Tariffs and non-tariff frictions in the world wine trade

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1 September 2014

Tariffs and non-tariff frictions in the world wine trade[§]

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June 2014

Abstract

This article empirically investigates the impact of trade barriers on the world wine trade, focusing on trade costs impeding exports, including transport, tariffs, technical barriers and sanitary and phytosanitarystandards. A gravity model is estimated *using data from the main importing and exporting countries for the years 1997 to 2010. The* Poison Pseudo-Maximum Likelihood (*PPML) estimator accounts for heteroskedasticity and the presence of zero trade flows. Our results identify which regulations can adversely affect trade, providing useful information to policy-makers involved in negotiations on trade frictions. While sanitary and phytosanitary measures do not seem to obstruct exports, technical barriers have a varying impact on trade. A decreasing trend for tariffs has largely been compensated by more stringent technical barriers. The overall result is that frictions in the world wine trade have not changed during the past fifteen years.*

Keywords: tariffs, technical barriers to trade, sanitary and phytosanitary regulations, gravity model, PPML

JEL code: F13, Q17, Q18

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[§] *A revised version has been accepted for publication in the European Review of Agricultural Economics*

Suggested Citation:

Dal Bianco A., Boatto V. L., Caracciolo F., Santeramo F. G. (2015) Tariffs and non-tariff frictions in the world wine trade. *European Review of Agricultural Economics. DOI: 10.1093/erae/jbv008*

1. Introduction

A decade has passed since Kym Anderson studied the effects of globalization on the world wine market: "Globalization is not new to the world's wine markets, but its influence over the past decade or so has increased significantly" (Anderson and Golin, 2004).

The wine sector is increasingly becoming an export-oriented industry. Half of world production is concentrated in three countries, which account for less than a third of global consumption, while the declining consumption in their domestic markets is pushing the industry to export to distant markets. The rapid and dynamic growth of the world wine trade and the rise of new exporters and importers have largely contributed to rendering wine one of the most global drinks consumed worldwide (Anderson and Nelgen, 2011).

During recent decades, world wine trade growth has been driven by a number of complementary factors[1], including technological improvements and political interventions. The former tightened transport costs, bringing distant countries ever closer, the latter aimed to reduce price mark-ups on imported goods. At the same time, new regulations have slackened trade. In general terms, Sanitary and Phyto-Sanitary (SPS) measures and Technical Barriers to Trade (TBT) have been introduced to guarantee safety and technical standards, and correct market failures (Mahé, 1997). A vast majority of scholars have argued that non-tariff barriers have simply been put in place to protect domestic industries from import competition (Vousden,1990; Yue and Beghin, 2009), raising international political concern (Disdier *et al*., 2008). The world wine market has been over regulated and, as repeatedly argued (Vousden, 1990; Foster and Spencer, 2002), it is likely that the effective level of protectionism has not changed at all: wine is perceived by consumers as a luxury good, and is regulated by governments accordingly, as a source of additional revenue. It is hard to contest the noble objective of reducing negative externalities from consuming alcohol,

[1] Aizenman and Brooks (2008) suggest that this could be the result of larger phenomena: the increase in migration and tourism flows, as well as a cultural revolution that, via globalization, is generating a new cultural collective identity.

although revenue seeking is the real, less noble, motivation for taxing wine consumption (Fogarty, 2010). As a result, the rate of taxation on wine is high.

An extensive academic literature on the effects of trade regulations analyzed the role of tariffs and non-tariff barriers and their impact in economic terms. Leamer (1990) showed how trade barriers largely reduce trade, while Harrigan (1993) concluded that trade between OECD members is limited by tariffs and transport costs rather than by non-tariff barriers. More recently, Heien and Sims (2000) found that the removal of tariffs and non-tariff barriers due to the establishment of the Canada–United States Free Trade Agreement increased trade between Canada and the USA by 10 and 19%, respectively. Similarly, Otsuki *et al.* (2001) demonstrated that the European standards on aflatoxins are the main barrier to imports of African Groundnuts. Fontagné *et al.* (2005) concluded that SPS and TBT in fresh and processed foods produce are not very restrictive. On the contrary, Henry de Fraham and Vancauteren (2006) stated that the harmonization of regulations in the food industry have largely increased intra-EU trade. Last but not least, Jayasinghe *et al.* (2010) analyzed trade frictions in world demand for US corn seeds, and concluded that "tariffs matter most, followed by distance and SPS measures". Needless to say, the relative importance of tariffs and non-tariff barriers is still not clear cut, and their impacts on trade are necessarily case specific. In contrast, several scholars have reconsidered the negative effects of non-tariff barriers on trade flows. Harrigan (1993) showed that trade between OECD members is limited by tariffs and transport costs rather than by non-tariff barriers[2].

The global nature of the wine sector, the complex set of existing trade regulations, and increasing trade volumes, are the key elements clamouring for a better understanding of trade barriers. These are the elements we focus on.

[2] Similarly, Fontagné *et al.* (2005) stated that SPS and TBTs in fresh and processed foods are not very restrictive, Santeramo and Cioffi (2012) found that a price ceiling is not as effective as tariffs for imported products in the EU; and Henson and Jaffee (2008) examined the concept of 'standards as catalysts' in the context of food safety standards in international trade, highlighting the need for careful analysis when considering the trade effects of TBTs.

The paper has a twofold objective. Firstly, we describe and analyze the structure of the world wine trade frictions in terms of tariffs and non-tariff barriers; secondly, we assess the impacts of trade barriers by means of an econometric analysis. The study is conducted on the main exporters and importers in the world wine trade, analysing data on bilateral trade flows from the 1997 to the most recent available.

The remainder of the paper is organized as follows: the next section details the state of the art of country-specific tariffs and non-tariff regulations; the third and fourth sections describe the methodology and empirical results. We conclude by summing up the results.

2. Trade frictions in the wine trade

This section explores the structure and development of trade frictions between the main bottled wine importers and exportes. In the choice of the group of countries to analyze the intention was to create a group representative of world supply and demand.

The wine-growing sector has been distinguished in recent years by dynamic trade at international level, which has mainly transpired following the fall in consumption in traditional producing countries, mainly France, Italy and Spain. During the 1990s, European countries had to tackle an important decline in internal demand, being forced to export an increasing production quota. On the other hand, exports were a driving force for the producing countries of the New World, which have therefore increased their production potential to satisfy the new demand. This process was made possible thanks to a geographical redistribution of wine consumption (Aizenman and Brooks, 2008), in particular towards North America and Asia.

During the last decade, the New World countries have notably increased exports, quadrupling the exported quantities in the last 15 years, which now contribute 27% of the exports from the 11 major world wine producers, against 16% in 1997. Despite this, in absolute terms, the export gap that separates the big European producers from countries of the New World has increased, passing from 68 to 107 million hectolitres. The volumes of wine exported have therefore almost doubled in the last 15 years, topping ten million litres in 2012, and today almost half of the wine is consumed outside the country of production (figure 1).

In the analysis proposed here, it was wished to include on the one hand all the principal world wine producers and on the other the principal importing nations. The set of countries chosen therefore covers more than two thirds of the import world and almost 90% of exports, considering the

average of the period 1997-2010 for bottled wine. More specifically, we considered trade among France, Italy, Spain, Germany, UK, USA, Canada, Argentina, Chile, Australia, China and Japan.

2.1 Tariff Barriers

Tariff barriers were calculated taking into account Most Favoured Nation (MFN) tariffs, chosen as reference for national tariff levels, and Free Trade Agreements (FTAs), if any. If the importer applied specific tariffs, these have been converted into *Ad Valorem Equivalent* (AVE), utilizing the average import price as reference. AVE calculations have done in order to aggregate the different HS8[3] codes in the same country and compare tariffs across different countries[4]. When an importer implemented many duty lines, Bureau *et al*. (2000) and Jank *et al*. (2002) suggest to utilize the average price calculated considering the average of the last three years on the HS8 code. According to Cipollina and Salvatici (2008) this approach is influenced by tariff peaks that may be present in the products constituting the HS code with 6 numbers. There is therefore the problem of identifying a methodology that is robust but at the same time allows to distinguish between the peculiarities and differences of the individual nations. The solution could be represented by the median, which also allows a central value to be obtained at the level of HS codes with 8 numbers and over, minimizing the influence of tariff peaks as recommended by Cipollina and Salvatici (2008), Anderson and Neary (2003), Bouët *et al*. (2008).

