Wine: The Punching Bag in International Trade Disputes

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Selected Paper prepared for presentation at the 2022 Agricultural & Applied Economics Association Annual Meeting, Anaheim, CA; July 31-August 2

1. Introduction

Wine is one of the most extensively traded products in the world and is the most traded beverage in value terms. To illustrate, of the 1,222 4-digit Harmonized System (HS) commodities (2017 revision), in 2019, wine was the 97th most-traded product by total value of trade (data from CEPII's BACI database; Gaulier and Zignago 2010), placing it in the top 8% of all 4-digit products in terms of total trade, agricultural or otherwise. Global wine exports in 2019 were tallied at $35.7 billion,[1] outpacing exports of other extensively traded alcoholic beverages such as whiskey ($34.0 billion) and beer ($16.5 billion), a figure which also exceeds trade in major non-alcoholic beverages such as soft drinks ($21.3 billion) and fruit juices ($14.6 billion). Wine is produced and traded by a large number of countries in nearly every part of the world, and while winemakers in the European Union produce the majority of the world's wine (over 17 million metric tons, accounting for roughly 60% of global production in quantity terms as of 2018; from FAO 2021), other countries also produce significant quantities, including the United States (8.2% of world output), China (6.6%), and Argentina (4.9%). Furthermore, while the European Union is likewise the origin of most exports of wine (roughly 67% of global wine exports as of 2018, a figure which includes intra-EU trade), other large exporters such as Australia (7.4%), Chile (6.7%), and the United States (5.0%) account for increasingly sizable shares of the international market.

Despite being so extensively traded, wine (in all its varieties) often faces significant import tariff barriers. On one hand, the low trade-weighted applied tariff rates (of around 4.5% ad valorem for bottled wine and 7.4% for bulk wine; authors' calculations based on data from the WITS TRAINS tariff database (UNCTAD, 2021) and CEPII) largely originate from the large volume of zero-tariff intra-EU wine trade. On the other hand, however, the high simple average of most-favored nation (MFN) tariff rates of 40% for bottled wine and 64% for bulk wine[2] reveals that many markets maintain import barriers well above the trade-weighted average. Several (predominately Muslim) countries maintain effectively prohibitive tariff rates (for example, MFN rates on bottled wine of 1,800% ad valorem for Egypt and 654% for Jordan), and a substantial number of developing countries maintain high tariff barriers, which are likely in place to significantly inhibit wine imports. For example, as of 2018,

[1]A figure which includes sparkling and still wines, based on data from UN Comtrade (2021). However, we will focus our analysis on still wines sold in bottles or in bulk, which account for the majority of international wine trade. We will thus not consider sparkling wine (for example, champagne and other fizzy beverages) and other fermented fruit-based products, such as vermouth. These commodities are less extensively traded and have largely avoided being targeted in trade retaliation.

[2]In comparison to the 14.8% global average MFN tariff on imports of food and agricultural products overall (based on data from UNCTAD 2021 and WTO 2020).

India, Brazil, and Thailand maintained ad valorem MFN tariff rates of 150%, 63%, and 57.6%, respectively, which limit access to large and growing markets with ever-increasing middle-income populations. These onerous trade restrictions are likely to cause significant losses in the gains from trade (Mariani and Pomarici, 2019).

Trade in wine is also widely and increasingly subjected to non-tariff measures (NTMs) which can create frictions for both imports and exports. Such measures can include sanitary and phytosanitary (SPS) standards, technical barriers to trade (TBTs), and commercial standards (for instance, rules on labeling or production methods), pre-shipment inspections (requirements on the characteristics of products for export enforced by a supervisory entity in the exporting country), and geographical indications for place-designated varieties. While a large number of NTMs are applied in a non-discriminatory MFN fashion (for instance, parties to the WTO's TBT Agreement are required to adopt MFN and National Treatment in the application of TBTs), country-specific NTMs (for example, elevated regulatory standards or special policies enacted by partner countries within preferential trade agreements) have become increasingly prolific (Santeramo et al., 2019). It is conceivable that such regulatory harmonization enacted under trade agreements could have trade-expanding effects; however, work on this area remains nascent. The degree to which NTMs depress or expand wine trade therefore remains an open question (Dal Bianco et al., 2016; Meloni et al., 2019), though research on other international agri-food markets has found their impacts on trade to be significant (Disdier and van Tongeren, 2010; Santeramo and Lamonaca, 2019). Since tariffs remain high in many emerging markets and are the primary policy instrument used in trade disputes (which we turn to next), our paper focuses on the impacts of tariffs on wine trade.

In addition to the widespread presence of import barriers and other trade distortions, the degree to which producers in many countries rely heavily on sales in export markets has caused wine to become a "battered commodity" for tariff retaliation in trade disputes. Furthermore, wine's geographically concentrated production across several large producers, along with its cultural significance in many countries (Marks, 2011), also make it a prominent target for punitive trade measures. Table 1 highlights several recent disputes in which wine has been caught in the crossfire, a number of which are still ongoing. Given the sizable wine trade between the disputing countries, these retaliatory tariffs have significant implications for consumers and producers on each side of the respective conflicts.

Table 1: Recent Trade Disputes Involving Retaliation Against Wine Exports and Announced Tariff Retaliation

Year	Importer	Exporter(s)	Pre-dispute tariff rate	Retaliatory tariff rate	Targeted exports
2020	United States	France, Germany, Spain, United Kingdom	2.41%	25%	$177 million
2020	European Union	United States	3.48%	25%	$422 million
2020	China	Australia	0%	116–212%	$789 million
2019	United States	France, Germany, Spain, United Kingdom	2.41%	25%	$1.5 billion
2018	China	United States	14%	15–25%	$70 million

Notes: "Pre-dispute tariff rate" indicates the importer's applied tariff on bottled wine from the indicated exporter(s) in the year prior to the enaction of retaliatory tariffs. "Targeted exports" indicates the value of exports in the year preceding the announcement of the tariff retaliation.

Most of the highlighted trade disputes originated over issues unrelated to wine trade. For instance, the years-long dispute at the World Trade Organization (WTO) between the United States and the European Union over subsidies to Boeing and Airbus has been marked by repeated instances of cross-sectoral retaliation, in which wine has been a frequent target of collateral tariff retaliation. As part of its WTO-authorized retaliation over EU subsidies to Airbus, in 2019 the United States imposed new duties of 25% on $1.5 billion imports of wine containing 14% alcohol or less from France, Germany, Spain, and the United Kingdom on top of MFN rates of 2.41%, and in late 2020 announced the planned extension of these duties to imports of wine containing more than 14% alcohol (worth around $177 million).

While the US tariff actions enacted in 2019 targeted a total of $4.5 billion worth of European food and agricultural exports (along with tariffs on $3 billion worth of aircraft exports), including whiskey and other spirits, cheeses, meats, and other processed food products, wine exports alone accounted for an entire third of this value (Congressional Research Service, 2020), suggesting that wine was a highly prominent target for these punitive duties. In identical fashion, in late 2020 the European Union announced intentions to impose retaliatory tariffs on nearly $4 billion of imported US products over government support for Boeing, including a 25% tariff on American wine exports worth $422 million.[3] In March of 2021, the United States and European Union agreed to pause the implementation of the latest round of tariffs, and in June the two sides reached a truce that suspended the retaliatory measures for the next five years. Thus, only the US tariffs on European wine exports of less than 14% alcohol were ever enacted. Nonetheless, with annual wine trade between the two

[3] Other US food and agricultural products targeted by EU retaliation included peanut butter, orange juice, and cotton.

sides numbering in the billions of dollars, the tariffs (if fully implemented in their threatened scope) promised to cause significant harm to an important trading relationship.

Retaliation and cross-retaliation in wine trade has not been confined to conflicts between the United States and the European Union. The US-China trade war that began in 2018 saw China impose tariffs of 25% (on top of its existing 14% MFN tariff rate) on American wine exports. Though wine was not the central focus of this dispute or China's retaliation, the duties were followed by a decline in annual US wine exports to China of $19.5 million from 2017 to 2018 (a roughly 29% decrease in export value), which fell by an additional $23 million in 2019. Even with a truce between the countries resulting from the Phase One trade deal in 2020, duties on US wine exports have remained in place to date.

Also, in late 2020, the ad valorem tariffs of up to 212% imposed by China on Australian wine imports – ostensibly enacted as an anti-dumping measure – jolted the Australian wine sector, as China is the largest foreign market for Australian wine sales and wine is Australia's third most exported agricultural product to China after beef and lamb (and Australia's 15th-most exported product overall to China by 4-digit HS code). While Chinese authorities enacted the tariff (without WTO authorization) based on their claims of dumping by the Australian wine industry, it has been speculated that the tariffs (along with other restrictions on Australian exports of red meat, barley, and seafood) were imposed because of broader political tensions between the two countries (Hufbauer and Jung, 2020). And while Australian meat exports encountered retaliatory Chinese duties of 12% and barley exports faced duties of 80%, these tariffs were arguably small compared to the ones imposed on wine.

Thus, while the highlighted disputes have encompassed many agricultural products and widespread cross-sectoral retaliation, it is clear that wine has been subjected to heavier barriers than many other products. Further, while the adverse impacts of tariffs are well known, limited quantitative evidence exists on the welfare and trade consequences of the complete array of existing tariff barriers or tariff retaliation in the multi-billion-dollar international wine trade. In light of this, the objectives of this study are twofold. First, we econometrically estimate a structural gravity model of bilateral wine trade to quantify the impact of tariffs on trade utilizing a detailed set of both MFN and bilateral preferential tariff rate data, while also accounting for the role of non-tariff determinants of wine trade. From this, we are able to determine the role of bilateral trade policies (including tariffs as well as preferential trade agreements) in shaping global wine trade. Second, based on the estimates from the econometric model and the underlying theoretical gravity framework, we simulate several policy counterfactuals to assess the impacts of both cross-retaliation on wine imports and tariff liberalization.

Our work contributes to the wide literature on agricultural trade policy. Many previous studies have examined the impacts of tariff and non-tariff policies in a gravity setting, for example, Lambert and McKoy (2009), Reimer and Li (2010), Sun and Reed (2010), Hejazi et al. (2017), and Luckstead (2022). We also add to the growing body of research examining the trade and welfare impacts of recent instances of strategic protectionism and cross-retaliation in trade, for instance, Freund et al. (2018), Grant et al. (2019), and Fajgelbaum et al. (2020). However, these studies do not focus specifically on the wine sector.

The literature on trade, policy, and related issues in the international wine market is also large and well established. Much of this work describes the market dynamics of the global wine industry, highlighting the unique and evolving attributes of the industry as they relate to production, consumption, and trade (see, for example, Anderson et al. 2003; Cusmano et al. 2010; Anderson and Wittwer 2013, 2015). This literature has often emphasized the wide range of tariff and non-tariff barriers that impact wine trade, the latter of which include factors that are of pronounced relevance for wine, including regulations such as SPS standards, TBTs, labeling and certification requirements, geographical indications, and others.[4] In this vein, Olper and Raimondi (2008) consider the collective roles of tariffs, NTMs, and domestic support programs in shaping trade in wine and other processed food products. Dal Bianco et al. (2016) analyze wine trade barriers, including both MFN tariffs and NTMs, for 12 major countries. Our study builds on this literature by considering both non-discriminatory (MFN) and bilateral (preferential) tariffs and counterfactual analyses of retaliatory tariffs and trade liberalization.

Given the prominence of the European Union in global wine trade, several studies have investigated the role of various EU policies and international agreements in shaping international wine trade. Along these lines, Anderson and Wittwer (2018) analyze the expected impacts of Brexit and proposed trade agreements between the United Kingdom and other countries on UK wine trade. Scoppola et al. (2018) consider the trade-creating effects of the European Union's trade agreements with non-EU countries on EU agricultural and food trade, including trade in wine. Recent work by Cipollina and Salvatici (2020) investigates EU tariffs on imports of agricultural and food items, focusing in particular on the European Union's preferential and Generalized System of Preferences (GSP) tariff rates. Our study extends these analyses by considering a global wine market with 102 countries.

[4] See Meloni et al. (2019) for a recent survey of domestic regulations and NTMs related to wine production and trade.

Most existing studies of wine trade focus on only a small subset of trading countries or consider wine as part of wider analyses. Rickard et al. (2018) examine the impacts of bilateral tariffs by focusing on trade between the United States and Europe. Macedo et al. (2020) employ a gravity model to analyze Portugal's exports of port wine to 60 trade partners. Castillo et al. (2016) adopt a gravity framework to analyze the wine trade and market dynamics of 9 exporting countries and 14 importing countries. Other recent work by Greear and Muhammad (2021) estimate a demand system to analyze the impacts of tariff liberalization on Japanese wine imports from a selection of Japan's major trading partners. Our study shares similarities with Raimondi and Olper (2011), who utilize a gravity framework to investigate the trade-creating and trade-diverting effects of tariff liberalization for a broad assortment of food and agricultural items, including wine (though measured at a higher level of product aggregation than our analysis). Most recently, Zhang et al. (2021) investigate the impacts of US tariffs on European wine exports enacted under the US-EU trade dispute; however, their demand-based analysis focuses solely on impacts on US consumers.

In contrast with existing work, our study offers a comprehensive, theoretically grounded analysis of the entire global wine trade in which we account for the bilateral trade of most countries engaged in wine trade, and define the wine products in our analysis at a comparatively disaggregated level. In this regard our work extends the broader agricultural trade literature on tariffs and other trade policies by fully exploiting the structural foundations of our econometric model based on recent advances in empirical trade modeling (e.g., the work of Anderson et al. 2018), which we describe in more detail below.

Our study is also one of the first to incorporate detailed product-level tariff data (including preferential tariff rates) at the bilateral level for this many trading countries in a gravity framework. This level of detail allows us to estimate an econometric model that captures effectively all of the relevant determinants of trade and that generates theoretically consistent estimates of trade elasticities and policy impacts. As our study is the first in the literature on trade in food and agriculture to both (1) implement a theoretically consistent structural gravity approach at a detailed commodity level that uses detailed tariff data, and (2) use the econometric estimates to undertake general equilibrium counterfactual simulations, our analysis thus provides a useful framework for researchers analyzing tariff impacts for other agricultural commodities in a gravity setting.

Our results offer strong evidence that import tariffs are a significant deterrent to wine trade, with the trade elasticity estimated to be –1.17 and –0.71 for bottled and bulk wine, respectively. Based on this estimate, we analyze two recent instances of tariff retaliation in international wine trade: the tariffs proposed as part of the broader trade dispute between the United States and the European Union, and the ongoing trade conflict between China and Australia. We show that these recent instances of collateral retaliation in wine imports have led to (or threaten to lead to) substantial losses, with $190 million in lost trade for the US-EU dispute and $149 million for the China-Australia dispute, for a total of $339 million annually in trade destruction – i.e., trade that no longer takes place, and which is not reallocated to other sources or destinations. Collateral retaliation has also been responsible for significant trade diversion in the wine sector, as imports from sources facing tariffs tend to be substituted with imports from sources facing lower or zero tariffs. Our policy counterfactual simulations also show that complete trade liberalization would generate substantial benefits, equivalent to a roughly 4% trade-weighted average increase in the welfare of wine consumers. These welfare increases are significantly larger for consumers in many large developing countries which currently maintain inordinately high tariff rates, such as India, Brazil, and Thailand.

The remainder of the paper proceeds as follows. In section 2, we describe our empirical strategy, detailing the structural gravity framework that underpins our analysis and the results of our econometric estimation. In section 3, we use the results of our econometric analysis as the basis for simulating several policy counterfactuals on barriers to international trade in wine to assess the impacts of these barriers on trade and welfare. In section 4, we discuss the broader implications of our analysis as they relate to trade disputes and international trade policy. Lastly, section 5 offers concluding remarks.

2. Gravity Framework and Econometric Analysis

In this section, we introduce the theoretical gravity structure that guides our analysis, which we use to develop an empirical gravity equation of bilateral trade. We then describe our data on bilateral trade and tariffs used in the empirical analysis and present the results of our econometric estimation, the estimated parameters from which serve as the basis of the counterfactual analysis that follows.

