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Article

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The determinants of voluntary traceability standards. The case of the wine sector

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Abstract

The aim of this paper is to study the determinants leading firms to choose among different kinds of voluntary traceability standards in the wine sector. To achieve this goal, we referred both to individual and institutional-level determinants, which are identified to play an important role in the literature related to the implementation of quality and safety standards. In specific, we referred to two theoretical approaches to better understand the industry behaviour towards the adoption of voluntary traceability, i.e. the Theory of Reasoned Action and the Institutional Theory. We developed a vis-à-vis survey through a questionnaire on a sample of Italian wineries approached during the most important Italian wine exhibitions in 2016. The results suggest that when wineries show positive cognitive beliefs towards voluntary traceability standards, they will probably implement complex traceability systems, which require high investments and efforts for their management. On the contrary, when the institutional environment plays a key role in the perception of wine processors, a simple and flexible traceability system seems to be preferred. © 2018 UniCeSV, University of Florence. Production and hosting by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Keywords: Voluntary traceability standards; Institutional determinants; Cognitive determinants

1. Introduction

The aim of this paper is to study the determinants of leading firms to choose among different kinds of traceability standards in the wine sector. This research aim finds support in the growing number of unfair practices affecting food supply chains, which raise the need to better manage the negative economic consequences affecting the efficacy of related economic activities (Manning and Soon, 2016; Tähkää et al., 2015). For example, the counterfeit of thousands of bottles of Brunello di Montalcino and Chianti, which were recently falsely labelled with geographical indication of origin, or the frauds concerning high-quality brands, such as Moët & Chandon, highlight the necessity of wineries to adopt efficient

systems able to manage quality risks and liabilities within the supply chain.

Traceability standards are among the instruments that can be used to foster the efficiency of vertical relationships within supply chains (Stranieri et al., 2017a, 2017b). Such schemes have been introduced both by public and private institutions in the EU. At the public level, traceability has become mandatory by Reg. 178/2002, and it is applied to all agri-food products, including wine. Voluntary traceability standards do not replace mandatory traceability, but they are usually used by wineries as instruments to accomplish quality requirements of supply chain agents or as instruments to better coordinate vertical relationships through an improved transaction transparency compared to mandatory traceability. Mandatory traceability relates to simple procedures with main the aim to identify the agents who are part of a certain supply chain; however, it does not allow an efficient increase of supply chain transparency that is better able to allocate liabilities among transacting parties. Voluntary traceability standards have been introduced

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to decrease information asymmetry among the supply chain partners and to increase product quality management.

The transparency provided by these standards depends on the traceability systems implemented by food firms. Indeed, the level of supply chain transparency delivered by the systems differs on the basis of the level of the traceability complexity implemented; that is on the kinds of rules and procedures adopted (Stranieri et al., 2017).

The recurrent frauds and misleading information characterizing the wine market have led wine operators to introduce voluntary traceability systems to determine the varietal origins of wines and reducing opportunistic behaviour among supply chain agents (Villano et al., 2017). Wine traceability is one of the biggest challenges for Italian wineries, which are among the world's largest producers of high-quality wine (Recupero et al., 2013). Wine operators have begun to implement innovative traceability tools to protect their reputation against the negative monetary consequences of counterfeit wines and to strengthen brand equity (Wang et al., 2017). In the wine sector, there are different kinds of voluntary traceability, such as, for example, the ISO 22005 and the private standards that are implemented by operators, like wineries or retailers. The complexity of the standard implemented does not depend on the type of standard applied but it relates mostly to firms' strategic decisions on the rules to be implemented.

Current debate on voluntary standards in the wine sector has mostly investigated the motivations and the consequences associated with the implementation of such systems. The increase of the opportunities to enter new markets, the improvement of business performances, and the augmentation of product quality control have been identified as consequences of the implementation of voluntary quality standards in the wine sector (Aggelogiannopoulos et al., 2007; Giacomarra et al., 2016). With regards to the motivations affecting wineries' decisions to implement voluntary quality standards, most of the studies identify the internal business environment, namely, firm internal efficiency, and external business factors, such as, for example, customer requirements, as leading drivers for the adoption (Kafetzopoulos and Gotzamani, 2014; Corsinovi and Gaeta, 2017).

