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Global value chain integration and non-tariff measures

Irene Garcés, Achim Vogt *

University Bern, World Trade Institute, Hallerstrasse 6, Bern, 3012, Switzerland

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ABSTRACT

This paper investigates the degree to which domestic value added embodied in gross trade determines the formation of non-tariff measures (NTMs) imposed at the border and regulatory differences in technical regulation. We apply a recently developed political economy model of trade policies and global value chains to indicators of NTM restrictiveness. Our results demonstrate that higher domestic value added content in imports lowers policy makers' incentives to impose trade restrictive NTM policies in a similar way as tariffs. These effects are heterogeneous with respect to sectors and income group of the policy-imposing country.

1. Introduction

The organization of modern production into global value chains (GVCs) implies that imports from foreign producers are more likely to contain domestically produced intermediate content, i.e. domestic value-added (DVA). DVA is a measure that adds/subtracts own/foreign intermediate content entering bilateral gross trade via third countries and, as a result, is a suitable measure to test whether policy makers consider changes in returns to domestic intermediate suppliers when setting trade restrictive policies on final goods imports. To investigate this question, Blanchard et al. (2021, BBJ) introduce trade in factor incomes to the canonical optimal tariff model and show that higher DVA flows alter governments' terms-of-trade cost-shifting motive. They derive an empirically testable optimal tariff equation and demonstrate, inter alia, that tariffs and temporary trade barriers decrease with higher DVA in imports. Trade-liberalizing effects of GVC-integration have also been found in the context of lobbying (Ludema et al., 2021), antidumping measures (Bown et al., 2021), and sanitary and phytosanitary (SPS) standards (Raimondi et al., 2023).

This study applies BBJ's optimal tariff equation to two groups of non-tariff measures (NTMs); border measures and standard-like technical measures.[1] Recent evidence on policy substitution between tariffs and border measures (Niu et al., 2020) suggests that policy makers impose alternative policy measures to manipulate their terms-of-trade. In case this strategy is constrained by e.g. international agreements (Staiger and Sykes, 2011) show that terms-of-trade can be manipulated by raising standards. This motivates us to investigate whether these policies underlie similar GVC-related political economy motives as tariffs.

2. Estimation strategy

We estimate the BBJ optimal tariff equation for three trade policy variables defined over final goods (τ^k_{odk}) for the year 2018 using an OLS estimator.

$$\tau_{odk} = \gamma^{DVA} \ln(DVA_{odk}) + Z_{odk} + \delta_{dk} + \psi_{ok} + \varepsilon_{odk}$$
$$\text{with} \quad \tau_{odk} \in \{AVE_{odk}, DIF_{odk}, t_{odk}\} \qquad (1)$$

Here, o, d, and k stand for origin/exporter, destination/importer/policy-imposing country, and sector, respectively. NTM border measures are represented by an estimated tariff-equivalent rate (AVE_{odk}). For standard-like measures, we construct a bilateral regulatory difference indicator ($DIF_{odk} = HAR_{odk} - DIV_{odk}$), which increases in regulatory similarity, HAR_{odk} being the average number of common measure types imposed by the origin and destination country (harmonization) and DIV_{odk} being the average number of measure types imposed only by the destination country (divergence). Tariffs are defined as the difference between applied and most-favored nation (MFN) rates $t_{odk} = t^a_{odk} - t^m_{odk}$.

DVA_{odk} represents the value of intermediate inputs (goods and services) sold by firms of policy-imposing country d used in the production of final goods in exporting country o and is defined as a

* Corresponding author.
E-mail addresses: irene.garces@wti.org (I. Garcés), achim.vogt@wti.org (A. Vogt).

[1] Border measures are defined in Ederington and Ruta (2016). Standard-like measures are SPS and technical barriers to trade (TBTs) likely imposed on foreign and domestic firms (see Appendix A for a list).

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share of bilateral gross trade. In the BBJ-model, higher DVA in imports internalizes the terms-of-trade externality for country d because lower final goods prices received by the exporter caused by an increase in τ_{odk}^{k} are (partially) passed on to domestic intermediate input suppliers in d. We expect that trade policy restrictiveness of d decreases with higher domestic content in imports ($\gamma^{DVA} < 0$).

We control for other GVC-integration factors via the degree to which protectionist rents of domestic final goods producers can be passed on to foreign input suppliers by including an indicator of foreign value added in domestic production – FVA_{dk}, defined as the ratio of the total value of foreign intermediate content in final goods production of k in country d and bilateral trade. Furthermore, we include the inverse penetration ratio, which controls for policy makers' trade off between social costs of trade protection, rents of foreign input suppliers, and rents of domestic final goods producers generated by higher prices in protected markets – IP_{dk}, defined as gross output of final good k in d over bilateral imports.

