

# Quality, prices and production efficiency: an exploratory study of Italian wines with appellation of origin

PIER PAOLO MIGLIETTA\*, DOMENICO MORRONE\*\*

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## Abstract

*Wine is a complex and highly differentiated product of a very wide and heterogeneous compartment, where quality plays an important role in determining demand.*

*Wine production in Italy is unique in the world and important for all of its regions and its vineyards are placed in extremely different environments, from coastal plains to considerable altitudes and slopes. The Italian level of quality can be considered very high, since approximately 69% of wine production is characterized by Appellation of Origin (AO).*

*The main purpose of this study is to evaluate the potential efficiency in production of Italian wines with Appellation of Origin, in terms of quality, prices and vine yields.*

*Results of this study highlight the economic value generated annually by each declared hectare of vineyard, showing the “Top five wines”, allowing reflections that underline the strategic role of some factors, useful to create a high value production process.*

**Keywords:** *Wine, Appellation of origin, Italy, Prices, Efficiency.*

## 1. Introduction

Wine surely cannot be considered a new product, since its origins date back thousands of years b.C.. It is a complex and highly differentiated product of a very wide, heterogeneous and articulated compartment, where quality plays an important role in determining demand.

Although wine is not considered an essential food for human nutrition, it has always influenced the economy of the wine-producing countries thanks to its symbolic values, full of social and cultural meanings (Miglietta *et al.*, 2015).

World wine production is very remarkable. It is around 267 million hectolitres, considering the last data available referring to 2016 (OIV, 2017).

However, the wine market represents a challenging global market with an evident contraposition between the Old World producing countries and the New World ones, as stated by Campbell *et al.* (2006). The first group is the production leader where only three countries, respectively Italy, France and Spain, contribute to the half of the entire volume, thanks to a long tradition in this sector. But in the Old World consumption is decreasing, differently from the New World, where production and, above all, consumption are increasing, showing interesting numbers. For example the U.S. is the fourth producer with 23,9 million hectolitres, but the first consuming country with 31,8 million hectolitres. Other important consuming countries

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\* Department of Economics and Management, University of Salento, Lecce, Italy.

\*\* Department of Management, LUM University, Casamassima (BA), Italy.

Corresponding author: [morrone@lum.it](mailto:morrone@lum.it).

of the New World are China (17,3 mln. hl), Argentina (9,4 mln. hl), Australia (5,4 mln. hl), Canada (5,0 mln. hl) and Japan (3,5 mln. hl) (OIV, 2017). This means increasing competition (Malorgio *et al.*, 2008), where export activity plays a strategic role.

Therefore, the current overview of the international wine market shows, as stated by Hussain *et al.* (2007), the radical and rapid change of competitive positions and consumption patterns in the Old and New World countries.

Consequently, the global wine market has become more complex, also considering the evolution of the way of consumption. It is important to reflect not only in terms of volumes sold, but we even have to consider all variables that may affect consumer behaviour.

Following the analysis of Smith *et al.* (2007), several factors may influence wine consumption. They could be the general economic conditions (where homogeneity is increasing according to Kustin and Mitry (2003) and Smith and Solgaard (1997)), such as a developing health consciousness that drives consumers to more fashionable and healthful beverages.

Regarding the wine purchasing decision, Schamel (2006) identifies a positive effect coming from expert opinions or producer quality signals too, for example a regional differentiation (reinforced by the protection of geographical indications). In particular, the strong connection with the territory is one of the most important contexts to attract consumer preferences, as tested by the very well-known issue of territorial identity. Following the best example related to French wine with *terroir*, it demonstrated that the place of origin can evoke authenticity, as a presupposition for quality (Gade, 2004).

Therefore, all these circumstances continuously lead wineries to look for efficiency in every stage of production and selling, from the agricultural phase to promotional activity. The ultimate goal is to strengthen the different features of this beverage to underline its qualities. Thanks to technological progress you can measure and improve the quality of the wines produced through finesse, intensity, and originality in taste and smell and by microbiological and physicochemical stability (Colagrande *et al.*, 1994; Dubourdiou, 1986; Noble, 1988; Rapp *et al.*, 1986; Schreier *et al.*, 1979).

Considering the international market, wine producers need to put economic efficiency as one of the most important evaluations for their activity. The former is a wide concept that includes price and technical efficiency, as stated by de Sousa Henrique *et al.* (2009). From this point of view the perfect match that has to be reached among costs, production, sales and consumer preferences, to build the best value for wine is clear.

The aim of this study is to calculate the production efficiency of Italian wines with an Appellation of Origin (AO) in terms of value attained by each vineyard area, investigating the relation between yields and prices as representation not only of technical process factors, but also of economical aspects and territorial identities. The choice of AO wines is, in fact, motivated by the particular features they represent, with a particular meaning considering the market evolution and the commitment towards sustainable development direction.

The paper is organized as follows: Section 2 provides a background on quality features in the Italian wine market with a focus on regional differences. Section 3 is devoted to discussing the data used, the overall logical framework and methodology. Section 4 presents the discussion of results and Section 5 concludes.