To the best of our knowledge, there is still a gap in the literature related to the motivations affecting wineries to choose from different kinds of voluntary standards. In regards to voluntary traceability, wineries can choose from different kind of systems. The more complex the traceability is, the higher the costs associated with its implementation (Asioli et al., 2014). The proliferation of different traceability systems in the wine sector is not easily predictable, and it raises questions on the firm strategic decisions on the type of traceability system to be adopted. Current traceability-related literature has been discussing the most efficient analytical methods to improve wine traceability (Catalano et al., 2016; Geana et al., 2016; Versari et al., 2014). According to Karlsen et al. (2013), there is still a little understanding of firms' strategic behaviour on the kind of traceability to adopt and a need to conceptualize further on the mechanisms leading

firms to choose among different traceability rules and procedures.

To fill this gap, we analysed the influence of both the individual- and institutional-level determinants on firms' strategic decisions to implement traceability standards. Such determinants are identified to play an important role in the literature related to the implementation of quality and safety standards (Marshall et al., 2005). More precisely, individual determinants involve mostly cognitive factors related to firms' behaviours, namely, firm attitude towards a strategic decision or the influence of stakeholders' opinions that can influence firm strategic decisions. Institutional drivers consider all the factors of the institutional environment that are independent from firms' behaviours, and they can influence firms' strategic behaviours, namely, the regulatory framework, the characteristics of the market in which firms operate, and so on.

To conduct the analysis, we referred to two theoretical approaches to better understand the industry's behaviour towards the adoption of voluntary traceability; i.e. the Theory of Reasoned Action (Ajzen and Fishbein, 1980) and the Institutional Theory (Scott, 2001).

The paper is organized as follows: Section 2 describes the two theoretical approaches, Section 3 focuses on the methodology, and Section 4 deals with the results. The concluding remarks are drawn in the final section.

2. Conceptual framework

2.1. The economic implications of traceability systems

There are two different kinds of traceability systems (Stranieri and Banterle, 2017):

- the supply chain traceability system, and
- the supply chain and product traceability system.

Supply chain traceability aims at identifying the economic agents of the supply chain. This system is mandatory in Europe. The main purpose of such a system is the enhancement of food safety. However, this system does not allow an association of the traced information with a specific product, and it does not provide a reconstruction of the product's history. On the other hand, supply chain and product traceability refer to more complex systems. This is characterized by the management of raw materials and products in separate batches and by procedures that attribute specific information to each single batch.

According to Golan et al. (2004), different traceability systems can be distinguished on the basis of their breadth, depth, and precision. Breadth relates to the information recorded by the traceability system. Depth involves the sectors of the traced chain. Precision is associated with tracking unit dimension. Moreover, McEntire et al. (2010) introduced the traceability speed to describe the difference between traceability systems. The speed relates to the effectiveness of traceability in transferring the information traced.

The higher the breadth, depth, precision, and speed of the system implemented, the higher the costs for its implementation and the complexity of the procedures associated with the standard. Also, the economic effects of supply chain and product traceability will depend on the kind of system implemented, and it concerns three main aspects: food safety, food quality, and vertical coordination in the food supply chain.

With regards to food safety, in the case of food contamination, voluntary traceability allows the efficient management of the withdrawal of tainted batches through a more precise separation of batches compared to public standard (Banterle and Stranieri, 2008). The benefits related to improved food quality refer mainly to the guaranteeing of quality standards for food products through an augmentation of specific production rules and controls (Holleran et al., 1999). Moreover, voluntary traceability systems lead to the reorganisation of the vertical relationships along the food supply chain (Stranieri et al., 2016). According to Karipidis et al. Karipidis et al. (2009), the decision of the firm to implement a voluntary quality standard is related to the balance of the costs and benefits of the standards. When benefits are higher than the costs, the firm will adopt the standard. In the case of traceability standards, firms can estimate the costs associated with different kinds of traceability standards, but the benefits associated with these schemes are difficult to calculate. Indeed, the strategic decision on the kind of traceability to implement will depend on drivers, which lead firms to perceive the benefits associated with these kinds of systems. Such determinants need still to be investigated.

