# Estimating the Ad Valorem Equivalent of Sanitary and Phytosanitary Trade Measures:
# Evidence from Specific Trade Concerns

## Xin Ning and Jason Grant

# New Estimates on the *Ad-valorem Equivalents* of SPS Measures: Evidence from Specific Trade Concerns

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**Hidden Trade Costs? Maximum Residue Limits and US Exports of Fresh Fruits and Vegetables**

$$BSI_{codk} = \left(\frac{1}{N_{ck}}\right) \sum_{p \in N_{ck}} exp\left(\frac{MRL_{opk} - MRL_{dpk}}{MRL_{opk}}\right)$$

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**Evaluating the Trade Impacts of Bovine Spongiform Encephalopathy (BSE) Using Historical Simulations**

Everett B. Peterson

Jason H. Grant

Sharon Sydow

# AVOCADO PESTS AND AVOCADO TRADE

## EVERETT B. PETERSON AND DAVID ORDEN

This article evaluates the effects of a November 2004 phytosanitary rule that removed seasonal and geographic restrictions on the importation of fresh Hass avocados from approved orchards in Mexico to the United States. With the remaining systems approach compliance measures in place, pest risks do not substantially increase and U.S. net welfare rises by $77 million. Removal of remaining compliance measures may lead to lower net welfare gains depending on which measures are eliminated and the estimated probabilities of pest infestations.

*Key words*:  avocados, compliance costs, NAFTA, SPS barriers, systems approach.

Actual & Predicted Trade Flows for Avocados
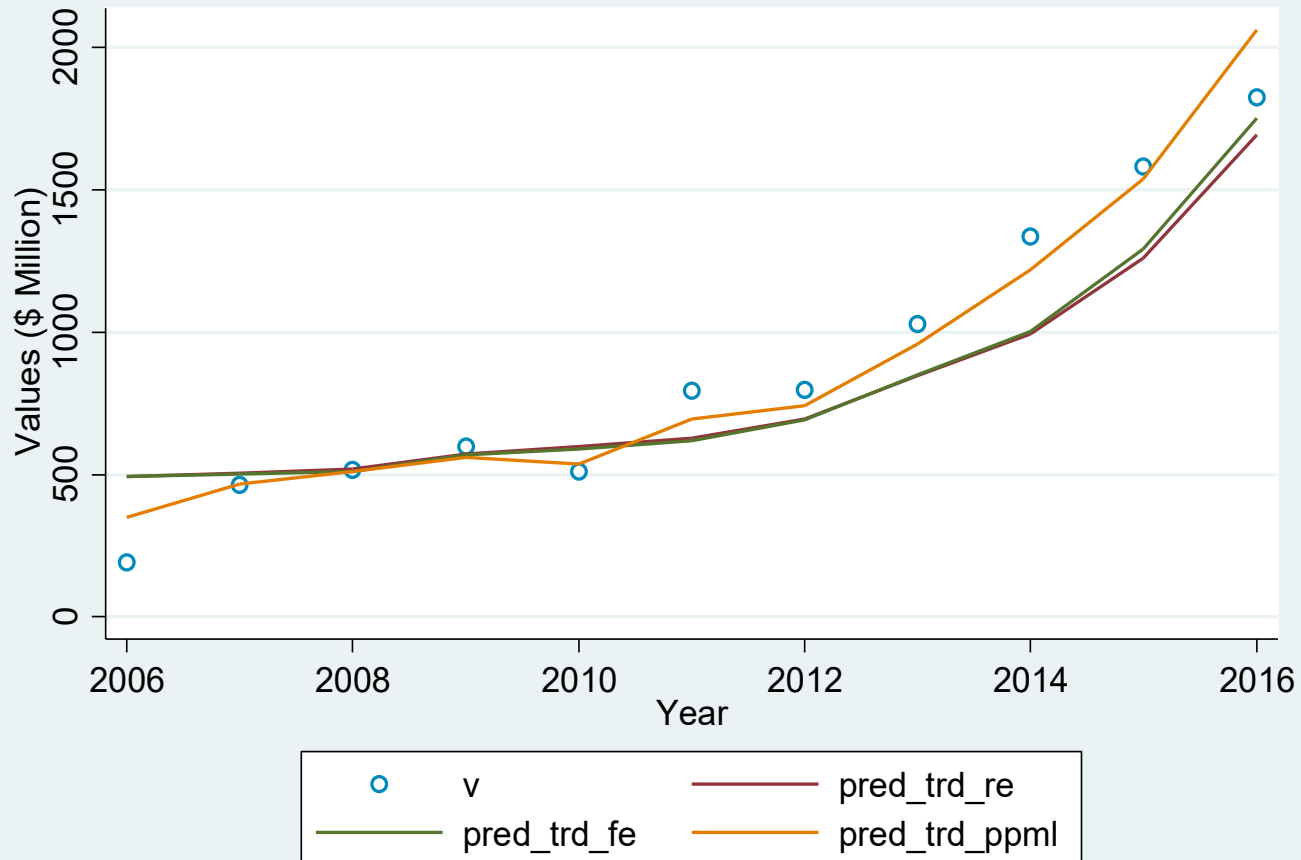
# Cooked Poultry from China and Boneless Beef from Argentina
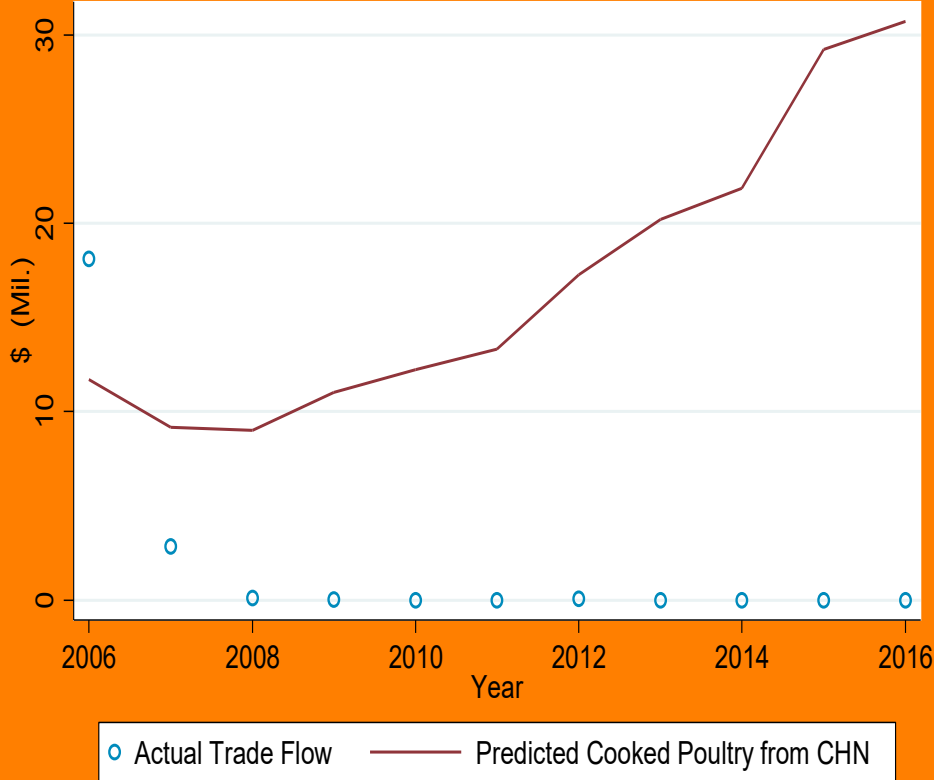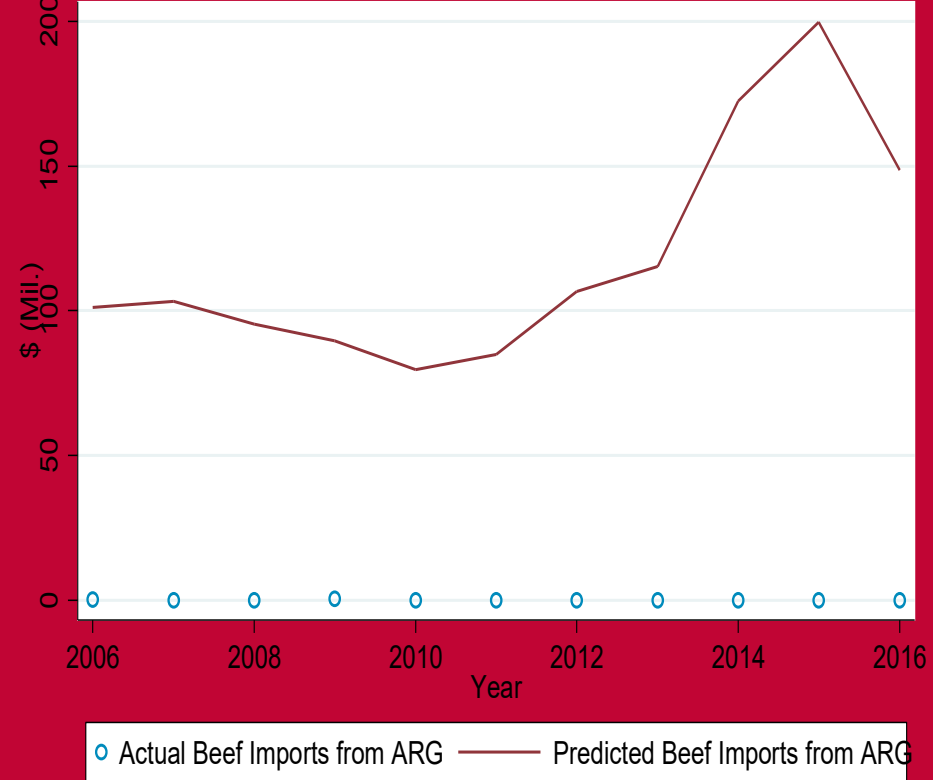
Sanitary and Phyto-Sanitary Measures:
Assessment, Measurement, and Impact

