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Measuring trade creation effects of free trade agreements: Evidence from wine trade in East Asia

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ABSTRACT

East Asia has experienced an unprecedented expansion in its wine market over the past two decades. This paper examines the extent to which import tariff reductions through bilateral free trade agreements (FTAs) have contributed to an increase in wine imports to Japan, China, and South Korea. Our empirical method involves estimating an augmented version of the gravity equation by the Poisson pseudo-maximum likelihood (PPML) technique. Analyzing a panel dataset for 1990–2016 covering 27 exporters, we find that overall a 1 percentage point reduction in tariff among FTA member countries is associated with an increase in the wine import volumes by 0.042%, which is seven times higher than a similar reduction in tariff on an MFN basis. The strongest trade creation effects are founded for bottle wine. The results are robust to various specifications.

1. Introduction

The deadlock-state of the multilateral trade negotiation under the World Trade Organization (WTO) has made the establishment of bilateral, reginal, and cross-regional free trade agreements (FTAs) a central trade policy for many countries during the past two decades. The number of FTAs in operation has grown for 22 in 1990 to 305 by 2020. Despite such growth, the question of whether or not FTAs actually create trade continues to remain a subject of controversy, as preferential tariff schemes under FTAs are not necessarily utilized given the extensive cost and bureaucracy associated with compliance with rules of origin, and the narrow tariff margins of the counterpart most favored nation (MFN) tariff rates (UNCTAD, 2018). Indeed, recent empirical trade literature concludes that trade creation brought about by FTAs is weak or even nil in most cases(Grant, 2013; Zhou, 2017).

This paper examines trade creation effects of FTAs in East Asia, with emphasis on their impact upon wine trade. Our focus on wine is motivated by the fact that relatively high MFN tariffs have been imposed on imported wine products in East Asian

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nations. For example, as of 2014, the simple average MFN tariff rates for all products were 5 % for Japan, 10 % for China, and 13 % for South Korea, whereas the MFN tariff rates for bottled wine were 14–15 % among these three countries (Table 2).[1] In addition, East Asian countries have witnessed a dramatic increase in domestic demand for wine over the past three decades, transforming global wine markets (Mariani, Napoletano, Pomarici, & Vecchio, 2014). Given a large proportion of this increased demand has been absorbed by foreign producers, wine trade in East Asia appears to be well suited for evaluating the trade creation effects of FTAs. In addition, wine tariffs in Japan, China, and South Korea have changed significantly since the WTO Doha Round of multilateral trade negotiations in 2004.

This paper empirically investigates the extent to which preferential tariff reduction under FTAs increased wine imports to Japan, China, and Sourth Korea. Our empirical method involves estimating an augmented version of gravity equation by the Poisson pseudo-maximum likelihood (PPML) technique, with a panel dataset for 1990–2016 covering the 3 importers (Japan, China, and South Korea) and 27 exporters. Our baseline specifications include the gross domestic products (GDP) of importers and exporters, distance between importers and exporters, wine consumption per capita, wine production volume per vine, real exchange rate, MFN tariff rates, non-tariff measures, importer-fixed effects, exporter-fixed effects, and year-fixed effects. We estimate our model by bottle, bulk, and sparkling wines separately, as well as their pooled samples.

The key findings of the paper are summarized as follows: first, interestingly, trade creation effects of tariff reduction under FTAs appear to be much greater compared to those of tariff reduction on an MFN basis. A 1 percentage point reduction in FTA tariffs, holding all other factors constant, led to an increase in the log wine import volumes by 0.042 %. In contrast, a 1 percentage point reduction in MFN tariff rates is associated with an increase in the wine import volumes by only 0.006 %. Seco Second, trade creation effects are strongest for bottle wine. Our baseline results are robust to alternative specifications that control for importer-year, exporter-year, and importer-exporter pair fixed effects, reassuring us that omitted variables are not a threat to our empirical analyses. Finally, non-tariff measures are also significant and are found to negatively affect wine export. Significant impacts were not observed, however, for sparkling wine, partially due to its small market share of wine trade and low consumption patterns in Asian countries.

The current paper contributes to the fledgling literature analyzing the tariff effects on wine trade (Bianco, Boatto, Caracciolo, & Santeramo, 2016; Heien & Sims, 2000; Mariani et al., 2014). Particularly, our paper relates closely to Bianco et al. (2016) that analyze the effects of time-series variations in tariffs on bilateral bottle wine trade, with a panel dataset for 1997–2010 covering 12 countries. As far as we are aware, this is the first paper to disentangle the trade creation effects of FTA preferential tariff rates from the effects of the MFN tariff rates, allowing for assessing the effectiveness of FTAs. The other novel contribution is that our estimation directly addresses the multilateral resistance terms in the theoretically-motivated gravity model (Anderson & Wincoop, 2003), by controlling for importer-year and exporter-year fixed effects. Finally, estimations in this paper are for a larger sample of wine products and a longer time period.

Our paper also adds to the literature analyzing the wine market in East Asia. Despite being the fastest growing market in the world, prior research has been limited to Anderson and Wittwer (2015) that simulate the future wine demand in Asia, and Anderson and Harada (2018) that reveal problems of wine trade statistics in Northeast Asia due to factors such as labelling issues, double-counting, and smuggling. The current paper provides empirical evidence on determinants of wine imports to Japan, China, and South Korea, broadening our understandings of the wine market in East Asia from the viewpoint of international trade.