With destination- and origin-sector fixed effects (δ_{dk} and ψ_{ok}) included in the model, FVA_{dk} and IP_{dk} enter (1) as the logarithm of their sum and are identified via variation in bilateral trade. Importantly, δ_{dk} controls for sectoral heterogeneity in the inverse export supply elasticity faced by importing country d capturing the ability to shift policy-induced costs to the exporter. Finally, Z_{od} includes standard trade cost variables, a PTA dummy, and indicators capturing differences in polity and governance.

We estimate (1) for a 2018 cross-section due to limitations of the NTM data. However, the relatively persistent nature of DVA and policy variables τ_{odk}^{k} render their identification-relevant bilateral variation cross-sectional (see BBJ).

DVA and FVA+IP are lagged by 4-years (i.e. 2014) to allow for policy to adjust. To attenuate endogeneity concerns, we employ a control function approach and instrument DVA with country d's DVA supplied to country o's services sectors (DVA-in-services) and FVA+IP with its 2004 value. When FVA and IP enter (1) separately, we instrument with the 2004 values of the share of FVA in total value added and IP ratio, respectively. Moreover, Z_{od} includes standard trade cost variables, a PTA dummy, and indicators capturing differences in polity and governance.

Production-based trade in value added flows are from Desilvestro et al. (2021), who use the Global Trade Analysis Project (GTAP) database. We consolidate data on preferential and MFN tariffs from ITC MacMap and UNCTAD TRAINS, take bilateral AVEs of NTM border measures from Kee and Nicita (2022, KN), and construct regulatory difference indicator from NTMTRAINS.[2] Importantly, while most NTMs included in KN are non-discriminatory, their estimation strategy retrieves a bilateral NTM effect motivated by compliance costs that vary across exporters.[3] We consolidate trade policy data at the 6-digit level, subset it to products categorized as final products by the Broad Economic Classification, and average over the GTAP sectoral accounts. Overall, our sample comprises 47 countries that overlap KN and the GTAP database (EU as one bloc) and 30 sectors (see Appendix B and C).

3. Results

Table 1 reports estimates of (1) for the following specifications: (I) DVA only, (II) model (I) plus FVA+IP and PTA, (III) model (II) controlling for changes in tariff margins from 2008 to 2018, distance, contiguity, common language, common legal system, and differences in polity and governance, (IV) DVA, FVA, IP, and PTA, and (V)/(VI) model (II)/(IV) with inside/outside PTA effects.

Table 1
Tariffs, NTMs, and GVC-integration.

	(1) Tariff	(2) AVE	(3) Dif
(I) Baseline			
DVA	−2.52***	−0.242***	0.126***
(II) FVA+IP, and PTA			
DVA	−0.955***	−0.144***	0.104***
FVA+IP	1.22***	0.177***	−0.100***
PTA	−6.35***	−0.301***	0.138*
(III) FVA+IP, PTA, trade costs & institutions, tariffs			
DVA	−0.579***	−0.097***	0.0005
FVA+IP	0.697***	0.105***	0.067
PTA	−6.20***	−0.247***	−0.013
Margin 08–18		−0.212	0.881**
(IV) FVA & IP, and PTA			
DVA	−2.04***	−0.250***	0.211***
FVA	−0.219	−0.199	0.046
IP	1.46**	0.378	−0.148**
PTA	−7.24***	−0.389***	0.226***
(V) FVA+IP, and PTA heterogeneity			
DVA - PTA	−0.581	−0.268**	0.295**
DVA - no PTA	−0.989***	−0.109***	0.057
FVA+IP - PTA	0.688	0.232***	−0.218***
FVA+IP - no PTA	1.28***	0.169***	−0.084***
PTA	−1.95	−0.746	1.10*
(VI) FVA & IP, and PTA heterogeneity			
DVA - PTA	−1.55	−0.287***	0.274***
DVA - no PTA	−2.08***	−0.241***	0.200***
FVA - PTA	−1.74	−0.375	0.009
FVA - no PTA	0.025	−0.167	0.050
IP - PTA	2.32*	0.579*	−0.168**
IP - no PTA	1.30**	0.344	−0.146**
PTA	−6.50	−1.14***	0.573

Note: (1) Models (I)–(III) and (V) include δ_{dk} and ψ_{ok}, models (IV) and (VI) include δ_d and ψ_{ok} fixed effects. (2) Robust SE clustered by country-pair, origin-sector and destination-sector omitted for brevity. (3) Following BBJ, DVA in (I) does not enter as trade share. (4) Control function for endogenous GVC variables included. (5) Complete results in Appendix D and E.

