

Coping with the economic crisis in agriculture: an analysis of the Tuscany (Italy) premium quality wine area and strategies for impact mitigation

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1. Introduction

1.1. The economic crisis effects on the national agricultural sector

The macro-economic scenario related to the present research is associated with the Global Financial Crisis (GFC) that started in the U.S. in 2007 and quickly affected the global economy (Foster and Magdoff, 2009). An understanding of its dynamics and long-term evolution is still emerging (Canova and Hickey, 2012). Since 2007, the housing and financial markets have begun a negative period of volatility and uncertainty (Harvey, 2011; Scanlon *et al.*, 2011). The outbreak of the U.S. housing bubble was accompanied by a profound crisis of the financial system that has weakened the banking system, which has been made even more unstable by the effects of the sovereign debt of some European countries, including Italy. At the same time, there has been a great instability of the markets for raw materials and energy products, which has led to an increase in the volatility of agricultural prices.

In this state of great uncertainty, the upward trend of the price of production factors has led to an increased erosion

Abstract

The recent economic crisis has impacted the agricultural sector in different ways worldwide. The scale of the evaluation, the specific area investigated and the size of the farms are some of the potential parameters that could lead to bias and distortion during impact analysis. In addition, the current literature reveals the lack of an examination of the main qualitatively and quantitatively influenced variables. As a consequence, the depiction of policy plans and mitigation strategies able to overcome or alleviate the effects of the crisis is a difficult task. Thus, this work aimed to characterise the main effects of the economic crisis on the wine sector in a case study area (region of Tuscany - central Italy). The research focused on top and medium-small brand name capital wine farms. Potential policy actions and managerial activities to improve the local sector were depicted. Due to the multi-faceted characteristics of the examined topic, the selected methodology for evaluation is a nonlinear analysis instrument. Specifically, Fuzzy Cognitive Maps, network indexes and scenario analysis were adopted. Among the results, the need for association and cooperation, long-term scheduling and planning, and the capability to obtain critical funding were highlighted.

Keywords: economic crisis, mitigation strategies, wine sector, Fuzzy Cognitive Map, network analysis.

Résumé

La récente crise économique a eu des conséquences variées sur le secteur agricole à travers le monde. L'échelle d'évaluation, la zone spécifique étudiée et la taille des exploitations sont parmi ces paramètres qui pourraient introduire un biais ou une distorsion dans l'analyse de l'impact. En plus, la littérature actuelle révèle que l'étude des principales variables influencées d'un point de vue qualitatif et quantitatif reste encore limitée. Par conséquent, il est difficile de décrire des plans politiques et des stratégies d'atténuation susceptibles de surmonter ou de réduire les effets de la crise. Le but de ce travail était donc de présenter une étude de cas, en essayant de caractériser les principaux effets de la crise économique sur le secteur vitivinicole dans la région Toscane, en Italie centrale. La recherche a été articulée autour des exploitations viticoles les plus importantes, de taille petite et moyenne, et de grande renommée. Nous avons également illustré des actions politiques et des activités de gestion qui pourraient contribuer à améliorer le secteur local. Compte tenu de la complexité du sujet traité, nous avons retenu comme méthodologie d'évaluation un outil d'analyse non-linéaire. En particulier, nous avons adopté des Cartes Cognitives Floues, des indicateurs de réseaux et des analyses de scénario. Les résultats ont mis en évidence la nécessité de renforcer l'aptitude à l'association et à la coopération, la programmation et la planification à long terme et la capacité à catalyser le financement.

Mots-clés: crise économique, stratégies d'atténuation, secteur vitivinicole, Carte Cognitive Floue, analyse de réseaux.

of operating margins for enterprises. As a consequence, they have been more exposed to the risk of financial unsustainability.

Focusing on the Italian agro-food sector, its performance levels – defined in terms of contribution to economic growth and employment – were better than that of the industry overall and the other economic sectors (De Filippis, 2012). Compared to other segments of the national economy, the agricultural sector has recorded a greater ability to cope with the negative effects of the crisis – at least until 2011 – thanks to both exogenous and endogenous determinants. The exogenous determinants are related to both the intrinsic characteristics of demand rigidity for food, at least in the short term, and the positive trend of international demand for “Made in Italy” food products.

The second endogenous determinants are due to structural changes, as well as innovations in the products and processes favoured

by European policies. However, the ongoing recession, as well as the uncertainties about the measures and policies to cope with crisis, leads to a worsening of both the demand and supply of agricultural products.

The national demand for food contracted due to the reduction of disposable income, while on the supply side there is a decrease of capital productivity and added value.

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Foreign demand expresses positive values but with a decreasing rate of exports. This is particularly noticeable for the wine industry, which is one of the most important Italian elements in international agro-food trade (Inea, 2013). On the other hand, the international agro-food sector shows increasing competitiveness, expressed by the phenomenon “Italian Sounding” (Ministero dello Sviluppo Economico, 2014).

The domestic market shows the most critical features in the current economic scenario, which are connected to the restrictive fiscal policy that has accompanied this period of crisis. The credit crunch is another critical element of the crisis, for which there are appreciable differences among enterprises according to their size. The credit crunch, in combination with a liquidity crisis in the banking system, has led to greater difficulties for farms – especially small to medium – in acquiring funding from both internal and external funding sources (Ismea, 2012).

All of these aspects affect the company’s ability to make investments, which are also affected by the increased level of entrepreneurial uncertainty and are linked to the liquidity problems associated with the timing of payments (Esposti and Lobianco, 2012).

An analysis of the level of confidence of the current situation and of farm economic perspectives for a 2- to 3-year term showed that, among farmers, there is a pessimism based on the increase in input costs and the stagnation of demand in both the domestic and foreign markets (Ismea, 2013). However, the wine industry is the only one that has experienced a positive value of optimism. It appears as one of the areas with the most attractive foreign markets, demonstrating the importance of extra-national markets in order to mitigate crisis effects.