Jason Grant and Shawn Arita
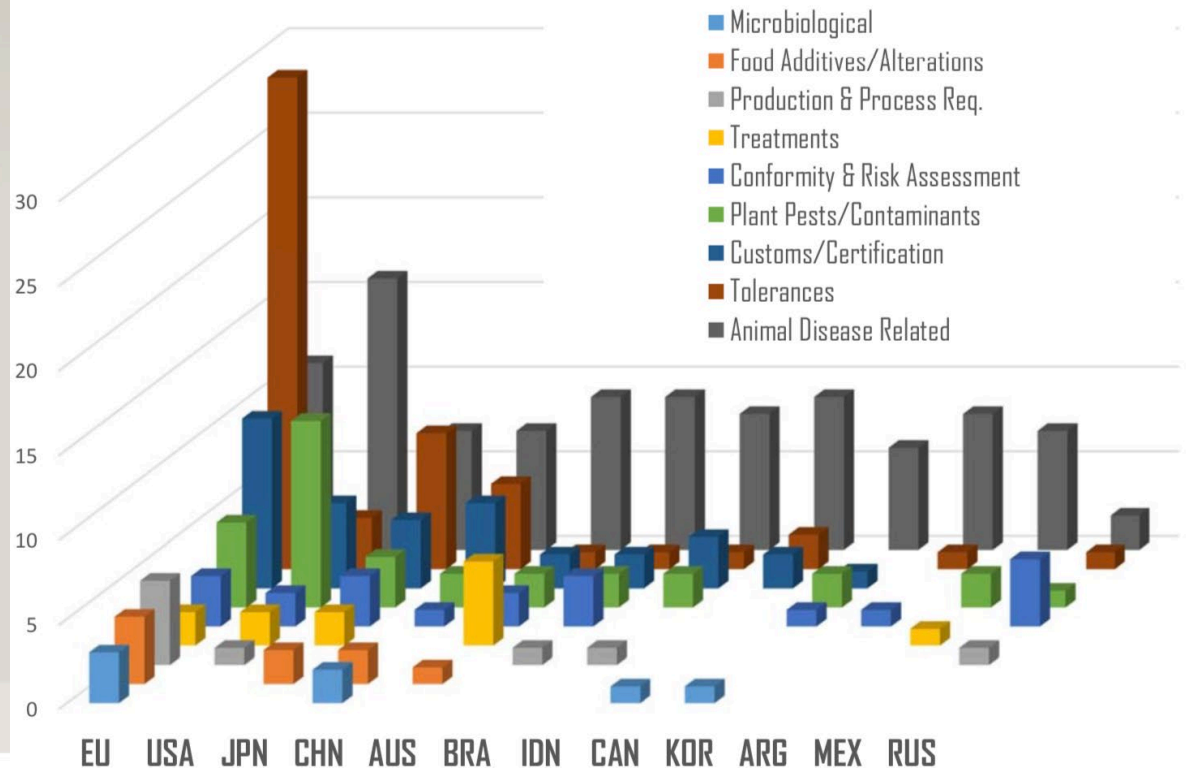
Center for
**Agricultural Trade**

# New Estimates of the Ad-valorem Equivalent of SPS Measures: Evidence from Specific Trade Concerns

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# **Overview**

- Motivation

- Econometric model

- Results

- Conclusion

# Increasing SPS and TBT Notifications



https://www.epingalert.org/
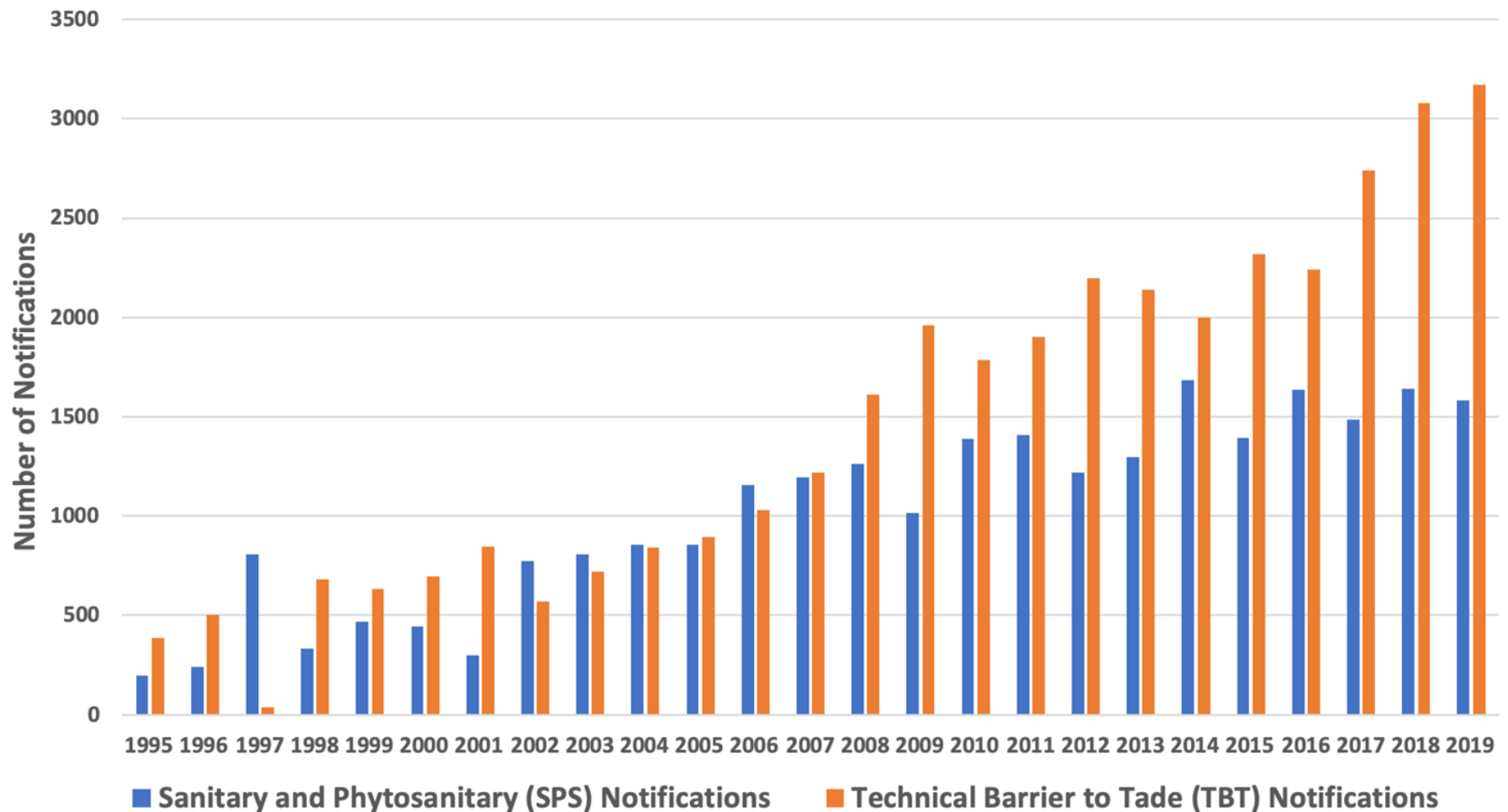
# Review of STCs by the TBT and SPS Committees, 2018

**TBT**

≈34,000
TBT notifications

580
"STCs"

6
Disputes (with Panel
and Appellate Body reports)

**(Not Raised Formally)**
Requests clarification from Enquiry Point
Bilateral Consultation

**Raised in
the Committee**

**Disputes**

**SPS**

≈24,000
SPS notifications

450
"STCs"

