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ARTICLE

Explaining bilateral patterns of global wine trade, 1962–2019

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Abstract
This study uses gravity models to explain bilateral patterns of global wine trade since 1962. This is, to our knowledge, the first study on global wine trade covering the second wave of globalization as a whole. The results suggest that the impact of distance, common language, and common colonizer post-1945 on wine trade was lower in the 1991–2019 period than in the 1962–1990 period. We also use gravity models to explain the impact on bilateral wine trade patterns of similarities across countries in the mix of winegrape varieties in their vineyards. Although our models do not allow us to identify causality, the results suggest that countries trade more wine with each other the closer their mix of winegrape varieties.

Keywords: gravity model; second wave of globalization; varietal similarity index; wine trade

JEL Classifications: F14; Q17

I. Introduction

The great boom in wine trade over the past six decades can be decomposed into two three-decade periods (Figure 1). The first period started in the 1960s, when traditional European wine-producing countries dramatically increased their wine exports, something that was influenced by a decrease in their domestic demand. The second period began in the 1990s, when several wine-producing countries in the southern hemisphere increased their exports at an accelerated rate in an explicit drive for export-led growth (Figure 1), raising the New World's share of global wine exports from less than 3% prior to 1990 to one-quarter in the 2010s.

This study aims to explain, econometrically, the impact of key variables affecting wine trade since the 1960s. We divide the second wave of globalization into two periods (1962–1990 and 1991–2019), which allows us to test how the influence of these key variables affecting wine trade has changed due to the impact of globalization. Our study is, to our knowledge, the first of its kind covering the second wave of globalization as a whole, complementing previous research that has focused on the first wave

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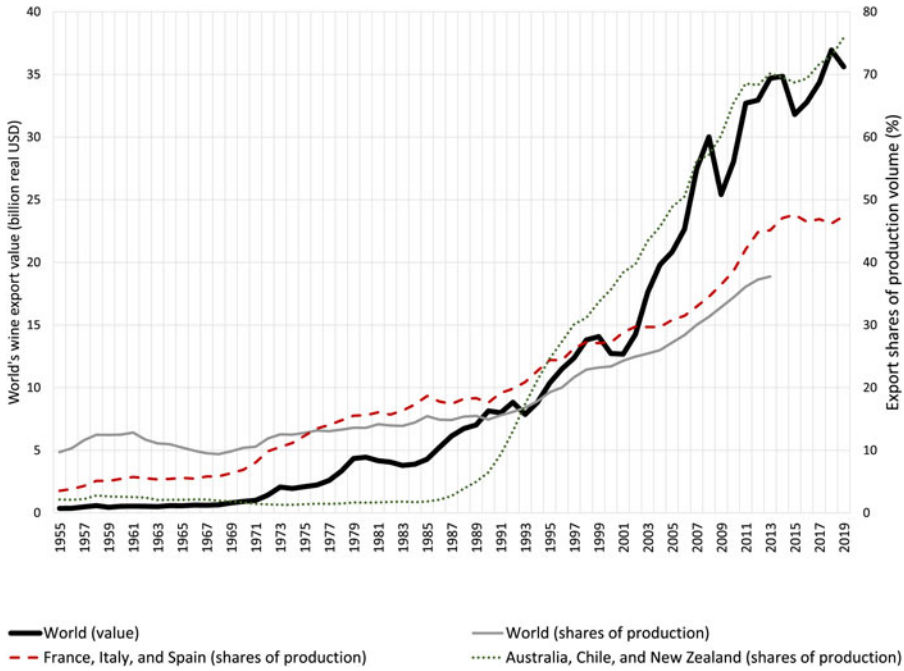


Figure 1. World's wine export values and export shares of production volume, 1995 to 2019.
Notes: Authors' computation is based on data from Anderson and Pinilla (2021, 2022). Exports values are deflated by U.S. CPI where 2015 = 1.00. The export shares of production volume are averages of the previous five years. For both three-country groups, the export shares of production volume are simple averages between the three countries of each group.

of globalization (Ayuda, Ferrer-Pérez, and Pinilla, 2020). Previous studies focusing on world wine trade use datasets that begin in the 1990s (Santeramo et al., 2019; Dal Bianco et al., 2016) or early 2000s (Balogh and Jámbor, 2018). We limit the time series to 2019 to avoid the next two years when wine trade was disrupted by COVID-19, Brexit, and China imposing punitive tariffs on Australian wine imports (Wittwer and Anderson, 2020, 2021).

Furthermore, we analyze the influence on wine trade of similarities across countries in the mix of their vineyards' winegrape varieties, something that has not previously been analyzed. We do so to test two contrary hypotheses from empirical trade research. One draws on the home-country bias phenomenon: because consumers enjoy most the varieties they are familiar with from domestic production (Friberg, Paterson, and Richardson, 2011), they also seek them from among those that can be imported; the opposite hypothesis draws on the consumers' love of diversity phenomenon: their choice of imports complements what is available locally (Krugman, 1980; Broda and Weinstein, 2004), and so its varietal mix is dissimilar to the mix of domestically produced winegrapes.

