EU-JRC)
- The data include payments based on output (A2), intermediate input payments (B1+B3) and factor payments (B2, C, D, and E)
 - For subsidies not tied to specific sectoral output, integration in the GTAP Data Base requires that assumptions be made to allocate these subsidies across sectors (Huang & Aguiar 2019; Boulanger, Philippidis & Jensen 2019).

Domestic distortions in the GTAP Data Base

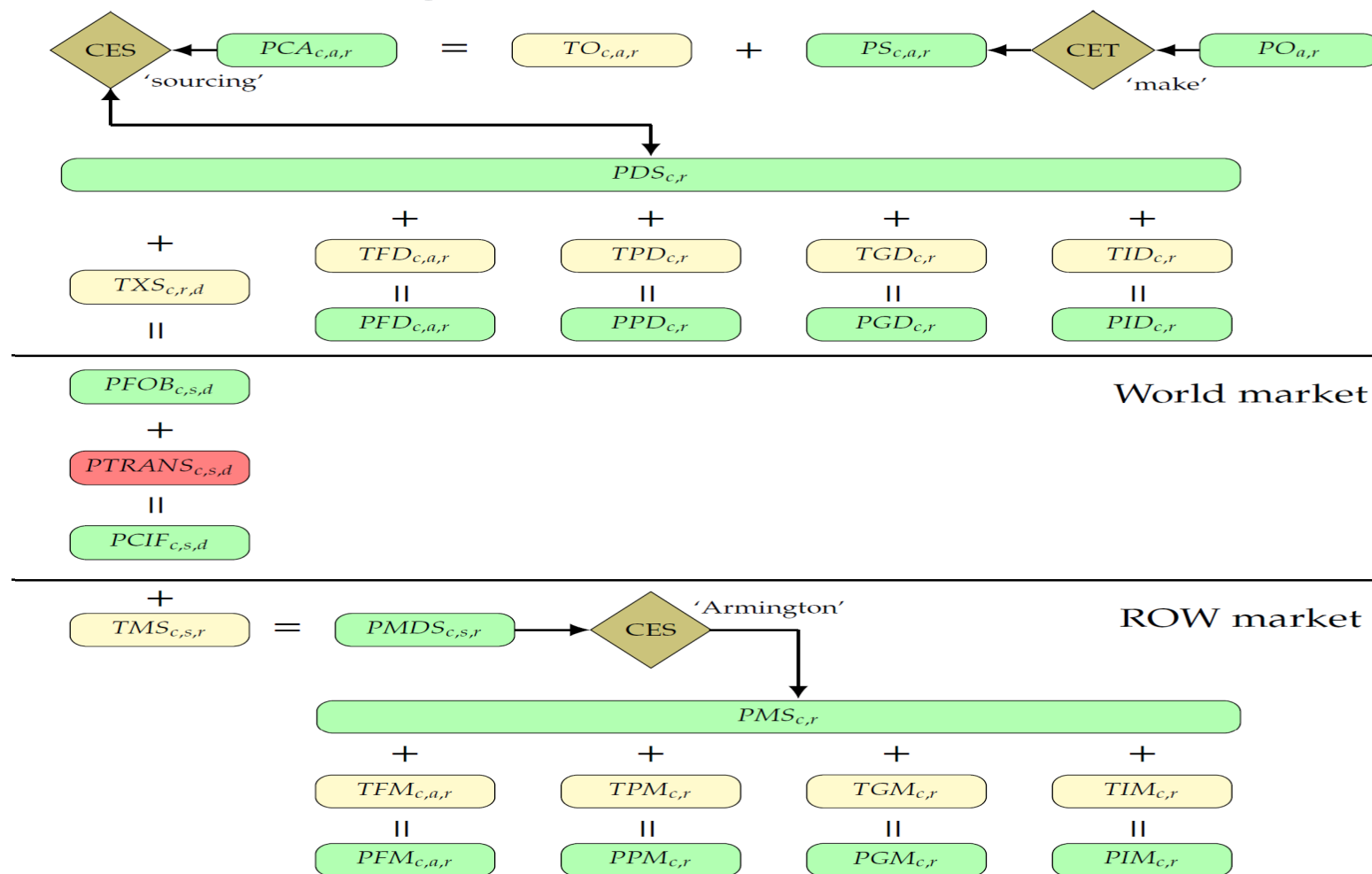
- **Factor endowment subsidies (FBEP) are available separately from factor taxes in the GTAP Data Base (FTRV)**
 - However, the standard GTAP model only reads in the net subsidy/tax: primary factor purchases at producer prices less purchases at basic prices (EVFP-EVFB)
- **Net Intermediate input and output subsidies (CSEP and OSEP) are available in the GTAP Data Base but the gross tax values for these headers are not included.**
 - This requires separating Domestic Support and IO table intermediate input and output tax flows from in data file.

