



Economía Agraria y Recursos Naturales. ISSN: 1578-0732. Vol. 10, 2. (2010). pp. 143-158

Performance of Traditional Cooperatives: the Portuguese Douro Wine Cooperatives^a

João Rebelo*, José Caldas* and Scott C. Matulich**

SUMMARY: Globalization is challenging the very core of cooperative governance and ownership decision, especially in Southern European countries, like Portugal, where a large number of producers are organized in traditional and Mediterranean-style agricultural cooperatives. This paper analyses the effects of governance and control variables related with size over two alternative indicators of performance: revenues transferred to members/patrons and capital structure. The results suggest that these cooperatives have difficulties being sustainable in the more competitive global wine markets, if they follow, essentially, a practice of maximum patronage refund, reducing their capacity to improve leverage and to finance more profitable, but risky, long run investments.

KEYWORDS: Econometric model, economic analysis, traditional cooperatives, wine sector.

JEL classification : Q13, D22, L25.

Performance de las Cooperativas Tradicionales: Las Cooperativas Portuguesas de Viño del Duero

RESUMEN: La globalización está poniendo en cuestión la esencia de la gobernanza cooperativa y su estructura societaria, sobre todo en los países del Sur de Europa, como Portugal, donde muchos productores están organizados en cooperativas agrícolas tradicionales y de estilo mediterráneo. Este trabajo analiza los efectos de las variables de gobierno y control relacionados con el tamaño sobre dos indicadores de comportamiento alternativos: los ingresos transferidos a los miembros/socios y la estructura del capital. Los resultados sugieren que estas cooperativas atraviesan dificultades para mantenerse sostenibles en un mercado de vino global y más competitivo si siguen, en esencia, una política de máximo retorno al socio, reduciendo su capacidad para de mejorar la estructura de su deuda y capacidad para financiar inversiones más rentables, aunque con mayor riesgo, a largo plazo.

PALABRAS CLAVE: Análisis económica, cooperativas tradicionales, modelo econométrico, sector vitivinícola.

Clasificación JEL: Q13, D22, L25.

^a *Acknowledgements:* The authors gratefully acknowledge the valuable comments of the editor of EARN and of three anonymous referees. The usual disclaims applies.

* Department of Economics, Sociology and Management (DESG) and CETRAD – University of Trás-os-Montes and Alto Douro (UTAD); Av. Almeida Lucena 1, 5000-660 Vila Real, PORTUGAL (contact address); **Emails:** jrebelo@utad.pt (corresponding author); jcaldas@utad.pt, phone + 351 259 302 200.

** School of Economic Sciences, Washington State University; Pullman, 99164 WA, U.S.A.; Email: matulich@wsu.edu.





1. Introduction

During the past two decades the wine sector has followed the general globalization trend. International trade increased, direct foreign investment in all facets of the industry is common, and viticulture is less and less linked to a specific region (*terroir*). Underpinning much of this change are transfers of scientific knowledge, including “business models”, and the tendencies for the qualitative and quantitative uniformity of consumption. Countries of the southern hemisphere, such as Australia, that previously imported European production technology, are now a source of knowledge and economic engine of change to “Old World” wines. These changes have literally uprooted the Old World wine industry as it attempts to address persistent excess production brought on by aggressive production of “New World” wines.

Annual data published by International Organisation of Vine and Wine (OIV, 2008) show that in the last two decades there is excess production; world wine consumption is 84% of annual production, on average. International trade of wines more than doubled in the last 20 years. Exports jumped from 13.6% of world wine production in 1987 to 29.4% in 2007. Global production and export pressures came principally from the New World producers in Australia, Argentina, Chile and South Africa.

Old World producers have been slow to react.

“... due to the recent trend of global grape and wine oversupply, markets are beginning to experience deep discounting as wineries look to clear out excess inventory in order to make room for new vintages. To sustain their growth wine producers will have two alternatives: either go along with the supermarket chains and become global by investing in some of the main wine producing countries, or develop a niche strategy (through a specific product, and or a specific service) to differentiate themselves (Remaud and Couderc, 2006: 406).”

Increased world wine competition underpins a growing industrial concentration to which the small-scale viticulture structure in much of the European Union may not be able to respond. Changes in the wine sector are challenging the very core of governance and ownership decisions, especially in southern European countries, like Portugal, where large numbers of producers are organized in a few wine cooperatives (WCs). Most of the WCs were founded during the 1950s and 60s in a top-down process and in order to address capitalization problems arising from very small scale wine processing, stocking and marketing. These cooperatives are legally organised following traditional cooperative principles (i.e., open membership, democratic control, restricted residual claim and benefits to members proportional to patronage), with poorly defined property rights and consequential difficulty in assuming risky investments that could add value in the medium and long run.

