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Full Research Article

Export propensity and intensity in the wine industry: a fractional econometric approach

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Abstract. Using export market shares as a measure of international competitiveness, this paper studies wine exports in terms of propensity and intensity. Based on data for the period 1999-2014, a two-part fractional regression model is applied. The results suggest that for importing countries GDP per capita, their own wine production, and EU membership have a positive effect on the probability of importing wine but tend to evolve inversely to market shares, as taste for variety becomes more important. Additionally, export propensity is positively affected by regional trade agreements, common language, similarity of religious culture, wine production in the exporting country, and the exporting country being from the Old World, while export intensity is boosted by common language and wine production in the exporting country. Bilateral distance has a negative effect on both margins of trade.

Keywords. globalisation, international trade, market share, fractional regression model.

JEL codes. F14, L66.

1. Introduction

International competitiveness has become a topic of growing interest over the last decades. The concept of competitiveness is multifaceted and multidimensional (De Grauwe, 2010), and researchers with such different backgrounds as economics, politics, management and history have all studied this concept. In economic literature, the roots lie in the international economic theories of Adam Smith, David Ricardo and their followers. A definition of competitiveness, as given by the European Commission is the ability "to sustainably produce and sell goods and services on a given market, in such a way that buyers prefer these goods to those offered by competitors" (European Commission, p. 12, 2014). On the other hand, the Organisation for Economic Co-operation and Development suggests it is the "ability of companies, industries, regions, nations, and supranational regions to generate, while being and remaining exposed to international competition, relatively high factor income and factor employment levels on a sustainable basis" (Hatzichronologou, p.20, 1996).

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These definitions suggest that competitiveness can be observed from different points, namely at a company, sector, or national level. While ratios of financial profitability are a predominant indicator of performance for companies and the sectors of which they are composed, a high-performing country is one with positive trade balance (Cardebat, 2019). This means that, although there is no "national decision" regarding trade in the sense of a centralized decision, the "national decision" is the sum of the decisions made by its companies.

The well-known export market share is a simple but informative measure of competitiveness that allows direct trading positions to be established and was used, for example, by Banterle and Carraresi (2007), Wijnands *et al.* (2008), and Carraresi and Banterle (2015). Generally, this indicator is calculated by dividing the exports of a country by the total exports of a trading area and it is a measure of the degree of importance of a country, henceforth called country *i*, within the total exports of that trading area. The market share is given by a fractional variable bound by 0 and 1, being 0 if country *i* does not export and being 1 when all exports of the area are made by country *i*.

In econometric modelling the fractional nature of this dependent variable provides limitations, in particular with linear specifications, where predicted values can be outside the boundaries [0, 1], resulting in meaningless outcomes. Therefore, the fractional regression model (FRM) developed by Papke and Wooldridge (1996, 2008) seems to be a preferable approach. Moreover, by considering a two-part model (2P-FRM) the aim is to estimate two different effects of explanatory variables: on the one hand, the effect on the decision of two countries establishing an international trade relationship (export propensity) and, on the other hand, the effect on the decision about how much to trade (export intensity). Following a similar logic, Bouët *et al.* (2017) estimated Cognac export propensity and intensity using the Heckman's procedure to correct a sample selection issue. Comparatively, the 2P-FRM has the advantage of not requiring an exclusion restriction (Ramalho *et al.*, 2011).

The global intensification of international trade have been accompanied by a wave of research estimating macroeconomic determinants mainly through the gravity framework to explain trade flows in value or volume (Bergstrand 1989; McCallum 1995; Anderson and van Wincoop 2003; Silva and Tenreyro 2006; Anderson and Yotov 2012; Cirera *et al.* 2016). Inspired by Newton's law of gravity, the gravity model sets out to explain trade between an exporting country and an importing country based on their economic masses and the distance between them. It follows that economic masses (generally represented through the GDP) are expected to positively influence trade, while bilateral distance is expected to have a negative effect. Over time, researchers have added more variables to the model and some works highlight the importance of studying the impact of trade agreements, transport costs, purchasing power, and cultural proximity, among other determinants, on international trade patterns.[1]

Wine is a good example of a product increasingly globalised during the last five decades, presenting diversified geography of production and consumption and fierce competition between countries and even among local wine regions. Studies on the global alcohol markets, and more specifically wine, have been multiplying in the last decades. Anderson *et al.* (2018) presented historic facts about alcohol consumption and highlighted the study from Holmes and Anderson (2017) to state the more recent trend of convergence in national consumption

[1] However, generally, such analyses do not take into consideration the contribution from the exporting countries to total imports in the destination country using, for example, market shares.