According to a recent interpretation (see, e.g., Esposti, 2011; De Filippis, 2012), the downturn in the Italian economy is conflated with a process of structural decline that has seen a loss of competitiveness in the agricultural sector compared with other European countries. This loss is expressed in terms of the reduction of added value, of resource productivity and of profitability.

Currently, there is a dearth of literature about the impact of the GFC on rural areas in relation to the public or private strategies adopted to reduce the vulnerability (Murphy and Scott, 2014). As matter of fact, some studies focus on the economic crisis’ effect on the environmental sector (Elliott, 2011; Canova and Hickey, 2012) or on developing countries (Bechir *et al.*, 2010), but the literature lacks short-term statistics in the agricultural field (De Filippis and Romano, 2010).

A few studies reveal farmers’ perceptions about economic crisis. Among them, the research developed by Murphy and Scott (2014) reveals the impact of the housing crash on the perception of life satisfaction in rural areas. At the national level, a study conducted in the Marche region (central Italy) provides a framework of farmers’ perception about the crisis. The results of that study reveal that the

main perceived issues are related to the increase in the prices of production factors, the decrease in the prices of products and the difficulty of collecting client payments (Esposti and Lobianco, 2012).

The current study contributes to the sparse literature and has two objectives:

- an analysis of the wine farm managers’ perception about the effects of the crisis and how this perception differs according to the corporate “brand name” parameter;
- an understanding of suitable policy interventions, as well as intervention strategies, advocated by farm managers to mitigate the effects of the crisis.

Due to the lack of similar analyses in both national and international contexts, the work was based on exploratory research in order to establish the foundations to extend the results of the study to different areas and scenarios. From the methodological viewpoint, nonlinear system approaches, such as Fuzzy Cognitive Maps and network analysis, were introduced. These methods seem to be proper techniques to evaluate the topic because of the complexity of the subject and their several applications for analysis of dynamic socio-economic behaviour.

1.2. Fuzzy Cognitive Maps: conceptual background and application in rural studies

In this paper, the theoretical basis for the evaluation of GFC effects is related to the “complex systems” and “vital systems” theory. According to these paradigms, the firm is interpreted as an open system capable of exchanging resources with the external environment, which will necessarily affect their evolutionary dynamics.

In this case, the exogenous variables – not attributable to the area of corporate responsibility – are linked to the evolution of the unfavourable macro-economic situation (Slatter and Lovett, 1999; Falini, 2011).

Wine farm managers’ perception of the effects of the economic crisis was analysed by means of Fuzzy Cognitive Maps (FCM). FCMs have been introduced by Tolman (1948) as a tool for psychology research. Then, cognitive maps were developed in the 1970s (Axelrod, 1976) in order to represent social scientific knowledge.

FCMs are considered a useful tool for the semi-quantitative representation of the belief of one or more individuals or social groups in response to a specific problem or stimulus (Steinbruner, 1974). They offer the possibility to provide a representation of the perceived reality through the identification of the most relevant variables and the causal relationships among the variables (Coban and Secme, 2005). FCMs can be obtained in different ways, e.g., by direct interviews or literature analysis (Özesmi and Özesmi, 2004). The revealed elements then can be synthesized in *concepts* (representation of system variables) as well as *links* (causal relationship among concepts) characterized by a direction and a weight (Kok, 2009).

FCM can be classified as a methodological process referred to as “stakeholder analysis” (Reed, 2008), which

supports decision makers to design effective, participatory and inclusive policies. The increasing use of stakeholder analysis is linked to the increasing attention to the role of stakeholders in influencing many participative processes in line with so-called bottom-up and active approaches (Prell *et al.*, 2009). FCM can capture the diverse perspectives of stakeholder groups (in our case, medium-small and top brand name capital farm managers), and they can be converted into a dynamic system that allows researchers to analyse the trajectories of the system under different policy options and mitigation strategies scenarios.

FCMs have been applied in several sectors, such as environmental, scientific-technological, socio-political and economic in order to understand organizational and decisional processes, as well as to support policy decision making (Wood and Bandura, 1989; Barr *et al.*, 1992; Axelrod, 1976; Muzzi and Ortolani, 2003). Applications for the analysis of environmental and rural topics include, environmental policy making (Kontogianni *et al.*, 2012), policy simulations for natural hazard mitigation (Samarasinghe and Strickert, 2013), deforestation dynamics (Kok, 2009), agroenergy planning (Lopolito *et al.*, 2011), as well as farmers' risk perception (Van Winsen *et al.*, 2013). According to the authors' knowledge, FCMs have never been applied before for the evaluation of the effects of the economic crisis on the rural sector.

2. Methodology

2.1. Study area and farm sampling

This study focused on farms located in specific Controlled Designation of Origin (DOC) and Controlled and Guaranteed Designation of Origin (DOCG) areas of the Chianti region (Tuscany, central Italy) because of the important socio-economic and cultural role played by the wine sector in that territory. The high variability of wine farms in that area could lead to complexity in their classification. In fact, the interrelationships among different parameters (e.g., size, turnover, annual work hours, characteristics of the manager, level of mechanisation, etc.) make the depiction of the explanatory variables for their categorization difficult (Traversac *et al.*, 2011). Thus, in this work, the wine farms were categorized into top brand name capital (T-BNC) and medium-small brand name capital (MS-BNC). In this research, BNC can be considered as an indicator of farm reputation and specificity in wine production expressed as costumers' awareness of a particular trademark. Due to the absence of a systematic classification related to BNC, this categorization was implemented by an expert-based process that involved researchers and local experts. Based on a high level of knowledge of the wine market and the local territory, the experts shared their perception about the potential BNC categorization of a list of regional farms. For each category (T-BNC and MS-BNC), the experts chose three representative farms to analyse. The limited size of the sample depends on both the nature of the developed analysis (exploratory research) and the typology of

the applied technique (FCM). In fact, as demonstrated by Özesmi and Özesmi (2004), the number of new variables of an FCM added per interview levels off within a small number of interviews. Managers of the depicted farms were selected as representative personnel of the enterprise among the roles of entrepreneur, supervisor, customer service or marketing. Managers were then asked to define the main proved and perceived consequences of the economic crisis on the activity of their farm, the potential mitigation strategies, as well as the policy interventions used to alleviate the crisis.