GTAP CGE model: Circular Diagram



Source: Corong, E., T.W. Hertel, R. McDougall, M. Tsigas and D. van der Mensbrugge (2017). "The Standard GTAP Model, Version 7". *Journal of Global Economic Analysis* 2:1

Price Linkages in the GTAP model



Source: Corong, E., T.W. Hertel, R. McDougall, M. Tsigas and D. van der Mensbrugge (2017). "The Standard GTAP Model, Version 7". **Journal of Global Economic Analysis** 2:1

THE GTAP-DS (DOMESTIC SUPPORT) MODEL

- **Extended the standard GTAP model (Corong et al., 2017) code to separate subsidies from taxes**
 - Enabling us to directly target reductions in subsidies (rather than subsidies net of any taxes, as in the standard GTAP model code)
- **Changes cover all equations where agricultural domestic support measures are identified in the GTAP Data Base**
 - In this presentation, we only implement changes just for factor subsidies

Model code changes

- Separate out taxes and subsidies

```
Coefficient (ge 0)(all,e,ENDW)(all,a,ACTS)(all,r,REG)
    EVFS(e,a,r) # expenditure on endowment e by act. a in r at basic prices #;
Formula (all,e,ENDW)(all,a,ACTS)(all,r,REG)
    EVFS(e,a,r) = EVFB(e,a,r) + FBEP(e,a,r);
Equation E_pfes
# price of endowment e by a in r at basic prices + subsidy #
(all,e,ENDW)(all,a,ACTS)(all,r,REG)
    pfes(e,a,r) = peb(e,a,r) + tfes(e,a,r);
Equation E_pfe
# links basic and firm demand prices for mobile endowments #
(all,e,ENDW)(all,a,ACTS)(all,r,REG)
!    pfe(e,a,r) = peb(e,a,r) + tfe(e,a,r);!
    pfe(e,a,r) = pfes(e,a,r) + tfe(e,a,r);
```