patterns of alcohol as a result of globalisation. Despite social, political, and fiscal differences among countries, consumption levels have decreased in "traditional" consuming countries (e.g. France, Italy, and Portugal) and increased in other countries without a tradition of wine consumption (e.g. China, Russia, and USA) (Smith and Mitry, 2007; Dal Bianco et al, 2013). Additionally, other topics were also studied such as the potential market implications of Brexit (Anderson and Wittwer, 2017), the emergence of Asia in the beverage market (Anderson, 2019), and the impact of climate change on wine industry (Anderson, 2017; Ashenfelter and Storchmann, 2016a, 2016b). A complementary strand of the literature deals with microeconomic factors of competitiveness. For example, Bargain *et al.* (2018) use a qualitative approach to discuss key comparative advantages of 16 wine-producing countries, and Ugaglia *et al.* (2019) dedicate several chapters to the study of the industrial organization of Old and New World wine producing countries.

Based on the gravity model, but considering the fractional nature of the explained variable, which leads to the application of the FRM, this research aims to contribute to the debate and provide further insight into the dynamics of international trade. To the best of our knowledge, there are no published studies that use the FRM to analyse the competitiveness of an industry. Specifically, a 2P-FRM is applied to data on wine exports from the main fifteen producing countries to 193 partner countries, between 1999 and 2014, taking into account explanatory variables inspired by the gravity equation.

After this introduction, the paper is organized as follows: Section 2 presents the model framework and the data used; Section 3 presents the results and discussion; and Section 4 concludes.

2. Material and methods

Given that the variable of interest y, i.e. market share, is a proportion defined and observed only in the interval $0 \leq y \leq 1$, an approach capable of dealing with a bounded and fractional response variable is required. Standard linear specifications can become inconsistent since they do not guarantee predicted values within the boundaries [0,1]. Following the seminal papers of Papke and Wooldridge (1996, 2008), the FRM is recommended since it presents advantages in relation to linear methods or other common solutions of the literature such as logit, probit, Tobit and Heckman sample selection model. Unlike the FRM, all these methods do not guarantee predictions within the meaningful interval [0,1] (Ramalho *et al.*, 2011). Comparing in particular with the Heckman model, the FRM presents also the advantage of not requiring an exclusion restriction, which is useful in empirical practice and, following Schwiebert (2018), avoids severe biases due to the imposition of an incorrect restriction. The FRM is a non-linear model that does not require transformations for values at the boundaries, accounting for the non-linearity in the data, while being fully robust under generalized linear model assumptions (Gallani *et al.* 2015). Observations at the extremes of the distribution are included based on the assumption that $E(Y|X) = G(X\beta)$, where fitted values are guaranteed within the unit interval by $0 \leq G(\cdot) \leq 1$. Papke and Wooldridge (1996) suggest the quasi-maximum likelihood (QML) method for estimations of β, which is based on the maximization of the Bernoulli log-likelihood function $LL(\beta) \equiv y \log[G(X\beta)] + (1 - y) \log[1 - G(X\beta)]$.

Furthermore, if there is a high concentration of observations at the boundary 0, Ramalho *et al.* (2011) advise that it is better to consider a two-part model. The 2P-FRM is

constituted of a binary model for the discrete component (0 or 1) and a fractional model for the continuous component. Choosing between one- or two-part models depends on the interpretation of the zeros based on the existence or not of two decision mechanisms for zeros and positive values [Ramalho *et al.* (2011) also suggest a P test to compare the two models]. In international trade, by the estimation of a two-part model, it is presumed that a country as representing all of its firms has two distinct decisions to make: the first is whether to establish a trade relationship with another country (export propensity) and the second concerns the amount to be traded (export intensity). If none of the companies from a country *i* decides to export to a country *j* (e.g., because costs are too high for potential profit), then the decision of country *i* is to not export to country *j*.

Therefore, in the 2P-FRM of this work, the first part estimates the factors influencing the probability of the wine of country *i* being imported by a certain country *j* and it can be defined as

$$\text{share}_{ijt}^{\star} = \begin{cases} 0 \text{ for } share_{ijt} = 0 \\ 1 \text{ for } share_{ijt\varepsilon}(0,1) \end{cases} \tag{1}$$

$$Pr(share_{ijt}^{\star} = 1|X_{ijt}) = E(share_{ijt}^{\star}|X_{ijt}) = F(X_{ijt}\,\beta_1) \tag{2}$$

where $share_{ijt}$ is the market share of country *i*'s exports as a proportion of the total of country *j*'s imports in year *t*, $F(\cdot)$ is a non-linear conditional mean specification and β_1 is a vector of coefficients for the covariates in X_{ijt}.

