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Adaptation in Food Networks: Theoretical Framework and Empirical Evidences

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ABSTRACT

The paper concerns the integration in food networks under a governance point of view. We conceptualize the integration processes in terms of the adaptation theory and focus the issues related under a transaction cost economics perspective. We conjecture that the allocation of decisions rights between the parties to a transaction is a key instrument in order to cope with the sources of basic uncertainty in food networks: technological innovation, sustainability strategies, quality and safety objectives. Six case studies are proposed which contribute to corroborate our conjecture. Managerial patters based on a joint decision approach also are documented

Keywords: integration, food networks, adaptation, decisions rights

1 Introduction

The objective of the paper is to contribute to the understanding of the integration among food networks units. We refer here to networks as the total of actors within one industry and/or between related industries, which can potentially work together to add value to customers: chains are instead considered to be composed of the actors in these networks which vertically work together to add value to customers (Omta *et al.,* 2001). While intensive research efforts was made in order to investigate the emerging of food networks organizational arrangements (Scheifer, Fritz, 2008; Karantininis *et al.*, 2010), it seems that a smaller attention was paid the emerging of integrating patterns in food networks. Integration is inherent to food networks because of the necessity of vertically coordinating the production processes and of channelling the information requested to quality and safety purposes including certification and traceability (Schiefer, Fritz, 2008; Omta *et al.*, 2001).

Integration of supply chains is often associated with interconnected business processes within and outside a firm's boundaries (Jayaram, Tan, 2010). Integration is articulated mainly in terms of functions, interfaces and mechanisms, such as contracts and joint decision devices (Arshinder *et al.*, 2008). Further approaches interpret integration as a construct based upon the flow of goods, planning and control, organization and the flow of information (Vijayarasathy, 2010; van Dork and van der Vaart, 2005).

Under a governance perspective the integration influence the units coordination patterns. To the purposes of the integration, the parties need to organize the current activities and the flows of resources, goods and information, as well as the probable future events. After the setting up of the organizational arrangement, the parties could actually face unforeseen events which in turn may negatively affect the performance of the relationship. Sustainability strategies, quality safety objectives, the need to develop and to adopt technological innovation are the main source of uncertainty in food networks. The adaptation of the governance structure to the probable events occurring in the life of the contract is thus a crucial necessity. Adaptation concerns with the activities the contractual parties undertake in order to cope with events unforeseeable at the contract outset. Adaptation is a central problem of economic

organisations (Williamson, 1985, 1991), and its conceptualisation is integrated within complementary theoretical perspectives (Gibbons, 2005, 2010; Afuah, 2001; Arruñada *et al*. 2005; Gulati *et al*., 2005; Geyske *et* al., 2005; White, 2005; MacNeil, 1978). In this paper we consider the economic integration in the light of the adaptation theory (Gibbons, 2005; Williamson, 1991) and concentrate on the allocation of decision rights among the contracting parties.

The paper is articulated as follows. The par. 2 presents the objective and the method of the study. The analytical framework and the hypothesis are illustrated in the par. 3. The par. 4 is dedicated to the empirical analysis. Three cases concern with agreement arranged at the Italian National level, three cases regard regional level Food Networks. Beyond the differences in the institutional environments, the cases also differ because of the degree of integration. The paper contributes to the literature by corroborating the theoretical hypothesis (Gibbons, 2005; Wu, 2006) and providing empirical information on how Food Networks manage contingencies emerging during the life of the contractual relationships in critical fields. Final remarks are presented in the last paragraph.

2 Method

The research method is based on the case studies approach (Yin, 1994), according to the following scheme. First, drawing form literature we developed the analytical framework and then we introduced a testable conjecture on the basis of the causal structure proposed (Dahlstrom and Nygaard, 2010). In order to test the hypotheses we carried out six cases study chosen under a confirmatory perspective (Seawright and Gerring 2008) concerning the design and the implementation of the organizational arrangement, intended to promote integration among the units of food networks taken into account: farmers, processors and traders. Drawing from the conceptual framework, the specific questions addressed in the study were:

- are critical decision rights allocated across the firms boundaries to face uncertainty?
- what are the circumstance under which the allocation is chosen by the parties?

In our view to answer to these question contribute to corroborate (or not) the prediction drawn from the literature and it may also provide guidelines for designing agreement intended to the governance of Agro-industry networks. The data gathering was aimed at identifying the organizational arrangement chosen by the parties and, according to Gibbons (2005), the allocation of the decision rights. Data collecting was realized by documents analysis and by carrying out unstructured interviews in two stages, in Summer-Autumn 2011 and in the Autumn 2012.

The elaboration of theoretical propositions, which represents the first step, uses existing theories which are the basis of the empirical research (Yin, 1994).

3 Analytical framework

3.1 Integration in food networks

The integration of the supply systems is basically conceived in terms of interconnection among the activities of network supply units across the firm's boundaries (Jayaram, Tan, 2010; Omta *et. al.*, 2001, 2002; Huggins, 2008; Vence *et al.*, 2000; Krug, Hendrischke, 2008; Hawkesworth, Imrie, 2009). Integration channels the flow of resources and products and requires exchange of information and joint planning and control (Vijayarasathy, 2010; van Dork and van der Vaart, 2005). Scholars recognize the direct connection between the integration of structures, processes and participants and the Food Network performance (Ziggers *et al.* 2010, p. 348). Integration could also characterize the strictly coordinated subsystems emerging in specific the Agri-Food sectors (Zylbersztajn, Farina, 1999). European Union encourages integration as a tool to enhance the Agri-Food system performance (Commission of the European Communities, 2009). The policy intervention in such direction seems to be more effective if it sustains the governance choices (Martino *et al.*, 2012). Broadly speaking the integration entails the organization of the production processes and supply activities under a comprehensive perspective requiring all the units involved to coordinate the use of material and immaterial resources as well as the production and the exchange decisions. The performance of integration depends upon how efficiently the integrating parties organize the transactions they carry out. Provided that the parties to a transaction align the characteristics of the governance structures to the transaction attributes (Williamson, 1985), the question on what governance structures are chosen to integration purposes arises. Among the transaction attributes (asset specificity, uncertainty and frequency, Williamson, 1985), we concentrate here on

