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**Article**

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# Development and trade competitiveness of the European wine sector: A gravity analysis of intra-EU flows

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**Abstract**

This study analyses the intra-EU trade of the world's chief wine exporters, namely Italy, France and Spain. Using an augmented version of the gravity model we empirically assess which of the three countries have experienced growth in intra-EU market trade. Effects of transportation costs, as well as demand and supply gaps between origin and destination countries, on the size of bilateral trade flows were specifically taken into account. Estimation results highlight the differences between bulk and bottled wine, providing useful information for European producers and policy-makers involved on regulation of wine sector. As concern bulk wine, Italy and Spain show no element of growth in competitiveness, while France shows a statistically significant annual decrease. In contrast, estimates for bottled wine all show a growth tendency, albeit with a different magnitude of coefficients. Italy is the country with the highest trend, followed by Spain and France which instead has a decidedly modest growth in export values. However, analysis of pricing policies shows that France does not appear to target an increase in export volumes so much as an increase in average unit price, while Italy, and especially Spain, have a tendency to increase export volumes, also to the detriment of prices.


*Keywords:* Export; Regression model; Trends

## 1. Introduction

In recent decades wine has become a widely consumed product, generating trade flows which affect not only traditional producing countries and consumers (Anderson et al., 2003; Anderson and Nelgen, 2011; Mariani et al., 2012) but also producers in the so-called New World[1] which have competed to broaden their supply geographically. The impetus of globalisation and the excellent image of the European lifestyle have contributed to the considerable spread of this drink (Dal Bianco et al., 2013, Cembalo et al., 2014): new markets and new consumers are gaining familiarity with wine. Trade is intensifying, and international competition is becoming ever fiercer (Mariani et al., 2014; Dal Bianco et al., 2016).

In this context the European Union (EU) remains by far the world's largest market as regards wine production and consumption, as well as the chief exporter and importer. The worldwide acreage used for the grapevine is 7.5 million hectares, about half of which is in the EU. Spain, France and Italy alone account for 34.5% of global grapevine acreage. The world production of wine (excluding juices and must) in 2014 was approximately 270 million hectolitres, 47% of which is produced in Italy, France and Spain.[2] Table 1 reports the data for the years 2000 and 2012 for the main European consumer countries and the four-country market (USA, Russian Fed, China and Japan) which accounts for over two billion inhabitants, viewed generally with great attention by its international competitors. The reduction in per capita consumption assumes

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[1]USA, Australia, Argentina, Chile, South Africa, New Zealand.
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[2]OIV: State of the Vitiviniculture World Market – December 2014 (http://www.oiv.int/oiv/info/enconjoncture?lang=en).

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Table 1
Per capita wine consumption (in litres) in Europe and in the main consumer countries.
*Source*: Our calculations from OIV data.

| Country | 2000 | 2012 | Var. | Country | 2000 | 2012 | Var. |
|---|---|---|---|---|---|---|---|
| France | 58.4 | 47.7 | −10.7 | Belgium | 24.4 | 26.9 | 2.5 |
| Germany | 24.5 | 24.4 | −0.1 | Luxembourg | 62.1 | 70.0 | 7.9 |
| Italy | 54.0 | 37.1 | −16.9 | Netherlands | 19.5 | 22.8 | 3.3 |
| Denmark | 33.7 | 32.6 | −1.1 | Ireland | 11.0 | 17.5 | 6.5 |
| Greece | 26.0 | 25.6 | −0.4 | United Kingdom | 16.4 | 19.9 | 3.5 |
| Portugal | 44.5 | 42.5 | −1.9 | Sweden | 13.3 | 21.1 | 7.7 |
| Spain | 34.9 | 19.9 | −15 | Czech Republic | 6.6 | 17.4 | 10.9 |
| Austria | 30.9 | 29.7 | −1.3 | Slovakia | 11.7 | 12.6 | 0.9 |
| Hungary | 30.8 | 20.3 | −10.5 | Slovenia | 34.4 | 37.7 | 3.3 |
| Latvia | 6.16 | 3.58 | −2.6 | USA | 7.5 | 9.2 | 1.7 |
| Bulgaria | 14.4 | 11.6 | −2.8 | Russian Fed. | 3.2 | 7.3 | 4.1 |
| Romania | 23.5 | 12.1 | −11.4 | China | 0.8 | 1.3 | 0.5 |
| | | | | Japan | 2.1 | 2.7 | 0.6 |

particular importance in Italy, France, Spain, Hungary and Romania while in seven other EU countries the decrease is less substantial (Di Vita et al., 2014). The same table also indicates the countries in which per capita consumption increased between 2000 and 2012. The market area which has seen a decrease in per capita consumption has a population of 330 million, while that with a positive sign includes the USA, Russia, China and Japan.

World wine exports in 2014 reached 105 million hectolitres. This means that about 40% of overall production is traded internationally, further testifying to the economic importance of this product. However, the EU would seem to be less affected by competition from New World products: in 2014, about 77% of imported wine came from another EU member state, thereby indicating an overall prevalence of trade between member states over extra-EU imports. It is widely held that this may be due to a generalised lack of trust on the part of consumers from traditional wine-producing countries in overseas wines, thought to be of poorer quality (Cicia et al., 2013; de Magistris et al., 2014). A further element supporting this hypothesis stems from the fact that, upon examining non-EU wine imports, the prevalence of bulk over bottled wines may be observed, a singular case among the world's main markets. Thus there may well be a strategy to import cheap wines from non-EU countries used in blending to produce low-range products. If this holds for traditional wine-producing countries, it must nevertheless be stressed that the import of non-EU wine today accounts for a significant share for non-producing European countries, especially the UK.