The rest of this article is organized as follows: Section 2 describes the data and shows long-term trends of imports and tariff rates for wine products in Japan, China, and South Korea. Section 3 presents the estimation models. Section 4 reports the estimation results. Section 5 concludes.

2. Background

2.1. Data

Bilateral wine trade data is downloaded from the UN Commodity Trade Statistics Database.[2] In this study, we analyze 3 wine products: bottle wine (HS code 220421), bulk wine (HS code 220429) and sparkling wine (HS code 220410).[3] We employ quantity data on wine trade measured in liters. We use “Global Wine Markets, 1860 to 2016” compiled by Anderson, Nelgen, and Pinilla (2017) to obtain the GDP of importers and exporters, wine consumption per capita, wine production volume per vine, and real exchange rates. The information on distance between importer and exporter, measured in kilometers, is obtained from the CEPPII Gravity Dataset.

Data on tariffs, non-tariff measures, and FTAs in force are from various databases compiled by WTO; Regional Trade Agreements Information System (RTA-IS), World Integrated Trade Solution (WITS), and Integrated Trade Intelligence Portal (I-TIP).[4] The RTA-IS allows for access to temporal changes in preferential tariff rates by country pairs and by products. The

[1] For reference, the MFN tariff rates for computers (HS code 827180) are 0% for the three Asian countries in scope. Average MFN tariff rates for clothes (HS code 620630) and automobiles (HS code 870322/HS code 870323) are 6.16%, and 7.66%, respectively.

[2] The database includes Taiwan, but data on Taiwan itself is not available so that our sample covers three East Asian countries.

[3] Vermouth (HS Code 220510) and bulk vermouth (HS Code 220590) were also analysed, but the import as well as consumption of the alcohol is very limited. We dropped the codes from our estimation due to small import quantity and less significant impacts of tariff reduction.

[4] WITS does not provide data on Singapore, Malaysia and the Philippines, which are also excluded from our importer sample.

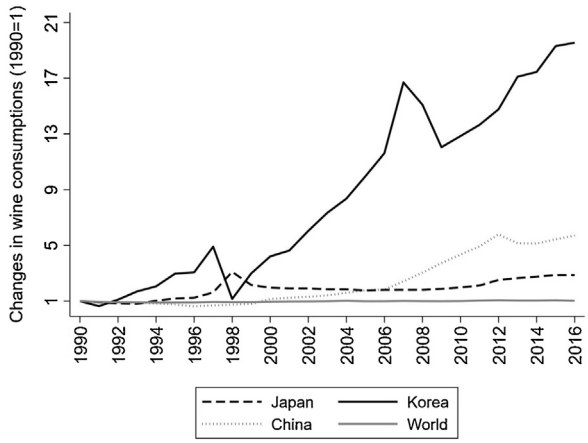

Fig. 1. Wine Consumptions, 1990–2016.
Notes: Wine consumption is measured in kiloliter.
Source: Authors' calculations based on "Global Wine Markets, 1860 to 2016" (Anderson et al., 2017).

WITS provides time-series data on MFN tariff rates by product. Information on temporal changes in non-tariff measures are available only at the country level.

2.2. Trends of wine consumption and imports

Fig. 1 presents the long-term trends of wine consumption, relative to the 1990 level, for Japan, China, South Korea and the world. The figure clearly shows that while global wine consumption had remained constant over the past three decades, the three East Asian countries experienced continuing growth. As of 2016, total wine consumption in Japan, China, and South Korea was 6, 3, and 20 times larger, respectively, compared to their 1990 levels. As a result, the share of the three East Asian countries in the global wine consumption increased from 2 % in 1990 to 8 % in 2016.

Fig. 2 shows the trends of wine imports (in levels) to Japan, China, and South Korea. The most salient feature is the rise of China as the key wine importer in Asia. The quantity of wine imports to China had been almost comparable to that to South Korea until the middle of 2000s. However, wine imports to China began to increase in 2005, and reached 640 million kiloliters in 2016, which was more than double Japan's annual wine imports. Although not as pronounced as China, both Japan and South Korea also experienced an expansion of wine imports. Wine imports to Japan increased 3 fold between 1990 and 2016, whereas imports to South Korea increased from 2 to 38 million kiloliters during the same period. Such rapid expansion of wine imports drove up the global share of the three East Asian countries from 2 % in 1990 to 9 % in 2016.

Fig. 3 shows the trends of aggregated wine imports to Japan, China, and South Korea by wine types. We see that an increase in wine imports to the three East Asian countries were driven by bottle wine.[5] The quantity of bottle wine imports increased from 60 million kiloliters in 1990 to 680 million kiloliters in 2016, accounting for a 72 % increase in total wine imports to the three East Asian countries. The quantity of bulk wine imports increased from 25 million kiloliters to 210 million kiloliters during the same period. The growth of sparkling wine imports was much slower than that of bottle and bulk wine imports, remaining below 100 million kiloliters as of 2016.

