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On the Effects of Bilateral Agreements in World Wine Trade

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Summary

During the last decades there have been significant changes in trade regulations that are modifying the global trade of wine. The number of non-tariff measures (NTMs) adopted in the wine sector is relevant. Similarly, a large number of bilateral trade agreements have been adopted. Despite the regulation is heavy, the impact of these policy instruments on trade is not always clear, nor quantified at global scale. We investigate the effects that bilateral NTMs are showing on global imports of wine. In particular, we estimate a gravity model to explain how bilateral NTMs influence wine trade, and we disentangle these effects for different segments of the international market of wine.

Our results suggest that bilateral NTMs tend to favour imports of wine. Differences emerge across market segments and types of regulations. In particular, the Technical Barriers to Trade favour (friction) bottled (bulk) wine; pre-shipment inspections enhance imports of bottled wine; the Sanitary and Phytosanitary Standards and the export-related measures are the most trade-enhancing NTMs, regardless of the market segment.

Keywords: global trade; NTM; policy; SPS; TBT.

JEL Classification codes: Q17, Q18, F13.

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1. INTRODUCTION

The negotiations of the World Trade Organisation (WTO), in the mid-1990s, has contributed to shape global trade of agri-food products. In particular, tariffs have been substantially reduced, while non-tariff measures (NTMs) have been increased. The proliferation of NTMs has led to a less transparent policy environment: the effects on trade have not been fully investigated nor clarified (Arita et al., 2017; Fernandes et al., 2017). This is true, in particular, for wine sector, where high levels of tariffs and bilateral NTMs coexist: wine trade is overregulated, and the level of overall intervention has been steady for years (Foster and Spencer, 2002; Anderson and Golin, 2004). Plausibly, governments tend to seek additional revenues through tariffs, standards and bilateral NTMs (Schnabel and Storchmann, 2010; Storchmann, 2012).

A large literature has investigated the influence of NTMs on trade of agri-food products, and has provided mixed evidence: NTMs may be barriers (e.g. Anders and Caswell, 2009; Peterson et al., 2013; Ferro et al., 2015) or catalysts (e.g. de Frahan and Vancauteran, 2006; Cardamone, 2011) for trade. Only few studies investigate if and how NTMs affect wine trade: Olper and Raimondi (2008) estimate the effect of NTMs on trade of processed food (e.g. spirits, wine, malt, drinks, oils and fats, milling products, bakery, etc.), concluding that NTMs play a trade reduction effect; on global trade of bottled wine, Dal Bianco et al. (2016) find that Sanitary and Phytosanitary Standards (SPSs) do not seem to obstruct exports, while Technical Barriers to Trade (TBTs) have heterogeneous impacts on trade; Meloni and Swinnen (2017a, b) investigate the impact of standards in wine trade between France and Greece, and conclude that standards reduced Greek exports. The limited empirical literature and the contrasting evidence on the effects of NTMs (and of bilateral trade agreements) on wine trade call for more investigation: are bilateral NTMs trade-enhancing or trade-impeding? Which measures are the most (and the least) influential? Are these effects heterogeneous across different segments of the wine market?

By adopting a gravity model approach, we investigate how and to what extent bilateral NTMs influence global imports of wine. In particular, we disentangle the contribution of bilateral NTMs mostly implemented on wine imports (SPSs, TBTs, pre-shipment inspections, export-related measures). We also discriminate the global effects of NTMs for different market segments of wine: sparkling, bottled, bulk, and musts. We focus on main exporters and main importers, and on trade that occurred from 1991 to 2016.

The novelty of our paper derives by the level of details we reach in classifying trade regulations and market segments. The detailed analysis allows us to identify which regulation is the most influential, and which segments tend to react more to bilateral trade regulations.

2. NON-TARIFF MEASURES AND TRADE: EVIDENCE FROM WINE SECTOR

A rapid and dynamic evolution has affected wine sector in recent decades, driven by changes in demand (Castillo et al., 2016), geographical redistribution of consumption (Aizenman and Brooks, 2008; Anderson and Nelgen, 2015) direction of trade flows (Mariani et al., 2012), and complementary determinants, such as novel types of policy interventions (Dal Bianco et al., 2016).

We consider wine imports of 24 countries and four market segments (sparkling, bottled, and bulk wines, and musts) (table 1): they cover more than 90% of global imports and exports' values and of global production volumes (Anderson and Pinnilla, 2017). They include developed (North, 62%) and developing (South, 38%) countries (United Nations, 2017), and are representative of Old World Producers (OWP, 46%) and New World Producers (NWP, 54%) (Anderson and Nelgen, 2015). Comparing average values of imports and exports¹, countries may be classified as net importers (NI, 62%) and net exporters (NE, 38%) (UN Comtrade, 2017).

Table 1. Country classification and 2015-16 average imports (mln US\$) arranged by wine segments.

