



AMERICAN ASSOCIATION OF WINE ECONOMISTS

AAWE WORKING PAPER

No. 83

Business

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A CLUSTER APPROACH

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May 2011

www.wine-economics.org

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Abstract

Globalization is challenging the core business of wine industry, especially in traditional European producers' countries, like Portugal, characterized by a *terroir* model, i.e., an economic structure supported by a large number of grape-growers, small and medium wine firms and high public regulation, to compete in international markets. Using a cluster approach, this paper presents the case of the most important Portuguese wine region, the Demarcated Douro Region (DDR), which is a strong reference of *terroir* and known for producing Port wine. To increase its competitiveness in the world wine market, the DDR needs to evolve from an organized to an innovative cluster.

Keywords: competition, innovation, wine, Douro region, cluster

JEL: D23, L23, Q12

1. Introduction

Since the beginning of the 1990s, the supremacy of European countries in international wine markets, particularly of France, Italy, Spain and Portugal, has been under attack due to the spectacular performance, both in production and exports, of new international players, the so-called 'New World' countries. These countries eroded the long established position of traditional (Old World) producers, and include both prosperous nations that are relatively new to the wine sector, such as USA and Australia, and developing countries (Chile, Argentina and South Africa). Several factors have contributed to the emergence in the international market of these New World wine countries.

On the supply side, a process of technological modernization and pervasive organizational change has been spurred by consistent investment and research effort supported by the establishment of specialized research institutions. Together with the technological catching-up process, New World players are particularly responsive to changes in wine consumption habits across the world, aligning scientific approaches and institutional building efforts with their branding and marketing strategies.

Faced with the threat of new competitors, the economic agents (public and private) of the Old World wine countries have been adopting competitive strategies in order to remain critical actors. In 2008, the European Union (EU) established the new Common Market Organization (CMO), in response to the ongoing challenges that the European wine industry has faced and set the goals to make the sector more competitive, reducing

overproduction, eliminating subsidies for the distillation into alcohol, promoting the replacement of vineyards with alternative crops and reducing the surface planted with poorly marketable varieties¹.

There is no doubt that the New World producers have been an important source of inspiration for the European countries. Australia and regions like Napa Valley, where a strong organizational structure was put in place to foster growth and innovation, have done better than others. The question of whether EU will reap the same results is very much open. The huge differences in national realities that EU must deal with and their enormous divergences in terms of background and behavior of economic agents argue in favor of studying concrete realities. A typical example is Portugal, a small country with 11 demarcated wine regions, shared by 26 sub-regions. The oldest (created in 1756) is known as Demarcated Douro Region (DDR), located in the north interior of Portugal, where the famous Port wine is produced. It is a region with an important wine industry based on the *terroir*² model,

The main objective of this paper is to analyze the organization of the DDR wine industry, using a cluster approach. For this purpose, the main sources of information are recent publications on the Douro wine industry (official statistics, economic studies), unstructured interviews to the main regional actors (entrepreneurs, cooperatives, professional organizations and public institutions) and the personal knowledge of the authors³ on the subject.

The paper is organized as follows: Section two includes a review of the literature on innovation and clusters, emphasizing the wine industry. Section three presents the Portuguese wine industry. In section four, the DDR wine cluster is discussed, giving special focus to the structure and multifunction of the vines, wine production and market and components of the cluster. Finally, in section five some final remarks are made.

2. Wine innovation and clusters

The economic development of a country or a region is strictly linked to the innovation process. OECD identifies four types of innovation: product innovation (which involves a

¹ Other goals of the OMC are: the restructuring of the chain of production, green harvesting and innovation, changes in wine-making practices, simpler labeling rules that will base quality assessment on designations of origin and protected geographical indications.

² *Terroir* is defined as a clearly identified and homogeneous territory endowed with a strong identity which is characterized by the whole of natural and cultural resources (Rastoin and Vissac-Charles, 1999), generally backed up by certificate of guaranteed origin label (Ditter, 2005).

³ During the last two decades the authors developed published research on the economic issues of DDR and, simultaneously, worked as consultants in private firms, allowing them a deep perception of the aims, problems and components of the DDR cluster. There is no doubt that this paper benefits and reflects the experience and knowledge of the authors.

good or service that is new or significantly improved); process innovation (which involves a new or significantly improved production or delivery method); marketing innovation (which involves a new marketing method, including significant changes in product design or packaging, product placement, product promotion or pricing); organizational innovation (introducing a new method in the firm's business practices, workplace organization or external relations). These types of innovation can be new to the organization, industry and world.

With the growth of the wine industry in New World wine countries emerged a new set of systemic research on innovation (Touzard, 2010). The pioneer analysis of Porter (1998), on the California wine cluster⁴, was followed, for example, by studies in the wine industries of Australia (Alyward, 2004 and 2006), Argentina (McDermott, 2007), Canada (Wolfe et al., 2005), and Chile (Gwynne, 2008). Most of these works: (a) underline the role of innovation networks in the emergence of these countries in the international wine market, highlighting the linkages between firms and research institutions; (b) use the concept of cluster in order to assess the relation between economic agents (grape-growers, cellars, traders) research organizations, government and professional associations.