2.1 Model

We base our approach on the canonical structural gravity framework described by Head and Mayer (2014) and Yotov et al. (2016), which is founded on a standard CES-Armington setting. The structural gravity equation is given by

$$(1) \quad X_{ijt}^{k} = \frac{Y_{it}^{k} Y_{jt}^{k}}{Y_{t}^{k}} \left(\frac{\phi_{ijt}^{k}}{\Pi_{it}^{k} P_{jt}^{k}} \right)^{1-\sigma^{k}} .$$

Here, X_{ijt}^k is the value of exports from i to j of commodity k (bottled wine or bulk wine) in year t and is a function of i's total production and j's total consumption (with $Y_{it}^k = \sum_j X_{ijt}^k$ and $Y_{jt}^k = \sum_i X_{ijt}^k$, both of which contain terms for intra-national trade, i.e., X_{ijt}^k for $i = j$), total world output Y_t^k, and trade cost terms reflecting bilateral (ϕ_{ijt}^k) and multilateral (Π_{it}^k and P_{jt}^k) barriers to trade.[5] The latter two terms are the outward and inward "multilateral resistance" terms, first characterized in Anderson (1979), defined as

$$(2) \qquad \Pi_{it}^{k\,1-\sigma^k} = \sum_j \left(\frac{\phi_{ijt}^k}{P_{jt}^k}\right)^{1-\sigma^k} \frac{Y_{jt}^k}{Y_t^k} \quad \text{and} \quad P_{jt}^{k\,1-\sigma^k} = \sum_i \left(\frac{\phi_{ijt}^k}{\Pi_{it}^k}\right)^{1-\sigma^k} \frac{Y_{it}^k}{Y_t^k}.$$

As described by Anderson and Yotov (2010), Π_{it}^k and P_{jt}^k (the latter of which is also equal to the CES ideal consumer price index) capture the incidence of all the trade costs in the trading system facing exporters in i and importers in j, respectively. Crucially, and of particular relevance in analyzing trade in wine, these terms fully account for the effects of any time-varying and non-discriminatory NTMs maintained by exporters and importers. As we will account for these terms in the estimation through the use of fixed effects, we will therefore be able to implicitly control for the role of these policies in influencing bilateral trade volumes. Finally, σ^k is the commodity-specific elasticity of substitution, which measures the substitutability of wine from different sources.[6]

Because our primary focus is on estimating the impacts of bilateral trade policies, we model the ϕ_{ijt}^k term as an exponential function of time-varying trade policy variables and time-invariant factors:

$$(3) \qquad \phi_{ijt}^k = \exp\left\{\log\left(1 + \tau_{ijt}^k\right) + \alpha^k PTA_{ijt} + \lambda_{ij}^k\right\}.$$

Here, τ_{ijt}^k is the ad valorem (or ad valorem equivalent) tariff rate imposed by importer j on wine type k from exporter i; because tariffs uniformly increase the price of imports, changes in bilateral trade costs are exactly proportional to changes in tariffs. PTA_{ijt} is an indicator variable equal to one or zero reflecting i and j's common membership in a preferential trade agreement (PTA), with associated coefficient α^k. We include the PTA variable to account for

[5] We estimate our model and perform our counterfactual simulations separately for the two commodities; however, we maintain the commodity k notation to make clear the commodity-specific nature of the analysis.

[6] We differentiate varieties of wine at the country level (rather than the product level) because no systematic data on trade and tariffs exists below the 6-digit Harmonized System commodity level. Many of the existing studies that consider the entire global trade in wine, such as Raimondi and Olper (2011), take a similar approach; however, most of these studies generally define products at even higher levels of aggregation, such as by 4-digit Harmonized System subheading.

non-tariff determinants of trade costs generated by countries' shared membership in trade agreements, such as the country-specific application of NTMs enacted under preferential trade agreements – for instance, regulatory harmonization of SPS and TBT measures, or mutual recognition and protection of geographical indications for wine varieties.[7] The fixed effect λ_{ij}^k is an essential element, as it accounts for both observable (e.g., the geographical distance between two partners, whether they share a common language or contiguous border, etc.) and unobservable time-invariant determinants of bilateral trade costs. As shown in Egger and Nigai (2015), λ_{ij}^k more accurately measures long-run bilateral trade costs than traditionally used variables. Because they capture all time-invariant bilateral factors, the λ_{ij}^k terms also account for time-invariant differences in international versus intra-national trade (i.e., border effects; see Yotov et al., 2016). Further, as argued by Baier and Bergstrand (2007), λ_{ij}^k also addresses potential endogeneity/reverse causality in the τ_{ijt}^k and PTA_{ijt} variables highlighted in Trefler (1993) and others. Such reverse causality might reflect, for example, the notion that countries which maintain high levels of trade with one another are potentially more likely to maintain low tariffs or enter into a preferential trade agreement.

As shown in the pioneering work of Santos-Silva and Tenreyro (2006), log-linearized versions of equation (1) estimated using OLS tend to produce inconsistent parameter estimates under heteroskedasticity. Furthermore, the logarithmic form of trade flows on the left-hand side of OLS gravity models necessarily excludes zero-trade flows, creating another source of potential bias. Consequently, following what has become standard in the empirical trade literature, we estimate equation (1) using Poisson pseudo-maximum likelihood (PPML) estimation. After substituting equation (3) into equation (1) and incorporating a stochastic component, our estimating equation is given by

$$X_{ijt}^k = \exp\left\{\beta_{0,t}^k + \beta_1^k \log\left(1+\tau_{ijt}^k\right) + \beta_2^k PTA_{ijt} + \gamma_{it}^k + \delta_{jt}^k + \eta_{ij}^k\right\} + \epsilon_{ijt}^k, \tag{4}$$

where $\beta_{0,t}^k = -\log\left(Y_t^k\right)$ is an intercept term equal to world output Y_t^k, $\beta_1^k = \left(1-\sigma^k\right)$ and $\beta_2^k = \left(1-\sigma^k\right)\alpha^k$ are coefficients, $\gamma_{it}^k = -\left(1-\sigma^k\right)\log\left(\Pi_{it}^k\right) + \log\left(Y_{it}^k\right)$ and $\delta_{jt}^k = \log\left(Y_{jt}^k\right) - \left(1-\sigma^k\right)\log\left(P_{jt}^k\right)$ are fixed effects that capture the Y_{it}^k, Y_{jt}^k, Π_{it}^k, and P_{jt}^k terms, $\eta_{ij}^k = \left(1-\sigma^k\right)\lambda_{ij}^k$ is a country-pair fixed effect, and ϵ_{ijt}^k is a mean-zero error.

The coefficient of interest is the trade elasticity β_1^k (which, as implied by equation (3), is equal to $1-\sigma^k$), and reflects the bilateral (or partial) impacts of tariffs on trade. The

[7] Many trade agreements implement country-specific streamlined NTM policies. For instance, the framework for the recent United Kingdom-EU Trade and Cooperation Agreement "provides for simplified certification, documentation, labeling and packaging requirements for the imports of wine produced in the other Party."

terms γ_{it}^k and δ_{jt}^k, however, are of equal importance, and reflect the multilateral impacts of tariffs and other trade barriers. Their inclusion explicitly accounts for the structural multilateral resistance terms, and as has been shown in the literature (e.g., Anderson and van Wincoop 2003), the omission of these terms leads to substantial bias in estimates of policy impacts. The estimates $\widehat{\gamma_{it}^k}$ and $\widehat{\delta_{jt}^k}$ obtained from our regression will also be central to our counterfactual analysis because they can be used to recover estimates of the underlying structural multilateral resistance terms ($\Pi_{it}^{k^{1-\sigma^k}}$ and $P_{jt}^{k^{1-\sigma^k}}$), with which we can simulate third-party or trade creation/trade diversion impacts of changes in trade policy, as described in the next section.[8]

2.2 Data and Econometric Estimation

The bilateral trade data (from CEPII's BACI dataset) covers the years 2003 to 2018 for the 6-digit Harmonized System (HS) commodities 220421 (bottled wine) and 220429 (bulk wine).[9] The sample includes bilateral trade for 102 wine-trading countries (listed in appendix Table A1), which together account for effectively all (more than 99%) of the global trade in wine.

As discussed previously, many empirical studies of the international wine market focus only on major producing and consuming countries, or combine less-major countries' demand and supply into a rest-of-world aggregate. While it is true that global wine production is largely concentrated in several major producing countries, consumption patterns are much more varied; to illustrate, 48 different countries undertook wine imports in excess of $50 million as of 2018. Given the availability of suitable data, we therefore consider a broad set of countries in order to capture potentially important adjustments in consumption dynamics in response to policy changes. Related to this point, many countries – often, large and rapidly growing developing countries such as (as mentioned earlier) India, Brazil, Thailand, and others – maintain sizable, borderline-prohibitive import barriers which are likely to contribute to such countries' observed low levels of consumption. Therefore, in order to assess the degree to which trade liberalization is likely to impact consumption in such markets, it is crucial that a comprehensive set of countries be included in the analysis, despite their apparent insignificance in the world market.

[8]Note that these terms also implicitly control for other one-sided determinants of trade such as market size (factors which are often captured through the use of proxies, for example, GDP or population).

[9]We begin our sample in the year 2003 because the available tariff data prior to the early 2000s is significantly less comprehensive, in that the tariff rates for many countries are not reliably reported in the TRAINS database in prior years. We choose 2018 as the terminal year for the sample because this is the most recent year for which we have comprehensive data on tariff rates and intra-national trade values.

Because the gravity structure hinges on the inclusion of intra-national trade (X^k_{ijt} for $i = j$, i.e., countries' purchases-from-self), we impute these flows using data from FAO (2021) by subtracting the value of total wine exports from total production (following Borchert et al. 2021) for each country in each year.[10] We then assign these values of intra-national trade to bottled versus bulk wine based on the share of each commodity in each country's total wine exports. Following Baier and Bergstrand (2007), we use data at three-year intervals to account for non-instantaneous adjustment to trade policy; as described in Trefler (2004) and Olivero and Yotov (2012), bilateral trade data pooled over consecutive years often produces inaccurate estimates of the impacts of bilateral trade policies.[11]

We estimate equation (4) separately for the two wine types because international trade for these commodities differs considerably (Mariani et al., 2012) implying trade policy is likely to have differential impacts on bottled wine versus bulk wine.[12] Our tariff data is based on MFN and preferential tariff rates reported in the WITS TRAINS database (UNCTAD, 2021), and information on preferential trade agreement membership is taken from the US International Trade Commission's gravity variable dataset; see Gurevich and Herman (2018). Our data therefore encompasses the non-discriminatory tariffs applied by those importers to every partner with which they maintain MFN status, and preferential tariff rates between member countries who are party to preferential trade agreements, Generalized System of Preferences regimes between advanced and developing economies, and any other type of preferential tariff relationship in wine.

[10]Using this identity, the imputed intra-national trade flows of several countries take negative values when the value of exports is larger than the value of production, which we observe for 250 out of the total 612 annual observations of intra-national trade over the period of 2003 to 2018 (measured at three-year intervals) for the 102 countries in our sample. In such instances, we record the value of intra-national trade as zero for countries that export but do not produce any wine (a situation that characterizes 216 of the 250 negative values, and which typically occurs for re-exporters such as the Netherlands and Singapore). A smaller number of observations (34 out of the 250) indicate negative values for intra-national trade despite the country maintaining non-zero values of production. Effectively all of these observations represent wine re-exporters that produce negligible quantities of wine and/or whose domestic production is destined almost entirely for foreign markets, e.g., Belgium, Israel, Latvia, Lithuania, and the United Kingdom. In such cases, we also record intra-national trade as zero, though in reality there are potentially small amounts of sales of domestically produced wine that take place in these markets.

[11]We test the robustness of this specification by also considering samples defined at four-year and five-year intervals; see appendix Table A2.

[12]Specifically, while bottled wine (defined as wine in containers of two liters or less) is typically sold for final consumption, bulk wine (defined as wine in containers more than two liters) is internationally traded for a variety of purposes, including final consumption, local re-bottling/further processing, or for mixing with locally produced wine. Production and exports of bulk wine are also much more geographically concentrated than bottled wine, leaving importers and consumers with fewer options for substituting to different sources of the good. It is for these reasons that we anticipate that the two markets are driven by different factors which are likely to engender differing responses to changes in trade policy.

Our tariff data thus offers a significant level of detail that is worth highlighting. The tariff variable τ^k_{ijt} contains information on 6-digit commodity-specific, country-pair specific ad valorem (or ad valorem equivalent, when available) tariff rates.[13] This implies that our tariff data reflects both MFN rates as well as all preferential tariff rates reported in the TRAINS database for each of the 102 countries in our analysis, implying 10,302 (= 102×101) bilateral tariff rates for each commodity and each year in the analysis. Comparatively few existing studies incorporate tariff data with this level of granularity at the commodity-level or for more than a handful of countries (and generally focus mostly on high-income countries), and this enables us to conduct product-specific analyses of trade policy impacts, an essential consideration in light of the highly targeted nature of tariff retaliation in the wine market.

Table 2: Summary Statistics

Variable	**Mean**	**Std. dev.**	**Min**	**Max**
International trade flows (X^k_{ijt} for $i \neq j$)				
Bottled wine (million USD)	4.8	40.4	0.0	1,320.3
Bulk wine (million USD)	1.4	8.7	0.0	261.8
Intra-national trade flows (X^k_{ijt} for $i = j$)				
Bottled wine (million USD)	672.0	1,816.8	0.0	11,321.3
Bulk wine (million USD)	96.0	279.3	0.0	2,241.7
Tariff rates, % (τ^k_{ijt})				
Bottled wine	28.2	132.8	0.0	1,800.0
Bulk wine	42.2	150.1	0.0	1,823.8
Preferential trade agreement (PTA_{ijt})	0.4	0.5	0.0	1.0

Notes: Based on observations at three-year intervals over the period 2003–2018. Mean tariff rates are calculated as simple averages.

Summary statistics for the data are presented in Table 2. Apparent from the table is that both intra- and international trade in bottled wine tend to be substantially larger than in bulk wine, while bulk wine faces higher tariffs on average. We also observe average tariff rates for both products that tend to be higher than for many other agricultural products, along with substantial variation in these rates. While a large number of trade takes place under zero or low tariffs (as evidenced by the average value of 0.4 for the PTA variable) some countries (generally, predominantly Muslim countries such as Egypt, Indonesia, and Malaysia) maintain tariff rates in the hundreds or thousands.[14]

[13] Note that while some countries impose per-unit tariffs on wine products (which may generate impacts on trade values different from those of ad valorem duties; see Curzi and Pacca 2015; Emlinger and Lamani 2020), the TRAINS database reports ad valorem equivalents of per-unit tariffs. Therefore, all tariffs – both ad valorem and ad valorem equivalent – are captured in one variable.

[14] There is also substantial variation in tariff rates between trading partners (not apparent from the table)

Table 3 presents the results from the estimation of equation (4).[15] Trade elasticities are approximately equal to –1.2 for bottled wine and –0.7 for bulk wine. Each of the estimated tariff coefficients are significant and align with both intuition and existing findings from the literature on trade cost elasticities. For example, our estimates are similar to the trade elasticity for beverages of –0.9 estimated by Philippidis et al. (2013). Preferential trade agreements are associated with higher levels of trade, with shared trade agreement membership corresponding to average increases in bilateral trade of 20.2% ($= \exp(0.184) - 1$) and 129.3% ($= \exp(0.830) - 1$), though only the latter estimate is statistically significant.[16]

While the finding on the insignificance of the former estimate is perhaps surprising, the result suggests that the tariff-reducing impacts of trade agreement membership (as captured directly by the tariff variable) account for the majority of the trade-expanding effects of PTAs. For bulk wine, however, PTA membership is found to cause large and statistically significant trade-expanding effects, conceivably due to regulatory policy harmonization (e.g., cooperation on and standardization of TBT measures) or other country-specific treatments of NTMs. This intuition aligns with recent work by Santeramo et al. (2019), who find that the impacts of TBTs (and consequently the implied effects of their harmonization or removal) are most pronounced for bulk wine.

On their own, these basic estimation results offer several insights. The parameterization of trade costs given in equation (3) above implies elasticities of substitution equal to roughly 2.2 ($\hat{\sigma}^k = 1+1.166$) and 1.7 ($\hat{\sigma}^k = 1+0.710$) for the respective commodities. These comparatively low estimates for the elasticity of substitution suggest that the substitutability of wine from different sources is relatively low. Given the considerable origin-based-differentiation between

that occurs because of changes in tariffs that took place over the course of the sample period. Many countries reduced their tariffs over time during this period, either unilaterally or as part of WTO commitments, or entered into trade agreements that significantly reduced bilateral tariff rates with their agreement partners. This further highlights the importance of combining MFN and preferential rates in the tariff data. Thus, we do not consider the sizable tariff changes in our counterfactual analyses below as significantly "out-of-sample" events.

[15]The estimation excludes singleton observations for which the bilateral-pair fixed effects perfectly predict the level of trade (generally, observations for trading pairs that never engage in trade with one another during the sample period; see Correia 2015). Consequently, the sample sizes differ between the two commodities and do not reflect the maximum potential number of observations over the sample period.

[16]We also estimate several alternative econometric specifications to verify the robustness of our results; see the subsection titled Robustness Checks in Appendix A. Specifically, we consider (1) gravity estimation without country-pair fixed effects, but with standard bilateral controls such as distance; (2) four-year time intervals for the data (2002, 2006, ..., 2018); (3) five-year time intervals for the data (2003, 2008, ..., 2018); (4) the exclusion of countries for which the majority of the population do not consume wine for religious reasons; (5) the evolution of international border effects over time to capture trends towards globalization. Our results are qualitatively unchanged in the alternative specifications (aside from (1), for reasons that we explain in our discussion of the results).

Table 3: Gravity Estimates

	(1) Bottled Wine	(2) Bulk Wine
$\log(1+\tau)$	–1.166**	–0.710**
	(0.491)	(0.326)
PTA	0.184	0.830***
	(0.142)	(0.165)
Observations	25,667	13,215
Pseudo R^2	0.997	0.991

Notes: The dependent variable is the value of unidirectional exports by commodity. Estimation method is PPML based on three-year data intervals. Estimation includes the fixed effects γ_{it}^k, δ_{jt}^k, and η_{ij}^k. Intercept is estimated but not reported. Robust standard errors clustered by bilateral country-pair are reported in parentheses. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

varieties of wine and strong country-of-origin preferences held by consumers (Balestrini and Gamble, 2006; Bruwer and Buller, 2013; Foroudi et al., 2019), the apparent low degree of substitutability is not overly surprising. Additionally, the relatively concentrated nature of global wine production means that importers and consumers have comparatively limited substitution options when suddenly faced with higher import barriers. Consequently, consumers' reluctance to substitute between wine from different source countries implies that import barriers in wine trade exert significant adverse impacts.