## 2. Background

### 2.1. Wine quality and the territorial identity

In the last few years the evolution of international wine markets has expressed a highly fragmented offer of products and relative labels (Bruwer, 2004). Therefore the *imperative* of differentiation to reach a desirable position in consumer preferences is not so simple. Following this direction, above all for wine, the identification with the place of origin may be one of the best possible business strategies (Thode and Maskulka, 1998). The growing importance of territory has been demonstrated through the consumers' willingness to pay higher prices for wines produced in a famous area, even if they do not have enough information related to quality (Schamel, 2006). This relation has been very well interpreted, as above mentioned, from the concept of *terroir*, identifying, according Vaudour (2002), different aspects like variety of plants,

typical foods, territory, strategies of advertising and marketing. Moreover, he underlines that, considering the sustainable production and the evolution of the wine market (Hardie, 2000; Corino and Calo, 2001), the connection with the territory is the way to represent the features of the place of origin through distinguished wines. Currently it is possible to affirm that the territorial identity is becoming a real competitive advantage in wine marketing policies (Rocchi and Gabbai, 2013). This strategic feature has been accepted not only by the Old World producers but also by New World ones, who definitely recognize it as an instrument for quality differentiation (Camanzi *et al.*, 2017).

Summarizing, geographic branding can be settled in a relationship with quality and sustainability (Warner, 2007), including social, economic and environmental aspects. When aiming to

reach a high position in the market, the connection between the place of production and quality is an obliged element (Beverland, 2005, 2006). Moreover, considering the limits imposed by the Appellation of Origin in terms of production restrictions (yield, territories, etc.), this certification often becomes, analyzing other agro-food sectors, a real non-tariff barrier (Chambolle and Giraud-Héraud, 2005). For this reason a structured strategy is fundamental. Surely, analyzing the place of origin and the quality of production is strictly connected with different environmental elements as soil, climate and other physical elements (Costantini *et al.*, 2016; Costantini and Bucelli, 2014; Van Leeuwen and Seguin, 2006) and an efficient vertical relationship between the phases of production and processing is important too (Malorgio *et al.*, 2013).

Table 1 - Wine Production by Italian Region (volumes in thousands of hectoliters).

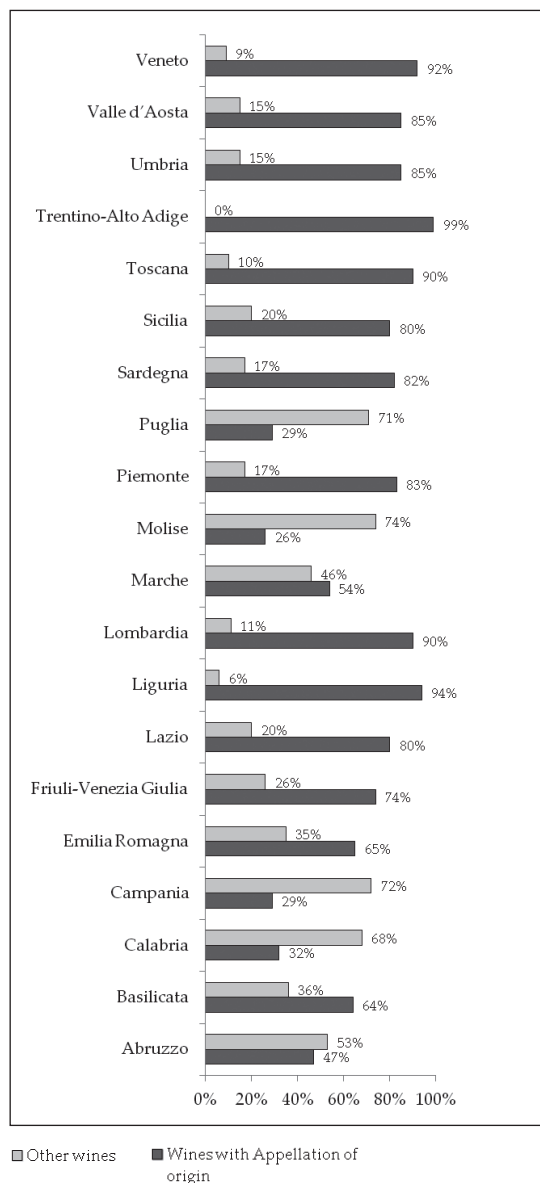
Region	2012	2013	2014	2015	2016	%Var 2012-2016
Abruzzo	2,443	2,728	2,273	2,936	2,937	20%
Basilicata	189	178	102	87	93	-51%
Calabria	400	370	314	404	391	-2%
Campania	1,542	1,644	1,183	1,614	1,286	-17%
Emilia Romagna	6,273	7,396	6,958	6,752	7,039	12%
Friuli-Venezia Giulia	1,281	1,073	1,367	1,872	1,856	45%
Lazio	1,365	1,571	1,302	1,676	1,523	12%
Liguria	46	46	63	79	63	37%
Lombardia	1,222	1,301	1,424	1,410	1,421	16%
Marche	918	1,039	915	959	959	4%
Molise	319	319	297	232	232	-27%
Piemonte	2,366	2,580	2,402	2,467	2,549	8%
Puglia	5,338	5,908	5,430	7,313	8,792	65%
Sardegna	503	638	746	794	804	60%
Sicilia	5,169	7,282	4,539	5,476	5,323	3%
Toscana	2,098	2,657	2,778	2,825	2,738	31%
Trentino-Alto Adige	1,210	1,362	1,029	1,230	1,140	-6%
Umbria	637	706	670	765	814	28%
Valle d'Aosta	17	20	15	14	15	-12%
Veneto	7,740	9,148	8,281	9,733	10,145	31%
<b>Italy</b>	<b>41,074</b>	<b>47,966</b>	<b>42,088</b>	<b>48,635</b>	<b>50,118</b>	<b>22%</b>

Source: based on data from Italian Wine Central (2017a).