The Douro Demarcated Region (DDR), where twenty WCs comprise about 45% of the total production and the majority follow the so-called “Mediterranean model” of governance, is characterised by the adoption of traditional cooperative principles and most of them with non-professional management.

Like many agricultural cooperatives, the DDR-WCs increasingly face survival challenges related to economic and financial issues, all of which are accentuated in the last decades. Factors such as member equity, capital acquisition and redemption are well known constraints on growth and sustainability that arise from ill-defined property rights in a cooperative environment (Cook and Iliopoulos, 2000). These factors lead cooperatives to a situation where they have to opt between the immediate patronage refund to patrons or reinforcing equity. Since both objectives are potentially consistent with the traditional Mediterranean cooperative model, we examine empirically both alternative objectives in the context of governance structure and of control variables related to size. The econometric model uses panel data to evaluate two competing/alternative indicators of DDR-WCs performance: (a) revenues transferred to members/patrons (share of gross revenue transferred to patrons), and (b) equity/total asset ratio (inverse of leverage). The next section includes a brief literature review of the cooperative organization models. In the remaining sections, the Douro Wine Cooperatives context is presented, followed by the econometric analysis of DDR-WCs performance. Final remarks concerning some ideas on the viability of traditional cooperatives under increasing pressures from a global and competitive world environment conclude the paper.

2. Cooperative organizational models

The economic justification of agricultural cooperatives is found at the level of member farms. Independent of the organizational model that they adopt, agricultural cooperatives are successful if they provide their members a net economic benefit higher than they can achieve individually or outside of the cooperative. As both main suppliers of raw materials and equity, members decide on the cooperative's retained earnings, investments, and farmer's output final price. However, since this price is related to the retained earnings and because the price of the farm product delivered by the members represent an important cost to the cooperative firm, the cooperative's profit is not, generally speaking, a useful measure of its performance (Rafat et al., 2009).

In order to cope with the changes in the agribusiness and food industries, cooperatives are introducing organizational innovations, evolving from the traditional cooperative to a new typology of cooperative models that assumes a new property rights structure of its members and governance.

The traditional cooperatives are companies that work in a single, common market, in which they are exposed to the same conditions as their competitors. These traditional cooperatives face problems similar to investor owned firms (IOF) but the solutions need to be quite different because the two business forms pursue different objectives. While traditional cooperatives try to maximize the patronage refund, *via* the price paid to products supplied by the members, IOF seek to maximize its profits, *i.e.*, the returns on capital, given a certain level of risk (Kyriakopoulos, 1997).

The type of ownership, expressed by the structure of property rights and governance, particularly management authority delegated to professional managers and/or



full time directors, is perhaps the best tool to analyze the incentives for the economic agents to create, maintain and improve their assets. Investments in cooperatives are no exception. Drawing from property rights theory, Chaddad and Cook (2004) offer a typology of six cooperative models: traditional cooperatives, proportional investment cooperatives, member investor cooperatives, new generation of cooperatives, cooperatives with capital seeking companies and investor share cooperatives, whose main difference is related to how property rights, in terms of residual claims and residual rights control, are attributed to economic agents that supply equity to the firm. These agents can be associated members (simultaneously investors and main suppliers of the transformed and commercialized input) or simply investors.

In the traditional cooperative model the ownership rights are restricted to member-patrons, residual return rights are non-transferable, non-appreciable and (partially) redeemable and benefits (surplus) are distributed among members in proportion to patronage (proportionally to the products delivered to the cooperative).

In the proportional cooperative model, property rights are restricted to members, nontransferable, non-appreciable and redeemable, but members are expected to invest in the cooperative in proportion to patronage. In member-investor cooperatives' returns to members are distributed in proportion to shareholdings in addition to patronage. In new generation cooperative model, property rights are in the form of tradable and appreciable delivery rights restricted to current member-patrons.

An alternative is to amplify the ownership rights linked to equity capital of non-members, sharing profits and eventually control rights with outside investors who are not necessarily patrons of the cooperative, and thus may have diverging interests between the two groups. The most radical transformation is the conversion of the cooperative to IOF. A strategy of the unit is to choose not to continue as a user-owned and controlled organization, with the residual claim and control rights reassigned among the firm's stakeholders. Alternatively cooperatives may acquire risk capital from outside investors, i.e. from capital seeking entities or investor shareholders. In the first case, investors acquire ownership rights in a separate legal entity or partly owned by the cooperative, with the outside investor not directly introduced in the same, but rather in trust companies, strategic alliances, or a publicly held subsidiary. In investor share cooperatives investors receive ownership rights in addition to ownership rights held by member patrons. In both models the shares are assigned to different ownership groups.