2.3. FTAs' preferential tariff rates on wines

Table 1 shows the list of FTA partner countries for Japan, China, and South Korea that came into effect during 1990–2016. The bolded countries or economic zones are included in our sample for empirical analyses. As can be seen, the expansion of FTA networks were phenomenon after the 2000s. As of 2016, the number of FTAs were: 15 for Japan, 13 for China, and 15 for South Korea respectively. It should be highlighted that their FTA partners encompass key wine producing countries, such as for Japan; Chile and Australia, for China; Chile, New Zealand, and Australia, and for South Korea; Chile, EU, United States, New Zealand, and Australia.

[5] The quantity of bottle wine imports dropped three times, from 1998 to 1999, from 2000 to 2001, and from 2013 to 2014. Several reasons can explain the movements. For example, polyphenol in wine, especially in red wine, was viewed favorably in Japan which helped promote wine as healthy drink in that country towards 1998. Wine imported from Chile to Japan increased more than 10 times towards 2000. To accommodate demand, importers carried high levels of inventory and when the boom ended the level of bottle wine imports temporally declined as a result. Regarding the dip from 2013 to 2014, in China a national anti-corruption policy, gradually commenced in 2012, focused on reducing bribes and the consumption of luxury goods by government officials. Expensive wine was impacted by its treatment as a luxury item under this policy and it is claimed that the drop in 2014 is attributable to this policy as a result. It is not clear from the figure but China imported less wine in 2013 than in 2012, and saw a decline in its imports by volume in 2014.

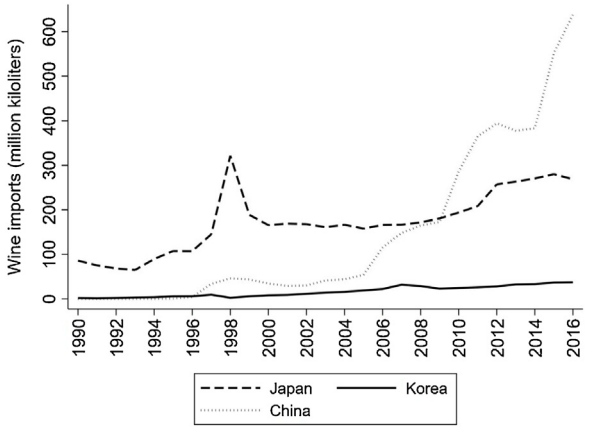

Fig. 2. Wine Imports by Destinations, 1990–2016.
Source: Authors' calculations based on "Global Wine Markets, 1860 to 2016" (Anderson et al., 2017).

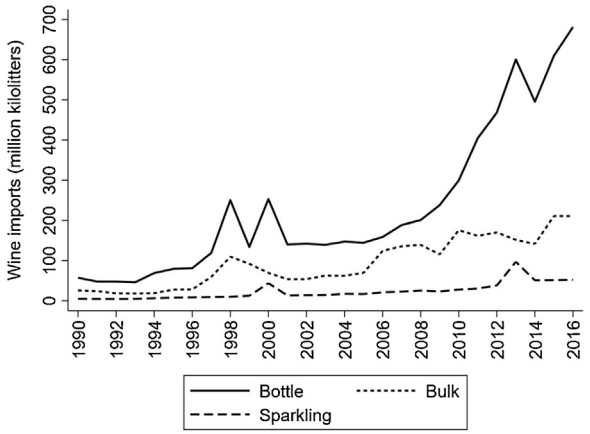

Fig. 3. Wine Imports by Products, 1990–2016.
Source: Authors' calculations based on UN Comtrade.

Tables 2–4 present time-series trends of FTAs' preferential tariff rates and MFN tariff rates imposed on imported wines to Japan, China, and South Korea for bottle wine, bulk wine, and sparkling wine, respectively. The preferential tariff rates are applied to each FTA partner only, whereas the MFN tariff rates are applied to all non-FTA nations. First, we see that the FTA preferential tariff rates have declined over time, however, the schedules of tariff reductions vary among the FTAs. For example, the preferential tariff rates for the China-New Zealand FTA declined at a faster rate than those for the China-Chile FTA. South Korea removed import tariffs on all wine products immediately after FTAs were concluded with the EU, the United States, New Zealand, and Australia.

Fig. 4 presents the changes in the share of FTA partner countries (as of 2016) in the aggregated wine imports to Japan, China, and South Korea over time. An important finding is that the share of FTA countries dramatically increased in 2010 and 2016, which is consistent with the fact that the number of FTAs in the three East Asian countries had grown considerably since the middle of 2000s (Table 1). The figure shows that the share of FTA countries had ranged between 8 % and 20 % from 1990 to 2005, but then increased dramatically in the 2010s to approximately 40 %. Given that the MFN tariff rates for wine products have been constant since the middle of the 2000s, it is likely that the FTA countries enjoyed the benefits of tariff reductions through the FTAs.

