Tariff Reduction and Its Effects on the International Wine Trade: A Gravity Model Approach

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Abstract

This paper examines an extent to which import tariff reductions through bilateral free trade agreements (FTA) are attributable to an increase in wine exports to East Asian countries. Our empirical method involves estimating an augmented-version of gravity equation with a panel dataset for 1990-2016 covering 28 exporters and Asian main three importers. We find that a 1 percentage point tariff reduction leads to 0.053 % increase in annual wine exports for bottled wine and 0.082% increase for bulk wine exports. This implies that tariff reductions through FTAs have significant positive effects on wine exports than MFN tariff reductions. Non-tariff measures also have negative significant effects on wine exports for sparkling and bottled wines. The results suggest that export growth induced by only tariff reductions through FTAs could account for 1.325％ of global wine export growth during 1990-2016.

Keywords; Tariff reduction, wine, international trade, non-tariff barriers, gravity equation, Poisson pseudo-maximum likelihood estimator.

JEL classification: F14, F69, L66

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1. Introduction

This paper examines the impacts of import tariff reduction on wine in East Asian countries focusing on recent free trade agreements (FTAs). Since the 1990s, bilateral FTAs have spread dramatically across the globe. International trade in wine has been boosted by increasing demand mainly in Asian countries, which until recently were only marginally involved in wine imports (Mariani, Pomarici and Botatto, 2012). Over the past 15 years, wine consumption in Asia and the Pacific Islands has increased 6.3% while that of western European wine net exporters has declined more than 14% (**Table 1**). The wine imports in Asia and the Pacific Islands showed a 7.7% increase, the biggest growth of all regions examined. Wine imports in western European net wine importers declined 20.4% over the same period. In terms of both consumption and imports, China, Japan and Korea are the three leading countries in Asia and The Pacific Islands as shown in Table 1. These countries are set to change global markets for wine dramatically.

The rapid growth of trade in wine is analysed in related literature. However, the rapid growth in wine imports in East Asian countries is not fully examined yet in terms of trade in wine, demand for wine nor tariffs. This paper empirically investigates the relationship between import tariff reductions and wine imports in East Asian countries. It then evaluates the impacts of East Asian countries' bilateral FTAs with wine exporting countries as it is believed that wine exporting countries gain greatly from FTAs. Wine tariffs in those countries have been changed significantly after the WTO Doha Round of multilateral trade negotiations in 2004, while wine tariffs in China underwent a sharp decrease when China joined the WTO in 2001.

Literature on tariff and non-tariff barriers to trade in wine is still quite limited, compared with the importance of the topic (Mariani et al., 2014). The world's wine sector is becoming increasingly competitive and oriented forward exporting, as almost half of the world's wine production is from the Old World (such as France, Italy and Spain), while countries in the New World (such as USA, Australia and Chile) have increased their wine

production and exports. On the demand side, global trade in wine has increased due to rising demand mainly in Asian countries. Analysing and understanding Asia's relatively new import markets, market access and trade barriers can benefit the growing global trade in wine. There is, however, limited literature that examines tariffs, non-tariff barriers and FTAs related to trade in wine that mainly examines Asian countries.

Our results are summarized as follows: First, tariff reductions throughout FTAs are attributable to an increase of wine, especially bottled wine. 1% tariff reduction after FTAs have significantly led 0.053% increase in annual wine exports while the effects of MFN tariff reductions are not significant based on the result by PPML. Second, NTMs are also significant and negatively affecting wine export. Significant impacts were not observed for sparkling and vermouth wines partially due to small amount of trade and consumption patterns in the Asian countries.

The rest of the article is organized as follows: We review the related literature examining trade in wine, bilateral FTA, East Asian regions' wine market in Section 2. Section 3 presents the data including country-specific tariffs and empirical model then empirical results are detailed in Section 4. Finally, we offer conclusions in Section 5.

Table 1 about here

2. Related literature

Although international trade in wine has been boosted recently by increasing demand in Asian countries, there are not so many related literature on Asian trade in wine nor the effects of tariff reduction on trade in wine. First, in next subsection, we discuss the long-run trends and import features, particularly focusing on China, Japan and Korea. Then FTAs and tariff rates, both preferential and MFN (most favored nation status) tariff rates for those three countries are explained. Since extensive empirical research has been carried out recently in terms of impacts

of bilateral FTAs on trade, related literature on the relationship between FTAs and trade for not only wine also agricultural products are also surveyed.

2.1 East Asia in global wine market

Some Asian countries are examined in related literature as recent growing wine importing countries (Bianco et al. (2016), Anderson and Wittwer (2015), Mariani et al. (2014), Bargain et al. (2018)). To our knowledge, there are few literature focuses on wine importing countries in the East Asia in spite of dramatically growing imports (see **Table 1** and **Figure 1**). Anderson and Wittwer (2015) explains Asia's wine production, consumption and trade then projects the world's wine market uses GEMPACK model. They find high growth both in per capita and total wine consumption in Asian countries and that China is a dominant force in their projections. Yoon and Lam (2012) suggests that aggressive industry lobbying was the main driving force behind the abolition of wine tariff in 2008 in Hong Kong. In the current paper, we examine the effects of wine tariffs' reductions on wine imports in East Asian Countries.

Bianco et al. (2016) where China and Japan included empirically investigates the impact of trade barriers on the world trade in wine focusing on trade costs impeding exports using gravity model. Bianco et al. (2016) identifies which regulations can adversely affect trade and that decreasing trend for tariffs has been compensated by more technical barriers and frictions in the world wine market have not changed over time. Mariani et al. (2014) contributes to the understanding of the complexities of international trade in wine using 83 countries. Quantitatively analysing trade flows, Mariani et al. (2014) finds that good competitive performance of EU can be explained by an increasing marketing efforts although France experienced a steady erosion of its market share, Italy saw a weakening of its market share. Growth of bulk wine trade is one of the characterising features explained in Mariani et al. (2014).