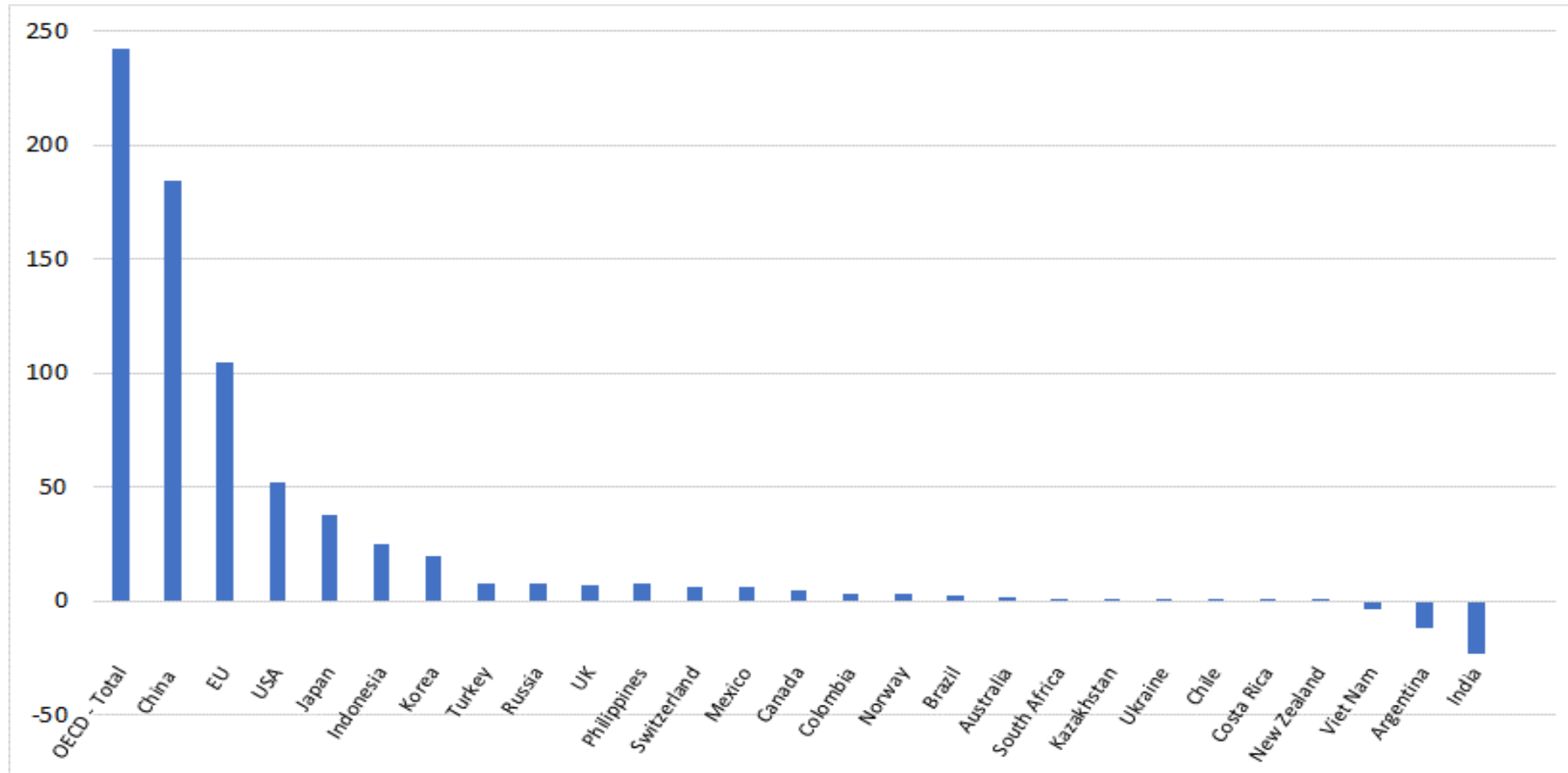
Modifying factor subsidies

- **Factor subsidies are by far the most important of the OECD subsidies integrated into GTAP**
 - More than 70% of total value of OECD factor, intermediate and output subsidies are included in the GTAP database
- **In the GTAP database, these factor subsidies (FBEP) are available separately from the factor taxes (FTRV)**
 - But in the model code they are combined as the difference between producer and basic prices, which includes both subsidies and taxes (i.e. $ETAX = EVFP - EVFB$)
- **The traditional way of modelling cuts to these subsidies is to assume ETAX to be a subsidy if it ends up negative and just eliminate these**
 - However, subsidies may be hidden in net taxes and net subsidies may be dampened by taxes, so this is not a very accurate means of eliminating subsidies
- **We have split factor subsidies and taxes in the model code, allowing us in simulations that only cut subsidies, to be much more accurate in our shocks.**

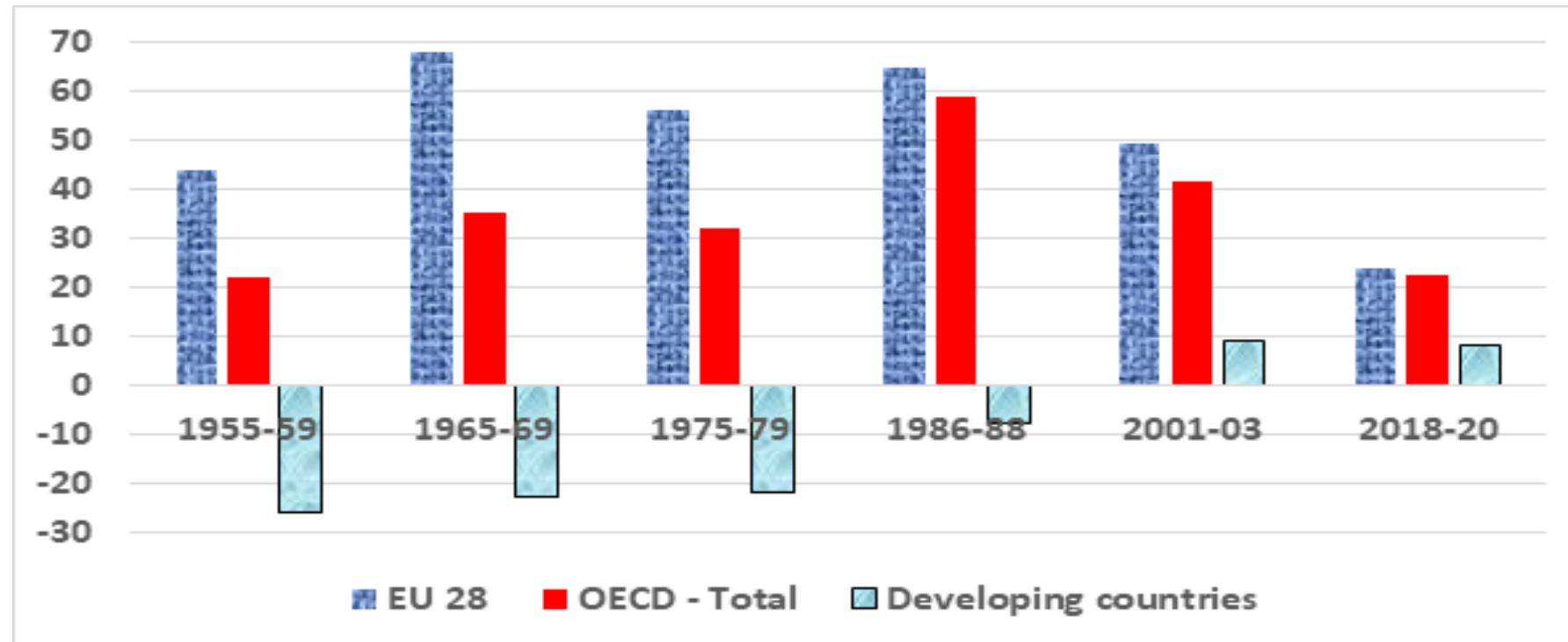
Research questions

- How important today are agricultural policies in the global cost of barriers to national goods markets?
- How important are domestic supports (the key item on the current agenda of the WTO's agricultural committee) in the global contribution of agricultural policies?
- To what extent are the global welfare costs due to high-income versus developing countries' policies?
- Compare results with previous studies

