Estimating Costs of Protection for Agricultural Exports to Developing and Emerging Markets

Yunus Emre Karagulle, Jason Grant, Xi He, and Charlotte Emlinger

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.

Estimating Costs of Protection for Agricultural Exports to Developing and Emerging Markets

Yunus Emre Karagulle [1] Jason Grant [1] Xi He [1] Charlotte Emlinger [2]

[1]Center for Agricultural Trade, Virginia Tech

[2]CEPII

IATRC Annual Meeting
December, 2023

Through 19th-21st century

- New transportation and communication systems
- General Agreement on Tariffs and Trade (GATT) of 1947
- World Trade Organization (WTO) in 1995
- Increasing number of regional trade agreements (RTAs)

$\Longrightarrow$ Reduce trade costs and boasted to the integration of world economies (Jacks, Meissner and Novy, 2011)

$\Rightarrow$ Connected and interdependent global economy

Friedman (2005) argues that "the world is flat!"

Why is the agricultural sector special?

- The URAA (1994) was the first agreement achieve to lower tariffs for agriculture (Bureau et al., 2019).
- 27% of agricultural products are excluded from trade agreements compared to 1% of manufacturing products (Damuri, 2012)
- Average tariff rates are significantly higher than other sectors(Guimbard et al., 2012).
- Subject to more regulations than other sectors (Blank and Egger, 2021; Gaigné and Gouel, 2022)
- Distinct challenges on transportation (Beghin and Schweizer, 2021)

Question?

How have agricultural trade costs evolved over the last two decades?

What we do

- Build a trade costs dataset
- Document the trade costs evolution
- Measure the variation in trade costs and explain it.

1. Bilateral Trade Costs

$$X_{ij,t}^{k} = exp[\alpha_{ij,\tau}^{k} D_{ij,\tau}^{k} + \eta_{i,t}^{k} + \theta_{j,t}^{k}]\varepsilon_{ij,t}^{k}$$

- $D_{ij,\tau}^{k}$ is directional country pair dummy equals 1 for each country pair ij for the period τ, and sector k, otherwise 0;
- $\alpha_{ij,\tau}^{k}$ is the country pair coefficient that denotes raw trade cost measure
- $\eta_{i,t}^{k}$ and $\theta_{j,t}^{k}$, denotes exporter-time; and importer-time fixed effects
- Estimating each sector (k) separately

1. Bilateral Trade Costs

$$X_{ij,t}^k = exp[\alpha_{ij,\tau}^k D_{ij,\tau}^k + \eta_{i,t}^k + \theta_{j,t}^k]\varepsilon_{ij,t}^k$$

2. Elasticities

$$X_{ij,t}^k = exp[\boldsymbol{\beta_1^k} ln Tariff_{ij,t}^k + \boldsymbol{\beta Z} + e_{i,t}^k + e_{j,t}^k]\varepsilon_{ij,t}^k$$

- **Z** is vector of bilateral determinants of trade.
- $\sigma^k = -\beta_1^k$

1. Bilateral Trade Costs

$$X_{ij,t}^k = exp[\alpha_{ij,\tau}^k D_{ij,\tau}^k + \eta_{i,t}^k + \theta_{j,t}^k]\varepsilon_{ij,t}^k$$

2. Elasticities

$$X_{ij,t}^k = exp[\beta_1^k lnTariff_{ij,t}^k + \beta \mathbf{Z} + e_{i,t}^k + e_{j,t}^k]\varepsilon_{ij,t}^k$$

$$ln(TC_{ij,\tau}^k) = -\frac{1}{1-\sigma^k}(\hat{\alpha}_{ij,\tau}^k)$$

3. AVE Trade Costs

Datasets Used

- UN Comtrade and FAO production data (Syrengelas, Emlinger and Grant, 2021) → Intranational Trade Flows
- MacMaps Database(CEPII)
  - Disaggregated tariff data (2001-2016) Guimbard et al., 2012)
- Gravity Database(CEPII) (Head, Mayer and Ries, 2010.; Head and Mayer, 2014

Constructing Trade Costs Dataset

- Exporter, importer, product, and period level.
- Directional/Asymmetric
- 2001-2018
- 37 products/sectors at the 4-digit level of the SITCR1.
- 151 exporters, 161 importers.