In East Asian countries, a zero tariff or lower tariff have been applied to some wine exporting countries since signing of FTAs. Even though import tariff has still not been completely lifted, exports of wine from some countries have increased markedly since the signing of a FTA. Effects of tariff reduction and FTA agreements on trade in wine seem to vary across in East Asian countries, however there is limited research on tariff reduction and its effects on world trade in wine. Australian Government Department of Agriculture, Fisheries and Forestry (2012) conducts economic analysis of import tariffs in the wine markets of China and Korea. In terms of Australian wine export to those markets, Australian Government Department of Agriculture, Fisheries and Forestry (2012) estimates of the benefits of a FTA with China and Korea and expects huge increase of Australian wine export to those markets if applied tariffs on wine are reduced to zero. Iijima (2018) qualitatively explains the details of the EU-Japan FTA focusing on liquor products. Applying the triple DID method for estimating trade between mainland China and Hong Kong, Zhou (2017) finds that there is no trade creation effect for domestic exports because it is re-exports and imports. Wine is not mentioned in Zhou (2017) but Anderson and Harada (2018) points out that certain amount of wine re-exports to China from Hong Kong and Macao are unrecorded and this smuggling issues is more likely to occur, the greater the difference between those territories' wine taxes.

Rapidly increasing wine consumption in China is analysed in Lee, Huang,Rozelle and Sumner (2009). Using Chinese wine market retailer data, imported wines in the market are analysed and Lee, Huang,Rozelle and Sumner (2009) finds that 21% of total wine shelf space is on average allocated to foreign wines and that most of supermarket shelf are allocated for red wine. Anderson and Harada (2018) explains that wine statistics in Northeast Asia are exaggerated due to labelling issue, double-counting issue, and smuggling issue and calculates alternative estimates of wine market statistics.

There are some characteristics in the wine markets in East Asian countries. In northeast countries including China, Korea and Japan, price of imported wine including insurance and freight charges is subject to not only tariffs but also other taxes depending on

country. Other taxes are not taken in consideration in the paper however it is important to clarify these taxes as they are indirectly related to the demand for wine.

A value-added tax and an ad valorem consumption tax are imposed on imported wine price in China. There is a value-added tax of 17% and a consumption tax of 10%. The total duty collected in Korea is liquor tax, an education tax and a value-added tax and that of Japan is a liquor tax and a consumption tax. A Liquor tax of 30%, an education tax of 10% and an value-added tax of 10% are imposed on wine in Korea. For the case of Japan, a liquor tax is collected / and the amount is / per kiloliter. There is a consumption tax of 8% in Japan as well.

Before China has joined WTO in 2001, the tariff on bottled wine was 150% in 1994 then became 65 % in 2001, 34.4 % in 2002, 24.2 % in 2003, its MFN (most favored nation status) rate has been 14% since 2004. A zero tariff rate has been applied to some wine exporting countries and wine tariffs for other countries are getting lower since signing of a FTA (The list of FTAs and tariff reductions of major wine exporting countries are in **Tables 2 and 3** respectively). Wine is generally heavily taxed in China where the ad valorem import tariff, the value-added tax and the ad valorem consumption tax are imposed on the price of imported wine, including insurance and freight charges. The MFN rate is 14% for bottled wine and 20% for bulk wine, while a value-added tax of 17% and a consumption tax of 10%.

A large amount of liquor is produced locally in Korea, whereas most wine sold is imported. Its MFN for bottled wine is 15% since 1997, however the tax rates applied to wine sold in Korea are numerous and heavy. These are a liquor tax, an education tax and a value-added tax and 30%, 10% and 10% respectively. An additional charge of between 7 and 8% might be applied to a bottle of imported wine due to various fees associated with customs clearance (Australian Government Department of Agriculture, Fisheries and Forestry (2012)).

While Korean liquor tax is imposed on a retail price, Japanese liquor tax is applied at the timing of shipments. Liquor tax rate on wine is 80,000 yen per kiloliter, which is 60yen per

750ml bottle. In addition to the liquor tax, a consumption tax of 8% is applied.[3] Tariff on wine bottles imported by Japan depends on its import price as Japan imposes tariff levied by choosing either an ad valorem tariff or a specific tariff. For a bottle of wine, lower tax rate of 15% or 132 yen per liter. That means, tariff rate on bottled wine is 15% or 125 yen per 750ml bottle, whichever is less with a minimum of 67 yen per liter. Tariff rates on sparkling wine, bulk wine and vermouth are specific tariffs and they are 182 yen per liter, 45 yen per liter and 69.3 yen per liter.

Figure 1 about here

Tables 2 and 3 about here

2.2 Related literature on trade in wine

Bianco et al. (2016) empirically investigates the impact of trade barriers on trade in wine focusing on trade costs impeding exports and finds a decreasing trend for tariffs has been compensated by more technical barriers. Castillo et al. (2016) analyse changes that have occurred in the global wine export dynamics. They find that exporting and importing countries' GDP have positively related to trade in wine and that an increase in income stimulates production and exports (imports). Mariani, Pomarici and Botatto (2012) finds that France and Italy experienced a steady erosion of its market share and showed that growth of bulk wine trade is one of the characterising features in recent wine trade. Anderson and Wittwer (2015) draws on a model of global wine markets to project developments in Asia. A new path of trade liberalization process and trade barriers are discussed in Mariani et al (2014). They say compared with the importance of the topic, literature on tariff and non-tariff barriers to trade in wine is still quite limited.

[3] Consumption tax rate is scheduled to be 10% from 8% in October 2019.

Heien and Sims (2000) analyses the impact of the Canada-United States Free Trade Agreement (CUSFTA) on wine exports to Canada by decomposing the effects into a couple of reasons such as tariff removal effects, removal of nontariff trade barriers and exchange rate effects. Sumner et al. (2001) conducts economic survey of the wine industry in the United States and Canada and discusses importance of export. Kashiha, Depken and Thill (2017) examines shipment of wine from European countries. They model the choice of European wine shippers as to what port to use when shipping wine to the United States. Using conditional logit, it is found that distance and crossing national borders are important influences on port choice. Mariani et al. (2014) analyses trade barriers, tariff and non-tariff barriers, affecting trade in wine and quantitatively finds that reducing trade barriers are highly desirable for more wine flows. Bargain et al. (2018) discusses key comparative advantages of wine-producing countries, using Porter's diamond, and reports results from a survey. Demand and market structures are found as key wine trade determinants for the future.

2.3 Related literature on agricultural product trade

Wines can be supported by agricultural policy in many countries. EU policy was designed to provide support measures, including promotion activities outside EU to strengthen competitiveness (Mariani et al. (2014). Issues on agricultural products are whether FTAs can play a positive role in strengthening food security, whether FTAs may contribute to reduce trade distortions and could increase food trade among countries, and so on. Food security is that people have access to sufficient and safe food and this is not so related to wine, however, related literature on the relationship between FTAs and agricultural product trade as agricultural policy where wine is included are addressed here.