Aggregate value of agricultural assistance, by country, 2019 (current US\$ billion)



Agricultural Nominal Rate of Assistance (NRA)



Source: OECD (2021), Anderson (2009), and www.ag-incentives.org.

The Relative Importance of Global Agricultural Subsidies and Tariffs, Revisited: Anderson, Corong, Strutt and Valenzuela (2023)

- **Over the past three decades**
 - Tariff protection to farmers has fallen
 - Partly been replaced by domestic support
 - Support for farmers in some emerging economies has grown
- **Simulations**
 - Removal of food and agricultural domestic support subsidies and agri-food tariffs
 - Removal of tariffs on imports of non-agricultural goods

Subsidy and Import tariffs (%)

	Domestic subsidies to agric+food producers	Import tariffs on agric+food products	Import tariffs on non-agric+food goods
High-income countries	3.3	5.1	1.3
Developing countries	2.0	7.5	3.6
WORLD	2.5	6.6	2.6

Welfare Results (EV decomposition)

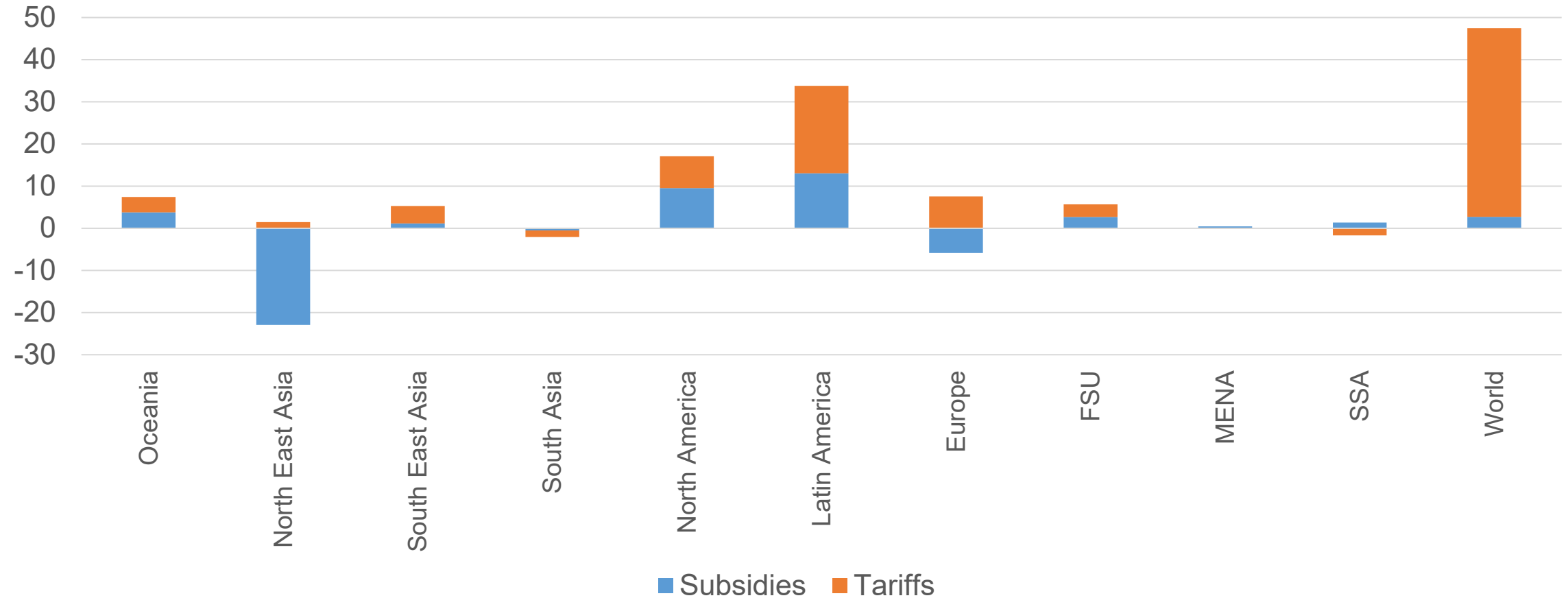
	<u>Welfare (US\$ billion) due to:</u>			<u>Due to liberalisation by:</u>		Gain per capita (US\$/yr)	% due to just subsidies	% due to DC reform
	subsidies	tariffs	TOTAL	HICs	DCs			
HICs	4.3	19.4	23.7	6	18	23	18	75
DCs	-1.5	25.2	23.7	14	10	4	-6	41
WORLD, 2017	2.7	44.8	47.5	20	28	6	6	58
WORLD, 2001	13	169	182	128	54	29	5	26

Source: Authors' GTAP model results and Anderson and Martin (2005).