uncertainty. Environmental (Walker and Weber, 1984; Robertson, Gatignon, 1998) and behavioural (Williamson, 1985) uncertainty give raise to contractual hazards which may undermine the performance of the integration. Changes in the market demand influence the production plans, the amount of the resources employed and thus the net gains of the parties. Although the parties know that the demand varies through the time, they cannot anticipate the changes over a long time period. Unexpected changes in the market demand would induce the firms to renegotiate the production plans and the coordination of the production processes they manage. Depending on the rigidities of the organization of these production processes, the renegotiation may be really costly as each parties may seek to force the counterparty choices. Sustainability strategies are usually based upon complex set of activities entailing the contribution of several network units (Fritz and Schiefer, 2008). The coordination of such activities is critical to the achievement of the integration expected outcome. On the other hand while complexity of the design of all the activities could support the achievement of the objective in the long term, failure in the short term may occur due to unexpected changes in carrying out one of some activities to be undertaken. Further contractual hazards are caused by the difficulties to manage quality and safety strategies. Information asymmetry may increase the monitoring and measurement costs but they also make extremely difficult to identify the critical elements of the context in which the production activities are carried out (Lupien, 2005; Mènard, Valceschini, 2005). Agri-Food companies currently face the necessity to innovate the products and the processes. Collaborative efforts are increasingly required to manage more efficiently the innovative process. As a consequence, the tacit and codified knowledge resources required are often gathered from several sources (companies). Appropriability hazards (Teece, 1986; Oxley, 1997; Sampson, 2004) may negatively affect the performance of the relationship. On the other hand, the technology specification in the integrating process requires systematically the transfer of knowledge therefore the emerging of appropriability hazards seems to pervasive. Unforeseen contingencies may push the governance structure out of the alignment and thus may give raise to ex post transaction costs (Williamson, 1991). As the contractual hazards are exacerbated by uncertainty (Williamson, 1985), the critical organizational issue in this context is the choice of the arrangement which allow the parties to cope with the unforeseeable events occurring during the life of the relationship. Integration is thus efficiently based upon patterns of cooperation and coordination among the partners, patterns which are embodied by the governance structure with a specific role for the opportunities of managing the emerging disturbances. Gibbons (2005) argued that an *adaptation theory* asks whether integration or non-integration better facilitates 'adaptive, sequential decision making' (Gibbon, 2005: 205). Under this view the integration is strictly associated with the adaptation processes of the governance structures. In the following we summarize this theoretical perspective.

3.2 Adaptation

At the time of the choice of the contractual arrangement the parties cannot anticipate all the possible future events. For example, changes in the market demand or technology may be expected to occur, but the parties may have not sufficient information to foresee the future events. Cost of misalignment and of renegotiation will arise due to unexpected events occurring after the sign of the contract (ex post stage). The parties should adapt the governance structure to the new circumstance in order to minimize those costs. Adaptation is based on workable, order-preserving mechanisms for adapting to disturbances in services yielding mutual gains and for adjusting to the capacity of the parties of a long-term contract to incorporate hazard-mitigating mechanisms within the ex-ante contractual agreement (Williamson, 2003, 2005). Gulati *et al*. (2005) conceptualise adaptation in the vertical relationship in terms of differentiation, concerning the state of collaboration among the units, and integration, regarding the state of the segmentation of the organisational systems into subsystems. Ménard (2004, 2006) states that hybrids aim to reduce the costs of contract specification and of the associated rigidities, by designing a general, relational, contractual framework. Gibbons (2005) subsumes the theme of adaptation in a complex theoretical structure by framing four elemental theories of the firm. Among them, the adaptation theory asks whether integration or non-integration better facilitates 'adaptive, sequential decision making' in the sense of Williamson (Gibbon, 2005, p. 205). Notably, the adaptation theory applies not only to make-or-buy problem, but also to a particular class of contracting problems, where two firms pass decisions rights across their boundaries by contract (Gibbons, 2005, p. 234). A key idea is that integration decision facilitate the parties relationship (Gibbons, 2005, p. 2009). Namely, Gibbons (2005, p. 235) assumes that an asset consists of three components: a vector of extricable decision rights *d* (which can be moved by contract, without changing the ownership of the asset); a vector of inextricable decisions rights δ (which are controlled by the owner) and an inextricable payoff π (received by the owner). While decisions are not contractible *ex post*, the decision rights can be contracted *ex ante* (Gibbons, 2005, p. 213). The parties negotiate *ex ante* the allocation of the critical decision rights to the party who is expected to maximize the total surplus:

(1) $TS^i \equiv Es\{U_1(s, d^i(s)) + U_2(s, d^i(s))\}$

where:

TS^i = total surplus, when the critical decision rights have been allocated to the party i=1, 2;
d^i = critical decisions allocated to the party i = 1, 2;
s = uncertain events observable *ex post*;
U_1 = utility function of the party i = 1, 2.