Baier and Bergstrand (2007) explains that an FTA approximately doubles two member's bilateral trade after 10 years and the effect of an FTA is likely to differ depending upon the agreement itself. The effect of the North American Free Trade Agreement (NAFTA), its predecessor CUSFTA, is examined in Ghazalian (2017) where empirically examines the

implications of the agreement for agricultural trade flows at disaggregated levels. With the gravity model using the Poisson pseudo-maximum likelihood (PPML) estimator, Ghazalian (2017) finds considerable differences across agricultural product categories. PPML estimation is used in many literature as it is preferred to OLS and the estimated impacts of FTAs are different if zero trade observations are considered. Heien and Sims (2000) analysing the effect of CUSFTA specifies that of wine trade and see some differences among trade in wine. Bottled wine exports were substantially increased while unit value of bulk wines dropped on a large increase in volume.

Jean and Bureau (2016) evaluates the impact on trade of regional FTAs using panel data at disaggregated product level and suggests that FTAs have increased partners' bilateral agricultural and food exports by 30-40% on average by counterfactural simulations. Jean and Bureau (2016) also finds non-tariff provisions have no measurable trade impact. While Grant (2013) concludes FTAs increase members' trade by as much as 150%, it is said that previous empirical work likely misrepresents the impact of agreements because of considerable heterogeneity in the depth of economic integration. The implication of Grant (2013) is that moving beyond shallow and moderate integration generates sizeable trade flow gain. Grant and Boys (2012) questioned the contributions of the enormous FTAs in strengthening food trade and investigates whether FTAs have increased food trade. Their empirical results suggest that multilateral institutions such as WTO have delivered significant positive impacts on trade but not on food but regional FTAs have are found to have increased food trade. Similar conclusions are obtained in Mujahid and Kalkuhl (2016). Sun and Reed (2010) evaluates agricultural thade creation and diversion effects using PPML and found that some FTAs have generated large increases in agricultural trade among members.

3. Data and Model

As discussed in the introduction, this paper attempts to quantify the impact of tariff reductions through FTAs on wine exports to East Asian countries. The approach is to estimate the Gravity model as discussed in next subsection.

3.1 Model specification

This subsection discusses the estimation model followed by a discussion of the variables' construction and estimation method. As employed by related literature, the estimation of the determinants of wine trade employs the following gravity equational functional specification:

$$\begin{aligned}\ln WIM_{ijt} = {} & \alpha + \beta_1 \ln GDP_{it} + \beta_2 \ln GDP_{jt} + \beta_3 \ln DIS_j + \beta_4 \ln WCP_{it} + \beta_5 \ln WPV_{jt} \\ & + \beta_6 \ln RER_{it} + \beta_7 \left[FTA_{ijt} \times \left(1 + PTR_{ijt}\right)\right] \\ & + \beta_8 \left[\left(1 - FTA_{ijt}\right) \times \left(1 + MFN_{it}\right)\right] + \beta_9 NTM\_1_{it} + \beta_{10} NTM\_2_{ijt} \\ & + \varepsilon_{ijt} \qquad (1)\end{aligned}$$

where subscript *i* stands for importers: China, Korea and Japan, *j* stands for exporting countries: *j* = 1,…28 and *t* stands for the year: *t* = 1990, 1991,…, 2016, 2017. Ln before the variables is a natural logarithm. ε is an error terms. We estimate an equation (1) by sparkling, bottled, and bulk wines, separately.

The quantity of wine imports are measured in liter. The importers/exporters' real gross domestic product (*GDP*) and distance (*DIS*) are included as measures of economic mass and trade costs, respectively. In addition to these gravity variables, three other control variables are included. Wine consumption per capita (*WCP*) captures the preference for wine in the importing countries. Wine production volume per vine (*WPV*) is added as a measure of the productivity level of the exporting countries. The control for the real exchange rate (*RER*) matters because changes in exchange rate cause changes in the relative price between importing and exporting countries.

Our interest is to estimate an extent to which tariff reductions through FTAs increased wine imports. The key empirical issue is to disentangle the effects of preferential tariff reductions through FTAs from those of MFN tariff reductions. The MFN tariff rates on wine had declined over time in China, Korea and Japan. Table 3 shows that the decline in China's MFN tariff rate is noticeable: MFN rate was 150% in 1992, and dropped to 70% in 1996, 34%

in 2002, finally 14% in 2004 (constant afterward). To address this issue, we include $\left[FTA_{ijt} \times \left(1 + PTR_{ijt}\right)\right]$ and $\left[\left(1 - FTA_{ijt}\right) \times (1 + MFN_{it})\right]$ into equation (1).

FTA is a time-variant dummy variable indicating if a FTA is in force between importing and exporting countries. *PTR* is time-variant preferential tariff rates on wine applicable to an exporting country under a FTA. *MFN* is time-variant MFN tariff rate on wine applied to all non-FTA exporting counties. Thus, β_7 captures an average increase in wine imports by one percentage point decrease in the FTA preferential tariff rates, whereas β_8 is interpreted as an average increase in wine imports by one percentage point decrease in the MFN tariff rates.

Non-tariff measures (NTMs) generally tend to be introduced and increased, as tariffs on goods and services decline through FTAs. This suggests that the failure to control for the influence of non-tariff measures could cause β_7 to be overestimated. To avoid this, we include two variables into equation (1). *NTM_1* is a time-variant dummy variable indicating if an importer imposes any requirements notified to WTO among antidumping, countervailing, quantitative restrictions, safeguards, sanitary and phytosanitary, special safeguards, technical barriers to trade, tariff-rate quotas, and export subsidies. *NTM_2* is a time-variant dummy variable indicating if an importer was claimed by an exporter to the WTO for any non-tariff barriers listed above.[4]

The Poisson pseudo-maximum-likelihood (PPML) technique is employed in this study. Estimating equation (1) by ordinary least squares (OLSs) might result in inconsistent estimates for two reasons (Silva and Tenreyro, 2006). First is the strong assumption that the expected value of the error term is independent from any values of explanatory variables. Violation of this assumption leads to inconsistency of the OLS estimator. Second, the parameters estimated by OLS might be biased under heterosckedasticity. In order to tackle these problems, Silva and Tenreyro (2006) propose the PPML technique as an alternative. They use a multiplicative form of the constant-elasticity model and demonstrate that PPML estimates

[4] The data is available only after 2009 from WTO Integrated Trade Intelligence Portal.

are less susceptible to bias. One of the useful properties of the PPML estimator is a wide range of applicability including panel data analysis (Wooldridge, 1999).

