From the short supply chain: new conceptual paradigm and evidences

AUTHORS

Piccinini L.C., University of Udine, Department of Civil Engineering and Architecture. Via delle Scienze, 206, 33100 Udine, Italy. *E-mail livio.piccinini@uniud.it*

Chang T.F.M., University of Udine, Department of Agrifood, Environmental and Animal Science, Via delle Scienze, 206, 33100 Udine, Italy. *E-mail chang@uniud.it*

Iseppi L., University of Udine, Agrifood, Environmental and Animal Science. Via delle Scienze, 206, 33100 Udine, Italy. *E-mail luca.iseppi@uniud.it*

Rosa F., University of Udine, Department of Agrifood, Environmental and Animal Science. Via delle Scienze, 206, 33100 Udine, Italy. *E-mail franco.rosa@uniud.it*

Paper prepared for presentation at the 149th EAAE Seminar 'Structural change in agri-food chains: new relations between farm sector, food industry and retail sector' Rennes, France, October 27-28, 2016

1. Introduction

The network and chain concepts have been extensively used in the agribusiness organizations to explain the relations between agents (inter-firm relationships, resource bases, network governance instruments), to gain competitive advantage (Wubben and Hagelaar, 2009). A network in operational research is composed of links that connect nodes whose components are each other's complementary (N. Economides 1996; 2001). In a neo -institutional framework, the network has been defined as a set of independent entities linked by horizontal interdependencies, which adopt common strategies and share the residual decision rights. Strong vertical ties form a strictly coordinated systems, when specific assets are involved and there exist a clear position of a leading firm (Sauvée, L., 2002). We will discuss the network organization in a econo-physics frame, that is the interdisciplinary approach using different theories originally developed by physicists to examine the relations among chain operators generating stochastic processes in this type of organization. A smart chain is somehow a short chain that embed together globality and localism. The purpose is to improve the performance of the short food supply chain (SFSCs) by optimizing the relations among agents from production to consumption to demonstrate that the short chain evolves into a smart chain as the increasing distance between producers and consumers do not cause significant increase in transaction costs due to loss in information or more difficulties in the coordination mechanism. The scheme of the paper is the following: the first section revises the literature about network theories: the Bak Sneppen algorithm is used here to solve the stochastic processes of the micro-chains coordination. The second section examines whether the micro-chains are residual fragments of previous chains to be regenerated for better economic sustainability, or whether they are totally new organizations still evolving, to explores the direction of their evolution. The third section deals with the re-compacting micro-chain organization, using the Bak Sneppen algorithm. The fourth section discusses the relationship between consumers and micro-chains, focusing on quality assessment of food products which goes beyond the simple traceability. This network approach generates new niche markets from smart micro-chains, and is economically sustainable even when the distance between producers and consumers increases substantially. If applied to regional niche markets, it pursues two targets: i) generate information for the public decision makers to set up innovative programming strategy that will encompass the interests of the different agents in the network; ii) to build an experimental design targeted to find the best practices to be adopted by the operators of the smart chains.

2. Methodology

The first part recalls the theoretical aspects of the structure of networks and some general methods of operational research; the second part is dedicated to the authors' original contribution to the Bak and Sneppen model, and presents some results relevant to the investigation of micro-chains.

2.1 Graph theory and micro-chains

To compare the concepts of supply chain and micro-chain (sometimes called short supply chain), it is useful to include them in a theoretical scheme of the directed graphs,

both general and devoid of cycles (lattices). The industry generally considers steps of material production and therefore has the structure of a lattice. The oriented lattice arcs represent the activities in their sequence, while nodes represent the system of precedence (American representation). The lattice is characterised by the fact that there are no cycles, i.e. no activity can be accomplished if it already presupposes a prior implementation. The flow is thus directed downward, and it is possible to establish a hierarchical ordering of operations (in general not unique). If the level of aggregation of the system is high, however, the presence of cycles may arise. In cases of strong aggregation such as the global economic system represented by the Leontief input-output matrix, where the economy is divided into a limited number of branches (between 50 and 100), it is possible that a product returns to a branch above, even if in this case different processes are involved. The hierarchical order is no longer possible, and then the quest is to search for a hierarchy that presents the best approximation. This problem of higher computational complexity is referred to as the "problem of linear ordering" or as "triangularisation of the matrices"[1]. In a broader analysis, inverse branches may also be considered (feedback) that carry information from downstream customers to upstream suppliers.