The choice of the better organizational model is strictly linked to the performance, whose measurement is the ongoing process toward achieving pre-determined objectives (Bourne et al., 2003). In agricultural marketing cooperative, which is a mix of vertical integration and horizontal coordination, the difficulties start with the concept of the firm and continue with the definition and alignment of economic objectives. Generally, the dominant viewpoint in the economic literature is to consider agricultural cooperative as user-owned and user controlled organization that aims to benefit its member-patrons, coexisting internally as different groups of stakeholders, namely members and managers, each one with its own economics objectives, not necessary aligned.



Rafat et al. (2009) present an ample review of the theoretical and empirical economic literature on the performance of agricultural marketing cooperatives. They conclude that empirical studies have failed¹ to address cooperative objectives as represented by the theoretical literature. Based on an overview of the studies on economic behavior and on a list of empirical works on the performance of agricultural marketing cooperatives presented by those authors, it is clear that the research on the topic is mainly focused on: (a) implementing the behavior model of cooperative as a profit-maximizing firm; (b) the use of financial ratios or frontier approach to analyze performance; (c) cooperatives located on USA; (d) the dairy sector that has been intensively studied.

To analyze the influence of different stakeholders' behavior on performance, the coalition theory (Staatz, 1983) assumes that agricultural cooperative consists of many groups, with each one attempting to maximize their individual utility, often at expenses of others groups. The game of allocating costs and benefits among groups can be cooperative or non-cooperative. In a traditional cooperative (Rebelo et al., 2008) it is expected that members try to maximize the price they receive for the products that they deliver, being the performance measured by the financial ratio between patronage refund and gross revenue.

According to the general formulation of the principal-agent model (Fama and Jensen, 1983a and 1983b), if members are not able to monitor and enforce managers behavior, it is expected that these ones have incentive to maximize their utility instead of the members'. It is especially true in the case of traditional cooperatives, where managers are compensated on fixed wages, not on profitability, and it is expected that managers pursue risk minimizing strategies rather than return to members. In determining the cooperative capital structure (another indicator of performance) managers are expected to show a preference for equity, because high leverage increases the bankruptcy risk of the cooperative. Hence the hypothesis is that when managers with power effectively influence the capital structure, the cooperative is less leveraged.

The empirical studies that dominate the literature, concerning the financial performance of agricultural cooperatives uses financial ratios (Rafat et al., 2009). Otherwise, the interpretation and the expectation of the financial ratio depend on the authors' objective and on the definition of each value (Gentzolanis, 1997). For instance, in traditional agricultural cooperatives, it is expected they are less leveraged when managed by professional managers and/or full time directors, and the patronage refund decrease when managed by professional and/or full time directors.

¹ *The lack of empirical application can be explained as a result of difficulty in obtaining relevant data (if they exist at all), lack of interest on the part of applied economists, or lack of theoretical approaches that are well developed for empirical application (Rafat et al., 2009: 457).*



3. The Douro Wine Cooperatives²

The Douro Demarcated Region is situated in the northeast part of Portugal, on the steep hills³ of the Douro Valley and its tributaries. In 1756, this region was demarcated to protect the quality of Douro wines against the competition of other Portuguese wines. This was a pioneering decision at a world level, both in concept and regulating principles of controlled denominations of origin. Despite the geographical, institutional and administrative changes, the DDR constitutes a region with a collective memory, with a strong tradition of grape farming and socio-economic specific characteristics, classified as a world heritage site by UNESCO in 2001.

The DDR comprises an area of 250,000 hectares; vineyards occupy about 18% of the land. There are 257,100 inhabitants, with a population density of 46.62 inhabitants per km². In the last 40 years, the region lost 40% of its population; the remainder is aging.

In the last five decades, important changes occurred in the supply chain of both Port and Douro wine. The industry is becoming horizontally/vertically integrated. The formation of wine cooperatives produced significant changes in the supply chain, becoming intermediaries of viticulturists and traders. Until the end of the 80s, and coinciding with the entrance of Portugal in the EU, these cooperatives were mainly focused in the vinification and storage activities, selling almost all of their wine production in bulk to warehouses and traders. Market liberalization, followed entrance of Portugal into the EU, in 1986. Wine cooperatives began to market wine in bottles, especially Douro table wine.

Port and Douro wines followed a different evolution, especially during the last thirty years. Firm concentration accelerated in the Port sector (Rebelo and Correia, 2008) along with upstream integration of commercial firms who planted new vineyards and built new vinification centres. These changes led many viticulturists, particularly the small and medium size ones, to concentrate on grape production in the highly regulated, quota environment of Port production. In the case of the Douro table wines, entrance into the EU began a phase of downstream vertical integration. Larger viticulturists became producer-bottlers, yielding so-called wine of the *quinta* (farm). Some of the wines quickly achieved domestic and international reputation. Niche marketing provided important opportunities for wines that were traditionally less valued in DDR. However, most Douro table wines are grown by very small farmers, who are organized through cooperatives following the traditional cooperative principles.

