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Assessing exports market dynamics: the case of Greek wine exports

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Abstract

Competitiveness in international wine markets has intensified during the recent years. The dynamic and revitalized presence of non-European producers (e.g. Australia, Chile, South Africa, USA), who have seen their market shares rising rapidly and the subsequent reduction in the market shares of traditional European producers (e.g. France, Italy, Greece) alongside a slight decrease of wine consumption worldwide, have shaped new trends for wine markets internationally and contemporary challenges for the traditional European wine exporters. The aim of the present study is to investigate the determinants of the Greek wine exports and to assess its competitiveness in the European market. Primary data regarding wine trade has been collected for the period of 2004-2011, referring to four main European producer countries, namely Greece, France, Germany and Bulgaria. A gravity equation model has been estimated in order to examine the factors that determine wine exports and wine exports competitiveness among those countries. The results offer a clear picture of the wine trade dynamics in the EU market, indicating as key determinants for its competitiveness the size of each country's economy, the geographical distance from other EU countries, the presence of common borders or common language among trading nations as well as the size of per capita wine consumption to the European wine markets.

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Keywords: wine trade, gravity equation model, competitiveness

1. Introduction

The wine industry has undergone significant changes recently due to market liberalization and the existence of new producer countries like the United States, Chile and South Africa along with changes in demand due to favored consumer preferences towards other alcoholic drinks. Despite its drop in consumption, wine trade has increased significantly over the years, proving that it is a highly internationally traded product. The industry has globalized, trying to respond effectively to increased competition in international markets and the emergence of new ones. Within this context, the European Union plays an important role since most of the trading quantities to international markets involve European countries. The EU-27 is the world's leader in wine production, producing approximately 141 million hectoliters (Mhl) of wine, with major producing countries being France, Italy and Spain, followed by Germany, Portugal, Romania, Greece, and Austria (Table 1).

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The EU-27 is also a leader in international trade, exporting 22.3 Mhl valued at 8.3 billion euro, while importing 13.6 Mhl valued at 2.36 billion euro. The United States remains the leading export market for the EU-27 as a whole (European Commission 2014). Main suppliers are Australia, Chile, South Africa, and the United States.

Table 1: Wine production* trend in the EU-27 ('000 Hectoliters)

	2007	2008	2009	2010	2011	2012
France	45672	41640	46269	45669	50757	40609
Italy	42514	46245	45800	46737	42705	39300
Spain	36408	35913	36097	35363	33397	31500
Germany	10261	9991	9228	6906	9132	8903
Portugal	6074	5620	5872	7133	5610	5857
Romania	5289	5159	6703	3287	4213	4059
Greece	3511	3869	3366	2950	2750	3150
Austria	2256	2628	2672	2352	1737	2815
Hungary	3222	3460	3198	1762	2750	1874
Other EU-27 Countries	3853	3604	3034	2616	3177	2773
EU-27	159060	158129	162238	154775	155671	140840

As far as per capita wine consumption is concerned, it has fallen during the years mainly because of the emergence of other alcoholic drinks (i.e. beer) that have seen their market shares rising, changing consumer preferences and lifestyles towards a more healthy living, along with anti-alcohol campaigns and prevailing laws in many countries that determine the consumption of alcoholic beverages by age, but also prohibits the wide use of alcoholic beverages to avoid road accidents. This is mainly evident to Southern European countries, whereas in the Northern part of the EU, consumption has remained flat or even slightly increased during the years characterized by the domination of PDO/PGI wines and a noticeable demand for low-cost bulk wines.

During the last decade, Greek wine exports displayed relative decline that resulted to subsequent reduced wine production value growth rates. The unfavorable global economic environment as well as the local economic downturn and a severe recession have resulted to a noticeable decline of wine exports worldwide. The Greek wine is exported to almost all countries of the world. In all of the European Union absorbs 85.2% of total wine export, by main suppliers Germany and France. However, exports to third countries cannot touch on the whole the same proportion as in the EU, but also absorb large quantities of wine. The U.S. and Canada absorb larger amounts of wine compared with other third countries, at rates reaching 42.8% and 14.2% respectively of the total (GAIN 2012).