Countries	ISO-3	Classification			Imports (mln US\$)				
		United Nations (2017)	Anderson and Nelgen (2015)	UN Comtrade (2017)	All wines	Sparkling	Bottled	Bulk	Musts
Argentina	ARG	South	NWP	NE	0.4	0.7	0.1	1.2	0.0
Australia	AUS	North	NWP	NE	9.2	10.6	14.0	4.8	0.0
Belgium-Luxembourg	BEL	North	OWP	NI	0.0	0.0	0.0	0.0	0.0
Brazil	BRA	South	NWP	NI	8.2	2.2	17.5	0.1	0.0
Canada	CAN	North	NWP	NI	33.9	7.6	63.7	6.9	0.0
Chile	CHL	South	NWP	NE	0.2	0.7	0.1	0.0	0.0
China	CHN	South	NWP	NI	39.0	3.2	100.0	7.8	0.0
Denmark	DNK	North	OWP	NI	9.4	3.0	21.1	5.8	0.2
France	FRA	North	OWP	NE	9.6	3.0	17.1	12.3	0.9
Germany	DEU	North	OWP	NI	46.9	23.1	80.5	38.0	1.6
Hong Kong	HKG	South	NWP	NI	27.5	3.4	63.1	0.6	0.0
Ireland	IRL	North	OWP	NI	5.2	1.1	12.5	0.4	0.5
Italy	ITA	North	OWP	NE	6.6	13.0	2.8	8.0	1.5
Japan	JPN	North	NWP	NI	25.8	24.9	46.4	5.8	3.6
New Zealand	NZL	North	NWP	NE	2.6	2.7	3.2	1.4	0.0
Portugal	PRT	North	OWP	NE	2.6	1.9	1.5	5.9	1.9
Russian Federation	RUS	South	NWP	NI	13.4	8.1	21.6	6.9	0.0
Singapore	SGP	South	NWP	NI	7.3	13.9	9.1	0.2	0.0
South Africa	ZAF	South	NWP	NE	0.5	1.3	0.3	0.0	0.0
Spain	ESP	North	OWP	NE	2.8	5.1	3.3	0.7	0.1
Sweden	SWE	North	OWP	NI	10.8	7.0	18.1	10.5	0.1
Switzerland	CHE	North	OWP	NI	14.7	8.3	33.1	5.1	0.7
United Kingdom	GBR	North	OWP	NI	59.9	41.7	124.0	30.5	0.2
United States	USA	North	NWP	NI	95.1	67.6	178.0	20.3	0.0

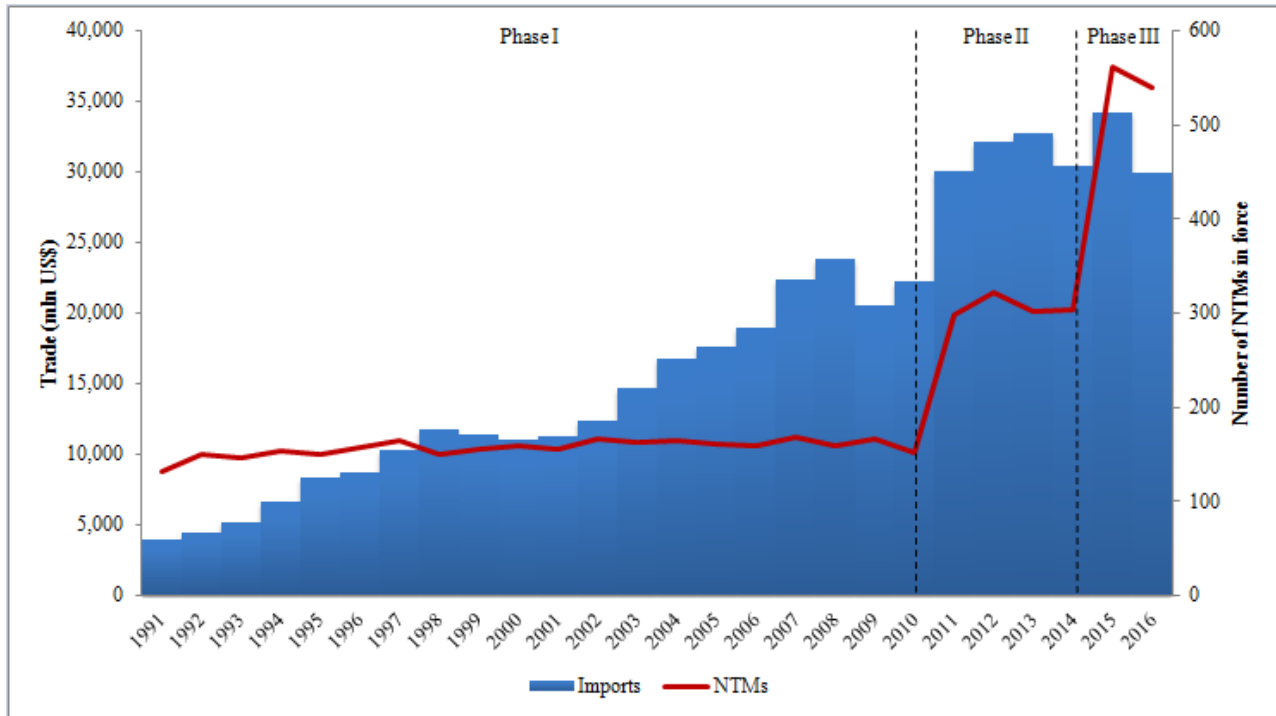
Notes: 'South' are developing economies, 'North' are developed economies; acronyms are New World Producers (NWP), Old World Producers (OWP), net exporter (NE), net importer (NI).