Table 1 presents a rough picture of trade openness of the principal world actors as regards transactions in bottled wine, with a comparison between two different periods to understand its evolution over time. The columns top importer and top exporter indicate the position of the country

[3] The Harmonized Commodity Description and Coding System (HS) of tariff nomenclature is an internationally standardized system of names and numbers for classifying traded products developed and maintained by the World Customs Organization (WCO). HS 2204 corresponds to "Wine Of Fresh Grapes, Including Fortified Wines; Grape Must (Having An Alcoholic Strength By Volume Exceeding 0.5% Vol.)".

[4] The most common methodology to aggregate the tariffs is the utilization of their weighted average, using as weight the respective quota of imports valuated at the frontier. This type of aggregation is criticized for its endogeneity , since the higher the tariff is, the greater its effect will be on restricting trade, as a function of the price elasticity of the demand (Anderson and Neary, 2003; Bouët *et al*., 2008). Leamer (1974) therefore proposes the use of the import world as weighting measure, while Bouët *et al*. (2008) utilize the imports of a group of countries of reference for the weighting. Unfortunately, this approach cannot be used with an HS8 level of detail because, varying from country to country, it is not possible to use common weights.

considered in the ranking of the major world importers/exporters of bottled wine (in value). The column MFN tariff indicates the MFN tariff in force for the country in the respective year, while the column average tariff indicates the real average duty imposed on the other countries in the dataset, therefore also considering all the FTAs that entail a reduction in the MFN duty.

[TABLE 1 ABOUT HERE]

As regards the MFN tariff, a clear differentiation may be noted on the basis of geographical area: the countries of North America operate the lowest protection of the domestic market through tariffs, while the countries of Latin America and especially those in Asia have the highest import duties among the set of countries considered.

Thanks to the WTO policies aimed at encouraging free trade, during the period considered all the countries have reduced the MFN tariff applied to imported bottled wine. Nevertheless, in the particular case of the European Union, the AVE calculated indicates the contrary; this apparent contradiction is due to the fact that the EU applies specific tariffs, and a diminution of these[5] is followed by a more than proportional diminution of the unit value of imported wine. Consequently the percentage of the duty calculated on the basis of the unit value of the imported product has increased.

The average diminution of the MFN tariff between 1999 and 2010 was nonetheless 22.7%, driven by China and Canada, both with a more than fourfold diminution, and also by Chile that has reduced its MFN tariff by 40%. China is the country with the highest reduction of the tariff applied in both absolute and relative terms, but this choice was certainly dictated by its entry into the WTO

[5] Duty modifications introduced by Regulations R1734/96, R2086/97, R2261/98, R2204/99, RO 948/09.

in 2001[6], given that the tariff began to reduce the following year, passing from 65% to 14% in only three years.

The position is different for Canada and Chile, where the diminution appears to be more linked to an effective willingness to open up to the international market, reinforced in the case of the South American country also by the large number of signed FTAs.

It is also very interesting to extend the reasoning using the average duty tariff as reference, which can consider the influence of the FTAs signed with the various trading partners. If in 1999 there was no difference between these two parameters, in 2010 all the nations considered[7] presented differences between the MFN tariff and the tariff then actually applied[8]. In particular, it was Chile that made most use of this type of trade agreement, and in 2010 the average tariff applied on imported wines was 90% lower than the MFN one, making Chile the nation with the lowest duty applied among those considered in the dataset.

[TABLE 2 ABOUT HERE]

2.2 Non-tariff barriers

As tariffs have been lowered, demands for protectionism have induced new technical barriers; among these, SPS and TBT are of increasing importance (Disdier *et al.*, 2008; Moenius, 2004).

Hillman (1991) described TBT as "any governmental device or practice other than a tariff which directly impedes the entry of imports into a country and which discriminates against imports, but does not apply with equal force on domestic production or distribution."; more recently Beghin

[6] China officially joined the WTO on 11 November 2001, formalized by access protocol WT/L/432.
[7] Considering the States of the European Union jointly.
[8] In reality even the country that has not shown variations, the USA, has signed various FTAs over the years. However these have not led to a more than 0.01% lowering in the average duty.

(2008), and Liu and Beghin (2011) defined TBT as the wide and heterogeneous set of intervention measures, different from custom duties, that influence and distort the commerce of goods, services and production factors.

Another definitio of TBT appeared over the years, and this has progressively been used to distinguish between measures that have as primary aim the protection of national products and the others that have not. Following this approach the definition of a TBT is linked to its legitimacy, so the term "barrier" should not be used if the measure has a collateral effect on trade, but its primary aim is to correct some market inefficiency. Establishing in an impartial way if a standard has a legitimate basis is not a simple task; for this reason Maskus *et al*. (2000), and Fischer and Serra (2000) evaluated the protectionist nature of a standard set by a government comparing it to those the same government would have set for the domestic market.

Also in the case of wine there has been a growing use of TBT by governments in order to protect domestic markets (Anderson and Golin, 2004). As shown in table 3, there is a big difference among countries in the amount of protectionist intervention, quantified on the basis of the number of TBT settled.

Regarding wine there are three countries with a very high resort of TBT. The first is Argentina, which, although it was one of the last countries to implement this type of regulation, by the end of 2010 it had issued a total of 18 TBT regulating wine. It is followed by the USA with a total of 14, which have instead had a more regular pattern over time, while the EU has stopped at 10 and only began to properly exploit these instruments at the beginning of the new millennium.

China is in fourth position, which, after having joined the WTO in 2002, was forced to lower its import duties, but has apparently pursued protection through TBT, producing new notifications at regular intervals, until there were 7 relating to wine at the end of 2010. The other countries have made less use of these instruments, at least for regulating wine: Australia has 5, Chile 4, Japan 3

and Canada only 2. Some nations stand out for the specificity with which they have regulated the wine sector: the EU, for example, of the ten TBT issued 8 were specifically created for products belonging to code HS2204 (Wine of fresh grapes). Argentina has also demonstrated great attention to the wine sector, given that, out of a total of 18 TBT, 9 are specific to this product. The other importing countries have not shown such zeal in meticulously regulating the sector, and wine is generally included in notifications that regulate a wide range of products.

According to the classification proposed by the WTO, which separates non-tariff barriers on the basis of what they regulate, the technical barriers are used in particular to set labelling (66.6% of the total) and food standards (25.4%)[9]. On the contrary there is almost nil recourse to sanitary and phytosanitary measures, since only Argentina, Australia, China, USA and the EU have produced one SPS notification, while none have been found for other countries.

Currently, the WTO inserts the TBT pertinent to wine in 6 classes: namely, Food Standard, Labelling, Conformity Assessment, Packaging, Food Containers and Human Health. Utilizing this same classification shows that the class relative to Labelling is the only one to have been utilized at least once by all the countries considered. In this class, among the subjects most legislated is the requirement to declare the presence of substances that might cause allergic reactions[10], protection of designations or specific names[11], regulating of the wording regarding the country or Designation of Origin[12], the presence of obligatory information like brand, alcohol content, vintage, etc.[13]. Some TBT have also been inserted to discourage the consumption of alcoholic beverages, including wine, covering the impossibility of mentioning any health benefits from wine, the obligation for warnings about possible repercussions on human health, and sometimes to regulate sales to young people[14].

