Influence of governance structure on the effectiveness of quality standards: The case of Geographical Indications

Susana López Bayón (✉) (University of Oviedo)
Manuel González-Díaz (University of Oviedo)
Vanesa Solís-Rodríguez (University of Oviedo)
Marta Fernández-Barcala (University of Oviedo)

Abstract

This paper analyzes how the governance structure of firms and quality standards interact in order to influence quality performance. Focusing on the wine industry, it first examines how typical agency problems related to the lack of specialization within the co-operative form of governance (versus investor-owned firms) may hinder the delivery of high-quality products. Second, the paper examines how the effectiveness of the quality standards promoted by Geographical Indications (GIs) is contingent on the governance structure of agri-food firms. The results show that although co-operative structures significantly lower the final quality of wine, this disadvantage is significantly reduced when producers are certified under the most stringent GIs (i.e., Qualified Designations of Origin, *Q*DO). In contrast, the stricter norms and requirements of the *Q*DO do not influence quality performance within the investor-owned firms. Thus, the paybacks of the quality standards promoted by the GIs depend ultimately on the specific form of governance adopted by the producers.

Keywords: Quality Standards, Quality Performance, Governance Structure, Geographical Indications, Cooperatives.

(✉) Address correspondence to: Susana López-Bayón, Facultad de Economía y Empresa, University of Oviedo, Avda. del Cristo s/n, 33071 Oviedo, Spain.
Tel.: +34 985 10 28 13; Fax: + 34 985 10 37 08; E-mail: sbayon@uniovi.es.

1. Introduction

Global agri-food supply chains' complexity and vulnerability to safety risks, as well as consumers' growing demand for high-value food products, have increasingly stressed the importance of quality management (QM) in agri-food industries across the globe (Henson and Reardon, 2005; Whippel et al., 2009).

As a result, numerous quality standards have proliferated to incentivize security and value creation in agri-food chains (Areté, 2013; Henson and Reardon, 2005; Marucheck et al., 2011; Trienekens and Zuurbier, 2008). Many of these standards have become *de facto* mandatory for producers and suppliers (e.g., ISO 9000; ISO 22000; GlobalGAP), and others, including Geographical Indications (GIs), one of the most widespread quality certification systems in the European agri-food sector (Evans, 2010; Ménard and Valceschini, 2005; Rippon, 2014), have evolved as strategic tools for differentiation and competitive positioning in high-value agri-food markets.

European Union regulations have introduced GIs to promote, guarantee, and signal the quality attributes of agri-food products from the specific *terroir* and know-how of a given region (e.g., Champagne, Parma ham, Roquefort cheese, and Rioja wine). To ensure that all firms entitled to use the GI as a trademark fulfill those quality standards, the GI organization must establish a list of product specifications – i.e., raw material requirements, technical standards, or production methods – and perform a verification and control function[1].

However, the effectiveness of GIs in signaling and promoting food value has been criticized and remains controversial. Similar to their arguments for other QM systems (e.g., Benner and Tushman, 2002; Trienekens and Zuurbier, 2008),

[1] See, for instance, Regulation (EU) No 1308/2013 establishing a common organization of agricultural product markets; and Regulation (EU) No 1151/2012 on quality schemes for agricultural products and foodstuffs.

practitioners argue that, instead of encouraging quality investments and coordination in the supply chain, quality standards promoted by GIs may actually operate as a bureaucratic burden, making production more costly and impeding in some way both competition and innovation (Josling, 2006). Neither is GIs' ability to improve food value from the consumer perspective clear (Bonnet and Simioni, 2001; Loureiro and Umberger, 2007; Souza-Monteiro and Lucas, 2001). Hence, the question of whether GIs lead to quality improvements remains open.

To address this issue, the present paper draws on the contingency theory of quality management effectiveness (Sousa and Voss, 2001, 2008). This approach considers that contextual factors of firms can moderate the relationship between quality practices and performance and, thus, explain their mixed results. Accordingly, recent research in operations management (OM) has identified a limited set of contingency variables at both the industry level (e.g., industry competitiveness, growth, and uncertainty) and the firm level (e.g., firm size, age, internal organization, and strategy) to examine in greater depth the effectiveness of quality management practices (see, for example, Lo et al., 2013; Zhang et al., 2012; Zhao et al., 2004). However, none of these studies has addressed the *governance structure* of firms as a key variable in their contingent view of quality management. Furthermore, while the economic literature has long recognized that the governance of supply chain relationships plays a significant role in assuring quality (Mahoney, 1992), with some notable exceptions (e.g., Novak and Stern, 2008; Steven et al., 2014), limited research has been conducted on the quality implications involved in different governance arrangements (Steven et al., 2014).

The proposition of this paper is that the effectiveness of GIs' quality standards depends on the context within which they are deployed, particularly on the governance structure adopted by agri-food firms. Therefore, our main theoretical argument is that

quality standards promoted by GIs and the form of governance have contingent effects on quality outcomes. To test this argument, this paper focuses on the wine industry, in which GIs are of particular importance. Actually, GIs' origins can be traced to the wine business (e.g., Maher, 2001), and even though they have proliferated worldwide among different agri-food products (London Economics, 2008; Rippon, 2014), most GIs (nearly 70%) currently correspond to wine.

Regarding the agri-food sector in general and the wine industry in particular, there are two basic solutions for farmers and processors to govern their supply relationships: the co-operative organization versus the investor owned firm (IOF). Co-operatives are of special interest here not only because they are widespread in this sector (over 54% of European farmers are members of an agricultural co-op) but also because of the incentives created by their unique governance structure – suppliers (farmers) are forward integrated into food-processing firms. In particular, co-operatives are collectively owned by their suppliers, encouraging free-riding and collective action problems that impair firm performance (Nilsson, 2001). However, a classical capital firm (IOF) owned by outside investors and characterized by the specialization of management and risk bearing (e.g., Fama and Jensen, 1983) could avoid such difficulties (Hansmann, 1996).

Building on these arguments, this paper seeks to make three basic contributions to the literature. First, it empirically addresses the question of how GI standards may influence the quality of the final products (i.e., wine) and how this influence may differ depending on the strictness of the GIs' regulations.

Second, it attempts to extend the contingency theory of QM by examining how the paybacks of GIs' quality standards depend ultimately on the particular governance structure adopted (Co-op vs. IOF). Specifically, we hypothesize that these benefits will

be facilitated within the co-op organization, where collective action problems would make GIs' coordination and monitoring devices more valuable. On the contrary, GIs will exhibit less beneficial effects in investor-owned firms. To our knowledge, this study is the first to demonstrate how quality standardization and certification devices may be more effective when used within suitable governance structures.

Third, this paper highlights that governance impacts quality not only *indirectly* by moderating the benefits of quality standards but also *directly* by shaping the incentives of supply chain members towards quality provision. There is an open debate in the literature about the hypothetical (dis)advantages that confront agri-food co-operatives, compared to IOFs, to meet the growing demands for food quality (Cook, 1995; Fulton, 1995; Nilsson et al., 2012; Rey and Tirole, 2007). This debate is fueled by inconclusive studies (see, for example, the recent conflicting results of Pennerstorfer and Weiss (2013) and Cechin et al. (2013)) and consistent criticism against co-operatives from the organizational economics literature (Nilsson, 2001). We shed light on this issue by re-examining the relative (dis)advantages of co-operatives in processing high-quality products. The results significantly contribute to the theoretical literature: In a context of high measurement difficulties, the incentive problems caused by co-operative governance will result in quality losses. Our findings also show that this drawback may nevertheless be effectively moderated by GIs' quality certification and control systems.

The rest of this paper is organized as follows: The next section presents the conceptual framework and research hypotheses. The following sections describe the research design and the empirical results. The final section offers implications and topics for future research.