14
Disputes (with Panel or Panel
and Appellate Body reports)
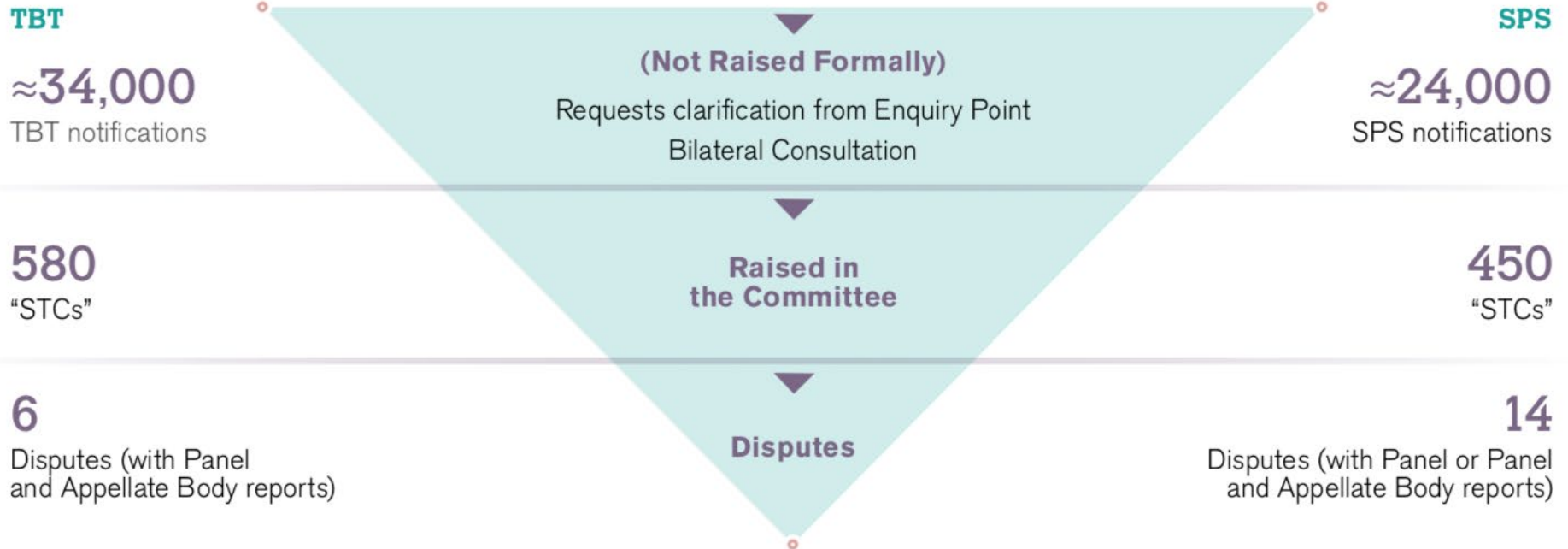
Source: WTO.

Note. Data valid as of March 2019.

## SPS Committee Meeting on Nov 7-8, 2019, Geneva

# Issues previously raised

STCs previously brought up in the SPS Committee included five EU SPS-related policies: maximum residue levels (MRLs) for several pesticides; legislation on endocrine disruptors; new MRLs for the insecticide lambda-cyhalothrin; and the new definition of the fungicide folpet.

The EU also raised previously addressed issues, including South Africa's import restrictions on poultry due to highly pathogenic avian influenza; China's country-wide import restrictions also due to highly pathogenic avian influenza; US import restrictions on apples and pears; Indonesia's approval procedures for animal and plant products; and general concerns regarding import restrictions due to bovine spongiform encephalopathy (BSE).

In addition, the Committee heard concerns regarding Turkey's foot-and-mouth disease (FMD)-related import restrictions on live cattle from Argentina; Ukraine's restrictions on swine products from Brazil; and Mexico's measures on imports of hibiscus flowers from Senegal.

https://www.wto.org/english/news_e/news19_e/sps_08nov19_e.htm

# U.S., other WTO members slam EU for pesticide regulation changes

November 12, 2019 at 9:00 AM

More than a dozen World Trade Organization members, including the U.S., last week criticized the European Union in Geneva for lowering some of its maximum residue levels for a variety of pesticides used largely for producing citrus fruits and bananas.

The U.S., Canada, Argentina, Brazil, India, Cote d'Ivoire and 11 other members argued at the WTO Committee on Sanitary and Phytosanitary Measures on Thursday and Friday that the change to the EU's regulation on pesticides would have detrimental effects, especially on developing and least-developed countries, because in many cases there are no viable alternatives, according to a Geneva-based trade official.

The EU regulatory change, made over the summer, lowered the maximum residue levels for nearly a dozen different pesticides. The U.S. has long targeted the EU regulatory system as a non-tariff trade barrier for many U.S. agricultural products and maintains it is not science-based.

# Questions Policymakers are Asking?

1. What are the costs to industry of compliance with SPS standards?
   - i.e., ractopamine free swine production; cadmium levels in cocoa/chocolate; aflatoxin in groundnuts; lack of equivalence and mutual recognition of standards; regionalization in animal disease events, etc.

2. What are the costs to developing countries both in terms of food security and producer income?
   - i.e., when international Codex standards are blocked or get held up or countries set standards independently that are more stringent than international standards

# Answers to these Policy Questions

- Quantify trade impacts of these SPS measures
  - Price-gap method
  - Quantity-gap method
  - Welfare method

- Estimate foregone trade potential when SPS trade concerns are operating as a measure of the potential trade impacts of SPS measures that have been flagged as concerns and maintained by importing countries

# Specifically …

1.  By how much do SPS measures that have been flagged as trade concerns impact members' agricultural trade?

2.  What types of SPS measures, in which destination markets and on what products, are responsible for the more significant trade shocks?

3.  How does trade respond when resolution of SPS measures is achieved?

# Data

- Bilateral trade data in SITC 4-digit, 1995-2016 (UN ComTrade)
  - Top 30 agricultural importing and exporting countries
  - Major 4 product sectors: meat, dairy, fruits & vegetables, cereals & preparations
  - 579,656 observations (26,348 triads x 22 years)
- SPS specific trade concerns, 1995-2016 (WTO SPS IMS)
  - Matched with 202 SPS trade concern measures
- CEPII (gravity variables such as distance, contiguity, common language, common RTA)

# Addressing Data Issues, i.e., adjustment of treatment periods



Brazil pork exports to EU-28, 1995-2016
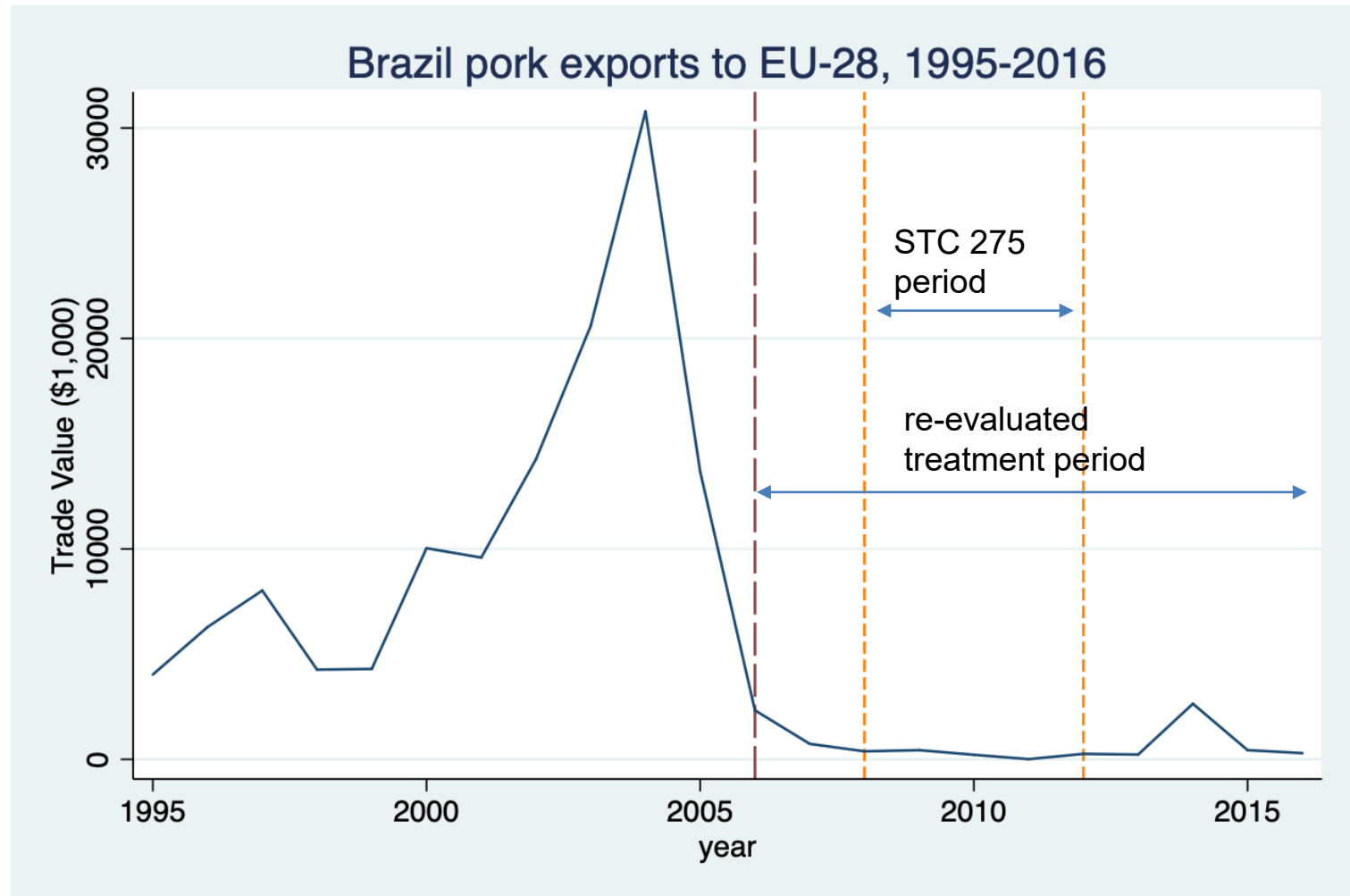
STC 275, use-of-ractopamine restriction