It would therefore seem that, although globalisation has greatly affected this sector as well, the EU has remained less adversely affected than other markets. A major question, and one which constituted the research topic of the present contribution, is whether the EU's trade in wine follows the same dynamics as its international counterpart or, alternatively, it is conditioned by factors that favour intra-EU trade. Such factors clearly include the customs union which allows for the free movement of goods and services but also geographical and cultural proximity. Our research set out to assess the determinants of the intra-EU wine trade which, as is well-known, has no tariff or non-tariff barriers, and is little affected by exchange rates. In this context we propose an analysis to gain insight into the evolutionary dynamics of the international vitivinicultural scenario and the performance of the world's three main historical competitors: Italy, France and Spain.

Our empirical strategy tried to address two needs: on one hand we appraise the competitive performance of the three countries concerned on two markets which, together, represent little less than 50% (both in value and in volume) of world imports of EU wine: Germany and the UK. To do so, we decided to push the analysis at the most convenient data detail (six categories-HS8 aggregation).

Secondly, using an augmented version of the gravity model we empirically assess which of the three countries experienced a growth of intra-EU trade: the effects of transportation costs, as well as demand and supply gaps between origin and destination countries, on the size of bilateral trade flows are specifically taken into account. Estimates are provided for two wider category aggregation: bulk and bottled wines.

## 2. The performance of Italy, France and Spain compared

With a view to comparing the competitive position of the three large world competitors, namely Spain, France and Italy, we opted to analyse two markets which together account for 50% of worldwide imports of EU wine: Germany and the United Kingdom. Below we describe the particular characteristics as well as the trends in trade between 2000/01[3] and 2013/14. Six wine categories were considered, as resulting from the aggregation of 106 customs items. The categories were as follows: (a) sparkling and semi-sparkling wines; (b) PDO[4] and

[3]By starting in 2000, we do not have to control for the change in the exchange rate (UK excluded).

[4]Protected Designation of Origin (PDO): means the name of a regio, a specific place or, in exceptional cases, a country used to describe a wine that complies with the following requirements. (i) its quality and characteristics are essentially or exclusively due to a particular geographical environment with its inherent natural and human factors; (ii) the grapes from which it is produced come exclusively from this geographical area; (iii) its production takes place in

Table 2
Germany imports: values in € '000s, quantities in hl '000s.
*Source*: our calculations from Eurostat data.

| Type of wine | 2000/01 | | 2013/14 | | Δ% | |
|---|---|---|---|---|---|---|
| | Value | Quantity | Value | Quantity | Value | Quantity |
| Sparkling and semi-sparkling wines | 410,571 | 1346 | 503,506 | 1319 | 23% | −2% |
| PDO and PGI white wines | 341,802 | 1686 | 363,278 | 1537 | 6% | −9% |
| PDO and PGI red wines | 937,937 | 3966 | 882,989 | 2942 | −6% | −26% |
| Fortified wines and Vermouth | 39,966 | 630 | 64,679 | 358 | 62% | −43% |
| PDO bulk wines | 25,404 | 343 | 48,837 | 470 | 92% | 37% |
| Other wines | 31,381 | 241 | 737,914 | 8993 | 2.251% | 3.632% |
| Total | 1,787,061 | 8212 | 2,601,203 | 15,619 | 46% | 90% |

PGI[5] white wines; (c) PDO and PGI red wines; (d) fortified wines and Vermouth; (e) PDO bulk wines; (f) other wines. This aggregation allowed us to classify imports into homogeneous clusters as regards category and packaging. In particular, the first four categories echo the classification proposed by Euromonitor[6] and allow the monitoring of bottled PDO wine imports by category. The bulk wine category covers trade in the remaining PDO wines sold in bulk or bag-in-box, while the "other wines" category refers to the trade in wines without PDO certification. Overall German wine imports in the period in question increased by 45.5% in value (from €1.8 billion to 2.6 billion) and by 90.2% in volume (from 8.2 million hl to about 15.6 million hl). The greater increase in traded volumes compared with value indicates a general reduction in the average price of imported wine. This is exclusively due to the fall in the average prices of wines belonging to the category "other wines" which fell by almost 37% in little more than a decade. All the other categories recorded an increase in the average price of imported wine. In particular "bulk wines" increased their average price of 40%, "red wines" of 27%, "sparkling and semi sparkling wines" of 25% and "white wines" of 17%. Fortified wines category, despite being the category with the highest loss of sales in terms of volume, obtained an increase of the sales in terms of value thanks to an increase of 184% of average price. Values and quantities for each individual product category are reported in Table 2. The largest contribution to the considerable increase was made by the category "other wines", which covers all the non-PDO bulk wines[7] (including must) and almost all the wines not produced in the EU. The increase in sparkling and semi-sparkling wines was also significant.

The UK market experienced more moderate growth rates (Table 3) insofar as overall wine imports grew by 27% in value and 39% in quantity. Compared with the German market, there is a smaller differential between growth in quantity and value, despite the occurrence also in this case of a decrease in mean unit price of imported wine.

If disaggregate data are considered, the picture that emerges is perfectly in line with what was reported for the German market. Indeed, also in this case, what explains the increase is especially the "other wines" category and, to a lesser extent, that of sparkling and semi-sparkling wines. Besides, all still PDO wines, whether bottled or bulk, recorded a decrease in imports. Also the trends of average unit prices are in line with those of the German market, showing the same signs, for all categories except "sparkling and semi-sparkling wines".

With respect to the value of flows, Graph 1 reports the way in which the two markets changed their wine supply by area and by exporting country. Germany strongly rewards rest of the world wines (+64%) but also imports of Italian wines rose appreciably (+53%); the increase in French imports, however, was modest (+28%). On the UK market the supply of Italian wines more than doubled in value, imports of Spanish wines increased by 36% and French by 34%. As regards imports from the rest of the world, they remained almost constant in the UK.

The variation in category composition of German wine imports between the two reference periods is shown in Table 4.