It is shown that the MFN tariff rates for wine products had substantially dropped from the 1990s until the middle of the 2000s in Tables 2–4. For example, the MFN tariff rates for bottle wine in Japan reduced from 21.3 % in 1990 to 15 % in 2004, and South Korea also dropped the MFN tariff rates from 50 % to 15 %. However, the decrease in China's MFN tariff rates is the most pronounced. The MFN tariff rate for bottle wine was 150 % in 1990 but had reduced to 14 % by 2004. This indicates that the temporal changes in MFN tariff rates should be controlled for in our estimation, to disentangle the trade creation effects of tariff reductions under FTAs from those of MFN tariff reductions.

As we have seen relatively high MFN tariffs have been imposed on imported wine products, there are some other characteristics of the wine markets in Japan, China, and South Korea to note. The price of imported wine, which usually

Table 1
FTA Partner Countries, 1990–2016.

Japan		China		South Korea	
Partners	Years of entry into force	Partners	Years of entry into force	Partners	Years of entry into force
Singapore	2002	Hong Kong	2003	**Chile**	**2004**
Mexico	**2005**	Macao	2003	Singapore	2006
Malaysia	2006	ASEAN	2005	**EFTA**	**2006**
Chile	**2007**	**Chile**	**2006**	ASEAN	2010
Thailand	2007	Pakistan	2007	**India**	**2010**
Indonesia	2008	**New Zealand**	**2008**	**EU**	**2011**
Brunei Darussalam	2008	Singapore	2009	Peru	2011
ASEAN	2008	Peru	2010	**United States**	**2012**
Philippines	2008	Costa Rica	2011	**Turkey**	**2013**
Switzerland	2009	Iceland	2013	**Australia**	**2014**
Viet Nam	2009	**Switzerland**	**2014**	**Canada**	**2015**
India	**2011**	**Australia**	**2015**	China	2015
Peru	2012	South Korea	2015	Viet Nam	2015
Australia	**2015**			**New Zealand**	**2015**
Mongolia	2016			Colombia	2016

Notes: Bolded partner countries are included in our sample. ASEAN (Association of South-East Asian Nations) comprises 10 countries; Singapore, Indonesia, Cambodia, Thailand, Philippines, Brunei Darussalam, Viet Nam, Malaysia, Myanmar, and Lao PDR. EFTA (European Free Trade Association) encompasses 4 countries; Iceland, Norway, Switzerland, and Liechtenstein. EU (European Union) consists of 27 member states; Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Ireland, Romania, Slovakia, Slovenia, Spain, and Sweden.*Source*: WTO Regional Trade Agreements Information System (RTA-IS).

includes insurance and freight charges, is subject to not only tariffs but also other taxes, depending on the country. Other taxes are not taken into consideration in this paper, however, it is important to mention these taxes as they are indirectly related to the demand for wine. Wine is 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. In addition to tariffs, a value-added tax of 17 % and a consumption tax of 10 % are imposed. The tax rates applied to wine sold in South Korea are also heavy. The total duty collected in South Korea is comprised of liquor tax, education tax and value-added tax, while in Japan total duty is comprised of liquor tax and consumption tax. Liquor tax of 30 %, education tax of 10 % and value-added tax of 10 % are imposed on wine in Korea. Liquor tax is charged and collected per kiloliter in Japan. While South Korea's liquor tax is imposed on retail prices, Japan's liquor tax applies to the timing of shipments. Liquor tax rates on wine is 80,000 yen per kiloliter and 60 yen per 750 ml bottle. In addition to the liquor tax, a consumption tax of 10 % applies. Tariffs on bottle wine imported into Japan depends on the import price, as Japan imposes either an ad valorem tariff or a specific tariff. For a bottle of wine, a lower tax rate of 15 % or 132 yen per liter applies.[6]

3. Empirical analyses

3.1. Baseline specification and estimation technique

We estimate an augmented version of gravity equation for wine trade (*WIM*) as follows:

$$\begin{aligned}\ln WIM_{ijt} = {} & \beta_0 + \beta_1 \ln GDP_{it} + \beta_2 \ln GDP_{jt} + \beta_3 \ln DIS_{ij} + \beta_4 \ln WCP_{it} + \beta_5 \ln WPV_{jt} + \beta_6 \ln RER_{it} \\ & + \beta_7 [FTA_{ijt} \times (1 + PTR_{ijt})] + \beta_8 [(1 - FTA_{ijt}) \times (1 + MFN_{it})] + \beta_9 NTM_{it} + \gamma_i + \delta_j + \sigma_t + \varepsilon_{ijt} \end{aligned} \quad (1)$$

where the subscript i stands for an importing country: Japan, China, and South Korea; j stands for an exporting country: Algeria, Argentina, Australia, Austria, Belgium-Luxembourg, 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; and t stands for the year: 1990, 1991, . . . , 2015, 2016.[7] ln before the variables is the natural logarithm symbol, γ, δ, and σ are importer, exporter, and year fixed effects, respectively. ε is an error term.

We chose the 27 exporting countries based on two criteria: first, we sought wine-producing countries listed in Anderson et al. (2017), except for Japan, China, and South Korea. As of 2016, there were 33 countries. Next, we dropped 6 wine-producing countries with poor data coverage for exports and other variables (Romania, Moldova, Bulgaria, Georgia, Ukraine, and Croatia). The selected 27 countries account for more than 90 % of world trade in wine. For importing countries, we focus on the three fastest growing wine importers in Asia. We limit our sample period to 1990–2016 for data availability.