The theoretical tools for the analysis of lattices fall within the operational research, particularly with regard to the optimisation of paths on directed graphs for both minimum distance and minimum cost. It can be assumed that the lattice represents the entire universe of activities and subjects that may be involved, but that for each user the pricing system is differentiated, and in general activities that take place in remote areas suffer from coming at too high a cost to be affordable. Where there are precedence constraints, techniques of Project Management may also be required (particularly CPM = Critical Path Method, CPM-Cost, PERT), to manage the subsections previously resolved with optimisation methods[2]. The theoretical advantage of this setting is to allow an assessment of the complexity of the supply chain (or its simplicity), not only empirically but also quantitatively. Moreover, the coincidence with the representation used in the problems of minimum distance gives elasticity to the model, as it is possible to alternate different optimisation techniques in the various sections in a manner consistent with the objectives and the nature of the problems.

The choice of the granularity of representation (and thus of the network complexity) is fundamental. The reticular system in particular allows the comparison of micro-chains with the average behaviour of the system as surveyed in the ISMEA matrix. A coarse granularity in which there were only four nodes such as: provisioning, preparation, transportation, and sales, would still be present in both a normal and a micro-chain. The elimination of transportation would be the only case that would distinguish a short chain, and sometimes the name *short supply chain* (European Parliamentary, 2013) is reserved for these cases (zero kilometres, farmers' market, direct sale, circuits courts, peri-urban agriculture). To be noticed, however, that the absence of transportation from the chain simply means that the burden is transferred to the customer, both on short and long distance. The short chain, however, is not necessarily compact in territorial terms, as was observed also in Renting et al. (2003), since the modern tools facilitate contacts over a long distance and what matters in a network is the higher number of decision

[1] There are several heuristic algorithms and some exact algorithms. Refer to Chang et al. 2013 where in particular an exact algorithm due to the authors was presented.

[2] An extensive discussion of the optimality of the algorithms on directed graphs is in Cormen et al. 1990, and a summary of the algorithms for Project Management can be found in Andreatta et al. 1990.

nodes and changes of ownership, rather than its sheer physicality. The lattice structure at a low level of granularity facilitates the comparison between micro-chains and normal chains, as it highlights the differences between the system of provisioning and distribution of the individual micro-chain, and the system average as derived from national statistical records for the branches concerned[3].

At a high level of granularity, a fundamental aspect of the supply chain can be studied: each task can be divided into as many alternative arcs as there are individuals who are able to provide it. This possibility increases the resilience of the system in the event of sudden drops of any of its players, which sometimes does not occur for the micro-chains that operate at specialised (or amateurish) level and that have few interactions. It should however be remembered that the redundancy of the arcs is not sufficient to guarantee the constancy of operation, as in the presence of a probability p of breaking of one of the arcs there is a probability p^n of breakage of the connection, where n is the number of arcs in parallel (provided the behaviour of the single arc is independent from that of the other). Resilience increases if each activity is divided into subsections and the subsection can be changed at each node[4]. In reality, however, any change in the usual route involves adjustment costs, and thus drives up the total cost of operations both in monetary terms and in terms of discomfort (see Project Management problems cited above), however it is important that the possibility of option still holds. For the micro-chain, on the other hand, the typical case that arises is that it is fragmented and requires external welding interventions to reconnect.

In defining the micro-chain (short supply chain) as opposed to a general chain (supply chain), consistently with the option (Piccinini, 2011), the fragmentation and lack of resilience will be highlighted, rather than the small spatial extent and the reduced volume of business.

Theoretically, the limiting case of a micro-chain is that of a hierarchical sequence step by step, with no alternative, with a compulsory order. However, normally the lattice is characterised by the redundancy of the branches. There are several suppliers of each level of service, from which it passes, more or less freely, to several forward service providers. Even the artisanal user of the smallest micro-chain gets tools available on the market, (mostly) uses energy produced elsewhere, disseminates information by mail, telephone and networks, and others, so that the real elementary micro-chains only exist in rare cases of complete amateurs.

An important aspect of the micro-chain is the traceability, which is expected to record the union of the original components and the processes that they have undergone. The more different agents operate the easier it is to lose track of the individual components; it is generally reasonable to allow aggregations: the wine of a certain farm was born from the union of grapes from different plants (and this is good). There are also aspects of the process that are often poorly tracked even if they can affect the goodness or the integrity of the product, e.g. transportation or the conditions under which it occurred.