This assignment will be assessed through an econometric model to explain the size of the wine produced and trade flows from Greece in the major importing countries through the approach of the "gravity model". The model used and the results achieved will be useful to predict likely trends in exports Greek wine. Taken into account macro - variables such as wine production, the AEP, population, etc. In addition, this model shows the ability of the participants to the disposal of the wine market and the potential to promote the product.

2. Gravity equation model

The utilization of Gravity Equation Model (GEM) as a method for the empirical analysis of international trade and foreign direct investment flows is widespread among the relevant literature of international economics and trade (Cheng and Wall, 2005). Several empirical studies have found, that the volume of trade between any two countries is given by:

$$T_{ij} = A * Y_i * Y_j / D_{ij} \quad (1)$$

where A is a constant, Tij is trade between country i and country j, Yi is the GDP country i, Yj is the GDP country j and Dij is the geographical distance between the two countries. The above link shows that bilateral trade between two countries is proportional to the product of GDP the two countries and inversely proportional to the geographical distance between the two countries. This is the basic form of the gravity model based on the theory of Newton, who expressed that the gravitational attraction between two objects is proportional to the product of the masses and decreases with the distance between them. Therefore, all GEM applications are based on the notion that the value of exports or imports among any two trading countries is an increasing function of their economic sizes and a decreasing function of the physical distance between them. The first major theoretical justification for the GEM came from Anderson in 1979 (Anderson, 2011) and more recently in 2013 by Bergstrand Egger and Larch (2013) who built a theoretically consistent GEM based on the standard Krugman model of monopolistic competition and increasing returns. In empirical analyses, using Y_i and Y_j as variables of the economic sizes of two trading nations i and j (national incomes) and D_{ij} as the capitals' distance among them, the GEM in log-linear form for the natural logarithm of trade value (T_{ij}) is stated as:

$$\ln T_{ijt} = a + \beta \ln Y_{ti} + \gamma \ln Y_{jt} + \delta \ln D_{ijt} + \varepsilon_{ijt} \tag{2}$$

where lnTij consist the dependent variable of our GEM and lnYi, lnYj and lnDij will function as independent variables.

3. Model specification and methodology of estimations

Following the scope of this paper, one augmented GEM for exports was estimated for each investigated country.

$$\begin{aligned} \ln X_{ij,t} &= a_0 + a_1 \ln Y_{i,t} + a_2 \ln Y_{j,t} + a_5 \ln D_{ij} + a_6 Euro_{ij} + a_7 ComLang_{ij} \\ &+ a_8 Landlocked_j + a_9 Contig_{ij} + a_{10} \ln WineCon_i + a_{11} \ln WineCon_j \\ &+ a_{12} \ln Vine_i + a_{13} WineProd_j + \varepsilon_{ij,t} \end{aligned} \tag{3}$$

The variables of the above model are defined as follows:

$X_{ij,t}$ denotes the value of wine exports of Greece (i=1), France (i=2), Germany (i=3) or Bulgaria (i=4) respectively, to the EU27 countries (countries j) in each year t,

a_0 is the constant term of the equation,

$Y_{i,t}, Y_{j,t}$ represents countries i (Greece, France, Germany and Bulgaria) and j GDP in year t,

D_{ij} denotes the physical distance, originating from the CEPII gravity database (CEPIIa, 2013) between country i and country j measured as the great circle kilometers distance between capitals,

$Euro_{ij}$ represents a binary variable that equals one if country i and *j* is a member of common euro currency. That particular binary variable is used in order to investigate firstly the differences between the value of trade flows to the member states of the EU and to the member states of EMU and secondly in order to examine if wine trade is influenced by the adoption of the common currency.

$ComLang_{ij}$ represents a dummy variable, originating from the CEPII gravity database (CEPIIb, 2013) that equals one if Bulgaria, Greece, France or Germany respectively and country j share a common language. The common language variable is used in order to investigate whether cultural similarities between wine trading partners exchange more wine in relation to ther countries that do not share a common language.