Figure 1: Change in trade costs for BICO sectors.

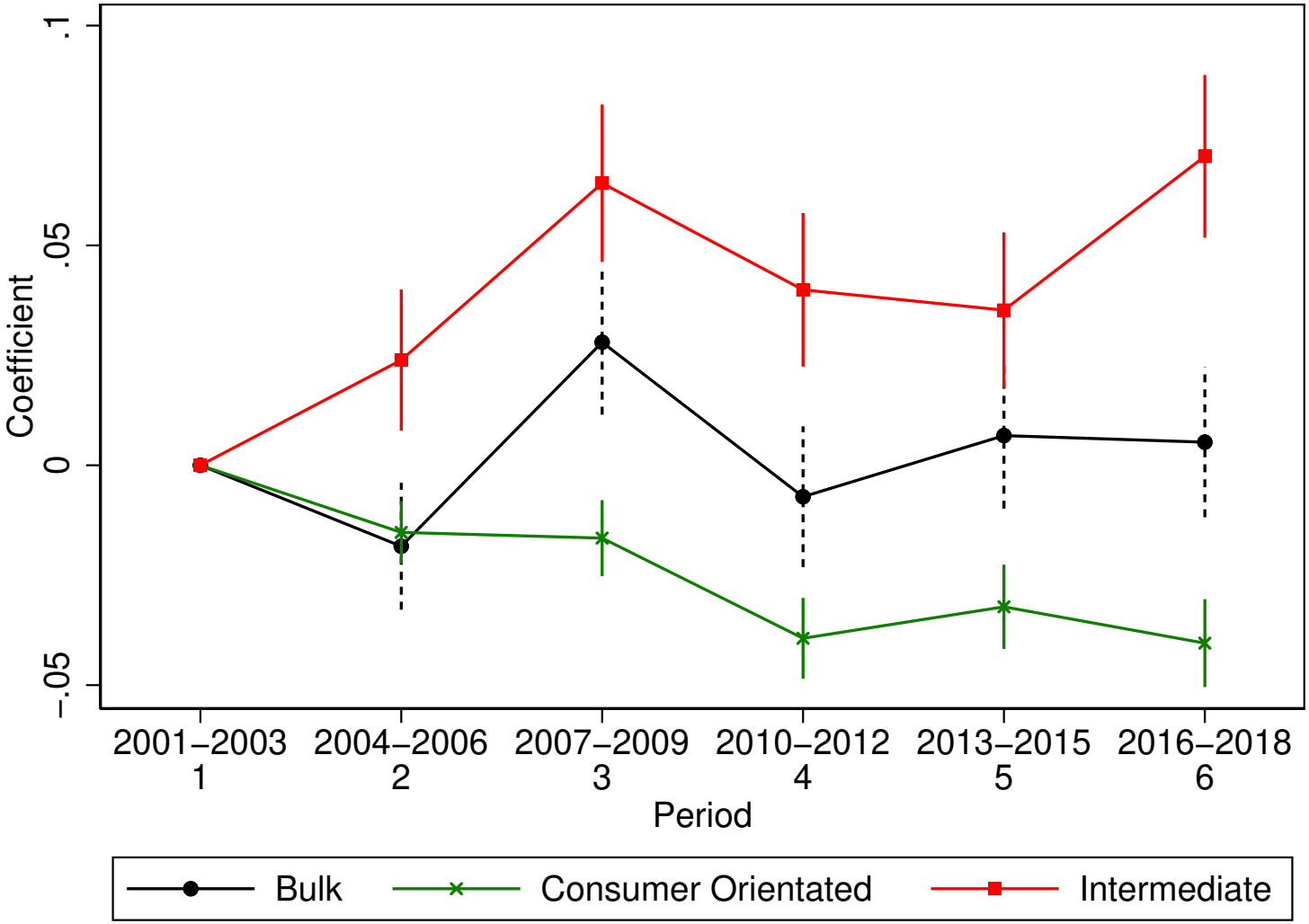


Figure 2: Trade costs evolution over time by exporter's income level.