Our findings also contrast with existing estimates of this parameter from the literature. Simonovska and Waugh (2014) find a comparable estimate of roughly 4 across a broad and highly aggregated assortment of manufactured goods (including food manufactures), though the level of aggregation in their analysis makes a direct comparison difficult. However, Simonovska and Waugh's value roughly characterizes the approximate range of findings in the trade literature on this elasticity. Focusing on wine, Raimondi and Olper (2011) also estimate a gravity equation of trade as we do using tariff data to recover the elasticity of substitution, finding values ranging from 2.183 (obtained from a Tobit model of log-linearized trade flows) to 9.448 (from a PPML model using only non-zero trade flows). Most related to our findings are the comparable estimates of Fontagné et al. (2022), who also use tariff data and a gravity approach at the 6-digit HS level to compute elasticities of 5.14 for bottled wine and 2.32 for bulk wine, which are somewhat above our estimates.

It is important to note the key differences between our approach and those of Raimondi and Olper (2011) and Fontagné et al. (2022). Raimondi and Olper's estimates are obtained using a cross section of trade flows, obliging them to account for bilateral trade costs with standard proxies such as distance, shared borders, and common language. While Fontagné et al. adopt a panel estimation approach that incorporates exporter-year and importer-year fixed effects, they do not employ bilateral country-pair fixed effects as our specification does, and likewise use variables such as geographical distance, common border, and common language to measure long-run bilateral trade costs.[17] These approaches therefore identify the trade elasticity based on between-country-pair variation. Put differently, these other estimates of this elasticity from the literature are obtained by exploiting variation in trade flows and tariff rates across different country pairs to estimate the impacts of tariffs on bilateral trade, which may capture the role of other confounding factors that determine trade between pairs of countries. In contrast, our identification derives purely from within-country-pair variation, that is, by identifying the tariff elasticity purely through variation in tariff rates over time within individual trading relationships having conditioned on unobserved between-country-pair differences.

3. Counterfactual Simulations

To assess the implications of import barriers in international wine trade for trade and welfare, we conduct a set of counterfactual experiments that exploits the features of structural gravity estimated by PPML with theoretically consistent fixed effects. We follow the approach described in recent work by Yotov et al. (2016) and Anderson et al. (2018) which allows us to directly recover the trade and welfare impacts of counterfactual tariff scenarios from the econometric analysis. Along these lines, we simultaneously estimate the impacts of tariffs along two dimensions: the partial trade impacts that arise because of the direct effects of changes in bilateral tariffs on bilateral trading relationships, and the multilateral effects that reflect changes to the overall level of trade barriers in the global trading system, i.e., changes that occur due to adjustments in the multilateral resistance terms facing each exporter and importer. Since our sample ends in 2018, ex post counterfactual analysis is undertaken to examine the impacts of the US-EU wine tariffs, the China-Australia tariffs, and trade liberalization scenarios on trade flows and welfare.

[17] In implementing the gravity specification of Fontagné et al. using our trade and tariff data, we obtain roughly comparable estimates for both elasticities; see column 2 of Tables A2 and A3 in Appendix A.

3.1 Computing the Impacts of Tariff Changes in Structural Gravity

Before introducing the specific scenarios that we consider, we describe the link between our econometric estimates, the underlying gravity structure, and the counterfactual analysis that follows. From the estimation of equation (4) above, we obtain estimates of each of the model's parameters, including for the fixed effects $\widehat{\gamma_{it}^k}$ and $\widehat{\delta_{jt}^k}$ for each exporter and importer. Because the exhaustive set of fixed effects for each country-year combination cannot be included in the original estimation due to collinearity, a reference importing country is chosen for which its fixed effects are excluded.[18]

While fixed effects estimation has long been a standard approach to controlling for the multilateral resistance terms in gravity (Feenstra, 2004; Redding and Venables, 2004), as demonstrated by Fally (2015), the fixed effects recovered from PPML estimation of gravity are perfectly consistent with the multilateral resistance terms. Specifically, it can be shown that the outward and inward multilateral resistance terms can be expressed as

$$\text{(5)} \qquad \widehat{\Pi_{it}^{k^{1-\sigma^k}}} = Y_{j_0 t}^k Y_{it}^k \exp\left\{-\widehat{\gamma_{it}^k}\right\} \quad \text{and} \quad \widehat{P_{jt}^{k^{1-\sigma^k}}} = \frac{Y_{jt}^k}{Y_{j_0 t}^k} \exp\left\{-\widehat{\delta_{jt}^k}\right\},$$

where $Y_{j_0 t}^k$ corresponds to the total consumption expenditures of the reference importing country j_0, Y_{it}^k is the total value of sales for exporter i in time t, and Y_{jt}^k is the total value of consumption for importer j. The reference importer's inward multilateral resistance term is thus normalized to one (i.e., $\widehat{P_{j_0 t}^{k^{1-\sigma^k}}} = 1$).

The multilateral resistance terms in equation (5) are used in conjunction with observed values of output ($Y_{it}^k = \sum_j X_{ijt}^k$), expenditures ($Y_{jt}^k = \sum_i X_{ijt}^k$), trade flows, and the trade policy variables to represent the baseline scenario (i.e., the current trade situation absent any retaliatory tariffs or trade liberalization). In the counterfactual alternative scenarios, we re-estimate the importer-time and exporter-time fixed effects under the new policy setting and then recompute the counterfactual multilateral resistance terms, which are used in conjunction with the partial trade impacts to predict counterfactual bilateral trade flows. The counterfactual trade flows are compared to the baseline trade flows to assess the impacts of particular tariff scenarios. In both scenarios, we estimate what Head and Mayer (2014) term the "modular" trade impacts, i.e., the impacts of changes in trade policy on bilateral

[18]None of the results are affected by the choice of reference country, though the choice matters for the interpretation of the relative welfare impacts. We choose Norway as the reference country because the country does not export significant amounts of wine, and currently maintains relatively low tariffs on wine (and thus does not experience large changes in trade in the trade liberalization scenario).

trade flows and welfare holding global output and expenditures fixed.[19]

Specifically, the simulation utilizes the counterfactual values of $\widetilde{\tau_{ijt}^k}$ corresponding to (1) tariff retaliation and (2) trade liberalization scenarios, described in more detail below. Then, based on $\widetilde{\tau_{ijt}^k}$, we then re-estimate equation (4) as before, but constraining the parameter values on the non-γ_{it}^k and δ_{jt}^k terms to be equal to the estimates obtained earlier (denoted by $\widehat{\beta_{0,t}^k}$, $\widehat{\beta_1^k}$, $\widehat{\beta_2^k}$, and $\widehat{\eta_{ij}^k}$):

$$(6) \quad X_{ijt}^k = \exp\left\{\widehat{\beta_{0,t}^k} + \widehat{\beta_1^k}\log\left(1+\widetilde{\tau_{ijt}^k}\right) + \widehat{\beta_2^k}PTA_{ijt} + \gamma_{it}^k + \delta_{jt}^k + \widehat{\eta_{ij}^k}\right\} + \epsilon_{ijt}^k.$$

The new estimates of γ_{it}^k and δ_{jt}^k obtained from estimation of equation (6), which we denote by $\widetilde{\gamma_{jt}^k}$ and $\widetilde{\delta_{jt}^k}$, are interpreted as the counterfactual fixed effects that are consistent with observed output and expenditures in the data, but under the counterfactual tariff regime. Using these new fixed effects and equation (5), the counterfactual multilateral resistance terms $\widetilde{\Pi_{it}^{k^{1-\sigma^k}}}$ and $\widetilde{P_{jt}^{k^{1-\sigma^k}}}$ are calculated, which reflect the multilateral barriers to trade that ensure that the predicted patterns of trade in the alternative scenario are consistent with the counterfactual level of tariffs, $\widetilde{\tau_{ijt}^k}$.

Thus, based on the baseline and counterfactual values of tariff rates (τ_{ijt}^k and $\widetilde{\tau_{ijt}^k}$, respectively) and multilateral resistance terms ($\widehat{\Pi_{it}^{k^{1-\sigma^k}}}$ and $\widehat{P_{jt}^{k^{1-\sigma^k}}}$), the parameterization of trade costs in equation (3), and the original gravity relationship in equation (1), predicted values of bilateral trade in the counterfactual scenario can be expressed as

$$(7) \quad \widetilde{X_{ijt}^k} = \left(\frac{1+\widetilde{\tau_{ijt}^k}}{1+\tau_{ijt}^k}\right)^{1-\sigma^k}\left(\frac{\widehat{\Pi_{it}^k}\widehat{P_{jt}^k}}{\widetilde{\Pi_{it}^k}\widetilde{P_{jt}^k}}\right)^{1-\sigma^k} X_{ijt}^k,$$

from which we can obtain counterfactual total exports and imports as, respectively, $\widetilde{X_{it}^k} = \sum_{j\neq i}\widetilde{X_{ijt}^k}$ and $\widetilde{X_{jt}^k} = \sum_{i\neq j}\widetilde{X_{ijt}^k}$. Note that equation (7) contains terms reflecting both the partial (i.e., bilateral) trade impacts (arising from changes in τ_{ijt}^k, the bilateral tariff rate) and multilateral trade impacts (arising from changes in the multilateral resistance terms), the latter of which impact trading relationships even for trading pairs that do not change their tariffs on one another (as seen in equation (2)) in the counterfactual scenario.

[19] While global wine production would conceivably adjust in response to the trade policy changes that we analyze – a setting that Head and Mayer (2014) describe as a "full endowment" general equilibrium scenario – the fact that wine typically takes at least a year to be produced implies that the response would not be immediate. Our analysis thus focuses on the reallocative effects of tariff policy on existing world supply and demand for wine. Our results do not substantively change when we analyze the full endowment scenario.

The final component of the analysis involves the calculation of welfare impacts, which are measured using changes in real expenditures and calculated in terms of changes in the consumer price index:

$$(8) \qquad \widetilde{W_{jt}^k} = \frac{\widehat{P_{jt}^k}}{\widetilde{P_{jt}^k}}.$$

Here, $\widetilde{W_{jt}^k}$ denotes the relative welfare level in the baseline versus the counterfactual scenario, in which the price indices are calculated based on the relationship in equation (5) and the values of σ^k implied by the original estimation. Note that equation (8) must be interpreted as being relative to the reference importer country. Because the reference importer's fixed effect is excluded from the estimation, the other importers' fixed effects – and thus the $\widehat{P_{jt}^k}$ and $\widetilde{P_{jt}^k}$ terms for each country – have the interpretation of being relative to the reference country.

3.2 The Impacts of Retaliation

The objective of the first set of counterfactuals is to assess the impacts of recent episodes of tariff retaliation, an important analysis given the outsize role that wine has played as a target in many recent trade disputes (as elaborated in the discussion from earlier describing the specific disputes that we highlight). We primarily focus on the collateral tariffs announced and partially enacted as part of the ongoing trade conflict between the United States and the European Union over subsidies to aircraft producers, because of both the enormous volume of trade between the two sides and the front-and-center role of wine in this dispute. While the dispute reached a truce in mid-2021 and the retaliatory duties were removed (in the case of the US tariffs on wine less than 14% ABV) or postponed indefinitely (in the case of the US tariffs on wine greater than 14% ABV, and the EU tariffs on US wine exports), the role of wine as a favorite target for retaliation in this trading relationship is nonetheless important to consider. We further consider the impacts of another major and recent instance of retaliation in wine trade, the China-Australia anti-dumping dispute. Though smaller in scope, this episode has nonetheless had significant implications for trade between the two countries, as well as other countries that have been indirectly impacted.[20]

As described in Table 1 above, the dispute between the United States and the European Union over subsidies to Boeing and Airbus led to announcements of 25% tariff rates on both regions' wine imports from one another on top of existing MFN duties.[21] While both sides

[20] To conduct the ex post analyses, we estimate the baseline and counterfactual scenarios using the most recent year in our trade data (2018).

[21] The original retaliatory action against EU wine exports by the United States in October 2019 covered

otherwise maintain comparatively low tariff rates on bottled wine (with average MFN ad valorem rates of around 3–4%), tariffs on bulk wine are considerably higher (with average MFN rates of between 17–20%). In either case, an additional 25% tariff makes imports significantly more costly, and based on the estimated tariff elasticities shown in Table 3, we should anticipate sizable reductions in trade to result.

The results of this analysis for the involved countries as well as significantly impacted "bystander" countries are presented in Table 4. For brevity, we present the detailed trade and welfare results for all countries for the respective analyses in the appendix; see Appendix B for the US-EU and China-Australia dispute scenario results. In our initial discussion, we primarily focus on the cumulative results across the two commodities, and to calculate the impacts on aggregate trade, we sum the predicted impacts on bilateral trade described in equation (7) above.

Focusing first on the conflict between the United States and the European Union, we find that the dispute (in its threatened scope) would lead to significant disruptions to trade – a roughly $189.7 million decline in annual wine trade when aggregated across all 102 countries in the analysis (see appendix Table B1). The countries directly involved in the dispute (the United States, France, and Germany) bear the brunt of these impacts, with respective cumulative export losses of $101.7, $73.5, and $4.8 million, and similar figures arise for their imports. And while the exports of other countries (Portugal and New Zealand) increase to varying degrees to meet the excess demands that arise in the affected markets, these positive reallocations of trade in response to the tariffs are paltry compared to the tariffs' trade-reducing effects. Furthermore, these third-party impacts are mediated entirely by changes in the multilateral resistance terms, because the bilateral tariff rates for these third-party relationships remain unchanged.

Because they partly reflect the reallocation of exports to destinations that are not part of the dispute (for instance, our finding that France substantially increases its exports to markets such as Canada, China, and Japan), the aggregate impacts presented in Table 4 obscure the extent to which the 25% tariff leads to significant trade destruction. Considering the specific impacts at the bilateral level, which are depicted in Figure 1, reveals these impacts

wine from France, Germany, Spain, and the United Kingdom. Because the United Kingdom completed its withdrawal from the European Union in January 2020, British wine exports (which have historically mostly constituted re-exported wine from the country's former fellow EU members) were no longer subject to the retaliatory duty, and we thus do not consider US retaliatory tariffs on wine exports from the United Kingdom in this analysis. Though the US tariffs on wine containing more than 14% and the EU tariffs on US wine exports were suspended before their implementation, we nonetheless simulate the impacts of these tariffs to model the effects of the dispute in its announced scope.

Table 4: Summary of Impacts of Tariff Retaliation on Aggregate Trade and Welfare

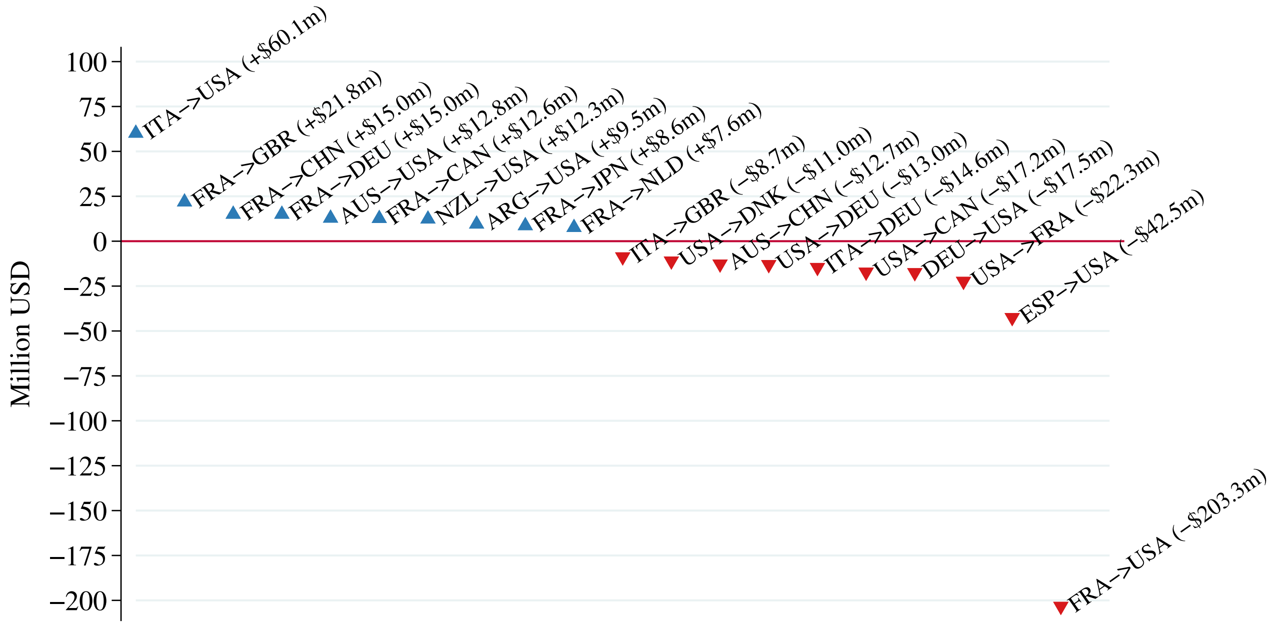
	ΔExports (million $)			**ΔImports (million $)**			**%Δ Consumer Welfare**		
	Bottled Wine	Bulk Wine	*Total*	Bottled Wine	Bulk Wine	*Total*	Bottled Wine	Bulk Wine	*Weighted Total* *
US-EU dispute (25% tariff in both directions)†									
United States	–97.9	–3.9	*–101.7*	–135.4	–8.4	*–143.8*	–5.4	3.5	*–4.1*
France	–71.6	–1.8	*–73.5*	–35.1	–1.4	*–36.5*	2.0	–0.1	*1.8*
Germany	–4.8	0.0	*–4.8*	–6.7	0.3	*–6.4*	–0.3	–0.7	*–0.4*
Spain	–2.8	0.3	*–2.5*	–2.4	0.1	*–2.3*	1.8	0.0	*1.3*
Portugal	1.8	0.0	*1.8*	1.2	0.1	*1.3*	–0.3	0.0	*–0.2*
New Zealand	3.3	0.1	*3.4*	0.7	0.0	*0.7*	–1.5	1.6	*–0.8*
China-Australia dispute (212% Chinese tariff on Australian exports)									
Australia	–142.9	–7.4	*–150.3*	–38.1	–1.4	*–39.4*	12.3	6.9	*11.3*
China	–1.5	0.0	*–1.4*	–97.2	–8.0	*–105.2*	–10.8	–16.6	*–11.0*
Chile	7.5	–0.2	*7.3*	0.1	0.1	*0.2*	–1.4	–4.2	*–1.9*
New Zealand	9.0	0.4	*9.4*	3.7	0.4	*4.1*	6.0	3.5	*5.5*
United States	10.5	–0.6	*9.9*	–9.3	1.1	*–8.2*	1.1	1.2	*1.1*

Notes: Changes in exports and imports indicate changes in aggregate trade. Results are presented for the directly involved disputant countries and other countries with significant changes (greater than $2 million) in trade.