The second part of the model considers only the observations of (1) where country *i*'s wine was imported, i.e. positive outcomes, to estimate the factors influencing the magnitude of a market share of country *i* in country *j*. It can be represented as

$$E[share_{ijt}|X_{ijt}, share_{ijt} \in (0,1)] = M(X_{ijt}\,\beta_2) \tag{3}$$

where in $M(X_{ijt}\,\beta_2)$ the regressors X_{ijt} are the same as the first part (despite not being required) and $M(\cdot)$ is also a non-linear conditional mean specification but not necessarily the same specification as $F(\cdot)$.

Hence, following Ramalho *et al.* (2011), $E[share_{ijt}|X_{ijt}]$ can be defined by

$$E[share_{ijt}|X_{ijt}] = M(X_{ijt}\,\beta_2) \cdot F(X_{ijt}\,\beta_1) \tag{4}$$

But to correctly interpret the estimated coefficients of non-linear econometric models it is advisable to estimate average and total partial effects. As x_{ijt} is a covariate of vector X_{ijt}, an average partial effect (APE) will be computed for the first part of the model to estimate the effect of x_{ijt} on the probability of a good (in this case wine) of country *i* being imported by a certain country *j*:

$$\frac{\partial\, Pr(share_{ijt}^{\star} = 1|X_{ijt})}{\partial x_{ijt}} = \beta_1 f(x_{ijt}\,\beta_1) \tag{5}$$

Similarly, another APE will be computed for the second part to estimate the effect of x_{ijt} on the magnitude of a non-zero market share of country *i* in country *j*:

$$\frac{\partial E[share_{ijt}|X_{ijt}, share_{ijt} \in (0,1)]}{\partial x_{ijt}} = \beta_2 m(x_{ijt}\beta_2) \tag{6}$$

Finally, a total partial effect (TPE) will be computed to estimate the effect of x_{ijt} on the magnitude of any (including zero) market share of country *i* in country *j*:

$$\frac{\partial E[share_{ijt}|X_{ijt}]}{\partial x_{ijt}} = \frac{\partial M(X_{ijt}\beta_2)}{\partial x_{ijt}} F(X_{ijt}\beta_1) + \frac{\partial F(X_{ijt}\beta_1)}{\partial x_{ijt}} = M(X_{ijt}\beta_2) \tag{6}$$

Inspired by the literature on the gravity model (Bergstrand 1989; McCallum 1995; Anderson and van Wincoop 2003; Silva and Tenreyro 2006; Anderson and Yotov 2012; Cirera *et al.* 2016), the covariates that could influence the wine market share are: geographic distance between countries *i* and *j* ($dist_{ij}$); GDP per capita of importer *j* in year *t* ($gdppc_{jt}$); wine produced in countries *i* and *j* in year *t*-1 (respectively, $prod_{it\text{-}1}$ and $prod_{jt\text{-}1}$); exporter *i* being an Old World country (old_i); the annual average exchange rate between the currencies of countries *i* and *j* in year *t* (er_{ijt}); importer *j*'s European Union (EU) membership status in year *t* (eu_{jt}); the existence in year *t* of regional trade agreements (RTA) between countries *i* and *j* (rta_{ijt}); the same official language in countries *i* and *j* ($lang_{ij}$); and countries *i* and *j* sharing common religion beliefs ($relig_{ij}$).[2]

As regards the expected sign of the explanatory variables, distance should have a negative effect on the probability of wine trade and on market shares as this is a proxy for transport costs. On the other hand, the existence of a regional trade agreement between two countries should reduce trade costs and, consequently, may have a positive effect. The same is expected for the effect of wine production in the importing country because more wine produced means possessing a greater stock to export. Exporting countries from the Old World may also present some advantage in wine trade due to their experience. Sharing a common language or common religion beliefs should also have a positive effect in both parts of the model because it represents higher cultural proximity.

Moreover, the sign of the effect provoked by an explanatory variable may not be the same in the first and second parts. For example, the GDP per capita of importing countries represents purchasing power, which should increase the probability of trade and quantity traded but can have a different impact on market shares. In fact, a hypothesis to be tested in the results section is that higher purchasing power may lead importing countries to search for differentiation, therefore spreading their imports across more countries.