# Structural Gravity Model Using PPML Estimation

**Peterson, Grant, Roberts, and Karov (2013)**

$$V_{odkt} = \frac{Y_{okt}E_{dkt}}{\sum_o Y_{okt}} \left(\frac{T_{odkt}}{\Omega_{okt}P_{dkt}}\right)^{1-\sigma}$$

$$T_{odkt} = (1 + tar_{odkt})\exp\left[\left(\prod_s \theta_s^* L_{od(s)}\right)RTA_{odt}^{\gamma*}SPS_{odkt}^{\lambda*}\right]$$

$$V_{odkt} = \exp\left[\alpha_{okt} + \alpha_{dkt} + \alpha_{odk} + \beta\ln(1 + tar_{odkt}) + \gamma_1 RTA_{od,t} + \gamma_2 RTA_{od,t-5}\right.$$
$$\left. + \lambda_1 STC_{1,odkt} + \lambda_2 STC_{2,odkt}\right]\varepsilon_{odkt}$$

$$V_{odkt} = \exp\left[\alpha_{okt} + \alpha_{dkt} + \alpha_{odk} + \beta\ln(1 + tar_{odkt}) + \gamma_1 RTA_{od,t} + \gamma_2 RTA_{od,t-5}\right.$$
$$\left. + \sum_{s=1}^{2}(\lambda_{s,1}AH_{s,odkt} + \lambda_{s,2}PH_{s,odkt} + \lambda_{s,3}FS_{s,odkt})\right]\varepsilon_{odkt}$$

# Four Model Scenarios

1. Global average
2. SPS measures of animal, plant, and food safety concern
3. SPS measures maintained/raised by US, EU and China
4. Six specific concern cases of SPS measures
   a) EU Aflatoxin restrictions
   b) EU GMO restrictions
   c) Import ban due to BSE outbreaks
   d) Japan MRL enforcement system
   e) Ractopamine restrictions
   f) China poultry restriction due to Avian Influenza

# ECONOMETRIC RESULTS

# AVEs of SPS Concern Measures: overall and by sectors
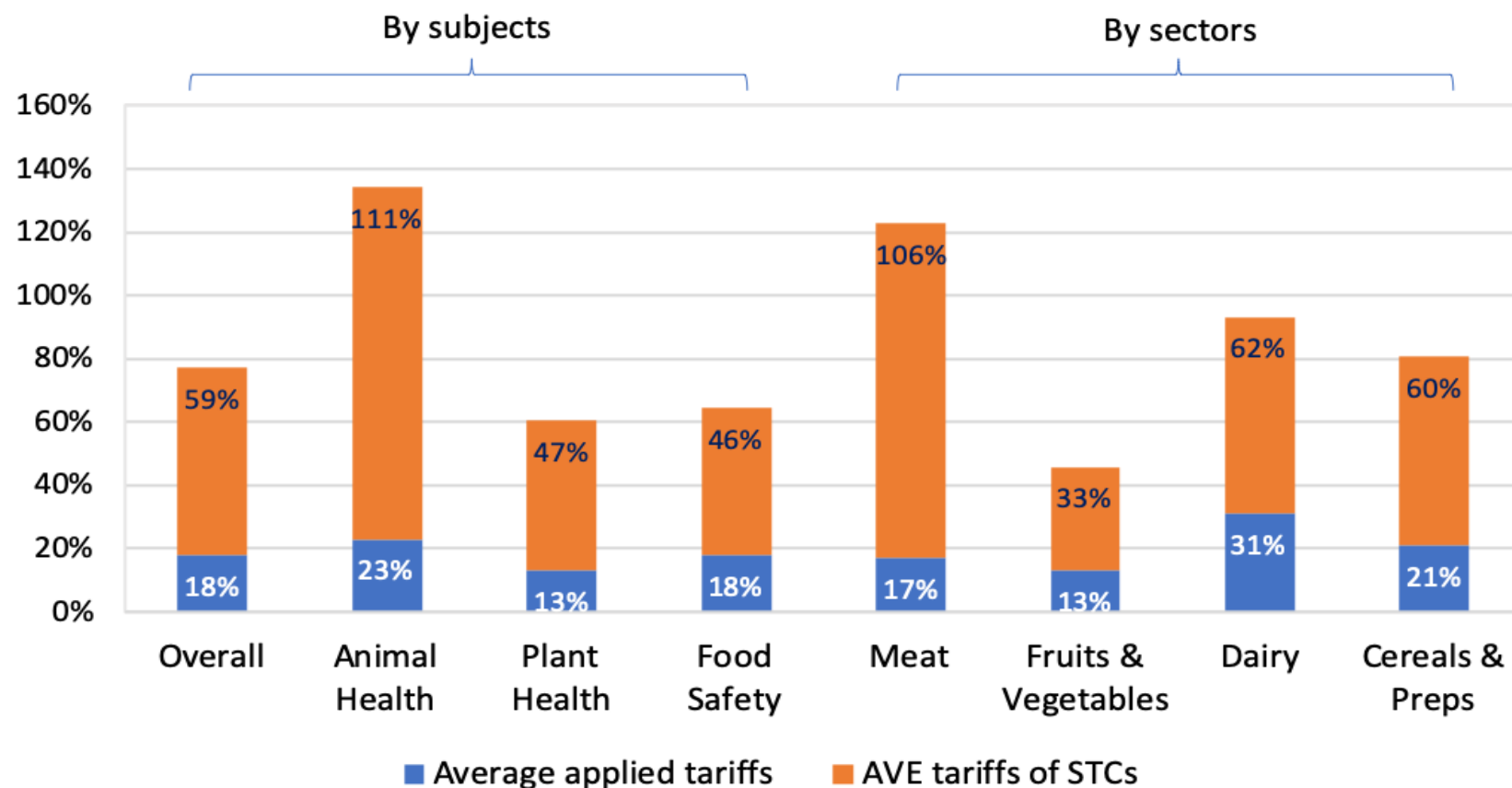


Note: applied tariffs in 5-year average across countries and products covered in each scenario.

# AVEs of SPS Concern Measures: specific country level



Note: applied tariffs in 5-year average across countries and products covered in each scenario.