$Landlocked_j$ is a dummy variable that equals one if country j is landlocked. Landlocked dummy is used in order to assess whether the presence of an inland country as trade partner is favoring or not wine exports and imports.

$Contig_{ij}$ represents a binary variable that equals one if country i and *j* share a common border and zero otherwise.

$\ln WineCon_i$ represents countries i natural logarithm of wine pre capita consumption. Wine consumption sizes are used in order to depict that higher per capita wine consumption in the four investigated is leading to higher exports and imports respectively.

$\ln WineCon_j$ represents countries j natural logarithm of wine pre capita consumption. Wine consumption sizes for the trading partners are incorporated to our estimated model in order to show that higher wine per capita consumption is a decisive factor to the attractiveness of wine exports and imports.

$\ln Vine_i$ represents countries i natural logarithm of vines cultivation area. Vines area is used to show that the larger the area of cultivated vines in the four investigated countries, the greater will be the exports to other EU countries.

$\ln Wine\mathrm{Pr}od_j$ represents countries j natural logarithm of wine production sizes of the EU27 countries that compose our trading partners.

a_n represents the parameters to be estimated,

$\varepsilon_{ij,t}$ is the error term of the equation.

The model was estimated eight times, one time for each investigated country i=1 (Greece), i=2 (France), i=3 (Germany) and i=4 (Bulgaria). In order to identify and evaluate the factors that affect the wine trade in EU a series of properly defined dummies (common language, common border, common currency, the case for landlocked partner) and real variables (wine consumption, wine production and vines land cultivation) were enriching the estimated model. Methodologically, the inclusion of the aforementioned dummies and real variables captured the magnitude of various agricultural, geographical, economical and cultural factors that favor or not EU wine trade. The difference between the magnitude of each dummy and real variable, among the four investigated countries, offered insights to the wine exports competitiveness in EU market and the factors influencing wine exports and imports.

The dependent variable of the model consisted of the values of Greek, Bulgarian, French and German wine exports with their current EU partners over eight years period (2004-2011). Observations of wine imports and exports were classified at the 112.1 code, according to the Standard International Trade Classification Revision 3 (SITC Rev. 3) and originated from the UNcomtrade database (United Nations Commodity Trade Statistics Database) of United Nations (UN, 2009). Data on wine consumption and production were extracted from the Wine Institute (2013) while GDP and population figures of the 27 EU member states were gathered from the statistical web service of the International Monetary Fund (IMF, 2012). Both trade observations and GDP figures were deflated using the U.S. consumer price index (Consumer Price Index - CPI). CEPII database constituted the source of geographical distance figures that comprised the distance variable as well as the origin of data for the synthesis of all dummy variables utilized (CEPIIa, 2013).

4. Results

The first model referred to wine exports from Bulgaria to the 27 EU member states and in order to examine the statistical significance of the coefficients and the variables in the model we used the t-statistic coefficient. In particular, for the first valued model where i = 1, the following coefficients were statistically significant (Table 2):

- lngdpp (= 2,192106) with (t = 3.24, P = 0.002). Specifically, for countries with GDP larger than Bulgaria is statistically significant. Bulgaria has presented increased exports by 2.19%.
- lndist (= -3,938663) with (t = 3,20, p = 0.002). For countries located away from Bulgaria, the results show a reduction in its exports by 3.93%.
- lnw_pc_con-r (= -2,086325) with (t = 3,20, p = 0.002). The increase in exports to other members of the EU causes a decrease in the domestic consumption of Bulgaria by 2.08%.

In addition, to examine the statistical significance of the overall model, the relation Prob>F is compared to 0.05. Based on the results, shown in Table 2, and given that Prob corresponding to F is equal to $0 < 0.05$ implies that the overall model is statistically significant. Another element is the R-squared, which expresses the explanatory power of the model and according to the value of the 47.45% of the variability of the dependent variable explained by the variability of the explanatory variables of the model and the remaining 52.55% of random error terms.