[2] The effect of tariff and non-tariff measures on wine trade have also been studied using the gravity model. The literature shows that specific tariffs may be a deterrent to trade (Dal Bianco *et al.*, 2016; Dal Bianco *et al.*, 2017) or not have a significant effect on certain wines (Gouveia *et al.*, 2018; Macedo *et al.*, 2019, 2020). However, there is an ongoing debate about non-tariff measures as the papers published on this subject relatively recent and scarce (Dal Bianco *et al.*, 2016; Santeramo *et al.*, 2019). Dal Bianco *et al.* (2016) find that only some non-tariff measures present a significant negative effect on wine exports, while Santeramo *et al.* (2019) find more of a positive impact of some non-tariff measures in wine imports. Although recognizing the relevance of this issue, it was felt that it deserves a deeper analysis, which is beyond the scope of this paper, i.e. the application of the FRM to international wine trade.

Similarly, wine production and EU membership of importing countries may have a positive impact on the probability of trade because it may represent a higher degree of cultural openness to wine consumption, however that may also result in a taste for variety that would have a negative impact on market shares.

Regarding the exchange rate, depreciation of an exporter *i* is expected to have a positive impact on market shares, because exports of country *i* become cheaper for importers *j*, while the converse will be true if exporter *i*'s currency undergoes appreciation. However, as suggested by Chaney (2016), the effect on the probability of country *i* exporting to *j* may be the opposite because, in the presence of fixed costs and liquidity constraints, a depreciation will also mean that the value of domestic assets abroad decreases and, therefore, foreign markets become less accessible to some firms of country *i* whilst appreciation will have the opposite effect. These two effects of exchange rate are not incompatible considering a two-part model. The first part of the model should be more sensitive to fixed costs constraints because it refers to the factors affecting the probability of trade. On the other hand, the second part of the model should not be sensitive to fixed costs constraints because it only considers existent trade relationships. Studying French wine exports, Cardebat and Figuet (2019) also identified that variations in exchange rates can lead to quality sorting, in the sense that higher-quality wines are less sensitive to exchange rate movements.

The model is applied to the fifteen main wine producers[3] (Argentina, Australia, Chile, China, France, Germany, Greece, Hungary, Italy, Portugal, Romania, Russia, Spain, South Africa and USA), focusing on 193 trade partners, all of which represent around 89% of world bottled wine exports during the period 1999-2014. Regarding the explained variable, data for wine exports of the main exporting countries and total imports of each destination country are from the COMTRADE database[4] in US dollars. The computation of the market share in this work measures the weight that an exporting country *i* has on total exports to a certain country *j* (or, in other words, on the total imports of a certain country *j*). About the explanatory variables, the sources are: World Development Indicators (WDI) database for GDP per capita in current US dollars and nominal exchange rate in local currency unit per US dollar (used to compute the exchange rate of exporting countries per 1 currency unit of importing countries); International Organisation of Vine and Wine (OIV) for wine production data; Cardebat (2019) for Old World countries[5]; EU official website[6] for EU membership dummy variable; and Gravity database from *Centre d'Études Prospectives et d'Informations Internationales* (CEPII) for bilateral distance in kilometres weighted by population, religious proximity[7], dummy for common official language and dummy for regional trade agreements. Descriptive statistics of all variables considered in the paper are present in Table A.1 in Appendix.

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[3] In this paper the sample considers the main wine producers instead of the main exporters to limit bias. Data on worldwide wine trade is not completely trackable and, consequently, they do not distinguish export from re-export. For that reason, countries such as United Kingdom, Switzerland and Hong Kong appear among the main wine exporters in COMTRADE database without producing relevant quantities of wine.

[4] Harmonised system codes starting by 220421

[5] Contrary to Cardebat (2019), in this study Hungary is included in the group of Old World countries for having a historically relevant wine industry (Luptak *et al.*, 2016).

[6] Website: https://europa.eu/.

[7] Index from Disdier and Mayer (2007) calculated by adding the products of the relative proportions of Catholics, Protestants and Muslims in the exporting and importing countries. Higher values in this index mean sharing more common religion beliefs.

3. Results and discussion

In order to assess the robustness of the results, the 2P-FRM is estimated assuming four alternative non-linear conditional mean specifications (cauchit, logit, probit, and loglog) for $F(\cdot)$ and $M(\cdot)$. Based on RESET and Goodness-of-functional-form (GOFF) tests (Ramalho *et al.* 2011), the results suggest adopting the logit specification in both parts of the model (see Table A.2 in Appendix).[8] Therefore, the results of the estimations with logit are presented in Table 1.[9] Columns (1) and (3) refer to the coefficients estimated for the export propensity (equations 1 and 2) and the export intensity (equation 3), respectively. Table 1 also presents the estimations of two APEs for each explanatory variable: in column (2) the effect on the

Table 1. 2P-FRM estimations, Average Partial Effects and Total Partial Effect.