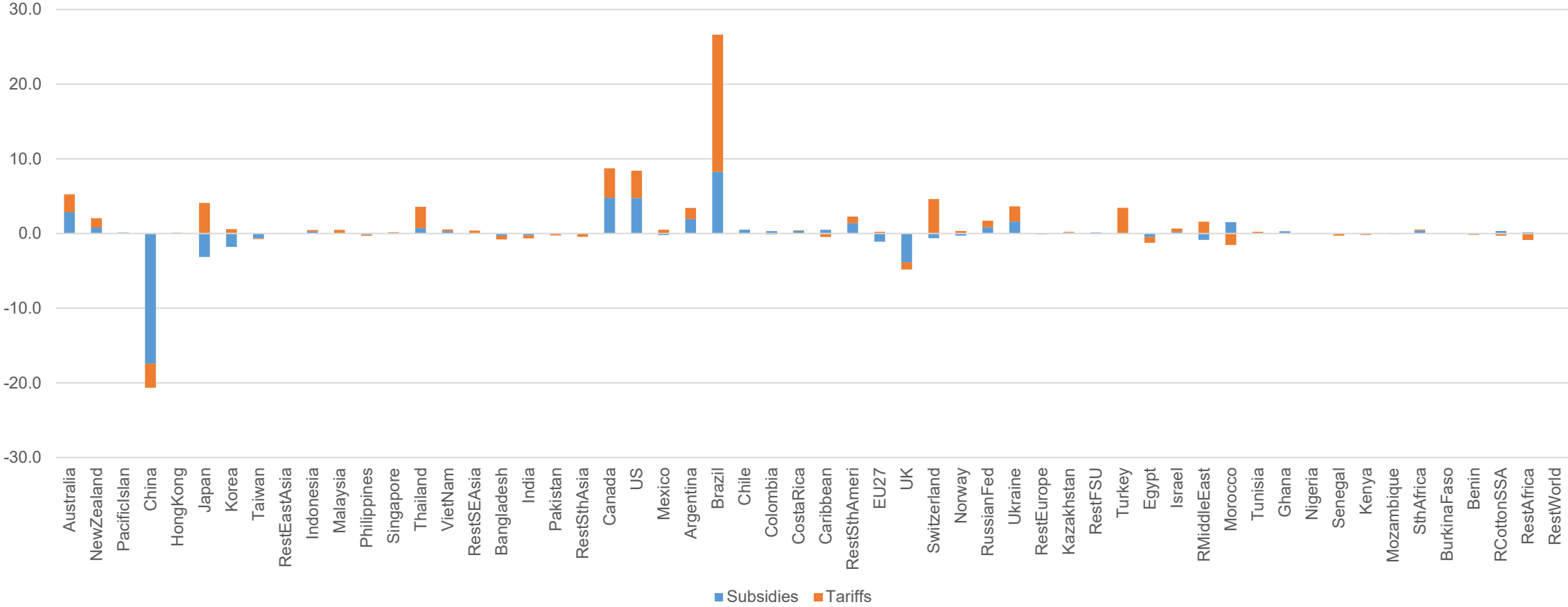
Welfare Results (EV decomposition)

	<u>Welfare (US\$ billion) in:</u>				<u>% of total gain in:</u>		
	HICs	DCs	World		HICs	DCs	World
Domestic subsidies:							
Primary factors	2.4	-2.3	0.0		10	-10	0
Intermediate inputs	1.9	0.3	2.2		8	1	5
Outputs	0.0	0.5	0.5		0	2	1
Total subsidies	4.3	-1.5	2.7		18	-6	6
Import tariffs	19.5	25.2	44.8		82	106	94
Total impact on welfare	23.7	23.7	47.5		100	100	100