² Data used in this paper was collected both from the annual reports/accounting of cooperatives and from three questionnaires to cooperative directors elaborated and conducted by the co-author Rebelo in 1990, 1998 and 2007. These questionnaires included sets of quantitative (e.g. socio-economic characterization of members) and qualitative (e.g., what strategy do de DDR-WCs adopt) open and closed questions. The publication *Quartenaire Portugal/UCP (2007)*, in which Rebelo participated, includes in annex a version of this questionnaire.

³ Most of the vineyards are situated in steep hills. By decreasing order of slope, the 45,371 ha of vineyards are distributed in the following way: 6,792 ha (>45%), 13,239 ha (30%-45%), 14,349 ha (15%-30%), 9,786 ha (5%-15%) e 1,205 ha (<5%).

The distribution of land is shown in Table 1. The 45,160 ha of DDR vineyards are distributed among the 39,506 viticulturists, for an average farm size of just 1.14 ha/farm. Note that roughly 35% of the DDR vineyards are owned by just 810 viticulturists, each with more than 8 ha of vines. The average farm size for this group is around 19.7 ha. Most of these farms belong to producers-bottlers and traders of Port wine. In contrast, small and medium size viticulturists are mostly members of DDR-WCs.

TABLE 1
Number of Farmers and Farm Size in DDR

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

Source: Quaternaire Portugal / UCP (2007).

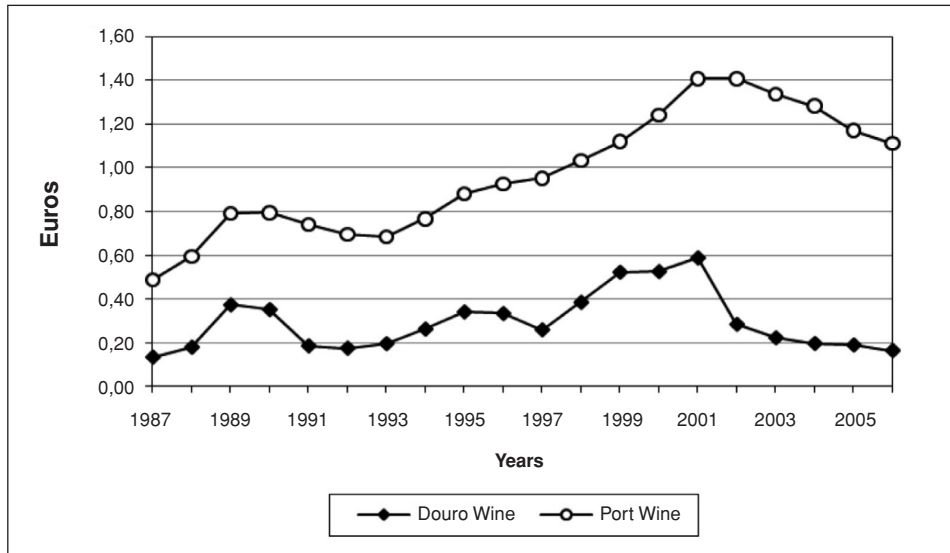
In 2007, 19,884 viticulturists were members of the 20 DDR-WCs (both Port and Douro table wine). Average vineyard size was less than one hectare. Moreover, most of them are part-time viticulturists whose objective is to complement other sources of income. They tend to view the cooperative as an organisation to which they can sell their grapes and not as a firm in which they are the owners. This behaviour generates high transactions costs, problems in equity acquisition and redemption, and difficulties in developing clear entrepreneurial strategies that are responsive to changing markets.

The number of DDR-WCs decreased from 22 to 20 during the last 20 years. These cooperatives vinify 56% of Douro wine, 37% of Port wine and, consequently, 46% of both types of wines. Many of the cooperatives produce both Port and table wines.

A reduction in the Port wine production-quota has contributed the relatively poor economic performance of the cooperatives over the past few years. Graph 1 shows that Port wine grapes traditionally enjoy a three-fold premium above Douro table wine grapes, so that the reduction in quota is particularly painful to the DDR-WCs members. Additional economic pressure is coming from a sharp drop in all wine grape prices that is largely attributable to the worldwide wine surplus. Both factors have contributed to members leaving DDR-WCs in recent years, some of them with the typical free-rider behaviour.



GRAPH 1
Average Prices per Kilogram Paid for Grapes from Douro and Port Wines,
1987-2006



Source: Own elaboration.

