Adaptation in Food Networks: Theoretical Frame Work and Empirical Evidences

Gaetano Martino [*] ***and Angelo Frascarelli*** [*]
[*] *Dept. of Agricultural Economics and Food Sciences*
University of Perugia, Italy
gaetano.martino@unipg.it ; angelof@unipg.it

Abstract
The objective of the paper is to contribute to a better understanding of the governance of the food networks focusing on two related aspect: the integration among the agents and the adaptation in the face of emerging disturbances. The paper aims at addressing the problem on what are the role of the adaptation processes in the implementation of sustainable strategies in Food Networks. Adaptation is a central problem of economic organisations (Williamson, 1985, 1991), and its conceptualisation is integrated within complementary theoretical perspectives. 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). According to Gibbons (2005) the adaptive, sequential decision-making is modelled in terms of contracting the ex ante allocation of critical decisions rights across firms boundaries to the party who is expected to maximize the total surplus of the relationship. After having elaborated and presented the theoretical framework, the paper illustrates and discusses six cases of governance agreement. 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 field research was carried out by documents analysis and interviews. The paper contributes to the literature by corroborating the theoretical hypothesis (Gibbons, 2005; Wu, 2006) and providing empirical information about the management of Food Networks in the face of emerging disturbances in critical fields: sustainability, quality systems and innovation.

Keywords*: decision rights, food networks, integration, adaptation, sustainability*

1 Introduction

The objective of the paper is to contribute to a better understanding of the governance of the food networks focusing on two related aspect (Gibbons, 2005): the integration among the agents and the adaptation in the face of emerging disturbances.

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). Vijayarasathy interpreted 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). 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).

After having elaborated and presented the theoretical framework, the paper illustrates and discusses six cases of governance agreement. 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 about the management of Food Networks in the face of emerging disturbances in critical fields: sustainability, quality systems and innovation.

The par2 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. Final remarks are presented in the last paragraph.

2 Objectives and method

The research method is based on the approach proposed by Yin (1994), according to the following scheme. First we developed the analytical framework drawing form literature and then identified theoretical propositions. We the introduce a testable conjecture on the basis of the causal structure proposed (Dahlstrom and Nygaard, 2010). The subsequent stage consists in searching for answering research questions which bring to the realization of a case study. Data searching was realized through documents analysis and unstructured interviews[1]. The elaboration of theoretical propositions, which represents the first step, uses existing theories which are the basis of the empirical research (Yin, 1994). We chose six case diverse studies (Seawright and Gerring, 2008) under a confirmatory perspective. 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.

3 Analytical framework

3.1 Food supply systems integration

The *integration* of 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). Scholars underline the fact the 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). The integration entails the organization of the production processes and supply activities under a comprehensive perspectives under which all the units involved have to contribute to coordinate the use of material and immaterial resources as well as the exchange decisions. Under this perspective the integration of a supply system is the outcome of organizational choices aimed at taking advantage of the specialization without loosing the gains of cooperation. According to the Transaction Cost Economics (TCE) integration as an outcome of coordination decision requires choosing adequate governance structures (Williamson, 1985). Provided that the parties to a transaction align the characteristics of the governance structures (market, hybrid, hierarchy) to the transaction attributes (asset specificity, uncertainty, frequency) (Williamson, 1985), one question thus regards what governance structures are (or should be) chosen to integration purposes. Williamson (1991, 2005) states that as the asset specificity

[1] One the authors has been also involved in the setting up of the agreement reported in the study.

increases, the agents are induced to adopt more tightly coordinated forms of governance. Furthermore, integration is based upon patterns of cooperation and coordination among the partners, patterns which are embodied by the governance structure in the parties relationships with a specific role for the opportunities of managing the emerging of *ex post* disturbances. This reflects circumstances of mutual interdependence associated to the necessity of maintaining legal autonomies of the parties: scholars have shown how, in such circumstances, complex institutional arrangements are established by agents, also entailing private and public orderings connections (Mènard, 2006; Gonzàlez-Diaz *et al.* 2003; Martinez *et al.*, 2007). Gibbons (2005) argued that an *adaptation theory* asks whether integration or non-integration better facilitates 'adaptive, sequential decision making' in the sense of Williamson (Gibbon, 2005: 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: 234). Under this view the integration is strictly associated with the adaptation processes of the governance structures adopted by the agents. In the following we summarize this theoretical perspective.