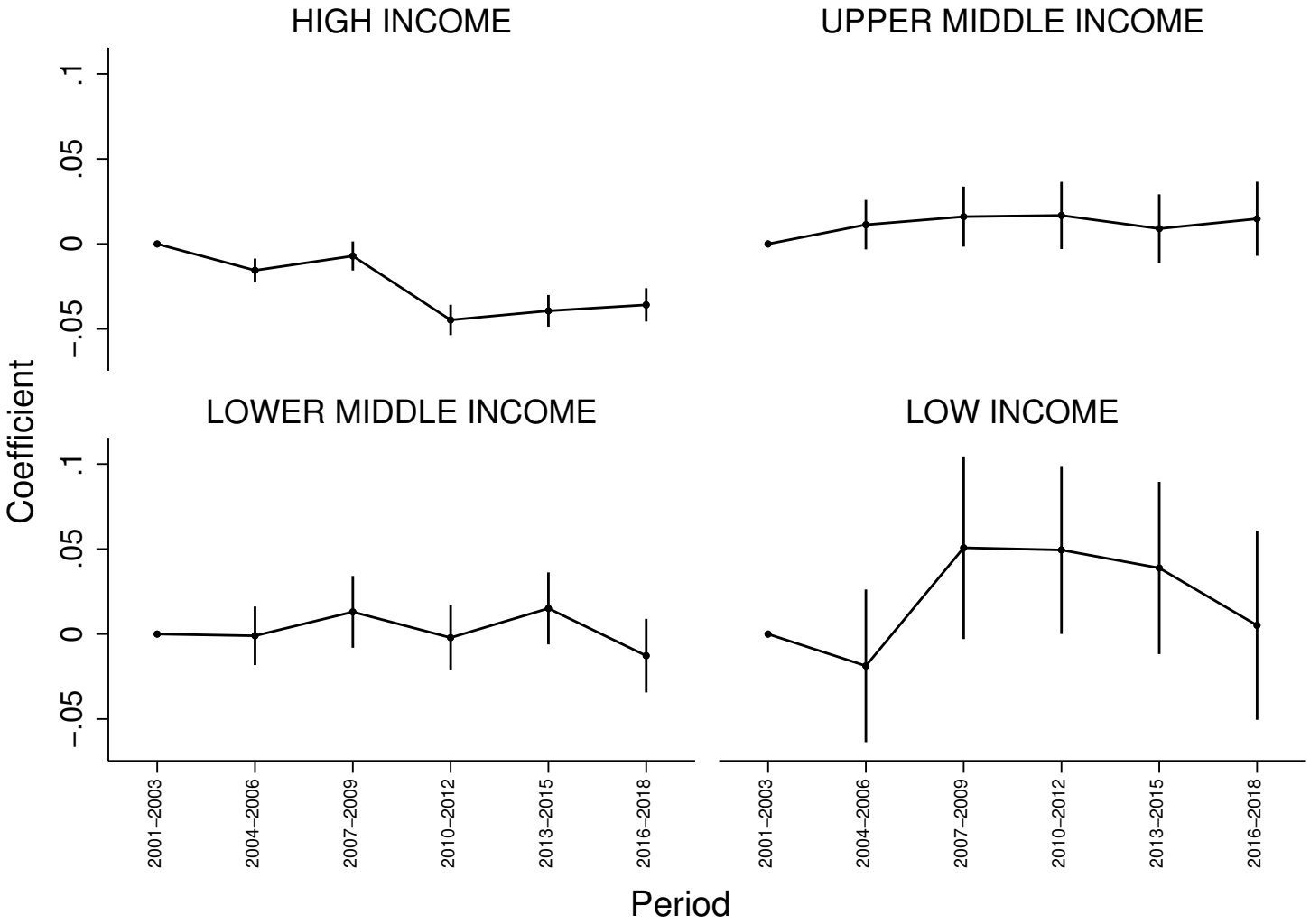
