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# **SURVIVAL IN THE FRENCH WINE INDUSTRY: COOPERATIVES VERSUS CORPORATIONS**

Justine Valette<sup>1</sup>, Paul Amadieu<sup>1</sup> and Patrick Sentis<sup>2</sup>

**Abstract.** This paper examines the survival rates of cooperatives. Traditional theories suggest that cooperatives are inefficient and consequently are prone to failure, but recent literature suggest they could be more resilient. Can cooperatives cope better? We found that French wine cooperatives survive longer than corporations. This result is robust to semi-parametric and parametric models, even when we control for mergers and acquisitions exits. The higher survival rate of wine cooperatives seems to be associated with an ability to shift the fluctuations of their environment to their members.

**Key words:** French wine industry – cooperatives – survival analysis

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## **1. Introduction**

This paper examines the survival rates of wine cooperatives, even in a turbulent environment. The French wine industry is worthy of investigation because it has been exposed to various shifts and mutations all along the 20<sup>th</sup> century. The decline in global wine consumption, coupled with the arrival of new producers, forced the French winegrowers to reduce their production. At this step, a qualitative shift was undertaken, strengthened by the evolution of consumers' behaviour – French consumers drink less, but better – and the consequences of the Evin Law which lead to a decrease in consumption at the domestic level. This fall in domestic consumption was unfortunately combined with a decline in exports, because of the competition from the New World wines. Companies were thus forced to adapt their strategies and to achieve a better fit to their environments (Stoeberl, Parker, and Joo 1998). Principal recommendations remain on market orientation and

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export effort. Two main policies emerged: differentiation through vertical integration (Cadot 2015) or massive production and cost reduction strategy. Whatever the choice made, the entire industry evolved and undergo irreversible transformations in its competitive dynamic (Agarwal, Barniv, and Leach 2002). We suppose - following the well-known adage - that is not the fittest, but the most adaptable who will survive. Thus, while most studies<sup>3</sup> on the topic try to highlight relevant strategy to create value and perform in these changing conditions, we re-examine the adaptability of French wineries to their environment through an original approach: survival analysis.

Survival analysis is generally defined as a set of methods for analysing data where the outcome variable is the time until the occurrence of an event of interest, e.g. the failure of a business. Models examine the hazard rate, which is the conditional probability that an event occurs at a particular time interval. In other terms, survival analysis tries to determine if some firms have more chance to continue in business than others, and to understand why. Thus, a lot of determinants (or key factors of survival) are found in the literature. Among them, two are particularly important: the ownership of the enterprise and its governance (Burdín 2014; Iwasaki 2014). Applied to the wine sector, this reminds the traditional distinction about cooperatives and corporations. As cooperatives are owned by their members, some crucial differences exist between them and corporations: (i) voting power is distributed through the rule of “one member-one vote”, (ii) benefits are proportional to patronage, not investment, and (iii) while corporations seek only maximum profitability, cooperatives assume the dual objective of providing member benefit and seeking firm profitability. These aspects reveal that cooperatives have a singular allocation of value. So far, in the French wine industry, most studies focus on commercial strategies and their impact on performance and value creation. We propose a renewed approach, dealing with value allocation and survival. In this context, we ask if cooperatives are more likely to survive than corporations. As the French wine sector experienced a sector-specific crisis that was at its paroxysm in 2004 and 2005 (Declerck and Viviani 2012) and was necessarily affected by the global crisis in 2009, the distinction between cooperatives and corporations is more timely than ever. Thus, the objective of

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<sup>3</sup> See, among others, Kyriakopoulos, Meulenbergh, and Nilsson (2004), Maurel (2009), Duquesnois, Gurău, and Le Roy (2010), Amadiou and Viviani (2011), Alonso and Liu (2012), Declerck and Viviani (2012) and Benos et al. (2015).

this paper is to assess the capacity of cooperatives to survive over time, and to adapt to their environment.

Our results indicate that the survival function of cooperatives is significantly different from the one of corporations: the survival probability at each point of time is greater for cooperatives than corporations. In other words, French wine cooperatives are more likely to survive than corporations. Moreover, we found some evidence that cooperatives are able to absorb a part of the impact of the wine crisis at the expense of their members, potentially explaining their better survival rate.

The remainder of the paper is organized as follows. The section 2 focuses on the theoretical foundations and hypothesis concerning the survival of cooperatives versus corporations. Section 3 deals with procedures: data and methods are presented. The results are given in section 4. Section 5 offers some discussion and possible explanations of the survival of cooperatives before concluding remarks.

## **2. Theoretical background and hypothesis**

Cooperatives have long been considered from the perspective that they suffer from property rights constraints and consequently have been the subject of many criticisms by economists (Nilsson 2001). Generally, cooperative studies focus on the concepts of ownership and governance and employ property rights theory (PRT) and agency theory (AT) as conceptual frameworks. In this way, traditional cooperative models can be defined as having the following property rights (Chaddad and Iliopoulos, 2013): ownership is restricted to members and residual claims are non-transferable and non-appreciable but redeemable at fair value. These ill-defined property rights (Cook and Iliopoulos, 2000) lead to incentive problems, such as free-rider, horizon and portfolio problems (Cook, 1995). Moreover, cooperatives also support governance costs. First, as cooperatives have a large number of members and apply the rule of “one member, one vote”, people can be discouraged to engage in costly monitoring because they will not bear the full cost of their investment. Second, cooperatives cannot rely on external mechanisms to place pressure on management (Staatz 1987), such as hostile takeovers or market valuation. Third, cooperatives could endure the collective-decision problem. Specifically, member heterogeneity can lead to divergent interests (Hansmann 1996) and any conflict in a cooperative, in contrast to a classic

corporation, must be addressed before a decision is taken (Hind 1999). Thus, reconciling the opinions of all members is time consuming, and some opportunities can be missed.

The arguments concerning the inefficiency of cooperatives made thus far have justified the limited interest that they have received. However, evidence shows that cooperatives are present to a much greater extent in market economies than has previously been suggested. While the PRT and the AT often conclude that cooperatives are inefficient, recent literature demonstrates that cooperatives are able to adapt themselves to their environment, and most of all, are able to reduce the probability of failure.

Cooperatives faced ownership and governance issues. Ownership issues were first recognized in relation to financial constraints: the authors highlight the difficulties related to investment and supporting growth (Chaddad et al., 2005). Cooperatives are forced to rely on self-financing, which affects their ability to invest and attitude towards investment. However, these difficulties are not a fatality, and cooperatives evolved towards new models. Chaddad and Cook (2004) distinguish five new models of cooperatives with a new allocation of residual claims and a relaxed ownership rights. These different models allow redeemable ownership rights to encourage investment from members and the procurement of outside equity, either in a separate legal entity or inside the cooperative. The fundraising problem is thus mitigated by innovation on the organizational structure. In the same time, cooperatives also move towards new governance models. Traditionally, the board of directors (BoD) manages the activity of a cooperative to ensure that member interests will be the primary objective. However, as the cooperative grows in scale and scope and as the environment becomes increasingly complex and competitive, professionals are hired and given responsibility to manage the cooperative (Bijman, Hendrikse, and van Oijen 2013). Thus, over time, the roles are redistributed. Chaddad and Iliopoulos (2013) propose a description of the evolution of governance models worldwide, focusing on the allocation of decision-making functions and formal and real authority. They present a continuum of governance structures, from no separation between ownership and control (gathered in members' hands) to conversion, i.e., the loss of members' control. While they grow, cooperatives have a tendency to move from left to right on the continuum and to give considerable autonomy and initiatives to professional managers or supervisors. Once again, these evolutions reflect the ability of cooperatives to adapt to their environment, by internalizing constraints and proposing innovative organizational changes.