## 2.2. The AO wine Italian production

Wine production in Italy is unique in the world and important for all of its regions and its vineyards are placed in extremely different environments, from coastal plains to considerable altitudes and slopes (Miglietta *et al.*, 2013; De Leo *et al.*, 2015).

Figure 1 - Wine Production in Italy and quality level in 2016 (% of the total volumes produced in each Region).



Source: based on data from Italian Wine Central (2017b).

Since approximately 69% of wine production is characterized by Appellation of Origin (AO), the Italian level of quality can be considered very high. As we can see from Table 1, Regions with the highest production volumes in 2016 are Veneto (10,145 thousand of hectoliters), Puglia (8,792 thousand of hectoliters), Emilia-Romagna (7,039 thousand of hectoliters) and Sicily (5,323 thousand of hectoliters).

Puglia and Sardegna are the best performing regions in terms of percentage of variation between 2012 and 2016, registering increasing values of production over 60%, beyond the Italian average of 22%. The two worst regions are Basilicata and Molise which have registered in the five-year period respectively -51% and -27% in their total production of wine.

Nevertheless, if we consider wine quality, each region has a different productive performance, whose ranking differs from the above figures based only on quantitative parameters.

As we can see in Figure 1, in Puglia 71% of production is destined to generic wines, while only 29% to the production of wines with AO (in particular PDO - Protected Designation of Origin and PGI - Protected Geographical Indication); in Veneto the situation is completely reversed, 92% of its wine production, accounting for 27% of AO Italian wine production and almost 19% of the total, is destined to PDO and PGI wines.

## 3. Materials and methodology

The main aim of this study is to evaluate the potential efficiency in production of AO wines, in terms of quality, prices and vine yields and the related efficiency trend.

The research design adopted is a secondary data analysis. Existing quantitative datasets have been used as data sources to realize an analysis and to verify our hypothesis.

The panel data used for the purposes of this study has been constructed based on FEDERDOC reports (Federdoc, 2012; 2013; 2014; 2015; 2016), used for the dissemination of statistics on wine production with Appellation of origin and ISMEA data (ISMEA, 2017). Federdoc is the National confederation of volunteer consortium

for the protection of Italian wines with Appellation of Origin. It publishes yearly the so-called “V.Q.P.R.D. d’Italia”, which contains data relating to the production of wines with Appellation of Origin in Italy on the basis of surveys provided by some supervisory structures.

Ismea (Istituto di servizi per il mercato agricolo alimentare), instead, is a public entity, controlled by the Ministry of Agricultural, Food and Forestry Policies, part of the SISTAN (National Statistics System) and of SIAN (National Agricultural Informative System).

For the scope of this study, a sample of 65 Italian wines with Appellation of Origin was selected among wines whose variables chosen for this research have been previously observed and were annually available for the analyzed period of time.

For this reason, not every AO Italian wine has been considered in this analysis, because of the lack of data.

The time series included in this research goes from 2011 up to 2015 and it does not go further because the years 2011 and 2015 are the only years when complete and reliable data for the variables used in our framework could be found.

In particular, the analysis is based on three fundamental variables: wine production, declared surface of grapes, and wine prices. These variables have been selected as the most important factors affecting economic and technical efficiency, since they include quality attributes, vine and grape yields related to cultivation and winemaking methods, market and consumption-driven aspects. Appendices 1, 2 and 3 report time series of these variables for each AO wine considered in the study.

The first variable, *wine production* has been measured by the production data, expressed as hectoliters of wine produced. The second variable, *declared surface of grapes*, has been measured by the extension in hectares used for the specific viticulture. The third variable, *wine prices*, has been measured by the average annual prices at source, i.e. the prices paid to producers on average in a year for a specific wine with Appellation of Origin, expressed in Euro/hectoliters, used as proxy for capturing not only tangible, but also intangible values, mainly imputable to territorial identity.

The methodological approach of this study consists of five steps. In the first, data on the *wine*

*production* and *declared surface of grapes* related to the 65 Italian wines with AO were collected and analyzed for the five-year period 2011-2015 (Federdoc, 2012; 2013; 2014; 2015; 2016), and then integrated with average annual wine price (ISMEA, 2017).

In the second step, descriptive statistics of each variable considered in this study were illustrated and a correlation matrix based on Pearson’s coefficient was calculated.

In the third step, we proceeded with the calculation of the production efficiency of AO wines, i.e. the value generated annually by each declared hectare of vines in the geographic areas interested by typical production, by the equation:

$$Eff_{wine} = \frac{Prod_{wine} \times Price_{wine}}{Area_{vineyards}}$$

where:

$Prod_{wine}$  indicates the production of wine, expressed in hl;

$Price_{wine}$  represents the average annual producer prices in €/hl;

$Ares_{vineyards}$  is the area expressed in terms of declared ha of grape.

After the calculation of the economic value generated by the areas under vines ( $Eff_{wine}$ ), in the fourth step a ranking was drawn up to highlight the top five AO wines in 2015, in order to capture potential specifications that characterize attitudes or attributes of these competitive productions.