By itself, however, traceability is not a guarantee: it can be achieved only when it is known that the procedures in use along the route were guaranteed in line with what is requested by the customer (and that does not always coincide with what authorities require). It must be realised that the traceability, like any other form of certification,

[3] The comparison and analysis of the ramifications of the supply chains are discussed in the light of national data in Chang and Iseppi 2011, 2012.
[4] A more detailed analysis, with numerical examples, can be found in Piccinini 2011.

requires the existence of an external person who gives the warranty. Even in the case of a micro-chain, certification requires the existence of a superior body, one often equipped with a complex structure, which intervenes in the process either in a systematic way or for sampling, exactly as in the case of quality control done within a single company. The control is not a recent invention since as early as the Middle Ages, workshops were subject to the control of the Arts and their workers were subject to a learning career even higher than today. Even in the figurative arts, the work of the shops was certified by the master, and there was a division of labour that now seems unthinkable. The very signature of works of art as a guarantee dates back to antiquity, although today we are accustomed to find it in the fashion garments.

2.2 Bak Sneppen processes and their variants

The model of Bak and Sneppen (Bak, 1993) is the core of a synthesis of many models of adaptive evolution of biological species and anthropogenic groups. Its key feature is to combine global information with local evolution, and then to respond to the models that combine totality and localism, which are still very current although the development of networks apparently argues in favour of the whole. At the actual level of the individual user the global network largely dissolves into one or more subsystems of a local nature, and for this the Bak Sneppen model retains its relevance, as it provides the framework for understanding the patterns of evolution typical of econophysics. The basic form of the Bak Sneppen model is as follows: there are *n* species arranged along a circle, so that each has two neighbours. Each species is characterised by a parameter of biological adaptability (fitness) that varies conventionally in the range [0,1]. For simplicity, the model operates at discrete times. At each moment of time there is a global intervention: the species that has the lowest fitness must be modified acquiring a new fitness. Such fitness in turn will reach a random value in the range [0,1]. This is the part of the overall process, and by itself would lead, albeit slowly, to the level of perfection of the whole system. The interesting aspect of the process of Bak Sneppen is the presence of the local part: the two species adjacent to the species affected by the change, in turn, change their fitness while having no other reason than the imitation of neighbours. There may be real perturbations, but in the case of the social sciences it can also be assumed that the demonstration effect (Duesenberry et al., 1949) operates. Each of these two species in turn acquires a new fitness taken at random in the interval [0,1], and then often worsens the previous situation. The experimental results show that the process goes toward a dynamic equilibrium (called self-organised criticality) in which the distribution of the average fitness is maintained uniformly in the interval [M, 1], with rare cases of fitness less than M. High numerosity trials show that M slightly exceeds 2/3, but no explicit formula for its calculation is known. However, the evolution of the model has been extensively studied, (see Piccinini et al., 2013).

A classic simplification which makes the model more tractable from the point of view of the exact calculation is to attribute to the fitness only a finite number of values, specifically the values 0 and 1, changing if necessary the law of probability of their frequencies (Barbay and Kenyon, 2001). In this case the element to be modified is chosen randomly, extracting one from among those with the lowest fitness. The authors have studied the version of three fitness levels in the presence of a partitioned system of species that can interact only at their interior, and have shown that there is an increase in the average value of the system, and that overtaking phenomena arise (Piccinini, 2013).

In this work, the reduced model of Barbay is modified to make it consistent with the simplest form of micro-chain, i.e. a finite sequence of strings without bifurcations. Here the exact results for the cases of 3 (the minimum to apply the model), 4, and 5 activities are presented. The evolution of the phenomenon is governed by a Markov chain (for the theory see, e.g. WOESS, 2009). In the case of the three activities the transition matrix is an 8x8 matrix that is given for documentation in table 1 (in the rows are the starting states, in column the arrival spaces).

Table 1. Transition matrix for the three elements micro-chain

	000	**001**	**010**	**011**	**100**	**101**	**110**	**111**
000	0.2083	0.0625	0.250	0.00	0.0625	0.125	0.00	0.0417
001	0.1250	0.1875	0.125	0.25	0.0625	0.125	0.00	0.1250
010	0.2083	0.0625	0.250	0.00	0.0625	0.125	0.00	0.0417
011	0.1250	0.1875	0.125	0.25	0.0625	0.125	0.00	0.1250
100	0.1250	0.0625	0.125	0.00	0.1875	0.125	0.25	0.1250
101	0.0417	0.1875	0.000	0.25	0.1875	0.125	0.25	0.2083
110	0.1250	0.0625	0.125	0.00	0.1875	0.125	0.25	0.1250
111	0.0417	0.1875	0.000	0.25	0.1875	0.125	0.25	0.2083

The frequencies are maximum for the states 111, and 101 that are worth 0.1691, intermediate for the states 001, 011, 100, and 110 that are worth 0.125, and minimum for the states 000, and 010, that are worth 0.081.