2.2. An integrated theoretical approach

Over the last decades, several studies have discussed the importance of integrating different theoretical approaches to better conceptualize the determinants of firms' strategic behaviours on standard adoption. Our analysis takes its cue from two different conceptual perspectives, which allow us to investigate both the individual and the institutional dimensions of wineries' strategic decisions; i.e. the Theory of Reasoned Action (Ajzen and Fishbein, 1980) and the Institutional Theory (Scott, 2001).

The two theoretical frameworks that we considered in our investigation differ in terms of unit of analysis. The Theory of Reasoned Action relates to a psychological framework that analyses cognitive drivers of individual behaviour, namely, the cognitive drivers of firm strategic decisions. The Institutional Theory analyses the influence of the institutional context in which firms operate (e.g. regulatory framework, market forces, etc.) on firm strategic decisions. In the Theory of Reasoned Action, the focus is on the individual drivers (i.e. psychological drivers) of firms' strategic decisions. In the Institutional Theory, the focus is on institutional drivers (i.e. factors that cannot be directly managed by wineries) of firms' strategic decisions.

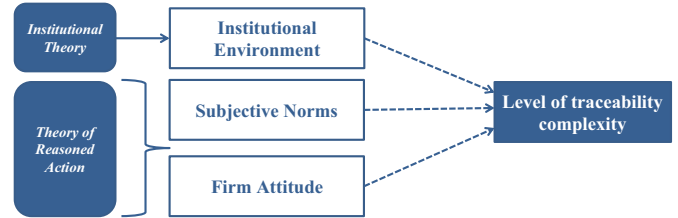


Fig. 1. Conceptual design.

Source: Own adaptation based on the economic theory.

In specific, we analysed wine producer behaviour towards traceability adoption by considering both individual and institutional-related drivers (Fig. 1).

2.3. The Theory of Reasoned Action

The Theory of Reasoned Action originates in the social psychology and has been successfully applied in different scientific fields to predict and explain individuals' behaviours (Head and Noar, 2014; Mishra et al., 2014; Paul et al., 2016). With regards to the food sector, the Theory of Reasoned Action and its theoretical developments have been applied to interpret consumer behaviour (Nuttavuthisit and Thøgersen, 2017; Maichum et al., 2016). Only a limited number of studies have already used such a framework to investigate the role of the cognitive processes of firms, even if the key role of firm attitudes on the creation of their strategic decision-making process is well recognized (Schlecht and Spiller, 2012). The Theory of Reasoned Action provides a useful theoretical framework to study the role of individual attitudes towards behaviours. According to such an approach, the most important drivers of an individual's behaviours are attitudes towards performing the behaviour and subjective norms.

Attitudes refers to the level of appraisal on a certain behaviour; i.e. the degree to which the person has a favourable assessment of the behaviour of the object of analysis. According to the theory, the higher the level of appraisal towards a certain behaviour, the higher the motivation of individuals to perform a certain behaviour.

Subjective norms relate to the social pressure perceived by individuals with regards to a certain behaviour. With regards to food-based firm behaviour, subjective norms refer to the level of importance which firms give to the expectations of stakeholders in relation to a certain behaviour, such as, for example, the adoption of quality and safety standards. On the basis of the Theory of Reasoned Action, the higher the level of importance perceived on the role of social actors, the higher the probability to comply with a certain behaviour.

In the food-related literature, Mattevi et al. Mattevi and Jeffrey (2016) found food-based firms' attitudes towards the adoption of traceability to be among the drivers affecting traceability's implementation. Heyder et al. Heyder et al. (2012) demonstrated a significant link between the social pressure perceived by firms and their willingness to invest in tracking systems. Moreover, Yapp et al. Yapp and Fairman (2006) highlighted how food-based firms' lack of motivation

Table 1
Variables description.