Gibbons states that: "The key theoretical challenge in developing such a theory is to define an environment in which neither contracts ex ante nor renegotiation ex post can induce first-best adaptation after uncertainty is resolved, so that the second-best solution may be to concentrate authority in the hands of a "boss" who then makes (potentially self-interested) decisions after uncertainty is resolved" (Gibbons, 2005, p. 208).

It is assumed that not only that decisions are not contractible ex post but also that *decision rights* cannot be renegotiated ex post. Namely: "the adaptation theory has no inalienable decision rights but explicitly considers the way different allocations of alienable decision rights facilitate "adaptive, sequential decision-making" as uncertainty is resolved." (Gibbons, 2005, p. 230). Therefore the adaptive, sequential decision-making is modelled in terms of contracting the ex ante allocation to one party of critical decisions rights (selected from the vector *d*) who will take the decision, having observed the state of the nature unforeseeable at the time of the choice of the governance structure. The ex ante allocation of the decision rights to one party is thus the means the parties adopt to undertake the ex post adaptation to disturbances (Wu, 2006).

On the basis of the adaptation theory we introduce then the following conjecture:

H_1: facing uncertainty, the parties to a transaction in Agro-industry chains will integrate their activities by allocating critical decision rights to the party who is expected to maximize the total surplus

We test this hypothesis by through the evidence of the empirical analysis.

4 Empirical analysis

4.1 The producers-processors contractual framework in the North Italian Sugar Network

The sugar beet producers established national level Producers Associations (*Associazione Nazionale Bieticoltori-ABI, Consorzio Bieticoltori Italiani-CBI, Associazione Bietico*ltori Italiani-ABI) according to European law. The main objective of these association is to concentrate and to trade the sugar beet produced channelling it toward the processing stage. In the context of a long-tern agreement, a general contract has been signed in 2011 between the Sugar Beet Producers Associations and the Co.Pro.B. a cooperative company engaged in the processing stage. Co.Pro.B. (Cooperativa Produttori Bieticoli) has the mission is to process beetroots, mostly granted by the member farms, in two sugar production plants and to sell sugar by its own network for selling Italian sugar. The Cooperative has 4.357 member farms, mostly located in Emilia Romagna and Veneto, which has some of the most suitable soil for beetroot cultivation. The agreement concerns with sugar beet produced in North and Central Italy and can thus thought of having a national level nature. The agreement is designed in order to rule the processing of sugar beet and energy from the pulps. The Co.Pro.B. invested 100 millions of Euro in 2011 in order to enlarge the scale of the processing stage and biodigesters. The agreement require the Sugar Beet Producers Association to invest 35 millions of Euro in order to built on seven biodigesters dedicated to the production of bioenergy processing the pulps obtained from the sugar production. The economic and organizational sense of agreement relates to the complex evolution of the regulation of the sugar beet European market. Actually the sugar beet market and the activities of the agricultural production and processing stages are included within a National Plan of intervention issued by the Italian Ministry of Agricultural Policies. Nevertheless, the timing of the plan is held to be not adequately scheduled with respect to the emerging necessities of the sector.

On the behalf of the associated producers, the Producers Associations have the decision right of designing and signing specific agreements and contracts with energy suppliers delivering the bio-energy produced by the biodigesters. Accordingly, the general agreement gives to the agricultural producers the right to withdraw a fixed amount of pulp. The amount is equal to 13.50% of the sugar beet production delivered to the processing plant The Co.Pro.B. realized the investment made even though it has to be completed.

Namely three biodigesters were built up. Co.Pro.B. has the ownership of the plants. The quantity of the pulps processed in the biodigesters corresponds to the 80% of the processing capacity. The remaining 20% is achieved by corn silage. The production plans are strongly framed by the European Union quotas. In implementing the contract, improvements of the profitability of beetroots occurred and this caused an increase of the land employed in the cultivation. The demand for energy did not increase in the ex post life of the contract. However, the Producers Association started to built on further biodigesters provided the profitability of pulp processing. . The input-output flows generated by the general agreement is illustrated in the figure 1.

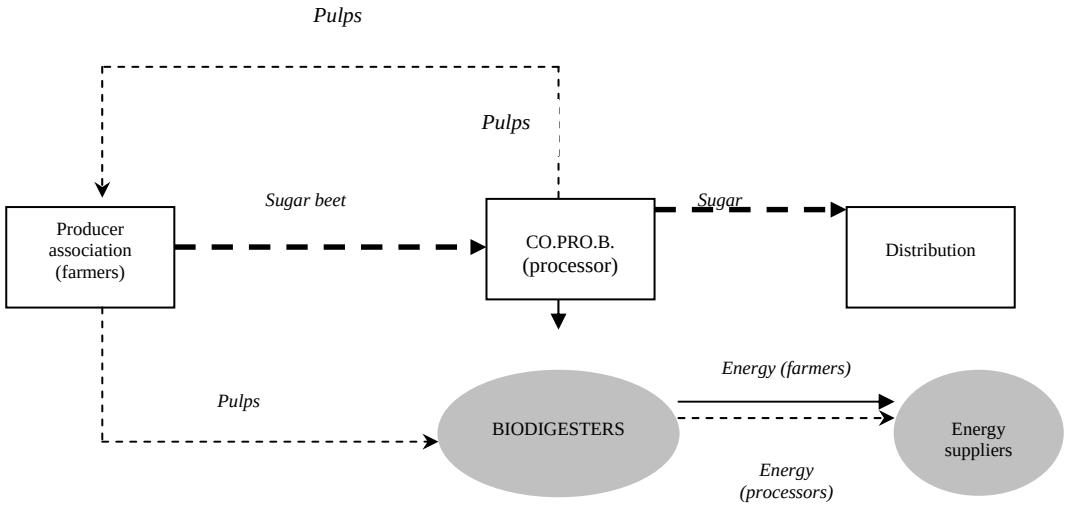

Figure 1. Sugar Chain general agreement – Input-Output flows
Source: the Authors

The contractual agreement thus allocates a critical decision rights to the Producers Associations. This choice is motivated by the fact that at the contractual agreement outset an environmental uncertainty existed due to demand for energy which may be faced by the producers and to the management of the completion of the building on the biodigesters. These two sources of uncertainty can be better faced by the Producers Associations both because their ability in managing the relationships with the agricultural producers and their ability in completing the investments.