Table 2. Average frequencies in a linear chain

Numerosity	**Overall average**	**Outside element**	**Median element**	**Central element**
3	0.5588	0.5882	-	0.5
4	0.6117	0.6675	-	0.5806
5	0.6542	0.7268	0.6187	0.5223

In the case of 4 activities the transition is represented by a 16x16 matrix, and in the case of 5 activities by a 32x32 one, in general $2^n \times 2^n$. The average levels grow with increasing abundance (and this is also the case in the classic Bak Sneppen model). What is new is that the average of the values of a given level decreases gradually as one approaches the centre of the system. The authors calculated the summary table 2:

3. The micro-chains between residual and innovation

The micro-chains may be segments of chains with elimination of some activities because obsolete or unprofitable. Industrialisation has eliminated those forms or stages of production of goods and services that were no longer competitive from the economic point of view, reducing the physical and cultural biodiversity. Despite the oxymoron, one can talk of technological biodiversity. However, with the economic and quantitative decline, the very tools needed for conservation are fewer. Beyond the purely biological plain, on the technology plain the preservation of an obsolete machine (a car or a computer, for example) is rendered essentially impossible by the lack of spare parts, fuel, or compatible software and operating systems from the time. At an amateur level some fragments of micro-chains that reproduce elements necessary for the restoration have been reproduced, even if they are philologically not perfect. These micro-chains are also integrated into the information system of access and sale, and from this point of view the Internet and its search engines have been valuable tools in terms of the

opportunity it gives for the creation of a niche market sufficient for reconstitution. As with any translation, there is always a collision with the quasi-reproduction of the original as is pointed out by Eco (2003), where all his semantic considerations can be transferred to the wider cultural context of biodiversity. The limits and the value of the reconstruction of lost segments have been a major problem in the restoration of works of art for over a century; the agile but severe synthesis of Brandi (1963) can be recalled.

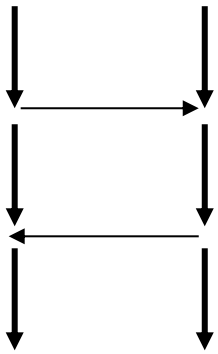

Figure 1. Bridge Innovative Micro-Chains between heavy chains

The micro-chains can also be branches rising for innovation and experimentation, or simply branches that want to compete with existing ones. An interesting case is that formed by budding off from a complete chain to test new markets or new marketing techniques. In this area more and more micro-chains that constitute bridges between chains of a different nature are spreading (Figure 1), such as a production chain with a chain of tourism and culture to create new integrated systems of collective imagination that use the more established chain as prevalent to spread the other. In some cases they play a symmetrical role, as in Tuscany's Chianti. In other cases, the potential is not yet fully explored, such as in Oltrepò Pavese and to some extent in the Veneto area of Prosecco, where the production process is well structured but the cultural-landscape return is modest.

The evolution of a system of parallel chains leads to a natural selection, so that some chains acquire a dominant efficiency in single sections, after which the others renounce operations in those sections, relying instead on the more specialised ones (Figure 2). These in turn may decide to leave the sections upstream and downstream where they were not dominant. In this way, upstream and downstream-segmented micro-chains arise, which are grafted onto a specialised and strong chain. Typically, this is in the areas of communications and transport, but also in wholesale distribution. Other functions are less material, such as information, advertising, insurance, and financial systems. The solution in some cases is of intermediate type, using cooperative structures or districts. There is always the need to determine the level of individuality of the product and the cost/benefit ratio of such a finding, or the convenience of merging it into a strong brand with higher penetration.