The multiproduct structure of DDR-WCs is reflected not only in their composition but also in the change in asset structure experienced over the past few years (Graph 2). Inventory grew at the expense of other assets, for more than a decade. In the last data year, 2006, the value of the Total Assets, around 218 million euro, was allocated 30.6% to Fixed Assets, 46.4% to Inventory and 23% to Other Assets. The absolute value of inventories no doubt reflects seasonality of the data³ but the change in relative share is not seasonally influenced, which may reflect difficulties in selling Douro wines in a more competitive market. Total equity peaked at 30.1% in 1998, slowly decreasing thereafter.

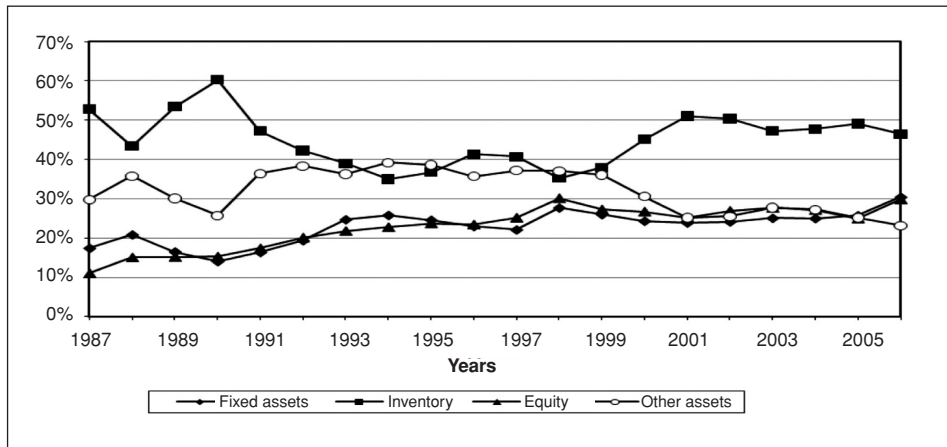
The sales and gross revenue of DDR-WCs peaked in 2001 (100.3 and 119.2 million euro, respectively), decreasing in the following years, reaching in 2006 a value of 74.5 and 76.8 million euro, respectively. Roughly half of the sales and gross revenue belonged to the three largest Port-dominated WCs.

Not surprisingly, the value of Subsidiary and Raw Materials has been decreasing since 2002 (Graph 3). In 2006, they dropped to 57 million euro or 74.3% of Gross

² The large proportion of Inventory in Total Assets may be explained by the fact that accounting values are computed in December 31, before most of Port wine harvested is sold, reflecting a certain seasonality. From the analysis of the Debt, the corresponding seasonality is reflected in the value of the debts to members and bank loans.



GRAPH 2
Relative trend of Total Assets Structure and Equity, 1987-2006

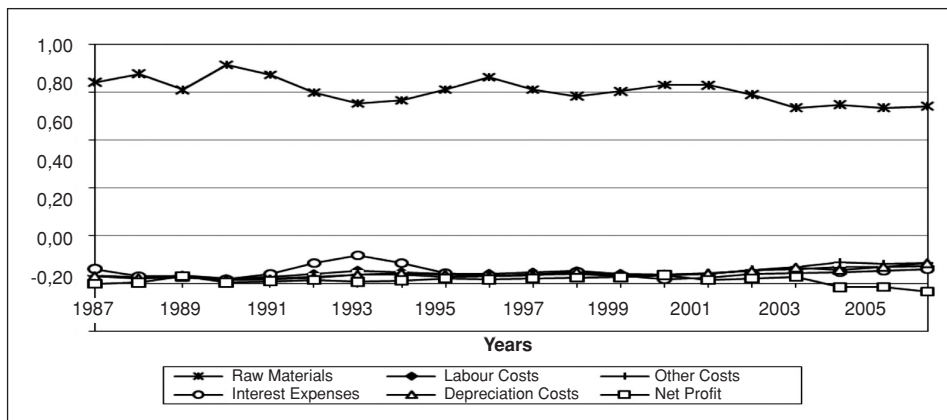


Source: Own elaboration.

Revenue. The high proportion of Raw Materials to Gross Revenue indicates that, overall, the DDR-WCs are generating little value added production. This inference is consistent with the fact that most of the wines, especially the greater value Port wines, are sold in bulk.

Labour Costs have been increasing in recent years, peaking in 2006 at 5.6 million euro (7.3% of Gross Revenue). A similar relation exists with Other Costs that reached 6.5 million euro in 2006 (8.5% of Gross Revenue).

GRAPH 3
Relative Weight of Costs and Net Profit in the Gross Revenue, 1987-2006



Source: Own elaboration.