3.2 Variable construction and data

An extent to which import tariff reductions through FTAs are attributable to an increase in the world wine exports are examined in this paper. Our empirical method involves estimating an augmented-version of gravity equation with a panel dataset for 1990-2016 covering 28 major exporters and three importers in East Asian countries; Algeria, Argentina, Australia, Austria, Brazil, Canada, Chile, France, Germany, Greece, Hungary, India, Italy, Mexico, Morocco, New Zealand, Portugal, Russian Federation, South Africa, Spain, Switzerland, Tunisia, Turkey, United Kingdom, United States and Uruguay as exporters and China, Korea and Japan as importers as they in the most growing wine importing countries in Asian countries. Literature on trade in wine, demand for wine and taxes on wine for the most growing wine importing area in Asia is quite limited as explained in the previous section. As all FTAs in which the three countries are involved have been signed in 2000s, the military dictatorship of Chile ended and democratic government took power in 1990, our analysis starts from 1990 in order to focus on how a FTA has impacted on exporting countries as it is believed that wine exporting countries gain greatly from FTAs.

Our coverage of 28 countries can explain more than 90% of world trade in wine. The selection of the countries is based on data availability of several sources. Anderson, Nelgen and Pinilla (2017), in where data on 47 countries and sub-totals for 8 regions in global wine markets are available, provides data on grape vine area, yield and production, consumption on wine, beer and spirits, shares of off-trade in total wine consumption[5], and macro economy data such as population and GDP data. Our wine data is downloaded from the UN Commodity Trade

[5] Off-trade refers to wine purchased and consumed off the premises. Sales from retail outlets including grocery and liquor outlets are included but not from restaurants, hotels, bars and pubs.

Statistics database (COMTRADE) for bilateral imported quantity. Their HS codes are 220410, 220421, 220429, 220510 and 220590 (See **Table 4** for HS codes for alcohol). COMTRADE includes Taiwan in other Asian countries and data on the country itself is not available. Tariff data is obtained from World Integrated Trade Solution (WITS) where data on Singapore, Malaysia and the Philippines is not provided. Variables used in the analysis are explained in **Additional Table** at the end of the paper**.**

Table 4 about here

One of the three importers, Japan, applies complex tariffs on imported wine, while other two countries impose ad valorem tariff. Import tariffs are per unit of wine for China and Korea, which is typical tariff on wine. Japan applies either the lower of a 15 percent ad valorem tariff or 125 Japanese yen per liter duty, with a minimum duty of 67 yen. That means tariffs vary with the price and alcohol content of each beverage. We additionally downloaded imported wine quantity and value for each country from the Ministry of Finance Trade Statistics Database in order to calculate average ad valorem equivalent rate.[6] [7] [footnote 5 check].

COMTRADE distinguishes sparkling wine (HS Code 220410), still wine in bottles of less than 2 liters (HS Code 220421) and bulk wine as other still wine (HS Code 220429).

[6] We first calculated average import price in order to distinguish which tariffs, either a 15 percent ad valorem tariff or 125 Japanese yen per liter duty has applied for each exporter, then chose either of them and tariffs are converted into ad valorem equivalent. However, tariff rates varied incredibly each year for an exporter. Our ad valorem equivalent tariffs are based on the total quantity, with dividing total imported value by total imported quantity. Ministry of Finance data is used for calculating ad valorem equivalent tariff in order to avoid the effects of the exchange rate.

[7] Specific tariffs based on volume are the most popular in Europe and North America, whereas ad valorem tariffs are used in the Asia-Pacific regions, with the exception of Japan and Malaysia (Anderson, 2010).

Additionally vermouth in bottles of less than 2 liters (HS Code 220510) and bulk vermouth as other (HS Code 220590). Tariffs imposed on bottled wine is shown for both tariffs after reaching FTA agreements and MFN tariffs. For the case of Japan, only ad valorem tax is shown, although under the World Trade Organization (WTO) MFN treatment, Japan applies either the lower of a 15 percent ad valorem tariff or 125 yen per liter duty to wine.

Non-tariff barriers refer to the wide range of interventions other than tariffs that are lows, regulations, policies or practices that restrict trade.

Korean tariffs are simple and wine exporters having signed a FTA with Korea enjoy zero tariff however it applies complicated tax system on wine. Liquor tax on wine is 30 percent, education tax is 10 percent, which is imposed on the sum of import tariff and liquor tax included, and 10 per cent of value added tax is imposed on the subtotal. Additional cost of about 8 percent of CIF price occurs for handling fees for customs clearance. Chinese MFN has declined dramatically from 150 percent in 1992 to 14 percent in 2017. Current MFN is 14 percent for bottled wine however retail price is generally higher than CIF price as consumption tax of 10 percent and value added tax of 17 percent are added. Japan currently imposes 8 percent consumption tax and liquor tax, which is 80,000 yen per kl and 70 yen per liter. Those additional duties are considered for the effects of import tariff reduction on wine due to FTAs but not included in this analysis and will be dealt in further analysis.

4 Estimation results

4.1 OLS estimation of the Gravity model

The results for OLS estimation of the Gravity model are reported in **Table 5.** Dependent variables for column (1) through column (3) are sparkling, bottled and bulk wines respectively and those for column (4) and column (5) are bottled and bulk vermouth. Importer-exporter dummy, importer-exporter product dummy and year dummy are included to account for unobserved heterogeneity.

Regarding to the estimates of bottled wine, column (2), and pooled OLS, column (6), parameter estimates are quite similar. 1 % reduction in preferential tariff rates after an FTA leads 0.123 % increase in annual wine exports for bottled wine and 0.073 % for pooled equation. As shown in Table 3, MFN tariff rates also have declined significantly, however the effects on wine exports are relatively smaller and they are also statistically significant and 0.026 % and 0.028% respectively. The role of geographical distance is not significant and the coefficients on importers' real GDP and exporters' real GDP are not significant either. The estimated elasticity for wine consumption per capita, real exchange rate are significantly positive both for bottled wine and pooled estimation. Non-tariff measures are negatively affecting and significant only for bottled wine.

For sparkling wine, the regression has lower R-square, this means the model less fits data. Importers' real GDP is the only significant coefficient in column (2), this might be related to the fact that the consumed amount of sparkling wine in China and Korea is smaller. Parameter estimates and signs for bulk wine are similar to those for bottled wine but they are less significant.

Table5 about here

4.2 PPML Estimation results

Similar to the estimated coefficients from the OLS, most coefficients obtained from the PPML model have the same sign and are significant. An advantage of the PPML model is that sample selection bias resulting from excluding zero observations are treated as parameters estimated by OLS lead to biased under heteroskedasticity. We confirm that the PPML model is to be preferred and that our estimation results have explanation power with higher R-squared and stable results.