2. Theoretical foundation

2.1. Effectiveness of GIs' quality standards

Quality is a strategic factor that allows firms to sustain their competitive advantage and growth. However, the market provision of quality is beset by measurement problems and asymmetric information difficulties (Barzel, 1982; Foss, 1996), leading to moral hazard risks (i.e., sellers may opportunistically use their informational advantages) that may prevent profitable transactions from taking place (Akerlof, 1970). Firms can spontaneously adopt various voluntary quality standards and organizational patterns in addition to their own brand name and related reputation to address this information problem and demonstrate the quality of their products (Marucheck et al., 2011), including various forms of collective codes of good practices (e.g., Global GAP) or voluntary certifications by a third party (e.g., ISO norms). In the agri-food industry, a particularly interesting instance of voluntary quality certification is represented by GIs.

GIs function as a collective quality-labeling system intended to guarantee food quality and safety (Ménard and Valceschini, 2005; Raynaud et al., 2005) by linking the value of the agri-food products to the specific (and unobservable) characteristics attributable to their region of origin (i.e., the *terroir*). Well-known examples include Champagne, Parma ham, Roquefort cheese, and Rioja or Porto wines. In reality, GIs are the main pillar of the European Union "quality policy" for agri-food sectors, and even though they have been used for a long time (Maher, 2001), they currently constitute a growing phenomenon (Rippon, 2014). According to the DOOR and E_BACHUS databases, the number of registered GIs has significantly increased in recent years and currently exceeds 4,000 (by July 2015, registered GIs included 2,883 wines and 1,280 agricultural products and foodstuffs).

As a quality certification system, GIs must perform both standardization and monitoring functions. First, they have to formalize a verifiable list of product specifications, that is, the requisites that all agents involved in the agri-food chain must meet to bear the GI brand. These product specifications identify the quality standards that will determine both the production processes (e.g., agricultural practices) of certified firms and the final characteristics of their agri-food products. Moreover, the definition of these quality standards has a private collective nature, namely, they are agreed on and established by representatives of supply chain actors (e.g., farmers, suppliers, and processors, among others).

Second, similarly to other certification programs (e.g., ISO 9000), GIs also stress the ongoing adherence to their standardized best practices. In particular, the credibility of a GI as a distinctive sign of quality is supported by the intervention of an official control body, which is responsible for approving product specifications and performing certifying and monitoring functions (i.e., it verifies the compliance of all operators in the value chain with GI norms). These control functions prevent the likely free-riding and opportunistic behavior that the collective nature of the designation of origin might otherwise foster. That is, without such monitoring, firms entitled to use the collective label could circumvent GI quality standards while benefiting from the GI reputation (Raynaud et al., 2005).

Overall, the potential of GIs as a strategic tool to supply quality information in agri-food markets has long been analyzed. However, in addition to providing conflicting results, most empirical studies have been limited to assessing the impact of GIs on consumers' perceptions and decision-making (for a review, see Grunert and Aachmann, 2016). Thus, the ability of GIs to improve firms' quality performance remains highly uncertain. Ultimately, this issue is important because GIs' value as a strategic tool for

differentiation will subsist only if they are able to produce higher quality. That is, the collective reputation of GIs should be associated with products of *superior* quality (Loureiro and Umberger, 2007). Otherwise, they would simply burden consumers with an overload of *terroir* information of dubious value (Josling, 2006)[2].

We argue that there exists a reliable link between GI certification and quality improvement. Specifically, the potential value-enhancing role of GIs rests on their ability to facilitate knowledge sharing and vertical coordination within the agri-food chain. Additionally, GI institutions will be interested in establishing quality standards above observable quality levels to make their certification attractive for producers, which may also explain the higher quality scores of products certified by a GI.

In the agri-food industry, quality and safety issues pervade the whole supply chain, so they cannot be reduced in only one stage of the chain. As a result, a coordinated response among farmers, processors, and distributors is essential for producing quality (Wever et al., 2010). Precisely, GIs operate as a wide scope quality management system (Wever et al., 2010) able to produce such vertical coordination. First, GI *specifications and controls* prevent all agents in the origin-labeled chain from distorting production practices, either opportunistically or accidentally, at the expense of quality (Lence et al., 2007). Second, beyond avoiding non-compliance, chain-wide monitoring may play an important value-added role by facilitating valuable knowledge sharing at the supply chain level. The *monitoring routines* developed by the supervising body allow awareness of what is being learned (or missed) by different chain suppliers and processors. This information adds to GIs' stock of knowledge, so it can be used to

[2] In a related study, scholars from the economic discipline have also developed several theoretical models aimed at understanding the welfare effects of GIs in terms of their potential to deliver quality, increase costs, and restrain competition (Josling, 2006). However, these studies have produced ambivalent outcomes (e.g., Mérel and Sexton, 2012; Moschini et al., 2008; Zago and Pick, 2002).

facilitate other chain actors to keep abreast of new ideas or better coordinate their activities towards quality. In this sense, GIs may function as a learning network able to create superior quality by effectively identifying and combining the diversity of knowledge that resides within the network (e.g., Dyer and Nobeoka, 2000; Heide et al., 2014; Powell et al., 1996), in our case, the GI system.

Additionally, GIs are expected to promote quality standards and thresholds above the observable quality levels in the market. In agri-food industries, the assessment of quality is characterized by high measurement costs and significant information asymmetries regarding the quality of supplies (Moschini et al., 2008). As a direct consequence, uninformed buyers will not be able to react to all quality improvements, and firms producing the highest-quality products (above discernible levels) will not secure the marginal benefits resulting from their quality efforts, leading to lower investments in quality. However, GIs offer the possibility of credibly demonstrating that the value of their products meets a certification standard above the highest observable quality. In this scenario, it is expected that GI organizations will choose the quality of their products strategically (e.g., Mérel and Sexton, 2012; Moschini et al., 2008). Specifically, as suggested by Buehler and Schuett (2014), GIs will set their standards above the quality threshold observable by uninformed consumers in order to ensure that the certification is attractive for producers, thus favoring higher quality and more differentiated goods.

It is worth noting that firms can choose among different types of GIs, depending not only on the territory they come from but also on the strictness and complexity of their certification standards. Specifically, in the wine industry, European regulations define two basic types of geographical designations: Protected Designations of Origin (PDOs), the most demanding, and Protected Geographical Indications (PGIs), the least

demanding (Regulation (EU) No 1308/2013). Moreover, within each category, country-specific laws may differentiate further levels of GIs. For example, Spanish wines can be granted with a higher level of geographical certification: the Qualified Designation of Origin (*Q*DO)[3], which is the most demanding PDO category; namely, it involves the most rigorous standards affecting wine traceability, production and distribution.

The most stringent GIs clearly require higher-quality investments and production costs to meet their quality standards (e.g., Belletti et al., 2007; Mérel and Sexton, 2012). However, in exchange, it is expected that stricter certification standards will drive greater variance reduction (in agricultural and industrial practices) and increased process control, which will strengthen the image of a unique product (Deselnicu et al., 2013) and prompt closer coordination within the agri-food chain towards quality. Taking into account the above arguments, we propose the following hypothesis:

> **H1.** *Certification standards promoted by the GIs positively influence quality. Specifically, as the stringency of standards increases, their (positive) influence on quality strengthens.*

2.2. Impact of governance structure on quality

All quality management strategies must address the incentives (or disincentives) for value chain agents in promoting quality practices and investments. We argue that such incentives can vary significantly depending on firms' governance structure. Specifically, we focus on two central forms of governance in the agri-food industry, the co-operative *versus* the IOF, to examine their relative influence on quality.