Variable	Variable description	N	Min.	Max.
LEVEL OF TRACEABILITY				
Size of product recall	Voluntary traceability allowed a reduced size of product recall (from strongly disagree = 1 to strongly agree = 5)	39	3	15
Speed of information traced	Voluntary traceability increased the rapidity of information exchanged within the food supply chain (from strongly disagree = 1 to strongly agree = 5)	39	1	5
Informaion traced	Voluntary traceability increased the traced information about quality characterisitics of raw materials and suppliers characteristics (from strongly disagree = 1 to strongly agree = 5)	39	1	5
INSTITUTIONAL ENVIRONMENT				
Compliance with retailer standards	Voluntary traceability was introduced to comply with retailers requirements (from strongly disagree = 1 to strongly agree = 5)	39	4	20
Compliance with stakeholders rules	Voluntary traceability was introduced to comply with stakeholders rules (from strongly disagree = 1 to strongly agree = 5)	39	1	5
Compliance with international public regulation	Voluntary traceability was introduced to comply with international standards (from strongly disagree = 1 to strongly agree = 5)	39	1	5
Future normative requirements	Voluntary traceability was introduced to comply with possible future normative requirements (from strongly disagree = 1 to strongly agree = 5)	39	1	5
SUBJECTIVE NORMS				
Important for consumers	Voluntary traceability was introduced to improve product reputation toward consumers (from strongly disagree = 1 to strongly agree = 5)	39	3	15
Important for retailers	Voluntary traceability was introduced to improve product reputation toward retailers (from strongly disagree = 1 to strongly agree = 5)	39	1	5
Important for suppliers	Voluntary traceability was introduced to improve product reputation toward suppliers (from strongly disagree = 1 to strongly agree = 5)	39	1	5
FIRM ATTITUDE				
Improvement of food quality characteristics	Voluntary traceability was introduced to improve food quality characterisitics (from strongly disagree = 1 to strongly agree = 5)	39	3	15
Improvement of reputation toward retailers	Voluntary traceability was introduced to improve product reputation toward retailers standards (from strongly disagree = 1 to strongly agree = 5)	39	1	5
Improvement of food safety risk management	Voluntary traceability was introduced to improve food safety (from strongly disagree = 1 to strongly agree = 5)	39	1	5

Table 2
Summary statistics. *Source:* Own calculations based on answers to survey

	N	Media	St. Err.	St. dev.	Alpha
LEVEL OF TRACEABILITY	39	9.90	0.60	3.78	0.8
Size of product recall	39	3.51	0.24	1.52	
Speed of information traced	39	3.26	0.25	1.55	
Informaion traced	39	3.13	0.22	1.38	
INSTITUTIONAL ENVIRONMENT	39	9.64	0.97	6.04	0.9
Compliance with retailer standards	39	2.38	0.25	1.57	
Compliance with stakeholders rules	39	2.38	0.24	1.52	
Compliance with international public regulation	39	2.49	0.27	1.68	
Future normative requirements	39	2.38	0.26	1.62	
SUBJECTIVE NORMS	39	8.77	0.45	2.80	0.7
Important for consumers	39	2.90	0.20	1.25	
Important for retailers	39	2.87	0.21	1.30	
Important for suppliers	39	3.00	0.20	1.26	
FIRM ATTITUDE	39	10.08	0.56	3.47	0.8
Improvement of food quality characteristics	39	2.95	0.20	1.28	
Improvement of reputation toward retailers	39	3.49	0.22	1.37	
Improvement of food safety risk management	39	3.64	0.20	1.22	

can represent a barrier in the compliance with food safety standards. Following the Theory of Reasoned Action and existing literature, we expect that attitudes and subjective norms of wine producers towards wine traceability should have an influence on the decision to adopt voluntary traceability schemes.