Using as benchmark the New World wine countries in EU appeared some works focusing on the wine industry cluster, in countries such as France (Ditter, 2005; Rемаud and Couderc, 2006) and Spain (Larreina and Aguado, 2008), and also a study that compares the regional wine clusters of Italy, Chile and South Africa (Cusmano et al., 2009), which suggest that the New World countries are driving the international process of innovation and cluster analysis. In Portugal, in 2004, a document was prepared outlining a strategy for the Portuguese wine industry and a set of initiatives conducted by the Monitor Group of Michael Porter, on behalf of ViniPortugal (Professional Association to Promote Portuguese Wines), but the results of this initiative were never published.

The literature review allow us to conclude that it is important to know more about the wine cluster, specifically in regions characterized by the *terroir* model, where innovation is crucial for international competitiveness. Generally innovation is framed and fostered at a higher level but occurs at firm level within the clusters. The rich and diversified literature on clusters classifies them according to the analytical process and reference variables. Assuming eleven criteria (independent variables) it is possible to reduce cluster typology into three (informal, organized and innovative), according the level of the variables, as expressed in Table 1.

⁴ For Porter, clusters help productivity, boost innovation and encourage the emergence of new firms. Firms' geographical proximity, close competition and production networks around them make a winning contribution. However, globalization has made this far less certain. More open trade and improved transport links may mean that bunching together in a cluster no longer offers such a strong defense against cheaper foreign rivals.

Table 1 - Types of clusters

Variables	Informal clusters	Organized clusters	Innovative clusters
Critical actors	Low	Low to medium	High
Size of firms	Micro and small	SMEs	SMEs and large
Innovation	Little	Some	Continuous
Trust	Little	High	High
Skills	Low	Medium	High
Technology	Low	Medium	Medium
Linkages	Some	Some	Extensive
Cooperation	Little	Some, not sustained	High
Competition	High	High	Medium to high
Product change	Little or none	Some	Continuous
Exports	Little or none	Medium-high	High

Source: Migone and Howlett (2010).

Independently of the typology of clusters considered, it is important to assume the spatial dimension. Effectively in regional clusters, the location is an important criterion, especially in accessing relevant resources like raw materials, skilled personnel, training and research facilities and critical infrastructures. This is particularly true in the wine industry, given its attachments to the vineyards and the presence of both vertical and horizontal relationships among players. Based on a literature review on regional wine clusters, Migone and Howlett (2010) conclude by the existence of (a) organized clusters in Australia (Victoria and NSW), Canada (Okanagan and Ontario), Chile (Colchagua), France (Bordeaux and Burgundy), Italy (Bolgheri/Vali di Cornia), Spain (Rioja) South Africa (country); (b) innovative clusters in Argentina (Mendoza), Australia (South Australia), New Zealand (Wairapa), USA (Napa Valley) and Italy (Montalcino), and (c) informal clusters in Italy (Colline Pisane), France (Languedoc), Chile (Casablanca) and Argentina (San Juan).

Relatively to the transference of information inside the cluster, the literature in economic geography and evolutionary economics makes a well-known distinction between tacit and codified forms of knowledge. The argument in a nutshell is that, because tacit knowledge is, by definition, more difficult to share in written, symbolic form and because it is strongly context specific it tends to be more commonly transmitted through direct face to face interaction. Consequently, those firms and industries for which innovations depend on tacit knowledge transmission and application will tend to cluster spatially with their customers, suppliers and competitors. Conversely, for those firms and industries in which codified forms of knowledge are relatively more important will be less constrained spatially to cluster in this way. Gertler and Wolfe (2006), consider three types of sources of knowledge that can influence the cluster: synthetic (tacit) = local; analytical (codified) = global; hybrid (tacit and codified) = local to global. *Terroir* wine clusters rely strongly on both scales of knowledge flows, although synthetic knowledge dominates the grape growing component of the chain.

3. The Portuguese wine industry

The level of exports is usually used as an indicator of the international industry competitiveness. In the case of wine, the cluster is enhanced by the ability of the firms to export and search for new markets, showing that the export strategy is strongly correlated with the success of the cluster and vice-versa (Aylward, 2004).

Based on data from 2007 (Table 2), we observe that almost half of the world wine production is still concentrated in the three main European producer countries (Italy, France, Spain), despite the intensive growth of the New World countries (Argentina, South Africa, Australia and Chile). The Portuguese ranking position has been declining in recent years, moving from the 10th position in 1991/95 to the 12th in 2007.

Table 2 Wine production (in thousand of hectoliters)

Country	2007		2006		2001/2005		1996/2000		1991/95	
	Volume	%	Volume	%	Volume	%	Volume	%	Volume	%
Italy	45,981	17.29	52,036	18.38	46,936	17.21	54,386	19.95	60,678	23.06
France	45,672	17.17	52,127	18.41	51,919	19.03	56,271	20.64	52,886	20.10
Spain	34,755	13.07	38,137	13.47	37,323	13.65	34,162	12.53	26,438	10.05
United States	19,870	7.47	19,440	6.87	20,399	7.48	20,386	7.48	17,619	6.70
Argentina	15,046	5.66	15,396	5.44	14,488	5.31	13,456	4.94	15,588	5.92
China	12,000	4.51	12,000	4.24	11,640	4.27	9,581	3.51	5,140	1.95
Germany	10,261	3.86	8,916	3.15	9,225	3.38	9,989	3.66	10,391	3.95
South Africa	9,783	3.68	9,398	3.32	8,040	2.95	7,837	2.88	8,228	3.13
Australia	9,620	3.62	14,263	5.04	12,543	4.60	7,380	2.71	4,810	1.83
Chile	8,227	3.09	8,448	2.98	6,389	2.34	5,066	1.86	3,326	1.26
Russia	7,280	2.74	6,280	2.22	4,346	1.59	2,512	0.92	3,348	1.27
Portugal	6,073	2.28	7,543	2.66	7,311	2.68	6,828	2.50	7,276	2.77
Romania	5,289	1.99	5,014	1.77	4,975	1.82	6,173	2.26	5,529	2.10
Greece	3,511	1.32	3,938	1.39	3,727	1.37	3,832	1.41	3,668	1.39
World	265,994	100.00	283,149	100.00	272,780	100.00	272,577	100.00	263,092	100.00