Imports show a notable growth in the period 1991-2008, due to increased consumption in non-producing countries, and a recover in 2011 after a reduction in 2009, due to the international economic crisis (figure 1). Indeed, domestic consumption of OWP have gradually reduced overtime, while new world consumers (e.g. Asian countries) have recently emerged (Anderson, 2013; Anderson and Wittwer, 2015).

¹Average values of imports and exports are computed over the period 1991-2016.

Emblematic is the case of China, whose consumption has increased from 5 to 16 million hl in a decade (from 2006 to 2016). In addition, volumes of production of OWP have been rather steady, whereas NWP have exponentially increased their production and exported quantities (from 78 to 7,885 million U.S.\$ in 1986-2016) (Anderson and Pinilla, 2017).

Figure 1. Trends in imports and non-tariff measures (NTMs) in wine sector in 1991-2016.



Source: elaboration on UN Comtrade (2017) and UNCTAD(2017).

Comparing the evolution of average values of imports across decades (table 2), we find the highest increase from 2000-01 to 2010-11 for all wines (+95%). Differences emerge across market segments: since 1990, some wines have grown more than others. Sparkling and bottled wines increased the most (Pomarici, 2016; del Rey, 2018): bottled wines doubled from 1990-91 to 2000-01, and again from 2000-01 to 2010-11, while in 2015-16 it has grown by 9%. Bulk wine has tripled from 2000-01 to 2010-11 (Mariani et al., 2012), while musts show a progressive downward trend after an increase from 1990-91 to 2000-01 (+23%).

Table 2. Wine imports by market segments: a comparison among 1990-91, 2000-01, 2010-11, and 2015-16 averages (mln US\$).

Wine segment	1990-91	2000-01	2010-11	2015-16
Sparkling	6	6	11	16
Bottled	10	20	40	44
Bulk	4	3	10	9
Musts	1	1	1	1
All wines	7	11	21	23

Source: elaboration on UN Comtrade (2017).

If we focus on 2015-16 (table 1), the United States (US), the United Kingdom (UK), Germany, China, and Canada are listed as top 5 for all wines and for bottled wine. It is worth noting that Germany, the UK, and the US have long been major destinations for wine exports, while Canada and China are the first

traditional and non-traditional importing countries, respectively (Mariani et al., 2012). Relevant importers of sparkling wine are Japan and Singapore (that overstep China and Canada). Germany, the UK, and the US are leaders in imports of bulk wine, followed by France and Sweden. Musts (not imported by Russian Federation, New Zealand, and Argentina) cover a relevant share of wine imports for Japan and European countries (Portugal, Germany, Italy, and France).

Global trade patterns have considerably changed over time (table 3): trade between OWP has drastically reduced (from 65% to 27%, in 1996-2016) in favour of a relevant increase in imports of NWP (from 22% to 44% from OWP, and from 4% to 21% from NWP, in 1996-2016). In 2016, global imports is absorbed by NWP for 65% and by North for 77% (UN Comtrade, 2017). Changes in the relevance of countries' groups in global wine market are significant: NWP have gained increasing market shares, driven by North (e.g. the United States, Canada, Australia, New Zealand).