*Calculated as the import-share-weighted average of the welfare impacts across the two commodities by country.

†The US tariff applies only to imports from France, Germany, and Spain, as the United Kingdom withdrew from the European Union in 2020.

Figure 1: Trading Pairs with the Largest Increases and Decreases in Trade in US-EU Dispute Scenario



Note: Values are cumulative across bottled wine and bulk wine.

more completely. We focus here on the trading relationships with the ten largest increases or decreases in trade.[22] Exports from France, Spain, and Germany to the United States fall precipitously (–$203.3, –$42.5, and –$17.5 million, respectively), amounting to nearly 20% declines relative to the typical annual wine trade between these countries. The corresponding fall in US exports to the European Union is smaller (–$69.3 million, or 14% of annual exports, when summed across all EU member countries) owing to the smaller volume of trade in this direction, though this figure still corresponds to substantial losses in export revenues. Notably, Italy's wine exports to the United States increase precipitously (an anticipated $60.1 million) in this scenario. Because the US tariff actions on European exports spared Italian wine (though other Italian products, including various cheeses and cured meats, were targeted), the US tariff retaliation induces a large substitution of US imports towards Italian wine.[23]

[22]The full set of results for each bilateral trading pair are available from the authors upon request.

[23]An examination of US import statistics for 2020 (data from the US Census Bureau's USA Trade Online database) supports the prediction of significant substitution towards Italian wine exports. Compared to 2019, US wine imports from France declined 20% year-over-year, from Germany, 30%, from Spain, 11%, and from the United Kingdom, a drastic 94% (as the United Kingdom does not produce significant quantities of wine, this figure likely reflects a reduction in re-exports from other EU countries). In comparison, the value of US wine imports from Italy shrank by around 1% from 2019 to 2020, which corresponded to a large increase in Italy's share in US wine imports given the decline in imports from other EU sources. It is essential to note,

In assessing the welfare impacts of the retaliatory tariffs, defined as the change in the consumer price index relative to the reference country, the United States is the clear loser, with a 4.1% reduction in consumer welfare across both commodities.[24] By imposing a sizable tariff on imports from the country's largest sources of wine, US consumers become unambiguously worse off in terms of real income. In contrast, EU consumers generally experience marginally positive welfare impacts: though the reduction in wine exports harms producers in the tariffed countries, the resulting expansion in the domestic availability of wine leaves consumers better off. These contrasting results are largely attributable to the high market share of EU wine in the US market, and the comparatively low market share of US wine in the EU market. Consumers in other large countries with no direct involvement in the dispute benefit as well, such as Japan and China, whose consumers each experience a slight increase in welfare (see appendix Table B2). However, consumers in some other major wine-producing countries are harmed (Argentina, Chile, and New Zealand, with roughly 1–2% declines in consumer welfare), as the expansion of these countries' exports leads to reduced domestic availability.

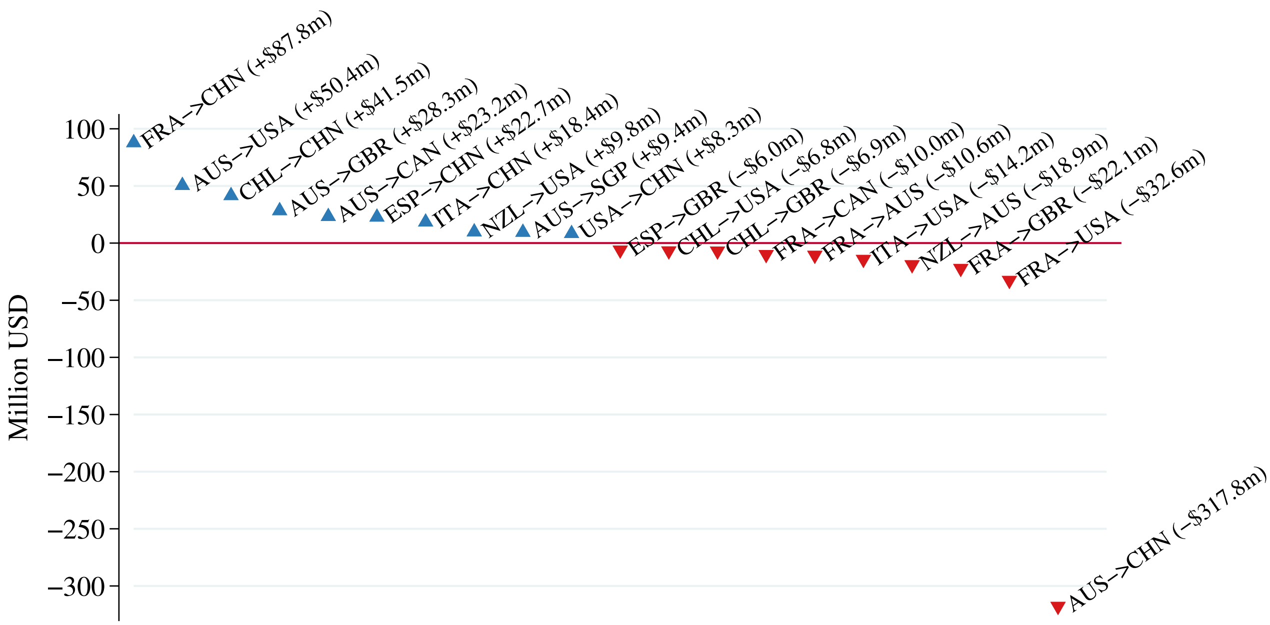
Similar findings are obtained for the analysis of the recent dispute between Australia and China. The results for this scenario on the bilateral trade relationships most affected by the dispute are depicted in Figure 2. Though the conflict only directly involves the two countries, global wine trade is estimated to decline by $148.8 million annually in this scenario (the total of the aggregate trade impacts shown in Appendix Table B3). Australia's exports to China decline dramatically as a result of the 212% tariff, with bilateral exports decreasing by $317.8 million, approximately half of the value of the annual wine trade between the two countries (a number larger than, but roughly comparable to, the observed reduction in Australia's wine exports to China of $198 million in 2021; Wine Australia 2021). Many of these exports are instead diverted to Australia's other major trading partners, such as the United States, the United Kingdom, and Canada; however, the overall negative impact on trade is unambiguous.[25] For China, imports are reduced, though exporters in other countries (France, Chile, and Spain, which increase their exports to China by $87.8, $41.5, and $22.7 million, respectively) step in to benefit from Australia's loss. The results from Table 4 show that the consumer welfare impacts likewise mirror those from the US-EU dispute, as consumers in the exporting market benefit (a commodity-share-weighted 11.3% welfare

however, that 2020 witnessed the global COVID pandemic and consequent major disruptions to world trade, which helps to rationalize the contrast between the small observed reduction in trade versus our prediction of a major expansion in Italy's exports to the United States.

[24]Calculated as the average change across the two commodities weighted by their respective import shares.

[25]This result mirrors the recent findings of Gleeson et al. (2021), who predict significant re-direction of Australia's wine exports from China to other trade partners in the medium-to-long run (AU$720 million by 2025).

Figure 2: Trading Pairs with the Largest Increases and Decreases in Trade in China-Australia Dispute Scenario



Note: Values are cumulative across bottled wine and bulk wine.

increase in Australia), and consumers in the tariff-imposing country are harmed (a 11.0% welfare decline in China).

The individual findings above offer detailed insights on the impacts of retaliatory tariffs in wine trade on trade and welfare. They incorporate both the direct (i.e., partial/bilateral) effects of tariffs, and importantly, the indirect (i.e., multilateral) effects, which together allow us to analyze how tariff retaliation, even between only a handful of countries, affects the entire world market. Worth emphasizing is that the hundreds of millions of dollars in trade destruction, and pronounced impacts on consumers – both in the directly involved countries, as well as in indirectly involved countries – arise over disputes that originated for reasons unrelated to wine trade itself. Given the frequency with which wine trade has been targeted for such collateral tariff retaliation, and the appreciable impacts these tariffs cause, few commodities are more befitting of the moniker of the "punching bag" in international trade retaliation.

3.3 Complete Tariff Liberalization

We next consider the impacts that would arise from the complete liberalization of all tariffs that are currently imposed on international wine trade. While such a scenario is unlikely to transpire in the real world, it nonetheless offers a useful benchmark for the extent to which the current international system of tariffs distorts the gains from trade for this commodity. Further, this analysis is important to undertake, in light of the sizable import barriers that characterize the markets of many large countries, because such barriers are likely sources of major welfare losses for consumers. Consequently, we implement this tariff liberalization analysis in order to measure the deadweight loss from tariff barriers in the global wine market, and to quantify the distribution of consumer benefits that would accrue in the markets with the highest trade barriers.

By setting $\tau_{ij}^{k} = 0$ for all bilateral trading relationships, we estimate the counterfactual effects of zero-tariff trade across all major and minor wine-trading countries. For brevity, we again present only the results for the countries that undergo the largest impacts, with the complete set of results on aggregate trade and welfare for all countries presented in Appendix C.

Figure 3: Increases in Total Exports and Imports under Complete Liberalization

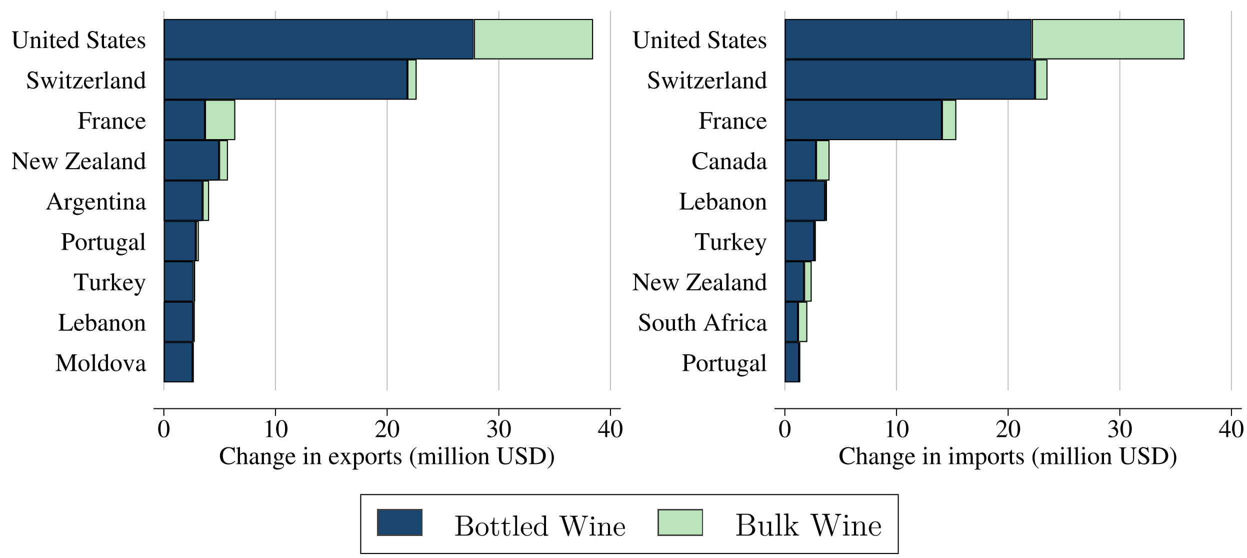


Figure 3 presents the estimated impacts on aggregate exports and imports for the nine countries impacted the most in the free trade scenario. Though bulk wine typically faces higher tariffs rates than bottled wine, because bottled wine is more extensively traded than bulk wine, the largest increases in trade volumes arise in bottled trade; however, trade in both commodities expands under complete liberalization. The clear winners for both commodities in this scenario are countries which, in the real world, (1) face significant trade barriers in current (and potential) export destinations, and (2) maintain significant tariff barriers themselves.

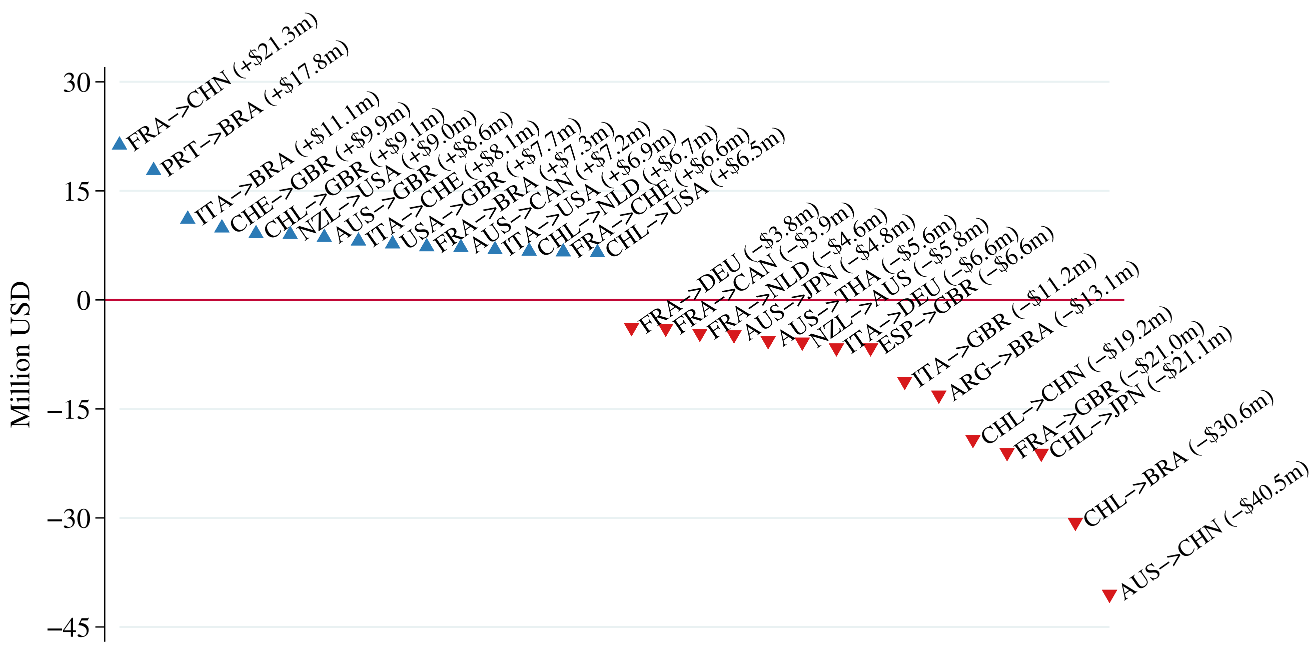
The United States undergoes a substantial increase in its exports of both bottled and bulk wine. As the United States currently faces an average trade-weighted tariff rate of 20% on its exports, it comes as no surprise that trade liberalization causes the large US market to supply more wine to international markets. Switzerland experiences the second largest increase in exports, with bottled and bulk wine exports and imports increasing in close proportion. This result arises because Switzerland is surrounded by many large EU markets, and while Switzerland is part of the European Economic Area (EEA) free trade bloc, the EEA excludes food and agricultural products. Furthermore, in the baseline scenario (i.e., the real world) the large majority of the country's production is currently consumed within its borders. Thus, by liberalizing wine trade with these EU markets, Switzerland sees significant increases in export sales to neighboring markets such as France and Germany. Other large and established exporters such as France, New Zealand, and Argentina undertake more exports, while other countries neighboring the European Union (Moldova and Turkey) also benefit when their exports face lower tariffs in large neighboring markets. Not all countries, however, gain in this scenario. Chile, for example, which currently faces low or zero tariffs because of its membership in multiple preferential trade agreements (with MERCOSUR, Japan, China, the United States, the European Union, and others), sees roughly $78 million in displaced exports (a figure not reported in the tables).[26] This occurs because many of Chile's trade partners – Brazil, China, and Japan, in particular – begin buying wine from other sources after trade liberalization, and instead Chile sells more of its product to destinations such as the United Kingdom, the United States, and Canada.