Finally, in order to respond to the purpose of this study, the change rate of the  $Eff_{wine}$  between 2011 and 2015 was computed in order to capture efficiency trend.

#### 4. Results and discussions

Descriptive statistics for the variables mentioned in the materials and methods section and collected in the Appendices 1, 2 and 3 are illustrated below in Table 2.

Before proceeding with the calculation of production efficiency of AO wines, Pearson’s coefficients were calculated in order to detect correlation between variables (Table 3).

The correlation matrix highlights a strong relation between declared vineyards and AO wine

Table 2 - Descriptive statistics of the variables used for the analysis for each year from 2011 to 2015.

		<i>Wine production (1,000 hl)</i>	<i>Declared surface of grapes (ha)</i>	<i>Wine price (€/hl)</i>
2011	Mean	172	2,367	118
	St. Dev.	235	2,823	100
	Min	4	107	34
	Max	1,351	14,645	617
2012	Mean	175	2,432	130
	St. Dev.	273	2,968	112
	Min	5	82	51
	Max	1,798	14,285	677
2013	Mean	186	2,459	139
	St. Dev.	307	3,176	115
	Min	6	81	54
	Max	2,141	17,490	710
2014	Mean	183	2,466	139
	St. Dev.	321	3,326	121
	Min	2	46	44
	Max	2,241	19,108	755
2015	Mean	213	2,655	153
	St. Dev.	473	3,776	138
	Min	4	63	44
	Max	3,648	23,979	880

Table 3 - Correlation matrix based on Pearson's coefficients for each variable considered in the analysis.

	<i>Wine production</i>	<i>Declared surface of grapes</i>	<i>Wine price</i>
<i>Wine production</i>	1.000	0.914	0.002
<i>Declared surface of grapes</i>		1.000	0.054
<i>Wine price</i>			1.000

Critical value at 5% (for two tails) = 0,1088 for  $n = 325$

production, which is equal to 0.914 and could be intuitively hypothesized. This relation is in fact strictly linked to the yields not only in terms of grapes produced by a certain vineyard area (crop yields), but also to the yields in terms of quantity of wine produced by a certain quantity of grapes (technical process yields).

The values of Pearson's coefficient for the relation between wine prices and wine production or declared area of grapes, which are approximately close to 0, underline a weak correlation, explained

by the fact that wine prices, contrarily to other agri-food products, capture other factors than the classical ones, such as supplied and demanded quantity.

Wine prices include intangible values, which are not merely connected with crop or technical processes, but are more linked to the concept of *terroir* mentioned in the background subsection.

Including wine prices in the production efficiency assessment of AO wines, as illustrated in the materials and methods section, helps in strengthening our results.

Table 4 - Top five Italian wines with Appellation of Origin in terms of annual production efficiency expressed in €/ha and percentage variation between 2011 and 2015.

Position	Appellation of Origin	2011	2012	2013	2014	2015	% change rate 2011-2015
1	Barolo	27,259	33,901	35,139	32,790	38,350	41%
2	Brunello di Montalcino	22,816	26,545	28,178	30,279	36,779	61%
3	Prosecco	19,154	19,509	14,690	13,605	26,775	40%
4	Conegliano Valdobbiadene	17,444	19,067	18,440	18,109	20,642	18%
5	Vino Nobile di Montepulciano	14,053	13,281	18,348	18,211	19,033	35%

Figure 2 - Efficiency trend of the top five Italian wines with Appellation of Origin in €/ha between 2011 and 2015.

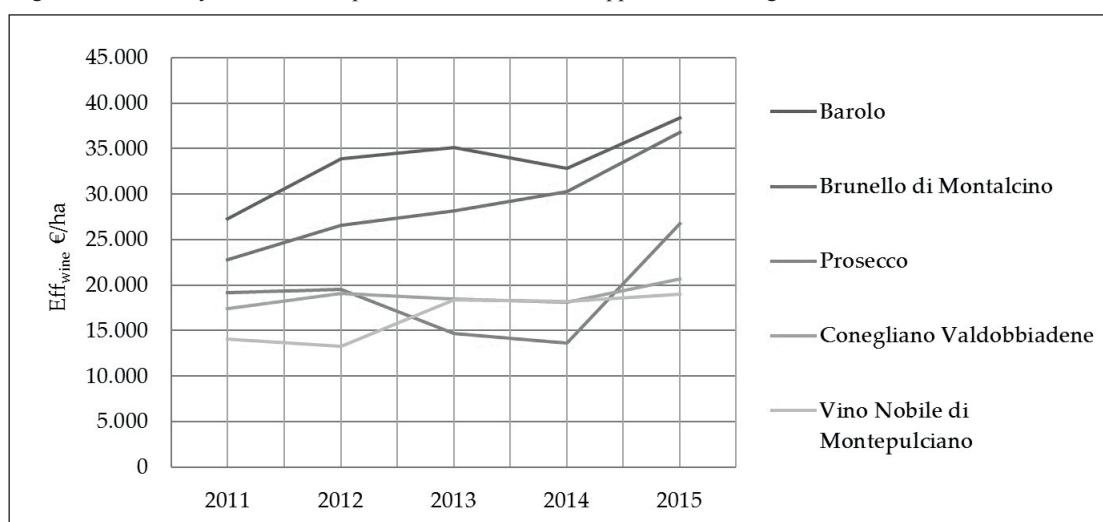


Table 4 and Figure 2 indicate the economic value generated annually by each hectare declared (in absolute terms), showing the “Top five wines” and their trends. Through these data it is possible to make some reflections that underline the strategic role of some above-mentioned factors, useful to create a high value proposition. These factors are, to cite the most important, technical efficiency as well as valorization, marketing and promotion activities.