2.4. The Institutional Theory

The Institutional Theory (Scott, 2001) considers the influence of external pressures on firms' strategic behaviours. The institutional context in which firms operate, such as, for example, the presence of different networks in terms of producers associations, suppliers, trade associations, or community groups, and of regulatory frameworks have been demonstrated to influence firms' strategic behaviours (Henson and Reardon, 2005).

With regards to the impact of the institutional environment on the adoption of quality and safety schemes, Fulponi (Fulponi, 2006) discussed how the growing importance of civil society and the changing legal and institutional frameworks are among the main motivations for the implementation of private standards within food supply chains. Nadvi (Nadvi, 2008) investigated how compliance with international food standards is a prerequisite for firms to access globalized production networks. Tregear et al. (Tregear et al., 2007) explained how the introduction of a regulatory framework on food quality schemes has determined the adaptation of food firm strategies. Codron et al. (Codron et al., 2005) analysed the link between public policy decisions and private initiatives in the retail sector with regards to food safety in the EU. Moreover, Codron et al. (Codron et al., 2014) investigated how the choice of farming practices for fresh agricultural

products depends on several external drivers, such as market forces and public and private safety regulations. Moreover, Naziri et al. (Naziri et al., 2014) demonstrated how collective action influences firms' decisions on the food safety level to adopt it within the vegetable supply chain. Hobbs and Young (Hobbs and Young, 2000) advised the key role of producer commodity groups for the establishment of quality assurance schemes.

Due to the key role of institutional drivers to explain firms' strategic behaviours, the institutional theory allows us to consider the impact of the context within which wine firms are operating on the voluntary traceability implemented.

3. Material and methods

3.1. Questionnaire

We developed a vis-à-vis survey through a questionnaire that was composed of 20 questions, which were arranged on a 5-point Likert scale. The questionnaire was designed in accordance with the dimensions introduced before (level of traceability, institutional environment, subjective norms, and firm attitude) in an attempt to identify exhaustive questions to capture these concepts. The questionnaire was provided only to wineries. The firms were approached during the most important Italian wine exhibitions in 2016 (Vinality and Enovitis). The implementation of voluntary traceability standards was used as recruitment criteria. Indeed, all firms presented at these events were approached (around 4,000 wineries), but only those who implemented a voluntary traceability system were selected to participate to the survey. Among the 100 participants selected, 39 participated. Time constraints certainly affected the willingness of wineries in participating. The total sample of 39 Italian wineries concern mainly firms located in the Northern regions. For each question, interviewees were asked to express a judgment by declaring their level of agreement (from a minimum of 1 and a maximum of 5) with the statements described below (Table 1).

In addition to these questions, we also collected general data from the firms interviewed (number of employees and other certifications implemented by the firm). The sections of the final questionnaire reflected the dimension identified by the conceptual framework: level of traceability, institutional environment, subjective norms, and firm attitude, as described by Table 1.

The questionnaire was structured with different sections. The first section aimed to measure the level of complexity in the voluntary traceability system. To reach this goal, we chose to refer to the traceability dimensions identified by Golan et al. (Golan et al., 2004) and McEntire et al. (McEntire et al., 2010). Following this approach, we identified different items that could be useful to measure the different level of traceability complexity implemented by firms. As shown in Table 1, we took into account three main characteristics: the size of the standard implemented, the speed of the traceability system, and the amount of traced information. The size of a product recall describes the precision of the traceability scheme, the speed