2.2. Application of Fuzzy Cognitive Maps and Network Analysis

As previously stated, the potential impact of the economic crisis on the wine chain was defined by means of Fuzzy Cognitive Maps (FCM). FCM were implemented following the procedure reported in Ackermann *et al.* (2004). Developed FCM were merged with each other for a single farm category, were condensed and were coded into adjacency matrixes with the procedures described in Özesmi and Özesmi (2004). The complex nature of FCM can be analysed through the Auto-Associative Neural Networks approach (Samarasinghe and Strickert, 2013), i.e., due to their dynamic behaviour, the system can be run as an iterative process until a stable state (steady state S_i) is reached for each concept formula [1] (Papageorgiou *et al.*, 2011):

$$C_{i,k} = f(C_{i,s-1}) + \sum_j C_{j,k-1} \cdot w_{j,i} \quad [1]$$

where $C_{i,k}$ is the value of concept i at iteration k , $w_{j,i}$ is the value (assigned weights) of the link between concept j and receiver concept i , f is an exponential equation able to compel the results in the range $[0,1]$ in order to facilitate the qualitative interpretation of FCM (Papageorgiou *et al.*, 2011).

In developed FCM, steady state S_i corresponds to the stable value of concept C_i at iteration k . In fact, each concept can tend to zero or to a constant value, can increase/decrease exponentially, can have a cyclic stabilization or a chaotic attractor (Dickerson and Kosko, 1994; Özesmi and Özesmi, 2004; Kok, 2009). In our case, steady state S_i is the reference value for the analysis of the concepts and the FCM.

By means of network analysis indexes, the following parameters were analysed in order to characterise both FCM and single concepts:

- the density of the maps;
- the cohesion of the maps;
- the centrality of concepts;
- the presence of cliques.

The network density highlights the number of relations among concepts. According to its density, the system can be classified as wide, medium and narrow knit (Trobia and Milia, 2011). The cohesion in a map was quantified by the "distance-based cohesion index". The above parameter

could be defined as an indicator of the compactness of a network, and it was computed in the range 0-1 (from null to total compactness) (Trobia and Milia, 2011), thus, the relation and perceived causal influence among concepts were represented with both density and cohesion.

Centrality defines a node's importance. It indicates the contribution of a criterion within the FCM. In this work, we refer to Bonacich centrality (Bonacich, 1972). For each concept, Bonacich centrality takes into account the number of nodes that are connected to each other, as well as the importance (weights) of these nodes.

Eventually, a clique can be defined as a sub-graph composed of at least two concepts connected to each other (Wasserman and Faust, 1997). For the aim of the work, the presence of cliques represents the potential perception of a sectorial segment for the topic. As a consequence, a clique is a clustering of information able to simplify the analysis of the system by the representation of strong relationships among variables on which it is possible to act to mitigate a negative crisis impact.

2.3. Effectiveness analysis of mitigation strategies

Once the FCM is analysed and the perceived crisis impact is stressed, the mitigation strategies, as well as the policy options can be simulated in order to achieve potential optimisation of the system and to cope with the economic crisis impacts. Thus, a simulation scenario was developed taking into account a "what-if" scheme (Shih-Chieh *et al.*, 2013). The "what-if" method can be applied to compare the steady state of a concept with and without the application of the mitigation strategies.

The effectiveness for each mitigation strategy m was

computed as the total improvement of the system $E_{T,m}$ by the following equation:

$$E_{T,m} = \sum_i E_{i,m} \tag{2}$$

with

$$E_{i,m} = \begin{cases} IF(i \in P) THEN(E_{i,m} = S_{i,m,MS} - S_{i,NoMS}) \\ ELSE \\ IF(i \in N)(E_{i,m} = S_{i,NoMS} - S_{i,m,MS}) \end{cases} \tag{3}$$

where i is a single concept of the FCM, P is the set of positive concepts of the FCM, N is the set of negative concepts of the FCM, $E_{i,m}$ is the effectiveness of mitigation strategies m for a single concept, $S_{i,m,MS}$ is the steady state of the concept with the application of mitigation strategy or policy m and $S_{i,NoMS}$ is the steady state of the concept without the application of mitigation strategies or policy.

In this case, positive and negative concepts refer to variables that can contribute either to an improvement or to a worsening of the "farm system" in the presence of the economic crisis or its effects.

Because the value of S_i is normalised as [0,1] for a better understanding of results (Eq. 2), the term $E_{i,m}$ is comprised in the range [-1,1] (from a complete worsening to a complete improvement).

3. Results

FCM of MS-BNC and T-BNC farms are composed of 47 and 42 nodes, respectively (Figure 1 and Figure 2).

Figure 1 - Fuzzy Cognitive Map for Medium-Small Brand Name Capital farms.