The *other wines* category, from being absolutely negligible, has now become predominant, accounting for about 45% of overall imports; at the same time there has been sustained growth in *sparkling and semi-sparkling wines*. Italy, France and Spain all share the growing importance of these two wine categories, although significant differences emerge especially for red wines, for which there is clear geographical diversification in imports in favour of Spain and to the detriment of Italy and France. As regards import from third countries, it has not been possible to make any differentiation according type of

(*footnote continued*)
this geographical area; (iv) it is obtained from vine varieties belonging to Vitis vinifera.

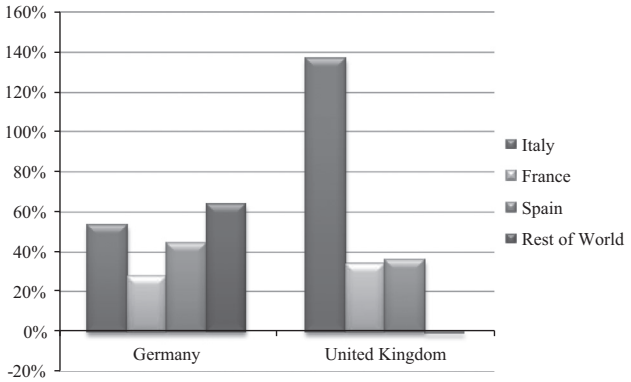
[5]Protected Geographical Indication (PGI): means an indication referring to a region, a specific place or, in exceptional cases, a country, used to describe a wine that complies with the following requirements. (i) it possesses a specific quality, reputation or other characteristics attributable to that geographical origin; (ii) at least 85% of the grapes used for its production come exclusively from this geographical area; (iii) its production takes place in this geographical area; (iv) it is obtained from vine varieties belonging to Vitis vinifera or a cross between the Vitis vinifera species and other species of the genus *Vitis*.

[6]Euromonitor classifies wine on the basis of five categories: still white, still rosé, still red, sparkling and fortified wine. In our study it was not possible to disaggregate the rosé category insofar as these wines use the same customs codes as red wines, and thus form a single category. Given the small share of rosé wine exports compared with that of red wines we feel justified in considering them as a single category with homogeneous characteristics.

[7]As regards bulk wines, in terms of customs duty all wines are classified as such (also PDO and PGI) if packed in containers holding more than 2 l.

Table 3
UK imports: values in € '000s, quantities in hl '000s.
*Source*: our calculations from Eurostat data.

| Wine category | 2000/01 | | 2013/14 | | Δ% | |
|---|---|---|---|---|---|---|
| | Value | Quantity | Value | Quantity | Value | Quantity |
| Sparkling and semi-sparkling wines | 370,514 | 549 | 682,947 | 1264 | 84% | 130% |
| PDO and PGI white wines | 1,011,094 | 4077 | 560,171 | 2123 | −45% | −48% |
| PDO and PGI red wines | 1,278,438 | 4091 | 998,916 | 2632 | −22% | −36% |
| Fortified wines and Vermouth | 74,095 | 340 | 121,237 | 420 | 64% | 24% |
| PDO bulk wines | 32,388 | 251 | 10,697 | 69 | −67% | −73% |
| Other wines | 98,119 | 398 | 1,273,433 | 6990 | 1.198% | 1.656% |
| Total | 2,864,649 | 9707 | 3,647,401 | 13,498 | 27% | 39% |




Graph 1. Variations % (2000–2014) in imported value by country of origin, *Source:* our calculations from Eurostat data.

Denomination of Origin. Indeed, the change of EU harmonization system that took place in 2004 and 2010 does not allow to discern imports consistently among wine categories over the years. The changes depicted above have shown their effects on the competitive ranking of the European producers counterparts which may best be described through the market shares reported in Table 5.

As shown above, Germany has proved to be a decidedly interesting market for sparkling and semi-sparkling wines. Significant beneficiaries are Italy and French which attained a share in value of 8.3% and 5.5%, thereby showing considerable commercial potential in recent years. This was at the expense of Spanish wines, which lost 15.6% in value and 13.9% in volume. For fortified wines and *Vermouth,* among the main three producers, only Italy has managed to increase his penetration in the German market, with a growth of 11.8% in value and 17.5% in volume, enhancing his position of market leader.

For white wines, Italy and France maintain their previously acquired rankings: Italy is confirmed as the top supplier with a share of over 50% and France stays in second place. Spain's position improved appreciably: it increased from 2% in value to 8.1%, and from 2% to 10.1% in volume.

Italy also performed well in red wines: there was a 6.6% growth in the value of German imports, and 3% growth in volume. There was also an increase for Spain (of about 5% in value and just below 10% in quantity). French reds have fallen back 4.6% in value and 6% in volume.

PDO bulk wines in Italy went in the opposite direction: there was a 8.8% fall in value and 7.3% drop in volume. France saw a similar trend over the same period, while Spain experienced a positive trend (+2.4% in value and +10.9% in volume), underlining a very aggressive pricing strategy.

As regards other wines, Italy, France and Spain showed a great performance, with an increase of market share-in value-of 19.2%, 15.5% and 9.6%, respectively. Conversely, the market share of other wines coming from the other EU countries dropped from 59.1 to 14.8%.

As regards the UK, Table 6 shows the variation in the composition of wine imports between the two periods of reference. The structure of the UK market differs from that of Germany. White wines and red wines account for 62.7% of imports from Italy, France and Spain. If imports of sparkling and semi-sparkling wines are also considered, which account for a further 17.5%, then these three wine categories almost exhaust the whole market. However, the circumstance that most distinguishes the English market is the fact that, is the rise of import from Extra-EU countries, increased of 69.5%. Otherwise, European producers showed a completely different trends: Italy and Spain increase their sales of 89.6% and 60.3%, respectively, while France and other EU countries showed a decline of 8.7% and 19.2%. Use of market shares, shown in Table 7, best represents what is stated above. As regards sparkling and semi-sparkling wines, in terms of volume there was sustained growth not only for Italy but also for Spain, which overtook France and recovered a considerable market share. France, that in 2000 accounted for more than of 50% of sales in terms of volume, lost more than half of its market share, and is now in third position. At present, Italy on its own controls more than 44% of the English market.

