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Regulatory Divergence in Non-Tariff Measures Across the Global Value Chains

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Regulatory divergence in non-tariff measures across the global values chains

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International Agricultural Trade Research Consortium

Clearwater Beach, FL, USA

Agenda

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2. Objectives of research
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4. Regulatory divergence in NTMs along the GVC
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6. Estimation results
7. Reviving TTIP: the potential impact of trade liberalization between the EU and US
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Motivation of research

1. **NTMs** as important trade policy measures regulating markets for undesirable externalities.
 - Example: recent **COVID-19 pandemic and border closures**
 - proliferation of regulatory **non-tariff measures (NTMs)** such as technical barriers to trade (TBTs) and sanitary and phytosanitary (SPS) measures
 - 46 TBTs citing COVID in their measure description while citing **Protection of Human health or safety**
 - 51 SPS measures citing COVID in all their measure description while **citing animal diseases, plant health, or food safety**
2. Few studies on **regulatory divergence** (Piermartini and Budetta, 2009; Cadot et al., 2015; Cadot and Ing, 2015, Knebel and Peters, 2019; Nabeshima and Obashi, 2021; Inui et al., 2021).
3. In the **presence of GVCs**, trade policy measures like tariffs or NTMs are amplified via backward and forward linkages (Ferrantino, 2012; Rouzet & Miroudot, 2013; Miroudot et al., 2013; Muradov, 2017; Escaith, 2017; Muradov, 2017; Ghodsi & Stehrer, 2022)

Objectives of research

1. Constructing a measure on **bilateral regulatory divergence** for each NACE two-digit bilateral relation in **objectives of TBTs and SPS** measures using the keywords cited in WTO notifications.
2. Constructing a measure on **bilateral regulatory divergence along the GVC**, to reflect the accumulation of regulatory divergence in previous stages of production of inputs sourced from the trading partner.
3. **Econometrics model of gravity** to analyse the effects of direct regulatory divergence, and indirect regulatory divergence through suppliers (backward linkages) on bilateral exports.
4. Reviving TTIP: the potential impact of liberalization between the **EU and US: tariff liberalization** and **regulatory convergence**.

Measuring regulatory divergence in NTMs

- Following Cadot et al. (2015), a binary variable $I_{jht}^{\tau c}$ is defined that indicates whether an importing country j has a regulatory NTM of type τ (i.e., $\tau \in \{TBT, SPS\}$) on HS six-digit product h in year t in force with an objective c cited in the keyword of the WTO notifications.
- The **regulatory divergence** between two trading partners i and j in that **regulatory measure τc** is then defined as:

$$RD_{ijht}^{\tau c} = |I_{jht}^{\tau c} - I_{iht}^{\tau c}|$$

- The **aggregation of regulatory divergence** over all classes for a traded sector s (including all HS six-digit products) between the importing country j and exporting country i in year t then yields the regulatory divergence that is calculated as follows:

$$D_{ijst}^{\tau} = \sum_c \frac{HC_{h,\tau} RD_{ijht}^{\tau c}}{HC_{h,\tau}}, \quad \tau \in \{TBT, SPS\}$$

- $HC_{h,\tau}$ is the total number of classes of NTMs of type τ that are imposed globally on product h and H is the total number of six-digit HS products in sector s .
- **This index converges to unity** when the two trading partners impose TBT or SPS measures that cover **different NTM classes** indicating the full divergence, and it **converges to zero** when the two trading partners impose TBT and SPS measures in the **same classes**.

Table 1 / List of TBT keywords and keyword classes in WTO notifications

TBT keywords Nr.	TBT keywords	Keyword class
1	Consumer information	1- Consumers
2	Consumer protection	
3	Crime protection	
4	Human health	
5	Prevention of deceptive practices and consumer protection	
6	Protection of Human health or safety	
7	Safety	
8	Food additives	2- Food
9	Food standards	
10	Genetically modified organisms	
11	Nutrition information	
12	Organic agriculture	3- Trade
13	Conformity assessment	
14	Harmonization	
15	Labelling	
16	Trade facilitation	4- Quality
17	Quality requirements	
18	Biofuels	5- Environment
19	Plant health	
20	Protection of animal or plant life or health	
21	Protection of the environment	
22	NA	6- Other
23	Other	
24	Cost saving and increasing productivity	7- Market
25	Metrology	
26	Packaging	
27	Electromagnetic compatibility	8- ICT
28	Telecommunication/Radiocommunication	
29	Animal feed	9- Animals
30	Animal health	
31	Animal welfare	
32	National security requirements	10- National

Figure 1 / Number of TBT notifications (based on keywords class) in force in 2021 globally