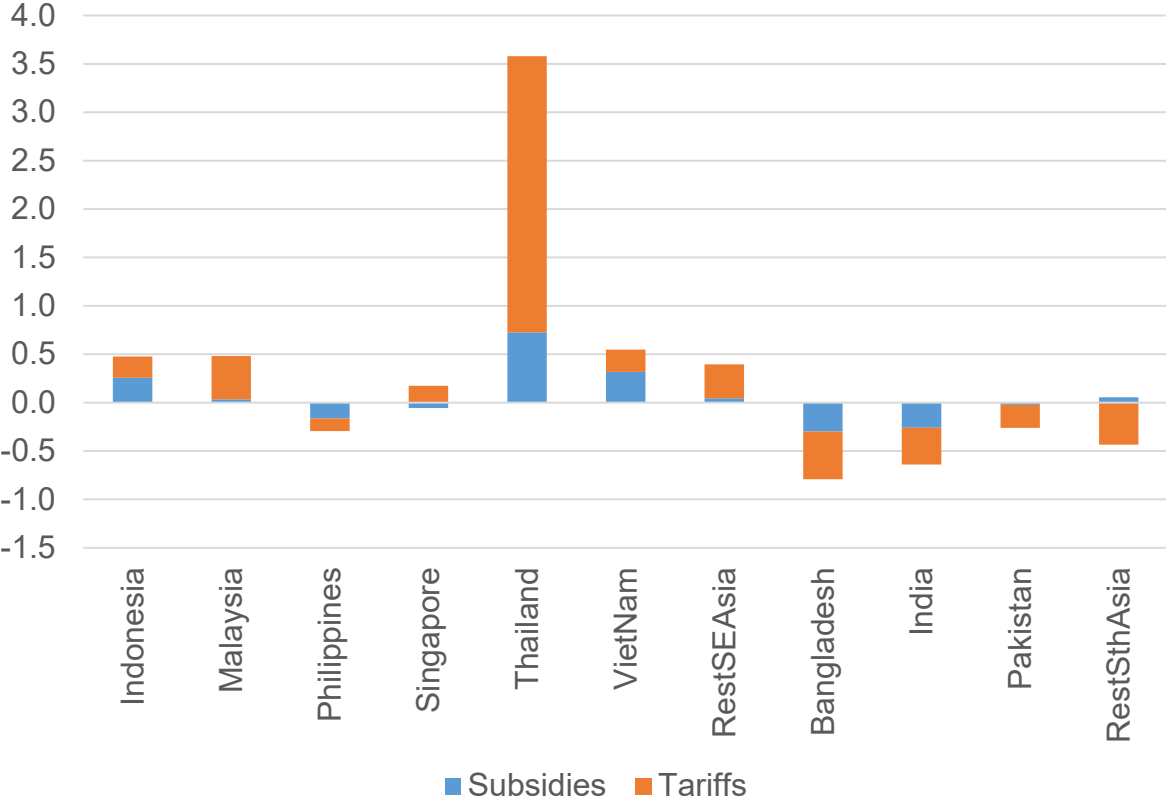
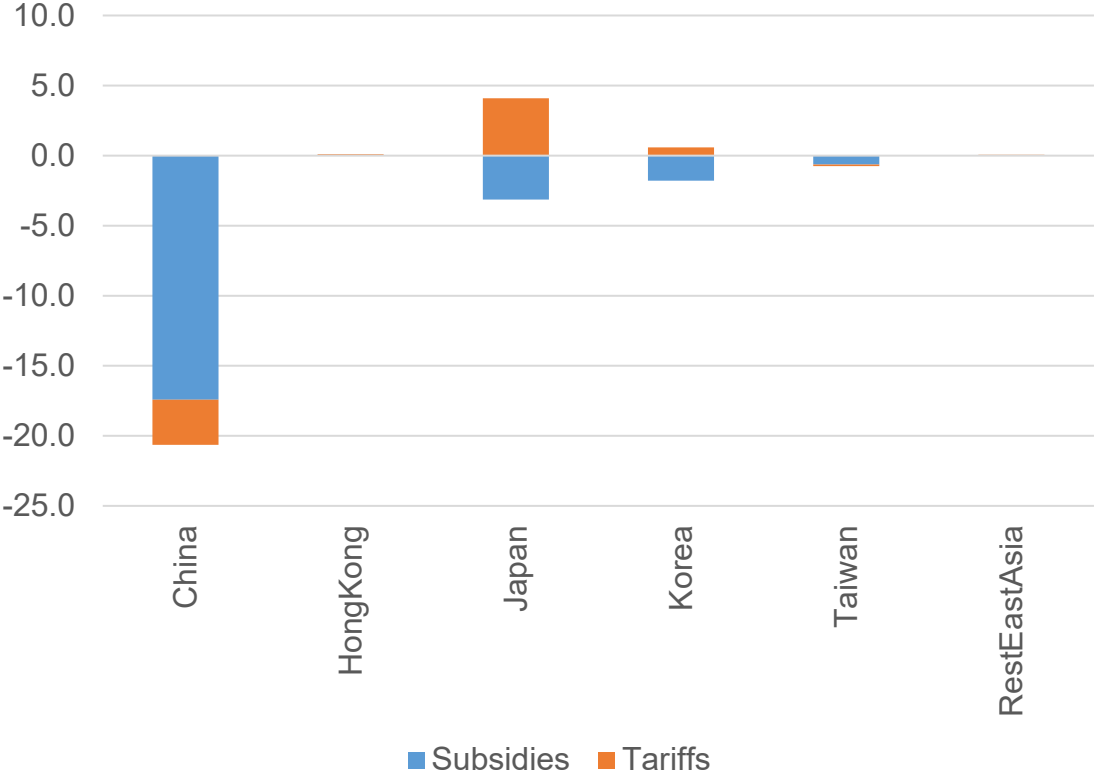
Welfare Results (EV in US\$ billion, by aggregate region)