# AVEs of SPS Concern Measures: selected case studies



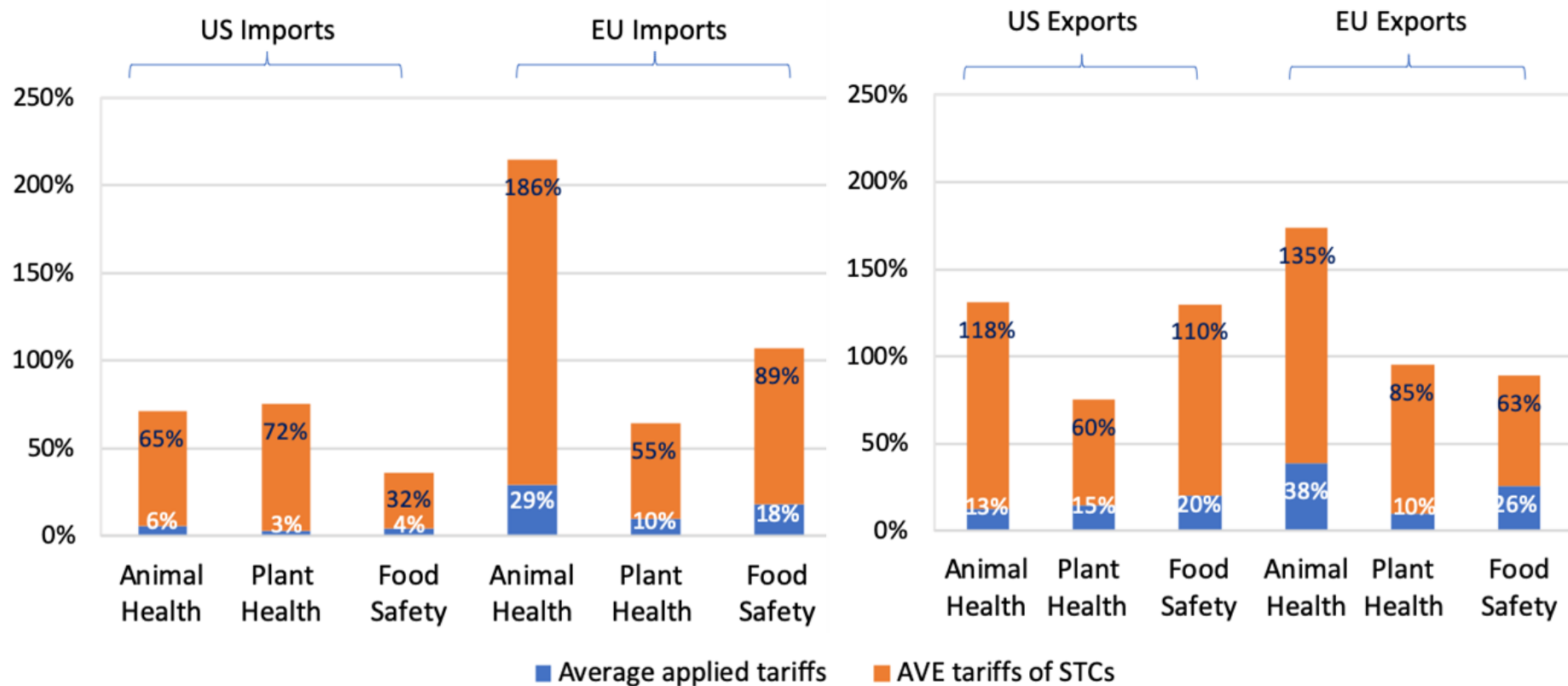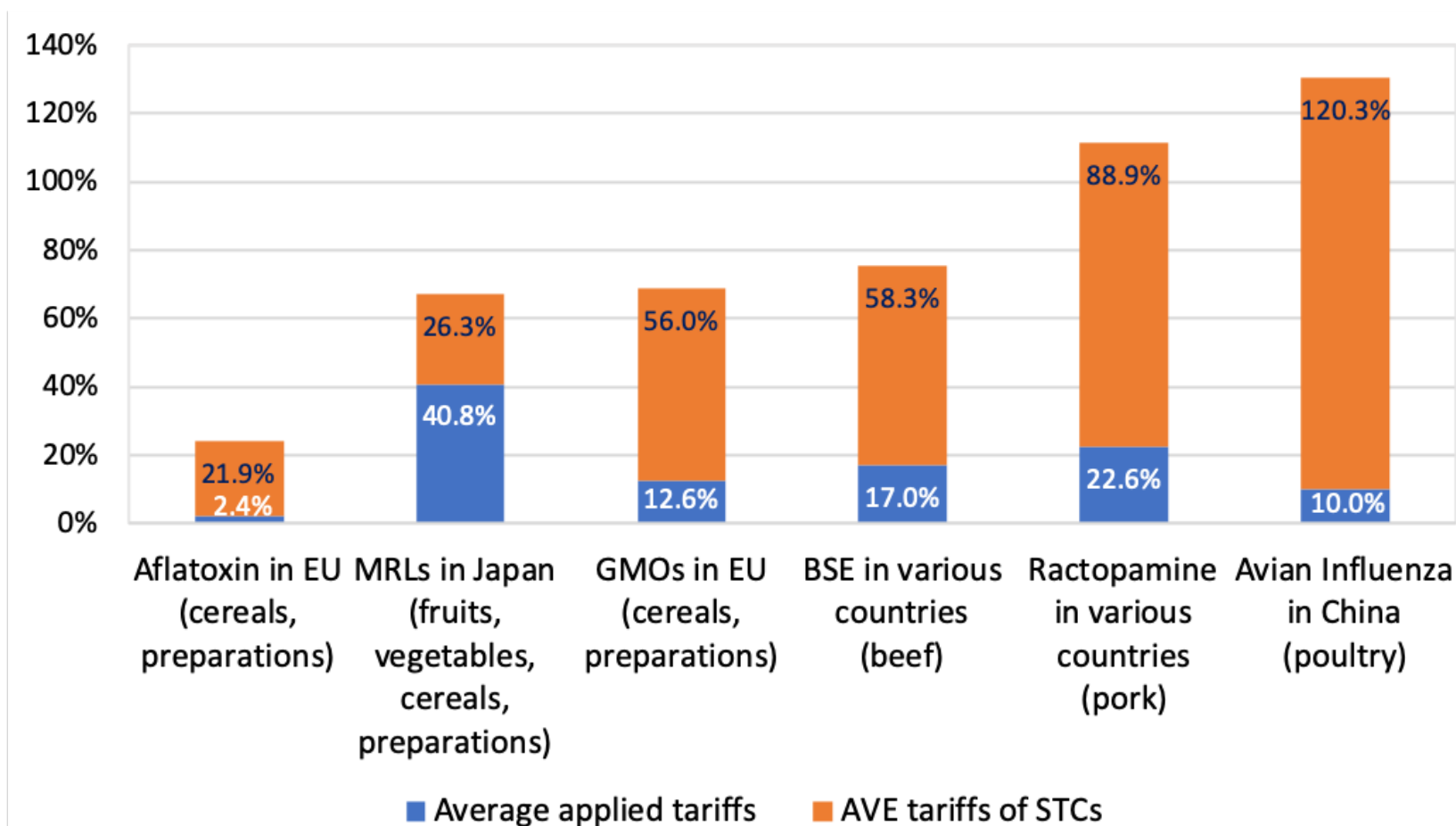Note: applied tariffs in 5-year average across countries and products covered in each scenario.

# Conclusions

- Globally, the est. AVE tariff of SPS measures ranged 33% ~ 106% for the major agri-food sectors.

- The est. AVE tariff of SPS measures maintained by US is 41%, considerably smaller than those maintained by EU (92%) and China (131%).

- China's restrictions on avian influenza and various ractopamine use on poultry and pork exports, respectively, are estimated to be the most prohibitive, causing an AVE effect of 120.3% and 88.9%.

# Caveats

- Our estimates of SPS trade effects are the upper end of non-tariff literature (i.e., vs. using all notifications)

    - We focus on a smaller subset of measures that have been flagged as concerns (potential selection issue).

    - Nevertheless, we felt it important to characterize the trade impacts of these more contentious issues.

# Thank you for listening!
# Q&A?

**Contact Info:**
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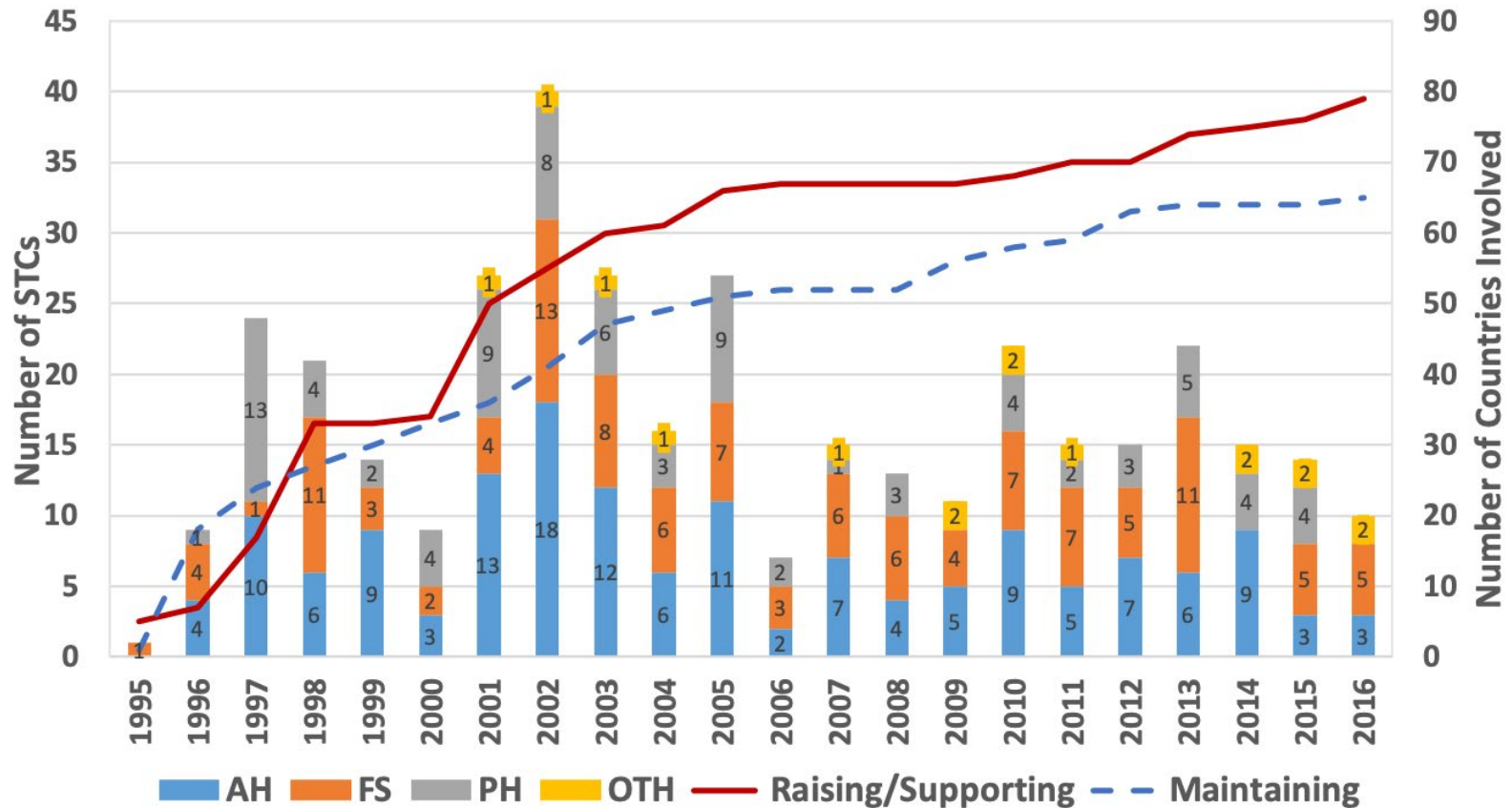Jason Grant, jhgrant@vt.edu