In order to be sure that these new combinations and models are sustainable in the long run, cooperatives should however keep in mind the source of their competitive advantage: their members. Fulton and Adamowicz (1993) argue that “the survival of any cooperative ultimately depends upon the commitment of its members to patronize the organization”. A cooperative is a firm that is collectively owned by its members, who are not only owners but also users and controllers (Barton 1989). Therefore, the main goal of a cooperative is to satisfy its members and insure that they will keep their membership. If members are not satisfied, they will not invest in the cooperative, or worse, they will exit. Member’s satisfaction and intention to maintain membership is obviously tied to economic considerations (Hernandez-Espallardo et al., (2013) but can also be affected by various organizational mechanisms other than economic ones, such as those related to the social community, democratic voice and the degree of control over the transaction (Cechin et al. 2013b). Moreover, reconciling growth and preservation of cooperative values could be hard: as cooperatives grow, they can find it difficult to maintain a special relationship with their members (Davies and Burt 2007), which can weaken their democratic principle. Finally, the literature reveals that social capital is the key to a successful growth strategy and survival. If cooperatives are able to combine innovations in their organizational structure with member commitment, thus they will be able to survive in a troubled environment.

In sum, all the works presented thus far highlight the high potential of cooperatives and their ability to adapt to their environment. However, despite this new view of cooperatives and the persistent controversy about the use of classical financial criteria to assess their performance, there are only few works on their survival. The main studies focus on worker-managed firms (Pérotin 2006; Burdín 2014). The last survival analyses involving producer cooperatives was run by Monteiro and Stewart (2015) in cooperatives of Portugal, and Núñez-Mickel and Moyano-Fuentes (2004) on oil mills in Spain. These four studies argue that cooperatives have better survival rate than corporations. The two first exclusively focus on worker-managed firms, and we cannot affirm that producer-managed firms and worker-managed work the same way. The study of Núñez-Nickel and Moyano-Fuentes (2004) relies on old data (1944-1998). Monteiro and Stewart (2015) presented the first evidence on a large dataset, in different sectors. However, the authors was unable to directly distinguish between cooperatives that are owned by consumers, workers or producers and should have make an approximation. Consequently, we can affirm that not only there are few works on survival of cooperatives, but none of them deal with survival of cooperative in the wine industry.

Thus, we want to test if French wine cooperatives have better chance of surviving in a highly competitive market.

Some recent studies confirm this theoretical intuition. In the particular context of agricultural cooperatives, where raw products are the unique fundamental resources, Núñez-Nickel and Moyano-Fuentes (2004) argue that the unusual ownership and governance structure of cooperatives gives them advantages over their corporations rivals. The authors explain that the cooperative form acts as an environmental buffer. Indeed, by internalizing suppliers as members, they strengthen their linkages with suppliers and ensure access to fundamental resources. These mechanisms reduce the probability of failure and, therefore, raise the survival rate of cooperatives relative to corporations. Moreover, many institutional reports argue that cooperatives are more resilient in time of crisis (Birchall 2013; Birchall and Ketilson 2009; Roelants et al. 2012). The major arguments advanced are as follows: cooperatives can use abundant capital to absorb shocks during the crisis; democratic control ensures the involvement of members and leads to a better capacity to react quickly; each member's capital investment creates a feeling of responsibility and leads to better commitment, and the involvement of members creates opportunities to pursue aims beyond business success and contributes to a durable business. In addition, Cechin et al. (2013a) found that cooperatives reduce market risk by maintaining prices paid to producers even in time of crisis. Lampel et al. (2014) and Burdin (2014) find that worker cooperatives performed better during the recession and have in general a better survival rate than their counterparts corporations.

The first hypothesis that will be tested is:

**cooperatives have a better survival rate than corporations.**

One of the most important key factors for achieving a competitive position currently comes from the ability to innovate and respond to market needs. To be successful, cooperatives should make some fundamental choices regarding their marketing approach. Specifically, one strategic attribute should be considered: market orientation. The importance and benefits of this strategic attribute for remaining competitive in a globalized economy are largely accepted, and they have been found to have positive effects on cooperatives' performance. However, market orientation is not enough, competitiveness today requires also to being able to operate at a global scale (Flecha and Ngai 2014).

These last decades, the long term success and survival of a firm in the wine industry have been described in the literature as depending mainly on a firm's ability to become market oriented, and to engage export and intangibles efforts. In a study on French wine industry, Amadiou and Viviani (2011) found that a high level of intangible expenses has a positive impact on performance by increasing the expected profit and reducing variance risk while a lower level of intangible expenses reduces risk and mean of profit of corporations. In a recent study, Benos et al. (2015) confirm that strategic attributes of cooperatives (i.e. market and brand orientation) increase their performance. Export is also frequently seen as a solution to increase performance of wineries (Maurel 2009) and even as a necessity to survive (Duval 2015).

However, cooperatives are often less engaged in intangible investments and export effort than corporations. Beverland (2007) suggests that traditional cooperatives may be able to develop innovative marketing programs but struggle to support them over the long-term due to problems in ownership structures. Hence, when he studied new models of cooperatives, he founds that they have more sustained long-term success, as members were able to capture the equity of intangible assets such as brand value, thus ensuring they undertook actions (such as channel support) consistent with building a sustainable long term positioning. Hanf and Schweickert (2014) highlight the fact that cooperatives were created by winegrowers who want to produce and market wine together. It results that the main objective of a cooperative is to support its members' businesses. Therefore, as the members are grape producers, cooperatives have a clear production orientation. Nevertheless, due to the recent changes in the wine market, client orientation is the key to success. Thus, the authors conclude that cooperatives have a lot of work to do to convey the benefits of intangible investments to their members. Amadiou et al. (2013) examine the issue of exporting on the relationship between intangibles and company performance in the French wine industry and distinguish cooperatives from corporations. However, they found no significant results for cooperatives, due to their low level of export intensity. The same situation appears with Maurel (2009) when studying the determinants of export performance: the results are always less significant for cooperatives. In sum, cooperatives are often less engaged in intangible investments and export effort than corporations (i.e. commercial strategies), because of their member-orientation. As the main determinants of survival in the wine industry are intangible and export efforts, this suggests that cooperatives possess specific capacities for survival.

Simon-Elorz et al. (2015) analyze changes on wineries' strategies. They postulate that transitions, notably from bulk production to market segmentation for example, necessarily affect performance, and to a much greater extent, survival. Their results are not very conclusive, but they highlight the importance of supplier negotiating power in the wine industry. This remark is particularly pertinent in the case of cooperatives, because the main suppliers are the members. We can imagine that cooperatives are able to absorb economic fluctuations at the expense of their members. Declerck and Viviani (2012) found that cooperatives were able to better resist at the wine crisis (mid-2000s) by increasing account payables to member, while corporations have not (could not?) increased trade account payables to vine growers. In the same vein, the objective of a cooperative is to maximize the value for members. Most of the time, members want to maximize the price of agricultural products, here grapes (Couderc and Marchini 2011). Thus, the price paid for coop members' agricultural products could be the variable to adjust result. We can hypothesize that survival of cooperative rely on their capacity to absorb fluctuations of the market by adjusting price paid to coop members.

The second hypothesis that will be tested is: **the determinants of survival in the French wine industry are different for corporations and cooperatives.**

Thus, the aim of this paper is to investigate beyond the classic determinants of survival and to highlight specific factors that allow cooperatives to cope better, assuming that the main difference between corporations and cooperatives rely on the allocation of value.

### **3. Method and Measures**

This section successively presents sample and data used in this empirical but exploratory study, measurements of different variables and the survival analysis approach<sup>4</sup>.

#### *3.1 Sample and data*

Our sample is constructed from a collaborative project financed by Crédit Agricole SA (the largest agricultural French bank) and undertaken under a partnership since 1998 with the Confederation of the French wine cooperatives (CCVF), the General association of the French wine firms (AGEVE), and the patronage of France Agrimer (representing the Ministry of agriculture). Data

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<sup>4</sup> The survival analysis methodology is based on Mills (2011) presentation.

about French companies (producers, wine merchants “négociants” and cooperatives) with a turnover above 2 million were extracted from the database ALTARÈS. A main difficulty appears with the wholesalers. Companies in this category can either buy and sell packaged wines, or blend and package bulk wine they have bought. Only this last category enters the ‘wine trade’ definition, as the ‘pure’ wholesalers obviously belong to the ‘distribution sphere’. We ask for an expert opinion in each producing region in France in order to validate the final selection. This expertise was obtained through the national or regional headquarters of the partners of this collaborative project.

Finally, a comparison of the sum of these about 1.000 selected firms export turnover have been compared to the French Customs wine exports statistics, in order to control whether this selection is exhaustive. In consequence one can consider that the sample is representative of the whole wine sector. At the end of this process, we obtain a sample of 951 enterprises. The sample contains 365 cooperatives and 586 corporations. We know the birth date of each firm, thus total time at risk of failure could be calculated. As the sample was built in 2008 and firms were followed up to 2015, we were able to identify demises over the 2009-2015 period.