For fortified wines and Vermouth, other European partners achieved growing penetration of the UK market, at the expense of Italy, France and Spain: during the first two-year period, the three countries initially accounted for 90% of the market. This subsequently declined to just 59%.

The story for white wines was very different. Italy became the market leader with 33.5% in value and 42.7% in quantity. France and Spain also performed well: thanks to significant

Table 4
German imports by country of origin: quantities in hl '000s.
Source: our calculations from Eurostat data.

| Wine category | Italy | | France | | Spain | | Rest of EU27 | | Extra-EU27 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2000/01 | 2013/14 | 2000/01 | 2013/14 | 2000/01 | 2013/14 | 2000/01 | 2013/14 | 2000/01 | 2013/14 |
| Sparkling and semi-sparkling wines | 675 | 785 | 182 | 209 | 454 | 266 | 16 | 50 | N.a. | N.a. |
| PDO and PGI white wines | 932 | 810 | 307 | 340 | 31 | 155 | 308 | 231 | N.a. | N.a. |
| PDO and PGI red wines | 1276 | 1098 | 1398 | 931 | 440 | 645 | 592 | 263 | N.a. | N.a. |
| Fortified wines and Vermouth | 230 | 179 | 106 | 33 | 103 | 42 | 182 | 75 | N.a. | N.a. |
| PDO bulk wines | 82 | 78 | 65 | 51 | 141 | 244 | 56 | 97 | N.a. | N.a. |
| Other wines | 67 | 2909 | 22 | 1093 | 28 | 1992 | 92 | 406 | N.a. | N.a. |
| Total | 3262 | 5859 | 2080 | 2657 | 1197 | 3344 | 1246 | 1122 | 429 | 2631 |

Table 5
Market shares of EU competitors by wine type – German market.
*Source*: our calculations from Eurostat data.

| German market | **MS value** | | **MS volume** | | **MS value** | | **MS volume** | |
|---|---|---|---|---|---|---|---|---|
| | **00/01** | **13/14** | **00/01** | **13/14** | **00/01** | **13/14** | **00/01** | **13/14** |
| | Sparkling and semi-sparkling wines | | | | Fortified wines and Vermouth | | | |
| Italy | 29.9% | 38.2% | 50.9% | 60.0% | 33.0% | 44.8% | 37.0% | 54.5% |
| France | 38.0% | 43.5% | 13.8% | 15.9% | 17.8% | 12.3% | 17.1% | 10.1% |
| Spain | 30.9% | 15.3% | 34.2% | 20.3% | 26.6% | 10.0% | 16.6% | 12.6% |
| Rest of EU27 | 1.2% | 3.0% | 1.2% | 3.8% | 22.5% | 33.0% | 29.2% | 22.8% |
| | PDO and PGI white wines | | | | PDO and PGI red wines | | | |
| Italy | 56.9% | 48.6% | 59.1% | 52.8% | 32.6% | 39.2% | 34.4% | 37.4% |
| France | 25.9% | 28.4% | 19.4% | 22.1% | 39.1% | 34.5% | 37.7% | 31.7% |
| Spain | 2.0% | 8.1% | 2.0% | 10.1% | 13.5% | 18.7% | 11.9% | 22.0% |
| Rest of EU27 | 15.2% | 14.9% | 19.5% | 15.0% | 14.8% | 7.6% | 16.0% | 9.0% |
| | PDO bulk wines | | | | Other wines | | | |
| Italy | 27.6% | 18.8% | 23.8% | 16.5% | 21.1% | 40.3% | 32.0% | 45.5% |
| France | 29.6% | 24.1% | 18.9% | 10.9% | 8.1% | 23.6% | 10.5% | 17.1% |
| Spain | 31.2% | 33.6% | 41.0% | 51.9% | 11.7% | 21.3% | 13.3% | 31.1% |
| Rest of EU27 | 11.5% | 23.5% | 16.3% | 20.7% | 59.1% | 14.8% | 44.2% | 6.3% |

Table 6
UK imports by country of origin: quantities in hl '000s.
*Source*: our calculations from Eurostat data.

| Wine category | Italy | | France | | Spain | | Remaining EU27 | | Extra EU27 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2000/01 | 2013/14 | 2000/01 | 2013/14 | 2000/01 | 2013/14 | 2000/01 | 2013/14 | 2000/01 | 2013/14 |
| Sparkling and semi-sparkling wines | 134 | 539 | 254 | 303 | 82 | 315 | 17 | 60 | n.a. | n.a. |
| PDO and PGI white wines | 647 | 900 | 897 | 612 | 197 | 258 | 849 | 338 | n.a. | n.a. |
| PDO and PGI red wines | 536 | 718 | 1172 | 999 | 366 | 653 | 279 | 259 | n.a. | n.a. |
| Fortified wines and Vermouth | 77 | 85 | 80 | 79 | 146 | 85 | 34 | 167 | n.a. | n.a. |
| PDO bulk wines | 12 | 4 | 63 | 48 | 50 | 10 | 126 | 6 | n.a. | n.a. |
| Other wines | 125 | 657 | 13 | 223 | 51 | 109 | 114 | 316 | n.a. | n.a. |
| Total | 1531 | 2903 | 2479 | 2264 | 892 | 1430 | 1419 | 1146 | 3385 | 5738 |

growth between the two periods, together with Italy they now account for over 84% of this market.

The same can be said for red wines. Indeed, in this specific case Italy, France and Spain account overall for as much as 89% of imports. Between the two-year periods in question, Italy increased its volume to 27%, Spain increased from 15.5% to 24.9%, and France, despite losing an 11.8%, confirmed its leadership with a market share of 38%.