Table 2: Wine export dynamics for Bulgaria- Gravity Model estimation results

Source	SS	df	MS	Number of obs = 104		
Model	820.755568	9	91.1950631	F(9, 94) = 9.43		
Residual	909.075006	94	9.6710107	Prob > F= 0.0000		
Total	1729.83057	103	16.7944716	R-squared = 0.4745		
				Adj R-squared = 0.4242		
				Root MSE= 3.1098		
lnwx	Coefficient	Std. Err.	t	P>|t|	[95% Confidence Interval]	
lngdpr	-5.692022	7.95708	-0.72	0.476	-21.49099	10.10695
lngdpp	2.192106	.6758371	3.24	0.002	.8502152	3.533996
lndist	-3.938663	1.230919	-3.20	0.002	-6.3826	-1.494645
euro	(omitted)					
com_lang	(omitted)					
landlock	-.1840906	1.018163	-0.18	0.857	-2.205677	1.837496
synora	-2.183171	1.862407	-1.17	0.244	-5.881024	1.514683
lnw_con_par	-1.007722	.727342	-1.39	0.169	-2.451877	.4364322
lnw_pc_con~r	-2.086325	.651725	-3.20	0.002	-3.38034	-.7923093
lnvineyard~r	.3017095	10.80571	0.03	0.978	-21.15328	21.7567
lnwine_pro~r	-2.300665	8.908997	-0.26	0.797	-19.98969	15.38836
_cons	174.4149	208.9416	0.83	0.406	-240.4436	589.2734

The second model refers to the export of wines from France to the 27 member-countries of the European Union (Table 3). The statistical significance of the coefficients and the variables in the respected model were assessed though the t-statistic coefficient.

Particularly, for the first valued model i = 2 statistically important are the following factors:

- lngdpp (= 0,4952835) with (t = 4,57, p = 0,000). Specifically, for countries with GDP similar to France , the results shows an increase in exports by 0.49% .
- lndist (= -1,296138) with (t = 5,43, p = 0.000), are statistically significant. For countries that are located far from France, the results show a decrease in its exports by 1.29%.
- landlock (= 1,058499) with (t = 3,89, P = 0.000) are statistically significant . Neighboring countries of France, not surrounded by the sea and located in the inland of Europe, exports are increased by 1.05 % compared with the countries that are surrounded by sea.
- synora (= 0,7981715) with (t = 2,26, P = 0.026) are statistically significant , because the neighbor countries have common borders with France, thus there is an increase in exports by 0.79%.
- lnw_con_par (= 0,2139528) with (t = 2,53, p = 0,013). The consumption of French wine by member-countries of the European Union, the French wine export has increased by 0.21%.
- lnw_pc_con-r (= -0,3471835) with (t = 2,11, p = 0,038). The increase in exports to other countries of the EU, causes a decrease in the domestic consumption of France by 0.34%.

Based on the results of the table and given that Prob corresponding to F is equal to 0 < 0.05 ultimately means that the whole model is statistically significant. Another element is the R-squared, which expresses the explanatory power of the model and according to the value of the 78.86 % of the variability of the dependent variable explained by the variability of the explanatory variables of the model and the remaining 21.14 % of random error terms.

Table 3: Wine export dynamics for France- Gravity Model estimation results

Source	SS	df	MS	Number of obs =104		
Model	290.37859	11	26.3980536	F(11, 92) = 31.19		
Residual	77.8534547	92	.846233204	Prob > F = 0.0000		
Total	368.232044	103	3.57506839	R-squared = 0.7886		
				Adj R-squared = 0.7633		
				Root MSE = .91991		
lnwx	Coefficient	Std. Err	t	P>|t|	[95% Confidence Interval]	
lngdpr	5.002332	6.73686	0.74	0.460	-8.377652	18.38232
lngdpp	.4952835	.1084336	4. 57	0.000	.279925	.710642
lndist	-1.296138	.2389079	-5.43	0.000	-1.77063	-.8216467
euro	-.1804601	.2387684	-0.76	0.452	-.6546748	.2937546
com_lang	.3727013	.46357	0.80	0.423	-.5479888	1.293391
landlock	1.058499	.2718132	3.89	0.000	.5186542	1.598343
synora	.7981715	.3530379	2.26	0.026	.0970076	1.499335
lnw_con_par	.2139528	.0845581	2.53	0.013	.0460131	.3818924
lnw_pc_con~r	-.3471835	.1646621	-2.11	0.038	-.6742166	-.0201503
lnvineyard~r	-.1980385	6.993049	-0.03	0.977	-14.08684	13.69076
lnwine_pro~r	1.818317	3.677952	0.49	0.622	-5.486413	9.123047
_cons	-155.6294	282.1821	-0.55	0.583	-716.0673	404.8086