Following Gibbons (2005, pp. 229-231) let us indicate:
a^C contractible *ex ante* decisions
λ^N inalienable *ex post* decisions that are not contractible *ex post*
d^N *ex post* decisions that are contractible *ex ante*
σ^0 observable signals
then, the critical aspects of the contractual agreement can be framed by through the following timing:

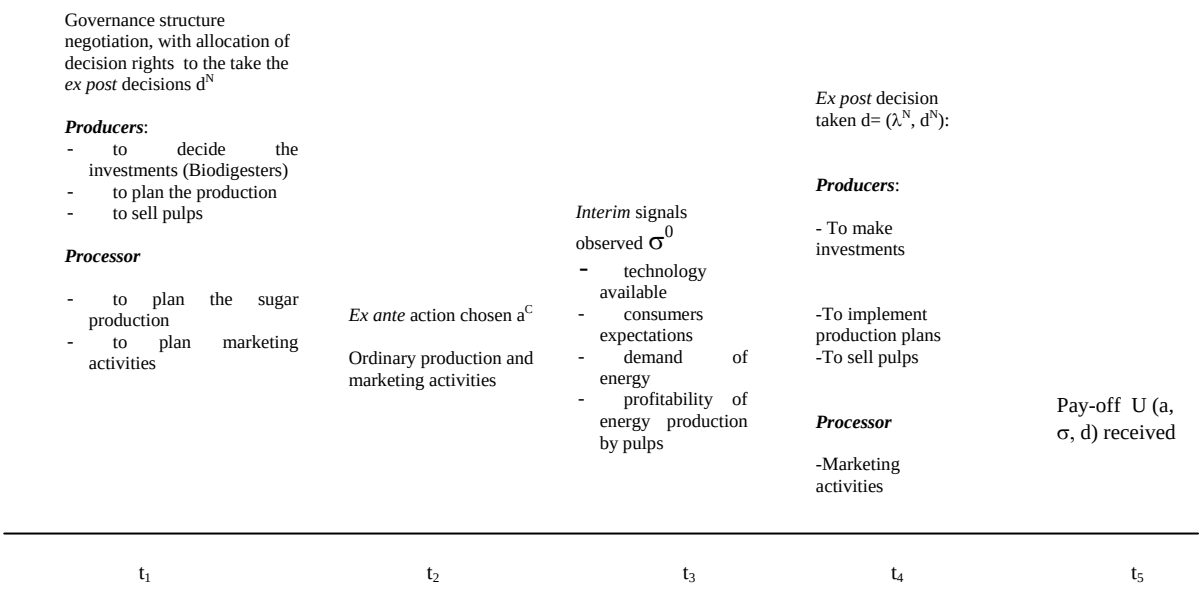

Figure 2. Sugar Chain general agreement – Timing of adaptation
Source: the Authors

4.2 The producers-processors contractual framework in the North-Italy Tomato Chain

We examined the Contract signed in 2010 by the Unaproa – a general association of Producers Associations – and the Associazione Italiana Industrie Prodotti Alimentari. The general agreement designs the contractual framework which provides the basic elements of the specific contract which will be signed by a Producers associations and the processors. This contributes to considers the Unaproa as a hybrid governance structure (Martino, Pampanini, 2006).

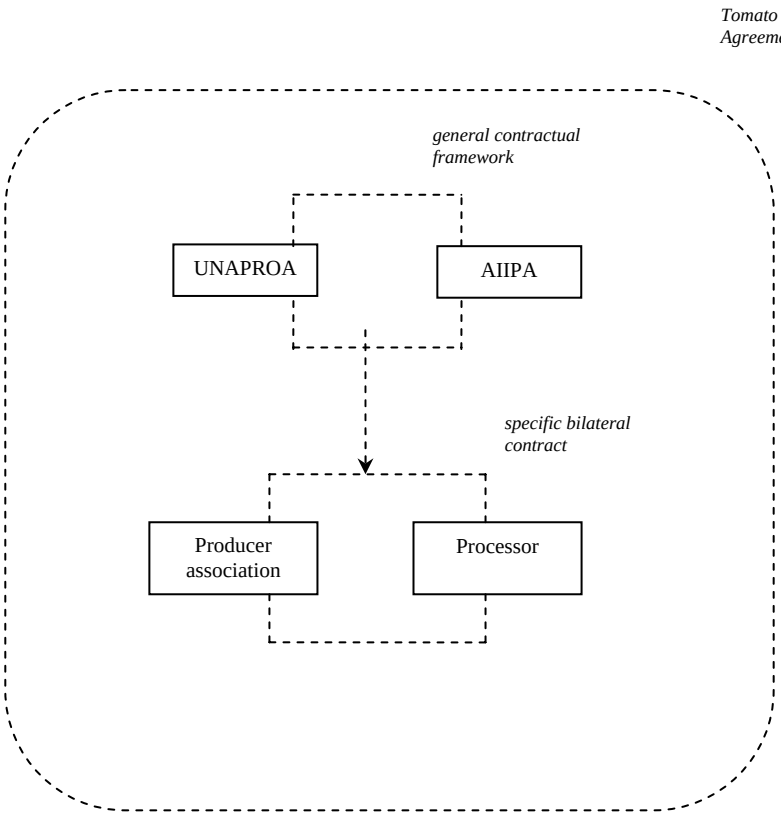

Figure 3. North-Italy Tomato chain agreement
Source: the Authors

The general objective of the agreements is to design the guidelines for planning the production by through coordinating the activities of the agricultural and processing stages. The agreement is furthermore intended to promote the marketing of the product and the enhancement of the quality. The basic activities are expected to be carried out under a joint management of the both agricultural and industry party:

- production planning;
- information disclosing;
- public monitoring supporting activities;
- marketing planning;
- quality improvement design and implementation;
- implementing of the traceability system.