For PDO bulk wines, France has a position of total dominance, accounting for about 70% of the market (in value and volume), while for the other wines category, Italy account for more than half of the market, followed by France with

Table 7
Market shares of EU competitors by wine type – UK market.
*Source*: our calculations from Eurostat data.

| UK market | MS value | | MS volume | | MS value | | MS volume | |
|---|---|---|---|---|---|---|---|---|
| | 00/01 | 13/14 | 00/01 | 13/14 | 00/01 | 13/14 | 00/01 | 13/14 |
| | Sparkling and semi-sparkling wines | | | | Fortified wines and Vermouth | | | |
| Italy | 6.9% | 24.4% | 27.5% | 44.3% | 17.1% | 18.1% | 22.9% | 20.5% |
| France | 83.3% | 64.2% | 52.1% | 24.9% | 12.2% | 10.7% | 23.7% | 18.9% |
| Spain | 7.0% | 8.1% | 16.9% | 25.9% | 59.1% | 23.5% | 43.2% | 20.3% |
| Rest of EU27 | 2.9% | 3.2% | 3.5% | 4.9% | 11.6% | 47.7% | 10.2% | 40.2% |
| | PDO and PGI white wines | | | | PDO and PGI red wines | | | |
| Italy | 20.6% | 33.5% | 25.0% | 42.7% | 18.2% | 19.3% | 22.8% | 27.3% |
| France | 50.5% | 45.2% | 34.6% | 29.0% | 55.8% | 54.7% | 49.8% | 38.0% |
| Spain | 6.2% | 8.3% | 7.6% | 12.3% | 15.0% | 16.3% | 15.5% | 24.9% |
| Rest of EU27 | 22.8% | 13.1% | 32.8% | 16.0% | 11.0% | 9.8% | 11.9% | 9.9% |
| | PDO bulk wines | | | | Other wines | | | |
| Italy | 4.6% | 6.3% | 4.7% | 6.4% | 19.7% | 50.8% | 41.4% | 50.4% |
| France | 34.3% | 70.4% | 25.2% | 70.0% | 4.7% | 17.1% | 4.1% | 17.1% |
| Spain | 26.2% | 14.0% | 19.9% | 14.9% | 14.3% | 5.6% | 16.8% | 8.4% |
| Rest of EU27 | 34.9% | 9.4% | 50.1% | 8.7% | 61.3% | 26.5% | 37.6% | 24.2% |

17.1%. With reference to this category, apart from Italy and France which has managed to increase their market share of 9% and 13%, participation of the other is decreasing.

A further point may be made regarding the relationship between market shares calculated by value and those calculated by volume (Table 8). Such relationships may be used as indicators of the capacity of a country to "create value": the higher the ratio, the greater is the value of the product traded. In other words the index indicates how much value each percentage point of the market share of volume manages to capture.

What is indicative is the fact that both on the German market and in the UK the values of the indicator for French wines are, with rare exceptions, systematically higher than those of Italian and Spanish wines. Finally, it would appear logical to state that although the results described certainly do not indicate a good performance for France, its greater ability to create added value on international markets remains broadly confirmed.

In the next section, the competitive dynamics of the three countries are analysed quantitatively by means of a gravity model, supplying estimates through time of trade flows in the period 2000-2014. Given the particular trend in the aggregate "Other Wines", two distinct estimates will be presented: one concerning bottled wine (which includes *sparkling and semi-sparkling wines*, *PDO and PGI white wines*, *PDO and PGI red wines*, *fortified wines and Vermouth*), the other concerning bulk wine, that is *PDO bulk wines and others*. This distinction is also justified by the fact that these two macro categories present important differences in commercial terms. Bottled wines are positioned at the end of the production chain, being purchased and traded as they are, while bulk wine generally

Table 8
MSvalue/MSvolume ratios.
*Source*: our calculations from Eurostat data.

| Wine category | Market | Germany | | United Kingdom | |
|---|---|---|---|---|---|
| | *Partner* | 2000/01 | 2013/14 | 2000/01 | 2013/14 |
| Sparkling and semi-sparklingwines | *Italy* | 0.59 | 0.64 | 0.25 | 0.55 |
| | *France* | 2.76 | 2.73 | 1.60 | 2.58 |
| | *Spain* | 0.90 | 0.75 | 0.42 | 0.31 |
| | *Rest of EU27* | 1.03 | 0.79 | 0.83 | 0.65 |
| PDO and PGI white wines | *Italy* | 0.96 | 0.92 | 0.82 | 0.78 |
| | *France* | 1.33 | 1.28 | 1.46 | 1.56 |
| | *Spain* | 1.00 | 0.80 | 0.81 | 0.67 |
| | *Rest of EU27* | 0.78 | 0.99 | 0.70 | 0.82 |
| PDO and PGI red wines | *Italy* | 0.95 | 1.05 | 0.80 | 0.71 |
| | *France* | 1.04 | 1.09 | 1.12 | 1.44 |
| | *Spain* | 1.14 | 0.85 | 0.97 | 0.66 |
| | *Rest of EU27* | 0.92 | 0.84 | 0.93 | 0.99 |
| Fortified wines and Vermouth | *Italy* | 0.89 | 0.82 | 0.75 | 0.88 |
| | *France* | 1.04 | 1.21 | 0.51 | 0.57 |
| | *Spain* | 1.60 | 0.79 | 1.37 | 1.15 |
| | *Rest of EU27* | 0.77 | 1.45 | 1.14 | 1.19 |
| PDO bulk wines | *Italy* | 1.16 | 1.14 | 0.97 | 0.98 |
| | *France* | 1.57 | 2.21 | 1.36 | 1.01 |
| | *Spain* | 0.76 | 0.65 | 1.32 | 0.94 |
| | *Rest of EU27* | 0.71 | 1.13 | 0.70 | 1.08 |
| Other wines | *Italy* | 0.66 | 0.89 | 0.47 | 1.01 |
| | *France* | 0.78 | 1.38 | 1.14 | 1.00 |
| | *Spain* | 0.88 | 0.68 | 0.85 | 0.67 |
| | *Rest of EU27* | 1.34 | 2.34 | 1.63 | 1.09 |

undergoes a further process (blending or winemaking practices) and packaging before being traded (Malorgio et al., 2013).