[9] According to WTO classification of TBT.
[10] TBT/N/EEC/11, TBT/N/USA/205, TBT/N/CAN/248, TBT/N/ARG/252, TBT/N/CHL/95, TBT/N/JPN/123.
[11] TBT/N/EEC/15, TBT/N/EEC/57, TBT/N/USA/158, TBT/N/USA/593, TBT/N/ARG/18, TBT/N/ARG/107. TBT/N/CHN/72, TBT/N/CHN/197, TBT/N/CHN/733.
[12] TBT/N/EEC/191, TBT/N/EEC/254, TBT/N/EEC/264, TBT/N/EEC/305, TBT/Notif.95/348, TBT/N/CHL/33, TBT/NOTIF.95/155.
[13] TBT/N/USA/110, TBT/N/USA/126, TBT/N/USA/290, TBT/N/CAN/8, TBT/N/ARG/64, TBT/N/ARG/65, TBT/N/ARG/130, TBT/N/ARG/164, TBT/NOTIF.99/235, TBT/NOTIF.98/272, TBT/N/CHN/33.
[14] TBT/Notif.99/541, TBT/N/USA/6, TBT/NOTIF.96/221.

"Food Standard", the second most frequent class, regulates the technical requisites of the product like acidification[15], production methods in general[16], and the maximum contents of some particular substances. Some TBT that regulate sectors, are generally not strict regulations in the case of wine: in particular this is true for regulations belonging to the classes Packaging[17], Food Containers[18], Conformity Assessment[19] and Human Health[20]. Each of these classes has been utilized by only one of the countries studied, so these TBT can be considered country-specific.

[TABLE 3 ABOUT HERE]

The SPS measures generally have a big importance in the fresh product trade, but their field of application also considers bottled products like wine. Of the eight countries analyzed, in fact, only half have issued just one SPS relating to wine, while no notification presented to the WTO was found for the others. Argentina made use of this instrument to stipulate the maximum limit of lead, arsenic and zinc in wine[21]. China, by means of SPS/N/CHN/P/133 of April 2002, regarding all alcoholic beverages, has formalized the requisites and supervision and inspection procedures of alcoholic beverages at ports and on the domestic market. The USA also has a sanitary barrier regarding wine, the G/SPS/N/USA/196 of November 1999. This document regulates the labelling of alcoholic beverages, prohibiting, on labels or in advertising, any claim regarding the health benefits deriving from the consumption of any alcoholic beverage, unless that statement is qualified, objective, sufficiently detailed and specific. Lastly the EU issued G/SPS/N/EEC/247 on

[15] TBT/N/EEC/19.
[16] TBT/N/EEC/158, TBT/Notif.00/423, TBT/N/ARG/93, TBT/NOTIF.97/317.
[17] G/TBT/Notif.99/89
[18] TBT/N/USA/509
[19] G/TBT/Notif.99.255, G/TBT/Notif.99.375.
[20] TBT/N/CHN/2
[21] G/SPS/N/ARG/140

1st September 2004, which sets the maximum limit for ochratoxin A in different foods, including wine.

[TABLE 4 ABOUT HERE]

3. Empirical framework

In order to quantify the impact of trade barriers on the world wine trade we augmented the standard gravity equation (Tinbergen, 1962) linking trade flows to economic masses and distances with tariffs, technical barriers, and sanitary and phytosanitary regulations. Scholars have reached a consensus on the proxies for economic masses, namely the countries' GDP, and distances, proxied by the physical distances (*cfr*. Head and Mayer, 2013). In our model, we refined the proxy for the exporter's economic mass Y by replacing GDP in country *i* with wine supply in country *i* in year *t*. A standard CES specification was adopted:

(1) $X_{ijt} = \mu Y_{it}^{\alpha} Y_{jt}^{\beta} D_{ij}^{*\delta}$

where Y_{it} represents the exporter's supply (namely the variable *Production* for country *i*) at time *t*, Y_{jt} stands for importer's GDP at time *t*, D_{ij} proxies geographical distance, and X_{ijt} stands for wine trade flows at time *t*. In analogy with previous studies (*cfr*. Jayasinghe *et al*., 2010), we modelled trade resistance induced by trade regulations including tariffs and non-tariff barriers by assuming a multiplicative form:

(2) $D_{ijt}^{*} = (1 + D_{ij})^{\delta_1}(1 + t_{jt})^{\delta_2}(1 + B_{jt})^{\delta_3}$

where D_{ij}^{*} proxies the "economic" distance, including physical distance and trade regulations, and $\delta_1, \delta_2, \delta_3$ replace the parameter δ of equation 1. D_{ij} represents the pair-wise geographical distance between *i* and *j*; t_j stands for the j-specific tariff; B_j collects j-specific non-tariff barriers (e.g. regulations on labelling, food standards, and so on). We expect a negative and statistically significant coefficient ($\frac{\partial X_{ij}}{\partial D_{ij}^{*}} < 0$), for the "economic" distance.

After log-linearization the gravity model becomes:

(3) $lnX_{ijt} = \mu + \alpha lnY_{it} + \beta lnY_{jt} + \delta_1 ln(1 + D_{ij}) + \delta_2 ln(1 + t_{jt}) + \delta_3 ln(1 + B_{jt}) + \varepsilon_{ij}$

where the additive error, ε_{ij}, is assumed to be identically and independently distributed.

In order to control for home bias effects[22] (Anderson and Van Wincoop, 2003), we introduced total wine supply in country *j* as explanatory covariate. Evidence of trade resistance due to home bias would be supported by a negative and statistically significant coefficient of the variable *Production* for country *j*. Moreover, we controlled for another covariate that has been widely adopted in analyses of trade flows: a common language dummy variable, assuming a value of one if country *i* and country *j* share the same official language. The resulting specification includes thirteen covariates and country-specific fixed effects (Table 5)[23]:

(4) $$lnX_{ijt} = \mu + \mu_i + \alpha_1\, lnY_{it} + \alpha_2\, lnProduction_{it} + \beta\, lnProduction_{jt} + \delta_1 ln(1 + D_{ij}) + \delta_2 ln(1 + t_{jt}) + \sum_{m=1}^{M} \delta_{3m}\, ln(1 + B_{jt}) + \lambda\, Language_{ij} + \varepsilon_{ij}$$

where B_{jt} stands for the TBT (label, food standards, conformity assessments, food containers, human health and packaging) and SPS measures of country *j* in year *t*.

[TABLE 5 ABOUT HERE]

Data in our model were collected from the Global Trade Atlas (GTA) database[24] for export values, the CEPII database[25] for distance, WTO, WITS[26], and from national customs offices for tariffs and non-tariff barriers as described in the previous section. Supply data were collected from StatOIV Extracts. Data on tariffs were obtained from the WTO official database. It reports the Most Favoured Nation (MFN) tariffs applied by importers: we computed the *Ad Valorem Equivalent*

[22] We considered "home bias" in the context of the wine trade as the resistance to importing foreign products due to the supply of national products.
[23] We tested for significance of time-varying fixed effects. Results were not affected, while time-varying fixed effects were statistically not significant.
[24] GTA database is based on official customs data collected from reporting countries. Products are classified at eight digit level according to the Harmonized System (HS) codes. Data are available for most countries since 1997.
[25] In the CEPII database the calculation is based on bilateral distance between cities, weighted by the share of the city in the overall population in the country.
[26] WITS (World Integrated Trade Solution) is a database provided by the World Bank. It provides the AVE tariffs for each country, starting from 1996.

(AVE) tariffs (*see appendix for further details*). For non-tariff barriers we considered the most widely adopted trade regulations (Maskus *et al.*, 2000): we included both technical regulations (TBT) and sanitary and phytosanitary measures (SPS). Information to model count variables on TBT and SPS were extracted from the "*Technical Barriers to Trade Information Management System*" database and the "*SPS Information Management System*" database, respectively.