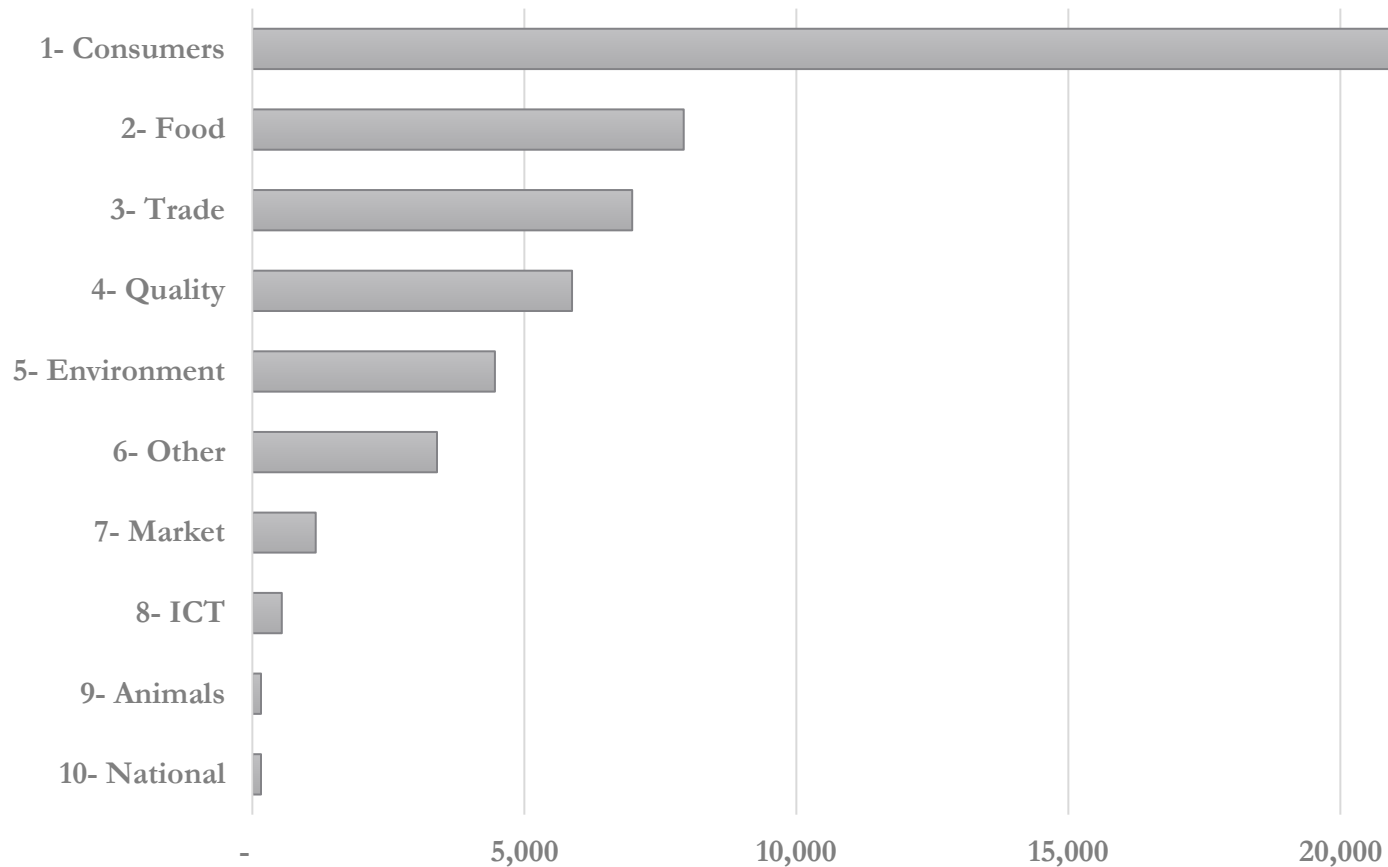


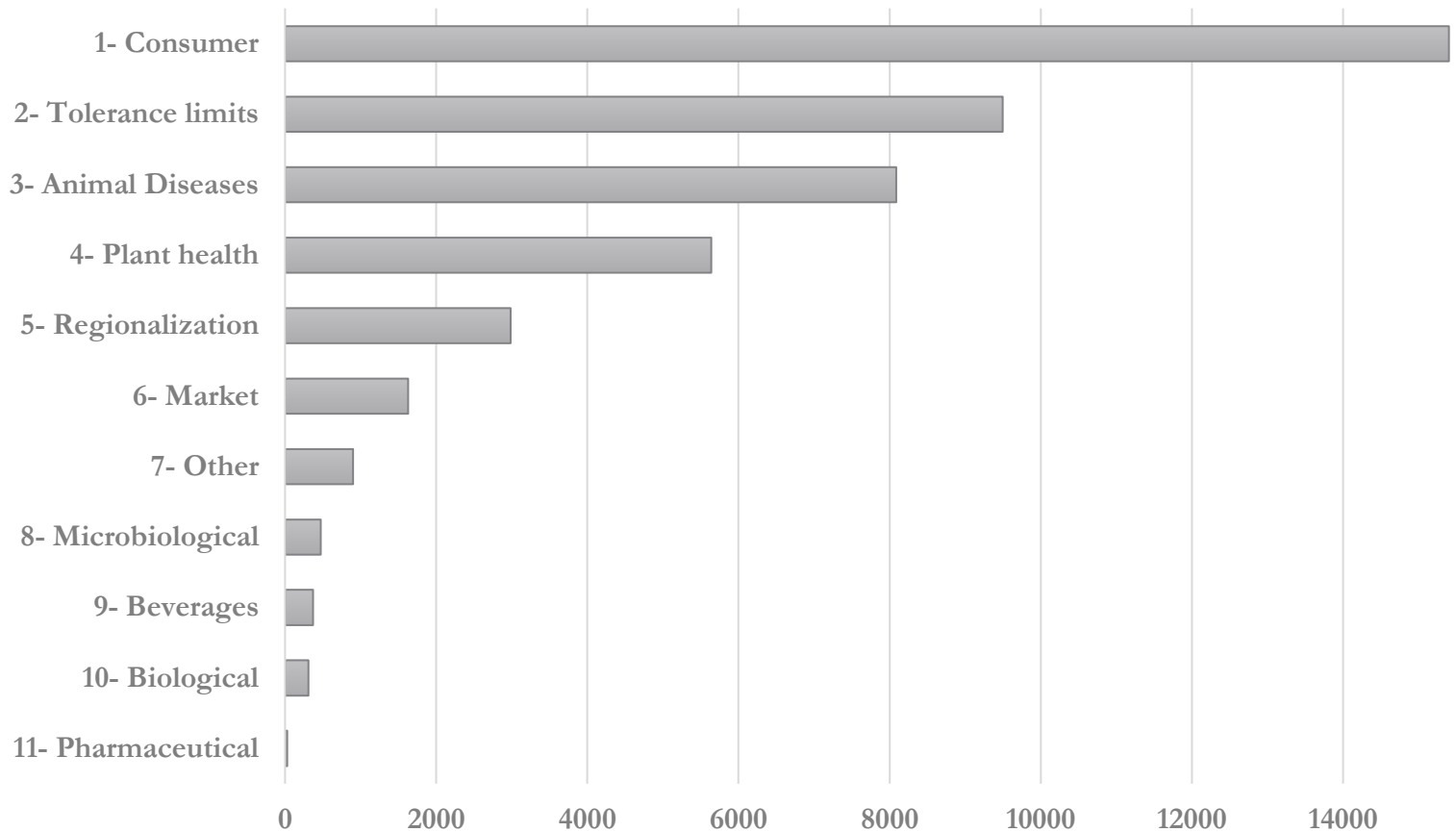
Table 2 / List of SPS keywords and keyword classes in WTO notifications

SPS keywords Nr.	SPS keywords	Keyword class
1	Food safety	
2	Human health	1- Consumer
3	Protect humans from animal/plant pest or disease	
4	Aflatoxins	
5	Allergens	
6	Contaminants	
7	Dioxins	
8	Feed additives	
9	Food additives	
10	Heavy metals	
11	Irradiation	
12	Maximum residue limits (MRLs)	2- Tolerance limits
13	Mycotoxins	
14	Ochratoxin	
15	Pesticides	
16	Polychlorinated biphenyls	
17	Tolerance exemption	
18	Toxins	
19	Veterinary drugs	
20	Animal diseases	
21	Animal feed	
22	Animal health	
23	Animal welfare	
24	Avian Influenza	
25	Bluetongue	
26	Bovine Spongiform Encephalopathy (BSE)	
27	Classical Swine Fever	
28	Foot and mouth disease	
29	Fruit fly	3- Animal Diseases
30	H1N1 influenza	
31	Invasive species	
32	Nematode	
33	Newcastle Disease	
34	Pests	
35	Scrapie	
36	Transmissible Spongiform Encephalopathy (TSE)	
37	Zoonoses	