3.2 Adaptation

Adaptation is a central problem of economic organisations (Williamson, 1985, 1991), and its conceptualisation is integrated within complementary theoretical perspectives. Williamson (2005) focuses on the comparative efficiency with which alternative modes of governance affect good order during the ex-post contract implementation interval. 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.

Namely, following Gibbons (2005) let us indicate:

a^C contractible *ex ante* decisions

λ^N inalienable *ex post* decisions that are contractible *ex ante*

d^N *ex post* decisions that are not contractible *ex post*

σ^0 observable signals

then, the adaptation theory as a model of ex post governance is structured in a formal integrative framework articulating the following timing (Gibbons, 2005: 230-231):

I. the governance structure is negotiated contracting on the *ex ante* actions a^C with the allocation of decision rights to the take the *ex post* decisions d^N that are not contractible *ex post*.

II. *Ex ante* actions chosen a^C.

III. *Interim* signals observed $\sigma=\sigma^0$

IV. *Ex post* decision taken $d= (\lambda^N, d^N)$

V. Pay-off U (a, σ, d) received

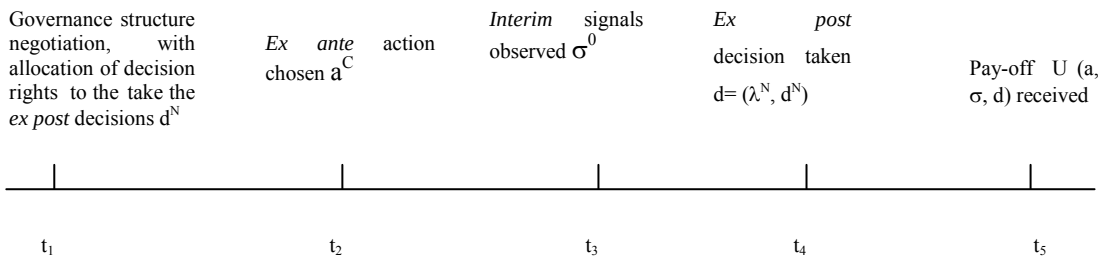

Figure 1. Adaptation theory - Timing

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*) (stage I) who will take the decision (stage IV), having observed the state of the nature (stage III) unforeseeable at the time of the choice of the governance structure (stage I). 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: In the face of the 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 Bieticoltori Italiani-ABI*) according to European law. The main objective of these association is to concentrate and trade the sugar beet produced channelling it toward the processing stage. The table 1 summarize the recent evolution of the total Italian supply of sugar beet.

Table 1.
Production of Sugar Beet in Italy by geographical area

Year			North	Center	South	Italy
2000	UAA	Ha	154547	52457	42146	249150
	Production	tons	8319477	1640172	1609532	11569181
2001	UAA	Ha	135790	49906	36897	222593
	Production	tons	7114253	1409045	1386513	9909811
2002	UAA	Ha	162213	46406	37097	245716
	Production	tons	8980235	2266264	1481291	12727790
2003	UAA	Ha	133641	41473	39056	214170
	Production	tons	4994150	938007	1204341	7136498
2004	UAA	Ha	118748	34777	32278	185803
	Production	tons	6103182	1088839	1281002	8473023
2005	UAA	Ha	169286.12	46900.18	36856.98	253043.28
	Production	tons	10552674.16	2122229.335	1480779.485	14155682.98
2006	UAA	Ha	58.179.078	14.194.510	19.729.890	92.103.478
	Production	tons	3.453.190.112	670.466.700	705.688.717	4.829.345.529
2007	UAA	Ha	60.207.160	12.347.410	13.083.680	85.638.250
	Production	tons	3.556.163.039	482.365.592	591.364.338	4.629.892.969
2008	UAA	Ha	48.929.240	2.298.380	9.943.990	61.171.610
	Production	tons	3.008.361.416	100.816.187	411.677.760	3.520.855.363

***Source**: Authors elaboration from ABI*

A general contractual agreement 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 s.c.a is the only Italian sugar producer having the form of a cooperative society.

Its mission is to process beetroot, 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 2001 in order to enlarge the scale of the processing stage. 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 input-output flows generated by the general agreement is illustrated in the figure 2.