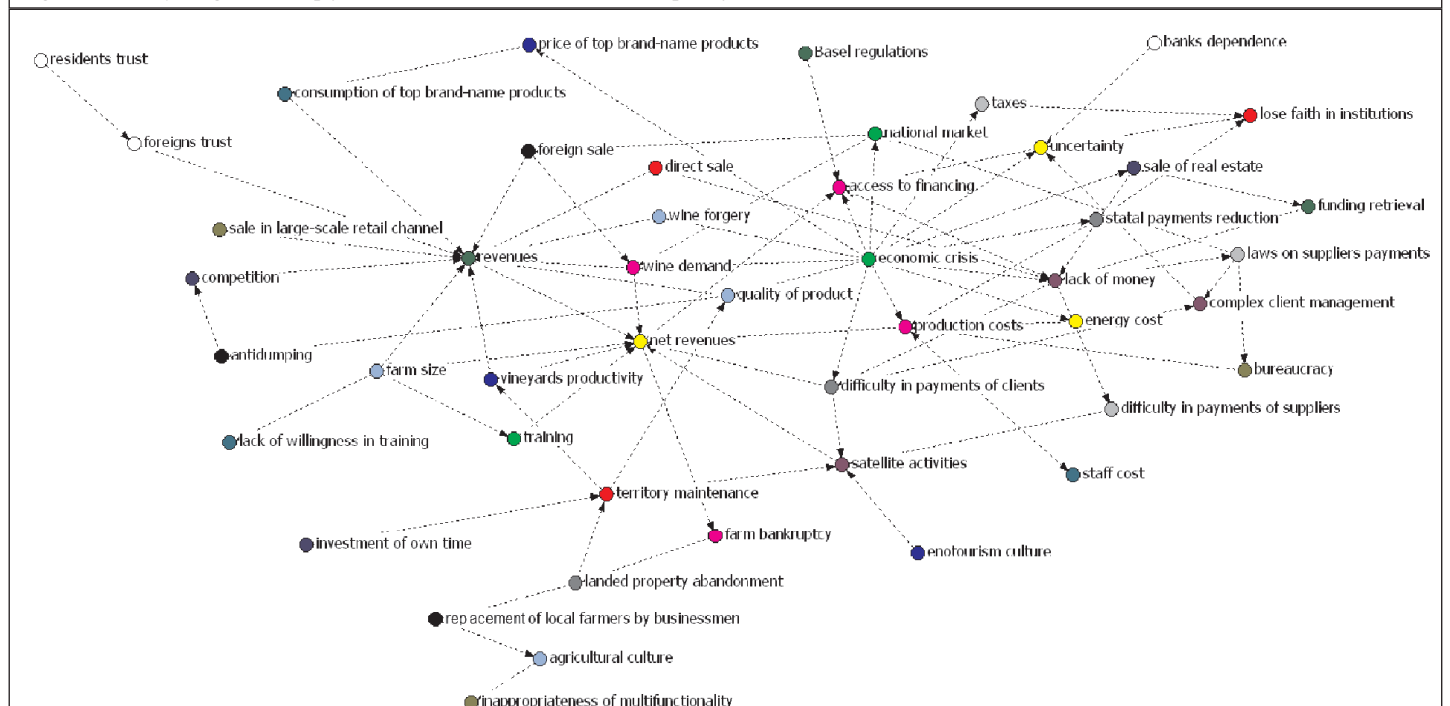
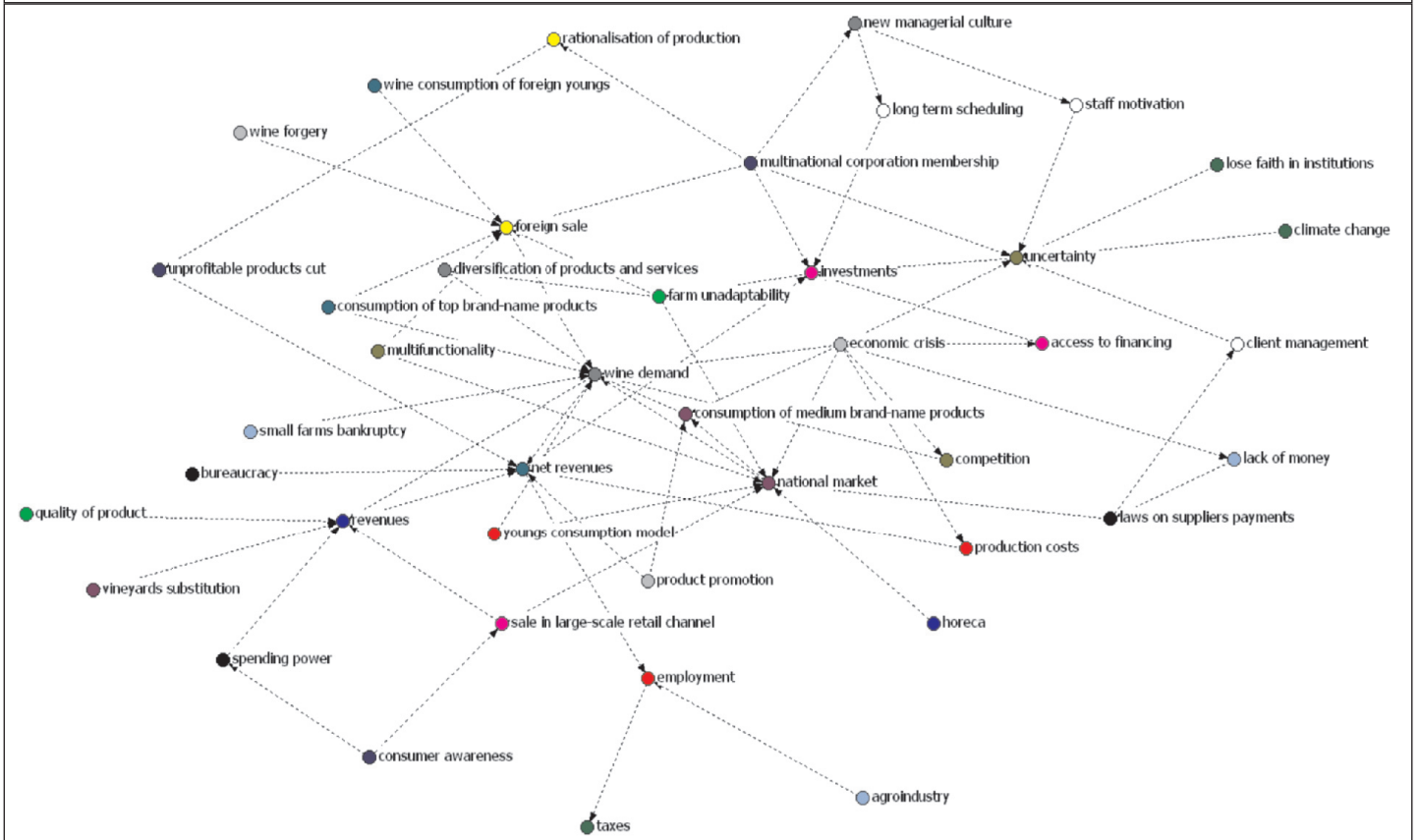