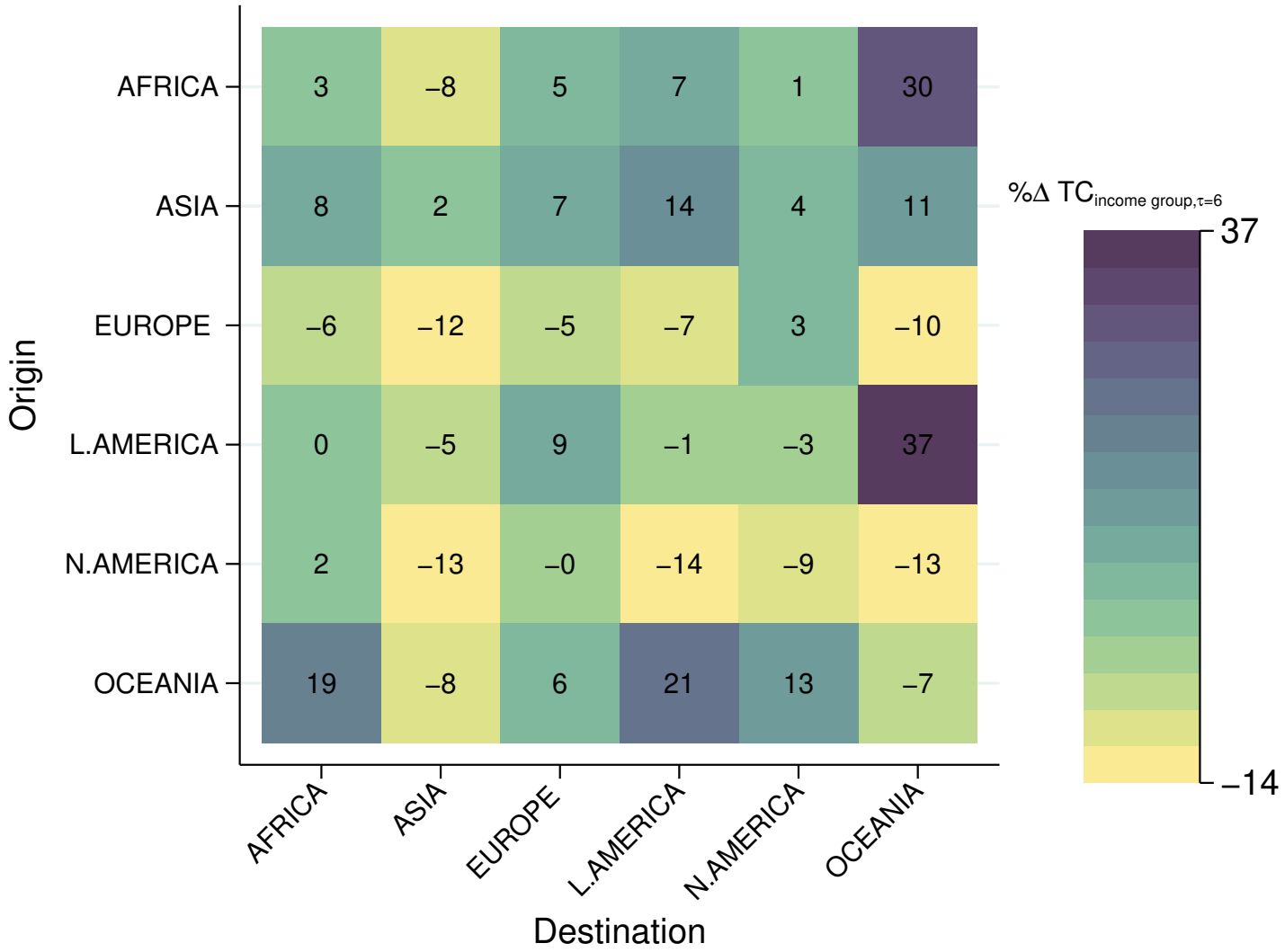