Variables	(1)	(2)	(3)	(4)	(5)
	Export propensity		Export intensity		TPE
	β_1	APE	β_2	APE	
GDP pc importer (log)	0.349***	0.057***	-0.167***	-0.014***	-0.003**
	(0.029)	(0.004)	(0.032)	(0.003)	(0.001)
EU importer	1.037***	0.170***	-0.292***	-0.024***	0.000
	(0.145)	(0.024)	(0.105)	(0.009)	(0.005)
Production importer (t-1) (log)	0.127***	0.021***	-0.054***	-0.004***	-0.001
	(0.012)	(0.002)	(0.012)	(0.001)	(0.001)
Production exporter (t-1) (log)	0.824***	0.135***	0.661***	0.054***	0.038***
	(0.047)	(0.007)	(0.066)	(0.005)	(0.003)
Old World exporter	0.772***	0.127***	-0.066	-0.005	0.007
	(0.082)	(0.013)	(0.117)	(0.010)	(0.005)
Exch. rate (log)	-0.069***	-0.011***	0.038**	0.003**	0.001
	(0.013)	(0.002)	(0.016)	(0.001)	(0.001)
RTA	0.611***	0.100***	0.071	0.006	0.010**
	(0.107)	(0.017)	(0.102)	(0.008)	(0.004)
Distance (log)	-0.278***	-0.046***	-0.620***	-0.051***	-0.029***
	(0.060)	(0.010)	(0.054)	(0.005)	(0.003)

[8] RESET and GOFF tests to the specification also reject the one-part model, which corroborate with the results of the P test suggested by Ramalho et al (2011). Additionally, estimations of the 2P-FRM with a sample of 154 exporting countries (the maximum number for which information is available) were attempted but the specification was rejected by RESET and GOFF tests. However, the results are fairly similar. The only differences in signs and significance of coefficients estimated are that, in the 1st part, religious proximity is not statistically significant and, in the 2nd part, exchange rate is not significant while RTA is positive and significant. These results are available upon request.

[9] For robustness of analysis, estimates were also made by splitting the sample into two sub-periods: before and after the financial crisis of 2008. The results do not indicate any marked differences between the two sub-periods (Table A.3 in Appendix).

Variables	(1)	(2)	(3)	(4)	(5)
	Export propensity		Export intensity		TPE
	β_1	APE	β_2	APE	
Common language	1.486***	0.244***	1.469***	0.121***	0.080***
	(0.138)	(0.022)	(0.106)	(0.009)	(0.005)
Religious proximity	1.644***	0.270***	-0.141	-0.012	0.014**
	(0.192)	(0.031)	(0.149)	(0.012)	(0.007)
Constant	-9.317***		-1.961***		
	(0.650)		(0.750)		
Observations	44,313		22,671		
Pseudo R^2	0.341		0.328		
Time effects' significance	44.76***		97.11***		
	[0.000]		[0.000]		
RESET	0.205		2.476		
	[0.651]		[0.116]		
GOFF1	1.049		1.093		
	[0.306]		[0.296]		
GOFF2	1.294		0.216		
	[0.255]		[0.642]		

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Figures in [ ] indicate *p*-values; Time dummies included but not reported; GOFF1 and GOFF2 are goodness-of-functional-form tests; GDP pc is the per capita gross domestic product of the importer; EU is European Union membership (or not) of the importer; wine produced in period t-1 in importing and exporting countries are represented by Production importer and Production exporter, respectively; Old World is a dummy variable coded 1 if the exporting country is considered an Old World country in wine trade and 0 otherwise; Exch. Rate is the annual average exchange rate between the currencies of importing countries and exporting countries; RTA is a dummy variable coded 1 if there is a regional trade agreement between the exporter and the importer; Distance is the geographical distance between the exporter and the importer; Common language is a dummy variable coded 1 if importer and exporter share the same official language; and Religious proximity is an index measuring common religion beliefs. Source: Authors' computation.

probability of wine of country *i* being imported by a certain country *j* (equation 5); and in column (4) the effect on the magnitude of a non-zero market share of country *i*'s wine in country *j* (equation 6). Column (5) includes the TPE (equation 7). Time effects are considered through yearly dummy variables (omitted due to space considerations), and standard errors account for intra-group correlation.

The results suggest that all parameters estimated in the 1st part of the model (propensity to export) are statistically significant. By observing the APEs, it is also possible to confirm the expected signs for all explanatory variables. It is estimated that the distance between two countries has a negative effect on the probability of wine of an exporting country *i* being imported by a certain country *j*. A depreciation of the exporter's currency in relation to an importer's currency has a negative effect on the export propensity, which following Chaney

(2016) is an expected result in the presence of fixed costs and liquidity constraints. On the other hand, GDP per capita of the importers, wine production of both trade partners, the exporting country being an Old World country, EU membership of importing countries, regional trade agreements established between both countries, and cultural proximity aspects, such as religion and language, present a positive effect.