Figure 2 - Fuzzy Cognitive Map for Top Brand Name Capital farms.



As reported in Table 1, both FCMs can be described as wide knit maps. Low values of density are, in fact, registered. This data, linked to the evaluation of cohesion indexes (which are also quite low), shows how a few interrelations among concepts are perceived by both MS-BNC and T-BNC farm managers. The analysis of impacts and potential solutions to the economic crisis seems to be interpreted with linear reasoning. Due to this perception, mutual influences among nodes, and feedback loops do not seem to be very relevant in the FCM. This result could lead to less efficient mitigation strategies and policies considering that the propagation of benefits from these interventions can be reduced by the lack of mutual relationships among concepts. To cope with this limit, the analysis should be guided by the interviewer who would provide an in-depth explanation of the system to the interviewee. However, in our research the focus was on the perception of farm managers, and the guided-approach has been limited.

Centrality analysis of MS-BNC maps obviously stresses the greater importance of the “economic crisis” node with respect to the other ones (Table 2). In fact, it represents the

main driver concept of the system. It’s worth noting how, following the ranking of Table 2, a great significance is shown for “sale of real estate”, “lack of money”, “funding retrieval” and “access to financing.”

In the T-BNC map (Table 3), after the “economic crisis” node, the concepts of “multinational corporation membership,” “consumption of top brand-name products”, “farm inadaptability” and “wine demand” are the most central. A first consideration could be the difference in the most central parameters for both MS-BNC and T-BNC farm managers’ perception. In the MS-BNC farms, concepts related to the availability of capital and funds are strongly weighted. On the other hand, characteristics and agreements of the farm, as well as the amount of wine selling, seem to reach a high level of importance in T-BCN. For example, the low farm size of MS-BNC influences the capability to access financing and increases the potential need to sell real estate as a source of financing. The relevant foreign market positioning of T-BNC depicts a strong importance of the “wine selling” node, as well as of participation with multinational corporations and the diversification of products and services.

For both farm categories, a consistent centrality is also depicted for the concepts foreign sale”, “revenues” and “uncertainty”. Even though expectations due to the localisation of farms in the DOC and DOCG areas, as well as sometimes complicated national rules, a strong centrality is

Farm category	Density	Distance-based cohesion ("Compactness")
MS-BNC	3.6%	3.2%
T-BNC	3.1%	4.0%

Concept	Centrality	Concept	Centrality
economic crisis	5.46	landed property abandonment	0.29
sale of real estate	1.82	bureaucracy	0.28
lack of money	1.69	staff cost	0.28
funding retrieval	1.52	quality of product	0.26
access to financing	1.21	satellite activities	0.24
direct sale	1.05	competition	0.24
wine demand	0.94	price of top brand-name products	0.23
farm size	0.93	taxes	0.23
foreign sale	0.83	complex client management	0.21
net revenues	0.81	national market	0.19
difficulty in payments of clients	0.78	investment of own time	0.18
vineyards productivity	0.75	farm bankruptcy	0.17
uncertainty	0.67	foreign trust	0.17
revenues	0.56	sale in large-scale retail channel	0.17
production costs	0.47	enotourism culture	0.10
statal payments reduction	0.44	difficulty in payments of suppliers	0.10
territory maintenance	0.42	wine forgery	0.09
banks dependence	0.39	antidumping	0.08
Basel regulations	0.36	residents trust	0.06
training	0.34	agricultural culture	0.01
energy cost	0.34	replacement of local farmers by businessmen	0.01
laws on suppliers payments	0.34	inappropriateness of multifunctionality	0.00
consumption of top brand-name products	0.31	lack of willingness in training	0.00
lose faith in institutions	0.30		

Concept	Centrality	Concept	Centrality
economic crisis	4.17	unprofitable products cut	0.59
multinational corporation membership	2.69	wine consumption of foreign young people	0.58
consumption of top brand-name products	2.06	quality of product	0.49
farm inadaptability	1.58	rationalisation of production	0.49
wine demand	1.35	small farms bankruptcy	0.48
foreign sale	1.12	laws on suppliers payments	0.47
investments	1.05	client management	0.46
diversification of products and services	0.90	bureaucracy	0.45
net revenues	0.88	consumer awareness	0.44
access to financing	0.87	new managerial culture	0.44
wine forgery	0.75	national market	0.44
revenues	0.73	lack of money	0.39
uncertainty	0.70	vineyards substitution	0.38
Long-term scheduling	0.70	staff motivation	0.36
competition	0.69	lose faith in institutions	0.36
consumption of medium brand-name products	0.69	climate change	0.25
Young people consumption model	0.64	horeca	0.16
multifunctionality	0.63	product promotion	0.04
spending power	0.61	agroindustry	0.01
sale in large-scale retail channel	0.60	employment	0.00
production costs	0.59	taxes	0.00

not shown for “quality of product” and “bureaucracy” concepts. However, additional nodes linked to bureaucracy are revealed in MS-BNC maps, including “Difficulty in payments of clients”, “banks dependence” and “Basel regulations”.