[6] That means that the tariff rate on bottle 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 and bulk wine are specific tariffs; 182 yen per liter, 45 yen per liter and 69.3 yen per liter, respectively.

[7] As the FTAs of the three importing countries under analysis were signed in the 2000s, and military dictatorship in Chile ended in 1990 giving way to democratic rule, our analysis starts from 1990 as Chile is one of important countries in the analysis.

Table 2
FTA Preferential Tariff Rates and MFN Tariff Rates for Bottle Wine.

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

		2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Japan	MFN	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
	Australia						MFN						12.3	9.4
China	MFN	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
	New Zealand		MFN			11.2	8.4	5.6	2.8	0	0	0	0	0
	Australia						MFN						11.2	8.4
South Korea	MFN	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
	EU				MFN				0	0	0	0	0	0
	United States					MFN				0	0	0	0	0
	New Zealand				MFN				0	0	0	0	0	0
	Australia						MFN					0	0	0

Notes: Unit is %. Bottle wine is defined as HS code 220421.
The grey shades are years MFN tariff rates have been imposed. Numbers in the tables are all reduced tariff rates based on bilateral trade agreements.*Sources:* WTO Regional Trade Agreements Information System (RTA-IS) and WTO World Integrated Trade Solution (WITS).

Table 3
FTA Preferential Tariff Rates and MFN Tariff Rates for Bulk Wine.

		1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
MFN	Japan	21	21	21	21	21	21	21	21	21	22	15	15	15	15
	China	150	150	150	150	150	70	70	65	65	65	65	65	38	29
	South Korea	50	50	40	40	40	30	30	15	15	15	15	15	15	15

		2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Japan	MFN	15	15	15	15	15	15	15	15	15	15	15	15	15
	Chile	MFN			7	6	6	5	5	5	3	3	2	2
	Australia						MFN						7	6
China	MFN	20	20	20	20	20	20	20	20	20	20	20	20	20
	Chile	MFN		18	16	14	12	10	8	6	4	2	0	0
	New Zealand		MFN			16	12	8	4	0	0	0	0	0
	Australia						MFN						16	12
South Korea	MFN	15	15	15	15	15	15	15	15	15	15	15	15	15
	Chile	13	10	8	5	3	0	0	0	0	0	0	0	0
	EU				MFN				0	0	0	0	0	0
	United States					MFN				0	0	0	0	0
	New Zealand				MFN				0	0	0	0	0	0
	Australia						MFN					0	0	0

Notes: Unit is %. Bulk wine is defined as HS code 220429.
The grey shades are years MFN tariff rates have been imposed. Numbers in the tables are all reduced tariff rates based on bilateral trade agreements.*Sources:* WTO Regional Trade Agreements Information System (RTA-IS) and WTO World Integrated Trade Solution (WITS).

The real *GDP* of importers and exporters 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 the extent to which preferential tariff reductions through FTAs has increased wine imports to Japan, China, and South Korea, isolating any resultant increases from the trade creation effects of MFN tariff reductions. The key empirical issue here is to disentangle the effects of preferential tariff reductions through FTAs from those of MFN tariff reductions. The MFN tariff rates on wine have declined over time in Japan, China, and South Korea. The term, $\left[FTA_{ijt} \times \left(1 + PTR_{ijt}\right)\right]$ and $\left[\left(1 - FTA_{ijt}\right) \times \left(1 + MFN_{it}\right)\right]$ is included in Eq. (1). *FTA* is a time-variant dummy variable indicating if

Table 4
FTA Preferential Tariff Rates and MFN Tariff Rates for Sparkling Wine.

		1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
MFN	Japan	14	14	14	14	14	14	14	14	14	14	12	12	12	12
	China	150	150	150	150	150	70	70	65	65	65	65	55	34	24
	South Korea	50	50	40	40	40	30	30	15	15	15	15	15	15	15

		2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Japan	MFN	12	12	12	12	12	12	12	12	12	12	12	12	12
	Chile	MFN			9	8	7	7	6	5	4	4	3	2
	Australia	MFN											9	7
China	MFN	14	14	14	14	14	14	14	14	14	14	14	14	14
	Chile	MFN		13	11	10	8	7	6	4	3	1	0	0
	New Zealand	MFN				11	8	6	3	0	0	0	0	0
	Australia	MFN											11	8
South Korea	MFN	15	15	15	15	15	15	15	15	15	15	15	15	15
	Chile	13	10	8	5	3	0	0	0	0	0	0	0	0
	EU	MFN							0	0	0	0	0	0
	United States	MFN								0	0	0	0	0
	New Zealand	MFN							0	0	0	0	0	0
	Australia	MFN										0	0	0

Notes: Unit is %. Sparkling wine is defined as HS code 220410.
The grey shades are years MFN tariff rates have been imposed. Numbers in the tables are all reduced tariff rates based on bilateral trade agreements.*Sources*: WTO Regional Trade Agreements Information System (RTA-IS) and WTO World Integrated Trade Solution (WITS).