The Unaproa has the decision rights of designing the services systems, namely the traceability system. We submit that all the critical uncertain elements are expected to be jointly managed by the parties. At the same time, the environmental uncertainty at stake concerns mainly the contingent fluctuations of the final demand. On the other hand the governance of the Tomato chain is made more complex by a further level of general agreement the interprofessional organization Tomato District, an association among several economic and policy agents established since 2007, according to Reg. CE 1234/2007, in order to design and to carry out activities concerning: quality, innovation and efficiency. The Tomato District includes Producers Organizations, Processing companies, four Provincial Administrations, and four Chambers of Commerce, Research Centers and further professional associations. In the figure 3 we distinguish between the general contractual framework designed by the professional organizations and the specific, bilateral contract designed by the parties (e.g., a farmer and a processor). The Figure 3 synthesizes the relations among the district agreement, the general contractual agreement signed by the Associations and the specific bilateral contract. The latter is framed within the more general level which

reduce the degree of freedom of the parties in negotiating the terms of the bilateral contracts. In specifying the framework of the agreement among the chain agents, the district and the general contract reduce the uncertainty affecting the chain relationships. In addition, the parties explicitly aim at establishing a joint management of critical decisions. An example is the way adopted to cope with market uncertainty. The whole quantity managed within a contractual arrangement was reduced in 2012 according to the strategic decision made at the Tomato District level. Therefore the relationship among the different level of contract also tends to induce the agents to collaborate.

4.3 The producers-processors contractual framework in the North-Italy Potato Chain

The Italian Union of Potatoes Producers' Associations (Unione nazionale tra le associazioni dei produttori di patate, UNAPA), located in Rome, reunites 12 Associations and is officially recognised by the Italian Ministry for Agricultural Policies.

UNAPA aims to represent, protect, assist and coordinate the associated organizations active in the potato processing industry, according to the rules of the Common Market Organization. It enhances the supply concentration, increases its value added, and design a framework for the associated organizations. It promotes development of seed potatoes production, protection and value added for production and marketing of potatoes for fresh consumption and industrial use, helping to strengthen trade relations in the food supply chain.

We take in consideration the general agreements signed in 2008, 2009 and 2010 in the context of the 2008-2011 plan by the UNAPA and three association of processing companies. The agreement are aimed at:

- providing the frame for designing bilateral contracts between agricultural producers associations and processors;
- promoting the experimenting of new forms of integration in order to face the competition in North Italy;
- regulating the mechanism of prices formation for the agricultural prices;
- promoting high quality standards;
- promoting traceability;

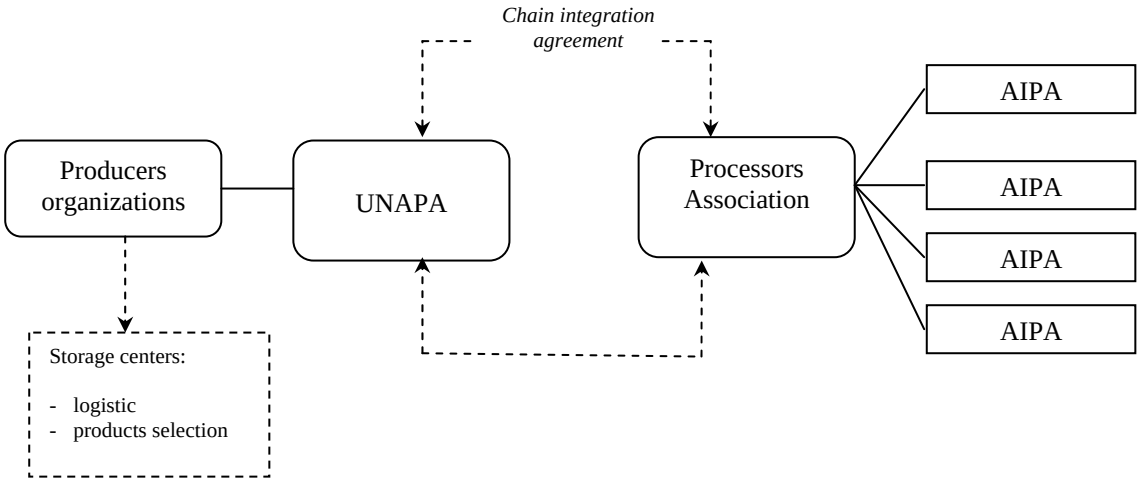

Figure 4. Potato Chain general agreement
Source: the Authors

The general agreement includes specific formulas to determine the agricultural prices and also establishes qualitative standards. The general contractual framework specify how to allocate critical decision rights.

Notably the contract allocates decision rights to the parties:

- the parties (e.g. a given agricultural producers association and a processor) have the right to negotiate betters terms;

- both the farmers and the processors have the rights to choice the best technology they prefer (provide the quality constraint and objectives).

Also in this case a general contractual framework between associated agents seems to reduce the opportunity for negotiating decision rights a the level of the specific bilateral contract.