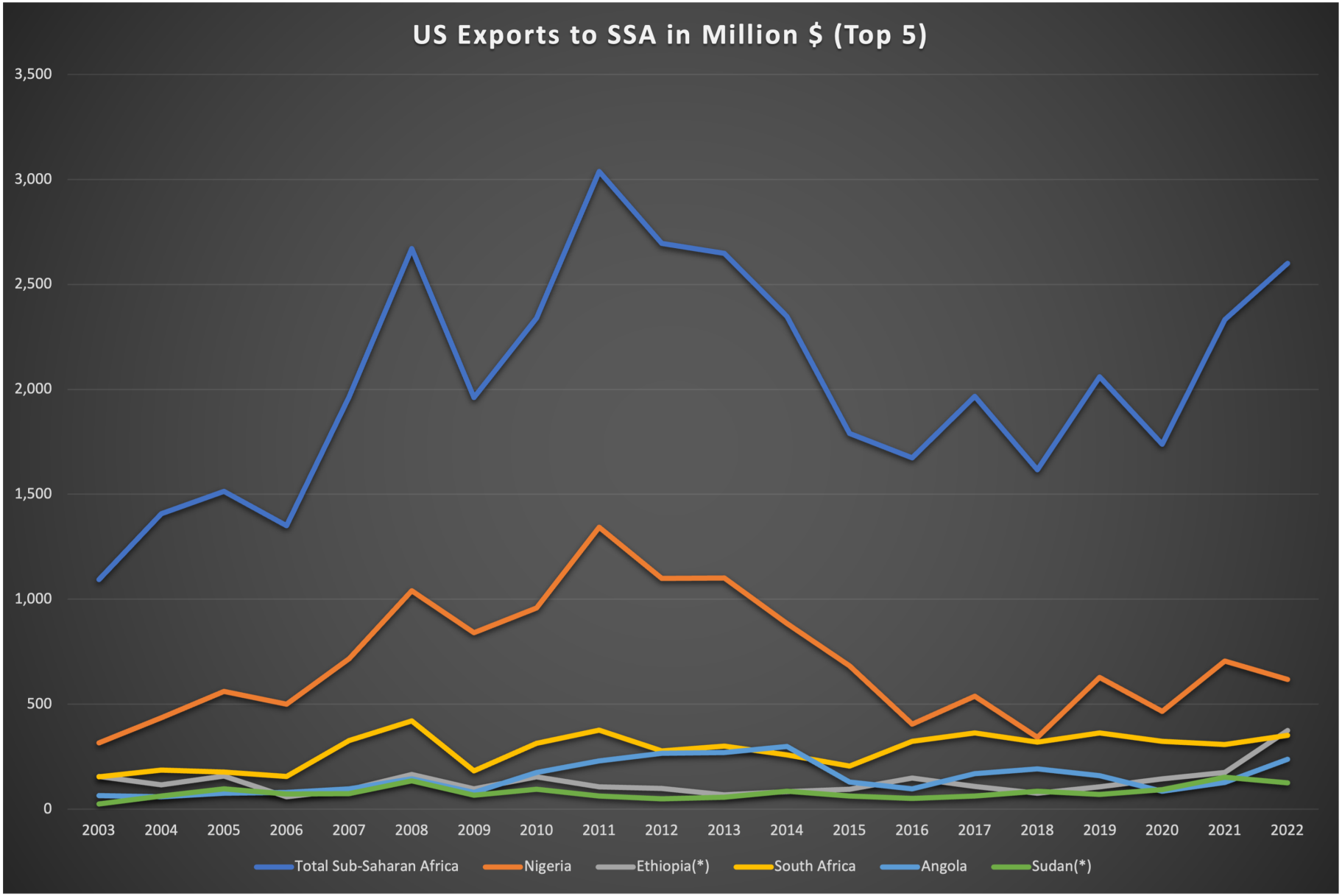