Table 2 / List of SPS keywords and keyword classes in WTO notifications

SPS keywords Nr.	SPS keywords	Keyword class
38	Citrus canker	
39	Fungi	
40	Plant diseases	
41	Plant health	4- Plant health
42	Plant protection	
43	Protect territory from other damage from pests	
44	Sudden Oak death	
45	Regionalization	5- Regionalization
46	Territory protection	
47	Certification	
48	control and inspection	
49	HACCP Plan requirements	
50	Labelling	6- Market
51	Packaging	
52	Traceability	
53	Wood packaging / ISPM15	
54	Equivalence	7- Other
55	Seeds	
56	Bacteria	
57	Escherichia coli	8- Microbiological
58	Listeria monocytogenes	
59	Salmonella	
60	Beverages	9- Beverages
61	Biological control agents	
62	Biotechnology	10- Biological
63	Genetically modified organisms	
64	Pharmaceutical products	11- Pharmaceutical

Figure 2 / Number of SPS notifications (based on keywords class) in force in 2021 globally



Regulatory divergence in NTMs along the GVC

- Following Miroudot et al. (2013), we track tracking the cumulative tariffs and regulatory divergence in NTMs denoted as $\Phi_{\tau,ijst} \in \{T_{jst}, D_{ijst}^{TBT}, D_{ijst}^{SPS}\}$ along the backward linkages within Global Value Chains (GVCs).
- Tariffs or the regulatory divergence causing trade disturbance on the **production of a single unit of a product in industry l within country i during year t** is computed as $\sum_{js} \Phi_{\tau,ijst} \alpha_{tsl}^{ji}$. The components of vector $\Phi_{\tau,tijW}$ represent the tariffs applied by country i on imports of products from industry s in country j , or the regulatory divergence in TBT or SPS measures between these two trading partners in sector s . It is assumed that these trade policy disturbances are consistent across all using industries in country i that utilize intermediate inputs from country j and industry s .
- α_{tsl}^{ji} represents the direct requirements of industry l in country i for inputs sourced from industry s in country j during year t .

Regulatory divergence in NTMs along the GVC

$$\Phi_{\tau,t,GVC} = [\mathbf{I}_C \otimes \mathbf{e}_{1N} \times \mathbf{B}_t \times (\mathbf{I} - \mathbf{A}_t)^{-1}]', \forall t = 1, \dots, T, \tau \in \{T_{ijst}, D_{ijst}^{TBT}, D_{ijst}^{SPS}\}$$

- \mathbf{A}_t represents the $NC \times NC$ matrix of direct requirements in each year t , and $(\mathbf{I} - \mathbf{A}_t)^{-1}$ signifies the corresponding Leontief inverse (Leontief, 1936).
- \mathbf{B}_t is a $NC \times NC$ matrix obtained by element-wise multiplication of each country's direct requirements by its vector of annual bilateral industry-specific AVEs. $\mathbf{B}_t = [\Phi_{\tau,tijW} \otimes \mathbf{e}'_N, \dots, \Phi_{\tau,tC} \otimes \mathbf{e}'_N] \odot \mathbf{A}_t$ (where \mathbf{e}'_N represents a $1 \times N$ vector of ones, \otimes signifies a Kronecker product, and \odot denotes element-wise multiplication).
- \mathbf{I}_C is an identity matrix with the dimension equal to the number of countries, \mathbf{C} , while \mathbf{e}_{1N} is a row vector of ones with a length corresponding to the number of sectors, \mathbf{N} .
- The resulting $\Phi_{\tau,t,GVC}$ forms a $\mathbf{C} \times \mathbf{NC}$ matrix, indicating the indirect implied trade policy disturbances resulting from the proliferation of NTMs and levied tariffs at the bilateral-industry level.

Figure 3 / Evolution of regulatory distance in NTMs and tariffs over years – 1996-2020

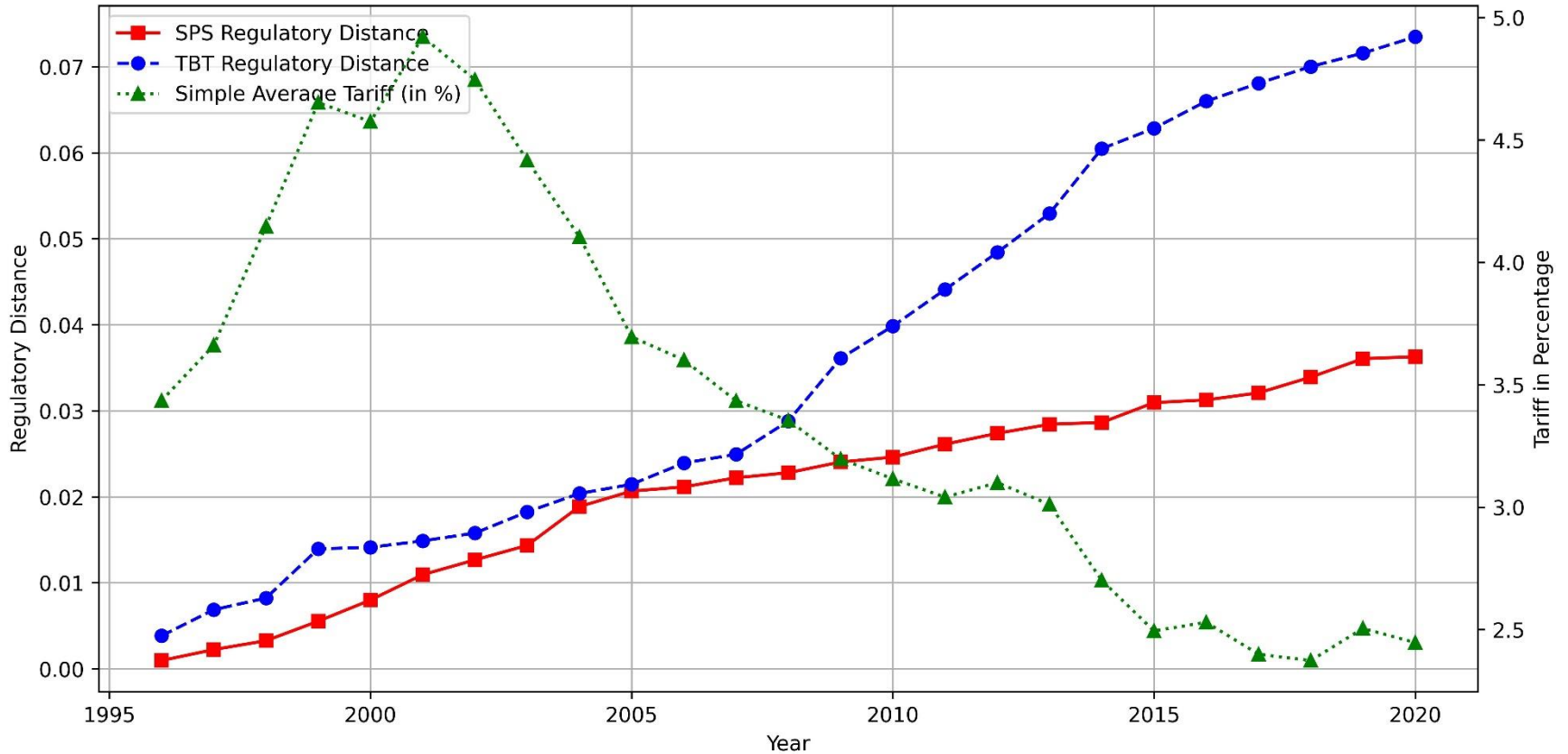


Figure 4 / Global average tariffs and regulatory divergence in TBTs and SPS measures across non-services NACE sectors in 2020