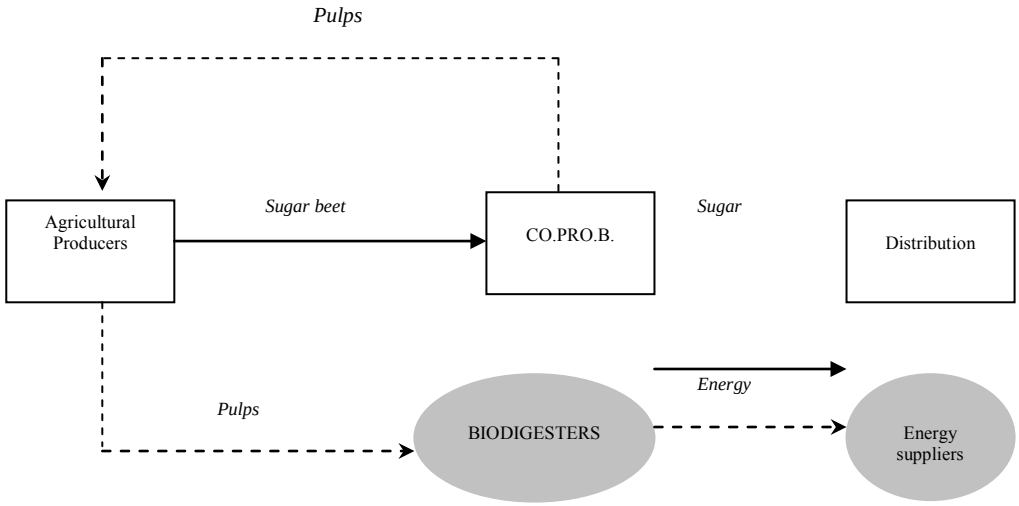

Figure 2. Sugar Chain general agreement – Input-Output flows
Source: the Authors

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.

According to the Gibbons theory the critical aspects of the contractual agreement can be framed by through the following timing:

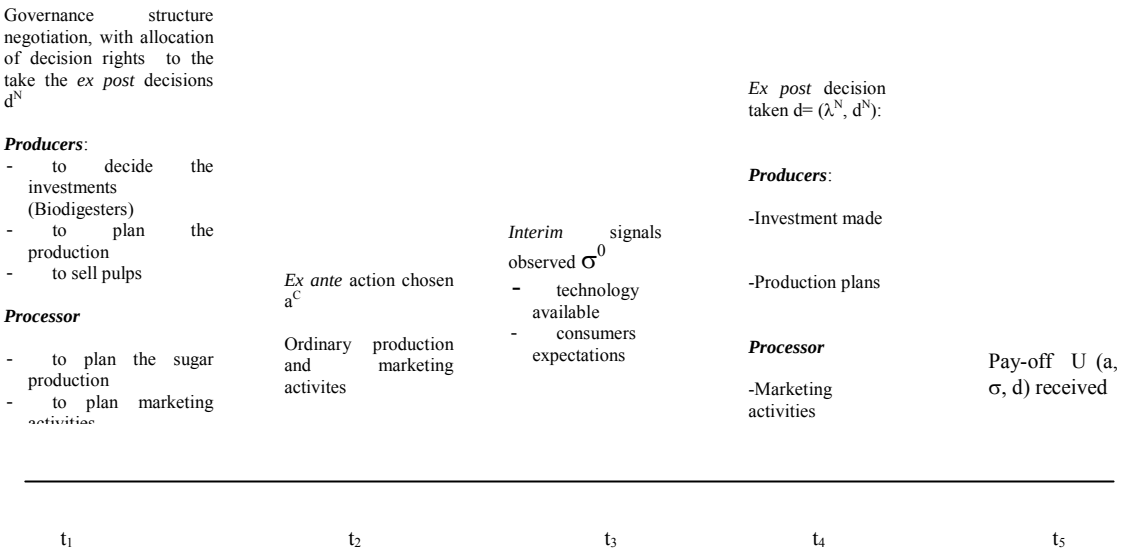

Figure 3. Sugar Chain general agreement – Timing of adaptation
Source: the Authors

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

The of the general contractual agreement for the tomato production does not offer specific elements supporting the theoretical hypothesis here considered.

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). 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 if 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. This is the basis of crucial organizational innovation, nonetheless this right is not taken for granted in the general agreement or at least it is not explicitly allocated. 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 Tomato District, an association among several economic and policy agents established since 2007, in order to design and to carry out activities concerning: quality, innovation and efficiency.

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 supply concentration and increase its value added, frame-contracts 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 2008 general agreement signed by the UNAPA and three association of processing companies. The agreement is aimed at:

- providing the frame for designing individual 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.

The general agreement includes specific formulas to determine the agricultural prices and also establishes qualitative standards.