Agricultural co-operatives are firms collectively owned by an association of independent upstream farmers. In the particular case of the wine industry, co-operatives

[3] The Spanish *Q*DO level is similar to the French AOC (Apellation D'origine Controlée) or the Italian DOCG (Protected and Guaranteed Designation of Origin).

are owned by an association of grape growers, such that the co-operative buys grapes from its proprietors (patrons) and then produces wine that can be marketed either bottled or in bulk.

Most agricultural and co-ops have been established as a response to market failures and the necessity to enhance the economic and social well-being of their members (farmers) by providing them better terms of trade (e.g., superior prices) (Boone and Özcan, 2014; Tennbakk, 2004). In fruit and vegetable sectors, similar to the vine growers, such market failures are due largely to the bulky and perishable nature of the product, the risks and uncertainties surrounding agricultural production attributable to unforeseen weather conditions, the information asymmetries surrounding the honest assessment of the product's quality, or the oligopolistic structure of processors and distributors. Consequently, individual farmers usually confront low bargaining power and high transaction costs in trading their products. However, by forming a co-operative and owing the downstream partner, farmers can overcome information asymmetries and imbalances in their bargaining power *vis-a-vis* the processor or distributor firms and thus deliver inputs at more favorable prices (Bijman et al., 2012; Staatz, 1987). Additionally, through the co-operative, farmers can reap economies of scale and spread their risk by pooling their returns and expenses (Nilsson, 2001; Van Dijk, 1997).

However, despite these rationales, property rights and agency theories have claimed that in most circumstances, the co-operative solution is a weak competitor against alternative forms of organization and, particularly, vis-à-vis IOFs (e.g., Cook, 1995; Nilsson, 2001). In this sense, they suggest that the main feature impairing the performance of co-operatives is their lack of ownership specialization; that is, independent farmers delivering to an IOF are only suppliers of inputs, whereas in co-operative firms, they are also the proprietors. This ownership feature, along with their

organizational principles,[4] result in (1) a dual nature of co-operatives because they not only aim to be profitable but also provide a service to their farmer-owners (e.g., Soboh et al., 2012) and (2) a set of vaguely defined property rights among their "members (patrons) versus investors" (Nilsson, 2001).

Specifically, in agri-food co-operatives, ownership and control rights are held collectively. Their members receive firm surplus in the form of improved terms of trade, such as better prices for their farm produce. Consequently, profit distribution is not proportional to their equity share but rather to their patronage, namely, the *quantity* of products marketed through the co-operative. Furthermore, pooling of revenues constitutes a basic feature of co-ops. It usually implies a uniform pricing rule under which the allocation of revenues to the co-op members is made independently of the quality delivered (Hendrikse, 2011). In addition, the members' share in the society is not openly tradable and its monetary value is generally redeemable at *par value*. Regarding decision rights, most co-operatives are governed according to the one-member-one-vote principle, following a democratic control rule, regardless of members' share of capital.

The economic literature has recognized a number of relative disadvantages of co-operatives compared to IOFs arising from their specific form of governance (see, for example, Cook, 1995; Fulton, 1995; Rey and Tirole, 2007). Such disadvantages also include pessimism about co-operatives' ability to deliver high-quality products (e.g., wines) (Bijman et al., 2012; Pennerstorfer and Weiss, 2013). In this regard, the most

[4] The organizational principles of co-operatives, known as the Rochdale principles of co-operation, were formally adopted in 1937 by the International Co-operative Alliance (ICA). Afterwards, the ICA adjusted these principles and established the Statement of Co-operative Identity. The first three principles: (1) voluntary and open membership, (2) democratic member control, and (3) members' economic participation, can be considered as the fundamental ones. For more details, see Oczkowski et al. (2013).

important weakness of farmer co-operatives can be summarized as follows (Hanf, 2009; Mérel et al., 2009; Saitone and Sexton, 2009).

First, typical pooling practices of agricultural co-operatives may result in internal free-riding behaviors and adverse selection problems that affect input-supply activities and, thus, the quality of the final product (Liang and Hendrikse, 2013; Saitone and Sexton, 2009). Co-operatives are obliged to process all their members' supplies; therefore, they cannot exclude marginal members even though farmers may produce either high- or low-quality produce (e.g., wine grapes). Moreover, co-operatives' pooling practices imply an averaging process wherein producers share the expenses and returns associated with the commodity handled, independent of the quality delivered by each member. These practices often fail to reward producers of the highest-quality products – that is, producers have to bear the full costs associated with higher quality, while the benefits resulting from their effort are collectively shared with low-quality farmers, increasing the farmers' incentive to cheat on quality. Rational growers will anticipate this free-riding problem. Consequently, they will have strong incentives to deliver low-quality products to the co-operative (Liang and Hendrikse, 2013; Saitone and Sexton, 2009). For instance, wine co-operatives might act as the "last-resort buyer" for low-quality grapes. Eventually, farmers of high-quality products will have no incentive to join the co-operative; they will prefer to deliver their premium grapes to invested-owned firms (wineries) not bounded by such pooling practices.

These incentive problems are particularly harmful in the case of the wine industry. Wine quality hinges on multiple interrelated factors, many of which are controlled by grape growers (soil characteristics and the agricultural practices used, among others). In reality, as the wine value-added increases, the required quality for wine grapes becomes more stringent and growers' requirements become more

demanding (Goodhue et al., 2003). Thus, incentive problems faced by co-operative firms at the farm level (internal free-riding and adverse selection of grape growers) could leave them in a permanent position of disadvantage to compete in quality-differentiated wine markets.

To overcome these difficulties, various studies have suggested implementing strict quantity and quality rules through *partial* pooling practices (e.g., Bijman et al., 2012; Liang and Hendrikse, 2013), which involves requiring co-op members to bring all their production to the co-operative and developing differential pricing policies based on quality evaluations of farm products. However, the quality requirements of *premium* grapes are not perfectly contractible. That is, the assessment of the grapes required for high-value wines is challenged by significant levels of uncertainty and high measurement costs (Goodhue et al., 2003; Hennessy, 1996; Ponte and Ewert, 2009). In this sense, it can be expected that the visibility of cheating – and, thus, the possibility of free-riding punishment – will diminish as demand for quality increases. In other words, the use of differential pricing or pay-for-performance schemes (partial pooling) may prove to be too costly to ensure high levels of quality within the co-operative[5].

Finally, compared to IOFs, co-operatives can also suffer from a *horizon problem* that may cause an underinvestment in long-term strategies (Cook, 1995; Vitaliano, 1983) and undermine quality improvements. Co-operatives are financed primarily by their users' equity (and through retained earnings), but equity shares are not transferable at a market price. Consequently, if farmers leave the co-op, they will have no access to the assets they contributed through their previous investments. Thus, patrons might be more interested in short-term returns than in long-term returns. This horizon problem is

[5] According to this measurement difficulty, Goodhue et al. (2003) found that, in California, price incentives for wine grape growers affect prices only marginally. In the same vein, Fraser (2005) found that, in Australia, price incentives are more likely to be included in supply contracts for low-quality grapes.

aggravated by the co-op democratic principles and common ownership. Namely because "new" members of the co-operative are treated like "old" members, the entrance of new farmers usually dilutes the equity of the current patrons, which again undermines the motivation to invest in the co-op (mainly long-term) because its returns are not safeguarded against dilutions caused by new entrants. This reluctance to invest in long-term riskier strategies can lead to an underinvestment in new technologies and branding strategies (characterized by too-long productive lives) that are necessary to support and communicate a high-quality differentiation policy. Ultimately, this problem, along with the abovementioned free-riding behaviors, will lead to the weakness of co-ops in producing high-quality products (wines). Thus,

> **H2:** *Compared to that of IOFs, the co-operative form of governance negatively influences quality performance.*

2.3. *Governance structure as a moderator of quality standards' effectiveness*

Quality standards established by GIs determine food product requirements necessary to promote value-added and differentiation. However, as with other quality certification systems, GIs' effectiveness may depend on the specific context in which they are deployed (Sousa and Voss, 2008). As Zhang et al. (2012, p. 12) highlighted, "taking a one-size fits all approach to quality management may not lead to optimal outcomes. Different organizations may need different approaches to quality". Building on this contingent approach, we argue that, even though GIs' specifications are expected to benefit all GI members, the effectiveness of GI standards will vary depending on the governance structure in which they are applied: Co-ops vs. IOFs. In particular, the inherent benefits of GIs' norms are expected to be greater in a co-operative. The reason for this is twofold.