Several econometric issues need to be considered for a correct estimation of the gravity equation. Firstly, Anderson and van Wincoop (2003) and Feenstra (2004) suggest that the standard gravity equation is incorrectly specified as it does not include the multilateral resistance terms. One of the suggested solutions to solve this problem is to include exporter and importer fixed effects in order to account for the multilateral resistance terms (Baier and Bergstrand, 2007; Subramanian and Wei, 2007). Fixed effects are able to eliminate problems arising from incorrect deflation of trade (Baldwin and Taglioni, 2006). Secondly, as has become widely recognized in recent years, the presence of zero flows and heteroskedasticity in the error term affect the gravity-type estimations (Silva and Tenreyro, 2006). In particular, least squares estimates tend to be biased by the presence of zero trade flows. Two naïve approaches consist of replacing zero trade flows with small numbers or dropping observations with zero flows. The former neglects the intrinsic information conveyed by zero trade flows; the latter discards an even larger proportion of information contained in the dataset. A further solution consists in estimating a Tobit model. However, there is a consensus on the necessity to model the presence of zero trade flows (Jayasinghe *et al*., 2010; Xiong and Beghin, 2012) to correct for bias: the larger the percentage zeros the larger the bias is likely to be. The Heckman (1979) specification can handle sample selection induced by zero flows. In our setting the limited portion of zero flows and the heteroskedasticity disfavour the adoption of the Heckman estimation. We followed the approach proposed by Silva and Tenreyro (2006) and widely supported in recent studies (Jayasinghe *et al*., 2010; Xiong and Beghin, 2012; Raimondi and Olper, 2011, among others). It consists of assuming an additive error in specification (1) and estimating the

model by a pseudo-Poisson Maximum Likelihood estimator (PPML), with the following set of first-order conditions:

(4) $\sum_{i=1}^{k}(X_k - \exp(Z_k\hat{\alpha})) = 0$

where $X_k$represents trade flows, Z_k is the full vector of explanatory covariates, $\exp(Z_k\hat{\alpha})$ is the expected value of $X_k$conditional on covariates (i.e. $E[X_k|Z_k]$). Wooldridge (2002, p. 676) argues that PPML Z_k is consistent if the conditional mean is correctly specified, that is if $E[X_k|Z_k] = \exp(Z_k\hat{\alpha})$ holds. The property applies regardless of the count data adopted.

4. Model results and discussion

The results for different estimation methods are reported in table 6. We considered four estimation alternatives. The first column reports OLS estimates in log form. By adding a constant to the dependent variable we could also estimate the model for observations with zero bilateral trade. The second column presents Tobit estimates, based on Eaton and Tamura (1994). The third and fourth columns report Heckman and PPML estimates, respectively. Country fixed effects are included to account for unobserved heterogeneity: they proxy average country-specific frictions in trading with other trading partners (Cardamome, 2011). Estimates with fixed effects are a valid tool to consider "multilateral resistance" (Baier and Bergstrand, 2007; Subramanian and Wei, 2007), and to eliminate problems arising from incorrect deflation of trade (Baldwin and Taglioni, 2006).

[TABLE 6 ABOUT HERE]

While OLS, Tobit and Heckman estimated coefficients are quite similar, most coefficients obtained with PPML differ significantly from those obtained with other models (exceptions are estimates on GDP and Language). This suggests that heteroskedasticity (rather than truncation) is responsible for the differences between PPML results and those of other models (Silva and Tenreyro, 2006).

P-values from the heteroskedasticity-robust RESET test (Ramsey, 1969) on OLS, Tobit and Heckman models fail to reject the null-hypothesis while we may reject the null-hypothesis of misspecifications for the PPML model. We conclude that PPML modelling has to be preferred[27]. Moreover it allows to deal with sample selection bias that may result from excluding zero

[27] A limitation of PPML, pointed by Martin and Pham (2008), is that estimates tend to underestimate coefficients relative to other estimators when they work with few zero-trade flows, while they overestimate when the number of zero-trade flows is substantial. In our analysis, the limited number of zero-trade flows implies that estimates might be slightly biased downwards.

observations. Although selection bias rarely affects the sign of the variable, it often influences the magnitude, statistical significance and economic interpretation of the marginal effects (Haq *et al.*, 2013). In the following, unless specified otherwise, we refer to the estimates from PPML.

Estimates on GDP and distance are statistically significant and have the expected signs: positive and negative respectively. The estimated elasticity for GDP is almost 1.5 in all specifications. This result is supported by Silva and Tenreyro (2006): they argue that the coefficients on importer's and exporter's GDPs should not be close to unity. The role of geographical distance is significantly larger under OLS and Heckman. The estimated elasticity is negative and close to 0.4, whereas the PPML estimate is much lower (-0.17). Compared to the literature on the gravity model (Disdier and Head, 2008), we found that physical distance has a limited impact on the wine trade. This result is not surprising since exported wine is highly priced and has long storage. Furthermore, variable costs account for a small share of total transport costs. In addition we have to consider that, as underlined by Silva and Tenreyro (2006), OLS estimation exaggerates the role of geographical proximity. We conclude that transport costs have a limited role in the determination of trade patterns. Our explanation for this result is that product differentiation plays an important role in the wine trade. Imported wines cannot be perfectly substituted therefore distant importers do not substitute imports from distant markets by trading with closer partners.

The results on wine supply deserve attention. The variable "Production" in country *i* (exporter) is statistically significant (at 5% level) and positive: it captures the stimulus of domestic supply on exports. On the contrary, "Production" in country *j* (importer) is negative and significant at 1% level: we conclude that trade resistance is due to home bias. The elasticity of the former variable (0.48) is twice that of the latter (-0.19). "Language" is statistically significant: its impact is large and positive (1.73). These results are well supported by previous studies (Disdier *et al.*, 2008, Grant and Boys, 2012; Kandilov and Grennes, 2012).

The coefficients on "Tariffs" are negative in all specifications. PPML estimates indicate an elasticity of trade to tariffs of -0.474: *ceteris paribus*, a 1% increase in tariffs would decrease trade by 0.47%.

Technical barriers are revealed as being strongly restrictive, and this result is in line with those of several authors (Heien and Sims, 2000; Olper and Raimondi, 2008; Liu and Yue, 2009). In particular we found that sanitary and phytosanitary measures do not inhibit trade, while technical barriers are relevant frictions to exports. As expected, coefficients on country-specific technical barriers, if statistically significant, are negative. The coefficients on "Food Containers" are statistically not significant. We argue that such a barrier is non-prohibitive. "Human Health" and "Conformity Assessment" are statistically significant, at 5% and 1% respectively. "Label" is also statistically significant (at 10%) and negative.

Barriers due to "Food Standard", despite being widely adopted, do not seem to be prohibitive: in all specifications coefficients are statistically not significant. Our interpretation for this result is that, while standards on wine are motivated by food safety arguments to protect consumers, modern techniques and innovations in the wine industry allow international standards to be easily satisfied.

The results on equivalent tariff (ET) for technical barriers are reported in table 7. The estimates represent the change in tariff that would be equivalent to the imposition of TBT[28]. Moreover, we evaluated the actual impact of both tariffs and non-tariff barriers on the world wine trade by computing the marginal effect of trade frictions and the actual impact on exports[29].

[TABLE 7 ABOUT HERE]

[FIGS. 2 and 3 ABOUT HERE]

[28] The formula for the equivalent tariff (ET) for the *b-th* TBT is as follows: $ET_b = \frac{E[\partial X/\partial B_b]}{E[\partial X/\partial t]}$.

[29] The formula is: $\sum_i \left(\frac{\partial E[X_i]}{\partial B_{bj}} \cdot B_{bj}\right)$.

The "Conformity Assessment" and "Human Health" are equivalent to 2.77 and 1.56 tariffs respectively. We conclude that the barriers are prohibitive given that the weighted average tariffs[30] in 2010 were close to 5.04. Being country-specific, these technical barriers tend to be very prohibitive as they raise the average transaction costs incurred by exporters.