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# APPENDIX

# SPS Specific Trade Concerns, 1995-2016



Source: WTO SPS IMS database

# Top 10 countries raising/supporting SPS STCs by product sectors

# Top 10 countries maintaining SPS STCs by product sectors

# Identification of SPS Measures

- Expand each SPS trade concern into a time series and map with bilateral trade data for each country-pair-by-product
  - i. Use the raised STC as a signal of identifying problematic trade pair
  - ii. Evaluate the trade flow for the affected country-pair-by-product during, before and after the raised/resolved dates suggested in the SPS committee minutes, various web-based national sources and consultation with WTO, USDA and USTR officials
  - iii. Determine the length of time trade flow was impacted (if any) beyond those recorded in the minutes; if no clear pattern emerged, we coded the concern as recorded in the minutes

# Estimated trade effects = $\exp(\hat{\lambda}) - 1$

$$\tau = AVE^{SPS}$$

$$= \exp(\frac{\lambda}{\beta}) - 1$$

$$= \exp(\frac{\lambda}{1-\sigma}) - 1$$

Trade elasticity of substitution estimates from Soderbery (2015, 2018)

| | ALL | Meat Products | Fruits & Vegetables | Dairy Products | Cereals & Preparations |
|---|---|---|---|---|---|
| | | | *Effect in aggregate* | | |
| STC, active | -0.678*** | -0.816*** | -0.507*** | -0.674*** | -0.688*** |
| | (0.023) | (0.030) | (0.041) | (0.041) | (0.046) |
| STC, post-resolved | -0.139** | -0.297*** | -0.096 | -0.206** | 0.107 |
| | (0.061) | -(0.109) | -(0.078) | -(0.090) | -(0.217) |
| | | | *Effect by subjects* | | |
| Animal Health, active | -0.839*** | -0.858*** | | -0.733*** | |
| | (0.027) | (0.028) | | 0.054 | |
| Animal Health, post-resolved | -0.388*** | -0.448*** | | 0.041 | |
| | (0.104) | (0.105) | | 0.206 | |
| Plant Health, active | -0.612*** | | -0.629*** | | -0.503*** |
| | (0.057) | | (0.061) | | (0.192) |
| Plant Health, post-resolved | -0.137 | | -0.268** | | 1.199 |
| | (0.116) | | (0.112) | | (0.762) |
| Food Safety, active | -0.605*** | -0.715*** | -0.401*** | -0.635*** | -0.695*** |
| | (0.034) | (0.061) | (0.052) | 0.059 | (0.048) |
| Food Safety, post-resolved | -0.016 | 0.115 | 0.034 | -0.330*** | 0.018 |
| | (0.084) | (0.254) | (0.104) | 0.079 | (0.203) |
| Other, active | -0.734*** | | -0.678*** | | |
| | (0.045) | | (0.109) | | |
| Other, post-resolved | 0.093 | | -0.084 | | |
| | (0.208) | | (0.217) | | |
| Importer-product-time FE | Y | Y | Y | Y | Y |
| Exporter-product-time FE | Y | Y | Y | Y | Y |
| Importer-exporter-product FE | Y | Y | Y | Y | Y |
| Observations | 555,258 | 109,058 | 230,701 | 74,005 | 141,494 |
| $\sigma$ | 3.364 | 3.452 | 3.348 | 3.387 | 3.332 |

# AVEs of SPS concern measures: by type
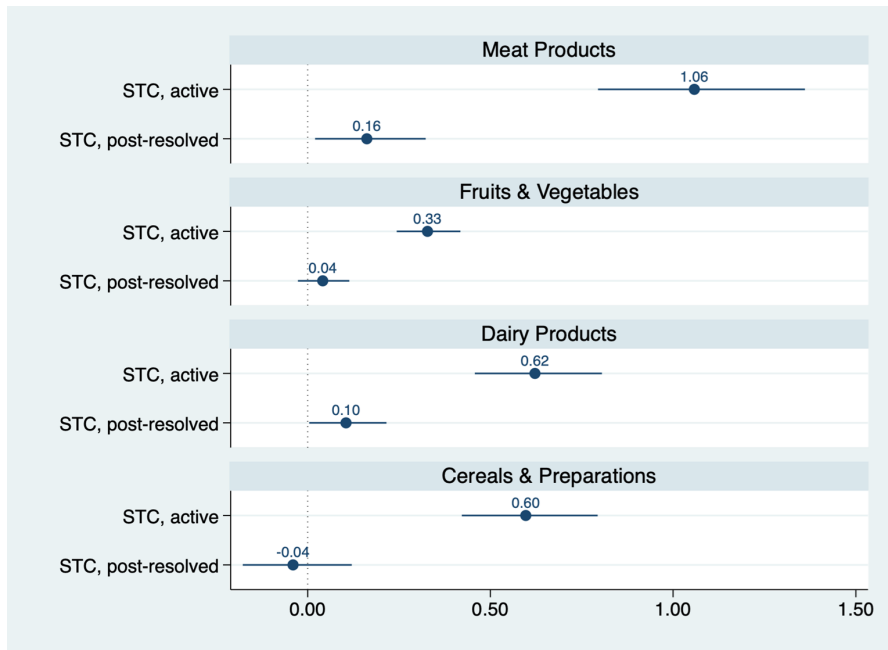


Estimates with zero trade flow
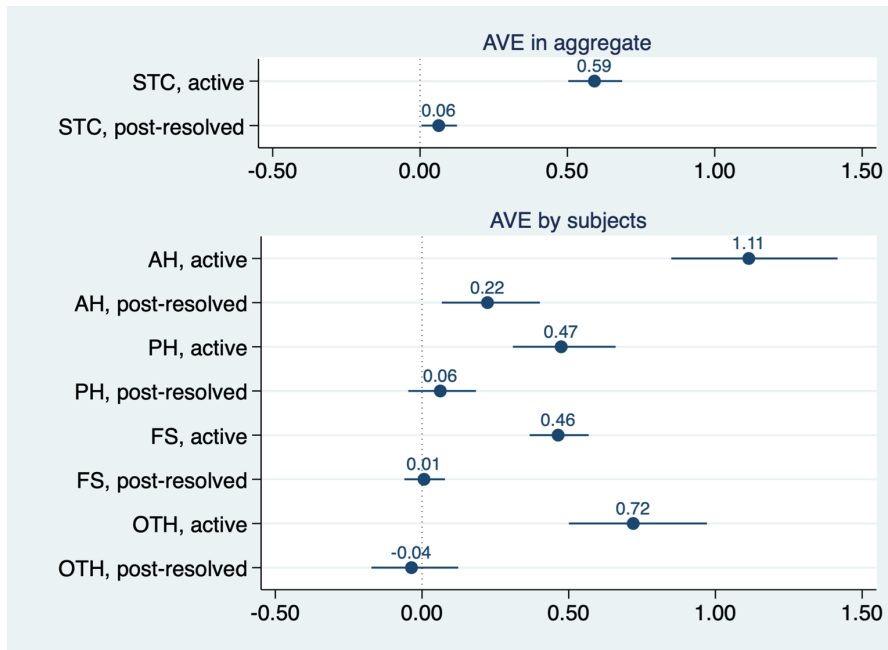
Estimates without zero trade flow
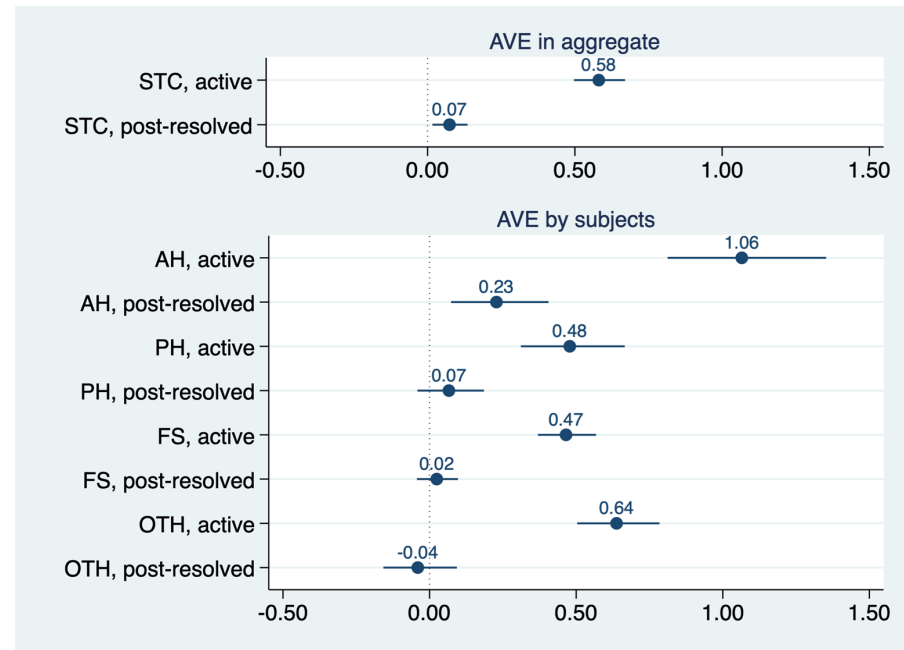
# AVEs of SPS concern measures: by sector