In recent years, emerging problems for wine industries are linked to the potential importance of the Appellation of Origin (AO) system in the international wine market (Mal-

orgio *et al.*, 2008) and to wine forgery (Hubert *et al.*, 2009). As highlighted in FCM centrality, the problems presented by this latter concept seems to be proportionally related to the importance of the farm's brand name – the "wine forgery" node is ranked 41st of 47 concepts in MS-BNC and 11th of 42 in T-BNC.

Despite the presence of the Protected Designation of Origin system for both farm categories, a greater relationship to local territory can be stressed for MS-BNC farms thanks to emerging concepts such as "territory maintenance" and "landed property abandonment". The stronger relation of that concept with MS-BNC farms could derive from the family-run based model of these enterprises, as well as their long-term establishment in the territory. T-BNC farm managers seem instead to focus on the reorganisation of their activities and long-range planning. In this sense, "investments", "long-term scheduling", "unprofitable products cut" and "rationalisation of production" all seems to be strictly related to the above-mentioned nodes "multinational corporation membership" and "diversification of products and services."

A picture of the different perceptions of MS-BNC and T-BNC farm managers is also shown by peculiar nodes that only appear in one of those categories. For MS-BNC farms, the concepts "foreign trust", resident trust" and "direct selling" depict the importance of direct contact with the customer. For T-BNC farms, as expressed by the nodes "quality of product," "client management" and, in particular, "consumer awareness" the direct contact with the customer seems to be important but less salient. T-BNC farms seem to perceive a wider framework and economic system as a context for their activity, which is confirmed by the presence of nodes such as "cli-

mate change" or "agroindustry", as well as "horeca". An additional insight arising from the differences between the two farm categories can be identified in the cultural approach to wine production. Specific elements of FCMs are in fact "Agricicultural culture" and "Replacement of local farmer by businessman" (the last one is seen as a problem) in MS-BNC farms, as well as "New managerial culture" as an opportunity for T-BNC. In this case, a stronger entrepreneurial and business-based idea of production process seems to be expressed by the T-BNC farm managers.

The mutual relation among concepts, and the presence of perceived clusters, can be stressed by the analysis of cliques with the hierarchical clustering of the overlap matrix (H-COM) approach (Everett and Borgatti, 1998) (Figure 3 and Figure 4; for a complete decoding of figures see the Appendix). HCOM shows how many sub-groups of concepts were shared between two or more nodes. Thus, through HCOM we can see which parameters are most involved in cliques (that are then located in tightly knit portions of the graph). In this sense, a higher level in a clique represents a higher correlation among variables (Figure 3 and Figure 4).

To homogenise the analysis for both MS-BNC and T-BNC maps, the reference parameter of both figures is the level 1.

MS-BNC farm managers (Figure 3) perceive six significant clusters: MSi) "difficulty in payments of clients (17) – satellite activities (28)", MSii) "farm size (19) – revenues (38) – net revenues (43)", MSiii) "wine demand (21) – national market (33) – foreign sale (44)", MSiv) production costs (10) – energy cost (11)," MSv) "access to financing (2) – uncertainty (27)", MSvi) "economic crisis (13) – lack of money (30) – sale of real estate (47)".

Figure 3 - Cliques for concepts of Medium-Small Brand Name Capital farms.

Level	1	3	4	5	6	7	8	9	2	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	1	2	3	2	1	3	4	2	3	4	1	1	4	2	3	1	3	4							
3.000				
2.000		
1.667		
1.333		
1.000		
0.867		
0.750	
0.600	
0.333	
0.213
0.147	
0.091
0.020
0.000	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx			

Figure 4 - Cliques for concepts of Top Brand Name Capital farms.

Level	1	2	4	5	6	7	8	0	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	1	1	1	2	2	3	4	1	4	4													
2.000		
1.667	
1.000	
0.693		
0.142	
0.081	
0.035
0.000	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx			

Figure 5 - Total improvement of the system for mitigation strategy (Medium-Small Brand Name Capital farm).

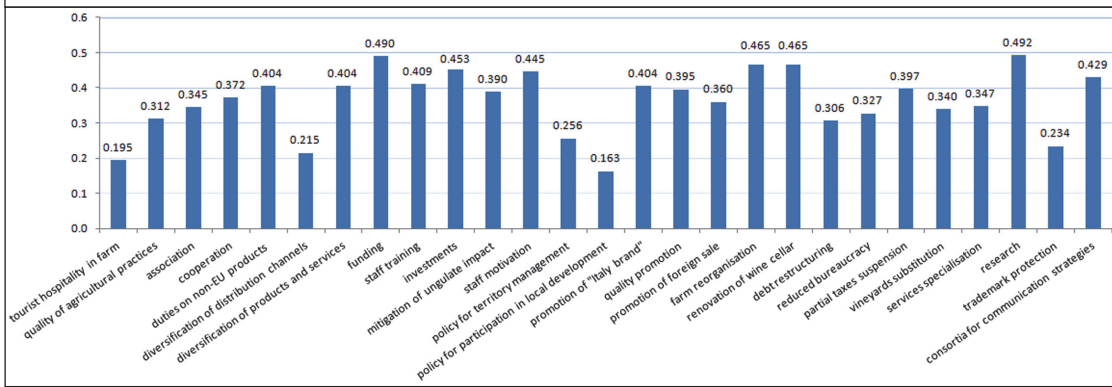
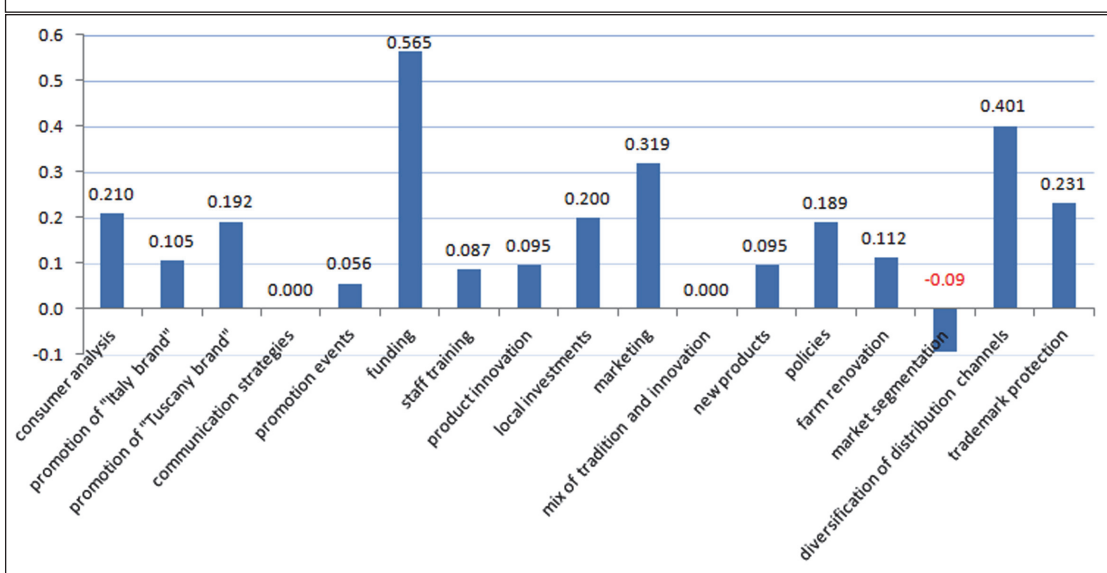