Source: http://news.reseau-concept.net/images/oiv_uk/Client/Statistiques_commentaires_annexes_2007_EN.pdf (OIV)

In terms of trade, around one third of the world production is exported (Table 3). Italy, France and Spain are the top world exporters (Table 3), followed by countries like Australia, Chile, Argentina and USA. During the last decades, the market share of these countries increased more rapidly than that of the traditional European countries. Portugal is in the 9th position in 2007, against the 5th position in 1991/1995, although Portuguese market share remained the same.

Table 3 Wine exports (thousand of hectoliters)

Country	2007		2006		2001/2005		1996/2000		1991/95	
	Volume	%	Volume	%	Volume	%	Volume	%	Volume	%
Italy	18,507	20.69	18,390	21.95	15,721	21.77	14,955	24.56	14,830	29.01
France	15,249	17.05	14,720	17.57	14,772	19.15	15,271	24.26	11,478	29.87
Spain	15,079	16.86	14,340	17.11	12,076	16.72	8,817	14.48	7,353	14.38
United States	4,231	4.73	3,761	4.49	3,226	4.47	2,314	3.80	1,180	2.31
Argentina	3,598	4.02	2,934	3.50	1,534	2.12	1,027	1.69	591	1.16
China	98	0.11	43	0.05	29	0.04	25	0.04	35	0.07
Germany	3,543	3.96	3,197	3.82	2,640	3.65	2,330	3.83	2,689	5.26
South Africa	3,126	3.49	2,717	3.24	2,364	3.89	1,197	3.88	371	2.34
Australia	7,862	8.79	7,598	9.07	5,455	7.55	2,088	3.43	1,002	1.96
Chile	6,100	6.82	4,740	5.66	3,924	5.43	2,249	3.69	868	1.70
Russia	24	0.03	141	0.17	8	0.01	10	0.02	26	0.05
Portugal	3,473	3.88	2,959	3.53	2,566	3.55	2,137	3.51	1,948	3.81
Romania	143	0.16	179	0.21	391	0.54	491	0.81	244	0.48
Greece	320	0.36	320	0.38	369	0.51	493	0.81	563	1.10
World	89,449	100.00	83,791	100.00	72,230	100.00	60,886	100.00	51,123	100.00
World exports/production		33.63		29.59		26.48		22.34		19.43

Source: http://news.reseau-concept.net/images/oiv_uk/Client/Statistiques_commentaires_annexes_2007_EN.pdf (OIV)

Based on the percentage of domestic production exported⁵ (Table 4) we found that: (a) the main producer countries have increased their export vocation, especially the new world countries; (b) In 2007 the countries with a strongly export orientation are Australia (82%), Chile (74%); (c) In the group of old world wine countries, Portugal led (57%) followed by Spain (43%) and Italy (40%).

Moreover, OIV data indicates that in countries such as Argentina, Chile, Spain, South Africa and Australia, total demand (domestic consumption + exports) is almost supported by domestic production, while in the south European countries the total demand is satisfied with imports, i.e, these countries are, in some degree, acting as commercial platforms. In the future they should increase domestic production to be able to satisfy their total demand.

⁵ Based on this indicator, Migone and Howlett (2010:121) classifies the countries in: non-export oriented (0-10%), weakly exported oriented (11-25%), exported oriented (26-40%) and strongly exported oriented (over 40%).

Table 4 Wine export as a percentage of total production of the country

Country	2007	2006	2001/2005	1996/2000	1991/95
Italy	40.25	35.34	33.49	27.50	24.44
France	33.39	28.24	28.45	27.14	21.70
Spain	43.39	37.60	32.36	25.81	27.81
United States	21.29	19.35	15.81	11.35	6.70
Argentina	23.91	19.06	10.59	7.63	3.79
China	0.82	0.36	0.25	0.26	0.68
Germany	34.53	35.86	28.62	23.33	25.88
South Africa	31.95	28.91	29.40	15.27	4.51
Australia	81.73	53.27	43.49	28.29	20.83
Chile	74.15	56.11	61.42	44.39	26.10
Russia	0.33	2.25	0.18	0.40	0.78
Portugal	57.19	39.23	35.10	31.30	26.77
Romania	2.70	3.57	7.86	7.95	4.41
Greece	9.11	8.13	9.90	12.87	15.35
World	33.63	29.59	26.48	22.34	19.43

Source: Authors computation from OIV data

Relatively to Portugal (Table 5), Port wine has an important contribute to wine exports, representing, in 2008, 26% of the quantity and 53% of the value of wine exported, being the price of Port wine more than double of the price of still wines. Comparing with international prices⁶, the Port wine price is always higher than the observed in other exporter' countries. A different situation occurs in Portuguese still wine prices that are generally lower than those observed in other exporting countries.