## 3. Gravity model, theoretical framework and empirical specification

Since the seminal study introducing the gravity model for the assessment of international trade (Tinbergen, 1962), gravity equations have been widely used to assess empirically the effect on trade of distance (Disdier and Head, 2008), common borders (McCallum, 1995), international agreements (Baier and Bergstrand, 2007; Grant and Boys, 2011; Rose 2004), fixed costs between countries (Helpman et al., 2008), tariffs (Baier and Bergstrand, 2001, 2007; Raimondi and Olper, 2011) and non-tariff barriers (Xiong and Beghin, 2011; Dal Bianco et al., 2016). The theoretical model is based on Newton's Law of Gravity, and in its basic form, the bilateral flow from region *i* to region *j* is a multiplicative – or log linear – function of the economic size of two countries and their bilateral distance. This elementary form can easily be augmented to include other variables that proxy trade costs, such as common borders, common language, originating the so-called "expanded gravity model".

Although gravity equations have produced over the years some of the clearest and most robust empirical findings in economics, paradoxically they had no theoretical foundation until Anderson (1979) formulated that, after controlling for size, trade between two regions is increasing as relative frictions of the two regions comparing to those of all the alternative partners is decreasing. This concept was further extended by Anderson and van Wincoop (2003) through the concept of multilateral resistance (MR) which refers to the theoretically appropriate average trade barrier and should be taken into account to correctly specified gravity equations.

Several studies have investigated the wine trade through the gravity approach. Dascal et al. (2002) use a gravity model to analyse the main factors affecting trade flows in wine in the EU, showing that trade is influenced by country remoteness, EU integration and exchange rate. Seccia et al. (2007) evaluate both the effects of regional integration and the impact of international trade liberalisation on the export performance of Italian high quality wine. They stress that the enlargement of the EU and the removal of customs barriers confer a significant commercial advantage. Seccia et al. (2009) use a gravity model to explain the size of wine exports from Italy to its main importing countries, finding wine quality and per capita GDP of importer countries to be important variables that positively influence trade. By contrast, Judinová and Zentková (2011) found a negative effect of importers' GDP in wine exports from the Slovak Republic. Their conclusion is that Slovak wine is perceived as an inferior good for the foreign consumer. Gravity estimations also show that distance between trading partners was not an influencing factor.

Pinilla and Serrano (2008) analyse the trajectory of Spanish table wine exported during the period 1871-1935, underlying the role of cultural and geographical proximity as well as the frictions made by tariffs. Fleming et al. (2009) assess to what extent the diffusion of modern information and communication technologies boost trade in wine, revealing that new technologies, and especially the internet, seems to increase trade value. Olper et al. (2012) examine the trade reduction effect induced by national borders, investigating the determinant of home bias in consumption in the beer and wine markets. They found empirical evidence for attributing part of the border effect differences to the home market effect, especially for wine. More recently, Agostino and Trivieri (2014) adopted a gravity framework to investigate whether the designation of origin has a positive pay-off in terms of greater export values, volumes and presence in different export markets.

In this paper we analysed the evolutionary dynamics in the European market of the world's three most important and historical competitors: Italy, France and Spain. In particular, we considered all the European countries which, in the course of the period in question, imported an average of over 50 million litres of wine per year.[8] This accounted for over 90% of intra-EU trade in volume for all the years considered, with a peak of 97.2% in 2002 and a minimum of 91.8% in 2012. Empirical analysis was performed on bilateral trade both of bottled wine, considered as the sum of wines in containers equal to or less than two litres (corresponding to the code of the harmonised system HS220421) and sparkling wines (HS220410), as well as bulk wine (HS220429).[9]

Analytically, the relation undergoing empirical inquiry may be described for each *i*-th wine exporter and for each *j*-th importer in year *t* as[10]:

$$\begin{aligned}\ln EXP_{ijt} = {} & \alpha_0 + \alpha_{ij} + \beta_1 \ln(\text{Supply})_{it} + \beta_2 \ln(\text{Demand})_{jt} \\ & + \beta_3 \ln(\text{Distance})_{ij}^{*} + \beta_4 \text{Lang}_i + \beta_5 \text{year}_t \\ & + \beta_6 (\text{year}_t * \text{France}_i) + \beta_7 (\text{year}_t * \text{Italy}_i) + \epsilon_{ijt}\end{aligned}$$

where the additive error, $\varepsilon_{ijt}$, is assumed to be identically and independently distributed, while $\alpha_0$, $\beta_1$, $\beta_2$, $\beta_3$, $\beta_4$, $\beta_5$, $\beta_6$, and $\beta_7$ are coefficients of regression and $\alpha_{ij}$ are the country-pair fixed effects.

Of particular interest for the purposes of our evaluation is the interpretation of coefficients $\beta_6$ and $\beta_7$. The latter are the coefficients associated to the trend recorded respectively for France and Italy, against the benchmark which is here associated with the dynamics of Spain (whose evolution is described by exclusion by coefficient $\beta_5$). In short, a statistically positive/negative coefficient $\beta_6$ (and $\beta_7$) indicates a rising/falling French (and Italian) export trend "*ceteris paribus*" with

[8] Namely: Austria, Belgium, Czech Republic, Denmark, Finland, French, Germany, Ireland, Italy, Luxembourg, Netherland, Poland, Portugal, Spain, Sweden, United Kingdom.