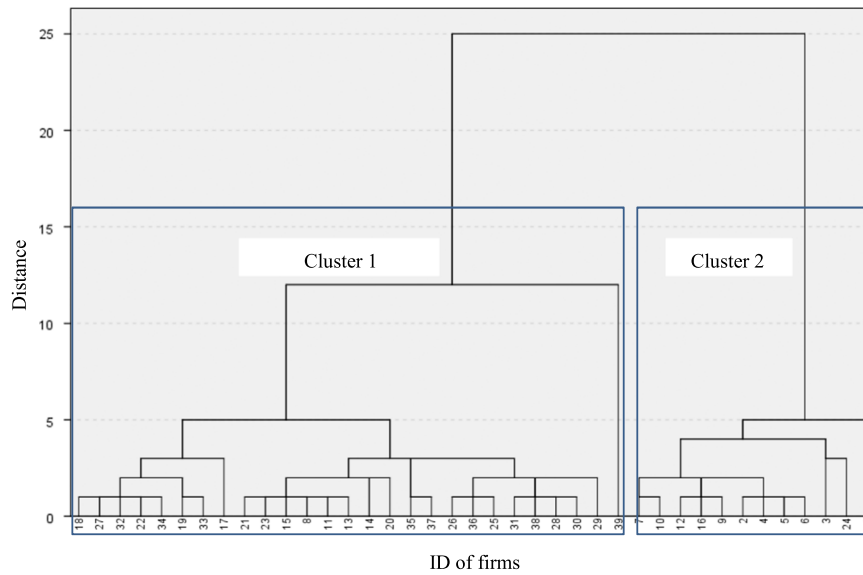


Fig. 2. Cluster dendrogram.
Source: Own calculations based on answers to survey.

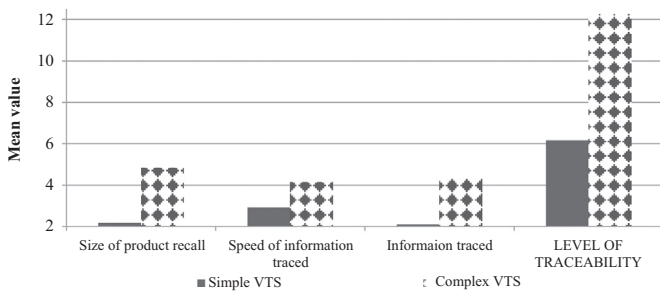


Fig. 3. Level of voluntary traceability complexity.
Source: Own calculations based on answers to survey.

Table 3
One-way Anova estimation. Source: Own calculations based on answers to survey

	Simple VTS	Complex VTS	F	Sig.
LEVEL OF TRACEABILITY	5.67	11.78	49.62	***
INSTITUTIONAL ENVIRONMENT	18.33	5.78	626.60	***
SUBJECTIVE NORMS	6.50	9.78	15.90	***
FIRM ATTITUDE	6.08	11.85	56.73	***

represents the measure of rapidity of the information exchanged within the traced food supply chain, and the information traced is a measure of the breadth of voluntary traceability (Stranieri et al., 2017).

Among the determinants that could affect the choice of different traceability systems, we chose to consider individual- and institutional-level drivers. Among these and starting with the literature, we identified three factors – institutional environment, subjective norms, and attitudinal factors – that correspond to the second, third, and fourth sections of the questionnaire. The institutional environment section was

measured by investigating the compliance with the retailer's private certification requirements, the stakeholders' rules, the international public regulation on certification implementation, and the future normative requirements.

The third section (subjective norms dimension) aimed to investigate the level of agreement about the fact that the implementation of the voluntary traceability scheme was considered important for consumers, retailers, and suppliers.

The firms' attitude towards voluntary traceability standards (fourth section) was measured using three statements. The first one investigated if the implementation of this kind of standard improved food quality characteristics; the second item measured if the voluntary traceability improved the firm's reputation towards retailers; and the third statement was about firm perception on the efficacy of traceability standards on food safety risk management.

3.2. Data analysis

The analysis of data followed different steps. In the first step of the analysis, a questionnaire was set up in accordance with the dimensions mentioned before.

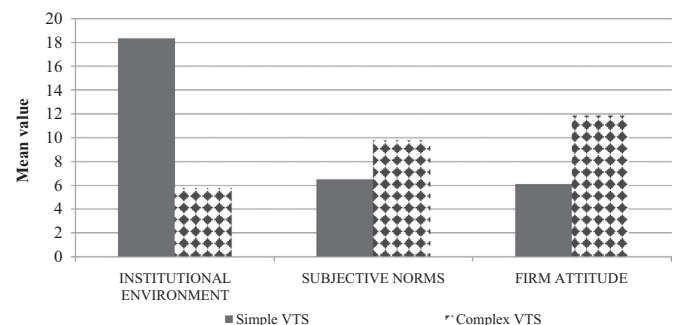


Fig. 4. The determinants of voluntary traceability standards.
Source: Own calculations based on answers to survey