The results by PPML for different alcohol beverages are reported in Table 6. For bottled wine, column (2), 1 % tariff reduction after an FTA significantly leads 0.053 % increase in annual wine exports while the effects of MFN tariff reductions are not significant in spite of considerable changes. The estimation coefficients of importers' real GDP, wine consumption

per capita, wine production per vine area and real exchange rate are all significant and positively related to wine export. Non-tariff measures are negatively affecting and its coefficient is 0.332 %, which is bigger than the effects of tariff reductions through an FTA.

Regarding to the estimates of two bulk wines, column (3) and column (5), and pooled estimation, column (6), the coefficients of tariff reductions under an FTA are significant while those for sparkling and vermouth are not. Non-tariff measures are like bottled wine, they are significant and have larger effects on annual wine exports. For vermouth both by OLS and PPML, the explanation of the models nor its coefficients are relatively poor, mostly due to small trading volume compared with wine.

China's import of bottled wine has increased dramatically in recent years, partly because the tariff rates imposed on bulk wine higher than bottled wine. Chinese consumers prefer red still wine and consumption of sparkling and white still wine are relatively small. These cultural aspects may affect our results as the coefficients of sparkling wine are not significant.

Table 6 about here

5 Conclusion

This paper examines the impacts of import tariff reduction on wine in East Asian countries on recent FTAs. Asia and the Pacific is the most growing wine consumption region while western European wine net exporters' wine consumption has declined dramatically over the past 15 years. However, the rapid growth in wine imports in Asia as well as recent growth of trade in wine are not fully examined. With discussing the long-run trends and wine import features, focusing on east Asian three countries, China, Korea and Japan, we examine the impacts of bilateral FTAs on trade in wine by quantifying the impacts of tariff reductions through FTAs.

As our interest is estimate an extent to which tariff reductions through FTAs increased wine imports in three countries, we disentangle the effects of preferential tariff reductions through FTAs from those of MFN tariff reductions with controlling the influence of NTMs.

Gravity equational function and the PPML technique is employed as suggested in recent related literature.

We find that tariff reductions throughout FTAs are attributable to an increase of wine, especially bottled wine as 1% tariff reduction after FTAs have significantly led 0.053% increase in annual wine exports of bottled wine while the effects of MFN tariff reductions are not significant based on the result by PPML. NTMs are also significant and negatively affecting wine export.

Potential improvements are on NTMs as the data is available after 2009. Our dataset has several sources as shown in additional table, countries covered by the sources are only 28 countries for exporters and three countries for importers in East Asia for the period of 1990-2017. Although we capture more than 90 percent of world wine trade and the first growing East Asian countries, our results cannot explain trading patterns of sparking and vermouth wines.

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TABLE 1

Shares of Wine Consumption and Imports by Countries and Regions

	Consumption			Imports		
	1990	2014	Change	1990	2014	Change
Western European Wine Net Exporters						
France	16.5	11.3	-5.1	10.9	7.4	-3.4
Italy	13.8	7.9	-5.8	1.8	1.6	-0.2
Portugal	2.6	1.8	-0.8	0.5	1.7	1.2
Spain	5.7	2.8	-2.8	0.1	0.7	0.6
Total	38.5	23.9	-14.6	13.3	11.5	-1.8
Western European Wine Net Importers						
Germany	8.8	7.4	-1.4	24.4	13.7	-10.7
United Kingdom	2.7	5.5	2.8	15.5	13.7	-1.8
Total	18.4	21.8	3.4	62.1	41.7	-20.4
Central and Eastern Europe and Central Asia						
Russia	8.0	4.9	-3.1	3.4	3.8	0.3
Total	18.0	13.3	-4.7	7.0	10.5	3.5
Australia and New Zealand						
Australia	1.3	2.2	0.9	0.3	0.8	0.6
New Zealand	0.2	0.4	0.2	0.2	0.4	0.2
Total	1.5	2.6	1.1	0.4	1.2	0.7
United States and Canada						
Canada	1.1	2.0	1.0	3.5	3.9	0.4
United States	8.2	13.8	5.6	5.8	10.5	4.7
Total	9.2	15.8	6.6	9.3	14.4	5.1
Latin America and Caribbean						
Argentina	7.5	3.5	-4.0	0.0	0.1	0.1
Brazil	1.0	1.4	0.4	0.2	0.9	0.6
Chile	1.2	0.9	-0.3	0.0	0.0	0.0
Mexico	0.1	0.7	0.6	0.5	0.6	0.2
Total	10.6	7.7	-2.9	1.5	2.5	1.0
Africa and Middle East						
South Africa	1.3	1.7	0.4	0.0	0.0	0.0
Total	2.7	3.5	0.8	2.0	1.6	-0.4
Asia and Pacific Islands						
China	1.2	5.9	4.7	0.0	6.0	6.0
Japan	0.6	1.5	0.9	2.1	2.5	0.5
South Korea	0.0	0.1	0.1	0.0	0.4	0.3
Total	1.9	8.2	6.3	2.7	10.4	7.7