Table 5 Portuguese wine exports

	2008		2007		2006		2005	
	Vol (hl)	%						
Port wine	767,070	26.16	814,050	23.44	785,250	26.54	807,750	30.39
Other wines	2,164,986	73.84	2,658,815	76.56	2,173,357	73.46	1,850,175	69.61
Total	2,932,056	100	3,472,865	100	2,958,607	100	2,657,925	100
Prices (euro /litter)								
-Port wine	4.12		4.21		4.22		4.23	
- Other wines	1.30		1.04		1.09		1.14	
-Average	2.04		1.78		1.92		2.08	

Source: IVV (www.ivv.min-agricultura.pt) and IVDP (www.ivdp.pt)

⁶ Applying an exchange rate of 1 euro =1.18 US\$ and using information contained in Migone and Howlett (2010), the average prices per liter on wine export, in 2005, are: Argentina – 1.18; Australia – 2.57; Chile – 1.78; France 3.99; Germany – 1.99; Italy 1.98; Spain 1.12; South Africa – 1.63; USA – 1.50.

4. The Douro wine region cluster

4.1. Structure and multifunctionality of the vine

The vines are the economic base of the DDR cluster. Archeological records sign the presence of vineyards in the Douro region since Roman times. However, the emergence of the present DDR dates from 1756, when it was recognized as the first demarcated region in the world, applying already a legislative framework similar to that currently used in the most famous traditional wine regions. DDR is a region where the *terroir* characteristics are present, as clearly expressed by UNESCO, when classified this region as a cultural evolving landscape and a world heritage site, according to the following: *Criterion (iii) - The Alto Douro Region has been producing wine for nearly two thousand years and its landscape has been molded by human activities; Criterion (iv) - The components of the Alto Douro landscape are representative of the full range of activities associated with winemaking - terraces, quintas (wine-producing farm complexes), villages, chapels, and roads; Criterion (v) - The cultural landscape of the Alto Douro is an outstanding example of a traditional European wine-producing region, reflecting the evolution of this human activity over time.*

DDR covers an area of 250,000 hectares, of which about 18% is occupied with vines⁷. According to CERVIM (Centre for the Research, Study and Advancement of Mountain Viticulture), the DDR is the largest and most heterogeneous wine mountain region in the world, characterized by valleys strongly embedded by steep high slopes along the river Douro and its tributaries, dominated by shale and cold winters, hot summers and low rainfall. We are in the presence of hillside vineyard, being more than 40% of the vines installed in plots with a slope higher than 40% (Quaternaire Portugal / UCP, 2007), which makes mechanization very difficult and requiring manual labor, consequently, leading to high production costs.

Similarly to the oldest wine regions of Europe, the property structure in DDR is skewed (Table 6), with 45,160 ha of vineyards distributed amongst 39,506 viticulturists, an average farm size of 1.14ha/farm. However, roughly 35% of the DDR area is owned by just 810 viticulturists. The average farm size for this group is around 19.7ha. Most of these farms belong to producers-bottlers and traders of Port wine. In contrast, small and medium size viticulturists are mostly members of wine cooperatives (Rebelo et al., 2010).

⁷ The economy of the region is not quite diversified, being based on wine industry and public support services to the resident population. The region has 257,100 inhabitants, with a population density of 46.62 inhabitants per Km². In the last four decades, lost 40% of its population, the remainder is aging.

Table 6 Number of grape-growers and farm size in DDR

Area (Hectares)	Number of viticulturists	Viticulturists %	Hectares	Size %
Until 0,5	23,743	60.1	4,221	9.3
0,5 – 2,0	11,162	28.3	11,260	25.0
2,0 – 5,0	3,134	7.9	9,649	21.4
5,0 – 8,0	657	1.7	4,074	9.0
8 – 10,0	201	0.5	1,802	4.0
More than 10	609	1.5	14,154	31.3
Total	39,506	100.0	45,160	100.0

Source: Quaternaire Portugal / UCP (2007)

4.2 Wines: Production and market

Two categories of wines are produced in DDR⁸: Porto wine and still wines (QWPSR – quality wines produced in specified region, regional wine and table wine), whose production and commercialization is mainly controlled by the regulator entity named IVDP (*Instituto de Vinhos do Douro e Porto*).

Historically, the main production of DDR was Port wine, a product highly regulated since the creation of DDR. The grapes used to produce Port wine are selected according to a quality criteria based on a scoring method that considers soil, climatic and other agricultural parameters. Based on sales, stocks, yields forecasts and commercialization expectations, every year, the IVDP, through the “statement of grape harvest” or *Comunicado de Vindima*, defines the amount of must that can be used in Port wine production (*benefício*) and how it is distributed by plots.

From data observed in DDR total production in the last three decades (Quaternaire Portugal/UCP, 2007) we can highlight that: (a) In 1985-1989 the average annual production was 1,182,500 hl, increasing to 1,265,000 hl in 1990-2000 and 1,474,000 hl in 2000-2006, from which 80% are red wines; (b) the share of still wines presents large yearly variations, ranging from 37% (1985-1989) to 51% (2000-2006). This variability is caused both by randomness of grape production and *benefício*. As the price of grapes with allowance for Port wine is at least the triple of those used in still wines (Rebelo et al., 2010), it is economically rational that grape-growers satisfy in first place the quota of Port wine.

Table 7 reports information on the wine production in most recent years. The annual average production is 1,562,687 hl, representing Port wine 55% of the DDR production and 13% of the Portuguese production. The DDR total production is around 24% of the country production.