The tariff equivalent for "Packaging", adopted only by the USA, is assessed as being close to unity. Some considerations deserve attention. Firstly, the USA system of protectionism is complex and includes a variety of technical barriers: the marginal contribution of each measure is relatively low. Moreover, the USA, the main world market, can exert market power in order to protect the growing domestic market (e.g. Californian supply). Figure 2 shows the dynamics of the total trade frictions per year, as composed by the two components, equivalent tariffs for technical barriers and AVE tariffs trade. It is worth noting that while AVE tariffs show a declining trend over the years, and equivalent tariffs an increasing trend, the total frictions pattern is quite steady and does not change significantly during the period 1997-2010 (weighting the measures according to actual trade flow). The result provides statistical and quantitative evidence of the real immutability of overall friction in the world wine trade. Moreover, Figure 3 breaks the total impact of the TBT down into the different and prohibitive components, providing a measure of the frictions in terms of real export values. While "Conformity Assessment" and "Human Health" TBT showed the greatest marginal impact on trade, they only have a potential and not a real impact on the trade given their low diffusion to date. On the contrary, notifications on "Labelling", since their diffusion, seem to represent the first non-tariff force slowing down world wine trade. The graph also shows that the impacts on trade of tariffs and technical barriers have been converging over the last decades: in 2010 the relative impacts of tariffs, regulations on labels and standards for packaging are equal.

[30] For computation we excluded intra-EU trade.

5. Conclusions

The expansion of the wine trade over the last decade is due to many factors. These include the Uruguay Round/WTO agreements, which have led to a progressive lowering of the import duties on agricultural products. As reported by Anderson and Golin (2004), various countries have attempted to maintain some level of protection of the domestic market by stipulating technical requisites that the imported products must satisfy. This new instrument has spread rapidly, as testified by the WTO notifications issued. The importance of the evaluation of its impact has been stressed more than once (*e.g.* Deardorff and Stern, 1997; Cipollina and Salvatici, 2008; Raimondi and Olper, 2011). This paper has verified how the principal wine importing countries are behaving, and in particular if there has been an effective implementation of the WTO Directive aimed at a progressive liberalization of trade. More specifically, using an extended version of the gravity model we studied the impacts of tariffs and non-tariff barriers. With our application, based on a panel dataset which captures more than two thirds of global trade from 1997 to 2010, we measured the impact of technical barriers and sanitary and phytosanitary measures. In order to focus on the economic aspects and avoid cumbersome notation, the econometric formulation was admittedly simple. Exploring the econometric issues in estimating gravity-type models is beyond the scope of this article. However, in order to consider the current advances in econometric estimation, we adopted different estimators, including the PPML suggested by Silva and Tenreyro (2006).

The study involved two innovations. Firstly, to our knowledge, it is a novel econometric approach to investigate the impacts of tariffs on the world wine trade. Secondly, using a modified gravity-type model to account for trade frictions, the equivalence of technical barriers and sanitary and phytosanitary measures with respect to tariffs has been obtained. This type of analysis is especially useful for identifying which regulations (more) efficiently achieve protectionist goals.

The econometric estimation of the gravity equation shows a negative impact on imports for most technical barriers. Moreover, our deeper analysis shows that in some cases TBT are not prohibitive. This is an important result, since this analysis on international trade barriers might justify the removal of inefficient technical standards on imported wine. This application also illustrates the danger of treating technical barriers as equivalent to tariffs aiming at restricting trade. In particular, our results show that trade costs do matter considerably in the world wine trade: tariffs have the largest impact, followed by the cost factor reflecting geographical distance. Regulations on SPS are the least relevant. Our findings are in line with previous studies on trade costs (Jayasinghe *et al*., 2010) and the wine trade (Raimondi and Olper, 2010). Jayasinghe *et al.* (2010) found that world demand for corn seeds is mainly inhibited by tariffs and distance, and only in a limited way by sanitary and phytosanitary measures. We found similar evidence in the world wine trade. Moreover, we show that the decreasing trend for tariffs has in most part been compensated by more stringent technical barriers. The overall result, foreseen by Anderson and Golin (2004) ten years ago, is that frictions in the world wine trade have not changed during the past fifteen years.

For policy-makers who are often interested in the impacts of standards and regulations on international trade and competitiveness, the current analysis provides clearly quantified results as measured by tariff equivalency. Rather than being limited to making broad statements about the impacts of technical barriers, policy-makers can negotiate bilateral reductions in trade frictions with a more precise idea of the expected gain in trade.

Our analysis is not exempt from potential improvements. Firstly, our dataset includes only trade observed among twelve countries during the period 1997-2010. Although we capture more than 90% of world wine exports and two thirds of global import flows, our results cannot explain trade dynamics between small traders. Indeed, our findings are worthwhile for the policy debate on trade liberalization in the world wine trade. Secondly, our comparison of the impacts on trade of tariffs and non-tariff barriers, challenged by the complex existing regulations on technical barriers – and

by challenges in its econometric modelling - might not be entirely satisfactory and invite further research. Empirical work on technical barriers in the world wine trade represents a promising area of research.

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Appendix - Data sources and methodology:

Tariff barriers

For the analysis of tariff barriers related to the exporting of products subject to code HS 220421, reference was made to the official WTO database, considering the MFN[31] tariff of the various importing countries for the period 1995-2010. The accuracy of the data was supported by a crosscheck with the duties reported in the WITS database, and with those of the respective national customs authorities, where possible. This procedure compensated for the initial lack of data on Chinese tariffs for 1998, 1999, 2000, 2009 and 2010, and made a clearer distinction on the basis of the HS code with 6 numbers for the European Union. No data interpolation was therefore necessary nor the use of "extreme" values to complete the dataset.

The MFN tariff was taken as base value indicative of the duty imposed by each importing country on all the other WTO members, but the various preferential agreements (FTA) already in force were also considered, as well as those instituted during the period considered. When there was a tariff deriving from an FTA for a given year and towards a given exporting country, this was substituted for the MFN. For the calculation of the tariffs deriving from preferential agreements reliance was initially placed on the WITS and WTO databases; yet, following a more thorough revision, it emerged that they were partially inaccurate, due to the lack of various preferential agreements, errors in the duties indicated and sometimes in the year they came into force. For this reason, the SICE portal[32] (Sistema de Informacion Sobre Comercio Exterior) was used for the analysis of all the official documents of the FTAs signed between the various countries, thus improving the information inserted in the dataset.

The tariffs were inserted in the dataset as *Ad Valuem Equivalent* (AVE) data, representative of the average import duty imposed on products subject to the code HS 220421. This operation overcame

[31] Most Favoured Nation

[32] http://www.sice.oas.org/agreements_s.asp

two methodological problems: on the one hand it was necessary to do an aggregation of the tariff profiles, in the case where the code HS6 included tariffs (HS8 or lower) with different duties. On the other, when the tariffs did not directly affect the value of the imported good, but were instead expressed as *Specific Tariffs*, a transformation into AVE data became necessary by means of the division of the duty by the value of the imported good.

The first step was therefore the transformation of all the specific tariffs into AVE data, at the level of codes HS6 or HS8 when present. The choice of the reference unit value of the imported good has been tackled in different ways in the past. The value of specific imports of the State in question is usually utilized for this operation, which has been shown to be entirely valid. It allows a qualitative distinction to be made of the imported goods, but it suffers from estimation errors and is often not significant where trade is limited.To overcome these problems Gibson (2001) proposed the use of the import world as reference. This provides more robust data but does not permit any qualitative distinction to be made of the imports. Bouet *et al*. (2008) further developed this methodology by proposing the use of the average importation value of a group of reference countries, i.e. a set of countries with similar characteristics. This approach is classified midway between the two previously described, and has been shown to be robust and able to partly take into account the qualitative differences. However, given that wine is a widely differentiated product, and that to minimize the estimation errors the dataset was constructed inserting the major exporters and importers, in this study it was preferred to utilize the value of specific imports of the State as reference.