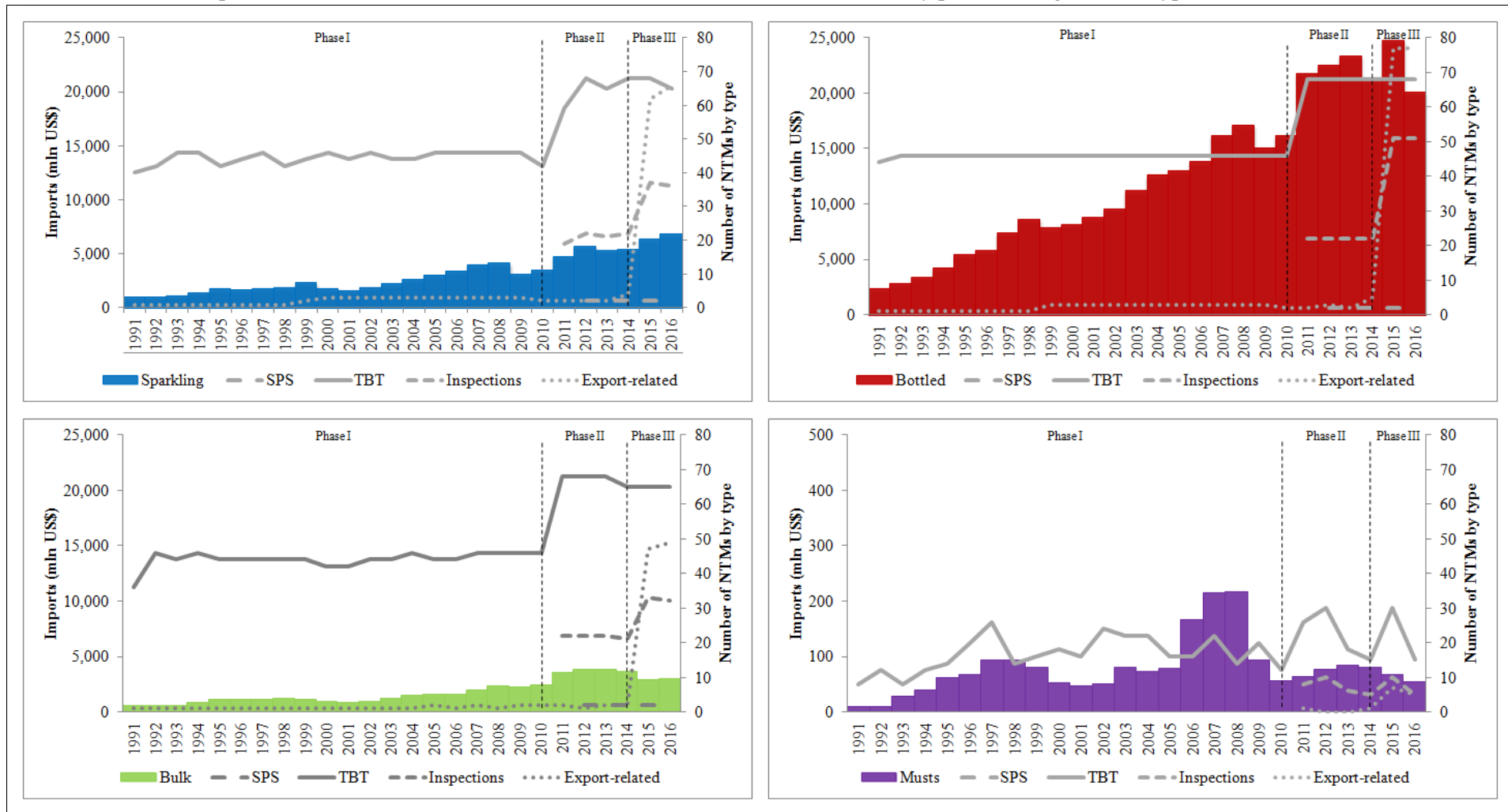
Table 3. Value of wine imports (mln US\$) arranged by trade patterns: focus on developed (North) and developing (South) countries, Old World Producers (OWP) and New World Producers (NWP), net importers (NI) and net exporters (NE).

Year	North-North	North-South	South-North	South-South
1996	7,900	432	334	11
2006	15,200	1,570	2,000	247
2016	20,700	2,410	6,050	926
Year	OWP-OWP	OWP-NWP	NWP-OWP	NWP-NWP
1996	5,630	730	1,940	381
2006	7,410	3,400	5,680	2,490
2016	8,190	2,420	13,100	6,290
Year	NI-NI	NI-NE	NE-NI	NE-NE
1996	642	7,390	57	584
2006	1,540	15,900	158	1,380
2016	1,990	26,000	208	1,870

Source: elaborations on UN Comtrade (2017).

Notes: In pairs of countries' groups, the former are importers and the latter are exporters.

Figure 2. Trends in imports and non-tariff measures (NTMs) in wine sector in 1991-2016: detail by product categories and types of NTMs.



Source: elaboration on UN Comtrade (2017) and UNCTAD (2017).

Notes: Types of NTMs are Sanitary and Phytosanitary Standard (SPS), Technical Barrier to Trade (TBT), Pre-Shipment inspection (Inspections), Export-related measure (Export-related).

The level of bilateral non-tariff measures (NTMs), almost stable until 2010 (Phase I), has approximately doubled in 2011 (from 152 to 299 in 2010-2011) (Phase II) and again in 2015 (from 299 to 561 in 2011-2015) (Phase III) (figure 1). Bilateral trade agreements on wine are heterogeneous (table 4): the most and the least adopted NTMs are Technical Barriers to Trade (TBTs, 75%) and Sanitary and Phytosanitary Standards (SPSs, 1%), respectively; others are pre-shipment inspections and export-related measures (24% in total).

Bilateral NTMs are segment-specific (figure 2). TBTs are the most widespread across product categories. For wines (sparkling and still), TBTs have been approximately constant until 2010 and sharply increased since 2011: the relevant increase in TBTs may explain the raise in total level of NTMs and the transition from ‘Phase I’ and ‘Phase II’ (see figure 1). For musts, TBTs have widely fluctuated from 10 to 30 during the period 1991-2016. SPSs and pre-shipment inspections have been implemented only since 2011 for all segments. Relevant is the increase in the number of pre-shipment inspections and export-related measures since 2015 for wines (sparkling and still): in particular, export-related measures are implemented by 5 out of 13 NWP (i.e. Australia, Canada, Russia, Singapore, and the US), while pre-shipment inspections are adopted in 3 out of 13 NWP (i.e. Canada, Russia, and the US) (UNCTAD, 2017). Their wide increase in 2015 may have determined the transition from ‘Phase II’ and ‘Phase III’ (see figure 1).