⁸ Additionally it is also produced a small quantity (almost 2% of the total production) of a fortified Douro Muscat.

Table 7 Production of RDD

	Port wine (hl)*	Still wines (hl)	DDR Production (hl)	Port wine/ DDR production (%)	Port wine/ domestic production (%)	DDR production/ Domestic production (%)
2008	871,864	502,047	1,373,911	63.46	15.33	24.15
2007	877,405	562,786	1,440,191	60.92	14.45	23.71
2006	867,107	850,766	1,717,873	50.48	11.50	22.78
2005	845,169	873,604	1,718,773	49.17	11.63	23.65
Total	3,461,545	2,789,203	6,250,748	55.38	13.03	23.53

* Includes the brandy added in final product Port wine (an average of 115 liters of brandy in 435l of must).

Source: IVDP (www.ivdp.pt) and IVV (www.ivv.min-agricultura.pt)

Port wine and still wines face different market demands. The Port wine has a story of more than two centuries of being sold in external markets, albeit cyclical movements. Recent data (Table 8) shows that presently the Port wine is witnessing a negative phase, expressed by a sales decrease in 11% in volume and 13% in value, between 2005 and 2009. Simultaneously, in the same period, the domestic demand remained relatively stable, around 13-14%, in quantity and 15-16%, in value. Unquestionably, it is a globalized product, sold around the world, although the main market is the EU (especially France, United Kingdom, Netherland, Belgium and Germany), followed by USA and Canada (www.ivdp.pt).

Table 8 Sales of Port wine

	2009	2008	2007	2006	2005
Domestic market					
- Volume (Hectoliters)	110,160	125,100	128,430	130,860	129,330
- Value (10 ³ euros)	51,874	59,578	61,704	64,224	63,029
- Euro/liter	4.71	4.76	4.80	4.91	4.87
Exportations					
- Volume (Hectoliters)	725,940	767,070	814,050	785,250	807,750
- Value (10 ³ euros)	300,266	316,222	342,550	331,685	341,930
- Euro/liter	4,14	4,12	4,21	4,22	4.23
Total					
- Volume (Hectoliters)	836,100	892,170	942,480	916,110	937,080
- Value (10 ³ euros)	352,100	375,800	404,254	395,909	404,959
- Euro/litro	4.21	4.21	4.29	4.32	4.32

Source: IVDP (www.ivdp.pt)

Regarding still wines, only a part of the total production⁹ is sold as AOC wines (Table 9). In the 2005-2009 production period the share of AOC wines increased, reaching 60% in 2009. The remaining production (table wine) is essentially vinified by cooperatives and

⁹ The IVDP only collects systematic information in AOC wines only since 2005. Regarding to table wine, whose market information is controlled by the IVV (a national organization), there is no detailed data.

sold in bag-in box and bulk, at a price around 0.5 euro/liter (Quatenaire Portugal/UCP, 2007). In 2009, the exports of AOC wines represented around 26%, in volume, and 30%, in value, of the total marketed, with an average price per liter of 2.97 euro in the domestic market and 3.59 euro in external markets, averaging 3.13 euro/ liter.

Table 9 Sales of AOC wines

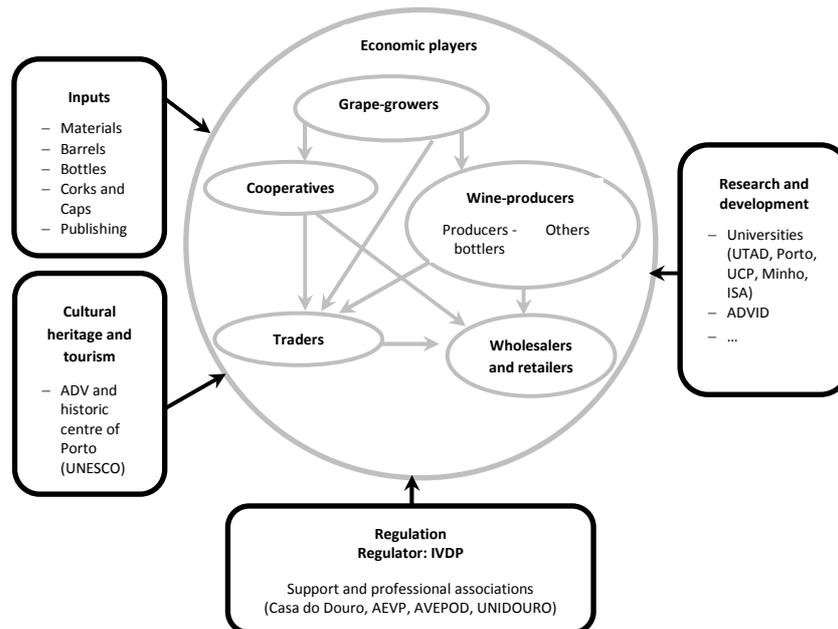
	2009	2008	2007	2006	2005
Domestic market					
- Volume (Hectolitros)	222,453	279,369	308,520	268,956	230,481
- Value (10 ³ euros)	66,156	70,645	70,070	62,374	51,866
- Euro/liter	2.97	2.53	2.27	2.32	2.25
Exports					
- Volume (Hectolitros)	77,202	74,646	69,822	58,140	49,545
- Value (10 ³ euros)	27,680	26,977	25,243	20,717	16,853
- Euro/liter	3.59	3.61	3.61	3.56	3.40
Total					
- Volume (Hectolitros)	299,655	354,015	378,342	327,096	280,026
- Value (10 ³ euros)	93,836	97,622	95,313	83,091	68,719
- Euro/liter	3.13	2.76	2.52	2.54	2.45
Still Douro wines/Production of year (-1)	0.60	0.63	0.45	0.37	0.30

Source: IVDP (www.ivdp.pt)

4.3. Components of the cluster

Taking into consideration the local, regional, national and international background of wine industry, this subsection is dedicated to the analysis of the components of the DDR cluster, namely the economic players involved in the supply chain, regulation, research and development and short references to inputs and cultural heritage and tourism (Figure 1).