Firm’s failures are determined by the exit of the database. We count 53 demises: 24 cooperatives and 29 corporations. Information on the reason for dissolution was not available in the database. Thus, for each demise, we collected information on official register (Bulletin officiel des annonces civiles et commerciales). Firms of our sample disappeared for three reasons: dissolution, liquidation<sup>5</sup> or merger.

### *3.2 Descriptive statistics and variables*

In our sample, representative of the French wine industry, the companies are relatively small: nearly 90% of our sample consist of SMEs with less than 50 employees. Cooperatives are smaller than corporations, whatever if the size is measured by number of employees, turnover or total assets. They also have a lower profitability (net income/sales) ratio than corporations. As expected, the return on assets and the return on equity of cooperatives are significantly lower than the one of corporations. This is coherent with the differences in the property rights structure: cooperatives do

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<sup>5</sup> Liquidation and dissolution are two alternative to close a business. Liquidation refers to the complete sale of the business’ assets. Dissolution refers to the closure of a business, often on voluntary terms of the business owners.

not aim to maximize profits. More surprisingly, cooperatives are less indebted (financial leverage) than corporations. Finally, they export (export intensity) significantly less than corporations. We could note that despite the high dispersion for each ratio or indicator calculated, the difference between cooperatives and corporations is always statistically significant (Wilcoxon test).

**Table 1. Sample descriptive statistics, 2008-2014**

	<u>Total sample (951)</u>		<u>Corporations (586)</u>		<u>Cooperatives (365)</u>		<i>W-test</i>
	Standard		Standard		Standard		
	Median	deviation	Median	deviation	Median	deviation	
Turnover (x1000 €)	14 414	54 452	18 721	67 930	7 881	14 587	0,000
Number of employees	8	71	11	84	4	19	0,000
Total assets (x1000 €)	22 212	97 953	29 203	122 670	11 336	24 045	0,002
Net income/sales (%)	0,98	8,92	1,58	11,18	0,26	2,46	0,000
ROA (%)	3,77	2 000	7,56	2 544	1,17	11,96	0,000
ROE (%)	3,10	185	7,40	234	0,46	30	0,000
Financial leverage	1,24	15,07	1,38	19	1,02	4,23	0,000
Export intensity (%)	5,41	27	22,39	27	0,00	19	0,000

The dependent variable is *firm failure*. As previously mentioned, failure is assimilated to exit from the database. The independent variable is *cooperative form/other organizational forms*. We analyse this effect by introducing a dummy variable which has the value of 1 when the company is integrated in the cooperative form and 0 otherwise. We then introduce control variables in our model. *Size* is measured as the natural logarithm of total assets. As *export* is clearly identified in the literature as a determinant of wine companies' success, we introduce the variable in our model. We choose one of the most frequently used export performance measure: export intensity given by the export to total sales ratio (Maurel 2009). We then introduce some financial metrics. *Profitability* is measured by the ratio net income to total sales and *financial leverage* is given by the ratio financial debt to equity. We then measure the *return on asset* and the *return on equity*. All the covariables are calculated by taking mean values over the period considered (2008-2014). Finally, we add a variable to control for a potential region effect. We cut the sample by following the traditional French wine regions: Alsace, Bordeaux, Bourgogne, Champagne, Loire, Languedoc,

Provence, Rhône and Sud-Ouest. To obtain a larger number of companies in each sub-sample, we decide to group regions “Sud-Ouest”, “Languedoc-Roussillon”, “Rhône”, and “Provence” (which share some common characteristics) in one sub-sample named “South”.

### *3.3 Method: survival analysis*

Taking into account the impact of time on failure is a methodological issue. Ordinary regression models does not allow for ‘censoring’ or time-varying covariates, justifying the use of survival analysis. Unlike other techniques, it allows a different approach, not only focusing on the outcome but also analysing the time to an event.

In survival analysis, the dependent variable is the hazard rate, which is the conditional probability that an event occurs at a particular time interval. Explanatory variables assess the impact of certain characteristics (e.g. being a cooperative or a corporation) on the dependent variable. The duration or time it takes before an event occurs (in our case, exit of a firm) is referred to as survival time. Thus, the variable of interest in the analysis of firm survival is the time elapsed between entry and exit, i.e., the spell from the foundation of the company to the end of its activities (Manjon-Antolin and Arauzo-Carod 2008). If this period of time is incomplete, we said that data is censored. As previously mentioned, a major advantage of survival analysis is to deal with censoring and particularly right-censoring, which occurs when the event is not experienced before the end of the study. If there is no information about the occurrence of the event, there is information about the survival time until the last point of observation which could be exploited. In our case, right-censored data correspond to survival firms at the end of the observation period. As our dataset comprises a lot of firms that are still active after 2014, it is important to use techniques that are able to deal with the presence of right-censored spells. For this reason, using survival analysis seems particularly adequate.

The starting point to run a survival analysis is to define  $T$  as a positive random variable, representing the survival time. Then, the probability law of  $T$  could be defined by different functions. The core concept in survival models is the **survival function** at time  $t$ , specified as:

$$S(t) = P(T > t) \quad \text{with } t \geq 0 \quad (3.1)$$

The survival function expresses the probability to survive until  $t$ . At origin time  $t = 0$ ,  $S(0) = 1$ , which means that all the subjects in the study are surviving at  $t = 0$ .

At the opposite, the **cumulative distribution function** of occurrence of the event represents, for a given  $t$ , the probability to die before  $t$ :

$$F(t) = P(X < t) = 1 - S(t) \quad (3.2)$$

The **probability density function** is given by:

$$f(t) = \frac{dF(t)}{dt} \quad (3.3)$$

It represents, for a given  $t$ , the probability to fail in a small time interval after  $t$ . This implies:

$$f(t) = \lim_{\Delta t \rightarrow 0} \frac{P(t \leq T \leq t + \Delta t)}{\Delta t} \quad (3.4)$$

which expresses the unconditional instantaneous probability that an event occurs in the time interval  $(t, t + \Delta t)$ .

The occurrence of an event (here, exit) and survival are related to each other, and are captured by the **hazard rate** (also called hazard function or instantaneous risk):

$$h(t) = \frac{f(t)}{S(t)} \quad (3.5)$$

The hazard rate indicates the rate at which subject fail by  $t$  given that he has survived until  $t$  and can be seen by:

$$h(t) = \lim_{\Delta t \rightarrow 0} \frac{P(t < T \leq t + \Delta t | T \geq t)}{\Delta t} \quad (3.6)$$

The hazard function is the most commonly used. It is important to note that the hazard function focuses on failing (i.e. experiencing the event) whereas the survivor function focuses on surviving (i.e. not experiencing the event). We should also be aware that by specifying only one of the probability density, survival or hazard functions, it is possible to ascertain the others.



#### 4. Econometric estimation and results: who survives better?

Our first objective is to test the difference between corporations and cooperatives' survival functions. We will then be interested in assessing if the ownership is a key determinant of survival, even in presence of control variables.

##### *4.1 Preliminary results: cooperatives' vs corporations' survival functions*

The nonparametric Kaplan-Meier estimator is based on the historical survival of all businesses and gives the probability of survival at a given period  $t$ . It is based on the following idea: survive after a time  $t$ , is to be alive just before  $t$  and not die at time  $t$ .