Table 5 lists and describes specific types of NTMs implemented for wine imports.

Table 4. Types of bilateral non-tariff measures (NTMs) implemented on imports of wine and of its market segments: incidence (%) on total NTMs in 1991-2016 (A) and number of NTMs in place in 1991 and in 2016 (B).

Types of NTM	Wine (total)		Sparkling wine		Still bottled wine		Still bulk wine		Musts	
	A	B	A	B	A	B	A	B	A	B
Sanitary and Phytosanitary Standard (SPS)	1%	[0; 6]	1%	[0; 2]	1%	[0; 2]	1%	[0; 2]	0%	[0; 0]
Technical Barrier to Trade (TBT)	75%	[128; 213]	76%	[40; 65]	74%	[44; 68]	77%	[36; 65]	77%	[8; 15]
Pre-shipment inspection	12%	[0; 124]	11%	[0; 36]	12%	[0; 51]	11%	[0; 32]	13%	[0; 5]
Export-related measure	12%	[3; 197]	12%	[1; 66]	13%	[1; 77]	11%	[1; 49]	10%	[0; 5]

Source: elaboration on UNCTAD (2017).

Table 5. Classification and description of Non-Tariff Measures (NTMs) implemented in wine sector.

Chapter	Classification	Description
A	Sanitary and Phytosanitary Standards (SPSs)	Measures that are applied to protect human or animal life from risks arising from additives, contaminants, toxins or disease-causing organisms in their food; to protect human life from plant- or animal-carried diseases; to protect animal or plant life from pests, diseases, or disease-causing organisms; to prevent or limit other damage to a country from the entry, establishment or spread of pests; and to protect biodiversity.
A220	Restricted use of certain substances in food and feed and their contact materials	Restriction or prohibition on the use of certain substances contained in food and feed. It includes the restrictions on substances contained in the food containers that might migrate to food.
B	Technical Barriers to Trade (TBTs)	Measures referring to technical regulations, and procedures for assessment of conformity with technical regulations and standards, excluding measures covered by the SPS Agreement.
B330	Packaging requirements	Measures regulating the mode in which goods must be or cannot be packed, and defining the packaging materials to be used.
B420	TBT regulations on transport and storage	Requirements on certain conditions under which products should be stored and/or transported.
B830	Certification requirement	Certification of conformity with a given regulation: required by the importing country but may be issued in the exporting or the importing country.
C	Pre-shipment inspections	Compulsory quality, quantity and price control of goods prior to shipment from the exporting country, conducted by an independent inspecting agency mandated by the authorities of the importing country.
C200	Direct consignment requirement	Requirement that goods must be shipped directly from the country of origin, without stopping at a third country.
C900	Other formalities, n.e.s.	Other formalities not elsewhere specified.
P	Export-related measures	Export-related measures are measures applied by the government of the exporting country on exported goods.
P130	Licensing- or permit requirements to export	A requirement to obtain a licence or a permit by the government of the exporting country to export products.
P500	Export taxes and charges	Taxes collected on exported goods by the government of the exporting country: they can be set either on a specific or an ad valorem basis.
P620	Certification required by the exporting country	Requirement by the exporting country to obtain sanitary, phytosanitary or other certification before the goods are exported.
P690	Export measures, n.e.s.	Export measures not elsewhere specified.

Source: International Classification of Non-Tariff measures, February 2012 version (UNCTAD/DITC/TAB/2012/2).

Types of bilateral NTMs on wine imports differ across trade patterns (table 6). Bilateral NTMs implemented by NWP has more than tripled over time (from 157 to 540 in 1996-2016) (UNCTA, 2017), while OWP, in general, adopt import tariffs rather than bilateral NTMs (Rickard et al., 2014, 2017; Global Trade Alert, 2017²). Governments have substantially increased the use of technical measures in order to protect domestic markets (Anderson and Golin, 2004): 213 TBTs have been used in 2016 by North to regulate imports from South (41%) and other developed countries (59%) (UNCTAD, 2017). There is almost no recourse to SPSs (in 2016, 6 SPSs have been implemented worldwide): in general, they concern trade of fresh products (Dal Bianco et al., 2016). Not negligible is the share of pre-shipment inspections (23%) and export-related measures (36%) in 2016: NWP have implemented them against OWP (about 43%) and other NWP (approximately 57%) (UNCTAD, 2017). Net importers adopt TBTs and pre-shipment inspection, while net exporters use SPSs only against other net exporters. Export-related measures are implemented both by net importers and net exporters. The level of intervention is emblematic in trade between countries with similar levels of economic development: in North-North trade NTMs have more than doubled in 2016, after a period of relative stability from 1996 to 2006; in South-South trade, absent until 2006, bilateral NTMs are 48 in 2016. In trade between countries with different levels of economic development, the number of policy measures changes drastically if imposed by North or by South: NTMs implemented by South against North are rather scant (87 measures in 2016) compared to NTMs adopted by North against South (169 measures in 2016) (UNCTAD, 2017). The frequent adoption of NTMs by developed countries may lead to a non-transparent trade policy environment (Athukorala and Jayasuriya, 2003; Fernandes et al., 2017): the consequences may be detrimental in particular for trade from developing countries of NWP (e.g. Argentina, Chile, Uruguay, South Africa), which have to find alternative outlet to their production.