Each of the above financial and economic indicators point to the same conclusion: economic viability of the industry is at risk. In the context of a global economy, a change in cooperative property rights and governance structure must be forthcoming or bankruptcy of DDR-WCs seems imminent and consistent with global industry trends.

The 2007 questionnaire to cooperative directors revealed several socio-economic factors that portend additional difficulties for DDR-WCs governance and survival.

Member education. Most (69.2%) attended only primary school; 11.6% do not know how to read and write. Only 12.9% completed the obligatory level of schooling; only 4.7% completed the high-school; and only 1.7% completed a university or similar degree. This education level suggests a member profile that tends to be risk adverse.

Member age. The largest percentage (48.3%) of the members is 40 to 60 years and 38.9% are more than 60 years old. Only 13% of cooperative members are under 40 years old. This age profile orients members toward a very short run perspective.

Member involvement in cooperative decision making. 90% of cooperative directors agreed (30% strongly agreed) that members behave in their narrow self-interest, performing like private sellers of grapes when they sell their grapes to the cooperative. Similarly, 90% of the directors believed that members favour short run returns over long run growth.

Full-time or part-time management. Most of the DDR-WCs directors (64%) only work part time. In addition to the directors, 50% of DDR-WCs have a full time manager/administrator. Both full time directors' and managers' returns depend on a fixed wage unrelated to their performance. Accordingly, one would expect the hired managers and full time directors to pursue risk minimising strategies of reinforcing equity rather than return to members.

In summary, the socio-economic characteristics of DDR-WCs members 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. Although, based on panel data model, the econometric analysis provided in the next section may clarify the influence of governance and size on two alternative indicators of performance.

4. Econometric Analysis of DDR-WCs Performance

Each of the socio-economic factors discussed above helps to define an econometric specification of DDR-WCs behaviour and performance within alternative objectives of a cooperative. If the cooperative objective is to maximize the short run financial benefits of the members (Sexton and Iskow, 1988), the patronage refund rate (PP),

measured as patronage refund (PR) divided by gross revenue (R), is an appropriate performance indicator. On the other hand, the equity/total asset ratio (EA) may be a more appropriate performance indicator in the presence of professional management. A professional manager this will change to manager should prefer a capital structure that favors equity accumulation over debt because highly leveraged cooperatives risk bankruptcy (Murray, 1983).

Among other variables, both of these performance indicators can *a priori* be influenced by: (a) the type of governance, i.e., professional management, expressed by the existence of full time directors (Dir) and/or managers (Man); and (b) size quantified by proxies like production in barrels (Prod)⁵ and number of members (NM). Thus, the two alternative performance models, based on identical explanatory variables and error term (ϵ) are:

$$PP \text{ or } EA = f(\text{Dir}, \text{Man}, \text{Prod}, \text{NM}) + \epsilon \quad (1)$$

Table 2 includes the definition of the variables used in the regression models, highlighting the expected sign. It is expected that cooperatives with a professionalized management tend to transfer less revenue to the members (negative sign in PP) and are less leveraged (positive sign in EA). The sign on Prod is expected to be positive possible due to scale economies. The effect of NM is not clear, a priori. The effect of membership size depends on demographic, economic and social structure and behaviour. For instance, either a small or large cooperative can favour short run decisions of high patronage, rather than pursuing the longer-run goal of financial sustainability for the cooperative, by diverting returns to equity.

Combining the number of years in operation (20 years for most of the 22 cooper-

TABLE 2
Variable Definitions and Expected Signal

Variable	Description	Expected sign on PP	Expected sign on EA
PP	Share of gross revenue transferred to patrons		
EA	Equity / Total asset ratio		
Dir	Full time directors, Dir=1, if yes; otherwise 0	Negative	Positive
Man	Full time managers, Man=1, if yes; otherwise 0	Negative	Positive
Prod	Total production (barrels)	Positive	Positive
NM	Number of members	Positive, negative or null	Positive, negative or null

⁵ One barrel = 550 liters.

atives), is obtained an unbalanced panel corresponding to 430 observations. Table 3 presents the descriptive statistics that correspond to total observations. The values clearly show heterogeneous performance and different structures of governance and size. On average, patronage accounts for 82% of the annual gross revenue generated by DDR-WCs, with a high concentration (coefficient of variation 14.6%) around the mean. The capital structure observed is 25%, however the coefficient of variation (56%) indicates a relatively high dispersion and amplitude. Throughout the observed period, 13 cooperatives have a professionalized management (full time director and or manager): 8 have only full time directors; 11 have only a manager; and 6 have both.

The total production (an average of 4,953 barrels and coefficient variation of 94.4%) and the number of members (mean of 615 and coefficient of variation of 62.3%) indicates heterogeneous sizes.