In the second step, a Cronbach's alpha test was used. Cronbach's alpha provides a measure of the internal consistency of a scale, and it is expressed as a number between 0 and 1. This consistency is achieved when the value of Cronbach's alpha exceeds 0.7. The internal consistency indicates how strongly the measured items are holding together in measuring the respective construct. In this research, this test was used to assess the degree to which a single construct (i.e. level of traceability) was properly measured by the items chosen (i.e. size of product recall, speed of information traced, and information traced). This test was used to check the internal consistency of all the indexes used in the analysis (institutional environment, subjective norms, and firm attitude).

In the third step of the analysis, we created four indexes on the basis of the above test. Such indexes represent the sum of the scores that each firm attributed to the following items: level of traceability, institutional environment, subjective norms, and firm attitude. The higher the index score, the higher the level of agreement of those interviewed.

After the creation of the indexes, we conducted a hierarchical cluster using the average linkage method and the squared Euclidean distance as a distance measure. The goal of the cluster analysis was to identify possible subgroups of wineries based on the different dimensions analysed. We chose to use the dendrogram to identify a suitable number of clusters. Indeed, the dendrogram represents a visual tree graph that displays the clustering procedure.

Afterwards, we conducted a one-way ANOVA to test the differences in the mean scores of the variables within each cluster found.

In the last step of the analysis, we analysed the main characteristics of the different firms that take part in each cluster in terms of level of traceability, institutional environment, subjective norms, and firm attitude to compare the different resulting clusters. For each variable of the questionnaire, we calculated the mean of the score for each group of firms.

4. Results

The value of the Cronbach's alpha for each one of the four indexes created, namely 'level of traceability', 'institutional drivers', 'subjective norms', and 'firm attitude', revealed the adequacy of the items chosen for each dimension. Indeed, the four Cronbach's alphas assumed values above 0.70, which can be considered 'acceptable' measures of internal consistency (Table 2).

The cluster analysis identified two different groups of firms. As shown by the dendrogram, the first cluster is composed of 27 firms that reached the highest scores for all the variables concerning the level of traceability (Fig. 2). Following Golan et al.'s (2004) approach, this means a large amount of information is recorded by the traceability system, a significant degree of assurance with which the system can identify products' flows and a high speed of the traced information exchanged. For these reasons, this first cluster was named the complex voluntary traceability standard (Complex VTS), and it

was used to identify a level of system more precise, accurate, and safe with respect to the other. The second cluster collects 12 firms that show low scores in the items that describe the level of the traceability system. Based on these results, we chose to name this second cluster the simple voluntary traceability standard (Simple VTS), and it was used to categorize those firms that implement traceability with few rules (Fig. 3).

A one-way ANOVA confirms the significant differences among the two clusters identified in relation to the variables used for the analysis. More precisely, the average scores of the indexes considered among groups were significantly different (Table 3).

With regards to the institutional environment, the Simple VTS cluster showed high scores in all variables considered. In specific, the questions investigating the firm's compliance with normative rules, such as retailer standards, stakeholder procedures, and public regulation, show a mean value above 5. Such a result suggests that when firms adopt simple traceability systems, they consider the institutional environment an important determinant. The compliance with normative rules leads firm to implement traceability standards which can be easily managed on the basis of the changes in the institutional framework (Fig. 4).

With regards to the subjective norms, the data revealed that firms that implement Complex VTS find the social pressure played by consumers, retailers, and suppliers important. In this case, we could suppose a direct link between the subjective norms and a firm's decision to apply complex traceability standards in the wine sector.

With regards to firms' attitudes towards VTS, results show that firms that consider the implementation of voluntary traceability important to improving the quality characteristics of food products, to increasing the reputation towards retailers, and to improving food safety risk management are more likely to apply a more complex traceability system.