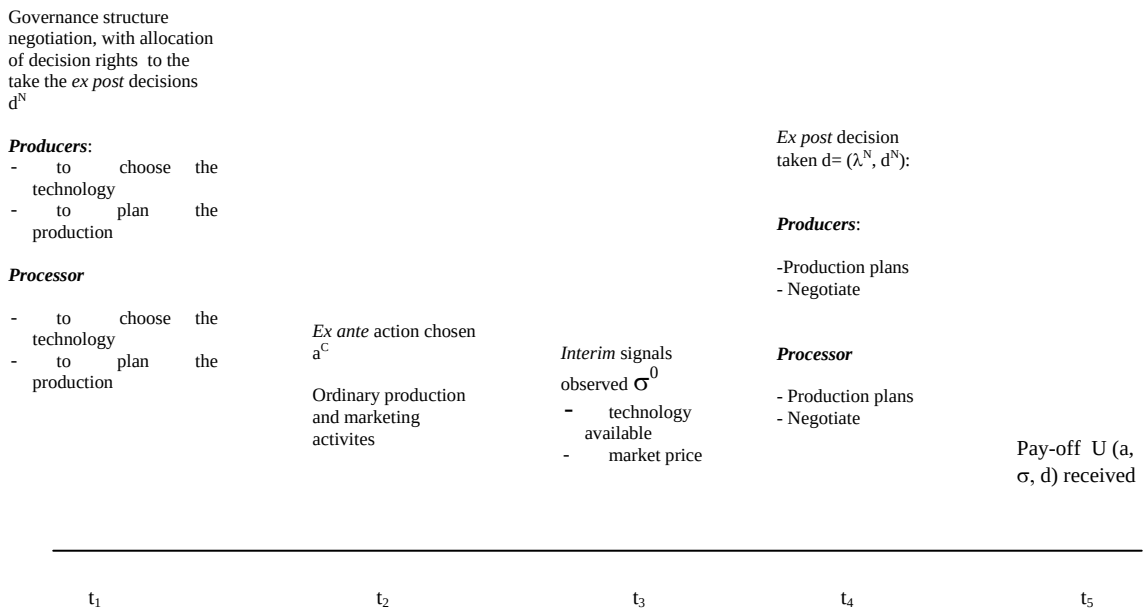

Figure 5. Potato Chain general agreement – Timing of adaptation
Source: the Authors

4.4 The "Pollo d'erba" system

The "Pollo d'Erba" case study considered relates the project of integration of agents involved in the supply of organic poultry meat (Martino *et al.*, 2012). This is a niche product obtained by traditional poultry genotypes with better qualitative characteristics and larger production costs than the conventional poultry meat. In this context the integration project was intended to establish a close coordination among the parties in order to structure their relationship and increase the possibilities of selling the product on selected market segments.

The integration project included the following main investments: a) Physical assets, at farms (Euro 255.500), intended to diffuse the poultry strains and to implement production protocol; b) Elaboration and implementation of certification systems and of the set of technical and organizational rules needed to introduce the commercial brand "*Pollo d'Erba*" (Euro 283.280).

The total number of parties involved were: a) four agricultural farms; b) one agricultural cooperative; c) a national level Association of Organic Producers (Aiab); d) a regional Technological park. The productive and institutional relationships are illustrated in the figure 2 (the solid lines indicate the flow of product, while the dot lines indicate the institutional relationship).

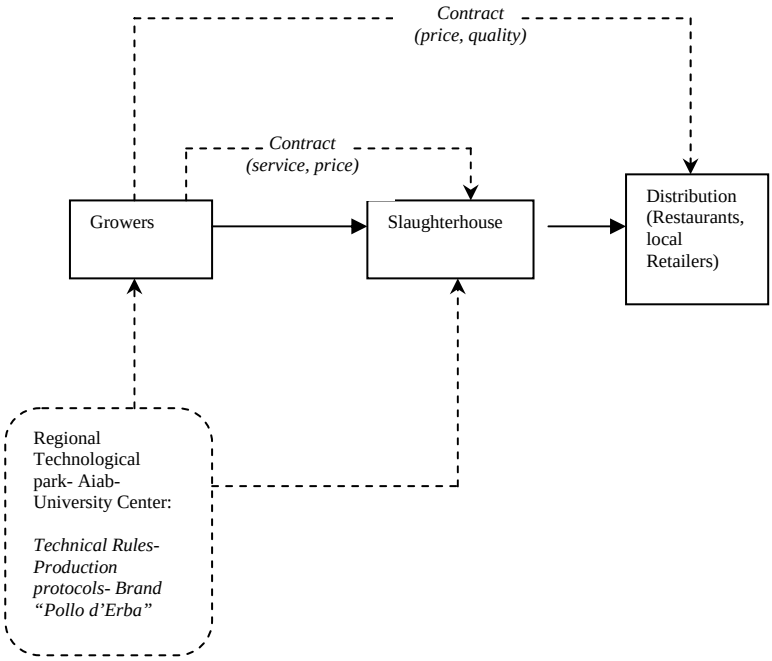

Figure 6. Case *Pollo d'erba* - Institutional and productive relationships (Martino *et al.*, 2012)

The five growers act as *producer*. They are in charge to make the investment identified by the general agreement signed by the parties under the supervision of the Regional Government of Umbria- However the producers have the right to choice the technology of the investment: i.e. the type of resources to be chosen and combined as well as the ways of using them in the context of the production plans agreed. The investments at stake will be directly managed by the growers within the organizational framework of their own farms.