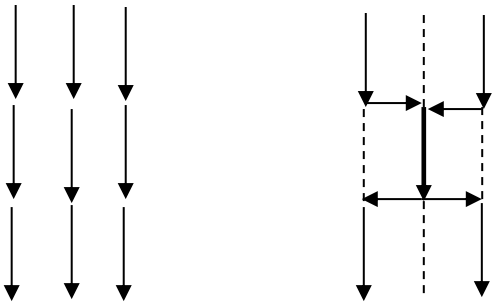

Figure 2. Micro-chain reduction for specialisation and consequent atrophy

The micro-chains of the regional typical dishes have rich case studies. There is the step of tradition transmission, full of dispersions and variants, followed by a time of consolidation and coding. Today encoding reaches the notarial deposit and one wonders whether the restaurateurs, or even the individuals, who want to take advantage of this recipe will have to pay the copyright to the entity (however worthy), which did the testing and coding. The expansion of a micro-chain is consolidated with the festivals and intercropping of restaurateurs who organise theme nights. In some cases it is possible to stabilise production, thus making it transferable in a credible manner without resorting to freezing (often it is formed into dry cakes).

4. **Integration and completion of micro-chains**

Consider first the case of a micro-chain that is a residue of a previous chain that was interrupted. The most obvious solution is to replace the part that no longer exists with another similar, if one can be found in the supply chain. The operation can entail not only a financial but also an organisational cost. There may be the need to make the product suitable for a working out of the premises, or suitable for transportation, or to keep it recognisable in view of the final sale. On the other hand, abdication of the identity of the product through intercropping may be necessary, as happens in dairy manufacturing or in the conferring of wine grapes. In certain cases identifiability of the product remains, but at some more aggregated level, often commercially more functional. Depending on the level where welding is accomplished, downstream of the micro-chain some segments may remain useless, and hence available for disposal. In general, the rupture of an element of the micro-chain involves the atrophy of some surrounding area (expanded local effect of Bak Sneppen type).

Where the micro-chain has the advantage of relying on the large chain (Figure 3) it is easy to succumb to the temptation to use it, although this may partly distort the philological integrity of the product. Consider the supply of raw materials, which may be more convenient if they are not local: think of the packaging suitable for non-selective transport and long waiting times: how difficult is it nowadays to eat fruit reaching a suitable point of maturity? Such a view is typical of operational research; in particular the Bellman dynamic programming which basically states that anything that belongs to the past should not affect the future (Bellman, 1957). Sometimes, however, the substitution takes place in a more proficient and cheap way by leveraging other existing supply chains with conservative character (fake antique, or metaphor of the ancient); sometimes there is a real process of deconstruction and reconstruction of the production method, in order to adapt its structural components to the valuable product.

Figure 3. Support relying on a strong chain

At the moment of the transition from a chain (or from an even more delicate micro-chain) to a strong connective structure there is the opportunity of choice, but also a rise in costs of adaptation and dressing of the product. From this point of view it seems that the connection systems also obey the model of evolution of Bak Sneppen (see section 1b), in which the perturbations on the elements adjacent to the main nucleus present unpredictable outcomes, not always positive. From the point of view of the representation by directed graphs a phenomenon arises that, borrowing a term from linguistics, we can define as *suprasegmental*. In road graphs, for example, it occurs when at a crossing there is a prohibition against turning left, towards a road that has no prohibitions. In this case, the distance cannot be calculated by taking the sum of the lengths of the two branches, because a deviation is required. The transitions in the nodes can therefore be affected by costs that must find their place in the economic and organisational optimisation model; this is done by enriching the system with appropriate virtual nodes and branches.

The welding of micro-chains to replenish themselves into a complete chain seems unlikely without intervention from officers. Most frequent is the case when the micro-chains stay at the top and tail of the main chain (with an effect of last mile type). The model of Bak Sneppen (as modified in section 1b) suggests an interesting aspect: although typically it takes a certain time or a high initial design to achieve a good level of fitness, in the following evolution the extremes of the chain, and therefore also the micro-chains, appear to be less vulnerable compared to the main parts of the system, adhering to Schumacher's saying "small is beautiful". However, it must be pointed out that the ascent of endpoints can take more time than the central branches of the system require. According to what was said in section 1b, in general an overall system that also has micro-chain terminals reaches more appreciable levels of functioning than does a reduced system that only supports the skeleton.