II. Gravity models

The gravity model constitutes the theoretical and empirical framework of our analysis (see Head and Mayer (2014) and Yotov et al. (2017) for reviews). We estimate two

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sets of models. The first set allows us to compare the influence of key variables on wine trade between the first and second half of the second wave of globalization. The second set of models allows us to test the influence of similarities in the mix of winegrape varieties on wine trade.

The first set of models is given by:

$$X_{ij,t} = \exp[\rho_{i,t} + \upsilon_{j,t} + \beta_1 lnD_{ij} + \beta_2 RTA_{ij,t} + \beta_3 CL_{ij} + \beta_4 CC_{ij} + \beta_5 CB_{ij}] \times \epsilon_{ij,t} \quad (1)$$

The dependent variable, $X_{ij,t}$, is the trade flow from country i to country j, in year t (FOB USD); $\rho_{i,t}$ ($\upsilon_{j,t}$) are exporter-time (importer-time) fixed effects that account for time-varying country-specific characteristics such as macroeconomic variables, exchange rates, and wine production. Importantly, these fixed effects also account for multilateral resistances (Olivero and Yotov, 2012). The natural logarithm of the physical distance between country i and country j is lnD_{ij}. The dichotomous variables $RTA_{ij,t}$, CL_{ij}, CC_{ij}, and CB_{ij}, take the value of one if countries i and j have at least one regional trade agreement (RTA), common official or primary language, common colonizer post-1945, and common borders, respectively. The β_s are parameters to be estimated, and $\epsilon_{ij,t}$ is an error term. We estimate Equation (1) separately for the 1962–1990 period and the 1991–2019 period.

The second set of models is given by:

$$X_{ij,t} = \exp[\rho_{i,t} + \upsilon_{j,t} + \alpha_1 VSI_{ij,t} + \beta_1 lnD_{ij} + \beta_2 RTA_{ij,t} + \beta_3 CL_{ij} + \beta_4 CC_{ij} + \beta_5 CB_{ij}] \times \epsilon_{ij,t} \quad (2)$$

The difference between Equations (1) and (2) is that Equation (2) incorporates a new variable, the Varietal Similarity Index (VSI), between countries i and j in year t ($VSI_{ij,t}$). The VSI between two countries takes values between 0 and 1, where 0 means that the mix of grape varieties (in terms of bearing area of these varieties) is totally different and 1 means that the mix of grape varieties is exactly the same for both countries. Anderson (2010) introduces this index and its formula. We estimate this second set of models for all countries, but also for those that have a wine self-sufficiency index higher than 33%, 50%, and 100% (to reduce the sample to countries that are themselves significant wine producers). We use data for the three years in which we have VSI data: 2000, 2010, and 2016.

We estimate the two sets of models using the Poisson pseudo maximum likelihood (PPML) estimator, which works well in the presence of heteroskedasticity and a large proportion of zero trade flows (Santos Silva and Tenreyro, 2006, 2011). Trefler (2004) argues that using data for all years does not allow for adjustments to changes in trade policy. Therefore, Olivero and Yotov (2012) propose using three- to five-year interval data. As a robustness check, we estimate the models given by Equation (1) using three-year interval data.

III. Data

We use export data from Harvard's Atlas of Economic Complexity, available at www.atlas.cid.harvard.edu/. We use VSI data from Anderson and Nelgen (2020) and wine

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Table 1. Estimation results of the gravity models given by Equation (1) for 1962–1990 and 1991–2019, with continuous data (preferred) and three-year interval data

	Continuous data		Interval data	
Variable	1962–1990	1991–2019	1962–1990	1991–2019
(ln) Distance	−0.465*** (0.116)	−0.351*** (0.089)	−0.477*** (0.114)	−0.350*** (0.089)
RTA	0.061 (0.243)	0.400** (0.195)	0.029 (0.225)	0.419*** (0.198)
Common language	1.228*** (0.163)	0.935*** (0.166)	1.269*** (0.169)	0.926*** (0.167)
Common colonizer post-1945	2.214*** (0.290)	1.310** (0.532)	2.009*** (0.295)	1.450*** (0.535)
Common borders	−0.154 (0.212)	0.169 (0.245)	−0.228 (0.209)	0.141 (0.245)
Constant	20.772*** (0.921)	20.807*** (0.760)	21.006*** (0.904)	20.763*** (0.760)
Exporter-year fixed effects	Yes	Yes	−0.477***	−0.350***
Importer-year fixed effects	Yes	Yes	(0.114)	(0.089)
Observations	63,435	161,273	24,528	54,876
R^2	0.941	0.923	0.943	0.924

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses. The dependent variable is the natural logarithm of wine trade between two countries (FOB USD). RTA denotes the presence of a regional trade agreement. The preferred model uses continuous data, while the model with three-year interval data serves as a robustness check.

self-sufficiency data from Anderson and Pinilla (2022). The source of the distance in km between the most populous cities of each country, common official or primary language, common colonizer post-1945, and common borders is the CEPII gravity database, available at www.cepii.fr/cepii/en/bdd_modele/bdd.asp.