The results achieved in the analysis add to the existing literature by highlighting that firms' decisions to implement complex traceability systems could be influenced mostly by the variables affecting the cognitive decision-making process of firm management. More precisely, the positive attitude towards these standards could lead firms to perceive the potential benefits of an improved system and, thus, to implement a complex traceability scheme. The analysis also suggests that the institutional variables lead firms to prefer simple standards with few rules to manage. More precisely, when wineries perceive the risks associated with external pressures, they will prefer that simple procedures be implemented. This is probably due to the fact that institutional drivers cannot be directly managed and predicted by the firms. Such drivers lead firms to flexible strategic decisions, which can be changed on the basis of the variation of the institutional environment.

5. Conclusion

The purpose of this paper was to study the determinants leading firms to choose from different kinds of voluntary traceability standards in the wine sector.

The results highlight that the cluster Complex VTS reached high scores for the determinants 'subjective norms' and 'firm attitude' and low scores for the 'institutional environment' dimension. On the other side, the cluster Simple VTS showed low scores for the determinants 'subjective norms' and 'firm attitude' and high scores for the 'institutional environment' characteristics. Such results suggest that when wineries show positive cognitive beliefs towards voluntary traceability standards, they will probably implement complex systems, which require high investments and efforts for their management. On the contrary, when the institutional environment plays a key role in the perception of wine processors, a simple and flexible system seems to be preferred.

This analysis suggests both managerial and policy implications. From a managerial point of view, the analysis gives wineries suggestions on how to select from different kinds of existing voluntary traceability standards. More precisely, if the normative setting represents one of the challenges for efficient firm management, wineries will adopt a flexible traceability system, which allows firms to adapt quickly to institutional changes. In this way, wineries will be free to efficiently manage new normative requirements and to guarantee the efficient management of unfair practices within the supply chain through the implementation of a system that increases transaction transparency among economic agents.

On the contrary, if the institutional environment in which firms operate is not considered important and if traceability standards are perceived as useful instruments, wineries will strongly invest in traceability systems. In such situations, firms will apply voluntary traceability standards that will imply the introduction of different rules within the supply chain. The introduction of these new kinds of standards will provide a reorganization of vertical relationships, and these standards will stimulate an efficient distribution of liabilities among supply chain partners thanks to an increase in transaction transparency (Contò et al., 2014).

Moreover, the possible positive association found between the level of traceability complexity and the firms' perceived social pressure to adopt voluntary traceability stresses the important role of stakeholders in wineries' managerial decisions on the kind of traceability to be adopted. In specific, our analysis highlights that when wineries perceive that stakeholders consider traceability to be an important instrument to guarantee product attributes, they will adopt systems able to ensure wine quality characteristics. In this case, voluntary traceability standards are implemented to gain or maintain firm reputation towards supply chain agents and consumers (Vlachvei and Notta, 2009; Contò et al., 2015).

From a policy point of view, the results of this analysis revealed that voluntary traceability standards are considered to be instruments able to manage both the normative environment in which the wineries operate and their economic relationships with supply chain stakeholders. However, from a vertical organizational perspective, the efficient reorganization of dyadic relationships due to the introduction of voluntary traceability standards is effective if they are associated with positive firms' beliefs. Policy interventions aimed at improving

wineries' awareness for voluntary traceability standards could lead to the introduction of effective instruments for the transparency of wine supply chains and the reduction of unfair practices.

This paper faced some limitations. The analysis is applied only to a sample of Italian wineries. For this reason, the interpretation of results cannot be generalized. Moreover, the analysis does not provide causal relationships between the behavioural and institutional determinants investigated and the traceability standard adopted. To deeply explore the results of cluster analysis, an extension on a bigger and international sample could help confirm our results. Moreover, the adoption of methods for the analysis of casual links between the complexity of the traceability adopted and the variables related to individual and institutional drivers of firms' strategic behaviours will be conducted in future studies. Also, the presence of possible moderation effects among drivers could be empirically tested to better understand which kind of determinants can mostly influence the adoption of different kinds of traceability standards.

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