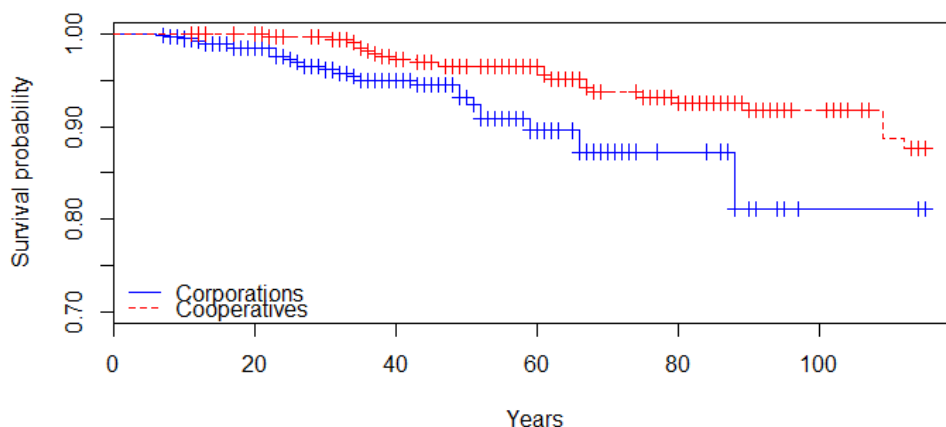
It is defined as follows:

$$\hat{S}(t) = \prod_{t_i \leq t} \frac{n_i - d_i}{n_i} \quad (3.7)$$

Where  $d_i$  is the number of exiting firms at time  $t_i$  and  $n_i$  the number of survivor firms prior to time  $t_i$ .

In the nonparametric approach, there is no assumption about the shape of the hazard function or about how covariates may affect that shape. Thus, it is often an excellent preliminary descriptive technique. As we can see in figure 1, the survival functions of cooperatives and corporations are different. The fact that the line for cooperatives lies above that of corporations indicates that cooperatives survive longer.

**Figure 1. Kaplan Meier estimate of survival in the French wine industry**



Although this figure is useful for visual comparison and expression of results, it is essential to engage in statistical testing of difference between the two curves. Thus, we examine if there is a statistically significant difference between the two survival curves. The most commonly test used is the log-rank test. The general rule is that a  $p$ -value of less than 0.05 based on the log-rank test indicates a difference in the survival curves. Here, we obtain a  $p$ -value of 0.0038, confirming that being a cooperative raises the survival probability<sup>6</sup>. However, all these analyses remain highly descriptive and do not allow for introduction of control variables. Thus, it is necessary to pursue investigation with a semiparametric approach and to assess if the ownership structure still impact the survival in presence of control variables.

#### *4.2 Cox model: the effect of ownership structure on the hazard rate*

Due to the fact that nonparametric methods cannot handle the inclusion of multiple covariates, the semiparametric approaches are often used. The most famous is the one of Cox. The Cox model can express the instantaneous risk of occurrence of an event according to explanatory factors and time. It has the advantage of not estimate the risk function, and thus to not make any assumption on it. This model is based on risk proportionality hypothesis to account for the effect of some covariates on survival time. The basic Cox model with fixed covariates is expressed as:

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<sup>6</sup> We also run analysis using alternative tests. All were significant at the 0.05 level except the Fleming-Harrington test, significant at the 0.10 level (see appendix A).

$$h_i(t) = h_0(t). \exp(\beta_1 x_{i1} + \dots + \beta_k x_{ik}) \quad (3.8)$$

where the hazard for individual  $i$  at time  $t$  is the product of two factors:  $x$  representing the covariates and  $h_0(t)$  the unspecified baseline hazard function, which can be interpreted as the hazard function for a subject whose covariates all have the value of zero.

Our objective is to confirm our preliminary results and to investigate about determinants of firms' survival. We want to check if being a cooperative impact the survival probability even in presence of control variables. We begin by estimating the time to failure with only the ownership variable (cooperative vs corporation) and we then introduce control variables. Results are reported in Table 2.

The likelihood ratio, Wald test and score log-rank (chi-square) statistics are tests of the null hypothesis that all of the coefficients ( $\beta$ ) are zero. The significance of the overall model is given by the  $p$ -values. Here, all models lead to very small  $p$ -values. As a consequence, we could affirm that the covariates effect cannot be assumed to be zero and that at least one of the covariates contributes significantly to the explanation of the duration to event (i.e. failure).

**Table 2. Determinants of firms' survival (Cox model)**

	Model 1		Model 2		Model 3		Model 4		Model 5	
	coef	p	coef	p	coef	p	coef	p	coef	p
COOP	-0,869	0,004 ***	-1,129	0,017 **	-1,021	0,014 **	-0,909	0,092 *	-1,018	0,082 *
Size			-0,512	0,144			-0,343	0,424	-0,270	0,531
Export			0,537	0,473			0,706	0,427	0,345	0,713
Profitability					-2,386	0,100	-3,044	0,053 *	-3,300	0,051 *
Financial leverage					0,012	0,000 ***	0,011	0,000 ***	0,012	0,001 ***
ROA					0,138	0,787	0,424	0,423	0,355	0,516
ROE					0,180	0,004 ***	0,083	0,005 ***	0,069	0,029 **
Alsace									-0,749	0,543
Bordeaux									-0,003	0,997
Bourgogne									-0,819	0,419
Champagne									-1,164	0,260
Loire									-1,527	0,288
South									-0,408	0,629
LK ratio test	8,24	0,004 ***	10,22	0,017 **	21,81	0,001 ***	20,50	0,005 ***	24,46	0,027 **
Wald test	8,09	0,004 ***	9,74	0,021 **	40,83	0,000 ***	35,88	0,000 ***	37,63	0,000 ***
Score (logrank)	8,43	0,004 ***	10,19	0,017 **	110,00	0,000 ***	91,07	0,000 ***	94,34	0,000 ***

\*\*\* significant at 1% level, \*\* significant at 5% level, \* significant at 10% level

The estimated coefficients of the ownership structure, the size and the profitability are all negative, traducing that they all decrease the hazard function (i.e. the probability of experiencing the event).

However, only the ownership structure is significant in all cases. It indicates that, as expected, being a cooperative decrease the hazard rate even in presence of control variables. The control variable for size is non-significant, suggesting that size of firms do not impact survival. More surprisingly, export is not correlated with the probability of failure. We previously suggested that cooperatives and corporations have different determinants of survival, and most of all that cooperatives export less than corporations. The finding that cooperatives are more likely to survive than corporations can thus explain the absence of significance of export. This hypothesis will be explored more in depth in the following section, when we will compare the determinants of corporations' and cooperatives' survival. Concerning the financial criteria, the profitability is only significant at the 10% level in the two last models. On the contrary, the financial leverage is highly significant and indicates, as expected, that the more leveraged firms are also the more likely to disappear. The return on asset doesn't impact the survival and the coefficient of return on equity is counterintuitive: it seems that the more profitable firms are also those which have the bigger probability to fail. All these financial results are quite surprising and hard to interpret. We believe that they are due to a misspecification of our sample, because we do not distinguish the different cause of demise.

In traditional survival analysis, the cause of demise is irrelevant to analysis. Thus, so far, we do not distinguish between the different forms of exit. However, they could have different causes and consequences, leading to misleading results (He et al. 2010). Our sample makes the distinction between different ways of demise relevant for two reasons. First, we account for three forms of exit: dissolution, liquidation and merger. Second, it appears that cooperatives almost always disappeared in mergers while corporations experienced the three types of demise (see table 4). When firms merge, they continue their business under another form. Some researchers consider the bigger firm as a continuing firm and the smaller as the exiting one (Esteve-Pérez and Mañez-Castillejo 2008), other distinguish merged firms of dead firms because of financial constraints (Görg and Spaliara 2014) and then exclude them. Another solution consists in implementing competing risks or multinomial models, which allow for different causes of demise and analyse the determinants of each of them.

**Table 3. Descriptive statistics about causes of demise**

	Dissolution	Liquidation	Merger	Total
Cooperatives		2	22	24
Corporations	10	6	13	29

To avoid potential bias, we need to address the different reasons to exit. Due to the small size of our sample, a multinomial model does not appear appropriate. Moreover, cooperatives almost exclusively disappear in mergers, reducing the pertinence of this approach. So, as the objective of this paper is to distinguish firms that are able to adapt to their environment and then to survive from firms that were not and then disappear, we choose to redesign the sample in order to keep exclusively the firms which disappeared consecutively to financial or economic difficulties and thus to only study demise relative to difficulties.

The task is easy for liquidated firms: they all disappeared because of financial difficulties. However, the question remains open for mergers and dissolution. We choose to not apply traditional way of dealing with mergers (i.e. distinguish between the two firms involved who is the survivor by taking size into account) because this approach does not seem pertinent in the wine industry. All the fusions are not absorption of the smaller by the bigger. While mergers and acquisitions always reflect strategic choices when they are implemented by large groups, in the case of small cooperatives, they can also be defensive, hazardous or opportunistic (Saïssset and Cheriet 2012). Indeed, in the wine industry, a lot of mergers are in reality rescue operations of financial distressed cooperatives by healthier ones. Thus, the key determinant to distinguish ‘offensive’ and ‘defensive’ mergers of cooperatives is the presence (or not) of economic and financial difficulties (Bélis-Bergouignan and Corade 2008).