Table 6. Number and types of non-tariff measures (NTMs) implemented in wine sector, arranged by trade patterns: focus on developed (North) and developing (South) countries, Old World Producers (OWP) and New World Producers (NWP), net importers (NI) and net exporters (NE).

Year	NTM	North-North	North-South	South-North	South-South
1996		99	58		
2006		95	60	4	
2016		236	169	87	48
2016	Sanitary and Phytosanitary Standards (SPSs)	6			
	Technical Barriers to Trade (TBTs)	126	87		
	Pre-shipment inspections	43	37	28	16
	Export-related measures	61	45	59	32
Year	NTM	OWP-OWP	OWP-NWP	NWP-OWP	NWP-NWP
1996				76	81
2006				72	87
2016				240	300
2016	Sanitary and Phytosanitary Standards (SPSs)				6
	Technical Barriers to Trade (TBTs)			102	111
	Pre-shipment inspections			55	69
	Export-related measures			83	114
Year	NTM	NI-NI	NI-NE	NE-NI	NE-NE
1996		27	31		
2006		26	33		
2016		103	169	5	10
2016	Sanitary and Phytosanitary Standards (SPSs)				3
	Technical Barriers to Trade (TBTs)	38	49		
	Pre-shipment inspections	21	43		
	Export-related measures	44	77	5	7

Source: elaboration on UNCTAD (2017), TRAINS NTMs: The Global Database on Non-Tariff Measures.

Notes: In pairs of countries' groups, the former are countries implementing NTMs and the latter are countries affected by NTMs.

² Available at: www.globaltradealert.org/ (accessed in December, 2017).

3. EMPIRICAL STRATEGY

In order to investigate the impact of bilateral non-tariff measures (NTMs) on global trade of wine, we use a standard gravity approach: bilateral trade flows are likely to be explained by economic masses, and by the economic distance between countries (Anderson and van Wincoop, 2003). Following Baldwin and Taglioni (2006), we proxy economic masses of importing (i) and exporting (j) countries with importer (β_i) and exporter (β_j) fixed effects, so to account for multilateral trade resistance terms. The fixed effects capture size effects, and control for the country-specific unobserved heterogeneity (Cardamone, 2011). We use time fixed effects (β_t) to control for time-specific events.

We model NTMs as dummy variables, equal to 1 if the NTM is in place (0 otherwise). The NTMs are time-specific (t), and related to the implementing country (i), the partner country (j), and the wine category (k)³:

$$\ln(X_{ij,k}) = \alpha + \sum_{i=1}^I \beta_i + \sum_{j=1}^J \beta_j + \sum_{t=1}^T \beta_t + \sum_{k=1}^K \gamma_k NTM_{ij,k} + \varepsilon \quad (1)$$

where $\ln(X_{ij,k})$ is the logarithm of (annual) imports of the k -th wine category between i and j , α is a constant, γ_k is the parameter of interest, and ε is the error term.

We estimate the model in equation (1) using the Poisson Pseudo-Maximum Likelihood (PPML) estimator. The PPML estimator is widely adopted in gravity-based analyses of trade policies in the agri-food sector (e.g. Hoeckman and Nicita, 2011; Winchester et al., 2012; Beckman and Arita, 2016; Dal Bianco et al., 2016; Arita et al., 2017). It allows us to deal with relevant econometric issues, peculiar of gravity-based models: the presence of zero trade flows and the heteroskedasticity in the error term (Silva and Tenreyro, 2006). By assuming an additive error, the PPML allows us to correct for heteroskedasticity and to avoid selection bias (due to exclusion of zero observations): the marginal effects tend to be more robust in terms of magnitude, as well as in term of statistical and economic significance (Haq et al., 2013). We compute the marginal effects (ME) for the bilateral NTM as change in imports with ($NTM_{(1)}$) and without ($NTM_{(0)}$) the specific bilateral trade agreement:

$$ME = \frac{\Delta X}{NTM_{(1)} - NTM_{(0)}} \quad (2)$$

We distinguish between net importers and net exporters in order to isolate potential differences in the effects of the bilateral NTMs on imports that may be due to the sign of the trade balance.