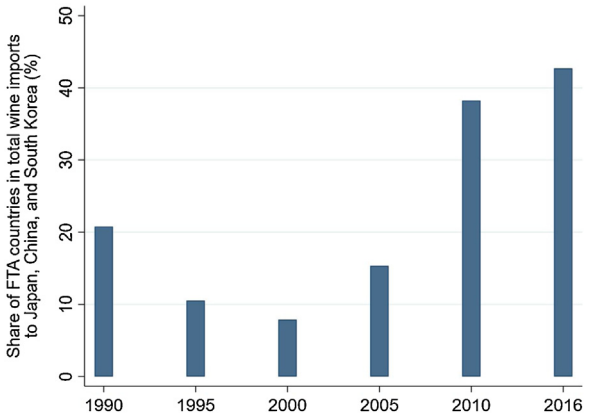

Fig. 4. Share of FTA Partner Countries (as of 2016) in Total Wine Imports.
Sources: Authors' calculations based on UN Comtrade and WTO Regional Trade Agreements Information System (RTA-IS).

a FTA is in force between importing and exporting countries. *PTR* is a time-variant preferential tariff rate on wine that applies to an exporting country in a FTA. *MFN* is a time-variant MFN tariff rate on wine that applies to all non-FTA exporting counties. Thus, β_7 captures an average increase in wine imports by a 1 percentage point decrease in the FTA preferential tariff rates, whereas β_8 is interpreted as an average increase in wine imports by a 1 percentage point decrease in the MFN tariff rates.

Non-tariff measures generally tend to be introduced and increased as tariffs on goods and services decline through FTAs. This suggests that the failure to adjust for the influence of non-tariff measures could cause β_7 to be overestimated. To avoid this possibility, we have included *NTM* into Eq. (1). *NTM* is a time-variant dummy variable indicating if an importer imposes any requirements as required by the WTO including; antidumping, countervailing, quantitative restrictions, safeguards, sanitary and phytosanitary, special safeguards, technical barriers to trade, tariff-rate quotas, and export subsidies.

The Poisson pseudo-maximum likelihood (PPML) technique is employed in this study for three reasons. First, we find evidence of heteroskedasticity.[8] Silva and Tenreyro (2006) show that log-linearized gravity equation estimated by ordinary

[8] Breusch-Pagan/Cook-Weisberg test for heteroskedasticity rejects the null hypothesis that the variability of the random error is constant across elements of the vector.

least squares (OLS) can be highly misleading in the presence of heteroskedasticity and propose that the PPML should be used as a substitute for the standard log linear model. Second, the PPML also provides a natural way to deal with zero values of the dependent variable that could significantly influence the estimation results. Finally, the PPML estimator has a wide range of applicability including in panel data analysis (Wooldridge, 2002).

Extending the PPML estimator to this study, the Eq. (1) can be rewritten as the multiplicative form of the constant-elasticity:

$$WIM_{ijt} = exp\{\beta_1 \ln GDP_{it} + \beta_2 \ln GDP_{jt} + \beta_3 \ln DIS_{ij} + \beta_4 \ln WCP_{it} + \beta_5 \ln WPV_{jt} + \beta_6 \ln RER_{it} + \beta_7 [FTA_{ijt} \times (1 + PTR_{ijt})] + \beta_8 [(1 - FTA_{ijt}) \times (1 + MFN_{it})] + \beta_9 NTM_{it} + \gamma_i + \delta_j + \sigma_t\} + \varepsilon_{ijt} \quad (2)$$

Thus, the Eq. (2) is estimated by the PPML estimator in this study.

3.2. Alternative specification

Anderson and Wincoop (2003) developed the "gravity with gravitas" model. The most important feature of the Anderson and Wincoop (2003) model is the inclusion of multilateral resistance terms that account for unobserved price indices. The inclusion of these two variables has a significant implication for estimating the gravity model, as an omitted variable bias could be corrected. The standard approach to incorporating multilateral resistance terms is to include importer-year fixed effects (F_{it}) and exporter-year fixed effects (F_{jt}) into estimation models (Baier & Bergstrand, 2007). Importer-exporter pair fixed effects (F_{ij}) can also be controlled to account for time-invariant factors that are difficult to measure, such as historical and cultural links between countries. We estimate the following specification (Eq. 3 below) by the PPML estimator to examine the robustness of our baseline estimates:

$$WIM_{ijt} = exp\{\alpha_1 [FTA_{ijt} \times (1 + PTR_{ijt})] + \alpha_2 [(1 - FTA_{ijt}) \times (1 + MFN_{it})] + F_{it} + F_{jt} + F_{ij}\} + \omega_{ijt} \quad (3)$$

Given the small number of importing countries, controlling for the exporter-year fixed effects might be tenuous. It is also possible that the contrasting results across wine products could emanate from scale heterogeneity. In order to address these issues, we estimate the following PPML specification:

$$SHARE_{ijt} = exp\{\alpha_1 [FTA_{ijt} \times (1 + PTR_{ijt})] + \alpha_2 [(1 - FTA_{ijt}) \times (1 + MFN_{it})] + \ln GDP_{jt} + \ln WPV_{jt} + F_{it} + F_{ij}\} + \omega_{ijt} \quad (4)$$

where the dependent variable is the bilateral wine trade divided by total exports of the corresponding wine products in percentage terms. Note that Eq. (4) drops exporter-year dummy but includes the two exporter-year varying variables (ln *GDP* and ln *WPV*) for controlling scale heterogeneity across wine types.