The third model (Table 4) represents Germany and its wine exports to the 27 countries of the European Union. Therefore, to examine the statistical significance of the coefficients and the variables in the appreciated model via software, the statistical coefficient t-statistic is used. More specifically, if t> 1.69 leads to a coefficient that is statistically significant. Otherwise, when t <1.69, this means that the coefficient concerned is not statistically significant. In particular, for the first valued model i = 3 statistically significant are the following factors:

- lnngdpp (= 0,6425027) with (t = 9,36, P = 0.000) . Specifically, for countries with GDP higher than Germany's, Germany has increased its exports to these countries by 0.64%.
- lndist (= -1,261428) with (t = 4,54, P = 0.000) are statistically significant . For countries that are far from Germany, Germany shows a decrease in its exports by 1.26%.
- com_lang (= 0,8732134) with (t = 2,37, p = 0,020) is statistically significant. Among the countries that share a common language with Germany, Germany 's exports to these countries have increased by 0.87%.
- lnw_pc_con-r (= -0,5453863) with (t = 3,92, p = 0,000) . The increase in exports to other members of the EU causes a reduction in the domestic consumption in Germany by 0.54%.

Therefore, to examine the statistical significance of the whole model the relation Prob>F is compared to 0.05. Based on the results of the table and given that Prob corresponding to F is equal to 0 < 0.05 one can say that the whole model is statistically significant. Furthermore, another factor is the R-squared, which reflects the explanatory power of the model and according to the value of the 78.44 % of the variability of the dependent variable explained by the variability of the explanatory variables of the model and the remaining 21.56 % of random error terms.

Table 4: Wine export dynamics for Germany - Gravity Model estimation results

Source	SS	df	MS	
Model	217.124409	11	19.7385826	Number of obs =104
Residual	59.6661766	92	.648545397	F(11, 92) = 30.44
Total	276.790585	103	2.68728724	Prob > F = 0.0000
				R-squared = 0.7844
				Adj R-squared = 0.7587
				Root MSE = .80532

lnwx	Coefficient	Std. Err	t	P>|t|	[95% Confidence Interval]	
lngdpr	9.932341	14.45745	0.69	0.494	-18.7814	38.64608
lngdpp	.6425027	.0686718	9.36	0.000	-.5061147	.7788907
lndist	-1.261428	.2775535	-4.54	0.000	-1.812674	-.7101833
euro	.2508775	.2254683	1.11	0.269	-.1969221	.6986771
com_lang	.8732134	.3685271	2.37	0.020	.1412867	1.60514
landlock	.4730747	.3003561	1.58	0.119	-.1234584	1.069608
synora	-.0538	.3222247	-0.17	0.868	-.6937661	.5861661
lnw_con_par	.1236742	.0676498	1.83	0.071	-.0107311	.2579855
lnw_pc_con~r	-.5453863	.1390176	-3.92	0.000	-.8214872	-.2692855
lnvineyard~r	-281.6306	351.7552	-0.80	0.425	-980.2468	416.9856
lnwine_pro~r	-1.925507	3.217183	-0.60	0.551	-8.31511	4.464095
_cons	3246.147	3993.201	0.81	0.418	-4684.694	11176.99

The fourth model simulates Greece and its exports of wine to the 27 (twenty seven) members of the European Union (Table 5). In order to test the statistical significance of the coefficients and the variables in the model via software, the statistical coefficient t-statistic is used. More specifically, if t> 1.69 leads to a coefficient that is statistically significant. Otherwise, when t <1.69, this means that the coefficient concerned is not statistically significant.

