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#### Tariff Evasion in Agriculture: The Role of Non-Tariff Measures

Xi He

Selected presentation for the International Agricultural Trade Research Consortium's (IATRC's) 2022 Annual Meeting: Transforming Global Value Chains, December 11-13, 2022, Clearwater Beach, FL.

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### Tariff Evasion in Agriculture: The Role of Non-tariff Measures

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2022 IATRC Conference

2022 IATRC Annual Conference Dec 11, 2022

#### Motivation: Size and detection of evasion

- **Size**: Illegal trade accounted for **8 to 15%** of global GDP in 2012-2014; Prevalent in both developed and developing countries (Transnational Alliance to Combat Illicit Trade, 2019).
- **Detection**: Gap in **mirror** trade Statistics (China General Administration of Customs, US Census Bureau).



### Motivation: Why evasion in Ag is important?

- Previous studies focus on manufacturing sectors.
- **Trade barriers** are more prevalent in ag than in non-ag sectors, and NTMs are increasingly used as alternative protection (Hoekman and Nicita, 2011).
- Public health and ecosystem consequences of evasion in some products, such as alcohol, tobacco, and timber (Yang, 2008; Chimeli and Soares, 2017; Beverelli and Ticku, 2020).

#### Research questions

- Is there tariff evasion in Ag?
  - **Tariff evasion**: import evasion (importers evade at the destination via channels such as price/quantity under-reporting, and misclassification) increases with tariff.
- Do NTMs affect tariff evasion in agriculture?
  - Increase evading incentives by higher trade costs (longer delivery time and higher production costs).
  - Reduce evading incentives via higher demand (certifying quality and safety to consumers).

#### Outline

- Empirical model
- Data sources and descriptive statistics
- Basic results

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### Empirical model: Measurement of import evasion

• Measuring import evasion

$$Gapv_{ijkt} = log(Expv_{jikt}) - log(Impv_{ijkt})$$
(1)

- *i*, *j*, *k*, *t*: importer, exporter, six-digit HS product, year;
- *Expv<sub>jikt</sub>*: country *j*′*s* reported export value;
- *Impv<sub>ijkt</sub>*: country *i*'s reported import value;
- larger Gapv<sub>ijkt</sub> means higher import evasion.
- Capture the case of complete smuggling

$$Gapv_{ijkt} = log(1 + Expv_{jikt}) - log(1 + Impv_{ijkt})$$
(2)

#### Empirical model: Baseline model

$$Gapv_{ijkt} = \alpha_0 + \beta_0 Tar_{ijkt} + \beta_1 Tar_{ijkt} * NTM_{ijkt} + \beta_2 NTM_{ijkt} + \gamma_1 X_{it} + \gamma_2 X_{jt} + \theta_{ij} + \mu_{ik} + \eta_{kt} + \epsilon_{ijkt}$$
(3)

- *Tar<sub>ijkt</sub>*: tariff country *i* imposes on country *j* for product *k* at year *t*;
- *NTM<sub>ijkt</sub>*:dummy denotes whether country *i* has an NTM for product *k* imported from country *j* at year *t*;
- X<sub>it</sub>: controls of county *i*/*j*, (corruption, property rights protection, rainfall and temperature)
- $\theta_{ij}$ ,  $\mu_{ik}$ ,  $\eta_{kt}$  denotes country pair, product by year, and importer by product fixed effects.

## Empirical model: Disaggregating NTMs

$$Gapv_{ijkt} = \alpha_0 + \beta_0 Tar_{ijkt} + \sum_{m=1}^{M} \beta_{1m} Tar_{ijkt} * NTM_{ijkt}^m + \sum_{m=1}^{M} \beta_{2m} NTM_{ijkt}^m + \gamma_1 X_{it} + \gamma_2 X_{jt} + \theta_{ij} + \mu_{ik} + \eta_{kt} + \epsilon_{ijkt}$$
(4)

- $NTM_{ijkt}^m$  a dummt measures the number of NTM type m.
- m denotes ten types of NTMs, pre-shipment inspection, quantity control, price control, three SPS subcategories (prohibitions/restrictions of imports for SPS reasons, tolerance limits for residues and restricted use of substances, and labeling/ marketing/packaging requirements), and three TBT subcategories, and other NTMs.

#### SPS and TBT classification

NTM Code	NTM Level	NTM Code Description
A000	1	Sanitary and phytosanitary measures (SPS)
<mark>A100</mark>	2	Prohibitions/restrictions of imports for SPS reasons
A200	2	Tolerance limits for residues and restricted use of substances
A300	2	Labeling, Marking, and Packaging requirements
A400	2	Hygienic requirements
A500	2	Treatment for elimination of plant and animal pests and disease-causing organisms in the final product (e.g., post- harvest treatment)
		Other requirements on production or post-production
A600	2	processes
A800	2	Conformity assessment related to SPS
A900	2	SPS measures not specified
B000	1	Technical barriers to trade (TBT)
<b>B100</b>	2	Prohibitions/restrictions of imports for objectives set out in the TBT agreement
<b>B200</b>	2	Tolerance limits for residues and restricted use of substances
<b>B300</b>	2	Labeling, Marking, and Packaging requirements
B400	2	Production or Post-Production requirements
B600	2	Product identity requirement
B700	2	Product quality or performance requirement
B800	2	Conformity assessment related to TBT
B900	2	TBT Measures not specified

Table A1. Sub-classification of SPS and TBTs in UNCTD NTM database.