Notably the contract allocates decision rights to the parties:

- the individual 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).
-

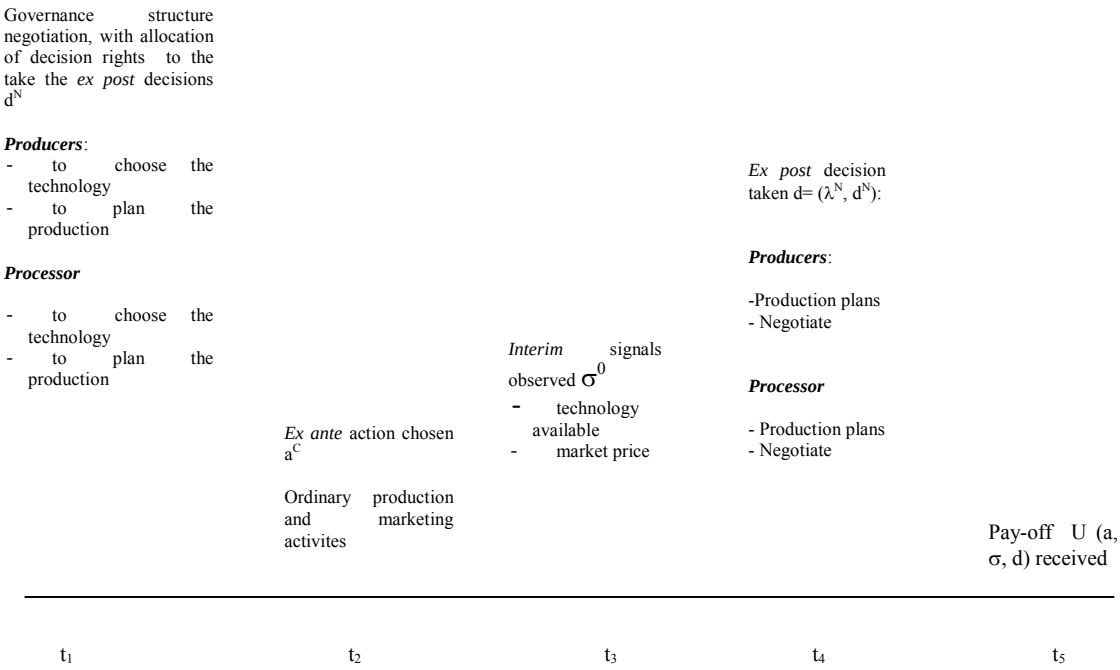

Figure 4: Potato Chain general agreement – Timing of adaptation
Source: the Authors

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 (Pampanini *et al.*, 2009). This is a niche product obtained by traditional poultry genotypes with qualitative characteristics very different from the conventional poultry meat. The production system is based on a few simple rules entailing natural feeding and housing and a very low density (n. of head/m^2). As a consequence the cost of production is larger than in the case of the conventional product and difficulties arise in efficiently organizing the supply system. This is also due to concentration of the poultry market. 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).

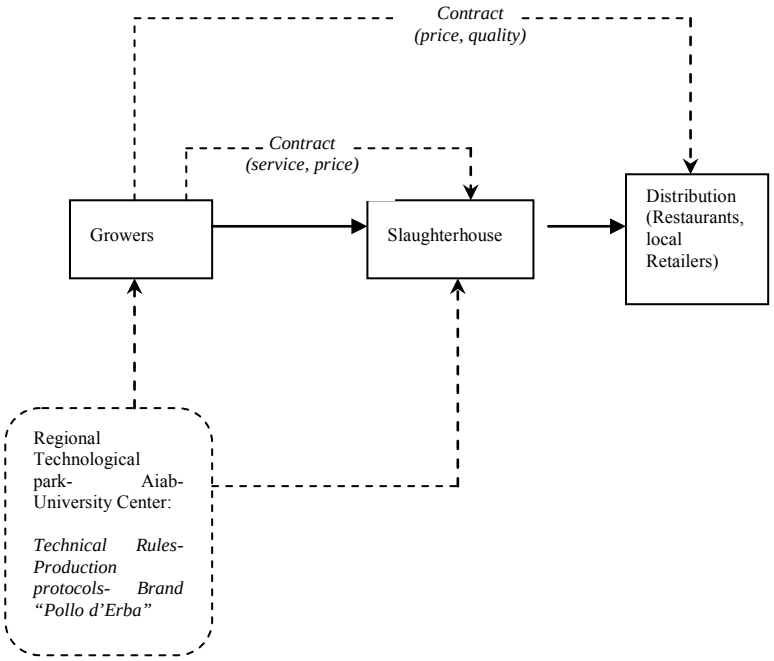

Figure 5. Case *Pollo d'erba* - Institutional and productive relationships (Pampanini *et al.*, 2009)