The general agreement allocate also to the producers the decision rights about the production plans. The third decision right allocated to the growers concerns the their sales. The growers can sell their own product to buyer not included in the agreement up the 49% of their total product. This gives to the producers a very large number of degree of freedom.

As for the *Processor* (the slaughterhouse company) the agreement explicitly mention only the assignment of duties (to slaughter, to channel to the market the output within the PDO umbrella, to pay to the grower a variable part of the price over the fixed payment agreed). In other words, the processor has the right to elaborate also strategies which may compete with the strategies agreed, but this right is nether recognized nor banned by the agreement in itself. However the task of elaborating marketing strategies includes the decision rights concerning several aspects of the practical activities which are influential on the whole performance of the agreement. The allocation of these rights can be predicted by the Gibbons theory: the *processor* is actually directly in touch with the distribution agents (see figure 6) and then she can better elaborate the marketing strategies.

The *Technological Park 3A* acts a provider of services and has the right to design product and process innovation and to provide them to the parties. The *Park* has also the right to provide specific marketing services which should be used by the parties in the context of the marketing strategies of the *Processor*.

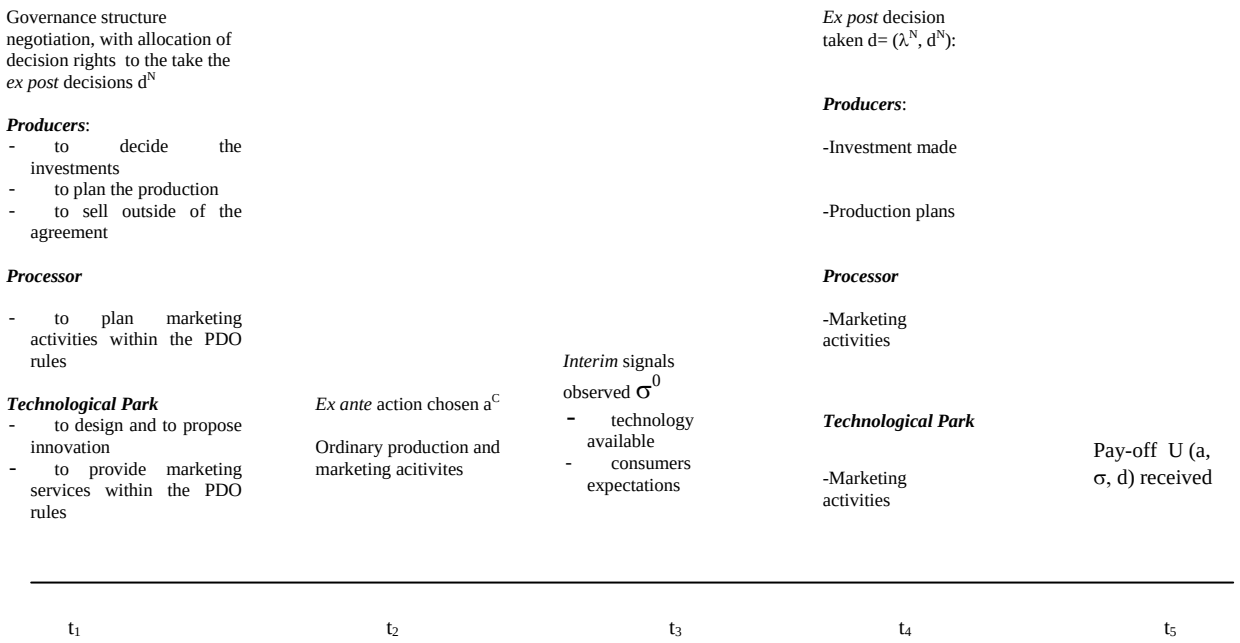

Figure 7. Pollo d'erba general agreement – Timing of adaptation

4.5 The producers-processors contractual framework of the Molini Popolari di Umbertide (Umbria) and of the Il Biroccio (Marche)

In this paragraph we present two cases concerning the cereals sector in two regions of Central Italy: Umbria (Molini Popolari di Umbertide) and Marche (Il Biroccio). The Molini Popolari di Umbertide designed a specific integration contract with 15 farms in the context of the 2007-2013 Rural Development Plan (RDP) of Regione Umbria. Molini Popolari Riuniti, located in Umbertide (Perugia, Umbria) is a cooperative society that has grains storage and milling as its core business, but is also active in cattle and pigs breeding, extravirgin oil production, bread-making and feed production. The grains milling activity serves two chains: feed production and bread-making.

The agreement is aimed at better coordinating the activities of the farms and the cooperative enhancing their relationships in order to cope with the challenges posited by the competition. The agreement covers the 9% of the regional cereals production and involves more than 3670 farms. The parties agreed on jointly carrying out the following activities:

- to choose the genotypes;
- to plan the production and to coordinate the agricultural supply with the processing stage;
- to design individual crop contracts;
- to optimize the logistic activities;
- to disclose information among the partners;
- to define standard and to comply.

Notably the agreement also allocate to the parties the decision rights about the investment to be made with the support of the RDP. Actually the parties agreed on investing 24,6millions of Euros both in the agricultural and in the processing stage. Nonetheless, the agreement describe exactly the investment which each party decided to do, according to her technological preferences and to the resources already managed.

The Cooperative "Il Biroccio", located in Filottrano (Ancona, Marche), processes and sells agricultural products of its own production or granted by its members. It manages two sales areas and sells its own products in mass-retailing stores. It also provides supplies for farming (to member farmers only) and manages its own land. 483 farms are members of the cooperative; they are located mostly in Filottrano and neighbouring towns.