Estimates with zero trade flow
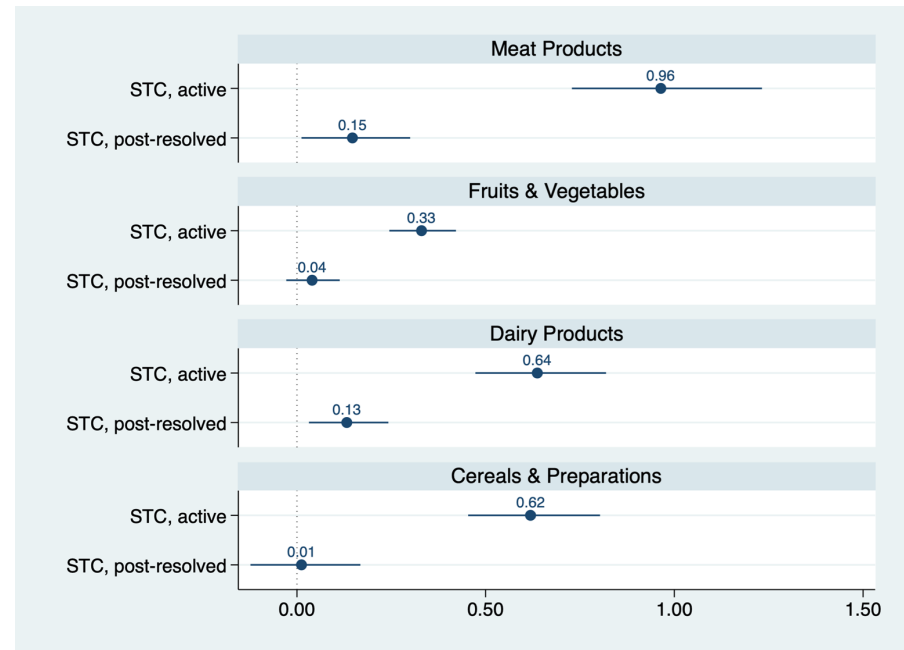
Estimates without zero trade flow

**Table A.2: List of countries (and/or regions) analyzed in the empirical analysis**

| Country | ISO3 Code | Development Level |
|---|---|---|
| Argentina | ARG | Developing |
| Australia | AUS | Developed |
| Brazil | BRA | Developing |
| Canada | CAN | Developed |
| Chile | CHL | Developing |
| China | CHN | Developing |
| Colombia | COL | Developing |
| Costa Rica | CRI | Developing |
| Ecuador | ECU | Developing |
| Indonesia | IDN | Developing |
| India | IND | Developing |
| Japan | JPN | Developed |
| Mexico | MEX | Developing |
| Malaysia | MYS | Developing |
| New Zealand | NZL | Developed |
| Philippines | PHL | Developing |
| Paraguay | PRY | Developing |
| Russian Federation | RUS | Developing |
| South Africa | ZAF | Developing |
| South Korea | KOR | Developed |
| Switzerland | CHE | Developed |
| Taiwan, China | TWN | Developing |
| Thailand | THA | Developing |
| Turkey | TUR | Developing |
| Ukraine | UKR | Developing |
| Uruguay | URY | Developing |
| United States | USA | Developed |
| Venezuela | VEN | Developing |
| Vietnam | VNM | Developing |
| European Union (28) | EUR | Developed |

Source: World Economic Situation Prospects, United Nations (UN [93]).

Table A.3: MTN sectors mapping to HS and SITC product codes

| MTN Category | Abbreviation | HS Code (Revision 2007) | SITC Code (Revision 1) |
|---|---|---|---|
| *Animal Products* | *MEAT* | 01, 02, 1601-1602 | 001, 011-013 |
| *Dairy Products* | *DAIRY* | 0401-0406 | 022-024 |
| *Fruits, Vegetables & Plants* | *FV* | 0601-0603, 07, 08, 1105-1106, 2001-2008, 1211, 13, 14 | 051-055 |
| *Coffee, Tea, Mate & Spices* | *CTS* | 0901-0903, 18 (except 1802), 2101 | 071-075 |
| *Cereals & Preparations* | *CER* | 0407-0410, 10, 1101-1104, 1107-1109, 19, 2102-2106, 2209 | 025, 041-048, 0554 |
| *Oilseeds, Fats & Oils* | *OILS* | 1201-1208, 15 (except 1504), 2304-2306, 3823 | 0813, 0913-0914, 221, 4113, 421-422, 431 |
| *Sugars & Confectionary* | *SGR* | 17 | 061-062, 5129 |
| *Beverages & Tobacco* | *BT* | 2009, 2201-2208, 24 | 111-112, 121- 122 |
| *Fish & Fish Products* | *SFD* | 03, 1504, 1603-1605, 230120 | 031-032, 0814, 4111 |
| *Other Agricultural products* | *OTHAG* | 0904-0910, 05, 0604, 1209-1210, 1212-1214, 1802, 230110, 2302-2303, 2307-2309, 290543-290545, 3301, 3501-3505, 380910, 382460, 4101-4103, 4301, 5001-5003, 5301-5302 | 0811-0812, 0990, 211-212, 262, 265, 291, 292 |

Note: Mapping to HS Codes is cited from World Tariff Profiles (ITC and UNCTAD [59]). Mapping to SITC Codes (Revision 1) is completed by the authors.

## Table A.4: List of selected case-study SPS specific trade concerns

| Topics | Maintained by | Raised/supported by | Products covered | Keywords |
|---|---|---|---|---|
| *Aflatoxin* <br><br> *(STC 39, 168, 198)* | European Union | Argentina; Australia; Bolivia; Brazil; China; The Gambia; India; Indonesia; Malaysia; Philippines; Senegal; Thailand; Canada; Colombia; Mexico; Pakistan; Paraguay; Peru; Philippines; South Africa; Turkey; United States; Uruguay | Milk, peanuts, other nuts, dried fruits, corn, cereals, other food preparations | Food safety |
| *GMOs* <br><br> *(STC 106, 110, 117, 396)* | European Union | Argentina; Australia; Canada; Egypt; Israel; Jordan; Singapore; Chinese Taipei; Paraguay; Philippines; United States | Cereals, grains, food preparations, other animal feeds | Food safety; Other concerns |
| *BSE* <br><br> *(STC 4, 96, 193)* | Argentina; Australia; Brazil; Chile; China; Japan; Singapore; South Korea; Thailand; Turkey; Ukraine; European Union; United States | Canada; Switzerland; European Union; United States; Uruguay | Beef | Animal health |
| *MRLs* <br> *(STC 212, 267, 283)* | Japan | China; Australia; Brazil; Philippines; Ecuador; New Zealand; United States | Fruits, vegetables | Food safety |
| *Ractopamine* <br><br> *(STC 275)* | China; Chinese Taipei; Thailand; European Union; Russian Federation | United States; Brazil; Canada; Costa Rica; Ecuador; Peru | Pork | Food safety |
| *AI* <br> *(STC 196, 259, 406)* | China | United States; European Union; Canada | Poultry | Food safety |