[9] We decided to group wine export in these two categories for two main reasons: first, since the EU HS of tariff nomenclature changed in 2005 and 2010, it has not been possible to create a consistent classification using HS8 digit codes. Secondly, we adopted this detachment since, from a macro perspective, bulk and bottled wine are completely different products, with extremely different type of transportation mode, marketing channel, unitary value, and quality level.

[10] Dal Bianco et al. (2016) show that this formulation derives from a CES cost function.

Table 9
Descriptive statistics of the variables used.
*Sources:* FAO, CEPII, GTA.

| Var. name | Var. description | Average | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| Distance | Average distance between exporter *j* and importer *i* (km) | 1315 | 574 | 379 | 2988 |
| Supply | Wine production of importer *i* in year *t* ('000s of hl) | 653,810 | 1,483,760 | 0 | 5,910,694 |
| Lang | Dummy variable that assumes value 1 if exporter *j* and importer *i* share the same official language, 0 otherwise | 0.025 | N.A. | 0 | 1 |
| Year | Year | 2007 | N.A. | 2000 | 2014 |
| Demand | Total wine imports of importer *i* in year *t* ('000s of litres) | 692,606 | 938,251 | 35,197 | 3,500,798 |
| EXP (*bulk*) | Value of imports (€ million) | 15.7 | 27.6 | 0 | 276 |
| EXP (*bottled*) | Value of imports (€ million) | 139 | 240 | 1.3 | 1430 |

Table 10
Gravity model: estimates.

| | Export (*bulk*) | Export (*bottled*) |
|---|---|---|
| Ln(dist) | −4.057*** | −1.016*** |
| Lang | 0.116 | 0.971*** |
| Ln(supply) | 0.028 | −0.037 |
| Year(∗)France | −0.054** | −0.034*** |
| Year(∗)Italy | 0.019 | 0.021** |
| Year(Spain) | 0.026 | 0.036*** |
| Ln(demand) | 0.628** | 0.795*** |

*Note*: specifications are in logarithmic form. ** and *** denote 5 and 1 percent significance level, respectively.

respect to what is observed in Spain. Should the coefficient $\beta_6$ (and $\beta_7$) not be statistically significant, it may be concluded that the export trend in France and Italy was not significantly different from that occurring in Spain. Zellner's seemingly unrelated estimator was used to obtain efficient coefficient estimates (Zellner, 1962).

Table 9 shows the definition and the descriptive statistics of data on which the estimates are based. In terms of the data source, export value at the detailed HS6 digit level was retrieved from the Global Trade Atlas (GTA) database[11]. Bilateral distance and the share of a common language are all extracted from the Centre d'Etudes Prospectives et d'Informations Internationales in the France (CEPII) database. In particular, CEPII methodology calculates the distance between countries considering the 25 most populated cities of each nation, then weighted by the share of the city in the country's total population. Using CEPII distance we overcome the common problems of representativeness that may arise using distance between capitals as a proxy of distance between nations. Wine production of importer countries was finally collected from the International Organisation of Vine and Wine (OIV) StatOIV Extracts. Both bulk wine and bottled wine dataset included a total of 675 observations.

[11]Bulk wine corresponds to the HS code 220429, while bottled wine is the result of the sum of the HS codes 220421 (still wine in containers of not over 2 L) and 220410 (sparkling wine). Overall imports are also available in the GTA database, and correspond to total wine imports through HS code 2204.

## 4. Results and discussion

The estimation results show that the export of bottled wine and bulk wine follow dynamics affected by different factors (Table 10).

Distance is significant for both products, yet with extremely differentiated coefficients: bulk wine is penalised by increasing distance between exporter and importer four times more than bottled wine. This could seem contradictory insofar as bulk wine is known to be exported globally over large distances. However, it must be borne in mind that as the EU is a relatively small area and not crossed by navigable rivers, the transport of bulk wine occurs almost exclusively by road. The direct consequence is that transport costs can be a substantial part of global costs, especially as the product is sold at a very low unit price. Bulk wine is widely held to be a fairly undifferentiated product, generally used to produce medium–low quality wines. Since its price is a primary component in the purchase decision (Cembalo et al., 2014), the importer will choose to buy it from the nearest production area to reduce transport costs. A further explanation for the high coefficient of distance is that in the EU there are no countries, such as Russia and China, which buy large quantities of bulk wine to then bottle it under their own brand or to blend with wines produced locally to enhance their quality. Such players buy large quantities, managing to minimise the impact of transport costs. It is therefore likely that their absence within the EU is a further factor penalising the trade in bulk wine. By contrast, bottled wine, with a coefficient close to one, is in line with what is normally encountered in the literature for agri-food products in general and wine in particular (Disdier and Head, 2008; Dascal et al., 2002).

The official language proved statistically significant (at the 1% level) and with a coefficient close to one for bottled wine, while it was not statistically significant for bulk wine. This is hardly surprising since bottled wine is a product which gives extensive information on the label in the language of the country of origin, while no such constraint exists for bulk wine since the packaging phase is carried out in the consumer country. Moreover, as firms which trade in bulk wine are generally medium-large in size with efficient business structures, it appears likely that language will not constitute a barrier to communication. Production in the importing country was not

significant either for the import of bottled wine or that of bulk wine. This result, contrasting with the literature on the international wine trade, would appear fully justified within the European context. Indeed, as regards bulk wine, for years there has been considerable trade between the three large European producers, which buy wine with different sensory characteristics from those of local wines, or they simply manage to obtain a better price. With regard to bottled wine, the widespread wine culture existing in producer countries, combined with the thrust of globalisation, generates in consumers curiosity and the desire to try wines from different countries. This ensures that origin has a major weight among the variables that lead to the purchase decision, especially for consumers who have travelled abroad (McCutcheon et al., 2009) and those who have a high wine involvement rate (Lockshin et al., 2006). It is therefore believed that these two factors may compensate for the resistance to imports from high domestic production and self-sufficiency.