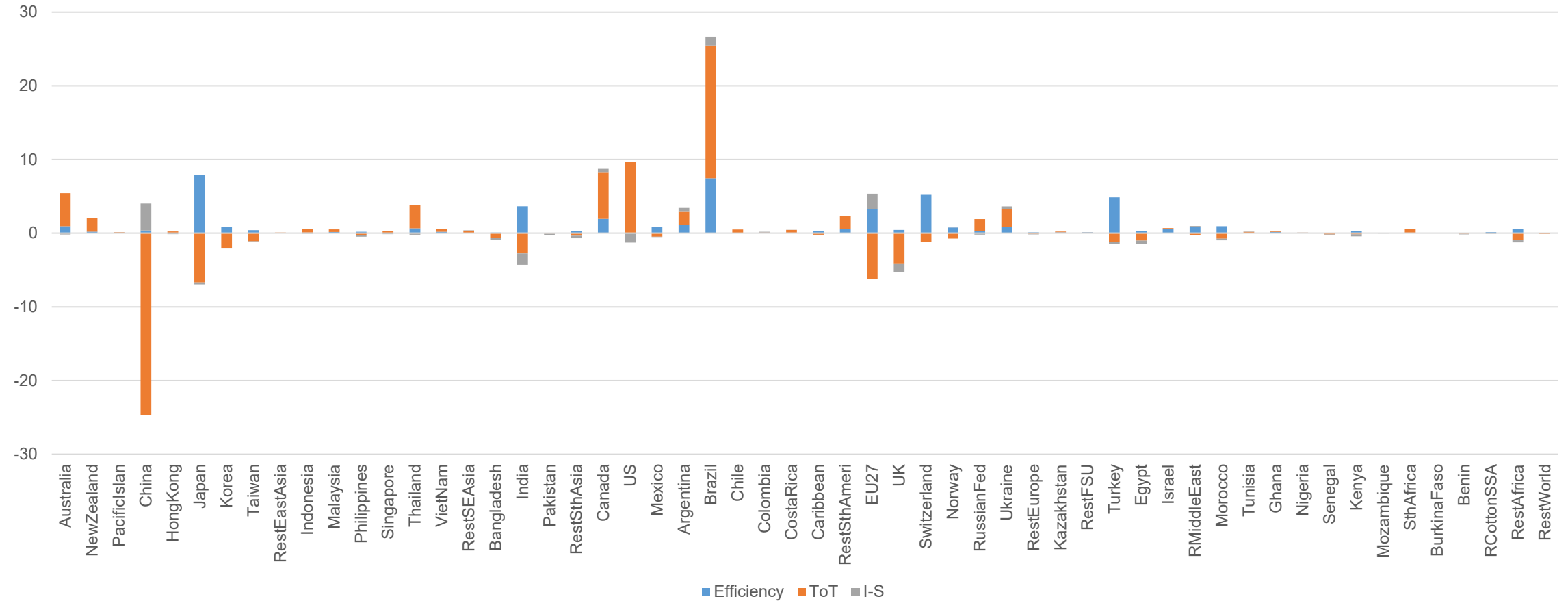
Welfare Results (EV in US\$ billion, by country/region)