4. Estimation results

Table 5 reports the PPML estimation results. Columns (1)–(3) present the results where Eq. (2) is estimated by bottle, bulk, and sparkling wines separately, whereas Column (4) reports the pooled estimation. All specifications control for importer, exporter, and year fixed effects. The goodness-of-fit of the regression ranges from 0.37 to 0.87, sufficient to conduct an econometric analysis. We find evidence of the trade creation effects of FTAs through the reduction in preferential tariff rates. The results suggest that overall, a 1 percentage point reduction in preferential tariff rates led to an increase in the log wine import volumes by 0.042 % in pooled estimation (4), holding the other variables in the model constant. The trade creation effects for bottle and bulk wines are 0.028 % and 0.074 %, respectively. The effects for sparkling wine are not precisely estimated. Interestingly, the trade creation effects of FTAs through reductions in preferential tariff rates appear to be more significant compared to those of the reduced MFN tariff rates; a 1 percentage point reduction in MFN tariff rates led to an increase in the log wine import volumes by 0.006 % in (4), which is statistically indistinguishable from zero.

The coefficients of the *GDP* of importers and exporters are positive and statistically significant. Contrary to expectations, we find no evidence that the geographical distance (*DIS*) determines wine trade. This is probably because the majority of wine exporters are based in Europe and America, and importers are in East Asia. The positive coefficients of wine consumption per capita (*WCP*) suggest that the changes in preference for wines do matter in explaining the increasing wine imports to the East Asia countries, particularly bottle wine. The positive coefficients of wine production volume per vine (*WPV*) suggest that improvements in the productivity levels of the exporting countries was an important determinant as a supply side factor. As expected, the coefficients of real exchange rate (*RER*) are negative but statistically insignificant.

The coefficients of non-tariff measures (*NTM*) are negative and statistically significant for all specifications. Japan and South Korea imposed non-tariff measures on wine products after 2010 and 2013, respectively. Given that the *NTM* is a time-variant dummy variable, the interpretation of the pooled estimate (–0.412) is that wine imports, on average, are 33 % smaller before and after non-tariff measures were imposed.[9] The results also suggest that the trade-reducing effects of non-tariff measures are most significant for bulk wines.

[9] The formula to compute this effect is $(e^{coefficient} - 1) \times 100\%$.

Table 5
Baseline Estimates.

Dependent variable:	Bilateral wine trade			
	Bottle (1)	Bulk (2)	Sparkling (3)	Pooled (4)
Ln Importers' real GDP	2.115***	−1.178*	0.927**	1.294***
	(0.355)	(0.697)	(0.389)	(0.295)
Ln Exporters' real GDP	1.947*	3.083***	−0.410	1.913*
	(1.149)	(0.933)	(1.638)	(1.155)
Ln Distance	1.174	−3.309	−0.511	0.559
	(2.113)	(2.598)	(1.881)	(1.525)
Ln Wine consumption per capita	0.861***	0.079	0.368	0.359
	(0.194)	(0.156)	(0.228)	(0.223)
Ln Wine production per vine area	0.758*	1.250***	−0.087	0.879***
	(0.424)	(0.378)	(0.555)	(0.307)
Ln Real exchange rate	0.971**	−0.432	−0.115	−0.149
	(0.402)	(0.325)	(0.442)	(0.595)
FTA dummy × Preferential tariff rate (+1)	−0.028*	−0.074*	−0.007	−0.042***
	(0.016)	(0.039)	(0.020)	(0.016)
(1–FTA dummy) × MFN tariff rate (+1)	−0.006	−0.050**	−0.026	−0.006
	(0.008)	(0.025)	(0.018)	(0.007)
Non-tariff measures	−0.283**	−0.706**	−0.476***	−0.412***
	(0.132)	(0.307)	(0.183)	(0.153)
R^2	0.87	0.77	0.82	0.37
Importer dummy	Yes	Yes	Yes	Yes
Exporter dummy	Yes	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes	Yes
Observation	1,777	1,399	1,332	4,515

Notes: The table shows the PPML (Poisson pseudo-maximum likelihood) estimation results for the Eq. (2). Importers are Japan, China, and South Korea. Exporters include 27 countries. Sample period is 1990–2016. Standard errors are clustered at the importer-exporter level.

Table 6 presets the PPML estimation results for the Eq. (3). Note that the inclusion of importer-exporter year fixed effects and importer-exporter pair fixed effects (F_{it}, F_{jt}, and F_{ij}) leads *GDP*, *DIS*, *WCP*, *WPV*, *RER*, and *NTM* to be dropped from the estimation model. As expected, the goodness-of-fit of the regression substantially improves for all specifications. We find that the point estimates for bottle wine and pooled samples are −0.049 and −0.087 at the 1 % statistically significant level. In addition, the estimated trade creation effects of tariff reductions under FTAs are larger than those of MFN tariff reductions. On the other hand, we find that the trade creation effects of tariff reductions are indistinguishable from zero for bulk and sparkling wine. The results provide reassurance that omitted variables are not a threat to our empirical analyses, at least for bottle wine.