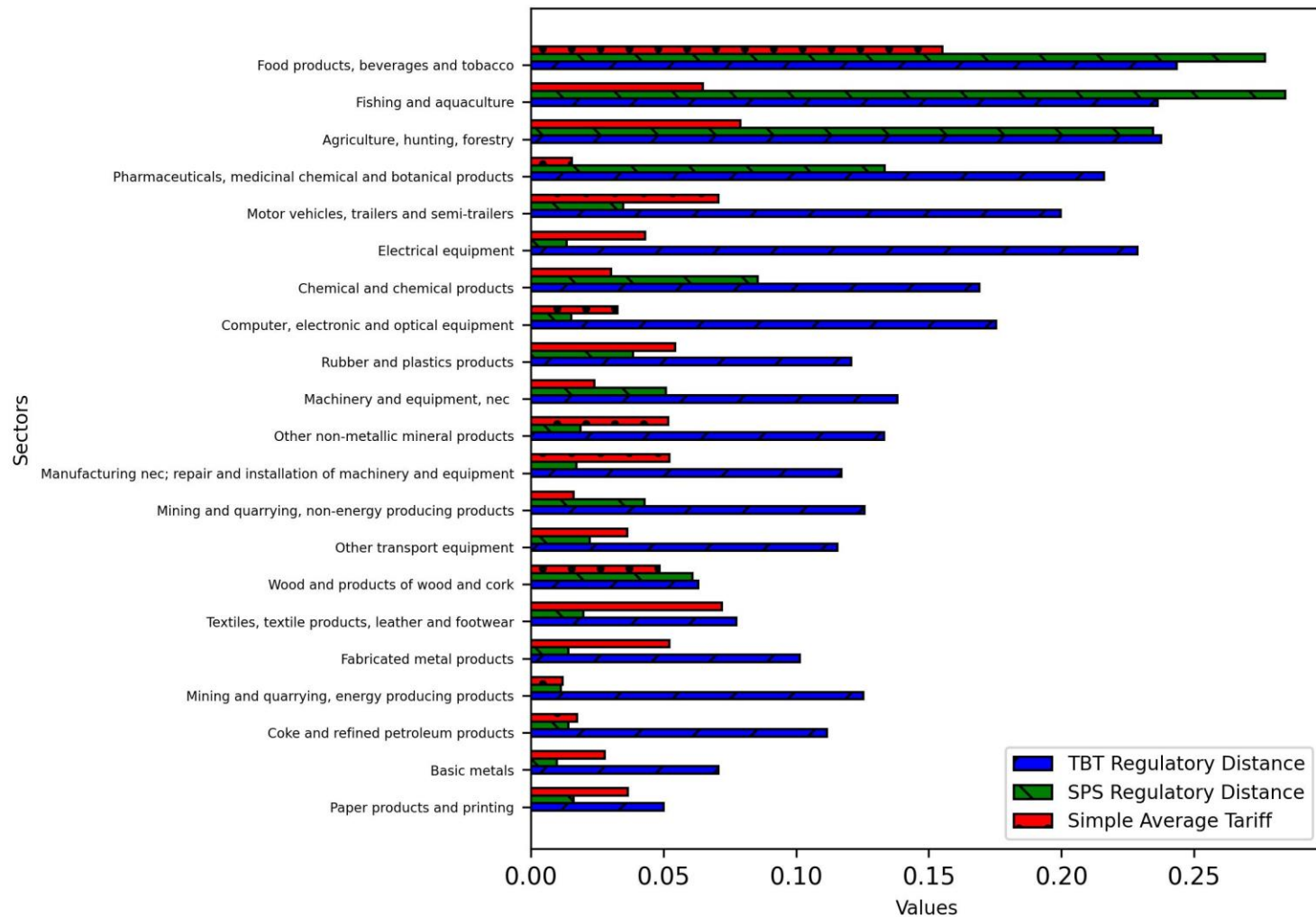


Figure 5 / Evolution of regulatory distance in NTMs and tariffs along GVC over years – 1996-2020