Wines named “Barolo”, “Brunello di Montalcino” and “Vino Nobile di Montepulciano” are not a surprise in this ranking, since they represent the crown jewels of the Italian wine panorama. They come from the well-known Italian regions dedicated to this kind of production, Piedmont and Tuscany. These wines were some of the first wines

launched in the national and foreign markets. The ongoing work of promotion has been also carried out thanks to the relevant contribution of consortia, which grouping all wineries, protect the image and the tradition, strictly connected with the origin territories.

In particular, the “Consortium for the Protection of Quality of Local Wines Barolo and Barbaresco” is one of the most ancient, founded in 1934, in the first decades of the last century. It is not a coincidence that currently Barolo is the wine with the “best value” in the proposed elaboration and was also mentioned in the book *The best Italian wines* since 1908 (Strucchi, 1908). These three above-mentioned typologies have reached these positions mostly for the efficiency of intangible assets. They did not receive a clear support from

the efficiency in production. Evaluating the first and the last year of the observations, Barolo registered a slight increase of the declared area (+7%), corresponding, substantially, to the same increasing level of production (+8%). On the contrary, the value of production per hectare has significantly developed (+41%), thanks to the positive trend of the prices (+39%).

On the same level are the results of Brunello di Montalcino, where it is possible to observe a better but marginal influence of efficiency in production. A non-relevant increase in cultivation areas (+2%) was followed by a good result in production (+15%) but, also in this case, the main reason for the growth of the value generated per hectare (+61%) must be attributed to the higher prices (+43%).

A particular case is *Vino Nobile di Montepulciano*. The reduction of the declared area in the five-year period (-7%) has been accompanied by a worsening in production capacity (-13%) but, thanks to a very positive trend of the prices (+44%), the final result is still more than interesting (+35%).

Conegliano Valdobbiadene followed the same direction of the above-mentioned wines. Definitively there is a balanced increase of area and production (respectively +25% and +27%), while the value produced for each hectare (+18%) can very well explained by the price increase (+17%).

A final consideration, not in order of importance, is given to Prosecco. It registered very important sales. In general the entire sparkling wine sector has seen a positive trend in recent years, but Prosecco is gaining ever-larger market shares. For this typology the double influence in the final result (+40%) of price evolution (+11%) and, even more, the efficiency in production is evident. The remarkable increase in the declared areas (+114%) has been followed by a more substantial increase in production (+170%).

The results shown represent clear evidence of the great value that an AO wine could reach, in terms of quality and revenues. In the Italian territory there are a lot of other AO productions that could follow the same direction, since in the past decades there has been an evident lack of strategic policies for different varieties, missing out on all of the opportunities coming from a wonderful heritage.

An example could be “Marsala”. This is a very ancient wine from west coast of Sicily, where the earliest traces of an international trade between Sicily and England date back even to the end of the seventeenth century. After this first development, there was an important story related to this wine, strictly connected with the local development. Unfortunately, some wrong choices caused a strong loss of value, mostly during the ‘60s and ‘70s. In that period, considerable quantities of Marsala were produced with different non-original flavors, altering the originality of the wine. Moreover, the same “production regulations” still today provide too many varieties, which is not good for defining a precise identity of Marsala (Carrera, 2013). In the last five years, the attention to quality and to consumer preferences, totally oriented to originality without modifications, have been sending a clear signal, verifiable through the average price that has had significant growth, going from 66 Euro in 2011 to 115 Euro in 2015 for each hectolitre, with an increase of 74% (Appendix 3).

## 5. Conclusions

The proper policies to restore the real wine identity are giving the first positive results in Italy, but there is still a long complex path to be followed. In this context the case of French wines can be considered emblematic. In 2015 the real total wine production in France was about 47 mln. hl, compared to 50 mln. hl of Italy (OIV, 2017). Despite this imbalance based on quantities produced, French wines were able to create a total value of 27.5 bn Euro, while Italian ones stopped at 13.4 bn Euro, less than half. This means that the real challenge for the Italian wine industry should be focused on the territorial identity in terms of efficiency, quality production, originality and promotion (INDV, 2017).

When investigating the ability of viticulture to combine input and output variables of the grape production processes, the level of efficiency assumes relevance, not only to policy makers, but also to farmers, who can benefit and base their business strategies on the efficiency results.

Producing AO wines is profitable in economic terms, given the high added value associated with



product itself, but the association between quality, prices and productive efficiency is still up for debate (De Leo *et al.*, 2015). Our study has focused on the assessment of AO wines, analyzing their performance in terms of economic values originated from areas under vines.

From this analysis it is clear that, particularly in some cases, grapevine adaptation to the traditional areas of production allows for the use of fewer resources than those that, in theory, are required, assuring sustainability from an economic productivity based view (Toma *et al.*, 2016). Strengthening the production of these AO wines would lead to an increase in the economic values generated by the sector, allowing plants to produce adequate quantities of grapes with fewer dedicated areas, focusing on higher yields in terms of grapes produced and related wine production, assuring efficiency, sustainability and nutritional quality of the final product.