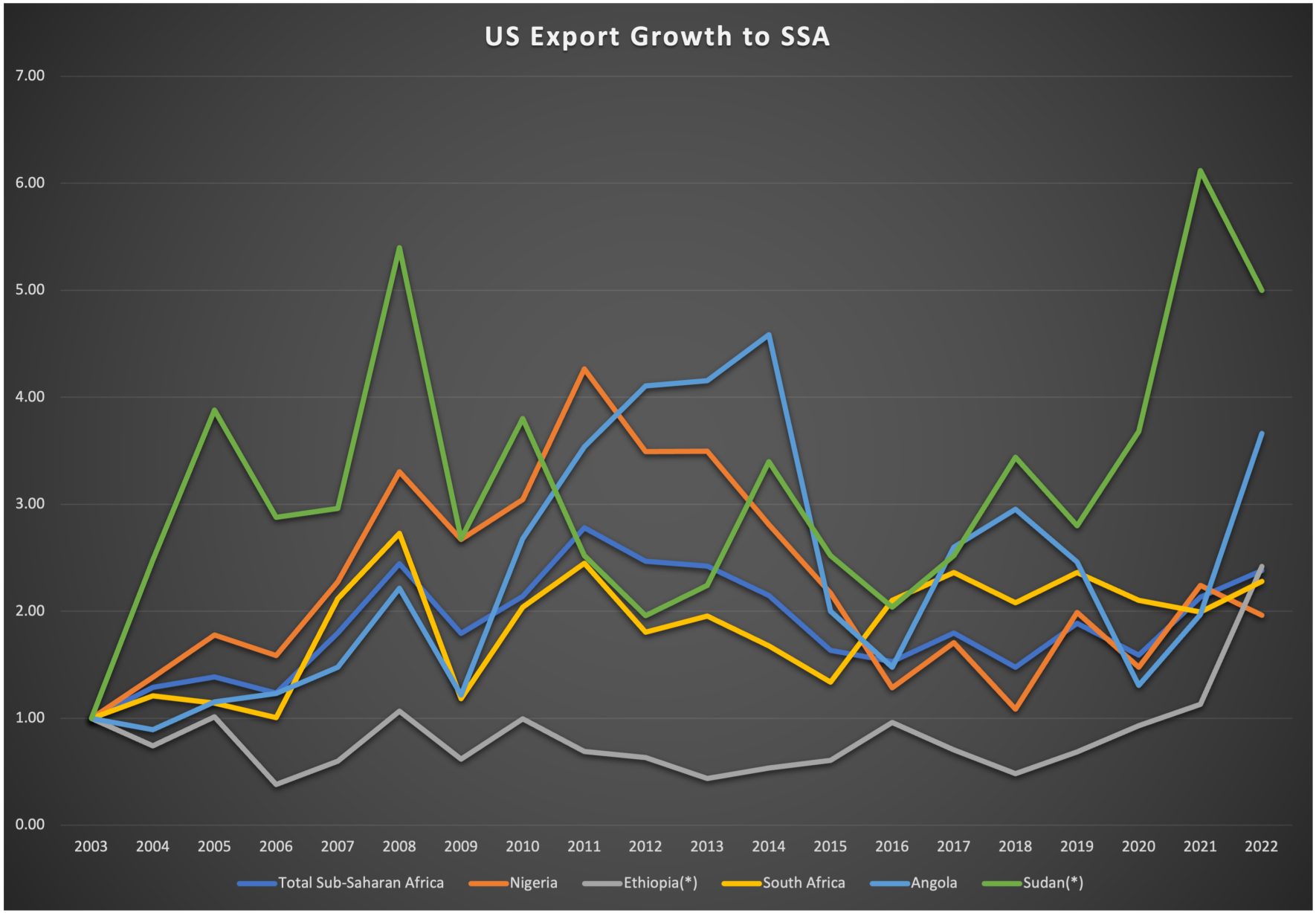
Figure 3: Percentage change in trade costs across regions in 2016-2018 compared to 2001-2003.