First, co-ops have a greater exposure to internal collective action problems (quality shirking and free-riding) than IOFs, which makes the *ex-post* monitoring role or the official control body of the GIs relatively more important. Moreover, the democratic principles of agricultural co-operatives – i.e., all members should actively participate in setting policies and decision-making have equal voting rights (one member one vote) regardless of their shareholding – usually constrain their boards of directors from exercising a direct authority and a hierarchical control over farmers (patrons). As noted by Bijman et al. (2011), farmers will probably use the majority rules and their decision-making power to avoid losing their autonomy at the farm level and to circumvent *internal* stricter rules, which would mean a greater need for the external governance tool of GIs to compensate for poor-quality practices/incentives and deficient internal monitoring by co-operatives. Qualifying for a GI also signals a credible commitment to its quality standards and fosters convergent goals towards a value-added strategy based on its code of practice., which is particularly beneficial for agricultural co-ops because they are characterized by the coexistence of two-sided objectives not always targeted toward firm profitability and quality differentiation: namely, better prices for a group of heterogeneous farmers *versus* investor returns. In contrast, IOFs are basically marketed oriented and may use hierarchical controls over production processes more easily, for example, by vertically integrating into farm production.

Second, co-ops may also take advantage of the technological and commercial know-how developed by GIs. The control and monitoring function of the inspection body (Regulatory Council) not only prevents opportunism but also offers valuable information feedback to farmers able to enhance their performance (Dyer and Nobeoka, 2000; Heide et al., 2014). That is, GIs play an important role in signaling which product/process attributes must be met and/or corrected to enhance vertical coordination

and to succeed in a quality-differentiated market. The access to this technological and commercial know-how is expected to be particularly helpful for co-ops because they are more exposed to the aforementioned horizon problem and, thus, to under-investments in R&D and high-quality strategies (which are usually long-term and riskier), which leads to a lack of valuable internal knowledge.

In summary, the positive effect of GIs' quality standards on vertical co-ordination and quality improvement is expected to be stronger within co-operatives, which can be expressed in hypothesis form as follows:

> **H3:** *The efficacy of GIs' standards in promoting quality will be moderated by the governance structure of the agri-food chain. Specifically, this influence will be stronger in co-operative organizations (vs. IOFs).*

3. Research design

3.1. Data collection and sample

We are interested in analyzing how quality standards promoted by GIs and the governance structure of supply chains interact to affect quality performance in the agri-food sector. The empirical setting for this research is the wine industry in Spain, the country with the highest surface area of vineyards in the EU and the third-largest worldwide producer of wine (*OIV;* International Organization of Vine and Wine)[6]. Specifically, our population consists of Spanish wineries that produce bottled wines registered under a protected designation of origin (PDO), so it does not include firms that produce and sell only unpackaged and unbranded wine to other wine companies. The reason for this is twofold. First, we are interested in final quality. Moreover, quality evaluations of wine experts are provided only for final products, that is, wines sold in labeled bottles. Second, the commercial strategy of wine producers (i.e., to

[6] Data available in: http://www.oiv.int/oiv/cms/index

commercialize bulk vs. bottled wine) may be a potentially discriminating factor for their quality policies (Courderc and Marchini, 2011) in that bulk producers may be biased towards lower-quality wines. Thus, focusing on bottled wines allows us to control for the strategic orientations of wineries.

The principal data source was a Spanish professional wine guide, *Peñín Spanish Wine Guide* (Peñín, 2006), which provides the most comprehensive list of the wineries that produce bottled wine in the various wine-producing regions of Spain. The guide offers general data about the wineries – such as hectares of vineyards held, storage capacity, and GIs endorsed by each cellar – as well as annual information regarding professional quality scores for their wines. The information used in this study refers to the year 2005 and was published in the 2006 wine guide, which contains data from over 2,000 wineries, representing over 70 percent of all Spanish firms producing bottled wine under a GI (MAGRAMA, 2004, 2006). However, it does not provide expert quality grades for all listed wines, so our final sample comprises 327 firms (with complete information on all variables included in the analysis), which account for 27.7% of the total Spanish area of vineyards belonging to a PDO. Because each winery usually has more than one wine tested and graded, the sample includes the scores for 1,951 bottled wines. All sample wineries are registered under either a *Q*DO) or a PDO because the professional guide provides quality grades only for a very limited number of firms producing (a) wines without a GI (*table* wines) or (b) wines registered under a Protected Geographical Indication (PGI). Due to their lack of representativeness, both types of wineries were removed from the database.

We compared this sample with the population for our key constructs, namely, type of GI and value chain governance, and we found no significant differences, which

suggests an absence of sample bias. The composition and main characteristics of the dataset concerning these organizational features are summarized below.

First, Table 1 shows the distribution of the population and the sampled wineries according to their GIs of origin.

Table 1: Population and sample distribution by PDO

Designation of Origin	Sample distribution 2005	Population distribution 2005 (*)	Population distribution 2013(*)
1. Rioja[(a)]	20.5%	19.57%	17.2%
2. Ribera del Duero	9.5%	7.04%	7.61%
3. Cava	7.6%	9.19%	7.03%
4. La Mancha	7.6%	7%	5.73%
5. Rías Baixas	4.0%	6.22%	5.1%
6. Penedés	3.1%	5.3%	4.58%
Accumulated frequency for the main GIs	52.30%	54.32%	47.25%
7. Priorat [(a)]	2%	2.1%	2.97%

(*) *MAGRAMA (*Ministry of Agriculture, Food and Environment).
(a) *Qualified Designation of Origin (Q*DO)

Although there are a large number of PDOs for Spanish wines, they differ significantly in terms of both the volume of wine processed and the number of wineries registered under each PDO. According to the Spanish Ministry of Agriculture (MAGRAMA), most wineries producing bottled wine are registered under six PDOs (see Table 1), which are the most relevant GIs in terms of the number of affiliates[7]. This feature has been maintained over time and is properly reproduced in our dataset. Specifically, in both the population and the sample, the *Q*DO *La Rioja* is the most important GI in terms of the number of wineries (and in terms of the volume of wine produced), followed by *Ribera del Duero*, *Cava*, *La Mancha*, *Rías Baixas* and *Penedés.*

[7] The total number of PDOs for wines in Spain was 63 in our reference year (2005) and increased to 89 to date (2015). However, as shown in Table 1, the principal GIs in terms of volume of wine processed and wineries registered did not change in this period.

The remaining producers are highly dispersed among a large number of minor PDOs in both the population and the sample.

Along with *La Rioja*, *Priorat* is the other qualified designation of origin (*Q*DO) in Spain and represents 2% of the wineries in both the dataset and the population. Thus, the sample resembles the whole population in terms of the wineries registered under a *Q*DO (approximately 20% of wine producers).