The fusion of different and complementary activities has additional costs, but also has benefits for contractors, since both parties benefit from the experience of the other party even if this is not spelled out. This phenomenon has been analysed in depth by Lavie[5] in the light of the Resource-Based View (Wernerfelt, 1984, with reference to the generalisation of Barney, 1991) that lends itself in particular to a thorough study of elite sectors of production. The fusion of different skills can sometimes lead to a better definition of the product, suggesting those changes that will make the characteristics more comprehensible to the public, eliminating those superstructures understandable only to specialists, and at the same time emphasising the differences that make it a unique product distinct from its competitors. At the same time, the final distributor may transfer information relating to customers' wishes, and the basket of goods that they expect to be available at the time of purchase (depending on the level of the point of sale). More technical, inversely, are the signs related to transportation, but also acquire

[5] An extensive and well documented synthesis can be found in Lavie 2006, while the analysis of case studies drawn primarily from information industry is contained in the doctoral thesis Lavie 2004.

decisive importance, particularly in regard to perishable goods or goods subject to strong competition. In Droli et al. (2013) an extensive discussion of these issues relating to the hotel and tourism sector can be found, while in Piccinini et al. (2009) the non-linearity of the processes of rarefying elitist goods is emphasised.

It is essential that the terminals of the supply chain are able to exercise control over large intermediate channels, as otherwise they may become simple satellites in the employ of the strong parts of the system, and therefore be subject to any change of strategy. This is not always possible, as in the case, apparently completely free, of the networks, where the powerful channel lies in the background, and search engines are the true masters of the supply chains; additionally there is the feed-back arising from access frequency and from the users authority, so that those who are already known become better and better known, while the neophyte will never be able to arrive at a central location (hub). Comparing Barabasi's theory of networks with the theory of algorithmic innovation of MacCormick[6], some of the mechanisms that enhance the non-linearity of cumulative successful advertising can be understood and mastered so that the intervention of new players can be driven.

5. The consumer and the smart micro-chain

A micro-chain that is to survive must be able to combine its classic features of niche with the possibilities offered by the new media (in particular, networks and search engines). A current successful micro-chain may therefore be defined as being *smart* rather than simply *short.* First of all, the niches in which it appears arise not only from a renewed awareness of the consumer (and who gives it to him?), but paradoxically from globalisation. This stems from the re-interpretation of the model of Sylos Labini (1982) of which, for completeness, we recall the essential lines: in the pre-industrial structure there were many small niches (usually with high prices), who met the few clients in a fully centred market; the next step was a medium industrial structure, where the prices came down. The satisfaction of some of the most demanding customers was low, but they were too few to provide economic sustainability to quality micro-chains, because there were still a variety of products that could satisfy most of the customers at affordable prices. Globalisation, inversely, has led not only to a further drop in prices but also to a decreased product differentiation. The number of consumers who cannot be satisfied by the global product therefore becomes higher, creating broader niches that are thus economically sustainable. In particular, the support of large networks of communication, which is in turn a global phenomenon, allows the coagulation of new-segmented niches into economic sustainability. The consumer must first know of the existence of micro-chains. Sometimes this is achieved by word of mouth, sometimes it is the final seller who gives the information, and sometimes it is through information obtainable via the network, albeit with the problems of visibility set out in the preceding paragraph.

The reaction of the final customer with respect to a short chain has been studied extensively over the last few years. One recent and important study in this regard is that of the EU under the guidance of Kneafsey (Kneafsey et al., 2013), where it is emphasised that there are psychological and social values that are added and which sometimes outweigh the cost of the quality/price ratio. Consumer confidence in the health of the process, direct knowledge of the manufacturer, and the effect of social aggregation of the market place are some of these effects.

[6] Barabasi 2004, link (=chapter) 7 and Mac Cormick 2012, chapters 2 and 3.

Apparent defects in the segmented chain are instability of characteristics, excess of the characterisation of the product followed by resulting stock-outs, and reduced time windows for seasonal products. Often, however, the consumer appreciates these aspects and is pleased with a lucky discovery, reaching a level of psychological satisfaction, but this doesn't always overcome the inconvenience of not finding a basket full of products as in supermarkets. Compromise solutions are given by the combination of a large-scale deployment of service with one or more "windows" of products from short chains, well highlighted and promoted both permanently and with rotations linked to seasonality. In this way the saturation phenomena, considered for example in Piccinini et al. (2002), can also be won.