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 basic reasons for allocating this right to the producers is directly motivated by the Gibbons adaptation theory. The investments at stake will be directly managed by the growers within the organizational framework of their own farms. Therefore the growers experience and technological knowledge play a crucial role in ensuring the possibility of achieving the value added of the investments. Tyre and von Hippel (1997) make clear as individuals elaborate on their relations with physical assets in productive activities and give raise to complex processes of information exchange and elaboration as steps of human capital formation at the production process level. Accordingly, the growers directly management of the new investments allow them to contribute to maximize the expected total surplus of the relationship in the sense of Gibbons. Furthermore, the experience of the growers allows them to take the right decision about the technology of the investment to be made, thus providing a further contribute to the maximization of the surplus.

The general agreement allocate also to the producers the decision rights about the production plans. The number of the growers and the scale of the slaughterhouse plant are fixed, therefore the supply may vary just because of the rate of exploiting of the scale of the plant (see below) or because the variation of the output supplied by the growers. On the other hand, the growers can just use the resources they own or control to the purpose of the agreement, therefore to allocate to them the right to plan the production avoid to underutilize or stress the resources available and then allow the parties to contribute to maximize the surplus.

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) - beyond the rights corresponding to the duties of the remaining parties (e.g. the right to process at least the 51% of the growers output) - 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). It is a controversial point, as the agreement, for example, say nothing about the possibility for the processor to elaborate productive and trading strategies which will not threat the strategies supported by the agreement. 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 2) 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*. Also the rights allocated to the *Park* can be easily predicted by the Gibbons theory because of the specialization of the Park in both technological research and services provision.

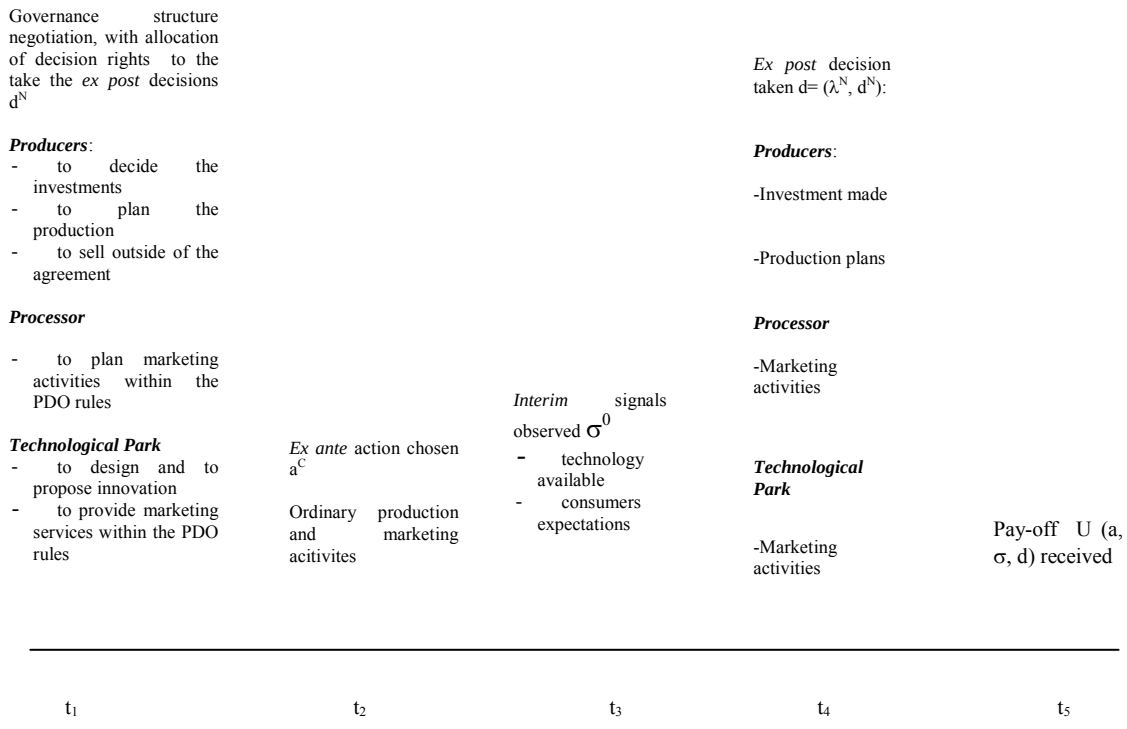

Figure 6: Pollo d'erba general agreement – Timing of adaptation
Source: the Authors

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

In this paragreaph 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 coordinate the activities of the farms and the cooperative enhancing their relationship in the face of 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 7 summarize the adaptation timing identified for both the cases.