Source: http://spsims.wto.org/

# Sri Lanka cinnamon exports to EU (STC 231, maximum tolerance levels of SO2)



Sri Lankan Cinnamon Exports to EU-28, 1998-2017
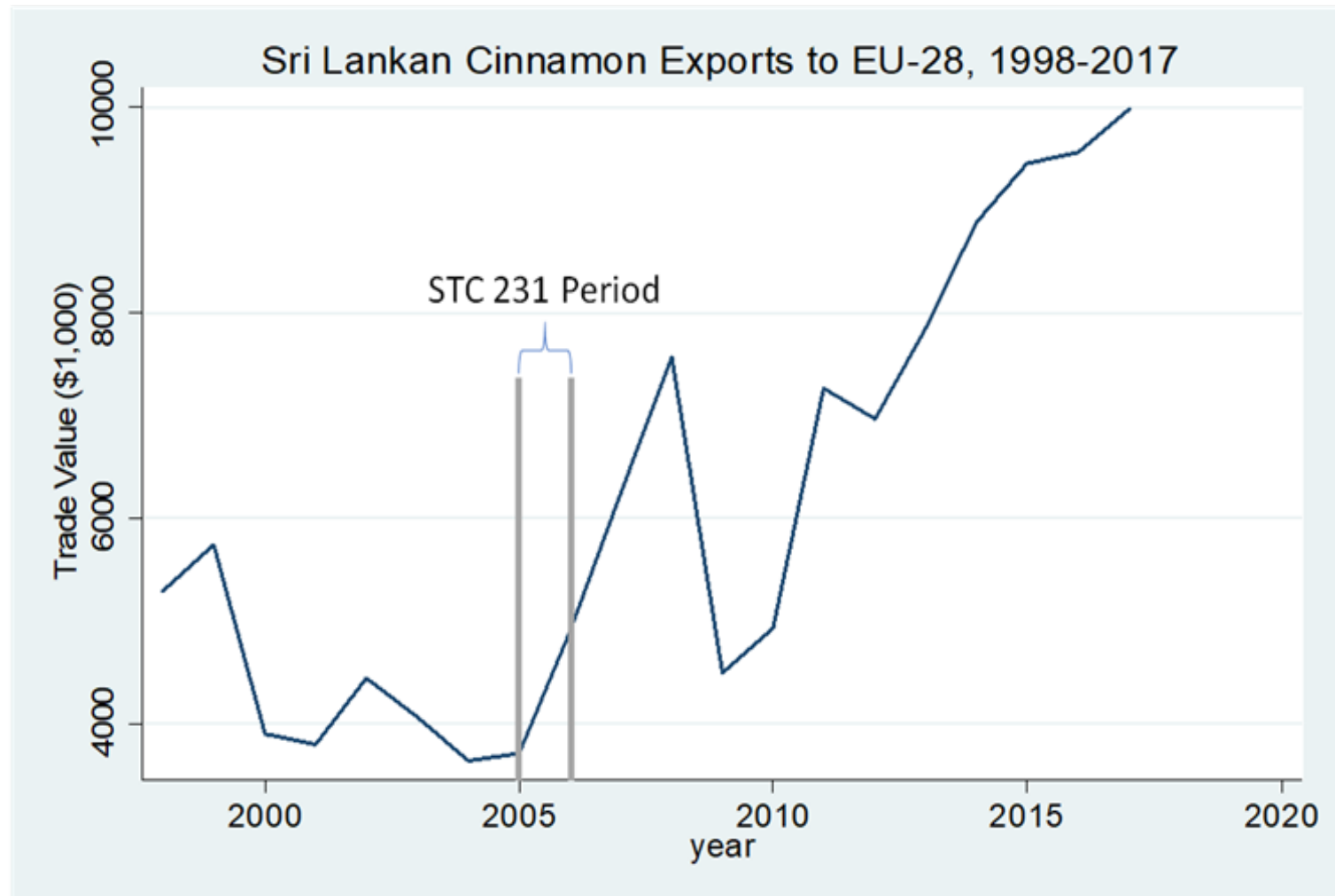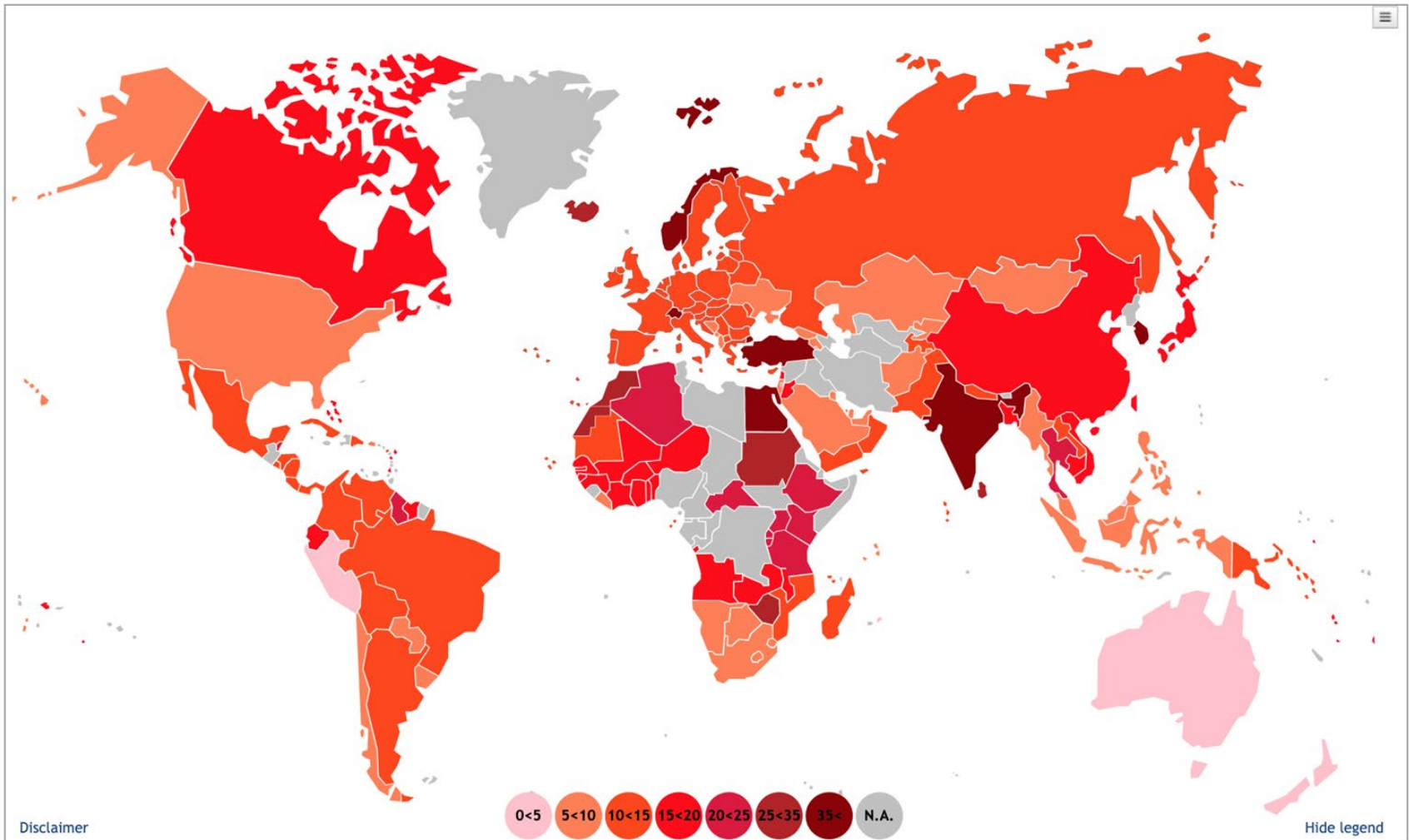
# Decreasing MFN Simple Average Tariffs



https://wits.worldbank.org/
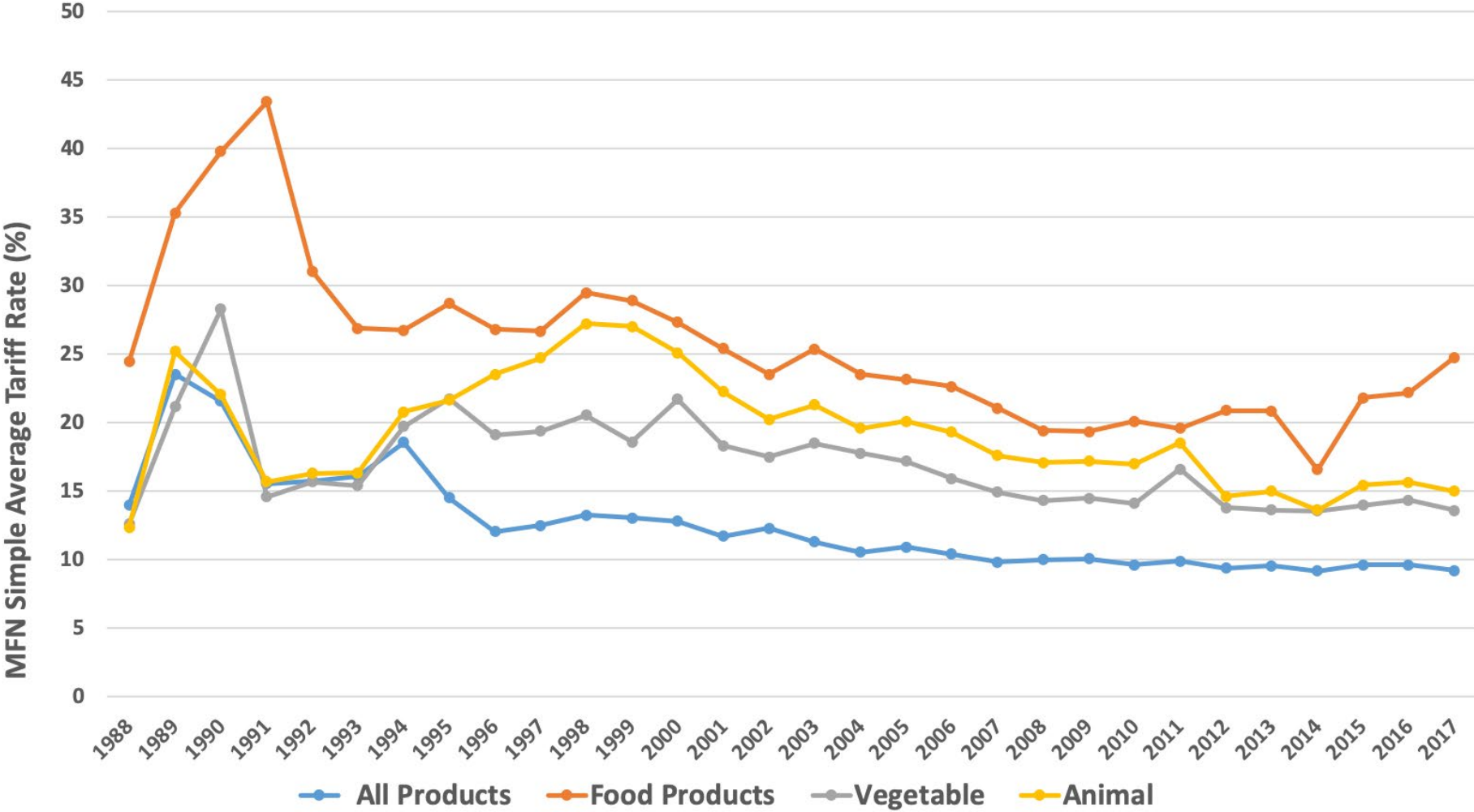
# Average Applied MFN Tariff on Ag. Products, 2018



Source: WTO International Trade and Market Access Data