The specific Tariffs were therefore transformed into AVE using the following methodology:

1) where the tariff was expressed on the basis of alcohol content (e.g. 10 €/%vol/hl), an alcohol content of 12% on volume was adopted, which can be considered an average value for the wine produced at world level, as suggested by the WHO;

2) where the tariff was a fixed sum on the volume imported (e.g. 1 €/L), the average importing price from each exporter country in the respective year was used as reference for the conversion;
3) where the tariff included a fixed sum on the volume to which a variable quota was added based on alcohol content (e.g. 1 €/L + 1 €/% vol/hl), the average price of specific imports per exporting country in the respective year was used as reference for the fixed sum, to which the variable quota was added calculated considering an alcohol content of 12%;
4) where the tariff included a percentage on the value plus a quota based on volume/alcohol content (e.g. 15% on the value + 1 €/L, or 15% on the value + 1 €/% vol/hl), this quota was transformed as indicated in points 1 and 2, and then added to the *ad valuem* tariff;
5) where the tariff included the lowest or highest level among the different possible options (e.g. 15% on the value or 125 yen/L), the two options were calculated with the methodology of the preceding points, then choosing the one indicated by the regulation in force;
6) where the importing country imposed a maximum and/or minimum limit to the tariff, the average tariff calculated by each exporter and each year was maintained if within the set limits, otherwise the set minimum/maximum limit was adopted as duty.

In response to the second methodological problem, i.e. aggregation of the different tariffs in code HS6, the different methodologies indicated include the simple average, weighted average and median. The simple average has been criticized because the tariffs have an irregular distribution (Cipollina and Salvatici, 2008), and it has no theoretical basis (Anderson and Neary, 2003; Bouet *et al*., 2008). The weighted average is instead valid but tends to underestimate the effect of high tariffs (Bouet *et al*., 2008), as high duties generally lead to a reduction in the quantities imported. The median is generally indicated as more robust and reliable, so was used for the aggregation of the tariffs in this paper.

The calculation method was used for each importing nation towards all the exporters and all years, to obtain a picture as clear and detailed as possible on the evolution of customs duty during the considered period. In order to obtain the maximum accuracy of the data the official values were used, expressed in the local currency of the different customs authorities, therefore without any conversion into US dollars.

Non- tariff barriers

In this study the non-tariff barriers that interact with the international trade in wine were identified through an analysis of all the TBT and SPS documents present in the WTO database.

The choice of these two classes, among the different types of obstacles to trade, derives from the fact that the technical barriers and sanitary and phytosanitary measures are the most utilized and important forms of non-tariff impediments (Maskus *et al*., 2000).

The TBT were obtained from the "*Technical Barriers to Trade Information Management System*" (*TBT IMS*), a public database created with the aim of guaranteeing transparency on technical regulations and evaluation procedures of the conformity and standards introduced by the member States. The database provides access to the various notifications introduced by the member States (including subsequent revisions, appendices, corrections, and supplements); to the bilateral and multilateral agreements between member States relating to the TBT measures, and to the documents issued by the standardization authorities in relation to the "*Code of Good Practice*".

To obtain the maximum level of detail all the documents issued were examined, in order to precisely identify those regarding wine and effectively a cause of impediment to trade. The period considered was from 1995, i.e. from the creation of the WTO, to the end of 2010. The breakdown of TBT into the different categories identified by the WTO was also maintained, which in the case of wine are: labelling, food security, packaging, conformity assessment, food containers and human health.

The sanitary and phytosanitary measures were traced consulting the "*SPS Information Management System*" (*SPS IMS*), containing information on the agreements signed within the SPS Agreement. The same period was considered as that for the technical barriers.

The TBT (6 classes) and SPS were inserted in the dataset as numeric variables, representing the total number of documents in force in the year t for the importing country i towards the exporting country j.

Fig 1 – Evolution of world wine exports (.000 hl), consumption (.000 hl) and exports/consumption (%)

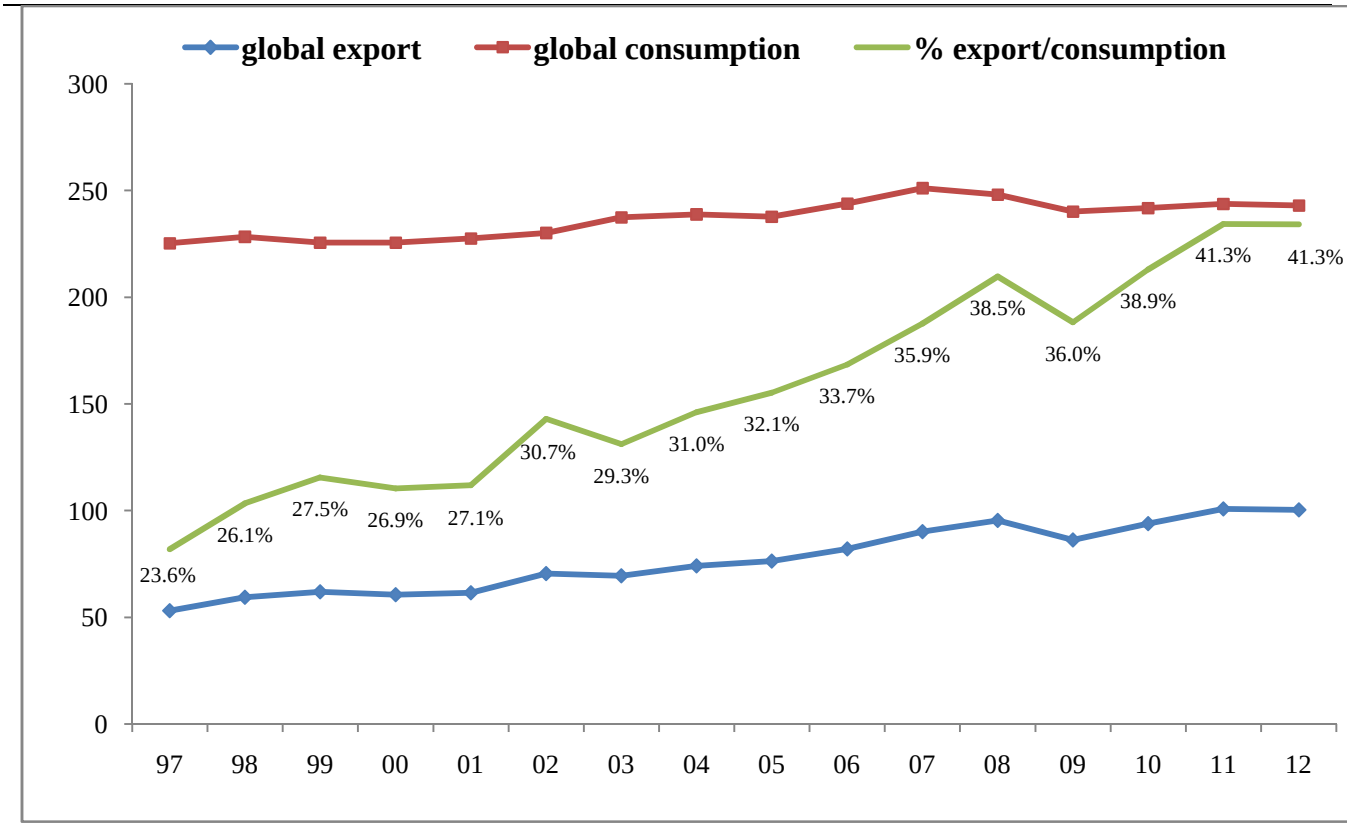

Fig 2. TBT tariff equivalents (simply and export weighted average values)