As a consequence, we decide to build a score able to discriminate, among those who disappeared in mergers, distressed firms from the others. In the French wine industry, the main reason for economic difficulties is linked to a decline in sales. Financial difficulties arise when the firms also know difficulties to finance its investments, i.e. when they are highly leveraged, and are often characterized by damaged repayment ability. In the special case of cooperatives (which are the most concerned by mergers), financial constraints also rely on difficulties to obtain capital from members. Thus, our score is based on four indicators concerning activity (variation of turnover), financial constraints (leverage and coverage ratio) and own resources (variation of capital stock).

All the details about the methodology are given in appendix B. In a word, we calculate the four indicators for the total sample and compare each exiting firms by mergers to the worst decile. The more indicators (for a given firm) in the worst decile, the higher the score, adjusted for deterioration over time. We choose the mean score to be the discriminant about economic and financial distress firms and the others. We then verify if this choice was pertinent by comparing the score of liquidated firms to this threshold. All liquidated firms have an equal or higher score, validating our choice. Finally, we calculate the score for all of the 53 exiting firms, in order to also discriminate among firms exiting for dissolution. This work results in a new sample, exclusively composed of failed firms consecutively to financial distress. This new sample is composed of 29 firms (9 cooperatives and 20 corporations).

We run all the analysis with this new sample, in order to check the robustness of our results. The Kaplan-Meier estimate still distinguishes two distinct survival probability functions for cooperatives and corporations, and the cooperatives' curve is above the corporations' one. The results are statistically significant for all statistical tests for differences between the two groups (see appendix A for details of *p-value*). We then implement a Cox model with this new sample (Table 4).

**Table 4. Determinants of firms' survival (Cox model) with sample redesigned**

	Model 1		Model 2		Model 3		Model 4		Model 5	
	coef	p	coef	p	coef	p	coef	p	coef	p
COOP	-1,412	0,001 ***	-2.617	0,002 ***	-1,807	0,001 ***	-2,817	0,001 ***	-2,780	0,003 ***
Size			-1.239	0,015 **			-1,255	0,037 **	-1,265	0,039 **
Export			-0.25	0,808			-0,597	0,629	-1,433	0,309
Profitability					-1,996	0,030 **	-1,985	0,108	-2,126	0,124
Financial leverage					0,015	0,000 ***	0,016	0,000 ***	0,016	0,000 ***
ROA					-0,040	0,880	0,046	0,901	0,044	0,919
ROE					0,033	0,141	0,042	0,107	0,027	0,383
Alsace									0,102	0,946
Bordeaux									0,994	0,409
Bourgogne									0,340	0,794
Champagne									0,222	0,865
Loire									-0,105	0,935
South									-0,261	0,831
LK ratio test	11,77	0,001 ***	20,97	0,000 ***	33,15	0,000 ***	40,35	0,000 ***	42,73	0,000 ***
Wald test	10,70	0,001 ***	16,46	0,001 ***	53,58	0,000 ***	49,96	0,000 ***	50,01	0,000 ***
Score (logrank)	11,87	0,001 ***	20,19	0,000 ***	261,70	0,000 ***	323,10	0,000 ***	323,20	0,000 ***

\*\*\* significant at 1% level, \*\* significant at 5% level, \* significant at 10% level

The coefficient for ownership structure (being a cooperative) remains positive and is highly significant (at the 1% level) even when all covariates are introduced. Results are unchanged for export, return on assets and regions (still non-significant). However, in this new sample, size becomes a determinant of survival. As the coefficient is negative, we can conclude that the bigger the firm, the higher the probability to survive. The financial leverage is still significant at the 1% level with a positive coefficient. Finally, this time, profitability and return on equity do not have any impact on survival.

With this new sample, the results are clearer and we can confirm our first hypothesis. The ownership structure has a positive impact on survival, even in presence of covariates. In other words, cooperatives have higher survival chances than corporations.

## **5. Going further: what are the differences between cooperatives and corporations?**

After having demonstrated that cooperatives survive better than corporations, we should investigate the reason of this phenomenon. First, we will compare the determinants of survival for cooperatives and corporations. Then, we will try to explain why cooperatives survive better.

### *5.1 Different determinants of survival*

In order to test the difference between the determinants of survival for corporations and cooperatives, we run two different Cox model - one for each subpopulation (table 5). We introduced in each model the same covariates previously used<sup>7</sup>.

The results demonstrate clearly that the determinants of survival are different for cooperatives and corporations. For corporations, we observe that financial leverage is an important determinant of survival: the most indebted firms are also the most likely to fail. More surprisingly, the return on equity is positively associated to failure. This phenomenon could be explain by considering that there are two ways to present a good return on asset: improving the net income and reducing equity. French wine companies with the higher return on equity could be the ones which were forced to reduce their equity in face of financial difficulties. Consequently, this variable is positively linked to failure.

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<sup>7</sup> This time, we choose to not control for potential region effects because the number of events is too small compared to the number of regions considered. The results would have been irrelevant.

**Table 5. Comparison of the determinants of survival for cooperatives and corporations**

	<u>COOPERATIVES</u>		<u>CORPORATIONS</u>	
	<i>coef</i>	<i>p</i>	<i>coef</i>	<i>p</i>
Size	0,233	0,852	-0,213	0,675
Export	2,689	0,016 **	-1,134	0,363
Profitability	-7,403	0,422	-2,396	0,121
Financial leverage	0,005	0,983	0,012	0,001 ***
ROA	1,099	0,814	0,287	0,570
ROE	-0,496	0,772	0,067	0,022 **
Price paid to members	-3,533	0,005 ***	0,362	0,715
Likelihood ratio test	14,89	0,037 **	13,70	0,057 *
Wald test	17,58	0,014 **	24,70	0,001 ***
Score (logrank) test	27,09	0,003 ***	53,42	0,000 ***

\*\*\* significant at 1% level, \*\* significant at 5% level, \* significant at 10% level

For cooperatives, results are quite different. We found a positive effect of export on the hazard rate, indicating that cooperatives which export the most are also the one with the most probability to survive. Concerning the profitability, the results are interesting: neither return on assets nor return on equity impact the survival of cooperatives. Even the profitability ratio of net income to total sales don't have any impact on survival.

These results should be put in perspective with the specific context of cooperation. A cooperative has a dual objective: being profitable but also satisfying members' benefits (Soboh et al. 2009; Staatz 1989). The results shows that profitability is not directly linked to survival. Thus, we need to investigate the effect of maximisation of the value for members.

In French financial statements, the members' remuneration is made through the raw materials purchases ("Achats de matières premières et autres approvisionnements") entry. Indeed, members are paid for the grapes they deliver. Consequently, we create a new variable called *Price paid to members*, given by the ratio of raw material purchases to total sales. This new variable is highly significant, and the negative coefficient indicates that the more the members are paid, the more the cooperative have a chance to survive. This result indicates that profitability is not the more pertinent variable to assess the survival of cooperatives and that more interest should be put on members' remuneration.



At this stage, our two hypothesis are validated: cooperatives survive longer than corporations and possess specific determinants of survival. Particularly, members' remuneration seems to play the bigger role. It is now time to investigate further this result, and to assess more in depth why cooperatives are able to go through difficult times.