We use imports of four product categories, coded according to the Harmonised System (HS) 6-digit: ‘wine, sparkling’ (220410), ‘wine, still, in containers holding 2 l or less’ (220421), ‘wine, still, in containers holding more than 2 l’ (220429), ‘grape must’ (220430). We include all types of bilateral NTMs applied in wine sector (UNCTAD, 2012): Sanitary and Phytosanitary Standards (SPSs), Technical Barriers to Trade (TBTs), pre-shipment inspections, and export-related measures. We collected bilateral annual data from the

³ The subscripts t have been omitted for clarity.

Global Database on Non-Tariff Measures for NTMs, and from the UN Comtrade database for imports. The dataset includes 24 countries (selected among the top importers, exporters and producers of wine), and cover data from 1991 to 2016.

4. RESULTS AND DISCUSSION

We estimate a Poisson Pseudo-Maximum Likelihood (PPML) model, and compute the marginal effects of bilateral non-tariff measures (NTMs) on imports, in order to disentangle how different types of NTMs affect global trade of wine and of its segments (table 7). Results suggest that the trade effects of bilateral NTMs are segment-specific, and differences emerge across types of NTMs. We find positive coefficients for Sanitary and Phytosanitary Standard (SPS), pre-shipment inspection, and export-related measure: as expected, bilateral NTMs tend to facilitate global trade of wine. This is true, in particular, for SPSs: on average, the SPSs are the most influential on imports. Global imports also raise if export-related measures and pre-shipment inspections are implemented, but to a their impacts are not as large as those observed for the SPSs. Our results complement the findings of Dal Bianco et al. (2016), who focus on exports of wine. In particular, we found that SPSs enhance imports, while they found that they have no impact on exports (Dal Bianco et al., 2016); we found that technical measures have mixed effects on imports, while Dal Bianco et al. (2016) conclude that they are important frictions for exports.

As for the segment-specific analyses, we find that bilateral NTMs enhance trade, exception made for the Technical Barriers to Trade (TBTs), whose effects are segment-specific. Moreover, the SPSs and the export-related measures are trade-enhancing: SPSs greatly affect imports of bulk wine; export-related measures foster imports of grape must. The effects of pre-shipment inspections is mainly due to their positive effect on bottled wine. The TBTs impact bottled and bulk wine, but we the evidence are mixed: imports of bottled wine are favoured, while imports of bulk wine are frictioned. The differences we observe for bottled and bulk wine may be due to changes in the composition of import flows: during the last decades bulk wine has gained market shares to the detriment of those related to bottled wine (Castillo et al., 2016). Large volumes of bulk wine are imported and bottled in the target market: it is plausible that, compared to bulk wine, bottled wine meets technical standards (e.g. packaging requirements, regulations on transport and storage, certification requirements) and, as a consequence, it is likely to have great imports. Our findings are specular to those of Dal Bianco et al. (2016) also for the TBTs: for bottled wine, they suggest that TBTs impede exports, and we show that TBTs favour imports.

We highlight how trade effects of NTMs differ for net importers and net exporters (table 8). TBTs and pre-shipment inspections are implemented only by net importers. TBTs are trade-enhancing for bottled wine, but trade-impeding for bulk wine. The trade-impeding effect of TBTs for bulk wine of net importers may be due to the high specialisation of some competitors, that are net exporters of bulk wine (i.e. Australia, New Zealand, and Spain) (Mariani et al., 2012). Pre-shipment inspections increase imports of bottled wine. SPSs are adopted only by net exporters, and increase imports of wine. Export-related measures do matter both for net importers and net exporters: they increase imports, especially for net exporters. Differently, the imports of musts of net exporters are not influenced by export-related measures.

Our results highlight that trade policy strategies are quite heterogeneous across countries. The net importers are frequent adopters of technical regulations (TBTs), and tend to impose formalities that should precede the shipments from exporting countries. The net exporters prefer measures aimed at ensuring food safety and preventing the dissemination of disease or pests (SPSs). Apart from specific differences, we may conclude that of the bilateral trade agreements are trade-enhancing, both for net importers and net exporters.

Table 7. Results of the Poisson Pseudo-Maximum Likelihood (PPML) estimation and marginal effects (mln US\$).