Figure 1- DDR wine cluster



Economic players involved in the supply chain of DDR

As mentioned before, in DDR there are 39,506 grape-growers holding 45,160 ha of vines. The grape production is vinified by wine producers, cooperatives and processors/traders. The remainder of the circuit is made up of wholesalers and retailers.

In the last five decades, important changes occurred in the supply chain of both Port and Douro still wines, becoming the industry more horizontally/vertically integrated. In the 1960s, the formation of wine cooperatives produced significant changes in the supply chain, becoming intermediaries between viticulturists and traders. Until the mid of the 1980s these cooperatives were mainly focused in vinification and storage activities, selling almost all of their wine production in bulk to traders. After the entrance of Portugal into the EU, in 1986, wine cooperatives began to sell wine in bottles, especially, Douro still wines. Moreover, firm concentration accelerated in the Port wine sector (Rebelo and Correia, 2008) along with upstream integration of commercial firms, who planted new vineyards and built new cellars. At the same time the Douro still wines witnessed a phase of downstream vertical integration, since the larger viticulturists became also producer-bottlers, yielding the so-called wine of *quinta* (farm). Some of these wines quickly achieved domestic and international reputation in market niches.

Following the nomenclature adopted in DDR, IVDP registers 81 entities with economic status in the Port wine subsector and 269 in the still wines subsector (Quatenaire Portugal/UCP, 2007). Relatively to Port wine, 31 are traders¹⁰, and 50 are producer - bottlers¹¹. In the case of still wines, 42 are traders, 196 are producer-bottlers and 31 are warehouses¹². Some players have simultaneously more than one statute.

In terms of market concentration, the share of the 4 (CR4) and 8 (CR8) biggest traders of Porto wine has been increasing, respectively, from 49% and 73%, in 1991, to 67% and 84%, in 2006 (Quatenaire Portugal/UCP, 2007). These indexes lead to the conclusion that the Port wine industry is characterized by strategic groups, being the market power of the dominant firms mitigated by the competitive fringe of firms.

Differently from Port wine, the still wines industry is atomized. Wine cooperatives had and still have an important but decreasing economic role in DDR wine industry. In 2007, the 20 DDR-WCs (both Port and Douro table wine) involved 19,884 viticulturists as members, each one holding an average vineyard size of less than one hectare. Most of them are part-time viticulturists, whose main objective is to complement other sources of income, viewing the cooperative as an organization to which they can sell their grapes to

¹⁰ A trader is a firm or group of firms that trade wine products (including grapes to process) in bulk or retail. Additionally, in the case of Port wine it is required to hold a permanent stock at less 1,500 hl.

¹¹ Firm that makes and bottles wines from fresh grapes of its own farm or bought to other grape-growers, but assuming itself the exclusive responsibility for the final product (bottled wine).

¹² Firm or group of firms whose activity includes the wholesale of wine and byproducts of wine, in bulk or bottled.

and not as a firm which they own. This behavior generates high transactions costs, problems in equity acquisition and redemption, and difficulties in developing efficient entrepreneurial strategies. The cooperatives process almost 40% and 20% of still and Port wines, respectively, an average of 30% of both, against an average of 50% 10 years ago. As Rebelo et al. (2010: 152) summarize *the socio-economic characteristics of DDR-WCs member' show, on the one hand, an inability of individual viticulturists to vertically integrate. They simply are too small to do so. On the other hand, their age and education profile seems to leave them incapable of making collective growth decisions that require long-run investment and risk taking, at the expense of short-run returns from grape sales to the cooperative. Most DDR-WCs appear to be hopelessly trapped in a risk averse, traditional cooperative model, with minimal professional governance to address the challenges of a global wine economy. If DDR-WCs are to survive in a competitive world wine market, a change in cooperative model may be essential.*

In the last two decades, the market share lost by cooperatives has been transferred to the producer-bottlers that made important investments in the reconversion the vines, in new vinification facilities and marketing activities, searching niches for premium wines. In the implementation of these initiatives, the knowledge provided by research and training institutions was relevant and at same time supported by the entrance of a new and young generation of oenologists and entrepreneurs that were able to make a real symbiosis between viticulture, technology, winemaking and marketing. The high scores achieved in international contests and the excellent references in specialized presses are the recognition of the high quality of the AOC Douro wines¹³.

Summing up, the interactions among the players of the cluster are essentially informal and heterogeneous. In terms of vertical coordination, the relationship between grape-growers and wine makers is higher in producer-bottlers and wine cooperatives and very low for growers selling grapes in the open market. The horizontal coordination between players is not high, provoking some difficulties in the transference of knowledge between them. Relatively to winemakers most of them have international experience, but mostly of growers do not.

Regulation

The DDR wine business is strongly regulated through the application of EU laws, namely wine CMO, and specific Portuguese legislation.