### *5.2 Why do cooperatives survive longer?*

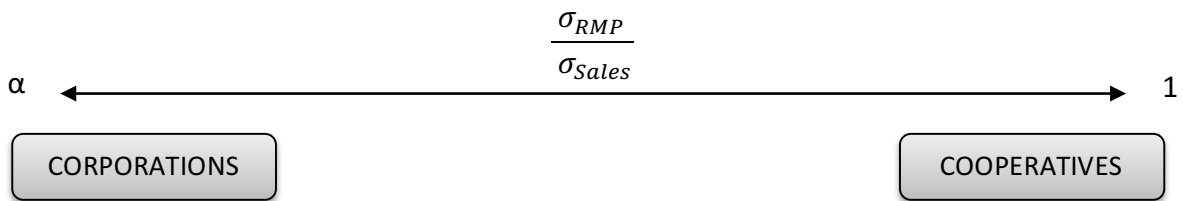
We assume that value creation within the cooperative is captured by members. As a consequence, we suppose that an increase in activity is therefore not translated into higher earnings, but results in a higher remuneration of members. We could simplify the value allocation and give the following equation:

$$\textit{Sales} = \textit{raw materials purchases} + \textit{fixed costs} + \textit{operating income}$$

In this view, the sales serves to remunerate suppliers of raw materials and to cover fixed costs necessary to make wine and sell it. Any residual is considered as profit.

**Figure 2. Test of different behaviour of corporations and cooperatives to absorb business activity fluctuations**

CORPORATIONS	COOPERATIVES
<u>Objective</u> : maximization of profit for shareholders	<u>Objective</u> : maximization of members' remuneration
<u>Variable of adjustment</u> : Operating Income	<u>Variable of adjustment</u> : Raw materials purchases (RMP)*
$RMP = \alpha Sales \quad (5.1)$	$RMP = Sales - Fixed costs \quad (5.3)^*$
$\sigma_{RMP} = \alpha \sigma_{Sales} \quad (5.2)$	$\sigma^2_{RMP} = \sigma^2_{Sales} + \sigma^2_{Fixed costs} - 2COV(Sales; Fixed costs) \quad (5.4)$
$\frac{\sigma_{RMP}}{\sigma_{Sales}} = \alpha$	$\text{but } \sigma^2_{Fixed costs} \text{ and } 2COV(Sales; Fixed costs) \text{ are negligible so that:} \quad (5.5)$
	$\sigma_{RMP} = \sigma_{Sales}$
	$\frac{\sigma_{RMP}}{\sigma_{Sales}} = 1$
	<i>*OI ≥ 0 but, more often, a “zero surplus” objective is pursued so that OI ≈ 0</i>



The ratio  $\frac{\sigma_{RMP}}{\sigma_{Sales}}$  aim to capture the amount of variation of raw material purchases (RMP) in proportion to sales in order to compare the behavior of corporations and cooperatives.

*For corporations, raw material purchases are variable costs depending on sales i.e. they are proportional to sales (eq. 5.1). Thus, any variation on RMP results on a proportional variation on sales (eq. 5.2). Consequently, the ratio  $\frac{\sigma_{RMP}}{\sigma_{Sales}}$  will be equal to  $\alpha$  (with  $1 - \alpha$  which can be interpreted as contribution margin).*

*For cooperatives, raw materials purchases are the variable to maximize. Consequently, they are equal to sales minus fixed costs (eq. 5.3). Remember that we assume there is no result, i.e. cooperatives reverse to members any profit generated through a higher remuneration. The squared standard deviation of RMP is thus equal to the sum of the squares of standard deviation of sales and fixed costs plus the covariance of sales and fixed costs (eq. 5.4). However, the fixed costs are supposed to be relatively constant overtime, thus their variation is negligible and fixed costs are assumed independent from sales so their covariance is equal to zero. Consequently, this allow us to argue that, in case of cooperatives, the standard deviation of raw materials purchases is equal to the one of sales, giving a final ratio of  $\frac{\sigma_{RMP}}{\sigma_{Sales}}$  equal to 1.*

We believe that cooperatives and corporations have different objectives, so that in case of business activity fluctuations, the variable of adjustment will be different for each group. Corporations aim to maximize profit for the shareholders. Thus, raw materials purchases are proportional to sales and operating income will traduce the variation. On the contrary, cooperatives aim to maximize the members' remuneration, with an objective of "zero surplus". The variable of adjustment is thus naturally the raw materials purchase entry.

Based on these postulates, we propose to examine the amount of variation of raw material purchases in proportion to the variation of sales for each group (corporations vs cooperatives). By doing so, we will be able to test our hypothesis about the different behavior of cooperatives and corporations, and particularly to assess if members are currently absorbing the fluctuations on business activity through their remuneration. If our hypothesis is true, the ratio  $\frac{\sigma_{RMP}}{\sigma_{Sales}}$  of corporations will be equal to  $\alpha$ , with  $\alpha$  close to  $1 - \text{contribution margin}$ , and the ratio of cooperatives will be close to 1 (figure 3).

We first compare cooperatives and corporations by calculating the mean for each subgroup. As the distribution does not follow a normal law, we are not able to use a parametric test to test the statistical difference between the two groups. The alternative is given by the Wilcoxon test.

**Table 6. Capacity to shift fluctuations of activity to members: cooperatives vs corporations**

CORPORATIONS	COOPERATIVES	Wilcoxon test
0.37	0.81	<i>0,000***</i>

This first result confirm our hypothesis that cooperatives and corporations behave differently, as they have respectively a ratio of 0.81 and 0.37. The difference is statistically significant at the 1%, confirming that cooperatives pursue an objective of maximizing the members' remuneration instead of maximization of profit. On other words an increase (decrease) of turnover will then automatically be traduced by an increase (decrease) in raw materials purchases (remember, i.e. members' remuneration). In others words, it means that the turnover variation will impact members' remuneration. We then want to test if this capacity to shift fluctuations to members is related to survival. Thus, we calculate the ratio for surviving and failed cooperatives.

**Table 7. Capacity to shift fluctuations of activity to members: surviving vs failed cooperatives**

SURVIVING COOPERATIVES	FAILED COOPERATIVES	Wilcoxon test
0.82	0.55	<i>0,000***</i>

This time again, there is a significant difference between the mean of the ratio for surviving and failed cooperatives (0.82 vs 0.55), suggesting that cooperatives which shift fluctuations of activity to their members are the more likely to survive.

These results confirm our hypothesis: determinants for survival are different for corporations and cooperatives. Indeed, cooperatives seem to use a particular mechanism to absorb fluctuations to their environment and survive overtime: they shift variations of the activity to members.

## 6. Robustness checks

We performed some robustness checks in order to test the validity of our results and to address some potential issues. First, we model lifetime through a parametric approach. Second, our sample could suffer from left truncated bias, so we propose some adjustments.

### 6.1 Parametric models

Although the Cox model minimizes specification errors by making any assumption about the pattern of duration dependence of the hazard, it produces less efficient estimates compared with the “correct” parametric model (Burdin 2014). The parametric approach models lifetimes by imposing a particular distribution for both variables and the dependent variable. The estimation of the model parameters is then performed following the maximum likelihood method. If the postulated distribution is correct, the estimators are more efficient than non-parametric and semi-parametric estimators.

Two models specifications are principally used to adjust the survival functions for the effects of the covariates. In the proportional hazards model (PH), the covariate have a multiplicative effect on the hazard function:

$$h(t_j) = h_0(t) \exp(x_j\beta) \quad (9)$$

where  $h_0(t)$  is the baseline hazard and  $\exp(x_j\beta)$  represents the vector of the exponent of the coefficients of parameters  $\beta$  for the various covariates  $x$  included in the model. If you let  $h_0(t)$  unspecified, you will estimate a Cox model. In parametric models, we assume that  $h_0(t)$  follows a specific distribution.

The second model is the accelerated failure time (AFT) model. In this case, the natural logarithm of the survival time,  $\ln t$ , is expressed as a linear function of the covariates:

$$\ln t_j = x_j\beta + z_j \quad (10)$$

where  $x_j$  represents the vector of covariates,  $\beta$  the vector of regression coefficients and  $z_j$  the error with density  $f()$ . It is the distributional form of this error that determines the regression model.

The most commonly parametric survival distributions used are: the exponential where the hazard function is supposed constant over time, the Weibull where the hazard function is supposed monotonous over time and the log-normal and log-logistic where the hazard function is supposed non-monotonous. The exponential and Weibull can be estimated as both PH and AFT models and the log-normal and log-logistic models only in the AFT metric.

The literature on firm survival indicates that the risk of failure is not constant overtime: numerous studies prone that older firms have lower hazard rates than younger ones (Manjon-Antolin and Arauzo-Carod 2008). Thus, the exponential distributions will not be appropriate. In the organizational ecology trend, more than the “liability of newness” (Stinchcombe 1965), some authors expect a “liability of adolescence” (Fichman and Levinthal 1991) or a “liability of senescence” (Barron, West, and Hannan 1994), thus both monotonous and non-monotonous could be used. In order to choose the model that best fits the data, we calculate the Akaike Information Criterion (AIC). The smaller it is, the best the model fits the data.