Figure 6 - Total improvement of the system for mitigation strategy (Top Brand Name Capital farm).



For T-BNC farm managers (Figure 4), four significant clusters result: Ti): “multinational corporation membership (3) – uncertainty (23) – investments (24)”, Tii) “consumption of medium brand-name products (12) – wine demand (17) – economic crisis (15) – national market (26)”, Tiii) “revenues (36) – net revenues (40)”, Tiv) “consumption of top brand-name products (11) – foreign sale (41)”.

Considerations of the above HCOMs can focus on the immediate perceived consequences of the economic crisis as well as potential measures to reduce the uncertainty related to crisis. In the case of MS-BNC farms, what arose in the centrality analysis is confirmed – the economic crisis leads to a lack of money and the need to sell real estate (MSvi). Another problem seems to be the small size of farms that makes them unable to compete with larger ones (MSii), as well as some difficulty to receive payment from clients (MSi). On the other hand, for the T-BNC farms, the effects are the increased consumption of medium brand-name products and the resulting reduced wine demand, as well as the decreased capability to sell their products in the national market (Tii). The main mitigation strategy perceived by MS-BNC farmers to overcome current uncertain-

ty seems to be the access to financing (MSv). T-BNC farmers intend to cope with this aspect by medium-long term action, such as becoming multinational corporations and investments (Ti). In the MS-BNC group, a perception of potential consequences of the crisis in the whole wine chain is shown. In fact, this aspect is stressed by the MSi cluster where the concept “satellite activities” is introduced in relation to the difficulty in collecting payments from clients. Eventually, in the T-BNC map the importance of foreign markets is highlighted for the selling of products (Tiv).

The first evidence arising from the evaluation of mitigation strategies and policies is the difference in the number between farm categories, with a strong prevalence in the MS-BNC with respect to the T-BNC (Figure 5 and Figure 6).

For MS-BNC farm managers, a strong importance can be depicted in policies related to exogenous aid, such as research application in farm management and funding from public entities. Strictly related to these aspects, endogenous mitigation strategies were highlighted by MS-BNC farm managers, e.g., the renovation of wine cellars, farm reorganization, the improvement of product quality, as well as investment opportunity. Following the ranking expressed in Figure 5, staff training and motivation, as well as consortia activities, association and cooperation are perceived as actions enabling the farms to cope with the effects of the economic crisis. In particular, this last aspect stresses how aggregation among farms could reduce perceived trouble due to farm size and competition, as well as favouring communication strategies.

Policies relevant for farm managers seem also to be interventions on taxes in terms of both the introduction of duties on non-EU products and partial suspension of taxes for national activity. A significant weight is related to the promotion of the “Made in Italy” brand and to the diversification of products and services. According to the efficiency of the intervention strategies, the trust of clients could be strengthened by

tourist hospitality in farm. The maintenance of quality in agricultural practices is also an important mitigation strategy. Eventually, in the MS-BNC farms – opposite from the T-BNC farms – a great relevance is outlined for policies for local development and territory maintenance.

Results from T-BNC farm managers highlight the strong importance of funding opportunity followed by the diversification of distribution channels and marketing strategies (with a particular emphasis on consumer analysis). Three policies are important for this farm category in terms of promotion and protection of brand: the promotion of the national and local product (Italy and Tuscany brand), as well as the protection of the trademark. This aspect confirms the higher trouble for T-BNC with respect to MS-BNC due to wine forgery, as expressed in centrality analysis.

A comparison between MS-BNC and T-BNC farms shows how the need of funding opportunities is supposed as an important element for the two categories. The analysis of additional mitigation measures and policies reveals that for both MS-BNC and T-BNC farm efficient interventions suitable to overcome the crisis are mainly related to endogenous parameters (e.g., farm reorganization and renovation, staff capabilities and motivation, investments, marketing strategies as well as diversification of distribution channel). Exogenous factors are identified in the wine trademark protection conveyed as promotion of “Tuscany (and Italy) brand”, as well as on duties on non-EU products.

4. Discussion and conclusions

The novelty of this research is to use an interactionist and structural paradigm (Putnam and Goss, 2002) to gain insights on the effects of the economic crisis on the wine sector. This paradigm represents – by means of Fuzzy Cognitive Maps (FCM) – the micro-macro characteristics of the effects perceived by wine producers and the possible mitigation strategies with both endogenous and exogenous actions.