Table 5: Wine export dynamics for Greece- Gravity Model estimation results

Source	SS	df	MS	
Model	1118.94307	11	101.7220198	Number of obs = 104
Residual	835.468948	92	9.08118421	F(11, 92) = 11.20
Total	1954.41202	103	18.974874	Prob > F = 0.0000
				R-squared = 0.5725
				Adj R-squared = 0.5214
				Root MSE = 3.0135

lnwx	Coefficient	Std. Err	t	P>|t|	[95% Confidence Interval]	
lngdpr	1.101641	7.967419	0.14	0.890	-14.72234	16.92562
lngdpp	1.838511	.2627432	7.00	0.000	1.31668	2.360341
lndist	.8280754	.9539041	0.87	0.388	-1.06646	2.722611
euro	-1.870969	.7971099	-2.35	0.021	-3.459098	-.2878403
com_lang	9.33692	1.792385	5.21	0.000	5.777089	12.89675
landlock	-2.458451	.844662	-2.91	0.005	-4.136023	-.7808797
synora	5.032894	1.997603	2.52	0.013	1.065483	9.000305
lnw_con_par	.457515	.2622422	1.74	0.084	-.0633207	.9783506
lnw_pc_con~r	-.1449168	.5288912	-0.27	0.785	-1.19534	.9055068
lnvineyard~r	58.85727	97.63017	0.60	0.548	-135.0447	252.7592
lnwine_pro~r	-5.986906	7.831569	-0.76	0.447	-21.54108	9.567266
_cons	-736.6743	1294.221	-0.57	0.571	-3307.109	1833.76

Particularly, for the first valued model i = 4 statistically significant are the following factors:

- lnngdpp (= 1,838511) with (t = 7,00, P = 0.000) . Specifically, for countries with GDP in comparison to Greece, Greece has increased its exports by 1.83%.

- euro (= -1,876909) with (t = 2,35, P = 0.021) are statistically significant. For countries that are outside the euro zone, Greece has increased its exports by 1.87%.
- com_lang (= 9,33692) with (t = 5,21, p = 0.000),are statistically significant . Among the countries that have a common language with Greece, Greece's exports to these countries have increased by 9.33 %.
- landlock (= -2,458451) with (t = 2,91, p = 0.005), are statistically significant. For neighboring countries and not surrounded by the sea and located in the inland of Europe, Greece's exports have increased by 2.45 % compared with the countries that are surrounded by sea.
- synora (= 5,032894) with (t = 2,52, P = 0.013) are statistically significant for Greece , for the bordering countries of Greece an increased export by 5.03 %.

Then, to examine the statistical significance of the whole model we focus on the Prob> F again comparing with 0.05. Based on the results of the table and given that Prob corresponding to F is equal to 0 < 0.05 we can say that the whole model is statistically significant. Finally, another factor is the R-squared, which reflects the explanatory power of the model and according to the value of the 57.25 % of the variability of the dependent variable explained by the variability of the explanatory variables of the model and the remaining 42.75 % of random error terms.

5. Conclusions

Having completed the study of winemaking, we conclude that one of the major problems of this factor is the fragmentation of the wine production in Greece, resulting in a dispersion of the supply. There is, namely, a reduction of production costs, which has an impact on the selling price of the product and consequently on the consumer. Concerning "the gravity model", is a great opportunity for the exporters of Greek wine to export in Europe.

In addition, the wine industry displays problems in the field of consumption. The cost of wine production configures the selling price of the product on the market. Therefore, the cost of the product has created ripples in the market, resulting in a decline of the number of the consumers. Furthermore, the industry of wine faces great competitiveness of other alcoholic beverages both in the domestic market and in other countries of the European Union. However, in recent years the availability of wines from the U.S., Argentina, Chile and other countries, has affected the wine market and has as an result reduced the market share of European wines. The low price of wines from countries like U.S, Chile etc. has attracted customers, resulting ultimately in the improvement of their wine production. These problems have led in recent years to reduce exports and sales of Greek wines resulting in an increasing product stocks to a great extent, which causes deterioration of the quality of production. The production of Greek wines should increase to seize the beneficial opportunities on the international market.

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