Note: This table shows the sub-classification of TBTs and SPS in the UNCTAD NTM database.

#### Figure 1: Sub-classification of SPS and TBTs in UNCTAD NTM database

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#### Endogeneity concerns

- **Reverse causality**: countries use trade policies to address evasion in an HS6 product category?
- IV: We use the average tariffs of the three closest neighboring countries in the sample as the instrumental variable for a country's tariff (Baldwin and Jaimovich, 2012; Tovar, 2019; Kee and Nicita, 2022; Kee and Nicita, 2022).
- Assumptions: neighboring countries' trade policies could correlate with the trade policies of the importing country due to regional trading agreements or common cultural/historical backgrounds. However, neighboring countries' trade policies are not likely to affect import evasion of the country of interest.

#### Data sources

Trade and trade policies:

- Bilateral trade: UNComtrade
- **Tariffs**: United Nations Conference on Trade and Development's (UNCTAD) Trade Analysis Information System (TRAINS);
- NTMs: UNCTAD global database on non-tariff measures;

Controls:

- **Property rights protection and corruption**: V-Dem project by Coppedge et al. (2020)
- Weather: NOAA National Centers for Environmental Information (NOAA NCEI, 2021)
- Geographical and economics variables: CEPII

#### Data cleaning

- Dropping countries without NTM data available;
- Dropping country pairs that never trade with each other during the study period;
- Dropping bilateral observations with less than \$5,000 in export value;
- Dropping the top and bottom 1% of observations in terms of import evasion;

Sample: an unbalanced panel of around 2.1 million observations: 99 importers, 106 exporters, and 327 six-digit HS products from 1990 to 2019.

#### Descriptive statistics: Import evasion over time



Figure 2: Export value-weighted import evasion in value across four types of agricultural commodities: 1990-2019.

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#### Descriptive statistics: NTMs over time



Figure 3: Share of products that were imposed any non-tariff measures (NTMs) in agriculture: 1990 to 2019.

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#### Impacts of NTMs on tariff evasion

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	IV	OLS	IV	OLS	IV
Trade policies						
Tariff	0.029	0.178***	0.033*	0.182***	0.032	0.272***
	(0.018)	(0.060)	(0.020)	(0.064)	(0.019)	(0.080)
Tariff*pre-shipment						
inspection			-0.088**	-0.105**	-0.072*	-0.181*
			(0.036)	(0.041)	(0.037)	(0.095)
Tariff*price control			-0.000	-0.045	0.024	-0.003
			(0.018)	(0.027)	(0.017)	(0.060)
Tariff*quantity control			0.036	0.070**	-0.007	-0.048
			(0.023)	(0.029)	(0.023)	(0.069)
Tariff*SPS 1			-0.002	-0.001	0.001	-0.011
			(0.024)	(0.029)	(0.025)	(0.110)
Tariff*SPS 2			-0.085***	-0.009	-0.121***	-0.168*
			(0.024)	(0.029)	(0.027)	(0.090)
Tariff*SPS 3			0.004	-0.021	0.025	0.073
			(0.022)	(0.025)	(0.024)	(0.085)
Tariff*TBT 1			0.007	-0.002	-0.010	-0.064
			(0.048)	(0.061)	(0.063)	(0.213)
Tariff*TBT 2			0.067	0.015	0.116*	-0.145
			(0.046)	(0.042)	(0.062)	(0.149)
Tariff*TBT 3			-0.055***	-0.075***	-0.029	-0 115
			(0.017)	(0.026)	(0.022)	(0.093)
Tariff*Other			0.017**	0.027***	0.008	0.044*
			(0.007)	(0.007)	(0.008)	(0.023)
Exporter characteristics	Y	Y	Y	Y	Y	Y
Country pair fixed effects	Y	Y	Y	Y	Y	Y
HS6 by year fixed effects	Y	Y	Y	Y	Y	Y
Importer by HS6 fixed						
effects	Y	Y	Y	Y	Y	Y
NTM as controls	N	N	N	N	Y	Y
R-squared	0.118	0.118	0.118	0.118	0.118	0.118
Observations	1 993 507	1 993 507	1 993 507	1 993 507	1 993 507	1 993 50