In the 2nd part of the model most of the covariates have a statistically significant effect, the exceptions being Old World exporting countries, regional trade agreements and religious proximity. The APEs indicate that the market share of wine from an exporting country *i* in a certain country *j* is negatively affected by GDP per capita, wine production, EU membership of importing countries and bilateral distance. However, the market share is positively affected by wine production in the exporting country, common language between trade partners and depreciation of the exporter's currency in relation to an importer's currency.

It is noticeable that only three explanatory variables have APEs with similar signs in both 2nd and 1st parts: distance, wine production in the exporting country, and common language between trading partners. Regarding the other variables, as expected, the effect of depreciation of the exporter's currency becomes positive in the 2nd part, as a result of wine becoming cheaper for importers. The effect of GDP per capita of importing countries goes from positive to negative, confirming the hypothesis that higher purchasing power leads importing countries to search for variety, therefore ranging across more countries to obtain their imports. A negative effect is also caused by higher wine production in importing countries and importer's EU membership, because these variables seems to indicate higher cultural openness to wine consumption but also a taste for variety, which has a negative impact on market shares. Regional trade agreements, religious proximity, and Old World exporting countries have a positive impact on propensity to trade but have not a significant effect on the intensity of trade, meaning that historical, cultural, and commercial relationship are advantages in market entrance.

The TPEs show the effect of each covariate on the magnitude of any market share (including zero) of country *i*'s wine in country *j*. This can be interpreted as a global view of the effect of explanatory variables in both parts of the model. Therefore, the results suggest that, overall, per capita GDP and distance have a negative impact on market shares, while wine production of exporting countries, regional trade agreements, common language, and religious proximity have a positive impact.

As far as it is known, there are no fully comparable results in wine trade literature, as the dependent variable is usually not the market share. The closest comparison can be made with studies focused on determinants of wine exports, in which the dependent variable is usually the value or volume of exports. Most of these works also suggest that bilateral distance has a negative effect on trade (Castillo *et al.* 2016; Dal Bianco *et al.* 2016; Lombardi *et al.* 2016), common language facilitates commercial relationship (Castillo *et al.* 2016; Dal Bianco *et al.* 2016; Lombardi *et al.* 2016; Gouveia *et al.* 2018), regional trade agreements enhance trade (Dascal *et al.* 2002; Castillo *et al.* 2016), and wine production in exporting countries creates an export stimulus (Dascal *et al.* 2002; Agostino and Trivieri 2014; Dal Bianco *et al.* 2016). With regard to the effects estimated for GDP per capita, wine production, and EU membership of importing countries, they are not comparable to such studies due to the difference in the nature of the dependent variable.

4. Conclusion

Competition may be within domestic markets but, in a globalised economy, competitiveness is more and more dependent on the ability of industries to trade at an international level. One of the measures of competitiveness is the export market share, allowing the establishment of direct trading positions. However, when studying international competitiveness it is important to distinguish export intensity from export propensity, as some determinants can present opposite effects in these two respective measures, suggesting that caution should be exercised in policies aiming to improve export propensity because those same policies can lead to deterioration in export intensity, and vice-versa. These aspects call for the use of a 2P-FRM.

It is inferred through the results that strategic decisions of firms in the wine sector should vary according to the objective of the boards. In the case of managerial boards aiming to enter new markets, they should focus on importing countries with high purchasing power, EU membership, and high levels of wine production. These are characteristics of countries with a tradition of wine consumption, which means greater openness to try new wines. Besides that, exploring markets with cultural (religious and linguistic) and commercial (trade agreements) proximity seems to increase trade propensity. On the other hand, corporate decisions should also be concerned about exchange rates and costs underlying distant markets.

A different strategy should be adopted for managerial boards aspiring to increase market shares. In fact, markets with high purchasing power, EU membership, and high levels of wine production become less attractive because their taste for diversification in wine consumption may limit market shares. Therefore, focus should be turned to markets with less tradition of wine consumption, despite the challenge of surpassing greater barriers to entry. This challenge can be overcome, for example, through the establishment of trade agreements and taking advantage of cultural proximity.