GVC-integration in the form of higher DVA induces less trade restrictive policies with respect to tariffs, border NTMs, and regulatory differences. These findings are robust to controlling for PTAs, standard trade cost indicators, differences in polity and governance, and tariffs. Comparing (II) with (IV) highlights that magnitude and precision of results depends on the inclusion of δ_{dk} to control for sector-specific unobservable factors in the policy-imposing country. Furthermore, comparing the results for models (V) and (VI) vs. (II) and (IV) shows that the effect of DVA within PTAs is insignificant for tariffs but more sizable for NTMs. This demonstrates that PTAs resolve the terms-of-trade externality for tariffs but not for NTMs.

The magnitude of DVA's effect on trade policy is comparable for tariffs and border NTMs. Taking specification (II), coefficient sizes imply that a DVA-increase of one standard deviation (2.85 log points) leads to a 33% and 29% decrease in tariffs and border NTM AVEs relative to their respective median of 8.3% and 1.41%, respectively. Analogously, the positive DVA-coefficient reported for DIF_{odk} shows that higher domestic content in imports increases regulatory similarity.[4]

In addition, we estimate specification (II) for different samples of sectors as well as income groups of policy-imposing countries (see Table 2). GVC-integration significantly decreases tariffs for High/Upper-Middle (UM) and Low/ Lower-Middle (LM) income countries across almost all sectors, which confirms our aggregate findings. The size of the effect varies by sector and is higher for High/UM countries.

[2] NTM border AVEs and regulatory difference indicators are based on NTMTRAINS data, which are regulatory inventories collected for a given year – in our case between 2015–2018.

[3] Traditional terms-of-trade determinants of KN's AVEs present a separate channel in BBJ and are controlled for in (1).

[4] A DVA-increase of one standard deviation leads to 0.3 unit increase in DIF_{odk}, with DIF_{odk} centered around zero with mean −0.65.

Table 2
Tariffs, NTMs, and GVC-integration, by sector and income level.

Income			Agri	Food	Chem	Tex	MinMet	Electr	HvyManuf	Auto	Other
All	Tariff	DVA	−0.942***	−1.05***	−0.405**	−1.81***	−0.777***	−0.346	−0.388**	−0.543	−0.809***
		IP+FVA	1.08***	1.19***	0.881***	2.51***	1.11***	0.759***	0.618***	1.36***	1.31***
	AVE	DVA	−0.069***	−0.375***	−0.129**	−0.006	−0.048**	−0.034	−0.011*	−0.072**	−0.022**
		IP+FVA	0.074***	0.526***	0.194***	0.060***	0.053**	0.059***	0.008	0.070***	0.029***
	Dif	DVA	0.176**	0.237***	−0.013	0.212**	−0.043**	−0.108**	−0.037	−0.045*	0.100**
		IP+FVA	−0.214***	−0.292***	−0.022	0.019	0.026	0.027	0.028	0.031	−0.004
		N	10,810	15,134	8,648	6,486	6,486	4,324	4,324	2,162	6,486
High/UM	Tariff	DVA	−0.944***	−1.17**	−0.514**	−2.06***	−0.822***	−0.376	−0.476**	−0.354	−0.858***
		IP+FVA	1.11***	1.41**	0.944***	2.67***	1.21***	0.831***	0.723***	1.47***	1.40***
	AVE	DVA	−0.094***	−0.543***	−0.214**	0.010	−0.100**	−0.086**	−0.020**	−0.149***	−0.053***
		IP+FVA	0.104***	0.722***	0.284***	0.083***	0.094***	0.101***	0.014*	0.111***	0.053***
	Dif	DVA	0.376***	0.520***	0.036	0.424**	−0.064**	−0.154***	−0.049	−0.036	0.171**
		IP+FVA	−0.401***	−0.531***	−0.087**	−0.024	0.028	0.017	0.020	0.016	−0.010
		N	7,130	9,982	5,704	4,278	4,278	2,852	2,852	1,426	4,278
Low/LM	Tariff	DVA	−0.718**	−0.712	−0.271	−1.42*	−0.549*	−0.350*	−0.207	−0.790	−0.758**
		IP+FVA	0.782**	0.519	0.582**	2.04**	0.668**	0.556***	0.314*	0.923**	0.942**
	AVE	DVA	−0.040	−0.231**	0.026	−0.018	0.003	0.030	0.0005	0.028	0.007
		IP+FVA	0.028	0.262***	0.024	0.025	0.014	0.006	0.0007	0.020	0.0007
	Dif	DVA	−0.030	−0.046	−0.067	0.016	−0.037	0.025	−0.038*	−0.011	0.008
		IP+FVA	−0.015	−0.074	0.061	−0.0008	0.038	−0.026	0.056***	0.007	−0.015
		N	3,680	5,152	2,944	2,208	2,208	1,472	1,472	736	2,208

Note: (1) Specification (II) of Table 1. (2) Robust SE clustered by country-pair, origin-sector and destination-sector omitted for brevity (see Appendix F). (3) Robustness checks with specification (III) of Table 1 (and with DVA only) in Appendix G (H).