Regarding the governance structure of the value chain (co-operatives vs. IOFs), co-ops have a strong presence in this sector; namely, they produce over 60% of all wine (COGECA, 2010). However, most remain in the transformation stage of the value chain, that is, they focus in producing and trading undifferentiated bulk wine. Therefore, compared to investor-owned firms, the number of co-operatives that produce and commercialize bottled wine is fairly small (Giagnocavo and Vargas-Vasserot, 2012), as reflected in the lower proportion of co-ops comprising our dataset: 33% of the sampled wineries are co-operatives (108 cases), and 67% are IOFs (219 cases).

3.2. Variables and measures

Dependent variable

The theoretical model focuses on the effect that supply chain governance structures and GI quality standards have on the *quality performance of firms* (i.e., wineries). Following previous studies (e.g., Benjamin and Podolny, 1999; Frick, 2004; Pennerstorfer and Weiss, 2013; Scott Morton and Podolny, 2002), measures of quality were obtained from a professional wine guide, the *Peñín Wine Guide* (Peñín, 2006). Quality ratings provided by professional guides are produced by wine experts following highly systematized procedures and rigorous standards of evaluation. As a result, these ratings show a high convergent validity across independent evaluations – i.e., wines

considered high/average/poor quality by one set of independent evaluators are generally considered high/average/poor quality by other evaluators – due to the aesthetic properties of the wine itself instead of external factors such as the wine's price or origin. Ultimately, these properties help to ensure the reliability of expert ratings as quality measures of wine (Benjamin and Podolny, 1999)

Thus, we first defined *wine* quality as the rating reported in the guide for a given labeled bottle of wine. This guide uses Robert Parker's rating system (e.g., Ali et al., 2008), which grades wine from 50 to 100 on a six-point rating scale ranging from numerical ratings of 50-59 for wine "deemed unacceptable" to 96-100 for "an extraordinary wine". Many industry experts consider that the *Peñín Spanish Wine Guide* provides the most comprehensive coverage of Spanish wines and equitable and well-respected quality ratings. We further assessed the reliability of the guide's quality measures by comparing these measures with those obtained from one of the most influential international wine guides, *The Wine Advocate* (TWA) developed by R.M. Parker. To this end, we identified all wines with quality scores in both guides for the same time period (2006). The two sets of ratings showed a significant and positive correlation index, which confirms that they reasonably agree in their quality rankings. Moreover, a test of means did not show any significant difference in the average scores between the two groups of evaluations.

The overall quality of each winery (QUALITY) was then operationalized as the average quality ratings of all bottles of wine reported for each château. As mentioned above, the final dataset includes quality information for 1,951 bottles of wine (produced by 327 wineries). Wine producers differ in the number of wines they elaborate and sell. In our sample, the mean number of wine brands produced and sold per winery is 6.9

(ranging from 1 to 28). On average, 87% percent of the wines produced by each winery in the dataset have an expert evaluation.

It is noteworthy that the mean value of QUALITY (82.8) is relatively high, corresponding to the fourth level in the quality scale reported in Table 2 ("barely above average wines"). Most wineries are ranked in this category, and no wineries in the sample were classified in the lowest category ("unacceptable wines"), which might suggest certain skewness toward higher-quality wines in the dataset. In this regard, previous studies have alleged that wines of inferior quality are often deliberately under-represented in wine guides for commercial reasons (Benjamin and Podolny, 1999; Bramley et al., 2009; Pennerstorfer and Weiss, 2013). We cannot completely reject a potential bias in our dataset towards wines pursuing a minimum level of quality. However, the wide coverage of our professional guide (it comprises over 70% of Spanish firms producing bottled wine and evaluates over 85% of their listed wines) may attenuate such bias.

Table 2: Wineries' QUALITY distribution
(Average quality of all bottles of wine reported for the château)

Quality scale	Frequency (%)
(50-59) unacceptable	0%
(60-69) below average	0.3%
(70-79) average	20%
(80-89) barely below average	76%
(90-94) outstanding	3.4%
(95-100) extraordinary	0.3%
N: 327	**100%**

Independent variables

Consistent with the proposed hypotheses, the independent variables are (1) the governance structure of wine producers and (2) the type (i.e., stringency) of quality standards (GI) adopted.

Governance form (CO-OPERATIVE vs. IOF) is a dummy variable coded as "1" if the winery was a co-op, and "0" otherwise (i.e., an IOF).

All the producers in the dataset are registered under a GI. To capture the *type of GI* based on the strictness and complexity of its certification standards, we included a dummy variable (*Q*DO) coded as "1" if the winery was registered under a *Q*DO vs. a PDO (coded 0). Note that *Q*DO is the most stringent type of GI in Spain. However, although there are a high number of PDOs (i.e., 33 different designations compose this category in the database), they differ only in the distinctive attributes of their production (such as the varietal and geographical origin of the wine grapes) and do not differ in the strictness of their requirements over the wineries' growing and production practices.

Control variables. Other factors besides ownership structure and GI regulations may affect the quality performance of the wineries. First, previous literature emphasizes the relationship between knowledge created by firm experience (learning economies) and performance (for a review, see, for example, Argote, 1999). Particularly, older wineries may produce higher-quality wines only because they reach a better understanding of the production process as experimental learning accumulates. Accordingly, we used the winery's age (number of years since its foundation) as a proxy for this learning effect (EXPERIENCE).

Second, various studies conducted in the wine industry have suggested a negative relationship between the wineries' size in terms of their scale of production and their orientation towards high quality (e.g., Oczkowski, 1994; Scott Morton and Podolny, 2002). From this view, small wineries tend to specialize more in high-end wines to differentiate themselves from more efficient and larger producers (Oczkowski, 1994). Consistent with previous research (e.g., Benjamin and Podolny, 1999; Scott

Morton and Podolny, 2002), to reflect the firms' size, we used the STORAGE capacity of the winery (in liters). Note that wineries can purchase a significant portion of their grapes from independent growers, so the extension of vineyards held by the chateaux may not be indicative of its size (scale of production).

Instrument variables. The purpose of the following variables was to account for potential endogeneity problems. To this end, we measured the vineyard hectarage owned by the wineries (HECTARE). We also controlled for whether the winery produced wines from various geographical indications (MULTI-GIs, coded 1) or was registered exclusively under one GI (coded 0). These variables are discussed in greater detail below.

Table 3 shows a summary of the main descriptive statistics obtained for each of the predictors and the dependent variable, as well as their correlations.

Table 3: Means, standard deviations, and correlations among variables

Variable	Mean	S.D.	Correlations[(a)]						
			1	2	3	4	5	6	7
1. QUALITY	82.80	4.197	1	-0.452**	0.181**	0.108	-0.215**	-0.322**	0.007
2. CO-OPERATIVE	0.33	0.471	-0.452**	1	-0.100	-0.112*	0.209**	0.472**	-0.142*
3. QDO	0.23	0.419	0.181**	-0.100	1	0.008	-0.105	-0.158**	-0.224**
4. EXPERIENCE	48.02	49.751	0.108	-0.112*	0.008	1	0.059	0.080	0.050
5. STORAGE Capacity	4,871,420	15,007,433	-0.215**	0.209**	-0.105	0.059	1	0.594**	-0.033
6. HECTARES	551.19	1193.270	-0.322**	0.472**	-0.158**	0.080	0.594**	1	-0.059
7. MULTI-GIs	0.17	0.375	0.007	-0.142*	-0.224**	0.050	-0.033	-0.059	1

N: 273

[(a)] Correlation statistically significant at * p<0.05; **p<0.01

4. Analysis and results

We tested our hypotheses with a regression involving the moderating effect of the governance form (co-op vs. IOF) on the relationship between GI certification (*Q*DO vs. PDO) and quality performance (See Equation [2] below)[8].