**Table 8. AIC comparison**

	<b>TOTAL SAMPLE</b>	<b>REDESIGNED SAMPLE</b>
<b>Model</b>	<b>AIC Estimates</b>	<b>AIC Estimates</b>
Weibull PH	397,2576	263,1015
Weibull AFT	401,2576	286,4313
Log-normal	405,4924	268,4313
Log-logistic	401,8103	268,0683

The AIC for the two sample indicates that the Weibull PH distribution is the one which best fits the model. Thus, we use it to run our parametric models. Results are presented in Table 10.

Once again, we observe a significant impact of the ownership structure (cooperatives vs corporations) on the probability of failure in the two models and the effect of other variables is confirmed. Thus, the parametric tests confirmed once again our first hypothesis.

**Table 9. Robustness checks with parametric models**

	TOTAL SAMPLE		REDESIGNED SAMPLE	
	Weibull PH		Weibull PH	
	coef	p	coef	p
COOP	-0,978	0,087 *	-2,842	0,001 ***
Size	-0,286	0,507	-1,324	0,031 **
Export	0,311	0,740	-1,503	0,300
Profitability	-3,152	0,069 *	-1,910	0,144
Financial leverage	0,012	0,000 ***	0,017	0,000 ***
ROA	0,358	0,536	0,012	0,977
ROE	0,066	0,034 **	0,024	0,387
Alsace	-0,820	0,506	0,089	0,953
Bordeaux	-0,119	0,887	1,029	0,393
Bourgogne	-0,863	0,393	0,460	0,722
Champagne	-1,230	0,231	0,375	0,771
Loire	-1,566	0,276	-0,029	0,982
South	-0,514	0,538	-0,162	0,892
Loglik	-185,63		-118,55	
Chisq	24,41	0,028 **	45,01	0,000 ***

\*\*\* significant at 1% level, \*\* significant at 5% level, \* significant at 10% level

### 6.2 Left truncated bias

Broadly speaking, there are two methods to obtain data for survival analysis. In a first case, researchers sample individuals entering the state of interest at some point during a fixed period of time and record the length of time each individual is in the initial state (Wooldridge 2010). This method is called flow sampling. In case of business survival, this method corresponds to cohort studies: a year is chosen and all firms born at this time are studied until death or end of the observation. Alternatively, the researcher can sample individuals who are already in the state of interest at a certain point in time. This sampling scheme is called stock sampling (Wooldridge 2010). In our case, there are only two states: going concern or demise. Thus, at the beginning of our observation period, all the enterprises were already in the state of interest. That is to say, we have a stock sample with follow-up: spells start before windows of observation and survive until at least start of window.

This kind of sample leads to left-truncated data and could introduce some bias: the firms in our sample are the one which have survived sufficiently longer to be sampled and the ones which have

experienced the event of interest prior to the truncation time are not observed (Klein and Moeschberger 2003). In others words, the remaining firms may be made up by an increasing proportion of firms fitter to survive. However, this problem is fairly easy to deal with (Wooldridge 2010). We only need to take into account the fact that the probability to go through the event at a time  $t$  is conditioned by the fact to have survived until the stock sampling date  $Y_i$ . Mathematically,

$$P[T > t | T > Y] = S(t)/S(Y) \quad (11)$$

That is, we analyse failures that have occurred between 2009 and 2014 conditional on surviving in the stock until 2008 (date of sampling). Thus, the likelihood contributions must be conditioned on the fact that the firm survived sufficiently longer to be in the sample (Esteve-Pérez and Mañez-Castillejo 2008). In concrete terms, we add a variable “age” to our model, given by the age of the firm at the sampling date.

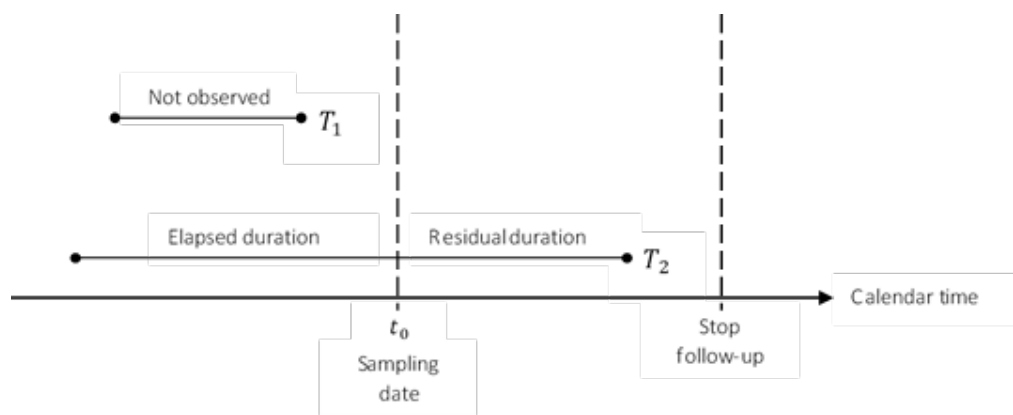


Figure 3. Left truncated data bias (Source: Cano-Urbilla, 2012)

Graphically, the results of KM estimate and Cox Model remain the same: the curve of cooperatives is above the one of corporations, suggesting that they survive longer. However, results are not significant anymore. If we look at the matter more closely, this is not surprising. Taking into account the left truncated bias consist in taking into account the age of firms, and we study their total lifetime to assess their probability to survive. Thus, this variable captures all the effect. It is consistent with our previous results: we have demonstrated that cooperatives survive longer than corporation, that is, they are older. This absence of significant results also means that we are not able, in this study, to argue about the better or worse resistance of cooperatives in time of crisis. Thus, it opens some perspectives for future research, maybe with a bigger sample in order to run more robust statistical analysis.



## 7. Discussion and conclusion

Cooperatives' survival has never been studied in the French wine industry. We found that French wine cooperatives survive longer than corporations, suggesting their greater ability to go through multiple troubles overtime. These results are robust on parametric models and also when we neutralize the impact of different kind of demises, i.e. when we are interested only in exits consecutive to economic and financial difficulties. Our findings are in line with previous studies dealing with survival analysis and cooperatives. Nunez-Nickel and Moyano-Fuentes (2004) found that cooperatives have higher survival probability in the Spanish oil milling industry. Burdin (2014) reached the same results for worker-managed firms: the hazard of dissolution for worker-managed firms is 29% lower than for conventional firms. Recently, Monteiro and Stewart (2015) confirm this tendency by comparing cooperative and capitalist modes of production in Portugal. They also found that cooperatives have a higher probability of survival. With this study we provide the first empirical proof of the phenomenon on the wine industry.

These results are robust even when we control for different effects. When we consider all the firms (cooperatives and corporations together), we found that size has an impact on survival. From an economic point of view, size confers more market power and allows to benefit from economies of scale. According to the current organizational ecology, large companies have, by their size, better access to funding and greater legitimacy (Goktan, Kieschnick, and Moussawi 2014) and can reduce or redeploy their activities in case of economic shocks (Hannan and Freeman 1977). More generally, large companies have at their disposal more resources to implement crucial strategies in the wine industry such as intangible investments or internationalization. Our findings indicates that the bigger firms are more able to resist to hard conditions. In compliance with theoretical expectations, financial leverage is also linked to survival: the more indebted firms are also the more likely to fail. Surprisingly, we do not found any significant relationship between export and survival in the French wine industry when we consider all the firms (cooperatives and corporations). Cooperatives were found to survive longer than corporations and cooperatives while they significantly export less (we found they realize on average 6% of their turnover at the export against 31% for corporations). Thus, the effects could potentially offset each other. Moreover, we found that export decrease the survival probability for cooperatives. We think that these results should be interpreted carefully. We do not believe that export is fundamentally bad for cooperatives. But, if we take a look to previous researches, we found that French wine cooperatives mainly adopt a

“price/volume” strategy (Duval 2015), and are relatively smaller. However, efforts are too much important for this small firms and it remains difficult to combine product adaptation to customer needs and geographical diversification. Thus, the export performance remains low. Amadiou, Maurel and Viviani (2013) suggest that cooperatives have a “defensive” vision of exporting and do not implement sufficient efforts to be performant at this level. We argue that our results confirm these previous findings and rather than discouraging cooperatives to export, they just highlight that this strategy is costly and should be implemented with caution.