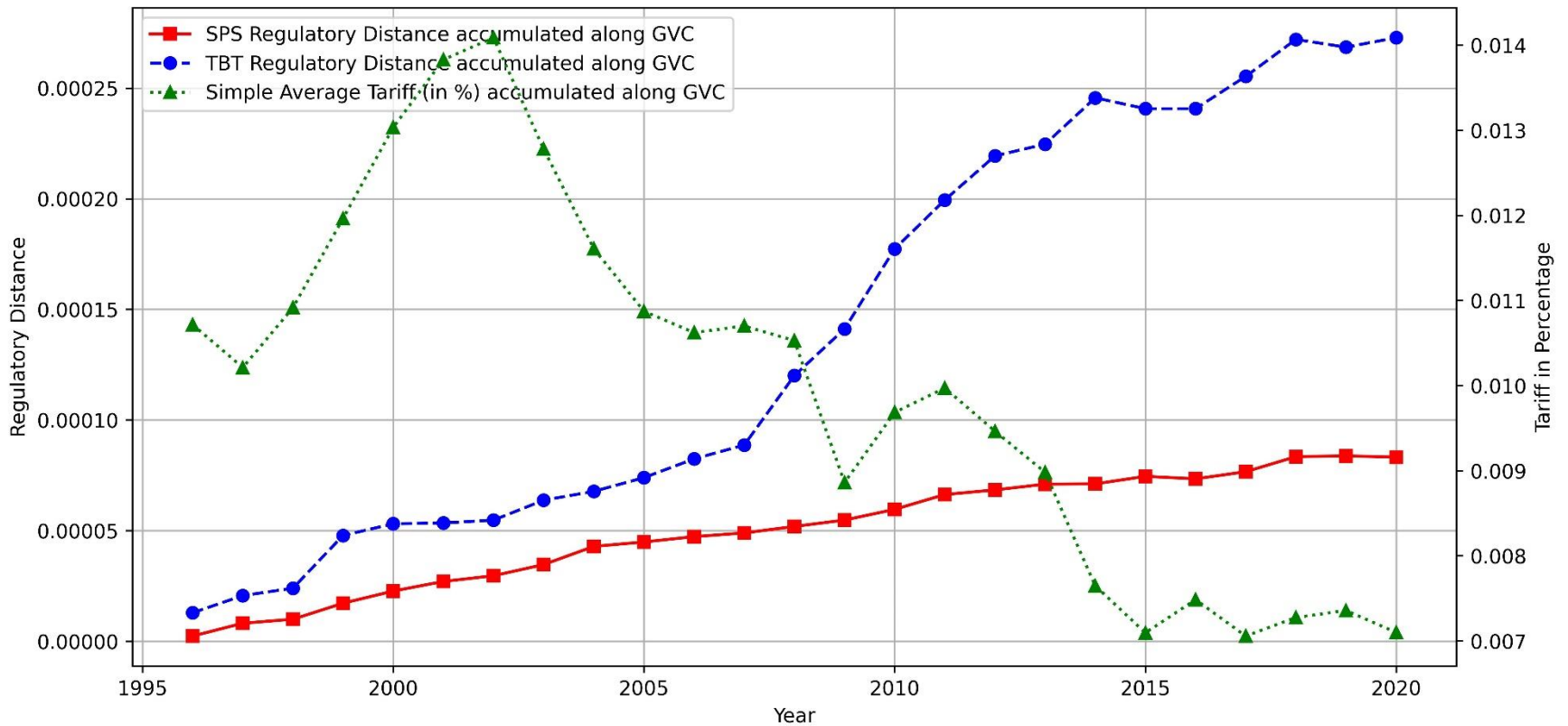
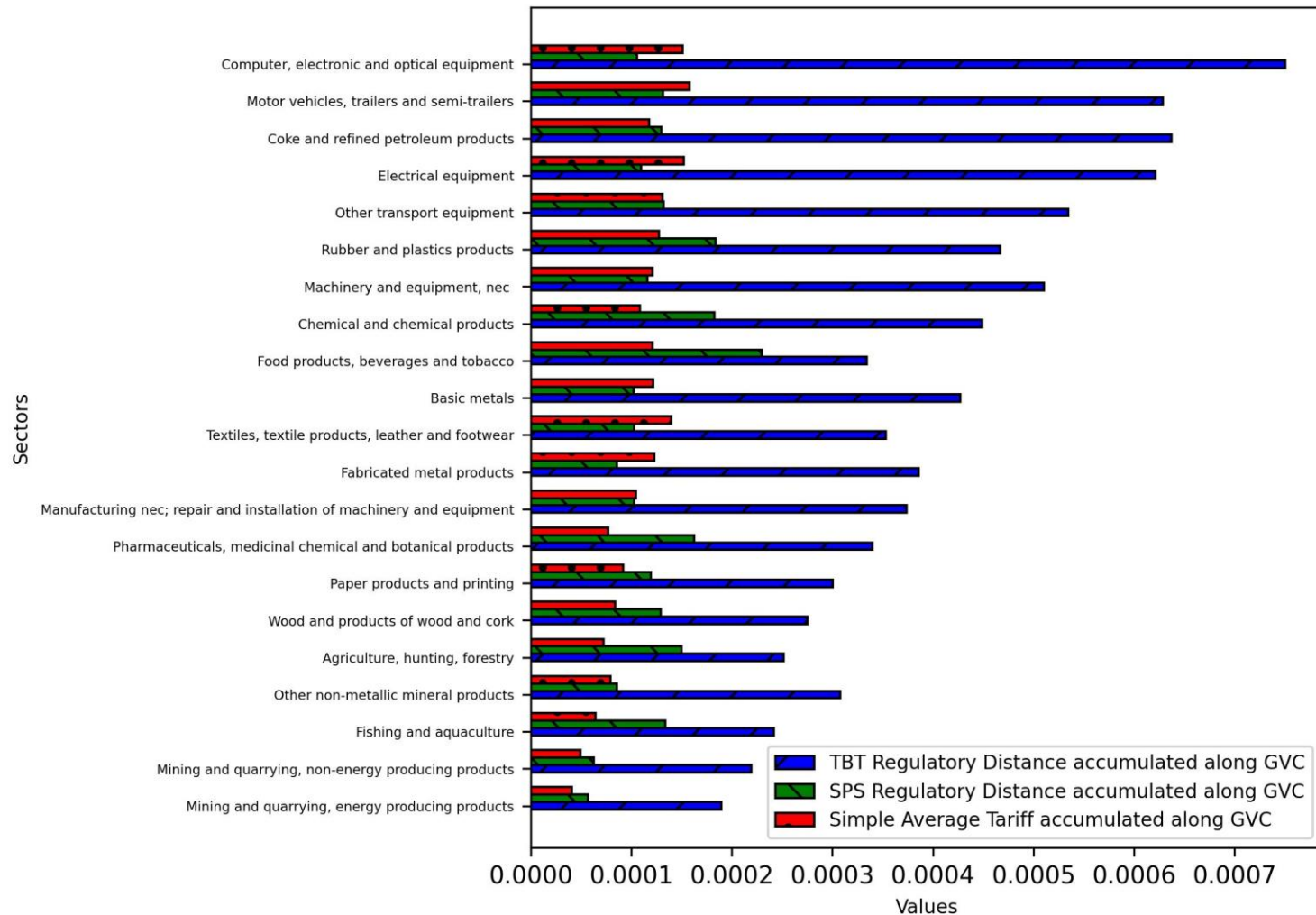


Figure 6 / Global average tariffs and regulatory divergence in TBTs and SPS measures across non-services NACE sectors in 2020 were accumulated along the GVC



Empirical Methodology

$$\begin{aligned}
 & X_{ijst} \\
 & = EXP [\gamma + \gamma_1 \text{arc } T_{jst} + \gamma_2 \text{arc } S_{ijst}^{TBT} + \gamma_3 \text{arc } S_{ijst}^{SPS} + \gamma_4 \text{arc } D_{ijst}^{TBT} + \gamma_5 \text{arc } D_{ijst}^{SPS} + \gamma_6 T_{ijst} \\
 & + \gamma_7 \text{arc } GVC_{ijst}^T + \gamma_8 \text{arc } GVC_{ijst}^{TBT} + \gamma_9 \text{arc } GVC_{ijst}^{SPS} + \gamma_{ist} + \gamma_{jst} + \gamma_{ijs}] + \varepsilon_{ijst}, \quad \tau \in \{TBT, SPS\}
 \end{aligned}$$