Results on imports partly mirror the results on exports, particularly for the largest gainers (the United States, Switzerland, and France). While the United States maintains comparatively low MFN and preferential rates on wine imports (a roughly 1% trade-weighted average), the country's large market size means that trade liberalization causes a significant increase in imports. This result is also inherently related to the finding on US exports: in exporting more, less US wine stays in the domestic market, which (in tandem with lower import tariffs) increases consumer demand for foreign varieties. Switzerland's imports similarly expand alongside its exports due to less-costly access to foreign varieties imported from its large wine-producing EU neighbors. Other European countries (France and Portugal) undergo slight increases in imports; however, as most of the wine trade of these countries is already comprised of zero-tariff intra-EU trade, the gains from complete liberalization are less stark.

[26] This result further highlights the importance of incorporating country-pair-specific preferential tariff rates in the analysis, without which we would not be able to accurately estimate the impact of tariff reductions on Chilean wine trade.

The results on aggregate trade in Figure 3 mask several important facets of the analysis, as significant bilateral trade creation and trade reallocation takes place in the wake of total trade liberalization.[27] The most significant gains and losses in bilateral trade are depicted in Figure 4. Trade between the United States and individual European countries expands, as total exports in both directions increase by roughly $40 million, led by gains in US exports to the United Kingdom and Germany, as well as expanded Italian and French exports to the United States. Some of the most noticeable trade creation takes place in low- and middle-income importers that currently maintain significant tariff barriers: China, for instance, is expected to significantly increase its imports – by roughly $35 million worth, with France alone accounting for about $21 million – from EU countries, and Brazil is anticipated to buy substantially more wine from sources such as Portugal ($18 million) and Italy ($11 million). Australian exports to China see the largest decline at –$40.5 million, as China increases imports from the European Union, and Australia's exports are diverted to countries such as Canada ($7 million) and the United Kingdom ($9 million).

Figure 4: Trading Pairs with the Largest Increases and Decreases in Trade in Free-Trade Scenario



Note: Values are cumulative across bottled wine and bulk wine.

[27] With the large distributional impacts of trade liberalization (as seen in Figure 3), the net impact of $76.1 million corresponds to only around 1% of annual wine trade. However, this finding is in line with comparable estimates on total trade liberalization in international goods trade in which predicted gains in global GDP amount to less than 1% (see Table 1 of Clemens 2011).

Table 5: Welfare Impacts in Complete Trade Liberalization Scenario

Country	%Δ*W*	Country	%Δ*W*	Country	%Δ*W*
Egypt	1,163.6	Cuba	12.2	Poland	1.3
India	153.2	Montenegro	12.2	Singapore	1.2
Jordan	149.7	China	10.6	Bahrain	1.1
Indonesia	130.5	Russia	9.1	Croatia	1.0
Trinidad and Tobago	82.3	Uruguay	8.1	Netherlands	1.0
Bermuda	82.0	Mauritius	7.5	United States	1.0
Sri Lanka	65.9	Venezuela	7.5	Romania	0.9
Fiji	59.6	Kyrgyzstan	7.2	Czech Republic	0.8
Saudi Arabia	50.3	Israel	6.9	Canada	0.7
Malaysia	47.8	Kazakhstan	6.5	Hungary	0.7
Vietnam	46.7	Armenia	6.1	Iceland	0.7
Jamaica	42.4	Georgia	5.8	Slovakia	0.7
Thailand	41.4	Dominican Republic	5.3	Bulgaria	0.6
Grenada	36.3	Uzbekistan	4.9	Australia	0.5
Algeria	32.7	Belarus	4.5	Germany	0.5
St. Lucia	30.6	Guatemala	4.3	United Arab Emirates	0.5
Turkey	30.6	El Salvador	4.2	Argentina	0.4
Barbados	29.6	Ukraine	3.8	Belgium	0.4
Switzerland	29.3	Chile	3.6	Lithuania	0.4
Brazil	28.4	Ecuador	2.9	Malta	0.3
Philippines	26.1	French Polynesia	2.8	Greece	0.1
Kenya	24.2	Mexico	2.6	Austria	0.0
Morocco	23.6	Colombia	2.5	Norway	0.0
Uganda	23.4	United Kingdom	2.4	Spain	–0.1
Rwanda	22.5	Bosnia and Herzegovina	2.2	France	–0.2
Antigua and Barbuda	21.2	Finland	2.2	Italy	–0.2
Japan	17.7	Cyprus	2.0	Zimbabwe	–0.2
Myanmar	17.0	Ireland	1.8	Slovenia	–0.5
Panama	15.7	Moldova	1.5	New Zealand	–0.9
Tunisia	14.8	South Korea	1.5	Portugal	–1.2
Azerbaijan	14.7	Denmark	1.4	South Africa	–2.6
Bolivia	13.4	Estonia	1.4	Macedonia	–2.7
Mozambique	13.2	Sweden	1.4	***Trade-weighted average***	***4.1***
Albania	13.1	Latvia	1.3		
Lebanon	13.0	Peru	1.3		

Notes: Welfare impacts are calculated as the import-share-weighted average of the welfare impacts for the two individual commodities. All welfare impacts are relative to the reference country (Norway). The trade-weighted average welfare impact is calculated as the average welfare change weighted by each country's share of total world wine imports.

Table 5 depicts the welfare impacts by country in the zero-tariff scenario (ordered by magnitude of the estimated welfare impact). Consumers in developing countries are the evident winners, with considerable welfare increases in large countries such as India (153.2%), Vietnam (46.7%), Thailand (41.4%), and Brazil (28.4%). While other countries (e.g., Algeria, Egypt, and Indonesia) have large predicted welfare gains because of the countries' high tariffs before liberalization, these gains are likely to be overstated, as religious factors make the consumer bases for wine in these countries comparatively small.[28] And though the average change in consumer welfare across all countries is positive (a 4.1% trade-weighted average increase), some countries lose in the free trade situation, generally, EU countries that already traded

[28]These results are similar when we exclude such countries in the simulation; see Appendix C.

wine between one another under zero tariffs. Under complete liberalization, consumers in these countries are typically worse off because a larger volume of wine is exported to non-EU destinations, reducing the availability and increasing the price for consumers in these markets.

In all, we estimate an annual $76.1 million in new trade to occur in this scenario, with $53.5 million of this trade creation occurring in bottled wine trade and the remainder in bulk wine.[29] While these results might seem admittedly modest relative to the size of the multi-billion dollar international market for wine, it is important to note two features of the analysis. First, this exercise holds total world output and demand fixed, and the dynamic adjustment to this scenario in the real world would likely yield additional gains to trade, particularly in large developing countries such as India that possess small (but growing) wine consumer bases. Second, a large portion of wine trade, principally between EU countries, already takes places at zero-tariff rates, suggesting that many of the static gains from trade liberalization in this market have already been realized. Ultimately, however, our prediction of an average 4.1% increase in consumer welfare suggests that trade liberalization would bring substantial benefits, and importantly, considerable benefits for consumers in markets which currently maintain high import barriers.

It is important to note, however, that import tariffs comprise only one aspect of the policy barriers that impact international wine trade. We therefore abstract from any hypothetical accompanying changes in NTMs, such as SPS and TBT rules or certification requirements, in this analysis (again, having captured the role of NTMs through the use of country-year fixed effects). However, further investigation of the extent to which specific NTMs inhibit wine trade, or alternatively, the degree to which policy harmonization (for example, regulatory conformity as effected under PTAs), would likely offer further insights on the impacts of trade policies in this market.

4. Policy Implications

Though our analysis focuses on a single commodity with two products (albeit one of the most extensively traded commodities in the world), our results shed light on several broader issues in international trade policy and ongoing trade disputes. We highlight here the implications of our findings as they relate to the design of effective trade policy, the scope of cross-retaliation in trade disputes that cause collateral harm on “bystander” commodities such as wine, and

[29] With the large distributional impacts of trade liberalization (as seen in Figure 3), the net impact of $76.1 million corresponds to only around 1% of annual wine trade. However, this finding is in line with comparable estimates on total trade liberalization in international goods trade in which predicted gains in global GDP amount to less than 1% (see Table 1 of Clemens 2011).

the adverse welfare consequences and distortionary inefficiencies for producers and consumers that these trade actions give rise to.

We first re-emphasize the fact that wine has predominantly been chosen for retaliation in trade disputes that originated over issues entirely unrelated to wine. Wine's prominence as a widely traded, high-value product has made it an attractive target for punitive tariffs, and the reliance of winemakers on export markets ensures that the pain from such tariff actions are sharply felt by the industry's stakeholders. While the WTO's dispute settlement mechanism offers complainants in trade disputes the right to enact cross-sector retaliation (under the idea that retaliatory actions on the directly offending sector might have limited effect), our results clearly demonstrate that this practice gives rise to harmful collateral impacts on non-offending industries. Not surprisingly, the respective US and EU wine industry associations, the European *Comité Européen des Entreprises Vins* (CEEV) and the US Wine Institute, each voiced continual opposition to the escalation of the ongoing US-EU trade dispute and urged the respective sides to seek a swift end to the conflict and to avoid further cross-retaliation.

Our principal policy insight, then, is that an effective international multilateral trading body, such as the WTO, should be cognizant of the adverse collateral injuries inflicted on unrelated and innocent parties unconnected to the trade dispute. While negotiators on the respective sides of the US-EU dispute were able to reach a truce in mid-2021, winemakers and allied industries faced tangible losses from the conflict to the order of hundreds of millions of lost export revenues; similar outcomes characterize the ongoing China-Australia dispute which is currently progressing through the WTO Dispute Settlement Body. These trade actions likely cause further distortions in that the winemakers (and other industries caught in the crossfire) needlessly have to engage in directly unproductive lobbying efforts to remove the unwarranted trade retaliations on their commodities, an additional negative outcome given the general economic inefficiency of such efforts (see, e.g., Bhagwati 1982). The tariff actions also lead to major welfare losses for consumers, including households and restaurants, as many popular foreign wine varieties faced steep increases in price on account of the tariffs. Our results show that these impacts were substantial based on our finding of a sizable estimated reduction in global wine consumption.

In brief, our results systematically highlight the profound impacts that arise from the collateral effects of cross-retaliation, and suggest a significant need for an international system of trade rules that limits the scope and intensity of such punitive cross retaliations. While no such reform of the WTO's dispute settlement mechanism appears imminent, policymakers should nonetheless consider the distributional implications of the current trade policy environment that allows for disputants to impose the large burden of the negative impacts from trade disputes on producers and consumers in unrelated industries.

Beyond the US-EU and China-Australia tariff dispute, we also consider a more global analysis through simulating free-trade scenario under which all wine tariffs are eliminated. These results should be of particular interest to policy makers engaged in the setting of trade policy and the design of trade agreements, as the analysis shows large consumer welfare gains in several markets. These gains are especially pronounced in large developing countries such as India, China, Brazil, and others where wine tariffs are currently high.

5. Conclusion

Only occasionally has wine been the direct focus in international trade disputes. However, its prominence as a high-value product that is both widely produced by numerous countries and heavily dependent on export markets has made it an increasingly attractive target for collateral tariff retaliation. We estimate the impact of existing bilateral and non-discriminatory (MFN) tariffs on wine trade in a gravity setting and simulate the economic impacts of recent episodes of tariff retaliation in wine, in particular focusing on the recent dispute between the United States and the European Union originating over subsidies in aircraft production as well as the ongoing conflict between China and Australia. In both instances wine was chosen in order to inflict the largest possible damage on the other party, and our results speak to the substantial impacts of these tariffs. It is for this reason that wine can be appropriately dubbed a "punching bag" in international trade disputes.

Beyond wine's role in recent trade disputes, the international market for wine is often characterized by high tariff barriers and NTMs, the latter of which are maintained in myriad forms. Though many of the largest consumers of wine – generally, advanced economies such as the United States, the European Union, Japan, and others – maintain low effective tariff rates, high applied tariff rates remain pervasive in many other large markets. Such trade restrictions are likely to have significant impacts on trade, which our trade liberalization analysis helps to elucidate. And while NTMs are a particularly important (and increasingly common) aspect of the global wine market's policy environment, for the sake of tractability, we chiefly focus on the impacts of tariffs in this market. Nonetheless, further investigation of the interaction of tariffs and NTMs in this market would be a fruitful direction for future research.

We present three broad sets of findings. First, we estimate the elasticity of bilateral trade with respect to tariff rates to be roughly –1.2 for bottled wine and –0.7 for bulk wine. These values imply that the elasticity of substitution in wine is comparatively low (2.2 for bottled wine and 1.7 for bulk wine). Second, based on these estimates of the trade elasticity, we conduct counterfactual analyses of two recent major trade disputes involving wine: the US-EU Boeing and Airbus dispute, and the China-Australia dispute ostensibly begun over Australian dumping. Both conflicts are estimated to cause substantial trade destruction: in total, world wine trade is reduced by roughly $339 million annually. The long-term damages that will accrue if these policies are kept in place (or, if the US-EU tariffs were enacted in their threatened scope) are likely to be substantial. Third and finally, we estimate the likely impacts of complete trade liberalization in wine trade. Such a scenario would lead to approximately $76 million in new trade and generate significant benefits for consumers, with producers in the United States and Switzerland experiencing the largest increases in exports. Despite the muted impacts on aggregate trade volumes in this scenario, of particular note are the profound impacts of trade liberalization for consumers in large developing countries such as India, China, Brazil, and others.

Our estimation and simulation framework offers several contributions in addition to our findings on the economic impacts of trade disputes in wine. Employing a detailed panel of tariff data, we follow the current best practices in structural gravity estimation to produce estimates of trade elasticities at the 6-digit commodity level. We also implement the recent methodology of Anderson et al. (2018) to conduct a counterfactual analysis of the trade and welfare impacts of tariffs and trade liberalization. Our work thus provides a useful benchmark for other researchers in empirical agricultural trade conducting analyses of trade policy at the product level.

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Appendix A - Information on Countries in Analysis and Alternative Gravity Specifications

Table A1: Countries in Analysis

Albania†	Dominican Republic	Kyrgyzstan†	Singapore
Algeria†	Ecuador*	Latvia	Slovakia
Antigua and Barbuda*	Egypt†	Lebanon†	Slovenia
Argentina	El Salvador*	Lithuania	South Africa
Armenia	Estonia	Macedonia	South Korea
Australia	Fiji*	Malaysia†	Spain
Austria	Finland	Malta	Sri Lanka
Azerbaijan†	France	Mauritius*	St. Lucia*
Bahrain*,†	French Polynesia*	Mexico	Sweden
Barbados	Georgia	Moldova	Switzerland
Belarus	Germany	Montenegro	Thailand
Belgium	Greece	Morocco†	Trinidad and Tobago*
Bermuda*	Grenada*	Mozambique*	Tunisia†
Bolivia	Guatemala*	Myanmar	Turkey†
Bosnia and Herzegovina†	Hungary	Netherlands	Uganda
Brazil	Iceland	New Zealand	Ukraine
Bulgaria	India	Norway	United Arab Emirates†
Canada	Indonesia†	Panama	United Kingdom
Chile	Ireland	Peru	United States
China	Israel	Philippines*	Uruguay
Colombia	Italy	Poland	Uzbekistan†
Croatia	Jamaica*	Portugal	Venezuela*
Cuba	Japan	Romania	Vietnam
Cyprus	Jordan†	Russia	Zimbabwe
Czech Republic	Kazakhstan†	Rwanda	
Denmark	Kenya	Saudi Arabia*,†	

* Only included in the counterfactual analysis for bottled wine (HS 220421) because of small amounts of trade in bulk wine (HS 220429). † Majority-Muslim country, which are excluded in the robustness analysis.

Robustness Checks

To assess the sensitivity of our econometric and simulation results to various attributes of the sample, we explore several alternative specifications to verify the robustness of our results. Namely, we estimate different specifications by considering (1) a gravity model without bilateral country-pair fixed effects (comparable to the specifications of Fontagné et al. 2022 and Olper and Raimondi 2008), using standard bilateral controls including distance and indicators for common border, common language, and historical colonial relationship in their place (data from the USITC gravity dataset); (2) data measured at four-year intervals (as opposed to three-year intervals in the baseline) over the years 2002, 2006, ..., 2018; (3) data measured at five-year intervals over the years 2003, 2008, ..., 2018; (4) a specification excluding countries with a majority of the population that does not consume wine for religious reasons; and (5) the inclusion of international border effects interacted with time indicator variables to measure the long-run effects of globalization on international wine trade. For comparison, we include our baseline gravity estimates for both commodities as given in Table 3.

Tables A2 and A3 present the results for bottled wine and bulk wine, respectively. The results are largely comparable, and for brevity we therefore focus primarily on the bottled wine results. As is seen in the table, the estimates on the tariff elasticity remain relatively stable across the specifications, with values ranging from –0.870 to –1.841 in the estimates from columns 3–6. Altering the sample interval (columns 3 and 4), excluding countries whose populations do not consume significant amounts of wine (column 5), and controlling for international border effects (column 6) do not dramatically alter the estimate of the tariff coefficient.

The notable exception is the set of estimates that omit country-pair fixed effects in favor of standard gravity controls to measure trade costs (shown in column 2). In this specification, the estimate is considerably larger in magnitude than the versions that do include country-pair fixed effects, though the large value is roughly comparable to many existing values from the literature (for instance, Anderson et al. 2003 assume an elasticity of substitution between different sources of wine equal to 16). We attribute these differences to the fact that the country-pair fixed effects control for a broader assortment of determinants of trade costs and also account for potential endogeneity of bilateral trade policy (Baier and Bergstrand, 2007; Egger and Nigai, 2015). While the other gravity controls in this version behave as anticipated, strikingly, we uncover negative estimates on the common border and PTA variables. These findings evade an obvious explanation, though we note that this specification is less rigorous than that used to obtain our baseline estimates.