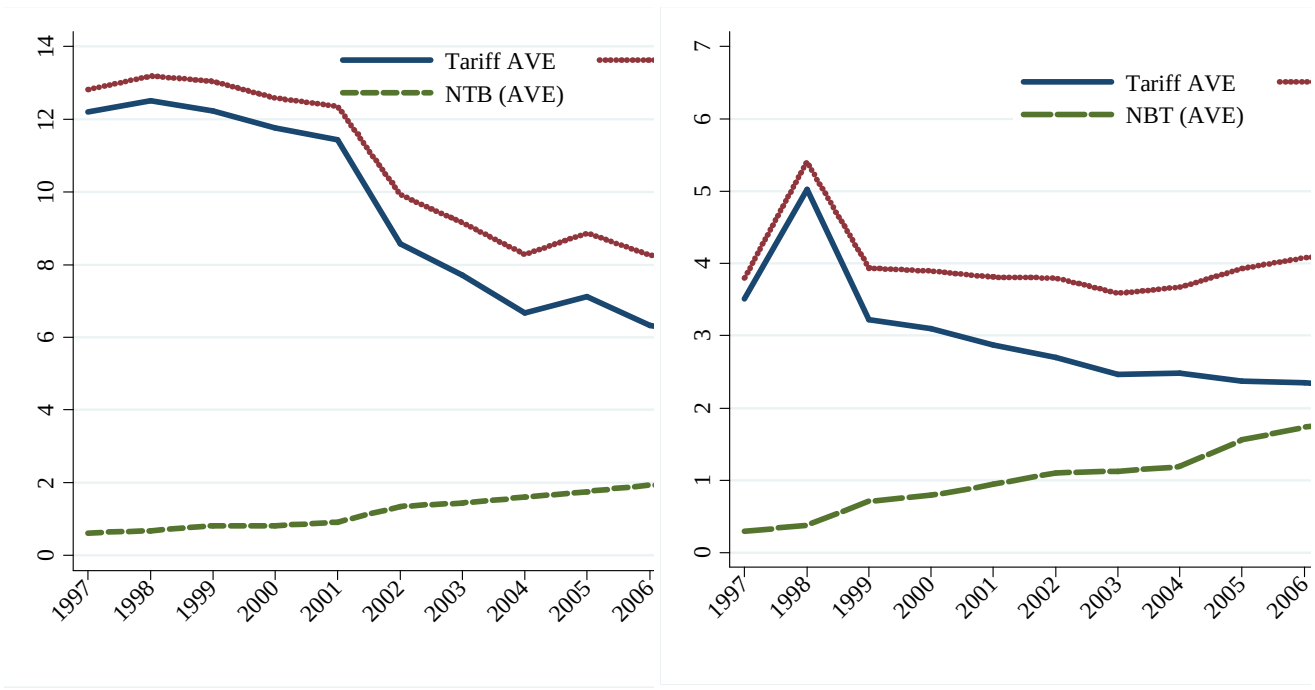

Fig 3. Evolution of relative impacts of tariffs and TBT on trade

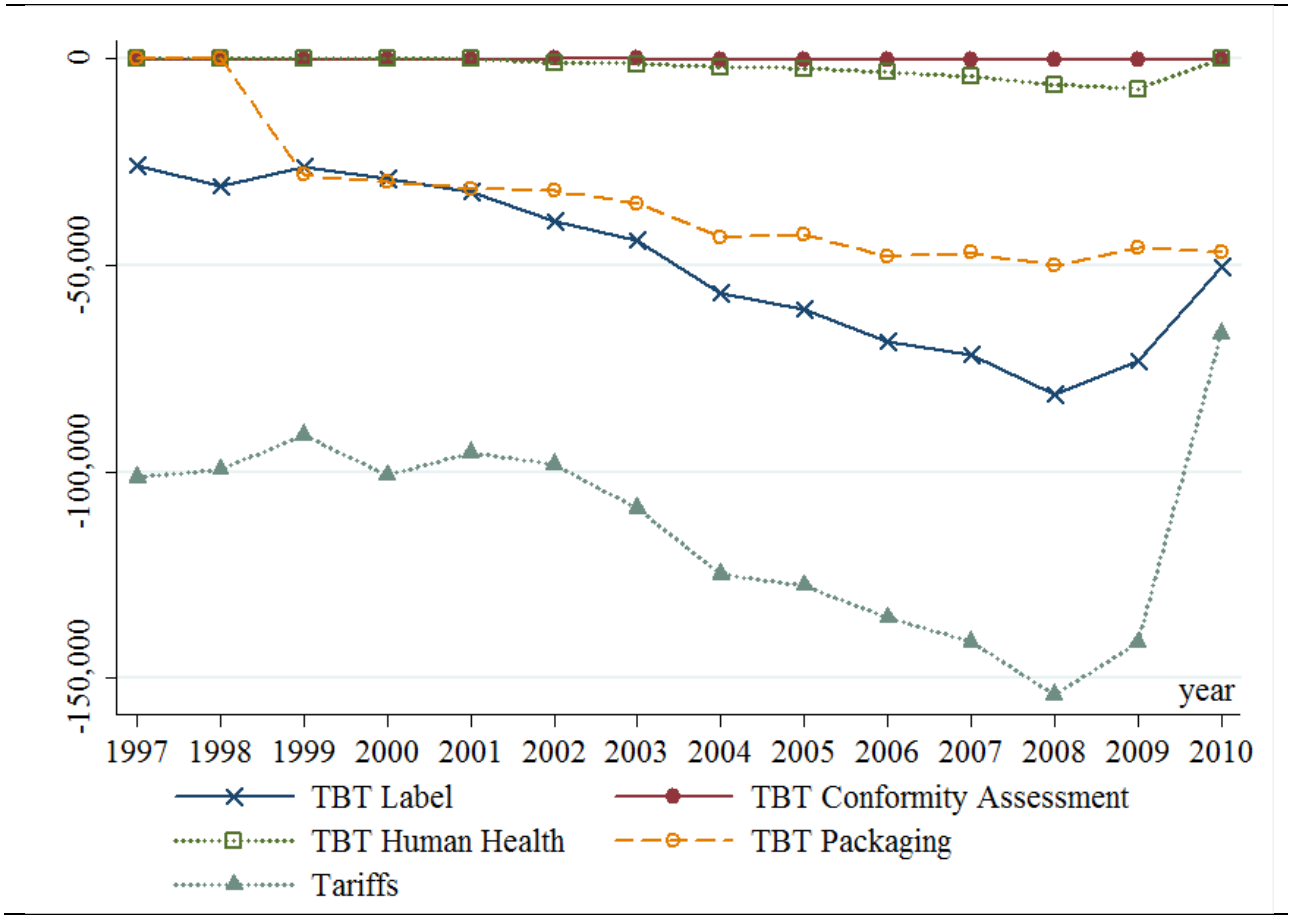

Table 1 - Structure of world wine trade concessions to main partner countries (1999 – 2010)

1999	Importer rank	Exporter rank	MFN Tariff (%)	FTA	Effective barrier [c] (%)
European Union [a]	1	1	4.12	0	4.12
United States [a]	2	4	1.46	1	1.46
Canada [a]	4	11	3.32	2	3.32
Japan [a]	3	17	21.55	0	21.55
China	22	13	65.00	0	65.00
Australia	14	2	5.00	0	5.00
Argentina	19	6	23.00	0	23.00
Chile	25	3	10.00	1	10.00
2010					
European Union [a]	1	1	5.95	1	5.87
United States [a]	2	4	1.27	3	1.14
Canada [a]	3	14	0.74	2	0.67
Japan [a]	5	20	20.60	1	19.37
China	7	13	14.00	1	13.60
Australia	10	2	5.00	2 [b]	4.77
Argentina	47	6	20.00	1	15.55
Chile	50	3	6.00	7	0.64

Sources: WTO, WITS, GTA, CBSA, Trade Statistics of Japan, EU Taric, Easy Comext, USITC.

[a] MFN tariffs includes AVE tariffs.
[b] Excluding the FTA with USA.
[c] Effective Protection, including FTA, for main partner countries.
Note: It is worth to note that the fifth exporter in 1999 has been South Africa, followed by Argentina and New Zeland. In 2010 the New Zeland has been fifth exporter, followed by Argentina and South Africa. We have considered Argentina that has been stably the sixth exporter. Moreover, Argentinean production is rapidly growing and is more and more export oriented, further reasons that make it an interesting case of study.