TABLE 3
Descriptive Statistics of the Variables

Variable	Mean	Standard Deviation	Minimum	Maximum
PP = Share of gross revenue transferred to patrons	0.82	0.12	0.03	1.39
EA = Equity/Total asset ratio	0.25	0.14	-0.69	0.74
Dir = Full time director	0.35	0.48	0.00	1.00
Man = Full time managers	0.37	0.49	0.00	1.00
Prod = Total production (barrels)	4,953	4,675	232	33,495
NM = Number of members	615	383	150	2,072

Considering the benefits from using panel data (Baltagi, 2009; Greene, 2003), both linear regression models are estimated applying this approach. The econometric procedure started with the estimation of the random effects and fixed effects models. Three statistical tests were conducted: (1) a Hausman test was conducted to test the hypothesis that the random effects are uncorrelated with the other regressors, (2) a Wald test was conducted to determine the existence of panel heteroskedasticity and (3) a Wooldridge test for first order serial correlation in panel data models was conducted.

From the application of the Hausman test, the hypothesis that the individual effects are uncorrelated with the other regressors in the model is rejected, i.e., the random effects models are not the best choice, because the estimators become biased and inconsistent. Additionally, the Wooldridge test allows the acceptance of the null hypothesis of inexistence of first order serial correlation⁶ and the Wald test indicates that the inexistence of groupwise heteroskedasticity cannot be rejected.

⁶ Ignoring serial correlation (and/or heteroskedasticity) when it is present results in consistent but inefficient estimates of the regression coefficients and biased standard errors.

Given the results of these tests, Table 4 shows the econometric outputs of a robust estimation of the fixed effects models⁷, being the standard errors corrected by the White groupwise heteroskedasticity consistent covariance.

TABLE 4
Econometric Results (Dependent Variables: PP and EA)

	Model 1: PP Parameter (Statistic t)	Model 2: EA Parameter (Statistic t)
Dir	-0.032 (-1.21)	0.063 (2.99)*
Man	-0.053 (-2.89)*	0.125 (5.98)*
Prod	0.000 (3.90)*	0.000 (0.98)
NM	0.000 (1.41)	-0.000 (-0.5)
Number of observations	430	430
Chi-square (degree of freedom -df)	144.86 (25)**	217.41 (25)**
R ² (explanatory – X – only)	0.0350	0.0615
R ² (group effects only)	0.2444	0.3484
R ² (X and group effects) 430	0.2860	0.3969

* Parameter significant at 1%; ** regression globally significant at 1%

Both models are globally significant (Chi-square significant at 1%) and both show a prominent influence of the group effects on the final fitted R² and thus, reinforce the presences of cooperative heterogeneity. Individually, in the model 1- PP, the 22 fixed effects estimated are all significant at the 1% level, versus a total of 20 in the model 2 (18 at 1% and 2 at 10% level), with slightly less cooperative heterogeneity in the EA model than in the model PP.

The sign and individual significance of the parameters indicate that during the last twenty years:

Patronage Refund of DDR-WCs varies a lot among cooperatives. Moreover, it is insensitive to the existence of full time directors and the number of members. On the other hand, and consistent with expectations, the patronage refund decreases with the existence of managers, and increases with the level (size) of production. These results confirm the existence of a heterogeneous behaviour among cooperatives. Although hampered by the existence professional managers, the members of larger units prefer patronage refunds, possibly due to: (a)

⁷ Within the fixed effects models the computation of Likelihood Ratio tests suggest the use of one way fixed group effects for cooperatives.



ill-defined property rights in the cooperative; (b) one-person, one-vote decision making or (c) stronger economic dependence on the viticulture. The patronage refund model leaves unanswered the question as to how long WCs can continue the Mediterranean-style cooperative behavior before succumbing to increased competition from the globalized wine industry.

Equity/Total Asset Ratio is insensitive to size, whether measured by total production or number of members. Both the existence of full time directors and managers is able to influence positively cooperative capital structure, as indicated by the significance and the positive coefficient of the respective variables. The DDR-WCs with professional management followed a strategy of equity reinforcement to finance their assets, appearing to be more competitive in the long-run and able to assume long run risk investments.

Summing up, the empirical results support the theoretical framework. The governance structure has opposite effects on the indicators of performance. When full-time directors and managers have bargaining power, cooperatives transfer less revenue to members and try to decrease leverage.

5. Final Remarks

Like many agricultural cooperatives, the DDR-WCs increasingly face survival challenges related to financial issues that are linked to acquiring and redeeming member equity capital, which can be a constraint on growth and sustainability. Increased global competition accentuates these challenges.