The main results confirmed findings that have been highlighted in the literature for sectors other than agriculture (see, e.g., Istituto G. Tagliacarne, 2010; IRES, 2011), namely, that recession effects at the European level have been particularly critical for medium and small enterprises.

This category of farms experiences difficulties mainly due to the financial structure, the reduction of net revenues, and difficulties in access to funding. In addition, they desire corrective action, such as public intervention expressed as tax breaks, incentives for investment and measures to support access to credit.

Additional evidence arising from FCM analysis was that the crisis (and in some cases the collapse) of the housing market has aggravated the debt situation because the property is often used as an element of bank guarantee in the negotiations.

The study area is characterized by a high specialization in wine production, depicted by many small local producer links, as well as a greater presence of dense and compact networks. This leads, especially for MS-BNC farms, to potential policies, such as cooperation for common services and the promotion of

local development activities. The intensification of aggregation and network paths could lead to the development of collective growth. However, as expressed in Osti (2003, page 12), the path of territory exploitation and development can lead to the need for, and coordination of, some “social catalysts”. Among them, organizations, consortia and associations – in accordance with some guidelines tracked to strategies for economic development in rural regions (Terluin, 2003) – can be mentioned. Especially in MS-BNC farms, priority could be given to improve their staff in terms of capacity, skills and internal cooperation. In fact, the prerequisite for an improvement of the system relates to the specific actions on vocational training, which fall under one active labour market policy. Other findings centre on perceived suitable strategies, such as a participatory process for local development, innovation, the promotion of adequate administrative structures, as well as a multi-level governance that stimulates bottom-up initiatives.

T-BNC farms hope for an implementation of medium-, long-term strategies for both support and promotion of quality investments to address the problems related to the effects of the crisis. Policies to overcome the crisis, rationalization and cost containment can be seen as additional adaptation strategies. Other tactics of repositioning assets are reflected in the diversification of business activities, in the search for new markets and new marketing channels, as well as in the reorganization of the farm production process. Eventually, both MS and T-BNC farms managers wish for government intervention to protect the “Made in Italy” brand. As also expressed in the literature, there is a need to support local networks in order to mitigate the consequences of such a vulnerability (Fox-Rogers and Murphy, 2014).

Moreover, according to some interpretations (see, e.g., Esposti and Lobianco, 2012), the problematic farm business cycle is part of a structural crisis in the agricultural sector. Therefore, to address business cycle issues, the interventions will have to better respond to market volatility and to restructure the sector by i) a generational change, ii) a greater market orientation, and iii) a greater ability to network.

From a methodological viewpoint, the application of FCM and network analysis seem to be useful for gathering preliminary information in favour of a “cognitive economy” with practical implications. Due to their capacity to capture scenario developments and to depict the future dynamics of highly uncertain and uncontrollable systems, FCM can be considered an adequate approach for the implementation of decision support tools based on participative approach.

The present work is an exploratory research; therefore, the results can be considered as a starting point for extending the analysis through additional study areas and local stakeholders (e.g., delegate of category associations). In addition, due to the limited sample, future studies could involve a larger number of enterprises. Moreover, the potential introduction and evaluation of probabilistic uncertainty, as well as validation techniques to measure the coherence of expert’s answers can be analysed.

The structure of the map determined through FCM inference could investigate the effects determined by the implementation of policy mix that might influence the whole system. This could be the next step of the research that can be achieved, e.g., by the application of non-linear programming (NLP) procedure able to rank mitigation strategies to alleviate economic crisis impact.

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Appendix

List of concepts for Medium-Small Brand Name Capital farms

1-landed property abandonment
 2-access to financing
 3-Basel regulations
 4-antidumping
 5-laws on suppliers payments
 6-bureaucracy
 7-competition
 8-consumption of top brand-name products
 9-wine forgery
 10-production costs
 11-energy cost
 12-staff cost
 13-economic crisis
 14-agricultural culture
 15-enotourism culture
 16-complex client management
 17-difficulty in payments of clients
 18-difficulty in payments of suppliers
 19-farm size
 20-banks dependence
 21-wine demand
 22-farm bankruptcy
 23-residents trust
 24-foreigns trust
 25-training
 26-inappropriateness of multifunctionality
 27-uncertainty
 28-satellite activities
 29-investment of own time
 30-lack of money
 31-lack of willingness in training
 32-territory maintenance
 33-national market
 34-price of top brand-name products
 35-vineyards productivity
 36-quality of product
 37-funding retrieval
 38-revenues
 39-lose faith in institutions
 40-replacement of local farmers by businessmen
 41-statal payments reduction
 42-taxes
 43-net revenues
 44-foreign sale
 45- direct sale

46- sale in large-scale retail channel
 47- sale of real estate

List of concepts for Top Brand Name Capital farms

1-access to financing
 2-agroindustry
 3-multinational corporation membership
 4-laws on suppliers payments
 5-wine consumption of foreign young people
 6-bureaucracy
 7-climate change
 8-spending power
 9-competition
 10-consumer awareness
 11-consumption of top brand-name products
 12-consumption of medium brand-name products
 13-wine forgery
 14-production costs
 15-economic crisis
 16-diversification of products and services
 17-wine demand
 18-small farms bankruptcy
 19-client management
 20-horeca
 21-vineyards substitution
 22-taxes
 23-uncertainty
 24-investments
 25-lack of money
 26-national market
 27-youngs consumption model
 28-staff motivation
 29-multifunctionality
 30-new managerial culture
 31-employment
 32-product promotion
 33-long term scheduling
 34-quality of product
 35-rationalisation of production
 36-revenues
 37-farm inadaptability
 38-lose faith in institutions
 39-unprofitable products cut
 40-net revenues
 41-foreign sale
 42-sale in large-scale retail channel