Table 2 - Structure of world wine trade tariffs to main preferential countries (1997 – 2010)

		1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
EU	**Chile**	*n.a.*	*n.a.*				MFN		5.4	2.3	1.1	0.0	0.0	0.0	0.0
	MFN	*n.a.*	*n.a.*	4.6	4.4	3.9	4.2	5.0	5.0	5.0	5.0	4.9	5.1	5.5	5.1
CAN	**Australia**	0.8	0.8	0.7	0.7	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.4	0.3
	Chile	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	USA	0.0	0.0	0.0	0.0	0.0	0,0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	MFN	1.0	0.9	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.5	0.4
JAP	**Chile**						MFN					13.8	14.0	11.5	11.5
	MFN	20.5	28.3	23.4	20.9	19.8	18.7	17.4	17.0	16.1	14.7	13.6	14.6	20.0	22.1
USA	**Chile**[33]					MFN				2.3	1.8	1.5	1.5	1.6	1.6
	Canada	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	MFN	2.3	1.9	1.6	1.7	1.5	1.5	1.4	1.4	1.4	1.3	1.3	1.2	1.4	1.5
AUS	**USA**					MFN				0.0	0.0	0.0	0.0	0.0	0.0
	Chile							MFN						0.0	0.0
	MFN	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
CHN	**Chile**						MFN					11.2	9.8	8.4	7.0
	MFN	65.0	65.0	65.0	65.0	65.0	34.4	24.2	14.0	14.0	14.0	14.0	14.0	14.0	14.0
ARG	**Chile**				MFN				15.4	14.4	0.0	0.0	0.0	0.0	0.0
	MFN	20.0	23.0	23.0	23.0	22.5	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
CHL	**USA**				MFN				0.0	0.0	0.0	0.0	0.0	0.0	0.0
	UE			MFN				5.0	4.0	3.0	2.0	1.0	0.0	0.0	0.0
	Cina					MFN					0.0	0.0	0.0	0.0	0.0
	Australia							MFN						0.0	0.0
	Japan						MFN						5.5	5.1	4.6
	Argentina					MFN					5.0	4.0	3.0	2.0	1.0
	MFN	11.0	11.0	10.0	9.0	8.0	7.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0

Sources: WTO, WITS, CBSA, Trade Statistics of Japan, Easy Comext, USITC, SICE.

Table 3 - Non-tariff barriers - 2010

	Total documents	TBTs	Wine TBTs						Wine-specific TBTs
			Food Standards	Labelling	Conformity Assessment	Packaging	Food Containers	Human health	
EU	715	544	3	7	-	-	-	-	8
USA	1262	811	-	12	-	1	1	-	3
Canada	695	463	-	2	-	-	-	-	0
Japan	622	488	2	1	-	-	-	-	1
Chile	249	225	2	2	-	-	-	-	0
Argentina	472	315	7	9	2	-	-	-	9
Australia	177	169	1	4	-	-	-	-	0
China	895	774	1	5	-	-	-	1	0

Source: WTO documents

Table 4 - SPS barriers - 2010

Country	Total SPSs	Wine-sector specific SPSs
Argentina	163	1
Australia	306	0
Canada	843	0
Chile	387	0
China	525	1
European Union	698	1
Japan	278	0
United States	3045	1

Source: WTO.

Table 5 – Definition of variables and descriptive statistics

Variable name		Mean	Std.dev
$Export_{ijt}$	The quantity wine traded from country i to country j in year t, expressed in million of dollars.	59.02	153.5
$Production_{it}$	The total supply (in millions of hectoliters) of wine in country i (or j) in year t	18.34	17.6
GDP_{jt}	The GDP (in billions of dollars) of country j in year t	2.48	3.1
$Distance_{ij}$	The distance between country i and country j in thousands of kilometers	8.88	5.0
$Language_{ij}$	The common language dummy variable for country i and country j	0.15	0.4
$Tariff_{jt}$	Wine-specific tariff protection (in percentage terms) of country j in year t	8.53	12.7
$TBT\text{-}Label_{jt}$	The dummy variable for regulations on labeling for country j in year t	2.37	2.8
$TBT\text{-}Food\ Standards_{it}$	The dummy variable for regulations on food standards for country j in year t	0.93	1.4
TBT-Conformity Assessment $_{jt}$	The dummy variable for regulations on conformity assessments for country j in year t	0.17	0.6
$TBT\text{-}Food\ Containers_{jt}$	The dummy variable for regulations on food containers for country j in year t	0.01	0.1
$TBT\text{-}Human\ Health_{it}$	The dummy variable for regulations on human health for country j in year t	0.05	0.2
$TBT\text{-}Packaging_{jt}$	The dummy variable for regulations on packaging for country j in year t	0.07	0.2
SPS_{jt}	The dummy variable for sanitary and phytosanitary measures for country j in year t	0.33	0.5

The statistics are computed from a pooled sample of twelve countries and fourteen years.

Table 6 –Trade barriers in world wine trade

Variable	OLS	Tobit	Heckman	PPML
$Production_i$	0.428**	0.345	0.323	0.481**
$Production_i$	-0.313***	-0.307***	-0.317***	-0.199***
GDP_i	1.306***	1.458***	1.544***	1.382***
$Distance_{ii}$	-0.372***	-0.427***	-0.433***	-0.120**
Language	1.091***	1.310***	1.432***	1.733***
$Tariff_i$	-0.224***	-0.219***	-0.235***	-0.474***
$TBT\text{-}Label_i$	-0.107	0.007	0.007	-0.173*
$TBT\text{-}Food\ Standards_j$	-0.067	-0.148	-0.136	0.214
TBT-Conformity Assessment $_i$	-0.267*	-0.668***	-0.687**	-1.314***
$TBT\text{-}Food\ Containers_j$	-0.095	-0.211	-0.239	-0.042
$TBT\text{-}Human\ Health_j$	-0.122	-0.162	-0.107	-0.740**
$TBT\text{-}Packaging_j$	0.462	-0.075	-0.131	-0.451*
SPS_j	-0.208	-0.265**	-0.279	-0.194

Specifications are in logarithmic form. For OLS and Tobit dependent variables we add an arbitrary small constant.

, ** and * denote 10, 5 and 1 per cent significance level, respectively.*

Tab 7 - Non-tariff barriers in tariff-equivalent terms

Non Tariff Barriers	Equivalent tariff[a]
Prohibitive	
TBT-Conformity Assessment	2.77
TBT-Human Health	1.56
TBT-Packaging	0.95
TBT-Label	0.36
Non-prohibitive	
TBT-Food Standards	*n.a.*[b]
TBT-Food Containers	*n.a.*[b]
SPS	*n.a.*[b]

[a] Equivalent tariff: $ET = \frac{E[\Delta X/\Delta B]}{E[\Delta X/\Delta t]}$. The estimate represent the change in tariff that would be equivalent to the imposition of the TBT.

[b] Estimates for TBT food standard, TBT Food Containers and SPS are statistical not different from zero.

Further tables

Table A1 – Estimates monetary and non-monetary trade frictions for main world importers.

	Import value (2010) Bottled wine - mln $	Import value (Δ%)	**(1)** MFN tariffs (ΔAVE)	**(2)** Non-tariff barriers (ΔAVE)	**(1) + (2)** [a] Total frictions (ΔAVE)
Net importers					
Canada	1,515	246.1%	-2,07	0,73	-1,34
China	657	9717.6%	-51,40	3,38	-48,02
Germany	1,814	33.7%	0,17	0,17	0,34
Japan	779	16.3%	-0,37	0,36	-0,01
United Kingdom	3,228	34.7%	0,38	0,72	1,10
United States	3,447	122.1%	-0,97	4,23	3,26

Change in tariffs and TBT tariff-equivalent refer to main partner countries (1997-2010)
[a] Total wine import frictions from Estimates for TBT food standard and SPS are statistical not different from zero.

Table A2 - Estimates monetary and non-monetary trade frictions for main world exporters.

	Export value (2010) Bottled wine - mln $	Export value (Δ%)	**(1)** MFN tariffs (Δ%)	**(2)** Non-tariff barriers (Δ%)	**(1) + (2)** Total frictions (Δ%)
Net exporters					
Argentina	667	500.1%	-4,45	3,28	-1,17
Australia	1,570	116.5%	-0,22	1,09	0,87
Chile	1,282	188.9%	-9,57	0,73	-8,84
France	5,268	44.7%	0,19	0,40	0,59
Italy	4,127	126.6%	0,14	0,23	0,36
Spain	1,614	101.2%	-0,62	0,24	-0,38

Change in tariffs and TBT tariff-equivalent refer to main partner countries (1997-2010)