Table A2: Alternative Gravity Estimates for Bottled Wine

	(1) Baseline	(2) Standard bilateral controls	(3) Four-year intervals	(4) Five-year intervals	(5) Country exclusion	(6) Border effects
$\log(1+\tau)$	–1.166**	–9.925***	–1.127***	–1.841**	–1.144**	–0.870*
	(0.491)	(1.644)	(0.427)	(0.740)	(0.517)	(0.471)
PTA	0.184	–1.352***	0.273*	0.129	0.182	0.197
	(0.142)	(0.216)	(0.156)	(0.138)	(0.145)	(0.127)
log(Distance)		–1.497***				
		(0.092)				
Common border		–0.759***				
		(0.259)				
Common language		0.911***				
		(0.174)				
Colonial relationship		0.314				
		(0.259)				
International × Year = 2006						–0.194***
						(0.069)
International × Year = 2009						–0.160
						(0.123)
International × Year = 2012						0.325**
						(0.130)
International × Year = 2015						0.348**
						(0.155)
International × Year = 2018						0.473***
						(0.171)
Observations	25,667	60,993	20,810	16,336	19,953	25,667
Pseudo R^2	0.997	0.956	0.997	0.997	0.997	0.998
Country-pair FEs	Y	N	Y	Y	Y	Y

Notes: The dependent variable is the value of unidirectional exports by commodity. Estimation method is PPML. The estimates in the "Baseline" columns are identical to the estimates from Table 3. The estimates in the "Standard bilateral controls" include the standard bilateral trade costs variables but do not include country-pair fixed effects. The estimates for "Four-year intervals" are obtained from data for the years 2002, 2006, ..., 2018, while the estimates for "Five-year intervals" are obtained from data for the years 2003, 2008, ..., 2018. "Country exclusion" excludes the 18 majority-Muslim countries described in Table A1. "Border effects" includes time-varying effects of international borders. Estimations each include the fixed effects γ_{it}^k and δ_{jt}^k. Intercept is estimated but not reported. Robust standard errors clustered by bilateral country-pair are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A3: Alternative Gravity Estimates for Bulk Wine

	(1) Baseline	(2) Standard bilateral controls	(3) Four-year intervals	(4) Five-year intervals	(5) Country. exclusion	(6) Border effects
$\log(1+\tau)$	–0.710**	–4.373***	–1.397***	–1.961***	–0.748**	–0.409*
	(0.326)	(1.216)	(0.325)	(0.649)	(0.364)	(0.225)
PTA	0.830***	–0.835***	0.802***	0.934***	0.846***	0.800***
	(0.165)	(0.189)	(0.173)	(0.239)	(0.167)	(0.151)
log(Distance)		–2.028***				
		(0.124)				
Common border		–0.405*				
		(0.223)				
Common language		0.669***				
		(0.179)				
Colonial relationship		1.028***				
		(0.323)				
International × Year = 2006						–0.316*
						(0.187)
International × Year = 2009						0.107
						(0.206)
International × Year = 2012						0.720***
						(0.167)
International × Year = 2015						0.225
						(0.183)
International × Year = 2018						0.357**
						(0.177)
Observations	13,215	40,823	10,510	8,079	10,885	13,215
Pseudo R^2	0.991	0.939	0.991	0.990	0.990	0.991
Country-pair FEs	Y	N	Y	Y	Y	Y

Notes: The dependent variable is the value of unidirectional exports by commodity. Estimation method is PPML. The estimates in the "Baseline" columns are identical to the estimates from Table 3. The estimates in the "Standard bilateral controls" include the standard bilateral trade costs variables but do not include country-pair fixed effects. The estimates for "Four-year intervals" are obtained from data for the years 2002, 2006, ..., 2018, while the estimates for "Five-year intervals" are obtained from data for the years 2003, 2008, ..., 2018. "Country exclusion" excludes the 18 majority-Muslim countries described in Table A1. "Border effects" includes time-varying effects of international borders. Estimations each include the fixed effects γ_{it}^k and δ_{jt}^k. Intercept is estimated but not reported. Robust standard errors clustered by bilateral country-pair are reported in parentheses. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

It is worth further discussing the evolution of international border effects, the results for which are shown in column 6 in each table. This specification introduces the indicator variable "International" corresponding to observations of trade between different countries (a variable equal to zero for observations of intra-national trade). As has been discussed in the recent gravity literature (Baier et al., 2019; Bergstrand et al., 2015), estimates on the impacts of trade policy such as tariffs and preferential trade agreements might be biased upward in that they could capture long-run effects of increasing globalization over time. In line with the approach of Piermartini and Yotov (2016), we interact the international border variable with a comprehensive set of time dummies for each year in the estimation sample, omitting 2003 (the first year in our sample) as the reference category. The interpretations of these interactions, then, represent the "border effect," that is, how much trade is diminished on average when it takes place across an international border in comparison to intra-national trade – and more specifically, how these border effects have evolved relative to the 2003 base year.

In the estimation for each commodity, the estimates on the tariff coefficients are largely preserved when accounting for border effects. Importantly, we find significant and unequivocal evidence for diminishing border effects over time, especially so for bottled wine. Relative to the 2003 base year, we find a strong and consistent positive trend in the border effect over time (illustrated by the border effect of –0.194 for 2006 versus 0.473 for 2018). The finding indicates that broadly defined trends towards globalization have led to higher levels of international wine trade in recent decades, a finding which aligns with similar work examining wider issues in international trade.

Appendix B - Detailed Trade Impacts for Dispute Scenarios

Table B1 gives the results for changes in aggregate trade for all countries in the analysis. As expected, the largest impacts materialize for the directly involved countries (the United States and EU countries); however, other countries (such as Chile and New Zealand) also undergo changes in their aggregate trade.

Table B1: Aggregate Trade Impacts for All Countries in US-EU Dispute Scenario

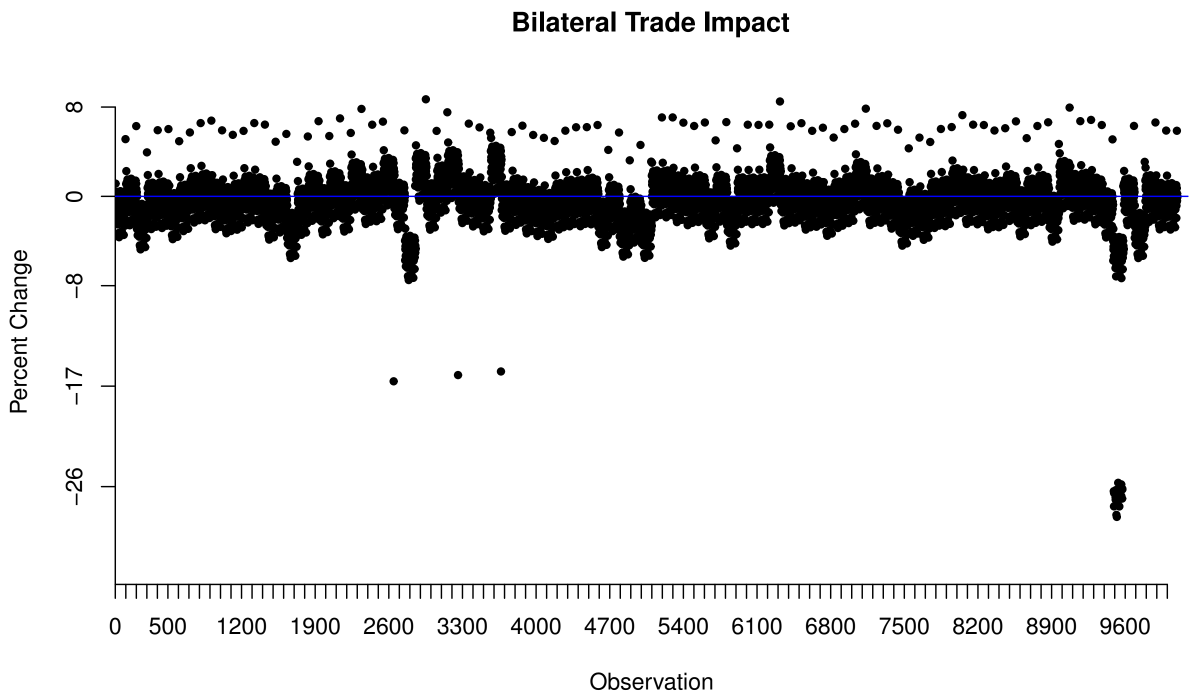
	Bottled Wine		Bulk Wine			Bottled Wine		Bulk Wine	
Country	ΔExports	ΔImports	ΔExports	ΔImports	**Country**	ΔExports	ΔImports	ΔExports	ΔImports
Albania	-	-	-	-	Kyrgyzstan	-	-	-	-
Algeria	-	0.1	-	0.1	Latvia	-	0.2	-	-
Antigua and Barbuda	-	-	-	-	Lebanon	0.2	0.2	-	-
Argentina	−0.2	0.2	0.3	-	Lithuania	-	-	-	-
Armenia	-	-	-	-	Macedonia	-	-	-	-
Australia	−6.5	2.2	-	-	Malaysia	-	0.1	-	-
Austria	−0.1	0.5	-	-	Malta	-	-	-	-
Azerbaijan	-	-	-	−0.4	Mauritius	-	-	-	-
Bahrain	-	-	-	-	Mexico	0.3	−0.6	-	-
Barbados	-	-	-	-	Moldova	0.1	-	-	-
Belarus	-	0.1	-	-	Montenegro	-	-	-	-
Belgium	0.3	−0.7	-	-	Morocco	-	-	-	-
Bermuda	0.1	-	-	-	Mozambique	-	-	-	-
Bolivia	-	-	-	-	Myanmar	-	-	-	-
Bosnia and Herzegovina	-	-	-	-	Netherlands	−0.2	1.8	-	-
Brazil	-	0.2	-	−1.4	New Zealand	3.3	0.7	0.1	-
Bulgaria	-	0.1	-	-	Norway	-	0.4	-	-
Canada	0.6	−7.1	−0.3	-	Panama	-	-	-	-
Chile	−5.1	-	−0.4	0.3	Peru	0.1	0.1	-	-
China	0.1	−6.5	-	-	Philippines	-	-	-	-
Colombia	-	-	-	-	Poland	-	2.0	-	0.1
Croatia	-	0.1	-	-	Portugal	1.8	1.2	-	-
Cuba	0.1	-	-	-	Romania	-	0.1	-	-
Cyprus	-	-	-	-	Russia	-	−0.8	-	-
Czech Republic	0.2	-	-	-	Rwanda	-	-	-	-
Denmark	-	−5.7	-	-	Saudi Arabia	-	-	-	-
Dominican Republic	-	−0.2	-	0.1	Singapore	-	−0.3	-	-
Ecuador	-	0.2	-	-	Slovakia	-	-	-	-
Egypt	0.1	-	-	1.2	Slovenia	-	0.1	-	-
El Salvador	-	-	-	-	South Africa	-	0.2	0.2	0.1
Estonia	-	-	-	-	South Korea	-	−0.5	-	-
Fiji	-	0.1	-	-	Spain	−2.8	−2.4	0.3	0.1
Finland	-	-	-	-	Sri Lanka	0.1	-	-	-
France	−71.6	−35.1	−1.8	−1.4	St. Lucia	-	-	-	-
French Polynesia	-	-	-		Sweden	-	−0.4	-	−0.2
Georgia	-	-	-		Switzerland	0.2	0.5	-	-
Germany	−4.8	−6.7	-	0.3	Thailand	-	-	-	-
Greece	0.3	0.3	-		Trinidad and Tobago	-	-	-	-
Grenada	-	-	-		Tunisia	-	-	-	-
Guatemala	-	-	-		Turkey	0.1	-	-	-
Hungary	-	0.1	-		Uganda	-	-	-	-
Iceland	-	-	-		Ukraine	-	-	-	-
India	-	-	-	-	United Arab Emirates	-	-	-	-
Indonesia	-	-	-	-	United Kingdom	0.4	7.6	-	1.5
Ireland	−0.2	0.9	-	0.1	United States	−97.9	−135.4	−3.9	−8.4
Israel	0.3	0.4	-		Uruguay	-	-	-	-
Italy	−3.0	2.1	−3.0	1.2	Uzbekistan	-	-	-	-
Jamaica	0.1	-	-	-	Venezuela	-	-	-	-
Japan	-	−2.2	-	-	Vietnam	-	-	-	-
Jordan	0.1	-	-	-	Zimbabwe	-	-	-	-
Kazakhstan	-	-	-	-	***Total***		***−181.7***		***−8.0***
Kenya	-	-	-	-					

Notes: Trade impacts are expressed in million USD. "-" indicates a change in trade of less than \$100 thousand.

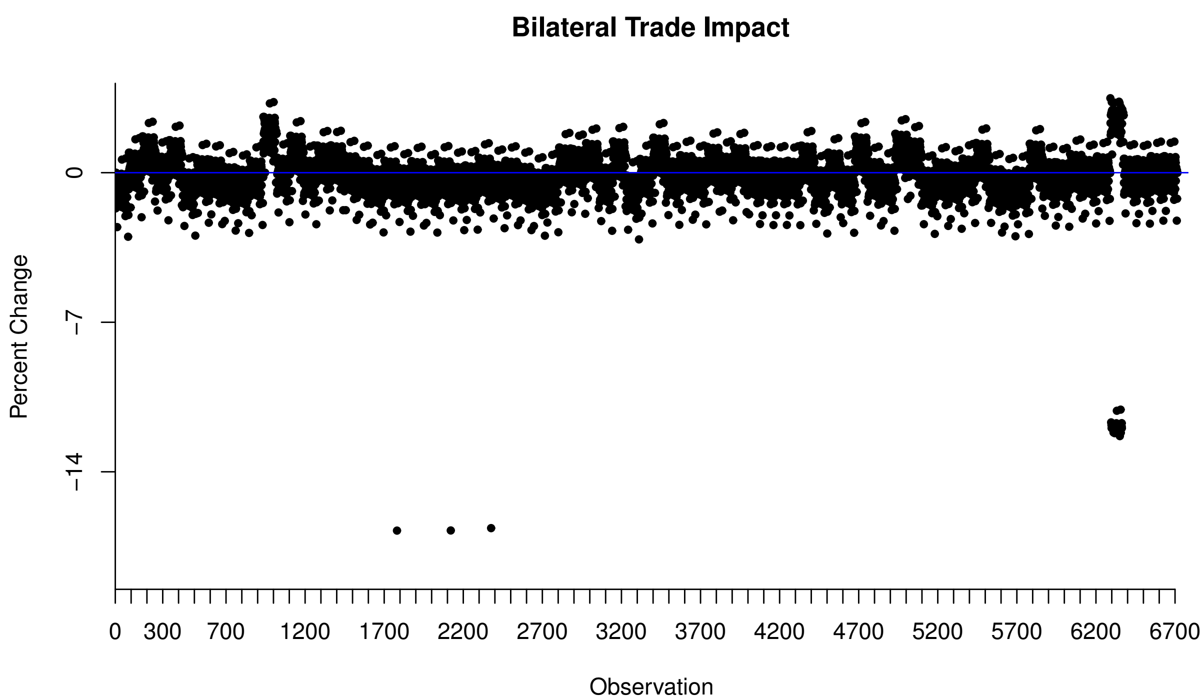
As described by equation (7), changes in bilateral tariffs for only a small number of trading relationships impact all other countries through multilateral trade impacts. To illustrate the complete extent of these impacts, Figure B1 depicts the impacts of the US-EU dispute scenario on all bilateral trade flows as the percentage change in exports in each direction for each bilateral trading relationship. Each point represents an observation for a particular unidirectional bilateral trading relationship. The three dots at the roughly –17% level indicate the decline in US imports from France, Germany, and Spain as a result of the 25% increase in the US tariff, and the cluster of dots around –26% portray the decline in EU imports from the United States as a result of the 25% increase in the EU tariff. The US import and EU import clusters reflect both the direct effect of trade from the tariff increase and the indirect effect arising from the adjustment in the multilateral resistance terms. However, the remainder of the dots (all of which are located at or above –8%) indicate changes in the bilateral trade flows of third-party countries, which occur only through adjustments in the multilateral resistance terms. It is for this reason that multilateral impacts must be carefully considered, as focusing solely on the partial trade impacts (i.e., the direct impacts of changes in bilateral tariffs) would obscure significant changes in trade.

Figure B1: Impacts on Bilateral Trade in US-EU Dispute Scenario

(a) Bottled Wine



(b) Bulk Wine



Detailed Welfare Impacts: US-EU Dispute

Table B2 gives the consumer welfare impacts for each country in the US-EU dispute counterfactual, as defined by the ratio of the counterfactual consumer price index to the baseline consumer price index (relative to the reference importer) for a particular country. These welfare changes are calculated as the average change over the two commodities, weighted by the share of each commodity in each country's imports. The impacts are predominantly positive, which reflects the benefits that accrue to wine consumers in other countries when major importers (the United States and the EU countries) impose sizable barriers to trade, thus increasing the availability and driving down the price of wine on the world market.