This paper attempted to garner insight into the question of cooperative sustainability by examining the effects of professional managers and full time directors. The analysis is based on the assumption that DDR-WCs follow the traditional cooperative model, only some of which have full time directors and/or managers.

Two alternative performance indicators, patronage refund and capital structure, were modelled. The results differ according to performance indicator. If the DDR-WCs attempt to apply a short-run strategy of maximizing the revenues transferred to patrons/members, the cooperative should not be managed by professional managers and will increase the size, benefiting of possible scale economies. If, however, the objective is to follow a long run strategy of improving the leverage, the cooperative should be run by a professional management. These results reinforce the belief that cooperatives structured differently have different and conflicting stakeholder interests. Cooperatives with non-professional management tend to maximize annual revenues from the grape production; cooperatives with professional directors/managers seek to reinforce equity, with a risk minimizing strategy.

The general results of our analysis suggest the cooperative organisation adopted by DDR-WCs may not be sustainable in the more competitive global wine markets, if they follow a practice of maximum patronage refund, which reduces their capacity to improve leverage and to acquire profitable, but risky, long -run investments with equity. Structural reorganization of the centuries old, atomistic Douro wine industry



may be essential if adequate investment in new products and international markets are to be fully incorporated in the decision making process⁸.

References

- Baltagi, B.H. (2009). *Econometric Analysis of Panel Data*. Fourth edition, John Wiley & Sons Ltd, Chichester, UK.
- Bourne, M., A. Neely, J. Mills and K. Platts (2003). "Implementing Performance measurement Systems: A Literature Review". *International Journal Business Performance Management*, 5(1): 1-24.
- Chaddad, F. and M. Cook (2004). "Understanding New Cooperative Models: An Ownership-Control Rights Typology". *Review of Agricultural Economics*, 26(3): 348-360.
- Cook, M. and C. Iliopoulos (2000). "Ill-defined Property Rights in Collective Action: The Case of Agricultural Cooperatives". In C. Menard (Ed.): *Institutions, Contracts and Organizations: Perspectives from New Institutional Economics*: 335-348. Edwards Elgar, London.
- Fama, E. and M.C. Jensen (1983a). "Separation of Ownership and Control". *Journal of Law and Economics*, 26(2): 301-327.
- Fama, E. and M.C. Jensen (1983b). "Agency Problems and Residual Claims". *Journal of Law and Economics*, 26(2): 327-349.
- Genzoglani, A. (1997). "Economic and Financial Performance of Cooperative and Investor-Owned Firms: An Empirical Study". In J. Nilson and G. Van Dijk (Eds.): *Strategies and Structures in the Agro-Food Industries*: 171-183. Assen Van Gorcum.
- Greene, W. (2003). *Econometric Analysis*. Prentice-Hall, New Jersey, USA.
- Kyriakopoulos, K. (1997). *The Market Orientation of Cooperative Organizations*. University of Nyenrode, Netherlands.
- Murray, G. (1983). "Management Strategies for corporate control in British agricultural cooperatives". *Agricultural Administration*, 14: 51-63 (Part I)*; 81-91 (Part II).
- OIV (2008). *State of Viticulture World Report*. International Organization of Vine and Wine, www.oiv.int.
- Quatenaire Portugal/UCP (2007). *Plano Estratégico para os Vinhos com Denominação de Origem Controlada Douro, Denominação de Origem Porto e Indicação Geográfica Terras Durienses da Região Demarcada do Douro*. IVDP, Porto, Portugal.
- Rafat, S., A. Lansink, G. Giesen and G. van Dijk (2009). "Performance Measurement of the Agricultural Marketing Cooperatives: The Gap between Theory and Practice". *Review of Agricultural Economics*, 31(3): 446-469.
- Rebelo, J. and L. Correia (2008). "Port Wine Dynamics: Production, Trade and

⁸ This conclusion was reiterated by the directors of the DDR-WCs when surveyed in 2007.



- Market Structure”. *Regional and Sectoral Economic Studies*, 8(1): 99-114.
- Rebelo, J., J. Caldas and S.C. Matulich (2008). “Manager Power, Member Behaviour and Capital Structure: Portuguese Douro Wine Cooperatives”. *Agricultural Economics Review*, 9(2): 5-13.
- Remaud, H. and J. Couderc (2006). “Wine Business Practices: A New Versus Old Wine Perspective”. *Agribusiness*, 22(3): 405-416.
- Sexton, R.J. and J. Iskow (1988). *Factor Critical to Success or Failure of Emerging Agricultural Cooperatives*. Department of Agricultural and Resource Economics, University of California, Davis, Report No 88-3.
- Statz, J. (1983). “The Cooperative as a Coalition: A Game Theoretic Approach”. *American Journal of Agricultural Economics*, 65(5): 1085-1089.