Variables	All wine		Sparkling wine		Still bottled wine		Still bulk wine		Musts	
	PPML	Marginal effects	PPML	Marginal effects	PPML	Marginal effects	PPML	Marginal effects	PPML	Marginal effects
Importer f.e.	Yes		Yes		Yes		Yes		Yes	
Exporter f.e.	Yes		Yes		Yes		Yes		Yes	
Time f.e.	Yes		Yes		Yes		Yes		Yes	
Sanitary and Phytosanitary Standard (SPS)	0.273 *** (0.017)	3.320 *** (0.204)	0.242 *** (0.015)	2.769 *** (0.172)	0.246 *** (0.010)	3.226 *** (0.135)	0.324 *** (0.021)	3.942 *** (0.255)	No	
Technical Barrier to Trade (TBT)	0.020 (0.021)	0.243 (0.256)	0.025 (0.030)	0.280 (0.345)	0.039 ** (0.020)	0.511 ** (0.256)	-0.098 ** (0.041)	-1.193 *** (0.500)	-0.014 (0.099)	-0.133 (0.947)
Pre-shipment inspection	0.052 *** (0.019)	0.631 *** (0.231)	0.028 (0.030)	0.317 (0.341)	0.048 *** (0.018)	0.633 *** (0.230)	-0.035 (0.037)	-0.422 (0.451)	0.077 (0.106)	0.738 (1.016)
Export-related measure	0.100 *** (0.016)	1.211 *** (0.192)	0.088 *** (0.026)	1.006 *** (0.298)	0.089 *** (0.018)	1.168 *** (0.235)	0.100 *** (0.026)	1.221 *** (0.319)	0.384 *** (0.064)	3.682 *** (0.611)
Constant	1.755 *** (0.021)		2.192 *** (0.033)		1.578 *** (0.027)		2.115 *** (0.083)		2.271 *** (0.078)	
Observations	27,854		8,192		10,971		6,832		1,859	
R-squared	0.455		0.659		0.756		0.604		0.541	

Robust standard errors are in parentheses. *** and ** indicate statistical significance at 1% and 5%. 'No' signals the exclusion of regressors due to the lack of observations for specific measures in certain product categories between pairs of countries.

Table 8. Results of the Poisson Pseudo-Maximum Likelihood (PPML) estimation: detail on net importers and net exporters.

Variables	All wine		Sparkling wine		Still bottled wine		Still bulk wine		Musts	
	<i>Net importers</i>	<i>Net exporters</i>	<i>Net importers</i>	<i>Net exporters</i>	<i>Net importers</i>	<i>Net exporters</i>	<i>Net importers</i>	<i>Net exporters</i>	<i>Net importers</i>	<i>Net exporters</i>
Importer f.e.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Exporter f.e.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time f.e.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sanitary and Phytosanitary Standard (SPS)	No	0.351 *** (0.021)	No	0.357 *** (0.030)	No	0.344 *** (0.020)	No	0.394 *** (0.032)	No	No
Technical Barrier to Trade (TBT)	0.017 (0.022)	No	0.024 (0.030)	No	0.036 * (0.020)	No	-0.108 *** (0.042)	No	0.012 (0.182)	No
Pre-shipment inspection	0.041 ** (0.020)	No	0.019 (0.030)	No	0.036 ** (0.018)	No	-0.056 (0.038)	No	0.110 (0.184)	No
Export-related measure	0.077 *** (0.017)	0.220 *** (0.049)	0.068 *** (0.026)	0.163 * (0.097)	0.067 *** (0.018)	0.244 *** (0.059)	0.0541 ** (0.025)	0.378 *** (0.089)	0.418 *** (0.156)	0.141 (0.088)
Constant	2.076 *** (0.021)	1.826 *** (0.030)	2.093 *** (0.049)	1.867 *** (0.053)	1.906 *** (0.026)	1.607 *** (0.050)	2.026 *** (0.097)	1.677 *** (0.139)	2.283 *** (0.115)	1.518 *** (0.297)
Observations	18,454	9,400	5,522	2,670	7,110	3,858	4,651	2,181	1,171	688
R-squared	0.407	0.473	0.667	0.654	0.743	0.729	0.618	0.551	0.549	0.639

Robust standard errors are in parentheses. ***, **, and * indicate statistical significance at 1%, 5%, and 10%. ‘No’ signals the exclusion of regressors due to the lack of observations for specific measures in certain product categories between pairs of countries.

5. CONCLUSIONS

Changes in trade regulations have largely influenced agri-food markets (Arita et al., 2017), and are modifying global trade of wine as well. The level of policy intervention (tariffs and non-tariff measures, NTMs) is remarkable in wine sector (Dal Bianco et al., 2016). The trends in the level of policy interventions seems to follow the pattern of global trade, with relevant changes in the relative importance of groups of countries (Mariani et al., 2012). On top of a substantial regulation established through multilateral trade agreements, there has been a strong tendency to stipulate bilateral trade agreements: their impact on trade is not always clear, nor quantified at global scale. We assessed the effects of bilateral NTMs on global imports of wine, through a gravity model approach. We quantify the effects for Sanitary and Phytosanitary Standards (SPSs), Technical Barriers to Trade (TBTs), pre-shipment inspections, and export-related measures, and conclude on differences observed for the segments of the wine market (sparkling, bottled, bulk, musts).

We found that bilateral trade agreements favour trade: NTMs increase imports of wine. Moreover, we show that the effects of the SPSs are similar (and large) for all types of market segment (sparkling, bottled, and bulk). The export-related measures are trade-promoting. The TBTs favour (friction) bottled (bulk) wine. The pre-shipment inspections are relevant for bottled wine.

Our analysis represents a first attempt to quantify the impacts of bilateral trade agreements on trade of wine. Despite bilateral agreements are expected to be always pro-trade, we show that large differences exist across market segments and types of NTMs. The emphasis that we pose on this issue is beneficial for policymakers and entrepreneurs.

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