One aspect that is not often highlighted is that the food chain does not end at the time of sale to the public. The last branches of the chain include the preparation of the food and its taste, and can be assigned either to catering facilities, particularly restaurants and taverns with their varying degrees of authenticity, or to the care of families. In the latter case especially, information on the uses and preparations that can be made, as well as on the food and wine pairings, becomes important. The extensive media coverage of these issues must be taken into account, as it may be aimed at supporting the dissemination of products that are already entered in the collective imagination, but can also be diverted if the use of the products of a micro-chain has never been promoted. Often the presentation of products takes place at events dedicated specifically to wine and food, or on the margins of events related to the areas of production, especially when they are distant and rich in touristic and cultural traditions. It could be kept in mind that the combination of the "window" with a series of cooking classes consolidates the loyalty of new customers, enhances the spirit of competition, and creates an effective network of testimonials scattered throughout the territory, which can carry out the effect of amplification from the bottom, and is now enhanced by the possibilities offered by social networks that partially correct the rigidity of the major search engines allowing sudden avalanches of information, as occurs especially in the entertainment world .

6. Conclusions

The empirical evidence is offered in a forthcoming work by a case study of a regional network composed by 5 production plants and 3 final agents joined in the network by contractual relations operating in different regions of Italy. Fifteen chains form the network and the simulations performed with the Bak Sneppen algorithm to evaluate the change in network configuration of the micro-chains after one year. The expected results are the evaluation of the impact of variables such as the geographic distance, knowledge about the intrinsic product quality, information diffusion among agents, and marketing strategies implemented with the "on line" Internet facilities (see Taverna et al., 2013). The degrees of freedom imposed to the 15 chains contribute to elaborate flexible solutions for different organisational strategies. However, flexibility and uncertainty of the outcomes, obtained with simulations depend on the political priorities. The actions performed upstream and downstream of the sale points are of greatest interest for the network performance (e.g. inclusion of market strategies, product continuous supply and seasonality, transport facilities, constraints on land use for rural areas, recreational or natural sites, ecological destination). During the year, alternative strategies are performed to observe the policy boundaries imposed on land use and other negative externalities. It is important that in addition to the 8 direct agents, external supports can be called both for possible transportation and primarily for media advertising. The supervision of the University is important because it allows it to

constantly have a broad picture of all the sectors, thus being able to give adequate information on the best practices that emerge, taking care however not to distort the trial, given that the payback in terms of loyalty is not of immediate perception, and therefore the identification of best practices in the short term may be biased. There is the need to encourage the return information from customers, including from social networks, and to insert some animator[7] that clots the cohesion process, so that the dimensional input barriers in the search engines can be overcome, which would greatly help the success of the initiative. Nowadays knowledge of the mechanisms for constructing search engines is an essential component in constructing an advertisement from below that will parallel the effectiveness of craft made word of mouth, and professional advertising through the mass media both general and targeted. This will be an additional reason for conferring the status of "smart" to these supply chains that transcend the simple short chain but which maintain high customisation and product recognition: clearly a concept more stringent than traceability.

References

Andreatta G., Mason F. and Romanin Jacur C. (1990). *Ottimizzazione su reti*, Libreria Progetto, Padova (Italy).

Bak P. and Sneppen K. (1993). Punctuated equilibrium and criticality in a simple model of evolution, *Physical Review Letters*, 71 (24): 4083-4086.

Barabasi L. (2004). *Link. La scienza delle reti*, Trad. Ital. di B. Antonielli d'Oulx, Einaudi Torino.

Barbay J and Kenyon C. (2001). On the discrete evolution model of Bak-Sneppen model of self-organized criticality. Proc. 12th Annual ACM-SIAM Symposium on discrete Algorithms, Washington DC.

Barney J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17, 99-120.

Bellman R. (1957). *Dynamic Programming*. Princeton University Press, Princeton

Brandi C. (1963). *Teoria del restauro*. Einaudi Torino

Chang T.F.M. and Iseppi L. (2011). Specialization versus Diversification in EU Economies: a Challenge for Agro-food? *Transition Studies Review*, 18:16-37, Springer.

Chang T.F.M. and Iseppi L. (2012). EU Agro-Food Chain and Vertical Integration Potentiality: a Strategy for Diversification? *Transition Studies Review*, 19, 1:107-130.

Chang T.F.M., Piccinini L.C., Iseppi L. and Lepellere M.A. (2013). The Black Box of Economic Interdependence in the Process of Structural Change. *Italian Journal of Pure and Applied Mathematics*, 31: 285-306.

Cormen T.H., Laiserson C.E. and Rives R.L. (1990). *Introduction to Algorithms*, 536-550, Mc Graw Hill, New York.

Droli, M., Chang T.F.M., Iseppi L. and Piccinini L.C. (2013). Managing trade contacts in HotRest intermediate markets: a resource-based view analysis in EU countries, *Tourism Economics* August, 20, 4: 757-778

[7] Recall that the Sicilian Nobel Prize Pirandello formally introduced among the spectators actors in seeming incognito, following the old use of circus shows imitated by Marinetti in his Futurism Soirées.