An important concern in this model is sample selection bias. The idea that organizational decisions are endogenous to their expected performance outcomes (Hamilton and Nickerson, 2003; Masten, 1996; Shaver, 1998) is a recurrent issue in studies analyzing governance mode choice. Here, wine producers might anticipate co-operative conflicts and self-select into governance structures (co-ops vs. IOFs) depending on their quality orientations. Similarly, the decision to join a co-op might be related to the farmer's characteristics and his expectations of how this choice will affect future profits. Because such choices are made systematically and not randomly, standard OLS estimates of the effect of ownership structure on performance can lead to biased coefficients.

To address the potential for sample selection bias, we used a two-step correction procedure based on Heckman (1979). The first step involved estimating a treatment model to describe the self-selection decision (Equation 1). The equation of interest (Equation 2) was then estimated after being adjusted for self-selection from the first equation. Maddala (1983, p. 122) and the Stata manual (v4, p. 282) show the likelihood function of this model.

The treatment equation in this study is a probit model that predicts the probability of establishing either a co-operative (value 1) or an IOF (value 0) as follows:

[8] In regression [2], because the interaction term involves a dummy variable (*CO-OPERATIVE*), the main effect of the regulation provided by GI standards is interpreted as its effect on the control group (i.e., the group of IOFs). To test the main effects of the GIs' certification system in the Co-op group, we re-estimated this regression using the reverse coding of the co-op dummy (IOF) (see the right side (b) of Table 4).

$$COOPERATIVE_i = \beta_0 + \beta_1 MULTI\text{–}GIs_i + \beta_2 HECTARES_i + \\ + \beta_3 QDO_i + \beta_4 EXPERIENCE_i + \beta_5 EXPERIENCE^2{}_i + \beta_6 STORAGE_i + v_i \quad [1]$$

The specification of the main equation (for quality performance determinants) is

$$QUALITY_i = \alpha_0 + \alpha_1 COOPERATIVE_i + \alpha_2 QDO_i + \alpha_3 COOPERATIVExQDO_i + \\ + \alpha_4 EXPERIENCE_i + \alpha_5 EXPERIENCE^2 + \alpha_6 STORAGE + \mu_i \quad [2]$$

Econometrically identifying Equation [1] requires introducing at least one instrument not considered in the performance regression into the treatment regression. Specifically, we used (1) HECTARES and (2) MULTI-GIs as instruments for the endogenous variable (*co-operative*). A leading factor explaining the association of farmers in a co-operative is gaining enough scale to counterbalance the market power of the processor and marketing firms and to provide growers with better prices (Tennbakk, 2004). In reality, agricultural co-ops are considered a form of downstream vertical integration into processing activities that allows farmers to benefit from collective action (Staatz, 1987). Wine co-operatives are owned by numerous independent farmers (vineyard proprietors) who supply wine-grapes to the winery. Simultaneously, the co-op is obliged to process all its members' supplies, which diminishes its dependency on external sourcing. In contrast, investor-owned wineries are not committed to vertically integrating backward into agricultural production, that is, because internal grape-growing is not an inherent characteristic of IOFs, they could easily outsource most of their supplies to external vineyards (vine growers) if necessary. Additionally, vineyard holdings have traditionally been highly fragmented into small-scale farming in Spain, so there are relatively few large landholders owning great extensions of land (78% of Spanish vineyard holdings are under 1 ha). This fragmentation has made the transmission and concentration of large extensions of land-ownership into the hands of a single firm more difficult (e.g., Allen and Lueck, 1998). Nevertheless, co-op organizations do not face such difficulties. The co-op organization constitutes an easy

way to concentrate and control large extensions of vineyards under a single winery because it does not require formal land transfers from numerous (and small) vineyard holdings. By definition, under a co-op, the land proprietors (grape growers) *collectively* own the winery, which will pool their resources and control their production. In summary, because co-ops are likely to be more vertically integrated into grape-growing and can concentrate large extensions of vineyards more easily than IOFs, HECTARES was used as an instrument for the endogenous variable (CO-OPERATIVE).

Regarding the second instrument, MULTI-GI, it is expected that conflicts among co-operative members over different pricing policies make it more difficult for co-op organizations to qualify for various GIs. If the co-op had established different prices for the grapes (e.g., depending on their geographical certification), less favored members would probably complain about favorable treatment toward better-paid farmers. Less-favored growers will try to pool revenues and establish a uniform pricing rule (i.e., dependent on the amount of grapes delivered instead of the real market value of grapes), which is likely because the farmers are the proprietors and co-operative democratic principles could allocate the majority of voting rights to lower-paid and/or less-value-adding farmers. In this case, producers of most valued GIs will eventually leave the co-operative. In contrast, the *product diversification strategy* of an investor-owned firm is less dependent on its current sources of supply and their specific (and heterogeneous) interests (i.e., grape-growers cannot interfere with winery strategies). As a result, producing wines from different geographical areas of origin (MULTI-GI) is expected to be less costly and less problematic for IOFs than for co-ops.

Regarding the control variables, we expect a non-linear effect of the EXPERIENCE variable, reflecting the need for time to develop the resources and know-

how required for production. Thus, a squared term for the age variable (EXPERIENCE^2) was introduced into the models together with its direct effect.

Regression results

Table 4 shows the results of the quality performance equation estimations of two different models. Model 1 examines the direct effects of geographical certifications (*Q*DO vs. PDO) and governance structures (co-ops vs. IOF) on quality (basic model), and Model 2 analyzes the moderating effect of governance on GI effectiveness. We also distinguish between the left-side (a) models estimated using the CO-OPERATIVE dummy and the right-side (b) models, which are re-estimations of these regressions using the reverse coding of the co-operative variable (i.e., IOF). Overall, all models have significant Wald Chi-squared statistics**.**

While not our focus per se, the first columns show the results for the treatment regression (CO-OPERATIVE and IOF models). Both HECTARES and MULTI-GIs are significant and have the expected sign on ownership structure, indicating that it is possible to use the treatment effect (Heckman's model)[9]. The likelihood ratio test indicates that Rho estimates are significantly different from zero in all models, suggesting that the equations are not independent because bias selection is statistically significant. Therefore, the treatment effect model is appropriate[10]. Finally, the variance inflation factor (VIF) test did not show any collinearity problems between variables, namely, it did not exceed the cut-off point of 10 (Hair et al., 1995) (the maximum value is 3.64).

[9] These variables have no effect on quality performance, which reinforces the argument that these variables predict ownership structure but not quality performance. Results are available upon request.
[10] This ratio test is a comparison of the joint likelihood of an independent probit model for the selection equation and a regression model for the observed data against the likelihood of the treatment effect model (Guo and Fraser, 2009, p. 103).

Turning to the hypothesis tests, first, it must be noted that the coefficient for *Q*DO is positive and significant (β= 1.2017, $p < 0.05$), as seen in Model 1 (Table 4). This result supports the first hypothesis that firms producing under more stringent GIs are positively associated with higher quality performance. That is, producers with a *Q*DO obtain better overall scores for their wines than wineries applying for less stringent certifications (PDOs), which suggests that stricter geographical certifications may ensure better coordination among the supply chain actors, leading to higher levels of quality.

The parameter for the CO-OPERATIVE variable is also significant and, as expected, negative (Table 4, left side, Model 1a: β= -4.7855, $p < 0.01$)[11]. This result supports hypothesis 2, suggesting that the co-operative form of governance significantly lowers the average quality of bottled wines. Specifically, it points to the hypothesized difficulties of agri-food co-ops compared to investor firms in providing correct incentives for quality (e.g., potential free-riding problems among members and underinvestment or horizon problems).

The results also support hypothesis 3, which establishes that the effectiveness of GIs (in enhancing quality) depends on their fit with the governance form of the value chain. The positive and significant coefficient of the interaction term *Q*DO×CO-OPERATIVE (Table 4, left side, Model 2a: β= 1.9709, $p < 0.1$) indicates that more stringent GIs are particularly useful under a co-operative organization; namely, GIs' positive payoffs are intensified under this governance structure.