After demonstrating that cooperatives survive longer than corporations, we investigate about the difference about cooperatives and corporations. We found that determinants of survival are different for cooperatives and corporations. Indeed, traditional financial criteria are not linked to cooperatives’ survival. In consequence, the following question arises: how are cooperative able to go through difficult times? What drive their ability to survive? Our findings validate the intuition that the ability of cooperatives to resist over time is linked to their capacities to shift fluctuations to members. On this point, Declerck and Viviani (2012) found that cooperatives absorb shocks by increasing account payables to members. Here, we use a ratio of standard deviation of raw material purchases in proportion to sales to study and compare the behaviour of cooperatives and corporations. We found that, while operating income is the variable of adjustment in case of business activity fluctuations in corporations, in cooperatives, the adjustment is made through the raw materials purchases. In other words, we argue that when there are some fluctuations on the business activity, they are absorbed by members through their remuneration for the grape they deliver. In time of crisis, it means that cooperatives survive at the expense of their members. In prosperity times, it confirms the fact that cooperatives could privileged a higher allocation of cash flow to current payments to members (or to accelerate equity redemption) at the expense of retained earnings (Iliopoulos and Hendrikse 2009). Such a policy, although profitable to members, can question the sustainability of the cooperative, which will constitute no more reserves and therefore mortgages its investment capacity. This reflects the traditional short-term vs long-term issue in wine cooperatives, which have to arbitrate between maximisation of value for members and creation and conservation of value inside the firm to allow investment and development. Thus, we propose that further research explores more in depth the value allocation within the cooperative, in order to determine an optimal level of distribution between members and the firm.

In sum, this study makes three major contributions that extend both our understanding of long-term survival in the French wine industry and the theoretical knowledge on cooperatives. First, wine cooperatives survive longer than corporations, underlining their capacity to innovate and adapt themselves to various shifts and mutations in their environment. Second, we found that the determinants of the survival of cooperatives and corporations are different, and that profitability - on its traditional sense - is not a driver of the survival of cooperatives. These results confirm the trend on literature arguing that cooperatives and corporations behave differently, and most of all that traditional performance criteria are not well suited to assess cooperatives' performance. We show that cooperatives can perform better than corporations and demonstrate the pertinence of employing original measure of performance. Third, we give an explanation of the survival of cooperatives. We found that cooperatives are able to shift activities fluctuations to their members, and that this mechanism is positively related to survival.

These results provide a base for continuing research. We have established that cooperatives survives longer but do not give any assumption about their capacity to resist to a particular crisis. It would be interesting, for example, to compare survival of corporations and cooperatives before, during and after the 2009's crisis. Then, while intangible investments are a key factor of success in the wine industry, we were not able to test its impact on survival. Moreover, further research seems to be needed in order to better interpret our assumption about the singular allocation of value within cooperatives. Which share of value should be kept within the firm or redistributed among members in order to both satisfy members and guarantee the efficient functioning of the firm? Finally, if members absorb shocks in cooperatives, lenders and shareholders could support less risk. It should be interesting to explore more in depth the financial part of our hypothesis.

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## Appendix A: Testing differences between two groups

In order to test if there is a statically significant difference between two survival curves, a variety of test could be used. The most commonly used is the log-rank test (or Mantel-Haenszel). The tests are calculated on the basis of a contingency table of membership to a particular group (e.g. cooperatives vs corporations) by status (e.g. dead or alive) at each observed time. The contribution to each test statistic at each observed survival time is obtained by calculating the expected number of events in each group (Mills, 2011).

**Table 10. Statistical differences for curves obtain with the KM estimates – Total sample**

	ChiSq	df	<i>p</i>
Log-rank	8,43	1	0,004 ***
Gehan-Breslow (Wilcoxon)	9,04	1	0,003 ***
Tarone-Ware	8,94	1	0,003 ***
Peto-Peto	8,56	1	0,003 ***
Fleming-Harrington, $p=0$ and $q>0$	3,08	1	0,079 *
Fleming-Harrington, $p>0$ and $q=0$	8,55	1	0,003 ***

\*\*\* significant at 1% level, \*\* significant at 5% level, \* significant at 10% level

**Table 11. Statistical differences for curves obtain with the KM estimates – redesigned sample**

	ChiSq	df	<i>p</i>
Log-rank	11,86	1	0,001 ***
Gehan-Breslow (Wilcoxon)	8,91	1	0,003 ***
Tarone-Ware	10,32	1	0,001 ***
Peto-Peto	11,79	1	0,001 ***
Fleming-Harrington, $p=0$ and $q>0$	8,93	1	0,003 ***
Fleming-Harrington, $p>0$ and $q=0$	11,80	1	0,001 ***

\*\*\* significant at 1% level, \*\* significant at 5% level, \* significant at 10% level

All the tests are significant at the 1% level, except for the first Fleming-Harrington for the total sample. In each test, a weighting scheme is chosen with  $p$  and  $q$ . If  $p > q$ , the test puts more weight on shorter survival times (i.e. earlier failures) while on the contrary, if  $p < q$ , more weight is put on longer survival times (i.e. later failures). In the log rank test  $p = q = 0$ . In the Gehan-Breslow, Tarone-Ware and Peto-Peto tests statistic applies more weight to early failures. In the second Fleming-Harrington test, as  $p > q$ , once again more weights is put on earlier failures. Finally, it is

only in the first Fleming-Harrington test that weight is put on later failures. The fact that the results are less significant are in consistency with our thesis and indicates that difference between cooperatives and corporations survival increased with time, i.e. cooperatives survive longer than corporations.

## **Appendix B: details about score calculation**

Our objective is to construct a score of financial difficulties able to discriminate firms exiting because of economic and financial difficulties from others. As we are mainly interested in differentiate offensive and defensive mergers, we begin by calculating a score for each firms which exit the database between 2008 and 2014 by merging.

We choose to focus on three criteria, measured by four ratios:

- Activity:  $\Delta CA$
- Financial constraints:  $DF/CP$  and  $DF/CAF$
- Own resources:  $\Delta CP$

In a first step, each ratio is computed for the total sample. We then calculate the first and last decile (D1, D9).

In a second step, we compare the ratios of each exiting firm because of merger with the worth decile (alternatively D1 or D9 according to the criterion) for the five years preceding their demise, and give each year a score of 1 if the firms is in the decile, 0 otherwise.

In a third step, in order to give more weight to the last years before exit, we moderate each annual score according to the year before demise: we multiply the score by five for N-1, four for N-2, three for N-3, two for N-4 and the score remained unchanged for N.

Each firm has now four scores, which the sum of the five annual scores (N-5 to N-1). These scores are included between zero and fifteen:

- Score 1 is related to the variation of turnover ;
- Score 2 is related to leverage ;

- Score 3 is related to repaying ability ;
- Score 4 is related to the variation of capital stock.

The final score is given by:

$$\textit{Final score} = \textit{score 1} + \textit{score 2} \times 0.5 + \textit{score 3} \times 0.5 + \textit{score 4}$$

Consequently the final score for each firm could vary between 0 and 45, with 45 signalling the more distressed firms.

The last step consists in determining a discriminant score. We calculate the mean score (15) and define it as the threshold. As this procedure could be arbitrary, we use information about demises to validate our choice. We know the reason of demise for each firm, and especially are able to identify firms that disappeared in a liquidation process, i.e. firms which were in economic and financial distress before demise. Thus, we verify the pertinence of this choice by comparing the score of liquidated firms to this threshold. All the liquidated firms have a score equal or higher than fifteen.

Finally, we calculate the score for the 53 exiting firms in order to keep in the new sample (called sample 1) all exiting firms with a score superior to fifteen. These firms could be considered as disappeared firms consecutively to economic and financial difficulties. The others firms, that is the firms with a score inferior to fifteen, are removed from the sample. Consequently, our new sample contains 924 firms. Among these 924 firms, 29 disappeared during the time of the study: 20 corporations and 9 cooperatives.

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