A Framework to Quantify Trade Costs of U.S. Agricultural Exports to SSA



Source:https://apps.fas.usda.gov/gats/



Source:https://apps.fas.usda.gov/gats/

Structural Gravity Model

$$X_{ijt} = \exp\left(\pi_{it} + \phi_{jt} + \beta \mathbf{Z}_{ijt}\right) + \epsilon_{ijt} \tag{1}$$

X_{ijt} represents trade flow from origin i to destination j of at time t. π_{it} and ϕ_{jt} are exporter-time, importer-time fixed effects, respectively. $\mathbf{Z}_{ijk}$ is a vector of explanatory variables.

$$\begin{aligned} X_{ijt} = \exp\big(&\beta_1 \text{DIST}_{ij} + \beta_2 \text{CNTG}_{ij} + \beta_3 \text{LANG}_{ij} + \beta_4 \text{CLNY}_{ij} + \beta_5 \text{RTA}_{ij} \\ &+ \beta_6 \text{INTBRDR}_{ij} + \sum_{\{f=\text{Asia}\}}^{\{\text{N.America}\}} \beta_f \text{BORDER\_USA\_FTA}_{ij} + \beta_{11} \text{BORDER\_USA\_SSA}_{ij} \\ &+ \pi_{it} + \phi_{jt}\big) + \epsilon_{ijkt} \end{aligned} \tag{2}$$

$$\%\Delta AVE = \exp\left(\left(\frac{\exp\left(\beta_{\text{USA\_FTA}}\right)}{\exp\left(\beta_{\text{US\_SSA}}\right)}\right)^{\frac{1}{1-\sigma}} - 1\right) \times 100 \tag{3}$$

Dataset

- New Structural Gravity Database that accounts for stock changes for storable commodities
  - USDA - PSD data $\rightarrow$ Intranational Trade Flows
  - BACI (CEPII) International Trade Flows
- Annual data from 2013 to 2022
- 36 Sectors
- 70 Exporters and Importers
- Tariff Data, MacMaps Database(CEPII)

	(1)	(2)	(3)	(4)
TARIFF	-3.53***	-3.73***	-3.75***	-3.65***
	(0.91)	(0.89)	(0.89)	(0.88)
RTA	0.48**	0.40*	0.39*	0.31
	(0.18)	(0.18)	(0.18)	(0.19)
BRDR	-3.97***	-3.97***	-3.96***	-4.00***
	(0.24)	(0.24)	(0.24)	(0.25)
BRDR_USA_NAFTA		-2.75***	-2.74***	-2.57***
		(0.38)	(0.38)	(0.38)
BRDR_USA_SSA		-5.39***	-5.34***	-5.27***
		(0.37)	(0.37)	(0.36)
BRDR_EU_SSA			-3.37***	
			(0.48)	
BRDR_USA_PPCC				-2.83***
				(0.46)
BRDR_USA_CAFTA				-2.66***
				(0.36)
BRDR_USA_KOR				-2.99***
				(0.37)
BRDR_USA_JPN				-2.60***
				(0.34)
CONSTANT	15.30***	15.17***	15.21***	15.17***
	(0.51)	(0.47)	(0.47)	(0.48)
N	38088	38088	38088	38088
pseudo R^2	0.98	0.98	0.98	0.98
p	0.00	0.00	0.00	0.00
FE	it,jt	it,jt	it,jt	it,jt

Distance, Colonial Links, Common Language, Contiguity are not shown here.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Relative Cost of Protection in AVEs (%)

	(1)	(2)	(3)	(4)
SSA vs NAFTA		-35.57	-35.17	-36.21
USA-SSA vs EU-SSA			-28.04	
SSA vs PCCC				-33.39
SSA vs CAFTA_DR				-35.27
SSA vs KOREA				-31.69
SSA vs JPN				-35.96

	(1) Wheat	(2) Grain	(3) Chicken
TARIFF	-2.97***	-1.72	-1.61**
	(0.75)	(0.92)	(0.61)
RTA	0.92***	0.80*	0.15
	(0.28)	(0.33)	(0.37)
BRDR	-4.55***	-4.54***	-6.40***
	(0.41)	(0.39)	(0.82)
BRDR_USA_NAFTA	-3.59***	-3.07*	-5.31***
	(0.84)	(1.35)	(0.92)
BRDR_USA_SSA	-4.68***	-5.86***	-5.95***
	(0.61)	(0.98)	(1.18)
Constant	17.59***	16.51***	11.91***
	(1.29)	(0.99)	(1.54)
Δ % AVEs			
SSA vs NAFTA	-16.57	-37.20	-10.14
N	37053	36849	35259
pseudo R^2	0.97	0.98	0.98
p	0.00	0.00	0.00
FE	it,jt	it,jt	it,jt

Distance, Colonial Links, Common Language, Contiguity are not shown here.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Concluding Remarks

- High trade frictions against the U.S. export to SSA region
- Slow down in trade cost reduction
- Trade costs evolution is;
  - Asymmetric/Directional
  - Heterogeneous among products, countries, regions and income groups
- Unequal integration of economies
- Hard to uphold the argument that agricultural trade becomes more connected and integrated