Moreover because the interaction term involves a dummy variable for the governance structure, the effect of adopting more stringent certifications (*Q*DO) on the

[11] Obviously, this parameter has the opposite sign when we run the model with the IOF dummy (Table 4, right side, Model 1b).

dependent variable for the two governance forms (Co-ops and IOFs) can be observed separately. The main effect of *Q*DO on quality cannot be interpreted for the full sample of firms when the interaction term is included in Model 2. The estimated coefficient for *Q*DO must be interpreted as the effect of this variable on the control group: the group of IOFs on the *left side* of Model 2a and the group of the co-operatives on the *right side* of Model 2b. While *Q*DO has a positive effect on quality within the co-op group (Table 4, right side, Model 2b: $\beta = 2.6661$, $p < 0.01$) – supporting the idea that belonging to the most stringent GIs is beneficial for co-operatives in terms of quality performance – *Q*DO has no significant effect on quality among the group of IOFs (Table 4, left side, Model 2a: $\beta = 0.6952$, $p > 0.05$).

Table 4: Regression models

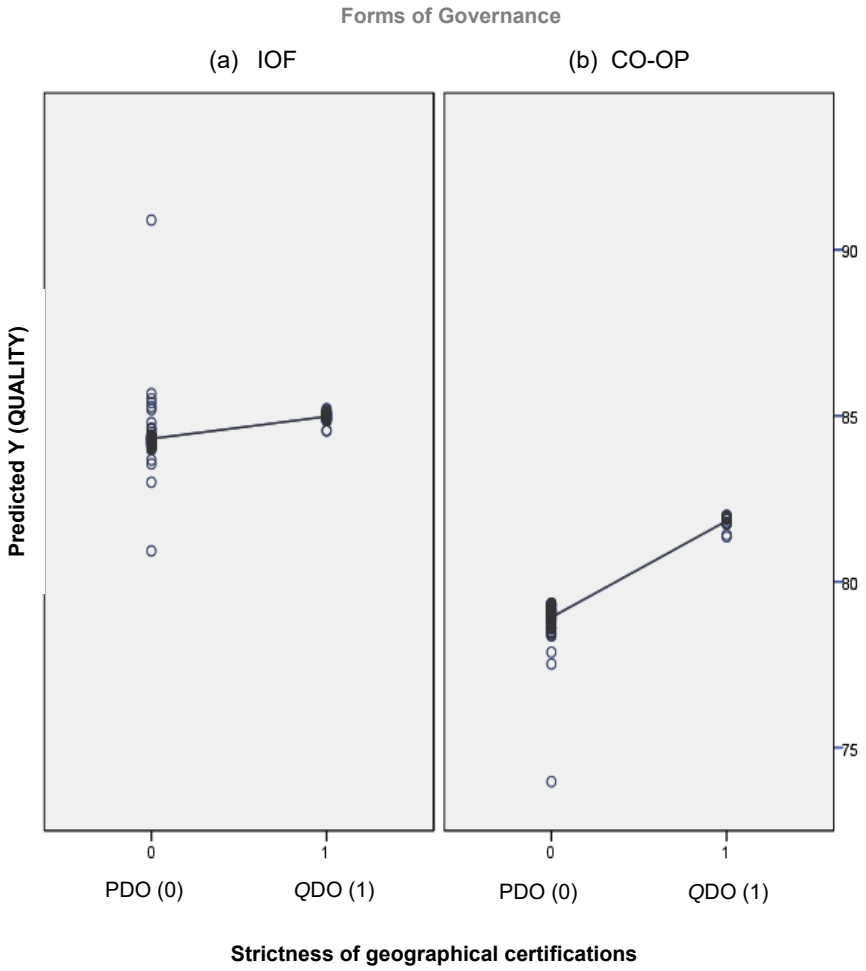
(a) Model using Co-operatives dummy			
Dependent variable	CO-OPERATIVES	**Model 1a** QUALITY (basic model)	**Model 2a** QUALITY (interactive effects)
(Constant)	-1.2355*** (-6.03)	84.3928*** (197.49)	84.4234*** (198.92)
***Q*DO**	-0.1113 (-0.53)	1.2017** (2.44)	0.6952 (1.24)
Co-operative		-4.7855*** (-6.98)	-5.0406*** (-7.23)
Co-operative x *Q*DO			1.9709* (1.80)
Experience	0.0384*** (3.80)	-0.0086 (-1.11)	-0.0070 (-0.91)
Experience^2	-0.0004*** (-3.86)	5.54e-05* (1.96)	5.14e-05* (1.82)
Storage capacity	-2.36e-08*** (-3.53)	-2.77e-08* (-1.92)	-2.65e-08* (-1.85)
Hectares	0.0012*** (5.98)		
Multi-GIs	-0.7723*** (-2.83)		
N		327	327
Wald test		93.99***	98.55***
Rho		0.3084** (2.35)	0.2758** (2.09)
LR test of indep. eqns. (rho = 0)		5.55**	4.40**

(b) Model using IOFs dummy			
Dependent variable	IOFs	**Model 1b** QUALITY (basic model)	**Model 2b** QUALITY (interactive effects)
(Constant)	1.2355*** (6.03)	79.6072*** (137.46)	79.3828*** (134.85)
***Q*DO**	0.1113 (0.53)	1.2017** (2.44)	2.6661*** (2.81)
IOF		4.7855*** (6.98)	5.0406*** (7.23)
IOF x *Q*DO			-1.9709* (-1.80)
Experience	-0.0384*** (-3.80)	-0.0086 (-1.11)	-0.0070 (-0.91)
Experience^2	0.0004*** (3.86)	5.54e-05* (1.96)	5.14e-05* (1.82)
Storage capacity	2.36e-08*** (3.53)	-2.77e-08* (-1.92)	-2.65e-08* (-1.85)
Hectares	-0.0012*** (-5.98)		
Multi-GIs	0.7723*** (2.83)		
N	327	327	327
Wald test		93.99***	98.55***
Rho		-0.3084** (-2.35)	-0.2758** (-2.09)
LR test of indep. eqns. (rho = 0)		5.55**	4.40**

Interaction graphs

In order to reinforce the above results, we plotted the interaction effect in Figure 1. The figure shows two coordinate axes, (a) and (b), for the relationship between geographical certifications (the *x*-axis) and quality performance (*y*-axis), one for each value of the moderating variable (governance structure).

Figure 1: Interaction effect of governance (Co-op vs. IOF) and geographical certifications (QDO vs. PDO) on quality performance



As seen in the Figure 1, the co-operative form of governance always performs worse than IOFs in terms of quality (H2) – i.e., the co-ops' predicted quality scores in axis (b) are clearly below the IOFs' predicted quality scores in axis (a). Figure 1 also shows how most stringent geographical certifications (*Q*DO) help to lower quality

dispersion – i.e., the variance of predicted quality scores is much lower under a *Q*DO, regardless of the governance form. However, the figure shows that the *Q*DO's positive impact on quality (H1) is more positive under co-ops (shown as a higher slope in the co-op curve) (H3). Moreover, the average quality of IOFs (approximately 84.5) does not seem to be significantly affected by the type of GI in which the wineries are registered, which reinforces that while co-operative organizations benefit from producing under a *Q*DO, IOFs do not.

The STORAGE capacity variable has a negative and significant effect in all models, which means that as the winery's size increases, the average quality of the bottled wines decreases. This result is consistent with the idea that small producers tend to specialize more in high-end wines to differentiate themselves from larger producers (Oczkowski, 1994).