The market share is a simple and informative measure of international competitiveness; nevertheless, in future research, it would be interesting to compare different measures to test the robustness of the results. Also, the search for explanatory variables not yet considered in the literature should be done, since their eventual omission can lead to endogeneity and to the subsequent correction of the econometric model. In terms of methodology, including country-pair fixed effects in the 2P-FRM, to treat neglected individual heterogeneity, or considering the Heckman fractional model in development, by Schwiebert (2018), could bring new insights to the nature of international competitiveness in the wine sector.

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Appendix

Table A.1. Descriptive statistics.

Variables	Obs.	Mean	Med.	Std. Dev.	Min	Max
Market share	44313	0.1	0.0	0.1	0.0	1.0
Distance	44313	7823.0	7687.4	4467.6	204.8	19539.5
GDPpc importer	44313	11905.0	3831.5	17791.7	102.6	119225.4
RTA (yes=1; 0 otherwise)	44313	0.2	0.0		0.0	1.0
Exch. rate	44313	23.5	0.3	109.0	0.0	2320.0
EU importer (yes=1; 0 otherwise)	44313	0.1	0.0		0.0	1.0
Production exporter (t-1)	44313	16285.7	10007.0	15483.5	1762.0	60535.0
Production importer (t-1)	44313	1359.8	0.0	6004.3	0.0	60535.0
Old World exporter (yes=1; 0 otherwise)	44313	0.5	0.0		0.0	1.0
Common language (yes=1; 0 otherwise)	44313	0.1	0.0		0.0	1.0
Religious proximity	44313	0.2	0.0	0.2	0.0	1.0

Note: For the binary variables RTA, common language, Old World exporter, and EU membership of the importer the mean represents the percentage of observations equal to one. Source: Authors' computation.

Table A.2. Alternative functional form specifications of the 1st and 2nd parts of 2P-FRM estimations.

Variables	Export propensity			Export intensity		
	Cauchit β_1	Probit β_1	Loglog β_1	Cauchit β_2	Probit β_2	Loglog β_2
GDPpc importer (log)	0.398***	0.200***	0.211***	-0.386***	-0.084***	-0.061***
	(0.034)	(0.017)	(0.018)	(0.086)	(0.016)	(0.012)
EU importer	0.962***	0.641***	0.826***	-0.707	-0.153***	-0.114***
	(0.207)	(0.082)	(0.123)	(0.467)	(0.051)	(0.036)
Production importer (t-1) (log)	0.131***	0.077***	0.078***	-0.167***	-0.026***	-0.018***
	(0.014)	(0.007)	(0.008)	(0.055)	(0.006)	(0.004)
Production exporter (t-1) (log)	0.850***	0.487***	0.595***	1.095***	0.351***	0.274***
	(0.059)	(0.027)	(0.032)	(0.338)	(0.030)	(0.021)
Old World exporter	0.825***	0.460***	0.495***	-0.288	-0.035	-0.026
	(0.099)	(0.048)	(0.051)	(0.456)	(0.056)	(0.039)
Exch. rate (log)	-0.084***	-0.039***	-0.034***	0.086*	0.021***	0.017***
	(0.017)	(0.007)	(0.007)	(0.051)	(0.008)	(0.005)
RTA	0.642***	0.355***	0.461***	0.180	0.038	0.030
	(0.128)	(0.063)	(0.081)	(0.257)	(0.051)	(0.037)
Distance (log)	-0.359***	-0.145***	-0.190***	-1.199***	-0.314***	-0.231***
	(0.067)	(0.037)	(0.040)	(0.138)	(0.027)	(0.021)
Common language	1.490***	0.886***	0.988***	2.399***	0.794***	0.642***
	(0.161)	(0.082)	(0.107)	(0.246)	(0.058)	(0.050)
Religious proximity	1.839***	0.936***	1.132***	-0.128	-0.076	-0.058
	(0.242)	(0.112)	(0.138)	(0.318)	(0.076)	(0.058)
Constant	-9.322***	-5.629***	-5.916***	-0.355	-1.285***	-0.962***
	(0.838)	(0.376)	(0.436)	(3.527)	(0.355)	(0.251)
Observations	44,313	44,313	44,313	22,671	22,671	22,671
Pseudo R^2	0.338	0.341	0.338	0.305	0.325	0.318
Time effects' significance	45.40***	44.97***	52.53***	39.34***	107.03***	116.64***
	[0.000]	[0.000]	[0.000]	[0.001]	[0.000]	[0.000]
RESET	75.262***	16.840***	193.217***	775.004***	19.202***	115.371***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
GOFF1	17.701***	18.047***	n.a.	530.827***	21.229***	n.a.
	[0.000]	[0.000]		[0.000]	[0.000]	
GOFF2	91.675***	7.477***	212.317***	307.573***	19.215***	114.896***
	[0.000]	[0.006]	[0.000]	[0.000]	[0.000]	[0.000]

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Figures in [ ] indicate *p*-values; Time dummies included but not reported; n.a. = not applicable. Source: Authors' computation.