Finally, Table 7 displays the PPML estimation results for Eq. (4) where the dependent variable is bilateral wine trade divided by total wine exports, and the exporter-year dummy variable is dropped from the equation. Again, the trade creation effect of tariff reductions under FTAs is observed for bottle wine only, with the effect larger than that of MFN tariff reductions. The results suggest that the contrasting results across wine products do not emanate from scale heterogeneity.

Why does the trade creation effect of tariff reductions under FTAs emerge for bottle wine? One possible explanation is that trade in final products is more sensitive to international price changes than trade in intermediate products (Burstein, Kurz, & Tesar, 2008; Nishitateno, 2013, 2015). For example, in the case of wine, consumers have a wide scope for substitution across bottle wine. Therefore, the fall in international prices through tariff reductions under FTAs is more likely to pass

Table 6
Alternative Specifications Controlling for Importer-/Exporter-Year Dummy Variables.

Dependent variable:	Bilateral wine trade			
	Bottle (1)	Bulk (2)	Sparkling (3)	Pooled (4)
FTA dummy × Preferential tariff rate (+1)	−0.049***	−0.005	0.002	−0.087***
	(0.014)	(0.025)	(0.009)	(0.007)
(1–FTA dummy) × MFN tariff rate (+1)	−0.019***	−0.005	0.006	−0.001
	(0.007)	(0.012)	(0.011)	(0.010)
R^2	0.99	0.98	0.99	0.43
Importer-year dummy	Yes	Yes	Yes	Yes
Exporter-year dummy	Yes	Yes	Yes	Yes
Importer-exporter pair dummy	Yes	Yes	Yes	Yes
Observation	2,324	1,483	1,705	5,512

Notes: The table shows the PPML (Poisson pseudo-maximum likelihood) estimation results for the Eq. (3). Importers are Japan, China, and South Korea. Exporters include 27 countries. Sample period is 1990–2016. Standard errors are clustered at the importer-exporter level.

Table 7
Alternative Specification Using Bilateral Trade Share of Total Wine Exports as Dependent Variable.

Dependent variable:	Bilateral wine trade divided by exporters' total wine exports, %			
	Bottle (1)	Bulk (2)	Sparkling (3)	Pooled (4)
FTA dummy × Preferential tariff rate (+1)	−0.117***	−0.055	−0.024	0.007
	(0.025)	(0.042)	(0.021)	(0.029)
(1–FTA dummy) × MFN tariff rate (+1)	−0.097***	−0.054*	−0.120**	−0.060**
	(0.023)	(0.032)	(0.060)	(0.025)
R^2	0.64	0.74	0.86	0.36
Exporter-year varying variables	Yes	Yes	Yes	Yes
Importer-year dummy	Yes	Yes	Yes	Yes
Importer-exporter pair dummy	Yes	Yes	Yes	Yes
Observation	1,987	1,456	1,429	4,959

Notes: The table shows the PPML (Poisson pseudo-maximum likelihood) estimation results for the Eq. (4). Importers are Japan, China, and South Korea. Exporters include 27 countries. Sample period is 1990–2016. Exporter-year varying variables include exporters' real GDP, and wine production volume per vine. Standard errors are clustered at the importer-exporter level.

through domestic prices and to increase imports of bottle wine to destination countries. On the other hand, bulk wine is often bottled as is or blended with domestic wine and sold in bottles labelled as national wine in East Asian countries, especially in China, as discussed in Anderson and Harada (2018). Given that the quality of bulk wine is specialized to each beverage manufacturer, substitutability of bulk wines is, therefore, rather limited, leading trade flows to be less responsive to changes in international prices through tariff reductions under FTAs. In addition, the flows of bulk wine imports closely relate to beverage manufacturers' expectations for wine market conditions, potentially offsetting the trade creation effects of tariff reductions.

5. Conclusion

East Asia has experienced an unprecedented expansion in its wine market over the past two decades. This paper has examined the impacts of import tariff reductions on wine due to recently agreed FTAs and the extent to which import tariff reductions through bilateral FTAs have contributed to an increase in wine imports to Japan, China, and South Korea. In this undertaking, we constructed a panel dataset for 1990–2016 covering 27 exporters across the world and estimated gravity equation by the Poisson pseudo-maximum likelihood technique. We found robust evidence of trade creation effects of FTAs through preferential tariff reductions, and the effects were larger than the effects of MFN tariff reductions.

The effectiveness of FTAs has been controversial in empirical trade literature. However, the empirical evidence of this paper suggests that the trade creation effects of FTAs are more likely to emerge for products with wider tariff margins between FTA preferential tariff rates and MFN tariff rates. Tariff rates of wines, as shown in the previous tables, are relatively high and the impacts of FTAs on wine are considered capable of boosting wine trade. Our results, for East Asian countries where wine imports are rapidly growing, support positive, significant impacts on wine trade. It would be interesting to also examine whether tariff margins play a crucial role in yielding trade creation effects for other products. In addition, the current paper has focused on the effects of FTAs on trade. Detailed analyses of how local consumers and producers in East Asia responded to an implementation of FTAs would be an interesting avenue for future research.

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