Source: Global wine markets, 1860-2016

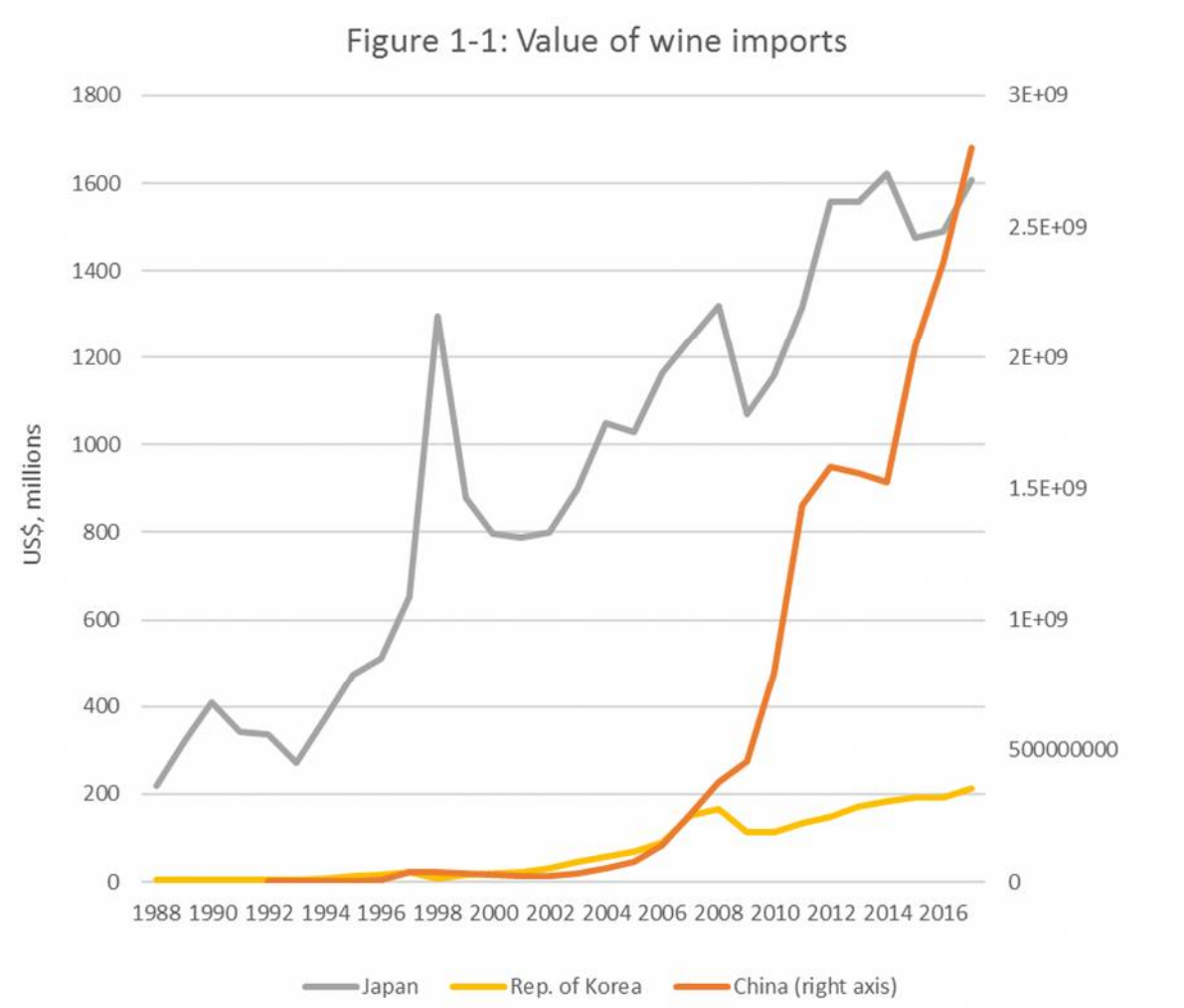
Figure 1-1: Value of wine imports
US$, millions
1800
1600
1400
1200
1000
800
600
400
200
0
3E+09
2.5E+09
2E+09
1.5E+09
1E+09
500000000
0
1988 1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016
Japan
Rep. of Korea
China (right axis)