Duesenberry J.S. (1949). *Income, Savings and Theory of Consumer Behaviour*, 89-125, Cambridge Mass, University Press.

Eco U. (2003). *Dire quasi la stessa cosa. Esperienze di traduzione*. Bompiani, Milano.

Economides N. (1996). The Economics of Networks. *International Journal of Industrial Organization*, 14: 673-699

European Parliamentary Research Service (2013). *Local Agriculture And Short Food Supply Chains*.

Kneafsey M., Venn L., Schmutz U., Balázs B., Trenchard L., Eyden-Wood T., Bos E., Sutton G. and Blackett M. (2013). *Short Food Supply Chains and Local Food Systems in EU* (F. Santini, S. Gomez y Paloma S eds.), JRC Scientific and Policy Reports Luxembourg. Publications Office of the European Union.

Lavie D. (2004). *The interconnected firm: Evolution, strategy and performance*, University of Pennsylvania http://repository.upenn.edu/dissertations/.

Lavie D. (2006). The competitive advantage of interconnected firms: an extension of the Resource Based View. *Academy of Management Revue*, 31: 638-658.

Mac Cormick J. (2012). *Nine Algorithms that Changed the Future*. Princeton University Press.

Piccinini L.C. and Chang T.F.M. (2002). La scelta del consumatore tra razionalità e gusto. *Agribusiness Paesaggio & Ambiente* 5: 49-60.

Piccinini L.C., Chang T.F.M and Taverna M. (2008). Dissoluzione e ricostituzione delle reti di comunicazione: da infrastruttura a valore turistico. Atti del convegno *La rete tratturale come mosaico paesistico-ambientale ed opportunità di ecoturismo*. Art Sannio Campania Benevento, 78-97.

Piccinini L.C., Chang T.F.M and Taverna M. (2009). Vette di unicità in un mare di uniformità. *Agribusiness Paesaggio & Ambiente*, 12: 183-191.

Piccinini L.C. (2011). Riflessioni sulle micro-filiere, in *La fingerprint bioculturale del Friuli Venezia Giulia* (Chang, Piccinini, Schenkel eds) 247-263, FORUM, Udine.

Piccinini L.C., Lepellere M.A. and Chang T.F.M. (2013). *Utopias of Perfection and their Dystopias. Society, Integration, Education*, Proc. of Intern. Conference: Sabiedriba, Integracija, Izglitiba, 3: 189-200.

Renting H., Marsden T. and Banks J. 2(003). Understanding alternative food networks: exploring the role of sort food supply chains in rural development, *Environment and Planning*, 35: 393-411.

Rizzo M. and Giudice V.L. (2013). Structural Analysis of Forms of Local Partnership in the Val d'Anapo Area. *Quality - Access to Success* 14 (Suppl. 1): 188-193.

Rosa F., Weaver R.D., Vasciaveo M. (2015). Structural Changes and Dairy Chain Efficiency in Italy, *Journal Food System Dynamics*, 6, 30, pp 191-211.

Sauvée, L. (2002). *Efficiency, Effectiveness and the Design of Network Governance*. In

proceedings of the 5th International Conference on Chain Management agribusiness and the

Food Industry Noordwijk, The Netherlands, June 7-8, 2002

Sporleder T.L., Boland M.A. (2011). Exclusivity of Agrifood Supply Chains: Seven Fundamental Economic Characteristics. *International Food and Agribusiness Management Review*, 14, Issue 5

Sylos Labini P. (1982). *Oligopolio e progresso tecnico*. Einaudi, Torino

Taverna M., Piccinini L.C., Chang M.T.F. and Iseppi L. (2013). *Structures and Paths for the Exploration of Landscape-Cultural Mosaic*. Society, Integration, Education, Proc. of Intern. Conference: Sabiedriba, Integracija, Izglitiba, 1: 517-527.

Wernerfelt B. (1984). A resource based view of the firm. *Strategic Management Journal*, 5: 171-180.

Woess W. (2009). *Denumerable Markov Chains*. European Mathematical Society.

Wubben E.F.M., Hagelaar G. (2009). *Innovative Coordination of Agribusiness Chains and Networks*. VII International PENSA Conference November, 26-28th, 2009 - Sao Paulo, Brazil.