Demand for wine proves significant, and the coefficients have the expected signs. The magnitude of the coefficients for bulk and bottled wine is similar, from which it may be inferred that demand acts with similar intensity regardless of the type of wine imported.

Analysis of trends revealed further differences between bulk and bottled wine. While the coefficients of *Year(Spain)* provide information on the annual change of Spanish trend, those related to France and Italy (respectively *Year(*)France* and *Year(*) Italy*) provide information on the differences of the France and Italian trends with respect to what is observed in Spain. For the bulk wine, Italy and Spain show no element of growth in competitiveness within the period concerned, while France recorded an annual decrease of 5.4% which was statistically significant at the 5% level. By contrast, the estimates for bottled wine show a common tendency to grow, albeit with a different magnitude of the coefficients. Italy had the best trend (+5.7%/year), followed by Spain (+3.6%/year) and France, the latter showing much more modest growth in export values (+0.2%/year). Nevertheless, the difference between Italian and Spain performances is not statistically significant, according the result of a test for equality of the estimated coefficients on the two trend variables ($\chi^2 = 0.78$, $p$-value 0.38).

## 5. Conclusions

New markets are appearing on the horizon and new wine-producing countries are joining the competitive international scenario. Despite these interesting developments, Europe is still the largest market for wine consumption as well as production and exports. Indeed, the world's top three competitors are European: Italy, France and Spain with their centuries-long viticultural tradition continue to represent the point of reference for world wine-making.

Since the international scenario is evolving rapidly under the thrust of technological, ethical and cultural stimuli, in this study we sought to examine the performance of these three large exporters. Six wine categories were therefore taken into consideration so as to detect those types which would be appropriate as a basis for comparing changes in the export portfolios of the competitors in question.

It was pointed out that the German and UK markets together account for half the imports from the EU, amounting to a value of over six billion euros in 2014. On both markets substantial changes were observed which resulted in two of the types of wines (*sparkling and semi-sparkling wines* and *other wines*) making up 50% of the market both in Germany and the UK. This overturning of the "structure" of imports has involved consequent changes to the supply of exporting countries, with differing results according to the cases.

In terms of market shares in Germany, a clear fallback of French positions and a notable rise in Spanish wines was observed. Italy obtained some good results with sparkling and semi-sparkling wines and with red wines.

On the UK market, Italy performed well with its white wines and Spain with its semi-sparkling wines. France had mixed results: on the one hand, it consolidated its position with white wines, red wines and PDO bulk wines; on the other, it lost considerable ground in the other three wine categories.

Finally, we should underline the growth of extra-EU imports, concentrated chiefly in the other wines category. That said, the market share of extra-EU wines remained stable during the period in question.

On the basis of the findings for Germany and the UK, our empirical model analysed the wine trade within the whole EU, dividing it into two large categories: bottled wine and bulk wine. The absence of tariffs and non-tariff barriers, combined with the presence of large exporters and importers spaced short distances apart makes the EU market an interesting case study. An OLS regression including the most common variables used in gravity estimation was performed for both types of wine.

Two empirical innovations were made in this study. First, we compared exports of different classes of wine, creating the new "bottled wine" class made by the sum of two different HS6 digit codes. Secondly, we assessed the "trend" effect in order to evaluate recent performances of the three main exporters. The results obtained are in line with the relevant literature on wine in particular and agricultural commodities in general.

Our findings show that the trade in bulk wine is greatly affected by transport costs, which penalise it considerably, partly by virtue of its low added value. Since Spain is more isolated geographically, and given France's negative trend, probably arising from trade policies, Italy could in future years have a sizeable advantage in exports of this wine category. However, an increase in bulk wine exports could be counter-productive, insofar as it entails not only the risk of entering into competition with the trade in higher-quality wines, but also that of penalising the image of Italian wine abroad.

In the case of bottled wine, the results show less influence of distance upon exports, with a coefficient in line with those found by other studies conducted on wine (Dal Bianco et al., 2016). Analysis of the trends of overall export values shows different performances among the three large competitors: Italy performed the best (+5.7%/year) followed by Spain (+3.6%/year). By contrast, France showed an almost flat trend (+0.2%/year). However, it would appear sensible to evaluate these results

together with the ratios of market shares in value to those in volume, indicating the ability of a country to "create value". This index shows a diametrically opposite situation, with France maintaining a steady advantage over Italy and especially Spain. It is thus clear that very different pricing policies are being implemented. France does not appear to target an increase in export volumes but rather an increase in mean price: the country would appear to be committed to a strategy of upward repositioning, with the exit from the market of cheaper wines in large quantities. At the same time, Italy and chiefly Spain sought to increase export volumes, also to the detriment of prices. This is confirmed by the growth of exports of especially non-PDO bulk wine which, according to Anderson and Golin (2004), is a clear indicator of oversupply in the wine sector. Indeed, Italy and Spain are two countries which have most increased exports of bulk wine towards the two main European importers.

Eventually, it seems that trade within EU has some distinctive characteristics that differentiate it from the global wine trade. Firstly, the high impact of the distance on bulk wine trade inside EU is in contrast to common estimation on international trade, and it may be well explained looking at the means of transport. Indeed, in the EU, bulk wine transport is made by road, that have an higher incidence on low value products. On international scale, bulk wine is transported over large distances by sea, with a relatively low incidence on unit price. Secondly, domestic wine supply seems not to have any influence on wine exports. It is an interesting outcome, potentially indicating that EU importers may be not able to adjust their wine demand according to the overall EU production. Thus, in case of very productive vintages, extra EU markets are demanded to absorb the EU wine surplus.

Further research could aim to give greater prominence to the quality differences of exported wines, using for example as a proxy of quality the mean export price. Finally, in methodological terms, although the absence of zero trade flows justifies the use of an OLS estimator, the use of the PPML estimator, as widely suggested recently, could represent a useful comparison for the purpose of interpreting coefficients.

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