Table B2: Welfare Impacts in US-EU Dispute Scenario

Country	**%ΔW**	**Country**	**%ΔW**	**Country**	**%ΔW**
France	1.8	Singapore	–0.1	Malaysia	–0.6
French Polynesia	1.8	Thailand	–0.1	Zimbabwe	–0.6
Algeria	1.5	Ukraine	–0.1	Bolivia	–0.7
Spain	1.3	Dominican Republic	–0.2	Colombia	–0.7
Cuba	0.9	Georgia	–0.2	El Salvador	–0.7
Mauritius	0.9	Moldova	–0.2	Antigua and Barbuda	–0.8
Lithuania	0.7	Portugal	–0.2	Australia	–0.8
Belgium	0.6	Romania	–0.2	Austria	–0.8
Morocco	0.6	Russia	–0.2	Barbados	–0.8
Egypt	0.4	Saudi Arabia	–0.2	Brazil	–0.8
Japan	0.4	Slovakia	–0.2	Denmark	–0.8
Rwanda	0.4	South Korea	–0.2	New Zealand	–0.8
United Arab Emirates	0.4	Iceland	–0.3	Peru	–0.8
China	0.3	Indonesia	–0.3	Sweden	–0.8
Jordan	0.3	Kenya	–0.3	Venezuela	–0.8
Tunisia	0.3	South Africa	–0.3	Greece	–0.9
United Kingdom	0.3	Sri Lanka	–0.3	Panama	–0.9
Lebanon	0.2	Uganda	–0.3	Ecuador	–1.0
Myanmar	0.1	Vietnam	–0.3	Slovenia	–1.0
Netherlands	0.1	Germany	–0.4	Uruguay	–1.1
Switzerland	0.1	Hungary	–0.4	Albania	–1.2
Turkey	0.1	Armenia	–0.5	Grenada	–1.2
Azerbaijan	0.0	Bulgaria	–0.5	Philippines	–1.2
Bahrain	0.0	Guatemala	–0.5	Fiji	–1.4
Belarus	0.0	Israel	–0.5	Jamaica	–1.5
Czech Republic	0.0	Malta	–0.5	Poland	–1.5
Kazakhstan	0.0	Montenegro	–0.5	Trinidad and Tobago	–1.5
Kyrgyzstan	0.0	Mozambique	–0.5	Bermuda	–1.6
Latvia	0.0	Bosnia and Herzegovina	–0.6	Italy	–1.6
Mexico	0.0	Canada	–0.6	St. Lucia	–1.6
Norway	0.0	Chile	–0.6	Argentina	–1.9
Uzbekistan	0.0	Croatia	–0.6	United States	–4.1
Cyprus	–0.1	Finland	–0.6	***Trade-weighted average***	***–0.8***
Estonia	–0.1	Ireland	–0.6		
India	–0.1	Macedonia	–0.6		

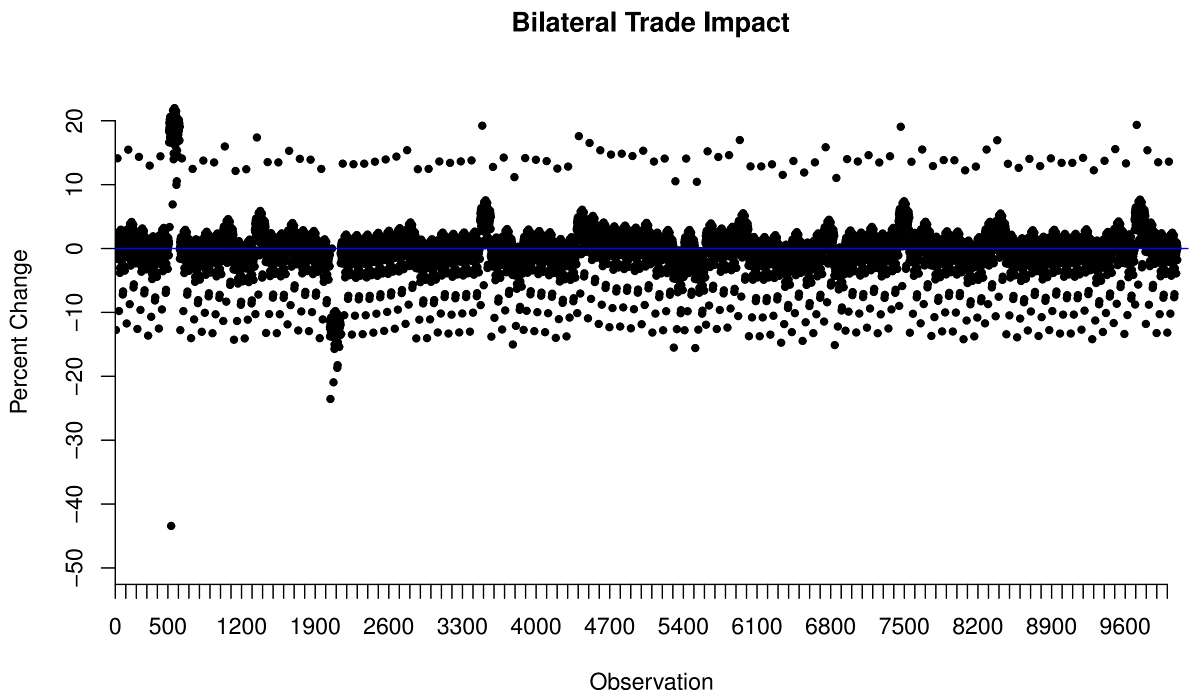
Notes: Welfare impacts are calculated as the import-share-weighted average of the welfare impacts for the two individual commodities. All welfare impacts are relative to the reference country (Norway). The trade-weighted average welfare impact is calculated as the average welfare change weighted by each country's share of total world wine imports.

Additional Results for China-Australia Dispute Scenario

Figure B2 presents the results on bilateral trade impacts for the China-Australia dispute scenario. The largest change in bilateral trade impacts arises in Australia to China exports, and is represented by the observation below –40%, which accounts for both the direct impact of the tariff increase that China imposed on Australian wine and the indirect impact of changes in the multilateral resistance terms. The remainder of the observations reflect the third-party impacts which are attributable solely to the adjustment in the multilateral resistance terms.

Figure B2: Impacts on Bilateral Trade in China-Australia Dispute Scenario

(a) Bottled Wine



(b) Bulk Wine

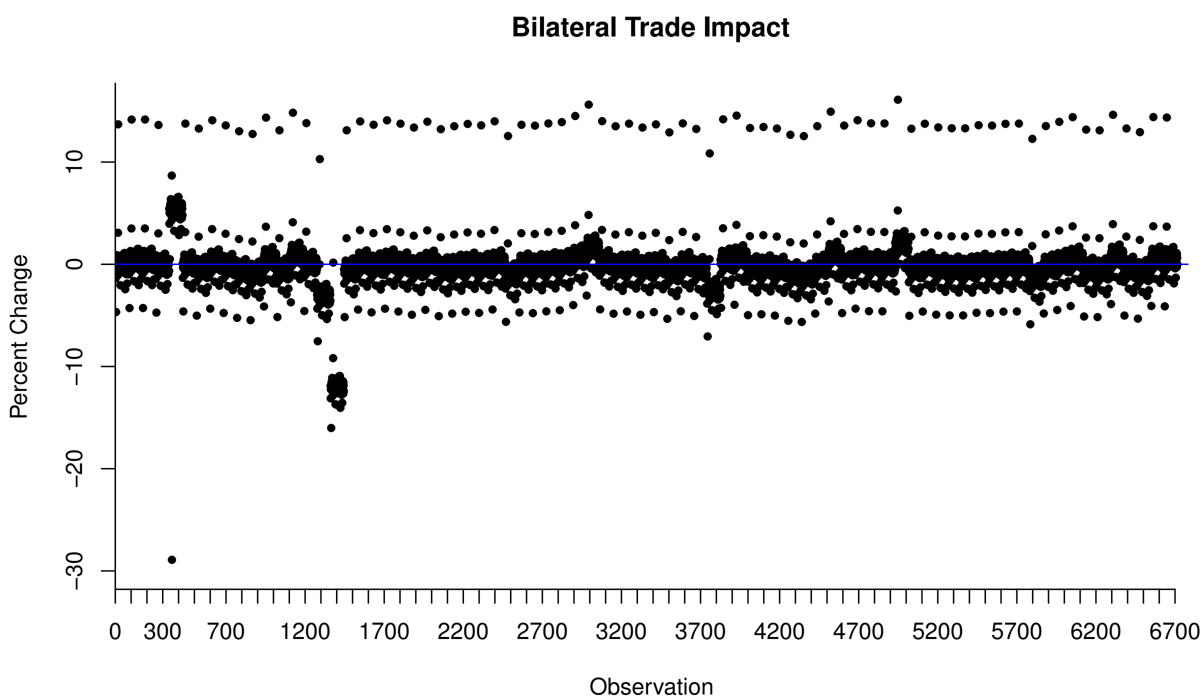


Table B3: Aggregate Trade Impacts for All Countries in China-Australia Dispute Scenario

	Bottled Wine		Bulk Wine			Bottled Wine		Bulk Wine	
Country	ΔExports	ΔImports	ΔExports	ΔImports	**Country**	ΔExports	ΔImports	ΔExports	ΔImports
Albania	-	-	-	-	Kyrgyzstan	-	-	-	-
Algeria	-	0.1	-	-	Latvia	-	0.2	-	-
Antigua and Barbuda	-	-	-	-	Lebanon	-	-	-	-
Argentina	–1.0	-	–0.2	-	Lithuania	0.1	0.2	-	-
Armenia	-	-	-	-	Macedonia	0.1	-	-	-
Australia	–142.9	–38.1	–7.4	–1.4	Malaysia	-	–0.6	-	-
Austria	–0.1	-	-	-	Malta	-	-	-	-
Azerbaijan	0.1	-	-	-	Mauritius	-	-	-	-
Bahrain	-	-	-	-	Mexico	-	0.2	-	-
Barbados	-	0.1	-	-	Moldova	0.3	-	-	-
Belarus	-	0.2	-	-	Montenegro	0.2	0.1	-	-
Belgium	–0.2	0.5	-	0.3	Morocco	-	-	-	-
Bermuda	0.1	-	-	-	Mozambique	-	-	-	-
Bolivia	-	-	-	-	Myanmar	0.1	0.1	-	-
Bosnia and Herzegovina	-	-	-	-	Netherlands	0.6	0.3	-	-
Brazil	-	–0.1	-	-	New Zealand	9.0	3.7	0.4	0.4
Bulgaria	0.2	0.2	-	-	Norway	-	–0.2	-	-
Canada	1.2	-	0.2	0.5	Panama	-	0.1	-	-
Chile	7.5	0.1	–0.2	-	Peru	-	-	-	-
China	–1.5	–97.2	-	–8.0	Philippines	-	0.1	-	-
Colombia	-	-	-	-	Poland	0.1	-	-	-
Croatia	-	-	-	-	Portugal	–0.1	-	-	-
Cuba	-	-	-	-	Romania	–0.1	0.3	-	-
Cyprus	0.2	0.2	-	-	Russia	0.3	0.2	-	-
Czech Republic	-	-	-	-	Rwanda	-	-	-	-
Denmark	-	0.5	-	-	Saudi Arabia	-	-	-	-
Dominican Republic	-	0.2	-	-	Singapore	0.2	2.5	-	-
Ecuador	-	-	-	-	Slovakia	0.1	-	-	-
Egypt	0.1	-	-	-	Slovenia	-	0.1	-	-
El Salvador	-	-	-	-	South Africa	0.2	0.4	0.2	-
Estonia	-	0.1	-	0.1	South Korea	-	0.7	-	-
Fiji	0.1	–0.1	-	-	Spain	1.3	0.5	–1.6	0.2
Finland	-	0.7	-	0.3	Sri Lanka	0.1	-	-	-
France	–27.2	7.5	0.3	–0.1	St. Lucia	0.1	-	-	-
French Polynesia	-	-	-	-	Sweden	-	–0.5	-	-
Georgia	–0.3	0.1	-	-	Switzerland	–0.4	–0.5	-	-
Germany	–0.9	0.6	-	-	Thailand	-	-	-	0.1
Greece	–0.2	-	-	-	Trinidad and Tobago	-	0.1	-	-
Grenada	-	-	-	-	Tunisia	-	-	-	-
Guatemala	-	-	-	-	Turkey	-	-	-	-
Hungary	-	0.2	-	-	Uganda	-	-	-	-
Iceland	-	-	-	-	Ukraine	0.2	0.6	-	-
India	-	0.7	-	-	United Arab Emirates	-	1.4	-	-
Indonesia	-	0.3	-	-	United Kingdom	–0.7	–17.4	-	–1.6
Ireland	0.1	–1.3	-	0.2	United States	10.5	–9.3	–0.6	1.1
Israel	-	-	-	-	Uruguay	-	0.2	-	-
Italy	0.7	–0.7	–0.1	–0.3	Uzbekistan	-	-	-	-
Jamaica	-	0.1	-	-	Venezuela	0.1	-	-	-
Japan	-	0.3	-	–0.1	Vietnam	-	-	-	-
Jordan	0.1	-	-	-	Zimbabwe	-	-	-	-
Kazakhstan	0.1	0.4	-	-	***Total***		***–140.6***		***–8.2***
Kenya	-	-	-	-					

Notes: Trade impacts are expressed in million USD. "-" indicates a change in trade of less than $100 thousand.

Detailed Welfare Impacts: China-Australia Dispute

Table B4 shows the welfare impacts in the China-Australia dispute scenario. Most countries undergo minimal changes in consumer welfare; however, China's consumers are dramatically worse off from the country's tariff hike. Furthermore, consumers in other countries in the Indo-Pacific region (Malaysia, New Zealand, and Thailand) benefit from the increased quantity of Australian wine available on the world market.

Table B4: Welfare Impacts in China-Australia Dispute Scenario

Country	%Δ*W*	Country	%Δ*W*	Country	%Δ*W*
Australia	11.3	Austria	–0.1	Mozambique	–0.6
Fiji	9.1	Greece	–0.1	Turkey	–0.6
Malaysia	6.3	Israel	–0.1	Uzbekistan	–0.6
New Zealand	5.5	Rwanda	–0.1	El Salvador	–0.7
Indonesia	3.2	South Africa	–0.1	Guatemala	–0.7
Singapore	2.9	Germany	–0.2	Morocco	–0.7
Thailand	2.9	Japan	–0.2	Spain	–0.7
Philippines	2.2	Kenya	–0.2	Colombia	–0.8
India	2.1	Malta	–0.2	Cuba	–0.8
Sri Lanka	1.6	Bolivia	–0.3	Ecuador	–0.8
United Kingdom	1.4	Egypt	–0.3	Armenia	–0.9
Canada	1.3	Poland	–0.3	French Polynesia	–0.9
United Arab Emirates	1.3	Switzerland	–0.3	Myanmar	–0.9
United States	1.1	Antigua and Barbuda	–0.4	Slovenia	–0.9
Trinidad and Tobago	0.9	Czech Republic	–0.4	Venezuela	–0.9
Vietnam	0.9	Dominican Republic	–0.4	France	–1.0
Bermuda	0.7	Estonia	–0.4	Russia	–1.0
Ireland	0.7	Grenada	–0.4	Ukraine	–1.1
Bahrain	0.6	Latvia	–0.4	Croatia	–1.2
Jamaica	0.6	Panama	–0.4	Algeria	–1.3
Saudi Arabia	0.6	Portugal	–0.4	Azerbaijan	–1.3
Barbados	0.3	Slovakia	–0.4	Romania	–1.3
Iceland	0.3	Tunisia	–0.4	Belarus	–1.4
Finland	0.2	Belgium	–0.5	Bosnia and Herzegovina	–1.5
South Korea	0.2	Bulgaria	–0.5	Macedonia	–1.6
Sweden	0.2	Cyprus	–0.5	Moldova	–1.7
Argentina	0.1	Jordan	–0.5	Chile	–1.9
Denmark	0.1	Mauritius	–0.5	Kyrgyzstan	–2.2
Italy	0.1	Mexico	–0.5	Montenegro	–2.2
Uganda	0.1	Peru	–0.5	Georgia	–2.3
Lebanon	0.0	Uruguay	–0.5	Kazakhstan	–2.6
Netherlands	0.0	Zimbabwe	–0.5	China	–11.0
Norway	0.0	Brazil	–0.6	***Trade-weighted* average**	***–1.1***
St. Lucia	0.0	Hungary	–0.6		
Albania	–0.1	Lithuania	–0.6		

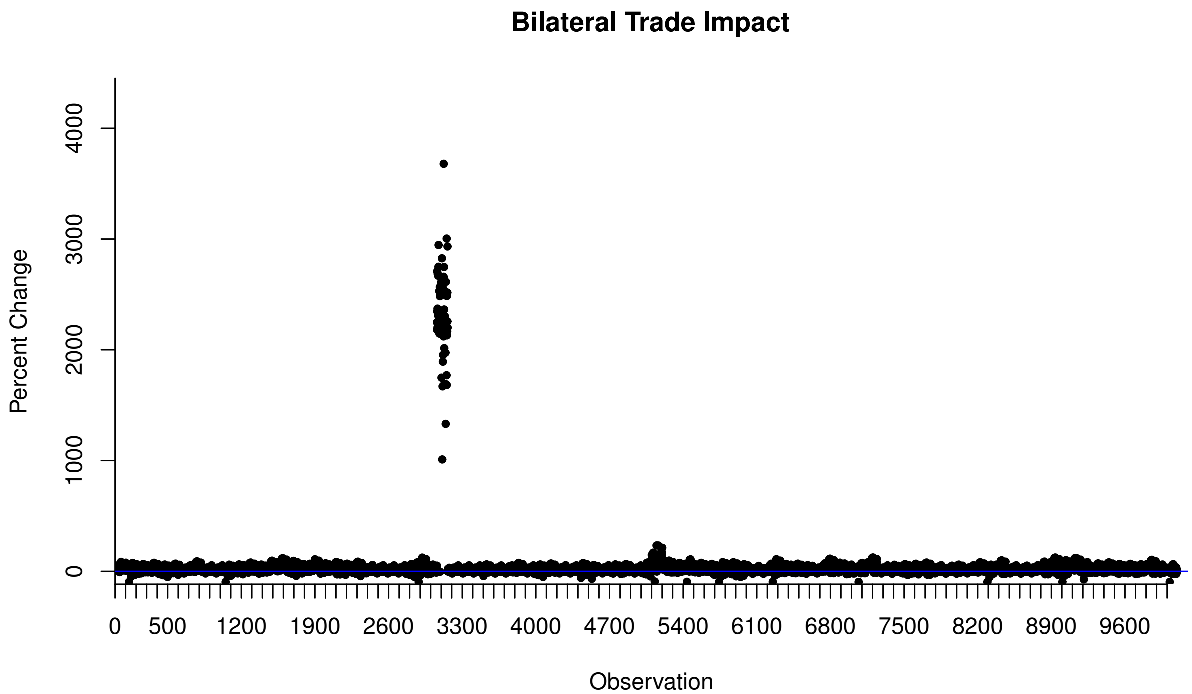
Notes: Welfare impacts are calculated as the import-share-weighted average of the welfare impacts for the two individual commodities. All welfare impacts are relative to the reference country (Norway). The trade-weighted average welfare impact is calculated as the average welfare change weighted by each country's share of total world wine imports.