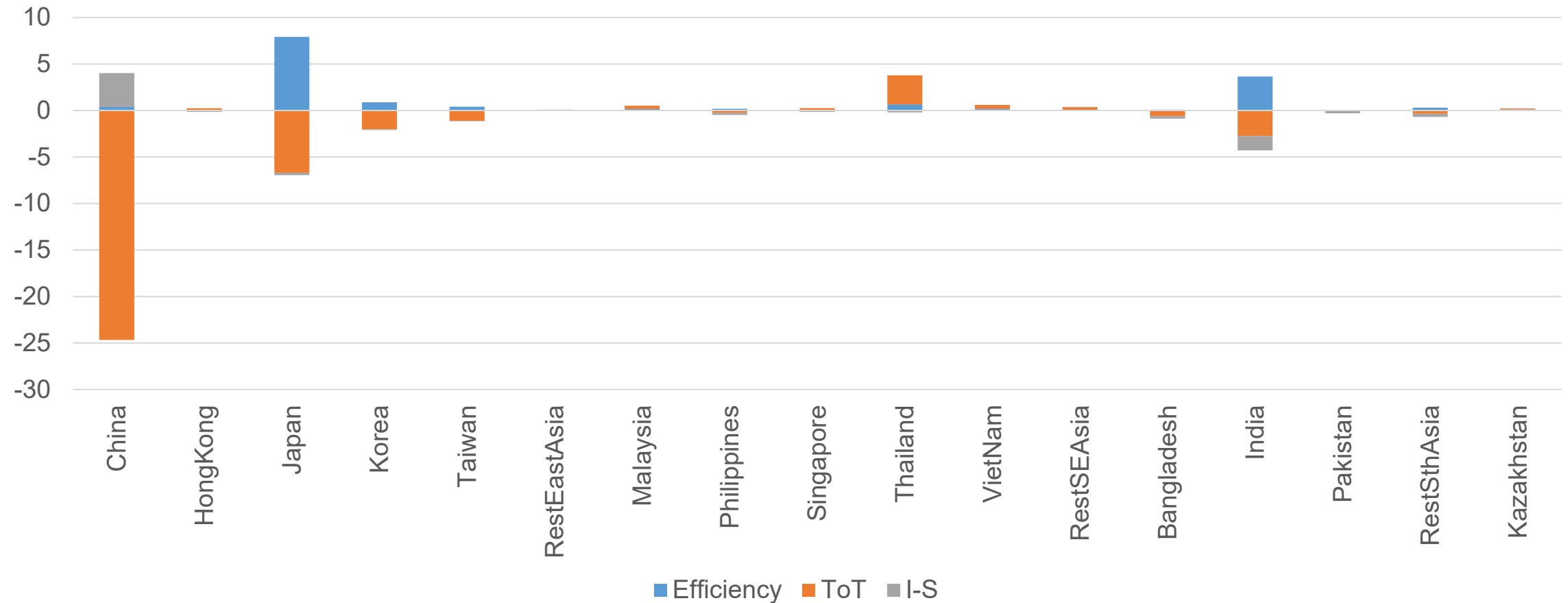
Welfare Results (EV in US\$billion, Selected Asian countries)



Welfare Decomposition (EV in US\$ billion, by aggregate region)



Welfare Decomposition (EV in US\$ billion, Selected Asian Countries)



Summary and Future Directions

- **Summary**

- Tariffs still dominate the global welfare cost of all farm-support programs.
- Domestic supports to farmers to have grown in relative importance but only modestly
- Simulations results indicate that agricultural policies are a smaller but nonetheless still substantial contributor to the global welfare cost of trade-related policies than two decades ago (albeit only half as costly as in 2001).

- **Future Directions**

- Incorporate consumer subsidies (AARES 2024)
- With recent estimates of the substantial contributions of agricultural production to greenhouse gas emissions and biodiversity losses (IPCC 2020, Dasgupta 2021, Johnson et al. (2023))
 - Assess GHG emissions associated with domestic supports
 - How could current agricultural supports be re-purposed to better serve society and the environment without harming farmer welfare?

References

Aguiar, A., M. Chepeliev, E.L. Corong and D. van der Mensbrugghe (2022), “The Global Trade Analysis Project Data Base: Version 11”, *Journal of Global Economic Analysis* 7(2): 1-37.
<https://jgea.org/ojs/index.php/jgea/article/view/181/216>

Anderson, K., E. Corong, A. Strutt, E. Valenzuela (2023). The Relative Importance of Global Agricultural Subsidies and Tariffs, Revisited. *World Trade Review*, Vol 22.

Anderson, K., E. Corong, A. Strutt (2022). The GTAP-DS (Domestic Support) Model. Presented during the 25th Annual Conference on Global Economic Analysis (Virtual Conference).
https://www.gtap.agecon.purdue.edu/resources/res_display.asp?RecordID=6588

Anderson, K. and W. Martin (2005), “Agricultural Trade Reform and the Doha Development Agenda”, *The World Economy* 28(9): 1301-27.

Corong, E.L., T.W. Hertel, R. McDougall, M.E. Tsigas and D. van der Mensbrugghe (2017), “The Standard GTAP Model, Version 7”, *Journal of Global Economic Analysis* 2(1): 1-119.
<https://jgea.org/ojs/index.php/jgea/article/view/47/30>

Johnson, J. A., U. Baldos, E. Corong, T. Hertel, S. Polasky, R. Cervigni, T. Roxburgh, G. Rutta, S. Thakrar. Investing in Nature can Improve Equity and Economic Returns. *Proceedings of National Academy of Sciences* 120: 27.
https://www.pnas.org/doi/10.1073/pnas.2220401120?_ga=2.122191947.1341894087.1689002644-977501363.1689002644



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Thank you!

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