With reference to typical products, local actors should develop strategies able to generate economic and environmental value on the basis of the specific characteristics of the territory, thus becoming a potential resource for the rural system through the creation of the value generated by the product itself (Tregear *et al.*, 2007; Marescotti, 2003).

In a modern marketing policy view, it is clear, in fact, that the fundamentals of sustainability cannot be omitted, and that the profit objective has to be balanced with environmental bounds (Morrone, 2012).

Moreover, the continuous work to promote wines and their territories produces an interesting value not only for wines, but also for the lands located in the areas delimited by AO wine specifications. It is a true virtuous circle that is possible to generate. In fact, analyzing the average prices of the land values related to vineyards (used to produce both wine and fruit to eat) found in the regions of the five above-mentioned wines, the increasing results supported by Barolo and Conegliano are evident. In fact, these had, respectively, a growth of 9% and 14%, from 2011 to 2015 (CREA, 2017).

Although this work has already widened the approach to land use indicator linked to the agricultural process, in order to improve the concept of productivity in an environmental context, future studies could also update the results of this paper,

extending the assessment to other geographical and agriculturally relevant areas, analyzing the impact of other environmental variables on efficiency using parametric and non-parametric models (Toma *et al.*, 2017).

In this perspective, further research should be addressed to assessing the environmental footprints of wine production and trade to test the productive specialization of different areas around the world, from a natural resource sustainability approach.

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**Appendix 1** - Production of 65 Italian wines with Appellation of Origin (expressed in thousand hectoliters).

<i>Appellation of Origin</i>	<i>Region</i>	<i>2011</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>	<i>2015</i>
Alcamo	Sicilia	8	18	11	12	18
Alto Adige o Sud Tirolo	Trentino	295	287	317	278	288
Asolo Prosecco	Veneto	11	16	17	50	62
Asti	Piemonte	817	769	712	812	705
Barbaresco	Piemonte	32	33	35	33	35
Barbera d'Alba	Piemonte	88	88	93	82	88
Barbera d'Asti	Piemonte	233	224	227	207	215
Barbera del Monferrato	Piemonte	65	56	64	59	54
Bardolino	Veneto	251	255	218	196	227
Barolo	Piemonte	98	99	104	96	106
Bianco Custoza	Veneto	119	115	112	95	104
Bolgheri o Bolgheri Sassicaia	Toscana	44	43	48	49	55
Bonarda dell'Oltrepò Pavese	Lombardia	196	169	189	181	185
Brunello di Montalcino	Toscana	71	77	76	77	82
Cannonau di Sardegna	Sardegna	90	100	87	87	100
Castel del Monte	Puglia	42	35	40	32	39
Cerasuolo d'Abruzzo	Abruzzo	59	60	63	58	64
Chianti	Toscana	769	673	733	823	846
Chianti classico	Toscana	286	228	258	293	294
Cirò	Calabria	30	35	41	30	36
Colli Orientali del Friuli	Friuli	85	77	72	73	87
Colli Piacentini	Emilia-Rom.	109	92	105	103	91
Collio Goriziano	Friuli	63	60	63	59	68
Conegliano Valdobbiadene	Veneto	528	571	589	606	669
Cortese dell'Alto Monferrato	Piemonte	15	16	15	15	14
Dolcetto d'Alba	Piemonte	65	68	66	47	54
Etna	Sicilia	12	22	25	27	27
Franciacorta	Lombardia	167	118	129	127	137
Frascati	Lazio	88	88	59	68	67
Friuli Grave	Friuli	237	161	160	163	174
Gavi	Piemonte	86	86	96	102	95
Gutturnio	Emilia-Rom.	90	80	84	82	93
Lambrusco di Sorbara	Emilia-Rom.	125	129	130	102	135
Lambrusco Grasparossa	Emilia-Rom.	118	105	109	113	114
Lambrusco Salamino di Santa Croce	Emilia-Rom.	184	186	172	183	151
Langhe	Piemonte	89	89	102	91	96

<i>Appellation of Origin</i>	<i>Region</i>	<i>2011</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>	<i>2015</i>
Locorotondo	Puglia	4	5	6	2	4
Lugana	Lombardia	82	89	98	104	116
Marsala	Sicilia	29	102	97	95	115
Modena	Emilia-Rom.	79	76	103	58	78
Montepulciano d'Abruzzo	Abruzzo	796	877	851	811	871
Morellino di Scansano	Toscana	76	70	75	77	78
Nebbiolo d'Alba	Piemonte	30	30	32	30	32
Nuragus di Cagliari	Sardegna	20	15	17	16	16
Oltrepò Pavese	Lombardia	198	172	193	151	168
Orvieto	Umbria	114	100	96	105	113
Primitivo di Manduria	Puglia	88	87	131	86	154
Prosecco	-	1,351	1,798	2,141	2,241	3,648
Reggiano	Emilia-Rom.	154	135	148	156	158
Roero	Piemonte	47	48	52	47	53
Rosso Piceno	Marche	82	71	74	67	89
Rosso Conero	Marche	13	8	14	15	13
Salice Salentino	Puglia	140	141	146	77	117
San Severo	Puglia	34	31	28	23	22
Soave	Veneto	412	530	517	506	422
Trebbiano d'Abruzzo	Abruzzo	188	197	187	166	191
Trentino	Trentino	563	520	606	502	653
Valdadige o Etschtaler	Trentino	100	97	117	114	104
Valpolicella	Veneto	356	354	380	425	378
Venezia	Veneto	137	106	108	109	162
Verdicchio dei Castelli di Jesi	Marche	146	129	154	149	165
Vermentino di Gallura	Sardegna	42	47	51	51	45
Vermentino di Sardegna	Sardegna	99	95	121	101	112
Vernaccia di San Gimignano	Toscana	42	37	39	44	40
Vino Nobile di Montepulciano	Toscana	62	55	58	65	54

Source: based on data extracted from Federdoc (2012, 2013, 2014, 2015, 2016).