Appendix C - Additional Results for Free-Trade Scenario

Figure C1 presents the impacts on each bilateral trade flow resulting from complete tariff elimination. The largest changes in trade (in percentage terms) occur in countries that maintain sizable tariffs. Egypt, for example, currently levies a 1,800% duty on bottled wine imports, and thus its percentage increase in trade after liberalization is orders of magnitude larger than those for other countries (though the corresponding change in absolute terms is small).

Figure C1: Impacts on Bilateral Trade in Free-Trade Scenario

(a) Bottled Wine



(b) Bulk Wine

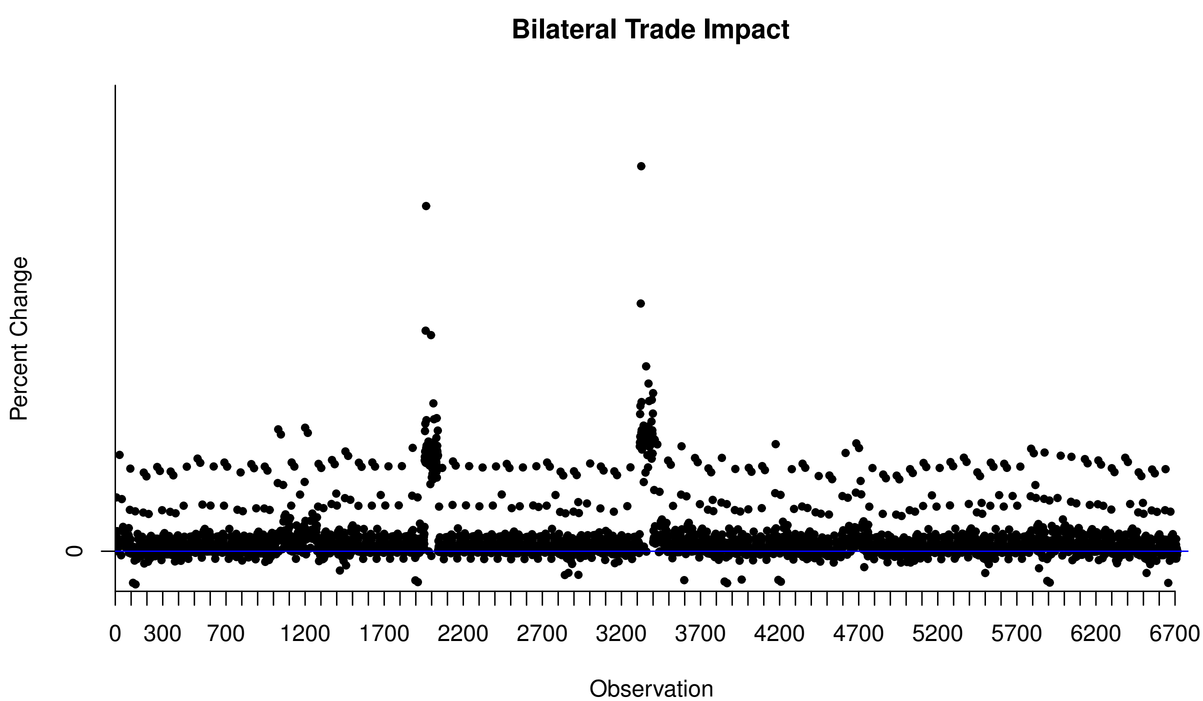


Table C1: Aggregate Trade Impacts for All Countries in Free-Trade Scenario

Country	Bottled Wine		Bulk Wine	
	ΔExports	ΔImports	ΔExports	ΔImports
Albania	0.3	0.2	0.1	-
Algeria	0.4	0.6	0.1	-
Antigua and Barbuda	-	0.1	-	-
Argentina	3.5	0.5	0.6	0.2
Armenia	-	0.2	-	-
Australia	−18.2	−0.2	−1.9	−1.0
Austria	-	0.3	0.1	-
Azerbaijan	0.5	0.3	-	0.2
Bahrain	0.1	0.1	-	-
Barbados	-	0.1	-	-
Belarus	0.2	0.7	-	0.1
Belgium	-	-	0.1	0.7
Bermuda	0.1	0.1	-	-
Bolivia	0.1	-	-	0.1
Bosnia and Herzegovina	0.2	-	0.1	0.2
Brazil	0.7	-	0.1	0.2
Bulgaria	0.2	0.2	-	-
Canada	0.2	2.8	1.3	1.2
Chile	−14.1	-	−1.5	-
China	1.3	−17.7	-	−2.9
Colombia	0.1	0.2	-	-
Croatia	0.3	0.2	-	-
Cuba	0.1	-	0.1	-
Cyprus	0.2	0.2	0.1	-
Czech Republic	0.1	0.6	-	-
Denmark	-	0.9	-	-
Dominican Republic	0.1	−0.5	-	-
Ecuador	0.1	-	-	-
Egypt	2.4	0.7	0.3	0.2
El Salvador	-	0.1	-	-
Estonia	-	-	-	-
Fiji	0.1	0.2	-	-
Finland	-	−0.2	-	-
France	3.8	14.1	2.7	1.3
French Polynesia	0.1	0.1	-	-
Georgia	−1.7	-	-	-
Germany	−1.5	−0.5	0.1	−0.2
Greece	-	-	-	-
Grenada	0.1	0.1	-	-
Guatemala	0.1	0.2	-	-
Hungary	-	0.1	-	-
Iceland	0.1	-	-	-
India	-	0.3	-	-
Indonesia	0.1	−1.8	-	0.1
Ireland	-	−0.5	-	0.1
Israel	0.5	−0.1	-	0.2
Italy	−1.6	1.0	2.8	−0.4
Jamaica	0.2	-	-	-
Japan	0.3	−2.6	0.1	−1.5
Jordan	0.2	0.1	0.3	-
Kazakhstan	0.2	0.6	-	-
Kenya	0.1	-	0.1	-
Kyrgyzstan	0.1	0.1	0.1	-
Latvia	-	−0.2	-	-
Lebanon	2.6	3.6	0.1	0.2
Lithuania	0.2	−0.2	-	-
Macedonia	-	0.2	-	0.1
Malaysia	0.5	-	0.2	0.4
Malta	0.1	-	-	-
Mauritius	0.2	0.3	-	-
Mexico	0.1	−0.2	-	0.1
Moldova	2.6	0.1	0.1	-
Montenegro	0.8	0.9	0.1	-
Morocco	0.8	0.5	0.6	0.5
Mozambique	-	0.2	-	-
Myanmar	0.1	0.3	-	-
Netherlands	−0.1	0.6	-	−0.1
New Zealand	5.1	1.7	0.8	0.7
Norway	-	-	-	0.1
Panama	-	0.1	-	-
Peru	-	-	-	-
Philippines	0.1	0.1	-	-
Poland	-	−0.9	-	-
Portugal	2.8	1.3	0.3	-
Romania	0.2	0.5	0.1	0.1
Russia	0.5	−1.2	0.1	−0.4
Rwanda	-	0.1	-	-
Saudi Arabia	0.1	-	-	-
Singapore	0.7	0.8	0.1	0.1
Slovakia	-	-	-	-
Slovenia	-	0.2	-	-
South Africa	0.2	1.2	−0.1	0.8
South Korea	-	0.8	-	-
Spain	1.8	0.4	−0.7	0.8
Sri Lanka	0.1	0.1	-	-
St. Lucia	0.1	-	-	-
Sweden	-	−0.8	-	−0.5
Switzerland	21.9	22.5	0.8	1.1
Thailand	0.3	−0.3	0.1	−0.3
Trinidad and Tobago	0.1	0.1	-	-
Tunisia	0.2	0.2	0.2	-
Turkey	2.7	2.6	0.2	0.2
Uganda	0.2	-	-	-
Ukraine	0.3	−0.9	-	-
United Arab Emirates	-	−0.2	-	-
United Kingdom	−1.3	−7.0	-	2.8
United States	28.3	22.7	10.7	13.7
Uruguay	−0.5	−0.3	-	-
Uzbekistan	-	-	0.1	-
Venezuela	0.1	0.2	-	-
Vietnam	0.1	0.6	-	0.2
Zimbabwe	0.1	0.2	-	0.1
Total		***53.5***		***22.6***

Notes: Trade impacts are expressed in million USD. “-” indicates a change in trade of less than $100 thousand.

Excluding Non-Wine-Consuming Countries

Tables C2 and C3 show the results for the trade liberalization counterfactual when excluding the 18 predominately Muslim countries described in Appendix Table A1. We undertake this analysis to assess whether the inclusion of small importing and exporting countries, which for religious reasons would be unlikely to change their consumption or production levels in response to trade liberalization, have an outsize impact on the results for trade and welfare in this analysis.

As is seen in Table C2, the results on trade are comparable in magnitude to the baseline results seen in Table C1, though the exclusion of several large economies from the analysis (Egypt, Indonesia, and Malaysia, among others) naturally leads to smaller estimates of overall trade impacts. The welfare impacts shown in Table C3 are also comparable to the baseline results in Table 5, both for individual countries and for the global welfare change calculation (an increase of 3.5% in overall consumer welfare for the country exclusion version in comparison with a comparable 4.1% increase in the baseline version).

Table C2: Aggregate Trade Impacts for in Free-Trade Scenario
(Country Exclusion)

Country	Bottled Wine		Bulk Wine		Country	Bottled Wine		Bulk Wine	
	ΔExports	ΔImports	ΔExports	ΔImports		ΔExports	ΔImports	ΔExports	ΔImports
Antigua and Barbuda	-	-	-	-	Latvia	-	–0.3	-	-
Argentina	3.5	0.5	0.6	0.2	Lithuania	-	–0.3	-	-
Armenia	-	0.1	-	-	Macedonia	-	0.2	-	-
Australia	–18.3	–0.5	–2.0	–1.1	Malta	-	-	-	-
Austria	-	0.2	0.1	-	Mauritius	0.1	0.2	-	-
Barbados	-	-	-	-	Mexico	0.1	–0.2	-	0.1
Belarus	0.1	0.7	-	0.1	Moldova	2.4	-	-	-
Belgium	–0.1	–0.1	-	0.7	Montenegro	0.7	0.7	-	-
Bermuda	-	0.1	-	-	Mozambique	-	0.1	-	-
Bolivia	0.1	-	-	-	Myanmar	0.1	0.2	-	-
Brazil	0.7	-	0.1	0.2	Netherlands	-	0.5	-	–0.2
Bulgaria	0.2	0.2	-	-	New Zealand	5.2	1.7	0.8	0.7
Canada	0.2	2.7	1.3	1.2	Norway	-	-	-	-
Chile	–14.1	-	–1.6	-	Panama	-	-	-	-
China	1.2	–17.4	-	–2.8	Peru	-	-	-	-
Colombia	-	0.2	-	-	Philippines	0.1	-	-	-
Croatia	0.2	0.2	-	-	Poland	-	–0.9	-	-
Cuba	-	-	-	-	Portugal	2.8	1.3	0.3	-
Cyprus	0.1	-	-	-	Romania	0.1	0.4	-	-
Czech Republic	0.1	0.6	-	-	Russia	0.5	–1.1	-	–0.4
Denmark	-	0.9	-	-	Rwanda	-	-	-	-
Dominican Republic	-	–0.5	-	-	Singapore	1.8	0.5	-	-
Ecuador	-	-	-	-	Slovakia	-	-	-	-
El Salvador	-	-	-	-	Slovenia	-	-	-	-
Estonia	-	–0.1	-	-	South Africa	0.2	1.1	–0.1	0.8
Fiji	-	0.2	-	-	South Korea	-	0.8	-	-
Finland	-	–0.2	-	-	Spain	1.9	0.4	–0.8	0.7
France	1.5	12.9	2.5	1.0	Sri Lanka	-	-	-	-
French Polynesia	-	-	-	-	St. Lucia	-	-	-	-
Georgia	–1.7	-	-	-	Sweden	-	–0.8	-	–0.5
Germany	–1.6	–0.7	-	–0.2	Switzerland	21.7	22.2	0.8	1.0
Greece	-	-	-	-	Thailand	0.2	-	-	–0.3
Grenada	-	-	-	-	Trinidad and Tobago	-	-	-	-
Guatemala	-	0.1	-	-	Uganda	0.1	-	-	-
Hungary	-	-	-	-	Ukraine	0.2	–0.9	-	-
Iceland	-	-	-	-	United Kingdom	–1.2	–7.9	-	2.8
India	-	0.2	-	-	United States	28.3	22.2	10.6	13.6
Ireland	-	–0.5	-	-	Uruguay	–0.5	–0.4	-	-
Israel	0.4	–0.2	-	0.1	Venezuela	-	0.2	-	-
Italy	–1.6	1.0	2.7	–0.4	Vietnam	0.1	0.5	-	0.1
Jamaica	0.2	-	-	-	Zimbabwe	-	-	-	-
Japan	0.3	–2.8	0.1	–1.5	***Total***		***38.0***		***15.9***
Kenya	0.1	-	-	-					

Notes: Trade impacts are expressed in million USD. "-" indicates a change in trade of less than $100 thousand. Simulation excludes the 18 majority-Muslim countries described in Table A1.

Table C3: Welfare Impacts in Complete Trade Liberalization Scenario (Country Exclusion)

Country	%ΔW	Country	%ΔW	Country	%ΔW
India	153.2	Venezuela	7.5	United States	1.0
Trinidad and Tobago	82.3	Israel	6.9	Romania	0.9
Bermuda	82.0	Armenia	6.1	Czech Republic	0.8
Sri Lanka	65.9	Georgia	5.8	Canada	0.7
Fiji	59.6	Dominican Republic	5.3	Hungary	0.7
Vietnam	46.7	Belarus	4.5	Iceland	0.7
Jamaica	42.4	Guatemala	4.3	Slovakia	0.7
Thailand	41.4	El Salvador	4.2	Bulgaria	0.6
Grenada	36.3	Ukraine	3.8	Australia	0.5
St. Lucia	30.6	Chile	3.6	Germany	0.5
Barbados	29.6	Ecuador	2.9	Argentina	0.4
Switzerland	29.3	French Polynesia	2.8	Belgium	0.4
Brazil	28.4	Mexico	2.6	Lithuania	0.4
Philippines	26.1	Colombia	2.5	Malta	0.3
Kenya	24.2	United Kingdom	2.4	Greece	0.1
Uganda	23.4	Finland	2.2	Austria	0.0
Rwanda	22.5	Cyprus	2.0	Norway	0.0
Antigua and Barbuda	21.2	Ireland	1.8	Spain	–0.1
Japan	17.7	Moldova	1.5	France	–0.2
Myanmar	17.0	South Korea	1.5	Italy	–0.2
Panama	15.7	Denmark	1.4	Zimbabwe	–0.2
Bolivia	13.4	Estonia	1.4	Slovenia	–0.5
Mozambique	13.2	Sweden	1.4	New Zealand	–0.9
Cuba	12.2	Latvia	1.3	Portugal	–1.2
Montenegro	12.2	Peru	1.3	South Africa	–2.6
China	10.6	Poland	1.3	Macedonia	–2.7
Russia	9.1	Singapore	1.2	***Trade-weighted average***	***3.5***
Uruguay	8.1	Croatia	1.0		
Mauritius	7.5	Netherlands	1.0		

Notes: Welfare impacts are calculated as the import-share-weighted average of the welfare impacts for the two individual commodities. All welfare impacts are relative to the reference country (Norway). The trade-weighted average welfare impact is calculated as the average welfare change weighted by each country's share of total world wine imports. Simulation excludes the 18 majority-Muslim countries described in Table A1.