Finally, the EXPERIENCE variable shows a negative and significant sign, as well as a non-linear effect, in all models. This result reflects the presence of a learning effect in the wine industry and the need for a minimum level of expertise to be able to (begin to) produce and commercialize wines with acceptable levels of quality.

5. Discussion and conclusions

Our study contributes to the contingency theory of QM (Sousa and Voss, 2008) and the organizational economics literature (e.g., Gibbons and Roberts, 2013) by investigating the various linkages among the effectiveness of quality certifications, the governance structure of agri-food chains and quality performance in the wine industry.

The study first clarifies the dubious effectiveness of GIs in promoting and enhancing agri-food quality (Josling, 2006), specifically tackling the question of how geographical certifications may influence the final quality of products (i.e., wine)

depending on their strictness. In this regard, our findings support that most stringent certification standards (i.e., *Q*DO requirements in the wine sector) can actually help firms to improve final quality (H1). In fact, the empirical results show that the most demanding GIs are able to reduce quality variance and increase quality scores of their final products (i.e., bottled wine). The paper, then, points to the capacity of GIs to improve quality performance by encouraging chain-wide adaptations to quality demands (Wever et al., 2010) and furthermore notes the potential of GIs as an effective knowledge-sharing network (Dyer and Nobeoka, 2000) that facilitates valuable knowledge transfer among GI members to improve quality (through the control routines developed by their official control bodies). Although we cannot check it directly, this quality improvement effect goes against the assertion that GIs act as a bureaucratic burden that restrains innovation and product enhancement.

Second, the study builds on contingency theory to develop a deeper understanding of the effectiveness of quality certifications. Research in this stream has suggested that firms cannot simply select some quality management practices (e.g., those supported by the GIs) and expect to realize the full benefits of implementing them because they are context specific (e.g., Das et al., 2000; Lo et al., 2013; Sousa and Voss, 2001, 2008; Zhang et al., 2012; Zhao et al., 2004). Our work supports this idea and extends prior research by incorporating the supply chain governance structure (co-operative vs. IOF) as a relevant QM variable with both direct and contingent effects on quality performance. In this regard, we contribute to the literature in two ways.

We first address the direct effects of supply chain governance on quality by examining how co-operatives, which are characterized by a downstream vertical integration of suppliers (farmers) into processing activities, may hinder the delivery of superior products (i.e., high-quality wines) (H2). Our empirical results are consistent

with the organizational economics literature and the premise that the lack of ownership specialization and the incentive structure of co-operatives increase their vulnerability to free-riding problems (e.g., Cook, 1995; Fulton, 1995; Nilsson et al., 2012; Rao and Neilsen, 1992; Rey and Tirole, 2007) and complicate the provision of efficient incentives for quality improvement (e.g., Pennerstorfer and Weiss, 2013; Saitone and Sexton, 2009). In contrast, IOFs overcome such problems more easily because they can arrange hierarchical controls over their internal supplies or, alternatively, use the reputation of external (independent) suppliers as an effective market safeguard against quality cheating more effectively (with lower costs). In fact, after controlling for selection bias problems and other meaningful factors, such as winery size, experience and geographical location, our results show that compared to IOFs, co-operative organizations have a significantly lower average quality of bottled wines.

This outcome also suggests that informal controls based on the co-operative's social capital are insufficient to restrain free-riding among wine co-operative members. The incentive and disciplinary roles of social norms, as a relational governance mechanism, are central to many literatures (e.g., Granovetter, 1985, 2005; Gulati and Nickerson, 2008) and particularly constitute an important strand of the literature on co-operatives (e.g., Nilsson et al., 2012; Österberg and Nilsson, 2009; Valentinov, 2004). This literature highlights that co-operative principles (philosophy) are grounded on mutual aid and co-operation to enhance business success. Furthermore, they assume that co-operative members have a vested interest in their organization, which creates a specific co-operative social capital able to guarantee the provision of product quality (e.g., Cechin et al., 2013). However, our study suggests that, when there are high measurement problems and quality becomes non-contractible, namely, when the design of formal incentives becomes too costly, as with the production of top-quality wines

(Goodhue et al., 2003; Vagnarelli, 2000), the co-operative's social norms cannot control for free-riding (quality cheating).

In addition to describing the direct effect of governance structure on quality, our research also highlights the moderating role that such governance structures (co-op vs. IOF) may play in determining the effectiveness of quality certifications (GIs) (H3). In this regard, the results of our contingent model indicate that the relative benefits of the most stringent quality standards (i.e., those promoted by the *Q*DO in the wine sector) for improving final quality are intensified under the co-operative governance form. In contrast, these benefits are insignificant under those governance solutions less exposed to free-riding and collective action problems, such as IOFs.

Overall, focusing on supply chain governance as a moderating variable heeds calls from the contingency literature to identify key variables not expected to be highly correlated to contextual factors addressed in previous studies (e.g., national and industry context, firm size, age or strategic orientation) (Sousa and Voss, 2008) and contributes to a greater understanding of the nexus between organizational economics and operations quality management. In fact, our findings indicate that operation management efforts to design and implement quality standards should also consider the governance context in which they will be applied because it can make these norms more or less valuable. In reality, there are scenarios (e.g., co-ops) in which those norms are more valuable.

The results also point to several **managerial implications** for the wine industry. Although co-operative firms account for a large share of the wine market in the leading wine-producing countries, they face an important challenge as customers' preferences evolve towards high-quality wines. Our results suggest that co-ops possess an important

organizational disadvantage because they must overcome both collective action and a lack of specialization problems, which are smaller in IOFs and undermine quality. However, this limitation can be substantially alleviated by *the most demanding GIs*. Our results support that these GIs effectively enhance quality performance in co-ops. The decision to join a GI remains the managers' responsibility.

Second, GIs affect corporate governance by introducing an independent quality control that forces all participants to fulfill the GI's norms and standards. According to our results, this quality control improves co-ops' quality performance, which indicates that co-op managers must find external norms and standards that allow them to force co-op members to comply with quality standards. In short, co-ops' quality controls cannot guarantee the output quality by themselves, either because co-ops' internal controls do not discipline enough or because co-op managers do not have enough authority to enforce them, while GI quality controls can do so. Any quality norm is therefore likely to help them and might yield substantial improvements.

Notably, even though GI systems are pervasive in the European wine industry, according to some studies (e.g., Gamble and Taddei, 2007), their dominance is challenged by non-PGI products that emphasize grape varietals, wineries' skills and brand differentiation at the firm level, rather than geographical labeling. Consistent with our results, however, the co-branding strategy resulting from adding a protected geographical indication to the firm's brand name remains of particular interest for the co-operative organization. In contrast, adding stronger public GI controls over production might not produce sufficient benefits to justify the additional organization and production costs for investor-owned wineries. Notice, in any case, that we consider only potential benefits in terms of quality performance improvements. That is, our study does not address other performance measures.

Our study does not come without **limitations**. First, to analyze the performance of co-operatives in comparison with IOFs, future research should take into account additional and complex alignments between external quality certification mechanisms (e.g., those provided by GIs) and the new internal governance mechanisms designed by co-operatives (new co-op models). That is, the co-op structure and the IOF have been analyzed as polar forms of organization. However, new co-op models that depart from the traditional co-op structure and principles may relax some of its disadvantages (Chaddad and Cook, 2004) and, thus, their moderating role on GIs' effectiveness.

Second, we focused on two types of geographical indications, namely, qualified versus protected designations of origin (*Q*DOs vs. PDOs). Further research is needed to document the comparative influence of (1) registering under the third level of geographical protection that characterizes the European wine industry: the PGI (protected geographical indication) and (2) not registering under any GI.

Finally, focusing on a single industry may limit generalizability. Future empirical research may explicitly address how the specificities of different supply chains belonging to different industries may alter our results.

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