**Appendix 2** - Declared area for 65 Italian wines with Appellation of Origin (expressed in hectares).

<i>Appellation of Origin</i>	<i>Region</i>	<i>2011</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>	<i>2015</i>
Alcamo	Sicilia	337	289	163	246	287
Alto Adige o Sud Tirolo	Trentino	4,490	4,585	4,622	4,607	4,669
Asolo Prosecco	Veneto	138	216	190	698	931
Asti	Piemonte	9,803	9,490	9,045	9,537	9,404
Barbaresco	Piemonte	678	684	728	733	738
Barbera d'Alba	Piemonte	1,438	1,565	1,598	1,589	1,561
Barbera d'Asti	Piemonte	4,367	3,546	3,600	3,285	4,727
Barbera del Monferrato	Piemonte	1,172	788	910	837	765
Bardolino	Veneto	3,000	2,932	2,816	2,428	2,336
Barolo	Piemonte	1,945	1,977	2,054	2,067	2,073
Bianco Custoza	Veneto	1,224	1,242	1,345	1,197	1,258
Bolgheri o Bolgheri Sassicaia	Toscana	834	926	888	956	994
Bonarda dell'Oltrepò Pavese	Lombardia	2,839	2,631	2,697	2,572	2,583
Brunello di Montalcino	Toscana	1,920	1,958	1,915	1,920	1,962
Cannonau di Sardegna	Sardegna	1,164	2,187	2,187	2,236	2,185
Castel del Monte	Puglia	623	334	417	310	395
Cerasuolo d'Abruzzo	Abruzzo	689	684	691	654	699
Chianti	Toscana	14,645	14,183	14,171	14,296	14,413
Chianti classico	Toscana	6,783	6,518	6,576	6,653	6,590
Cirò	Calabria	710	423	487	357	740
Colli Orientali del Friuli	Friuli	1,832	1,807	1,750	1,688	1,832
Colli Piacentini	Emilia-Rom.	1,661	1,658	2,610	1,220	1,065
Collio Goriziano	Friuli	1,277	1,234	1,262	1,203	1,257
Conegliano Valdobbiadene	Veneto	5,751	6,259	6,580	6,860	7,195
Cortese dell'Alto Monferrato	Piemonte	248	223	210	216	202
Dolcetto d'Alba	Piemonte	1,265	1,391	1,359	1,315	1,218
Etna	Sicilia	568	645	656	772	760
Franciacorta	Lombardia	2,629	2,580	2,530	2,445	2,633
Frascati	Lazio	1,187	839	865	890	830
Friuli Grave	Friuli	3,101	2,879	2,380	2,699	2,514
Gavi	Piemonte	1,424	1,455	1,460	1,474	1,507
Gutturnio	Emilia-Rom.	1,314	1,271	1,036	1,014	1,153
Lambrusco di Sorbara	Emilia-Rom.	1,261	1,937	1,185	957	1,076
Lambrusco Grasparossa	Emilia-Rom.	1,200	1,333	1,120	1,212	907
Lambrusco Salamino di Santa Croce	Emilia-Rom.	1,519	2,532	1,521	1,648	1,388
Langhe	Piemonte	1,533	1,264	1,371	1,448	1,519
Locorotondo	Puglia	107	82	81	46	63

<i>Appellation of Origin</i>	<i>Region</i>	<i>2011</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>	<i>2015</i>
Lugana	Lombardia	1,015	1,050	1,126	1,185	1,330
Marsala	Sicilia	1,480	1,672	1,479	1,737	1,836
Modena	Emilia-Rom.	648	1,017	774	667	841
Montepulciano d'Abruzzo	Abruzzo	9,203	9,332	9,264	9,055	9,559
Morellino di Scansano	Toscana	1,424	1,414	1,305	1,315	1,355
Nebbiolo d'Alba	Piemonte	523	649	700	713	748
Nuragus di Cagliari	Sardegna	175	131	152	144	146
Oltrepò Pavese	Lombardia	3,212	2,912	2,929	2,451	2,783
Orvieto	Umbria	1,813	1,942	1,531	1,676	1,804
Primitivo di Manduria	Puglia	2,228	2,050	2,345	2,366	3,100
Prosecco	-	11,215	14,285	17,490	19,108	23,979
Reggiano	Emilia-Rom.	1,409	1,072	1,176	1,394	1,256
Roero	Piemonte	724	878	1,015	1,028	1,052
Rosso Piceno	Marche	1,318	1,161	1,140	1,124	1,340
Rosso Conero	Marche	225	173	208	237	207
Salice Salentino	Puglia	2,067	2,196	2,215	1,564	1,866
San Severo	Puglia	342	315	287	251	233
Soave	Veneto	4,523	5,645	5,301	5,438	5,827
Trebbiano d'Abruzzo	Abruzzo	2,133	2,139	2,122	1,968	2,195
Trentino	Trentino	6,827	6,685	6,589	6,615	7,367
Valdadige o Etschtaler	Trentino	848	979	1,110	1,100	1,041
Valpolicella	Veneto	6,833	7,061	7,282	7,435	7,660
Venezia	Veneto	1,559	1,141	1,277	1,457	1,967
Verdicchio dei Castelli di Jesi	Marche	2,104	2,036	2,013	2,015	2,040
Vermentino di Gallura	Sardegna	623	865	1,107	1,180	1,241
Vermentino di Sardegna	Sardegna	762	851	1,081	902	1,522
Vernaccia di San Gimignano	Toscana	714	718	725	740	719
Vino Nobile di Montepulciano	Toscana	1,200	1,172	1,040	1,160	1,115