Figure 1-2: Quantity of wine imports

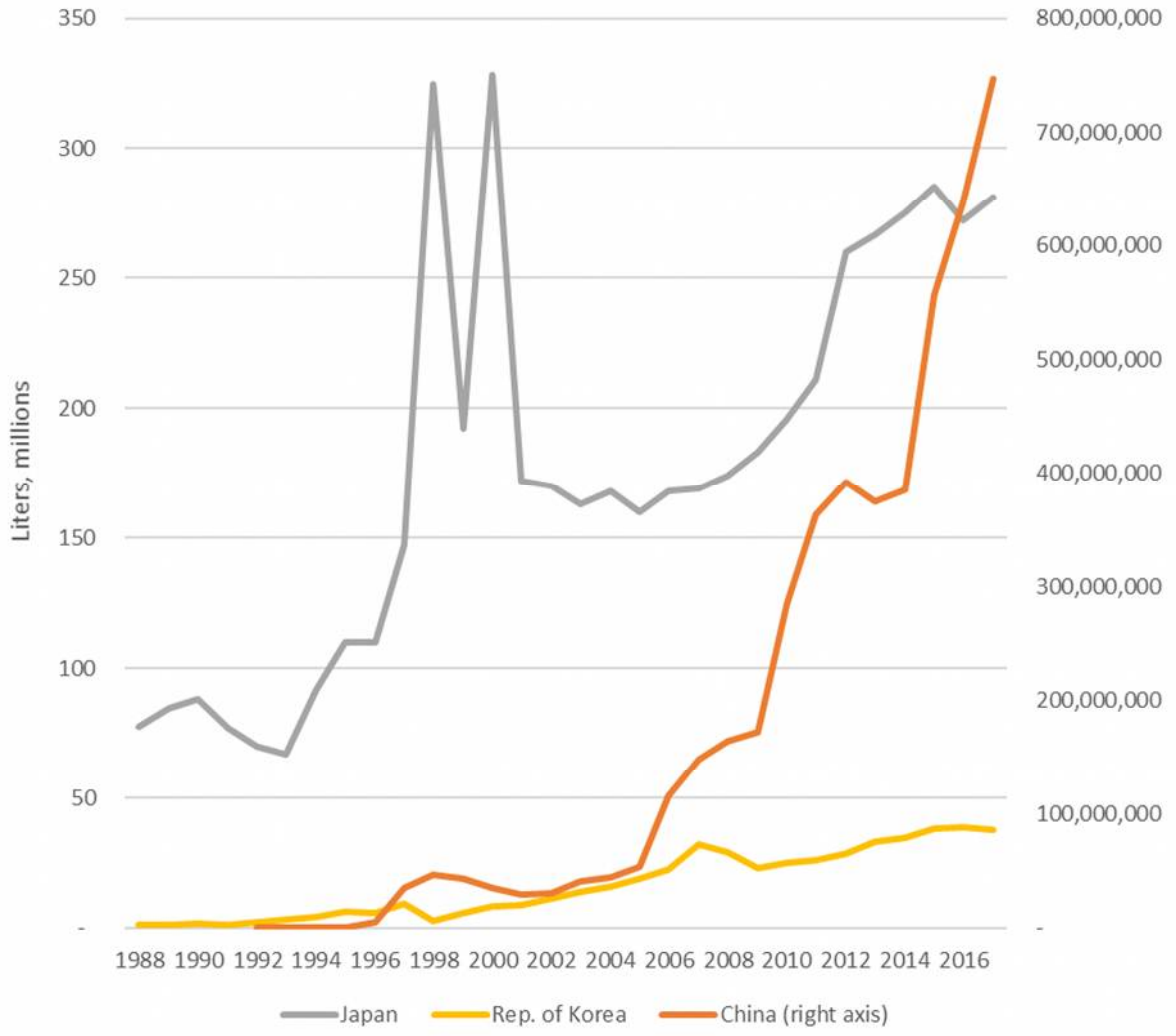

TABLE 2

Japan		China		South Korea	
Partners	Date of entry into force	Partners	Date of entry into force	Partners	Date of entry into force
Singapore	30-Nov-02	Hong Kong, China	29-Jun-03	Chile	1-Apr-04
Mexico	1-Apr-05	Macao, China	17-Oct-03	Singapore	2-Mar-06
Malaysia	13-Jul-06	ASEAN	1-Jan-05	EFTA	1-Sep-06
Chile	3-Sep-07	Chile	1-Oct-06	ASEAN	1-Jan-10
Thailand	1-Nov-07	Pakistan	1-Jul-07	India	1-Jan-10
Indonesia	1-Jul-08	New Zealand	1-Oct-08	EU	1-Jul-11
Brunei Darussalam	31-Jul-08	Singapore	1-Jan-09	Peru	1-Aug-11
ASEAN	1-Dec-08	Peru	1-Mar-10	United States	15-Mar-12
Philippines	11-Dec-08	Costa Rica	1-Aug-11	Turkey	1-May-13
Switzerland	1-Sep-09	Iceland	15-Apr-13	Australia	12-Dec-14
Viet Nam	1-Oct-09	Switzerland	1-Jul-14	Canada	1-Jan-15
India	1-Aug-11	Australia	20-Dec-15	China	20-Dec-15
Peru	1-Mar-12	Korea, Republic of	20-Dec-15	Viet Nam	20-Dec-15
Australia	15-Jan-15			New Zealand	20-Dec-15
Mongolia	7-Jun-16			Colombia	15-Jul-16
Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP)	30-Dec-18	Asia Pacific Trade Agreement (APTA)	17-Jun-76	Protocol on Trade Negotiations (PTN)	11-Feb-73
EU - Japan	1-Feb-19	Georgia	1-Jan-18	Asia Pacific Trade Agreement (APTA)	17-Jun-76
				Global System of Trade Preferences among Developing Countries (GSTP)	19-Apr-89

Source: World Trade Organization, Prticipation in Regional Trade Agreements

TABLE 3 : Bottle wine

		1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
China	**MFN**	-	-	150	150	150	-	70	65	65	65	65	65	34.4	24.2
Japan	**MFN**	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	15	15	15	15
Korea	**MFN**	50	-	40	-	-	30	30	15	15	15	15	15	15	15

		2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
China	**MFN**	14	14	14	14	14	14	14	14	14	14	14	14	14	14
	Chile	MFN		12.6	11.2	9.8	8.4	7	5.6	4.2	2.8	1.4	0	0	0
	New Zealand	MFN				11.2	8.4	5.6	2.8	0	0	0	0	0	0
	Australia	MFN											11.2	8.4	5.6
Japan	**MFN**	15	15	15	15	15	15	15	15	15	15	15	15	15	15
	Chile	MFN			13.8	12.7	11.5	10.4	9.2	8.1	6.9	5.8	4.6	3.5	2.3
	Australia	MFN											12.3	9.4	7.5
Korea	**MFN**	15	15	15	15	15	15	15	15	15	15	15	15	15	15
	Chile	12.5	10	7.5	5	2.5	0	0	0	0	0	0	0	0	0
	EU	MFN							0	0	0	0	0	0	0
	US	MFN								0	0	0	0	0	0
	New Zealand	MFN							0	0	0	0	0	0	0
	Australia	MFN										0	0	0	0

Unit: %

TABLE 4

Alcohol	HS code	Name	Description
Beer	220300	Beer made from malt	Beer made from malt.
Wine	220410	Grape wines, sparkling	Sparkling wine
	220421	Grape wines nes, fortified wine or must, pack < 2l	Other wine; grape must with fermentation prevented or arrested by the addition of alcohol :-- In containers holding 2 l or less
	220429	Grape wines, alcoholic grape must nes	Other wine; grape must with fermentation prevented or arrested by the addition of alcohol :-- Other
	220510	Vermouth and other flavoured grape wines - pack < 2l	In containers holding 2 l or less
	220590	Vermouth and other flavoured grape wines - pack > 2l	Other
Fermented beverages	220600	Fermented beverages nes (eg cider, perry, mead, etc)	Other fermented beverages (for example, cider, perry, mead); mixtures of fermented beverages and mixtures of fermented beverages and non-alcoholic beverages, not elsewhere specified or included.
Spirit	220820	Spirits obtained by distilling grape wine, grape marc	Spirits obtained by distilling grape wine or grape marc
Whisky	220830	Whiskies	Whiskies
Rum and tafia	220840	Rum and tafia	Rum and tafia
Gin and Geneva	220850	Gin and Geneva	Gin and Geneva
Vodka	220860	Vodka	Vodka
Liqueurs and cordials	220870	Liqueurs and cordials	Liqueurs and cordials
Other alcoholic liqueurs	220890	Alcoholic liqueurs nes	Other

Table 5 Estimation Results_OLS

Dependent variable: Ln Export volume	Grape wines			Other grape wines		Pooled
	Sparkling	Bottle	Bulk	Bottle	Bulk	
	(1)	(2)	(3)	(4)	(5)	(6)
Ln Exporters' real GDP	0.577	0.384	0.768	0.163	-2.395	0.456
	(1.505)	(0.983)	(1.217)	(0.737)	(2.847)	(0.824)
Ln Importers' real GDP	2.019**	0.843	0.178	1.007	-1.053	0.349
	(0.780)	(0.583)	(1.150)	(0.892)	(1.732)	(0.479)
Ln Distance	-0.616	1.699	-1.052	-1.032	-3.341	0.281
	(1.829)	(1.457)	(2.472)	(1.217)	(5.598)	(1.039)
Ln Wine consumption per capita	-0.014	0.630***	0.754*	0.338	0.800	0.665***
	(0.323)	(0.212)	(0.379)	(0.456)	(0.688)	(0.195)
Ln Wine production per vine area	0.167	0.379*	0.964**	0.233	0.613	0.427**
	(0.318)	(0.212)	(0.454)	(0.681)	(1.115)	(0.184)
Ln Real exchange rate	1.668	0.975**	0.161	0.786	1.939	0.550
	(1.019)	(0.475)	(0.620)	(0.723)	(2.735)	(0.392)
FTA dummy × Preferential tariff rate (+1)	-0.012	-0.123***	-0.111*	-0.065	-0.031	-0.073**
	(0.054)	(0.045)	(0.059)	(0.041)	(0.069)	(0.029)
(1-FTA dummy) × MFN tariff rate (+1)	-0.009	-0.026***	-0.029**	-0.029	0.008	-0.028***
	(0.008)	(0.006)	(0.011)	(0.022)	(0.035)	(0.004)
Non-tariff measures_1	-0.336	-0.935***	0.329	-0.286	-0.684	-0.476
	(0.361)	(0.287)	(0.503)	(0.708)	(1.143)	(0.329)
Non-tariff measures_2	0.047	0.184	0.014	0.154	-2.576*	-0.069
	(0.413)	(0.333)	(0.594)	(0.794)	(1.489)	(0.359)
Importer-exporter dummy	Yes	Yes	Yes	Yes	Yes	No
Importer-exporter-product dummy	No	No	No	No	No	Yes
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes
Observation	1185	1560	1106	508	230	4589
R2	0.787	0.847	0.752	0.761	0.670	0.792