IV. Results and discussion

The first set of models reveals differences between the 1962–1990 period and the 1991–2019 period (see first two columns of Table 1). These results are consistent whether we estimate Equation (1) using yearly data or using three-year interval data, which we use as a robustness check (see last two columns of Table 1). The impacts of distance, common language, and common colonizer post-1945 are smaller for the latter period. This is consistent with trade theory and the findings of previous studies (e.g., Borchert and Yotov, 2017), and it relates to the decline in trade costs over time (Anderson and van Wincoop, 2004). RTAs, on the other hand, have a greater influence in the latter period, consistent with the dramatic growth in the number of such agreements since the early 1990s (currently more than 350, see https://www.wto.org/english/tratop_e/region_e/region_e.htm).

The second set of models suggests that the VSI has a statistically significant positive effect on wine trade flows (see Table 2). This result is consistent whether the

Table 2. Estimation results of the gravity models given by Equation (2) for all countries, as well as for countries with a wine self-sufficiency index higher than 33%, 50%, and 100%

	Countries included in the model			
Variable	All	SSI > 33%	SSI > 50%	SSI > 100%
VSI	0.187***	0.205***	0.245***	0.237***
	(0.068)	(0.072)	(0.083)	(0.085)
(ln) Distance	−0.331***	−0.316**	−0.317**	−0.284**
	(0.122)	(0.127)	(0.129)	(0.126)
RTA	0.358	0.362	0.375	0.420
	(0.291)	(0.295)	(0.299)	(0.315)
Common language	0.874***	0.886***	0.864***	0.864***
	(0.202)	(0.209)	(0.214)	(0.249)
Common colonizer post-1945	2.994***	2.997***	2.986***	3.251***
	(0.605)	(0.620)	(0.631)	(0.698)
Common border	−0.089	−0.073	−0.103	−0.152
	(0.248)	(0.255)	(0.256)	(0.253)
Constant	21.703***	21.657***	21.809***	21.621***
	(1.073)	(1.114)	(1.136)	(1.090)
Exporter-year fixed effects	Yes	Yes	Yes	Yes
Importer-year fixed effects	Yes	Yes	Yes	Yes
Observations	3,988	3,335	2,996	2,024
R^2	0.938	0.938	0.939	0.935

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses. The dependent variable is the natural logarithm of wine trade between two countries (FOB USD). VSI denotes the varietal similarity index and RTA denotes the presence of a regional trade agreement. SSI stands for the wine self-sufficiency index. For example, a SSI > 50% means that the only countries included in the analysis are those that produce at least half of the wine quantity they consume. Estimated with data for 2000, 2010, and 2016.

model is estimated for all countries or for those who have a wine self-sufficiency index higher than 33%, 50%, or 100%. This suggests that those countries with a similar mix of grape varieties tend to trade more wine with each other, which is consistent with the home-country bias hypothesis and not with the hypothesis that consumers' choice of imports complements the varietal mix available from local producers. However, our models do not allow us to imply a causal relationship as there may be potential endogeneity issues due to reverse causality. For example, the specifics of the international demand for wine may influence decisions in exporting countries as to which varieties to plant.

Unfortunately, comprehensive time-series data on national expenditure on the various varieties of domestically produced wine are not available for most countries. If they were, more-robust models would be able to be estimated because those data would help solve the missing globalization puzzle (Borchert and Yotov, 2017) and better identify the impact of trade variables (Heid, Larch, and Yotov, 2021). Further, such models could use country-pair fixed effects to account for any resistance (preference) toward imported (domestically produced) wine.

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V. Conclusion

We have used a gravity approach to estimate the impact of important variables influencing wine trade for two time periods: 1962–1990 and 1991–2019. The results suggest that the impact of distance, common language, and common colonizer post-1945 on wine trade has decreased in the latter period. These results are consistent with previous studies focused on other industries and with the expected impact of globalization. We have also used a gravity approach to estimate the impact of similarities in the mix of winegrape varieties on wine trade flows. The results suggest that countries that have a more similar mix of winegrape varieties tend to trade more wine with each other. However, potential endogeneity issues do not allow us to imply a causal relationship. We argue that a database with intra-national trade flows would allow wine economists to estimate more robust gravity models that could yield important insights.

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