In the context of the RDP of the Regione Marche, the Cooperative "Il Biroccio" promoted the supply chain agreement known as "Futuro cereali delle Marche". The objectives of the agreement are:

- to improve the competitiveness of the farms;
- to enhance efficiency;
- to transfer technology;
- to experiment cropping technology;
- to increase the agricultural value added.

The activities aimed at achieving these objectives are the following:

- to provide extension services;
- to make investments both in the agricultural and the processing stage;
- to design new productive patterns
- to certificate the products

As in the case of the Molini Popolari di Umbertide, the general agreement allocate to the parties expected to maximize the total surplus the decision right on making investments.

The figure 8 summarize the adaptation timing identified for both the cases.

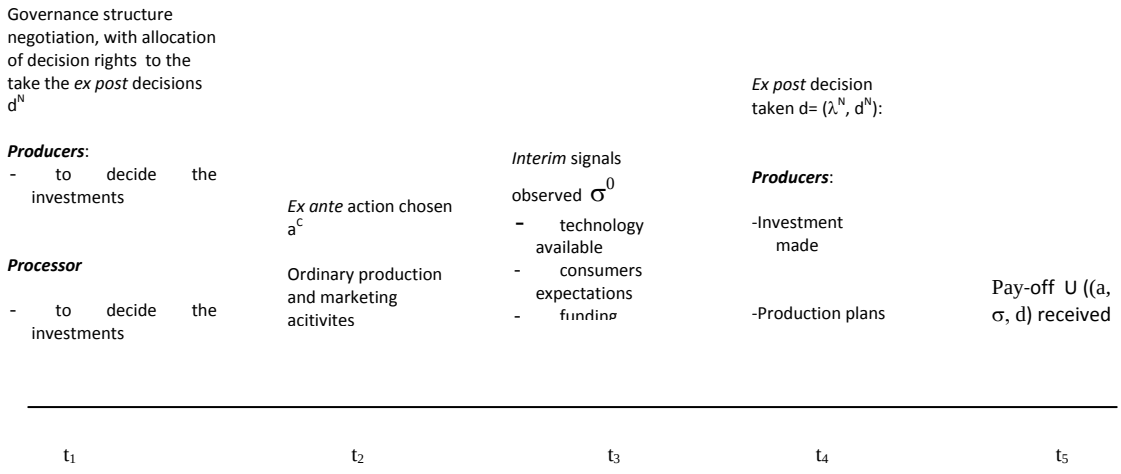

Figure 8. The Molini Popolari and Il Biroccio general agreements – Timing of adaptation
Source: the Authors

4.6 A synthesis

The case study provides a basic confirmation of the theoretical prediction concerning the allocation of critical decision rights across the firms boundaries. The Table 1 summarizes the decision rights allocated and associates them to the sources if uncertainty identified.

In general we submit that the findings corroborate our conjecture about the allocation of decision rights as a means to cope with uncertainty. The sources of uncertainty deal with the environmental uncertainty and mainly concerns with technology and quality or compliance with standards defined in the general contractual framework. Nonetheless differences emerges among the cases concerning the levels of contracting. It seems that two basic model of integration arrangements can be identified. One model appears to be based upon a contractual agreement in which the allocation of decision rights concerns directly the chain partners, regardless to their level of activities: this is the case of the *Sugar Chain*, the *Pollo d'erba*, the *Molini Popolari* and the *Biroccio*.

Table 1.
Decision rights and sources of uncertainty

CASES	SOURCES OF UNCERTAINTY	DECISION RIGHTS ALLOCATED				
		Size and type of invstements	Production plans	Market plan	Individual negotiation	Freedom of trade
North Italian Sugar Chain	Technology, Quality	X	X			
North-Italy Tomato Chain	Technology, Quality	X	X		X	
North-Italy Potato Chain	Technology, Quality, Market	none				
Pollo d'Erba system	Technology, Quality, Environmental sustainability	X	X	X		X
Molini Popolari di Umbertide	Technology, Quality,	X	X			
Il Biroccio	Technology, Quality,	X	X			

Source: the Authors

In all these case the allocation of the decision rights concerns specific decisions and activities the parties are committed to undertake. In the cases of *Tomato chain* and *Potato chain* a different model emerges, in which more than one contractual agreement is designed (interprofessional agreement and bilateral agreement). The general contractual framework favour the reduction of the transaction costs at the level of the bilateral contracts. Therefore, in the cases examined the connection between general and specific level of contracting seems to attenuate the influence of uncertainty on the bilateral level (e.g., between a farmer and a processor) and also promote a joint decision making approach.

Under a managerial perspective the allocation of decision rights is confirmed as an opportunity to cope with the sources of severe uncertainty in Agri-Food sector (Wu, 2006): mainly technological innovation and quality and safety objectives. Therefore an explicit attention should be paid to these sources in order to design effective contract which should enhance the performance of the chain. As for the regulation of the food supply systems we point the fact that the integration of the supply chain could be improved by supporting the paries in coping with uncertainty, beyond the necessity posited by the specific investments (Martino *et al.* 2012). The role of the professional organizations seems to provide opportunities for better design of the bilateral agreements.

5 Final remarks

The study concerns the integration of the activities in agro-industry chains. The analytical framework motivates the conjecture that the allocation of decision rights is central to the negotiation of organizational arrangement along the chains investigated. The empirical analysis shows that, among other, the negotiation concentrates of the allocation of decision rights relating to uncertain circumstance. Innovation issues, quality (and safety) objectives and consumers behaviours seems the main circumstances requiring the allocation of critical decision rights. Therefore the *ex ante* allocation of decision rights is critical to the economic and environmental sustainable strategies. The study of the environmental uncertainty appear to be critical to the design of modes of integration in agro-industry chain and therefore to their expected performance.

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