- X_{ijst} is the total value of exports of sector S from **exporting country i** to **importing country j** in year t .
- $\text{arc } T_{jst}$ is the arcsine transformation of **import tariffs** (divided by 100) levied by **importing country j** on the imports of sector S from exporting country i in year t .
- $\text{arc } S_{ijst}^{TBT}$ is the arcsine transformation of **summation of average number of TBTs** in sector S (i.e. across all its six-digit products) imposed by both partner i and j in year t ;
- $\text{arc } S_{ijst}^{SPS}$ is the arcsine transformation of **summation of average number of SPS** measures in sector S (i.e. across all its six-digit products) imposed by both partner i and j in year t ;
- $\text{arc } D_{ijst}^{TBT}$ is the arcsine transformation of the **regulatory divergence in TBTs** imposed by both partner i and j in year t that is calculated according to equation (1).
- $\text{arc } D_{ijst}^{SPS}$ is the arcsine transformation of the **regulatory divergence in SPS** measures imposed by both partner i and j in year t that is calculated according to equation (1)

Empirical Methodology

$$\begin{aligned}
 & X_{ijst} \\
 & = EXP [\gamma + \gamma_1 \text{arc } T_{jst} + \gamma_2 \text{arc } S_{ijst}^{TBT} + \gamma_3 \text{arc } S_{ijst}^{SPS} + \gamma_4 \text{arc } D_{ijst}^{TBT} + \gamma_5 \text{arc } D_{ijst}^{SPS} + \gamma_6 T_{ijst} \\
 & + \gamma_7 \text{arc } GVC_{ijst}^T + \gamma_8 \text{arc } GVC_{ijst}^{TBT} + \gamma_9 \text{arc } GVC_{ijst}^{SPS} + \gamma_{ist} + \gamma_{jst} + \gamma_{ijs}] + \varepsilon_{ijst}, \quad \tau \in \{TBT, SPS\}
 \end{aligned}$$

- $\text{arc } T_{ijst}$ is the arcsine transformation of import tariffs (divided by 100) levied by country i on the imports of sector S from country j in year t .
- $\text{arc } GVC_{ijst}^T$ is the **accumulated value of tariffs** along the value chains that are used in the intermediate inputs of production in sector S of exporting country i imported from country j in year t .
- $\text{arc } GVC_{ijst}^{TBT}$ is the **accumulated value of D_{ijst}^{TBT}** along the value chains that are used in the intermediate inputs of production in sector S of exporting country i imported from country j in year t .
- $\text{arc } GVC_{ijst}^{SPS}$ is the **accumulated value of D_{ijst}^{SPS}** along the value chains that are used in the intermediate inputs of production in sector S of exporting country i imported from country j in year t .
- γ_{ist} , γ_{jst} , and γ_{ijs} are respectively exporter-sector-year, importer-sector-year, and bilateral sector fixed effects to control for multilateral resistances.

Empirical Methodology - data

- The data on **bilateral export** values are constructed using the **Trade in Value Added (TiVA) 2022** edition provided by the Organization for Economic Cooperation and Development (OECD). This dataset includes 76 economies, encompassing all OECD, EU, G20, and ASEAN economies, over the period from 1995 to 2020.
- The **tariff** data are compiled from various sources through the **World Integrated Trade Solution provided by the World Bank**. The compilation of tariff data prioritizes effectively applied tariff rates, followed by preferential tariff rates, and lastly, the most-favored-nation (MFN) tariff rates. When available, ad-valorem equivalence of tariffs is utilized in the data.
- The data on **NTMs** are sourced from the **WTO's Integrated Trade Intelligence Portal (I-TIP)**. This dataset encompasses notifications of NTMs implemented by various countries, with some notifications predating the establishment of the WTO in 1995. While several countries only began notifying their NTMs to the WTO after 1995, some of these regulations had been in effect much earlier. Consequently, our analysis employs the date of implementation as a reference point.

Table 3 – PPML estimation on exports values of goods during the period 1996-2020

	M1	M2	M3
$\text{arc } T_{ijst}$	-2.71*** (0.17)	-1.94*** (0.20)	-2.82*** (0.20)
$\text{arc } S_{ijst}^{TBT}$	0.12*** (0.016)	0.11*** (0.016)	0.086*** (0.015)
$\text{arc } S_{ijst}^{SPS}$	0.0055 (0.0089)	0.0062 (0.0089)	0.0021 (0.0084)
$\text{arc } D_{ijst}^{TBT}$	-0.28* (0.16)	-0.26 (0.16)	-0.75*** (0.17)
$\text{arc } D_{ijst}^{SPS}$	-1.04*** (0.25)	-1.06*** (0.25)	-0.73*** (0.23)
$\text{arc } T_{ijst}$		-1.14*** (0.15)	-1.11*** (0.15)
$\text{arc } GVC_{ijst}^T$			45.0*** (5.44)
$\text{arc } GVC_{ijst}^{TBT}$			29.1*** (3.22)
$\text{arc } GVC_{ijst}^{SPS}$			12.5* (7.35)
Constant	10.7*** (0.0062)	10.7*** (0.0063)	10.7*** (0.0064)
Observations	2560290	2443504	2443504
Pseudo R-squared	0.996	0.996	0.996
AIC	19933050.7	19549660.6	19146023.8
BIC	19933114.5	19549736.9	19146138.2

Robust Standard errors in parentheses: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

All models include high-dimensional fixed effects γ_{ist} , γ_{jst} , and γ_{ijs} .

Figure 7 / Potential change in exports values between the EU and US due to trade liberalization