The IVDP is the organization whose mission is to regulate and control the products and activities along DDR wine chain, starting in the vine and finishing in the promotion. IVDP is an inter-professional association with delegated public powers formed by representatives of grape-growers, cooperatives, producer-bottlers and traders. As defined in its status the

¹³ As an example, see the ratings/awards published in Wine Spectator of April 30, 2010 and in Wine & Spirits of April 2010.

main scopes of IVDP are to: (a) propose strategic orientation and implement winegrowing production policy for the DDR; (b) regulate, control and supervise the production and marketing of wines produced in the DDR; (c) monitor, promote and defend the DDR denominations of origin and geographical indication and the other wine and wine products produced, developed in or passing through the DDR; (d) carry out investigations of misdemeanors and apply the correspondent penalties (e) promote the adoption of best practice in viticulture and in technological development.

The main professional associations of DDR are: Douro House (Casa do Douro), Association of Port Wine Companies (AEVP), Association of Douro Wine Cooperatives (UNIDOURO), Association of Porto and Douro Wine Producers Bottlers (AVEPOD).

Casa do Douro is a public association, constituted in 1932, to which all grape-growers must belong (compulsory registration). As part of the institutional organization implemented in 2007, the role of the Casa do Douro was redefined to enhance its nature as an association, and to emphasize its role as a representative of the farmers and support them in production economic activities.

AEVP is a private, non-profit organization, established in 1975 by Port wine traders. Its main goal is to promote and defend the Port wine industry and trade and to represent and safeguard the interests of its members, as they engage in this field of economic activity. The AEVP has 18 members, which represent 90% of the sales of Port wine and 35% of AOC Douro wines.

UNIDOURO is a second tier cooperative, which members are the wine cooperatives of the DDR, and its main objective is to be active in the wine sector and to carry out or implement actions and services for its members.

AVEPOD was constituted in 1986 by 33 Douro producer-bottlers to defend the interests of their peers and to promote their wines (*quinta* or producer wines), products and tourist services in domestic market and abroad.

We can say that: (a) the aim of AEVP, UNIDOURO and AVEPOD is the defence of the institutional interests of their members; (b) if the intra and inter linkages in these organizations could be higher, the knowledge transference among players would increase and the cluster performance improve.

The regulation framework in DDR follows the principles that are typical of the *terroir* model (Brouard and Ditter, 2008), where it is seen as a compensation for weak linkages and lack of trust among the different groups of economic players.

Research and development

Similarly to other industries, wine innovation is a complex task that should start in research centers and finish in business application, covering areas related with viticulture, wine making, management and marketing. To be efficient, the innovation system should

be structured in a way that scientific research, technological inventions and improvements in products and processes lead to higher value added to products. This goal is easily achieved if there is a network able to spread through the economic players the results of the research produced in universities and research centers.

In some degree, DDR benefits from the research developed both at national and regional level. Quarternaire Portugal /UCP (2007: 180) highlights that *Portugal is the country with the largest increase in scientific productivity in the area of wine, during the period 1975-2005. The number of annual publications in international journals has increased from an almost zero base to over 500. Furthermore, the ratio between the scientific production in the field of wine and the scientific production in all other scientific disciplines is greater than in any other country in the world. Using as a reference the wine-chain significant research has been made in areas related to food science, chemistry, biotechnology, microbiology, agriculture, horticulture, plant science, nutrition and dietetics.* This research, largely financed by public authorities and EU, has been conducted by universities and institutions located throughout the country. Relatively to DDR special emphasis should be made to the role played by the University of Porto, the School of Biotechnology (Portuguese Catholic University), the University of Minho, the University of Trás-os-Montes and Alto Douro, all located in the north part of Portugal, and the School of Agriculture (Technical University of Lisbon), located in Lisbon.

The Association for the Development of Douro Viticulture (ADVID) plays an important role as an interface institution between the providers of scientific knowledge and its business application. It is a nonprofit association whose members are enterprises involved in viticulture and trade of DDR wines, as well as individual growers.

ADVID was recognized by the Portuguese government as the leader and fostering entity of the Douro Wine Region cluster, within the public program called “collective efficiency strategy, 2007-2013”.

Table 10 summarizes the ADVID strategy (mission, vision, strategic objectives, anchor projects and results to be achieved) in this region. Taking into account this strategy, in the DDR innovation network, this organization is the bridge between research and economic wine players.

Table 10 ADVID strategy in the DDR cluster

Mission	Vision	Strategic objectives	Anchor projects	Results to be achieved
To foster and consolidate the Douro wine industry through a technologically sustainable strategy applied to all players.	An industry that is environmentally, economically and socially sustainable, supported by a culture of network cooperation to reduce threats and maximize opportunities.	<ul style="list-style-type: none"> • Increase in the resources available to develop and strengthen the cluster; • Increase the investment in R&D and business innovation through mobilizing projects with added value for wine production; • Increase the sector's technical and economic performance; • Optimization, capturing and dissemination of knowledge in the Region as a way of improving viticultural practices; • Development of methodologies that favor and increase the operational efficiency of local wine production; • Attracting public and private investment to the region; • Setting up of scientific knowledge-sharing platforms and support for initiatives adopted by economic agents aimed at innovation of processes and products; • Creation of business support services. 	<ul style="list-style-type: none"> • Climate change • Zoning and three-dimensional mapping of wine production potential based on micro-zoning • Functional biodiversity in viticulture • Assessment of grapes' wine-making potential • Preserving the genetic variability of grape varieties • Sustained production in viticulture • Rationalization of hillside vines • Skills development - Training and dissemination 	<ul style="list-style-type: none"> • Strength and capitalize business management, particularly small and medium-sized wine growers, with synergies resulting from association membership; increasing the added value of the wine sector • Increase technical skills and disseminate knowledge to enhance sustainability and competitiveness of the industry, namely: develop modernized agricultural production units; benefit from the use of synergies between enterprises, education institutions and R&D; promote innovative business practices to add value to local products; develop the attractiveness of the region in all its diversity; qualify labor resources