Source: based on data extracted from Federdoc (2012, 2013, 2014, 2015, 2016).

**Appendix 3** - Average annual prices at source for 65 Italian wines with Appellation of Origin (expressed in €/hl).

<i>Appellation of Origin</i>	<i>Region</i>	2011	2012	2013	2014	2015
Alcamo	Sicilia	63	76	90	92	99
Alto Adige o Sud Tirolo	Trentino	210	192	202	261	276
Asolo Prosecco	Veneto	190	209	206	205	222
Asti	Piemonte	153	169	173	171	160
Barbaresco	Piemonte	291	274	266	292	356
Barbera d'Alba	Piemonte	113	116	134	118	137
Barbera d'Asti	Piemonte	83	92	95	100	112
Barbera del Monferrato	Piemonte	68	83	88	85	88
Bardolino	Veneto	78	85	81	83	91
Barolo	Piemonte	541	677	694	706	750
Bianco Custoza	Veneto	67	70	74	83	94
Bolgheri o Bolgheri Sassicaia	Toscana	142	131	149	177	240
Bonarda dell'Oltrepò Pavese	Lombardia	63	66	67	68	80
Brunello di Montalcino	Toscana	617	675	710	755	880
Cannonau di Sardegna	Sardegna	131	169	167	100	104
Castel del Monte	Puglia	70	77	78	69	67
Cerasuolo d'Abruzzo	Abruzzo	47	63	79	67	73
Chianti	Toscana	101	103	127	147	134
Chianti classico	Toscana	142	131	149	177	240
Cirò	Calabria	142	134	139	139	138
Colli Orientali del Friuli	Friuli	118	136	131	127	135
Colli Piacentini	Emilia-Rom.	72	82	99	100	96
Collio Goriziano	Friuli	118	136	131	127	135
Conegliano Valdobbiadene	Veneto	190	209	206	205	222
Cortese dell'Alto Monferrato	Piemonte	55	68	80	78	91
Dolcetto d'Alba	Piemonte	115	115	102	81	110
Etna	Sicilia	117	127	136	140	126
Franciacorta	Lombardia	185	201	206	210	231
Frascati	Lazio	53	64	78	88	90
Friuli Grave	Friuli	72	70	84	88	93
Gavi	Piemonte	149	150	153	163	228
Gutturnio	Emilia-Rom.	70	71	84	80	80
Lambrusco di Sorbara	Emilia-Rom.	56	66	66	84	83
Lambrusco Grasparossa	Emilia-Rom.	52	56	56	76	76
Lambrusco Salamino di Santa Croce	Emilia-Rom.	47	53	54	70	70
Langhe	Piemonte	104	119	129	134	143



<i>Appellation of Origin</i>	<i>Region</i>	<i>2011</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>	<i>2015</i>
Locorotondo	Puglia	65	75	82	64	62
Lugana	Lombardia	67	70	74	83	94
Marsala	Sicilia	66	79	96	103	115
Modena	Emilia-Rom.	46	63	74	56	81
Montepulciano d'Abruzzo	Abruzzo	47	63	79	67	73
Morellino di Scansano	Toscana	122	117	138	162	187
Nebbiolo d'Alba	Piemonte	127	137	181	184	219
Nuragus di Cagliari	Sardegna	44	73	89	84	80
Oltrepò Pavese	Lombardia	106	109	107	104	107
Orvieto	Umbria	56	61	83	83	90
Primitivo di Manduria	Puglia	70	77	78	69	67
Prosecco	-	159	155	120	116	176
Reggiano	Emilia-Rom.	45	55	69	67	67
Roero	Piemonte	216	199	191	149	115
Rosso Piceno	Marche	54	58	58	58	58
Rosso Conero	Marche	113	113	113	113	113
Salice Salentino	Puglia	70	77	78	69	67
San Severo	Puglia	65	74	78	63	176
Soave	Veneto	65	77	89	87	84
Trebbiano d'Abruzzo	Abruzzo	34	51	68	44	44
Trentino	Trentino	127	138	145	137	144
Valdadige o Etschtaler	Trentino	140	164	170	166	168
Valpolicella	Veneto	155	250	244	231	239
Venezia	Veneto	118	136	131	127	135
Verdicchio dei Castelli di Jesi	Marche	69	75	88	83	89
Vermentino di Gallura	Sardegna	70	115	173	139	137
Vermentino di Sardegna	Sardegna	47	77	116	93	92
Vernaccia di San Gimignano	Toscana	124	135	137	149	141
Vino Nobile di Montepulciano	Toscana	272	283	329	325	393

Source: based on data extracted from ISMEA (2017).