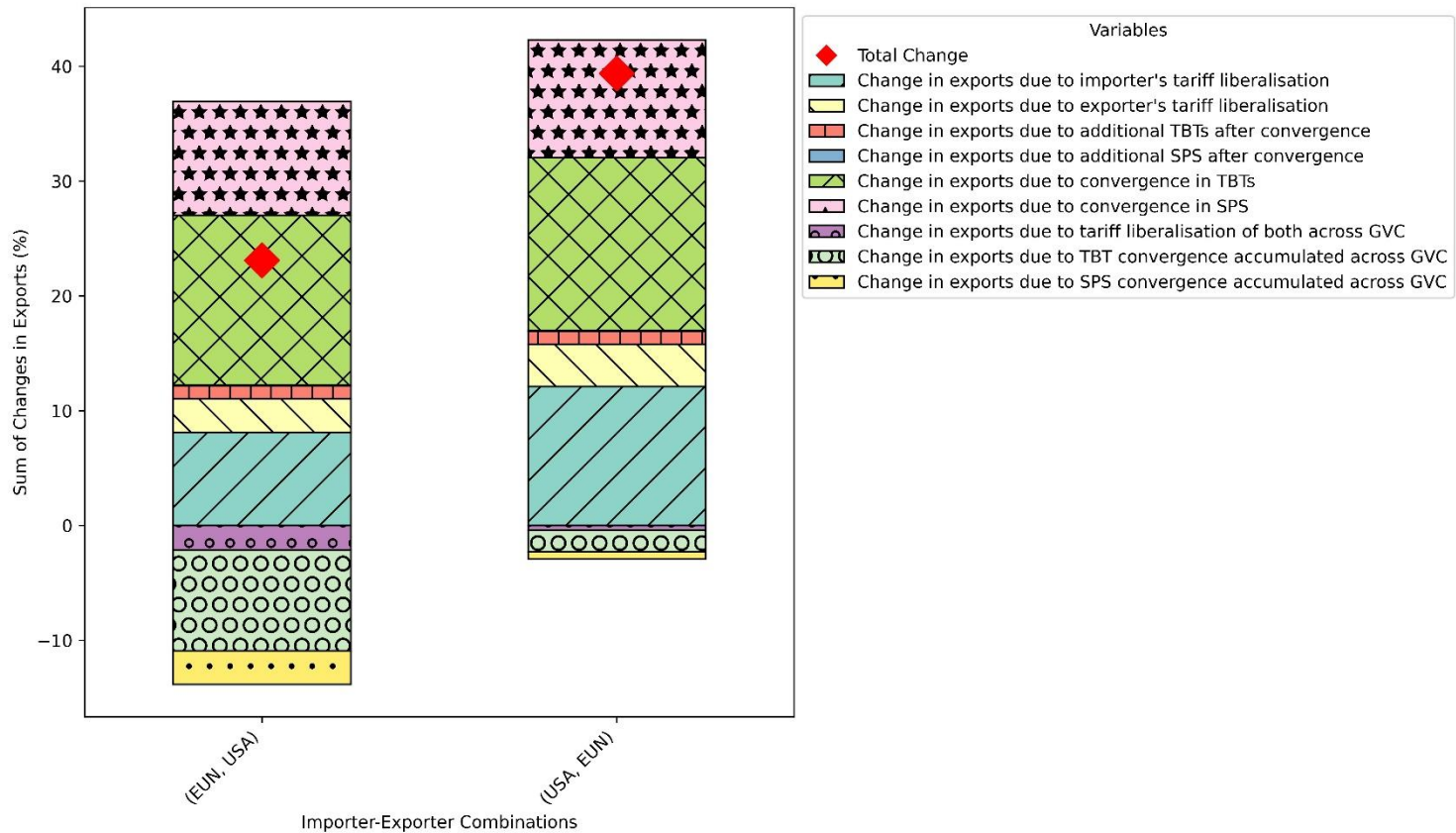


Figure 8 / Potential change in exports values from the US to the EU due to trade liberalization across sectors

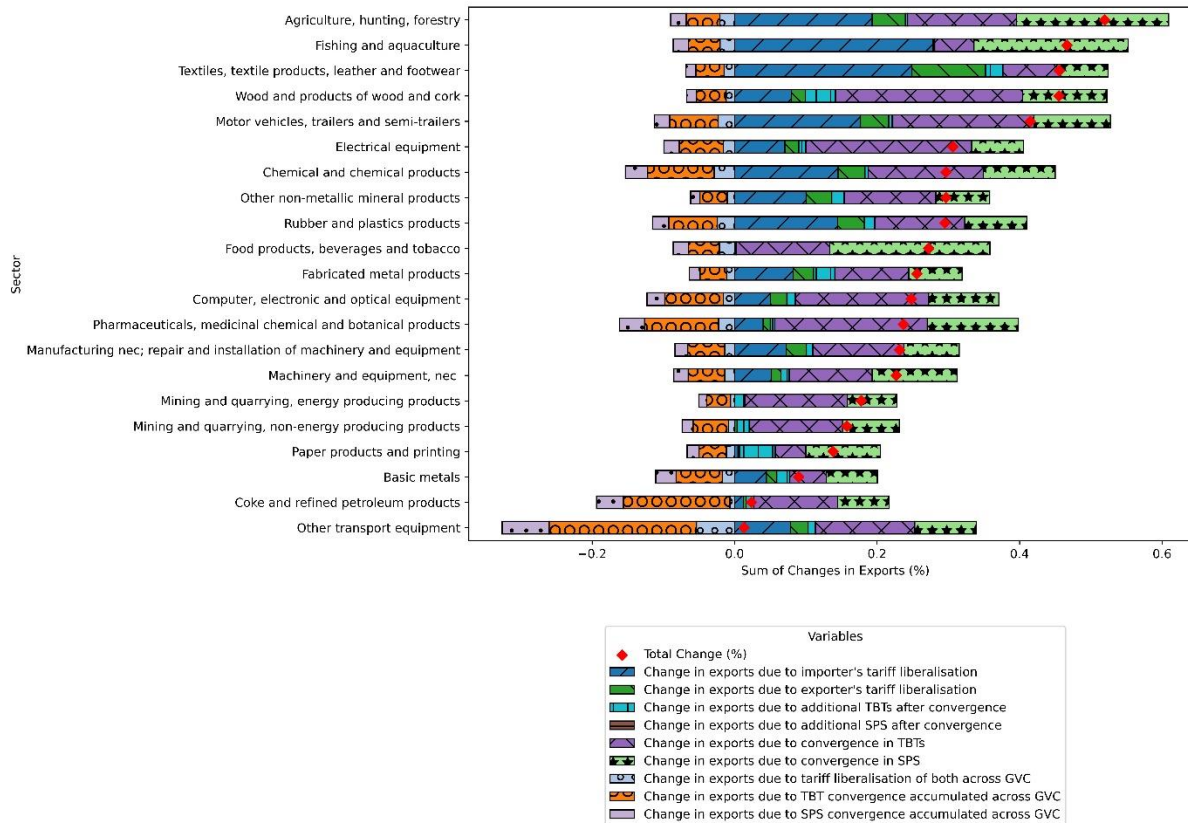
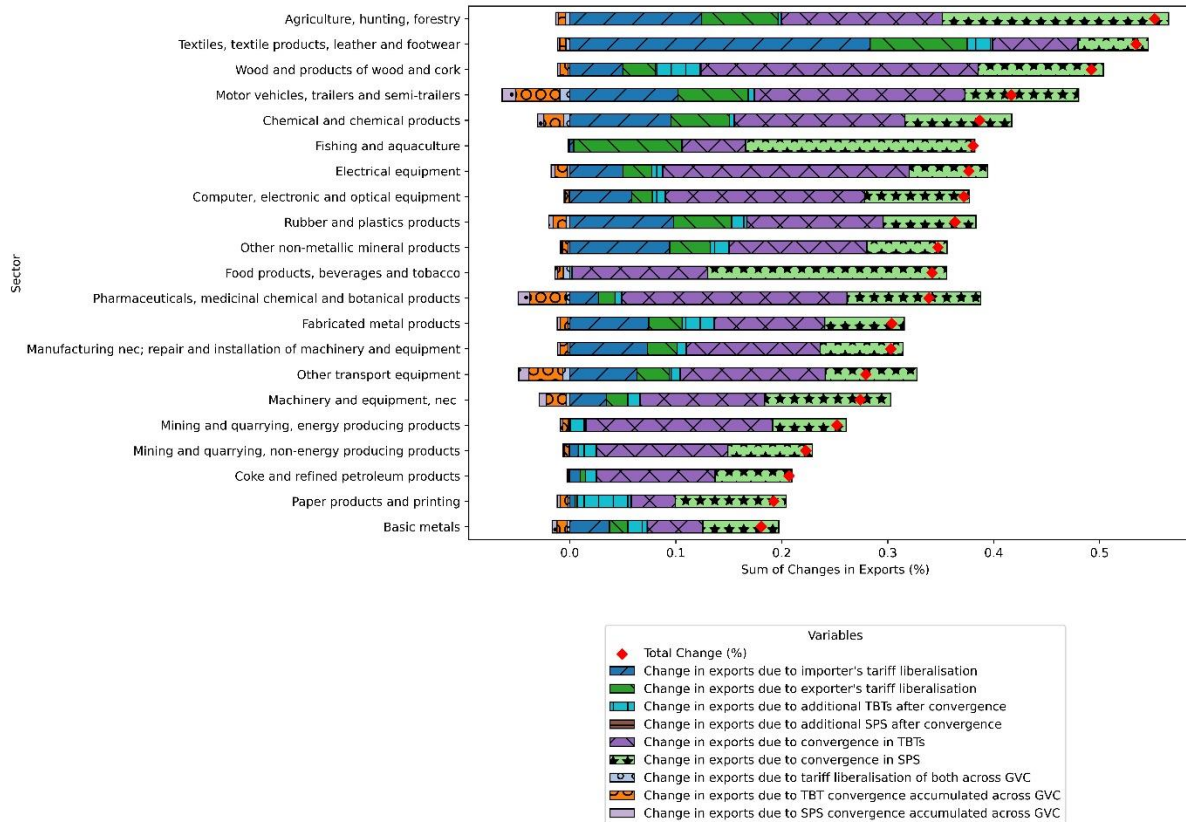