Source: Adapted from www.advid.pt

During the last three decades DDR benefited from results of the significant research developed by public institutions and ADVID played an important role in the transference of applied research results to farmers. However, there is still the need for more research in areas related with product (wine), models of organization/governance and marketing, as well as improvements in the process knowledge diffusion in a way that more and more economic players can increase their performance.

Simultaneously, with research developed in the wine chain, the higher education institutions (universities and polytechnics) also provided qualified human resources with graduate and post-graduate degrees in agronomic engineering, oenology, management, marketing and entrepreneurship. There are also medium level training programs provided by public secondary schools and private institutions. As the reputation of the region increases among experts and consumers recruiting qualified personnel will be easier.

In summary, the location of specialized training and education institutions in the region provides a steady supply of highly qualified labor to the firms in the cluster and facilitates the process of acquiring new technical knowledge, a source of competitive advantage for firms located in the DDR. However, the potential spill-over effect of the regional knowledge is cushioned by the inexistence of strong partnerships with important research and development players – governments, industry, universities, international organizations- and by the lack of capacity of most firms to finance significant research.

Inputs

The inputs (materials, barrels, bottles, cork and caps, publishing, marketing,...) used in DDR wine industry are, in general, not produced by firms located in the region, that can be considered global inputs. IVDP and the IVV (Instituto da Vinha e do Vinho) play an important role in the institutional and collective publicity and marketing of wines. Additionally, each firm makes promotion either individually or via networks¹⁴, according to his size and market target.

At the viticulture level some farming operations (e.g., pruning, spraying, grape harvest) are made by contracted specialized private firms that supply their services to several farmers, facilitating the innovation process, since they are diffusers of important and recent flows of information.

In sum, excluding the grapes used for wine processing (a typical regional input in this industry), the existence of suppliers of other physical inputs located in the region is not a strong factor of differentiation and competitiveness for DDR cluster.

Cultural heritage and tourism

As referred before, having in mind its historical and physical characteristics, DDR is a region where the wine industry is by nature linked to the heritage and tourism. Effectively the beauty of the Douro landscape mosaic, associated with the navigability of Douro river from Porto to the Spanish border, has resulted, during the last decade, in a growing demand in the tourism sector, including fluvial tourism. The classification of the world heritage site of the Historic Centre of Porto, in 1996, and Alto Douro Wine region, in 2001, enhanced the public visibility and promoted the attraction of this region. In response to the behavior of tourist demand, supply has answered through hotel boats and high quality infra-structures, like charm hotels, and units of rural tourism associated to the wine activity. The spill-over effects of cultural and tourism activities on wine industry are expressed in: (a) direct wine sales to tourists; (b) publicity of the brand Douro, which is already world recognized, the Port wine (c) emergence of a new segment of demanding consumers, many of them foreigners, who associate the wine to landscape,

¹⁴ The more known case is the Douro Boys, a network constituted by 5 producer-bottlers, with recognized success in AOC Douro super-premium wines.

strengthening the role of the concept of *terroir*. These spill-over impacts could be incremented with the realization of systematic and open initiatives, such as wine fairs and festivals.

5. Final remarks

Portugal is a country with a long history in both wine production and exports, with special emphasis in Port wine that can be considered a benchmarking case of globalization. Given the recent challenges posed by the new world wine countries, European countries and regions, traditionally wine producers, are at the crossroads of competitiveness, raising the question of survival of the *terroir* model. This issue is being analyzed using a cluster regional approach.

Similarly to other traditional European wine regions, the analysis of this paper shows that DDR is a typical *terroir* model, but it is not a real cluster as defined in a Porter's approach. For this author the key feature of cluster success is related to the high level of local embeddedness of firms in a very thick network of knowledge sharing, supported by close social interactions and institutions, and by building trust and formal and informal relationships among economic actors.

Using the Migone and Howlett (2010) typology, presented in table 1, the DDR cluster can be classified as organized, since: (a) there is a large number of micro, small and medium firms and a low number of critical actors; (b) the level of trust is medium and some innovation is observed; (c) the level of skills is medium-high and the technology is medium; (d) the competition is high and there are some cooperation and linkages between actors; (e) during the last decades de AOC wines suffered deep changes and the exports are considered medium-high.

If the aim of DDR cluster is to achieve the innovative level, it is necessary: (a) to increase the size of firms and the number of critical actors, in order to allow producers to make heavy investments that enables them to react outside pressures; (b) to introduce and spread a real culture of continuous innovations in the different phases of the wine-chain, anticipating or provoking changes in world market demand; (c) to amplify the cooperation and network between the different cluster players for a generalized and better diffusion of knowledge and skills.

The authors are aware that this exploratory research contains an overview of the issue that deserves future research in terms of empirical work, namely, via structured interviews to a large and diversified numbers DDR economic players and subsequent statistical and econometric analysis.

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