Notes: Importers are Japan, China, and South Korea. Exporters include 28 countries. Sample period is 1990-2017. Standard errors are clustered at the importer-exporter level.

Table 6 Estimation Results_PPML

Dependent variable: Export volume	Grape wines			Other grape wines		Pooled
	Sparkling	Bottle	Bulk	Bottle	Bulk	
	(1)	(2)	(3)	(4)	(5)	(6)
Ln Exporters' real GDP	-0.248	1.961*	3.957***	-0.746	-12.155**	1.801*
	(1.519)	(1.108)	(1.257)	(0.810)	(4.780)	(0.961)
Ln Importers' real GDP	0.857	2.012***	-0.713*	0.543	-0.942	0.885**
	(0.553)	(0.431)	(0.370)	(0.665)	(1.190)	(0.391)
Ln Distance	1.724	3.314*	3.851	-2.845***	-22.539**	2.247
	(1.605)	(1.699)	(2.598)	(1.036)	(8.954)	(1.823)
Ln Wine consumption per capita	0.432*	0.833***	0.186	0.654*	0.063	0.337
	(0.252)	(0.180)	(0.266)	(0.347)	(0.250)	(0.231)
Ln Wine production per vine area	-0.022	0.852**	1.095**	0.781	-0.229	0.615*
	(0.587)	(0.366)	(0.458)	(0.616)	(1.235)	(0.353)
Ln Real exchange rate	-0.025	1.237**	-0.187	1.657	3.311***	0.180
	(0.412)	(0.510)	(0.256)	(1.130)	(1.134)	(0.513)
FTA dummy × Preferential tariff rate (+1)	-0.012	-0.053**	-0.082***	-0.004	0.073*	-0.050***
	(0.021)	(0.021)	(0.022)	(0.028)	(0.038)	(0.016)
(1-FTA dummy) × MFN tariff rate (+1)	-0.023	-0.009	-0.030***	-0.006	0.021	-0.015***
	(0.017)	(0.009)	(0.007)	(0.008)	(0.013)	(0.006)
Non-tariff measures_1	-0.492**	-0.332***	-0.419	0.258	-2.658**	-0.544**
	(0.241)	(0.118)	(0.528)	(0.495)	(1.040)	(0.238)
Non-tariff measures_2	0.128	0.098	0.552	-0.014	-0.096	0.249**
	(0.120)	(0.127)	(0.360)	(0.426)	(0.468)	(0.127)
Importer-exporter dummy	Yes	Yes	Yes	Yes	Yes	No
Importer-exporter-product dummy	No	No	No	No	No	Yes
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes
Observation	1311	1753	1339	639	298	5424
R2	0.835	0.910	0.876	0.793	0.834	0.879

Notes: Importers are Japan, China, and South Korea. Exporters include 28 countries. Sample period is 1990-2017. Standard errors are clustered at the importer-exporter level.

Additional table

Variables	Definitions	Data sources	Websites
Exporters' real GDP	See Anderson et al. (2017)	Anderson et al. (2017). "Global Wine Markets, 1860 to 2016: A Statistical Compendium"	www.adelaide.edu.au/press/titles/global-wine
Importers' real GDP	See Anderson et al. (2017)	Anderson et al. (2017)	
Distance	The distance between importer and exporter, kilometers	The CEPII Gravity Dataset	http://www.cepii.fr/CEPII/en/bdd_modele/presentation.asp?id=8
Wine consumption per capita	See Anderson et al. (2017)	Anderson et al. (2017)	
Wine production per vine area	The volume of wine production (KL) divided by vine area (,000 ha)	Anderson et al. (2017)	
Real exchange rate	See Anderson et al. (2017)	Anderson et al. (2017)	
FTA dummy	Dummy variable taking one if a given product is treated favorably under FTA between importer and exporter in a given year	World Trade Organization (WTO)	https://www.wto.org/english/tratop_e/region_e/rta_participation_map_e.htm
Preferential tariff rate	Preferential tariff rate (+1) for a given product between importer and exporter in a given year	WTO	http://rtais.wto.org/UI/PublicPreferentialTariffAnalysis.aspx
MFN tariff rate*	MFN tariff rate (+1) for a given product between importer and exporter in a given year	WTO, World Integrated Trade Solution (WITS), Japan' custom data	http://rtais.wto.org/UI/PublicPreferentialTariffAnalysis.aspx, http://wits.worldbank.org/WITS/WITS/Default-A.aspx?Page=Default
Non-tariff measures_1	Dummy variable taking one if an importer imposes any requirements notified to WTO among Anti dumping, Countervailing, Quantitative Restrictions, Safeguards, Sanitary and Phytosanitary, Special Safeguards, Technical Barriers to Trade, Tariff-rate quotas, Export Subsidies, in a given year	WTO, Integrated Trade Intelligence Portal (I-TIP)	https://i-tip.wto.org/goods/default.aspx?language=en
Non-tariff measures_2	Dummy variable taking one if an importer was claimed by an exporter to WTO for any non-tariff barriers in a given year	WTO, I-TIP	https://i-tip.wto.org/goods/default.aspx?language=en

*Notes: (i) When mixed tariff (ad valorem (%) vs specific tariff (yen/litter)), we choose ad valorem tariff rate automatically. (ii) When only specific tariff available, we convert to ad valorem term using import volume, import values and specific tariff rate. Import data is from Japanese custom (http://www.customs.go.jp/toukei/srch/index.htm). (iii) We use detailed tariff data personally obtained from government officer.