Figure 9 / Potential change in exports values from the EU to the US due to trade liberalization across sectors



Summary and conclusions

- Regulatory NTMs such as TBTs and SPS measures **are frequently used by policymakers** to regulate the importing markets when the **market fails** to automatically adjust for **negative externalities** related to bad products or harmful production procedures.
- In this paper we study the **effects of international regulatory divergence** in non-tariff measures and their traces in GVCs on bilateral exports of non-services.
- Results show a substantial **negative** impact of **regulatory divergence** on exports values.
- The effects of **regulatory divergence through suppliers** of a sector on exports are positive, indicating the **cascading effects** of trade policy.
- The revival of TTIP with full tariff liberalization and regulatory convergence between the US and the EU **would bring benefits for both** regions.
 - Potential increase in imports of the EU from the US: 23.1%
 - Potential increase in imports of the US from the EU: 39.4%
 - Structure of trade, and trade policy measures across sectors matter.



**Thank you for
your attention**



@MMGhods

Table 3 / List of three-digit TBT subgroups in MAST classification 2019

Three-digit TBT subgroup Nr.	Three-digit TBT subgroup	Two-digit TBT subgroup
B14	Authorization requirements for importing certain products	
B15	Authorization requirements for importers	
B19	Import authorization/licensing related to technical barriers to trade not elsewhere specified	B1 Import authorization/licensing related to technical barriers to trade
B21	Tolerance limits for residues of or contamination by certain substances	
B22	Restricted use of certain substances	B2 Tolerance limits for residues and restricted use of substances
B31	Labelling requirements	
B32	Marking requirements	
B33	Packaging requirements	B3 Labelling, marking and packaging requirements
B41	Technical barriers to trade regulations on production processes	
B42	Technical barriers to trade regulations on transport and storage	
B49	Production or post-production requirements not elsewhere specified	B4 Production or post-production requirements
B6	Product identity requirements	B6 Product identity requirements
B7	Product quality, safety or performance requirements	B7 Product quality, safety or performance requirements
B81	Product registration/approval requirements	
B82	Testing requirements	
B83	Certification requirements	
B84	Inspection requirements	B8 Conformity assessment related to technical barriers to trade
B85	Traceability requirements	
B89	Conformity assessment related to technical barriers to trade not elsewhere specified	
B9	Technical barriers to trade measures not elsewhere specified	B9 Technical barriers to trade measures not elsewhere specified

Table 4 / List of three-digit SPS subgroups in MAST classification 2019

Three-digit SPS subgroup Nr.	Three-digit SPS subgroup	Two-digit SPS subgroup	
A11	Prohibitions for sanitary and phytosanitary reasons	A1 Prohibitions/restrictions of imports for sanitary and phytosanitary reasons	
A12	Geographical restrictions on eligibility		
A13	Systems approach		
A14	Authorization requirement for sanitary and phytosanitary reasons for importing certain products		
A15	Authorization requirement for importers for sanitary and phytosanitary reasons		
A19	Prohibitions or restrictions of imports for sanitary and phytosanitary reasons, not elsewhere specified		
A21	Tolerance limits for residues of or contamination by certain (non-microbiological) substances	A2 Tolerance limits for residues and restricted use of substances	
A22	Restricted use of certain substances in foods and feeds and their contact materials		
A31	Labelling requirements	A3 Labelling, marking and packaging requirements	
A32	Marking requirements		
A33	Packaging requirements		
A41	Microbiological criteria of the final product	A4 Hygienic requirements related to sanitary and phytosanitary conditions	
A42	Hygienic practices during production related to sanitary and phytosanitary conditions		
A49	Hygienic requirements not elsewhere specified		
A51	Cold or heat treatment		
A52	Irradiation	A5 Treatment for elimination of plant and animal pests and disease-causing organisms in the final product or prohibition of treatment	
A53	Fumigation		
A59	Treatments to eliminate plants and animal pests or disease-causing organisms in the final product not elsewhere specified or prohibition of treatment		
A61	Plant-growth processes		
A62	Animal-raising or -catching processes	A6 Other requirements relating to production or post-production processes	
A63	Food and feed processing		
A64	Storage and transport conditions		
A69	Other requirements relating to production or post-production processes not elsewhere specified		
A81	Product registration and approval requirement		A8 Conformity assessment related to sanitary and phytosanitary conditions
A82	Testing requirements		
A83	Certification requirements		
A84	Inspection requirements		
A85	Traceability requirements		
A86	Quarantine requirements		
A89	Conformity assessment related to sanitary and phytosanitary conditions not elsewhere specified		
A9	Sanitary and phytosanitary measures not elsewhere specified	A9 Sanitary and phytosanitary measures not elsewhere specified	