Table A.3. 2P-FRM estimations splitting the sample in pre- and post-financial crisis of 2008.

Variables	Period 1999-2008					Period 2009-2014				
	Export propensity		Export intensity		TPE	Export propensity		Export intensity		TPE
	β_1	APE	β_2	APE		β_1	APE	β_2	APE	
GDP pc importer (log)	0.347***	0.057***	-0.163***	-0.014***	-0.003*	0.345***	0.057***	-0.173***	-0.013***	-0.004**
	(0.029)	(0.004)	(0.032)	(0.003)	(0.001)	(0.035)	(0.005)	(0.038)	(0.003)	(0.002)
EU importer	1.122***	0.184***	-0.248**	-0.021**	0.004	0.939***	0.155***	-0.402***	-0.031***	-0.007
	(0.155)	(0.025)	(0.112)	(0.010)	(0.005)	(0.153)	(0.025)	(0.118)	(0.009)	(0.005)
Production importer (t-1) (log)	0.122***	0.020***	-0.058***	-0.005***	-0.001	0.137***	0.023***	-0.047***	-0.004***	-0.001
	(0.012)	(0.002)	(0.013)	(0.001)	(0.001)	(0.014)	(0.002)	(0.013)	(0.001)	(0.001)
Production exporter (t-1) (log)	0.833***	0.136***	0.610***	0.053***	0.037***	0.828***	0.137***	0.754***	0.058***	0.040***
	(0.049)	(0.007)	(0.066)	(0.006)	(0.003)	(0.053)	(0.008)	(0.075)	(0.006)	(0.003)
Old World exporter	0.739***	0.121***	-0.030	-0.003	0.008	0.815***	0.135***	-0.117	-0.009	0.004
	(0.084)	(0.013)	(0.123)	(0.011)	(0.005)	(0.091)	(0.015)	(0.121)	(0.009)	(0.005)
Exch. rate (log)	-0.058***	-0.010***	0.031*	0.003*	0.001	-0.082***	-0.014***	0.051***	0.004***	0.001*
	(0.013)	(0.002)	(0.017)	(0.001)	(0.001)	(0.014)	(0.002)	(0.017)	(0.001)	(0.001)
RTA	0.620***	0.101***	0.139	0.012	0.014***	0.609***	0.101***	-0.012	-0.001	0.006
	(0.136)	(0.022)	(0.120)	(0.010)	(0.005)	(0.109)	(0.018)	(0.110)	(0.008)	(0.005)
Distance (log)	-0.270***	-0.044***	-0.532***	-0.046***	-0.026***	-0.295***	-0.049***	-0.760***	-0.058***	-0.035***
	(0.061)	(0.010)	(0.057)	(0.005)	(0.003)	(0.067)	(0.011)	(0.062)	(0.005)	(0.003)
Common language	1.457***	0.238***	1.440***	0.125***	0.080***	1.522***	0.251***	1.498***	0.115***	0.078***
	(0.143)	(0.022)	(0.107)	(0.010)	(0.005)	(0.151)	(0.024)	(0.114)	(0.009)	(0.005)
Religious proximity	1.590***	0.260***	-0.167	-0.014	0.013**	1.742***	0.288***	-0.103	-0.008	0.014**
	(0.190)	(0.030)	(0.151)	(0.013)	(0.007)	(0.226)	(0.036)	(0.159)	(0.012)	(0.007)
Constant	-9.409***		-2.240***			-9.285***		-1.641**		
	(0.680)		(0.782)			(0.729)		(0.827)		
Observations	27,408		13,501			16,905		22,671		

Variables	Period 1999-2008					Period 2009-2014				
	Export propensity		Export intensity		TPE	Export propensity		Export intensity		TPE
	β_1	APE	β_2	APE		β_1	APE	β_2	APE	
Pseudo R^2	0.345		0.302			0.333		0.378		
Time effects' significance	28.19***		56.99***			18.44***		40.84***		
	[0.001]		[0.000]			[0.002]		[0.000]		
RESET	0.020		2.044			0.129		0.460		
	[0.888]		[0.153]			[0.719]		[0.497]		
GOFF1	0.026		1.169			0.864		0.117		
	[0.873]		[0.280]			[0.353]		[0.732]		
GOFF2	0.061		0.414			1.145		0.023		
	[0.804]		[0.520]			[0.285]		[0.881]		

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Figures in [ ] indicate *p*-values; Time dummies included but not reported.