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# Heterogeneity

	(1)	(2)
	<u>High-</u> income countries	<u>Non-high-</u> income countries
Trade policies		
Tariff	0.210**	0.332*
	(0.087)	(0.167)
Tariff*pre-shipment		
inspection	0.024	-0.438***
	(0.157)	(0.144)
Tariff*price control	-0.132	0.080
	(0.089)	(0.089)
Tariff*quantity control	-0.125	-0.053
	(0.110)	(0.155)
Tariff*SPS 1	0.058	-0.006
	(0.143)	(0.165)
Tariff*SPS 2	-0.036	-0.565***
	(0.118)	(0.184)
Tariff*SPS 3	0.051	-0.007
	(0.143)	(0.129)
Tariff*TBT 1	-0.681	0.043
	(1.163)	(0.209)
Tariff*TBT 2	0.200	-0.488*
	(0.196)	(0.248)
Tariff*TBT 3	-0.106	0.030
	(0.142)	(0.167)
Tariff*Other NTMs	0.040	0.036
	(0.033)	(0.033)
Importer characteristics	Y	Y
Exporter characteristics	Y	Y
Country pair fixed effects	Y	Y
HS6 by year fixed effects	Y	Y
Importer by HS6 fixed effects	Y	Y
NTM as controls	Y	Y
Observations	1,372,799	620,425

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#### Conclusions

- The first study to document tariff evasion and the role of NTMs in tariff evasion;
- Consistent evidence of tariff evasion;
- Pre-shipment inspections and SPS subcategory of tolerance limits for residues and restricted use of substances significantly reduces tariff evasion;
- Only significant for developing countries;

#### Implications, caveats and future work

- Implications: Accounting for NTMs' impacts on tariff evasion;
- Future work
  - **Case studies**: specific NTM-, product- or country-specific case studies?
  - Welfare implications: is import evasion welfare-enhancing or welfare-decreasing?

# Thanks! Q&A

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#### Mechanism Test: Price and quantity under-reporting

	Unit value gap	Import evasion in quantity
	(1)	(2)
Trade policies		
Tariff	-0.009	0.041
	(0.019)	(0.025)
Tariff*pre-shipment inspection	-0.106**	0.033
	(0.050)	(0.044)
Tariff*price control	0.025	-0.001
	(0.023)	(0.027)
Tariff <sup>*</sup> quantity control	0.019	-0.026
	(0.039)	(0.047)
Tariff <sup>*</sup> SPS 1	0.031	-0.030
	(0.027)	(0.029)
Tariff <sup>®</sup> SPS 2	-0.096*	-0.025
	(0.050)	(0.050)
Tariff <sup>®</sup> SPS 3	-0.026	0.051
	(0.030)	(0.034)
Tariff*TBT 1	0.069	-0.079
	(0.097)	(0.104)
Tariff <sup>®</sup> TBT 2	0.119	-0.004
	(0.103)	(0.135)
Tariff <sup>®</sup> TBT 3	-0.041	0.012
	(0.025)	(0.031)
Tariff*Other	0.025**	-0.017
	(0.012)	(0.013)
Exporter characteristics	Y	Y
Importer characteristics	Y	Y
Country pair fixed effects	Y	Y
HS6 by year fixed effects	Y	Y
Importer by HS6 fixed effects	Y	Y
NTM as controls	Y	Y
Observations	1.993.507	1.993.507

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#### Mechanism Tests: Product misclassification

$$Gapv_{ijkt} = \alpha_0 + \beta_0 \operatorname{Tar}_{ijkt} + \beta_1 \operatorname{Tar}_{ijkt} * Other\_high\_Tar_{ijot}$$
$$+ \sum_{m=1}^{M} \beta_{1m} \operatorname{Tar}_{ijkt} * Other\_high\_Tar_{ijot} * NTM_{ijkt}^m + \sum_{m=1}^{M} \beta_{2m} NTM_{ijkt}^m$$

$$+\gamma_1 X_{it} + \gamma_2 X_{jt} + \theta_{ij} + \mu_{ik} + \eta_{kt} + \epsilon_{ijkt}$$

	Import evasion in value	
	(3)	
Trade policies		
Tariff	0.006	
	-0.024	
Tariff*Dummy of higher tariff than similar products	0.046***	
F	-0.014	
Tariff®pre-shipment inspection® Dummy of higher tariff than similar products	0.034	
	-0.055	
Tariff*price control* Dummy of higher tariff than similar products	0.018	
	-0.031	
Tariff*quantity control* Dummy of higher tariff than similar products	-0.019	
	-0.061	
Tariff*SPS 1* Dummy of higher tariff than similar products	-0.054**	
	-0.025	
Tariff*SPS 2* Dummy of higher tariff than similar products	-0.017	
	-0.051	
Tariff*SPS 3* Dummy of higher tariff than similar products	-0.05	
	-0.048	
Tariff*TBT 1* Dummy of higher tariff than similar products	0.12	
	-0.088	
Tariff*TBT 2* Dummy of higher tariff than similar products	0.088	
	-0.168	
Tariff*TBT 3* Dummy of higher tariff than similar products	0.023	
	-0.035	
Tariff*Other* Dummy of higher tariff than similar products	0.008	
	-0.012	
Exporter characteristics	Y	
Importer characteristics	Y	
Country pair fixed effects	Y	
HS6 by year fixed effects	Y	
Importer by HS6 fixed effects	Y	
NTM as controls	Y	N 4 5 N
Observations	1,993,507	$r \rightarrow \pm r$

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(5)