Furthermore, we find that trade restrictiveness of border NTMs in food sectors decreases with higher DVA for both income groups with a more pronounced effect for High/UM countries. In manufacturing sectors, the significantly negative impact of GVC-integration on border NTMs is driven by High/UM income countries while an effect for lesser developed countries is absent. These results are consistent with a higher NTM incidence typically found for food sectors and for high income countries more generally.

The response of regulatory differences to GVC-integration is only significant for high income countries – in line with quality-related regulation being imposed to a greater extent in those countries – but ambiguous with respect to coefficient signs. While we confirm the positive effect of GVC-integration on reducing regulatory differences for agri-food and textile sectors, negative coefficient signs for most manufacturing sectors suggest that higher DVA increases regulatory differences.

One possible explanation is that if standards and product characteristics are market-specific, and if standard-related compliance costs are fixed, policy makers cannot affect world prices and manipulate the terms-of-trade (Grossman et al., 2021). Rather, they chose between regulating prohibitively different (or stringent) to induce delocation of foreign firms to the home market and a set of standards that does not constrain export choices of domestic firms.[5] Under a cooperative agreement mutual recognition facilitates the latter strategy but is constrained by the presence of local consumption externalities.

4. Conclusion

This paper shows that higher integration of domestic intermediate suppliers into world markets reduces incentives to impose trade restrictive policies on final goods imports. As a consequence, further globalization of production processes may trigger a reduction in NTM border measures and possibly lead to harmonization of technical regulation. However, re-shoring increases the risk of protectionism, which may occur primarily via imposing opaque NTMs rather than increasing tariffs, which in many cases are bound by international agreements.

[5] See Ghodsi (2020) for an empirical test of the "tariff jumping" effect of stringent standards.

Data availability

Data will be made available on request.

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Appendix A. Supplementary data

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.econlet.2024.111518.

References

Blanchard, Emily J., Bown, Chad P., Johnson, Robert C., 2021. Global Value Chains and Trade Policy. Updated 2016 NBER Working Paper (21883), Cambridge, MA, http://dx.doi.org/10.3386/w21883.

Bown, Chad P., Erbahar, Aksel, Zanardi, Maurizio, 2021. Global value chains and the removal of trade protection. Eur. Econ. Rev. 140, 103937. http://dx.doi.org/10.1016/j.euroecorev.2021.103937.

Desilvestro, Valentino, Francois, Joseph F., Tomberger, Patrick, 2021. Measuring the complexity of global value chains. Mimeo, World Trade Institute, University Bern, Bern.

Ederington, J., Ruta, M., 2016. Nontariff measures and the world trading system. In: Bagwell, Kyle, Staiger, Robert W. (Eds.), Handbook of Commercial Policy, Vol. 1. North-Holland, pp. 211–277. http://dx.doi.org/10.1016/bs.hescop.2016.04.010.

Ghodsi, Mahdi, 2020. How do technical barriers to trade affect foreign direct investment? Tariff jumping versus regulation haven hypotheses. Struct. Chang. Econ. Dyn. 52, 269–278. http://dx.doi.org/10.1016/j.strueco.2019.11.008.

Grossman, Gene M., McCalman, Phillip, Staiger, Robert W., 2021. The "New" economics of trade agreements: From trade liberalization to regulatory convergence? Econometrica 89 (1), 215–249. http://dx.doi.org/10.3982/ECTA17536.

Kee, Hiau Looi, Nicita, Alessandro, 2022. Trade fraud and non-tariff measures. J. Int. Econ. 139, 1–20. http://dx.doi.org/10.1016/j.jinteco.2022.103682.

Ludema, Rodney D., Mayda, Anna M., Yu, Zhi, Yu, Miaojie, 2021. The political economy of protection in GVCs: evidence from Chinese micro data. J. Int. Econ. 131, 103479. http://dx.doi.org/10.1016/j.jinteco.2021.103479.

Niu, Zhaohui, Milner, Chris, Gunessee, Saileshsingh, Liu, Chang, 2020. Are nontariff measures and tariffs substitutes? Some panel data evidence. Rev. Int. Econ. 28 (2), 408–428. http://dx.doi.org/10.1111/roie.12457.

Raimondi, Valentina, Piriu, Andreea, Swinnen, Johan, Olper, Alessandro, 2023. Impact of global value chains on tariffs and non-tariff measures in agriculture and food. Food Policy 118, 102469. http://dx.doi.org/10.1016/j.foodpol.2023.102469.

Staiger, Robert W., Sykes, Alan O., 2011. International trade, national treatment, and domestic regulation. J. Leg. Stud. 40 (1), 149–203. http://dx.doi.org/10.1086/658402.