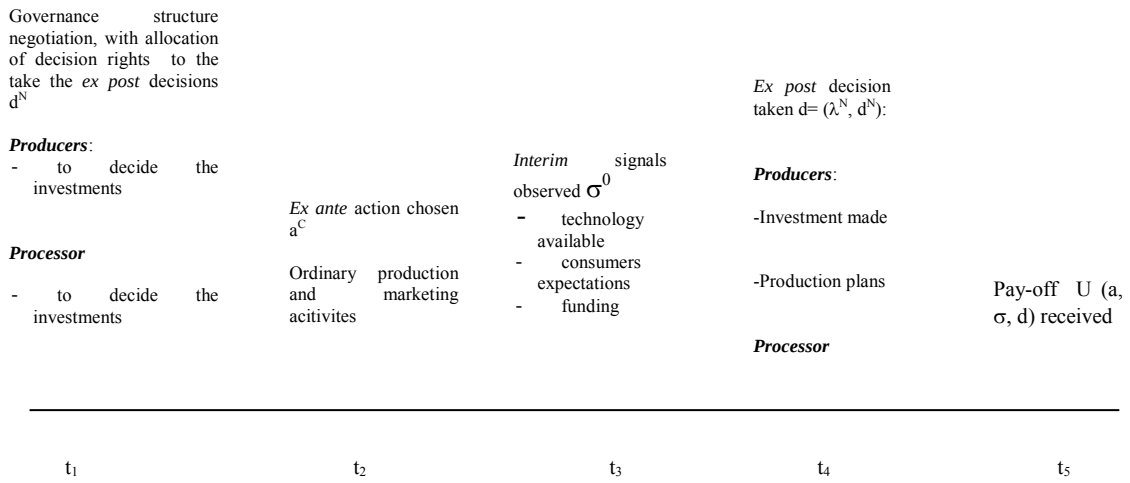

Figure 7. The Molini Popolari and Il Biroccio general agreements – Timing of adaptation
Source: the Authors

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 2 summarizes the decision rights allocated and associates them to the sources if uncertainty identified.

Table 2.
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 sutainability	X	X	X		X
Molini Popolari di Umbertide	Technology, Quality,	X	X			
Il Biroccio	Technology, Quality,	X	X			

Source: the Authors

Therefore we submit that the findings corroborate our conjecture. 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. The case of the *North-Italy Potato Chain* provides a disconfirming evidence which here is interpreted in terms of the various level of contracting. Beyond the differences in the institutional environments, the cases also differ because of the degree of integration. The expectations on the *ex post* uncertainty solution is often explicitly taking into consideration by the parties.

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.

References

Afuah, A. (2001). Dynamics boundaries of the firm: Are firm better off being vertically integrated in the face of a technological change. *Academy of Management Journal,* **44**: 1211-1228.

Arruñada, B., Garicano, L., and Vàzquez, L. (2005). Completing contracts ex-post: How car manufacturers manage car dealers. *Review of Law and Economics,* **1**: 149-173.

Baker, G., Gibbons, R., and Murphy, K. J. (2002). Relational contracts and the theory of the firm. *The Quarterly Journal of Economics,* **117**: 39-83.

Coase, R. H. (1937). The nature of the firm. *Economica,* **4**: 386-405.

Dahlstrom, R., Nygaard, A. (2010). Epilogue: Popperian perspectives on transaction cost economics and future directions of empirical research. *Journal of Retailing,* **86**: 284-290.

David, R., Han, S. K. (2004). A systematic assessment of the empirical support for transaction cost economics. *Strategic Management Journal,* **25**: 39-58.

Geysken, I., Steenkamp, J. B. E. M., and Kumar, N. (2006). Make, buy or ally: A transaction cost theory meta-analysis. *Academy of Management Journal,* **49**: 519-543.

Gibbons, R. (2005). Four formal(izable) theories of the firm**?** *Journal of Economic Behavior & Organization,* **58**: 200-245.

Gibbons, R. (2010). Transaction Cost Economics: Past, Present and Future?, *Scandinavian Journal of Economics*, **112**: 263-288.

Gulati, R., Lawrence, P., and Puranam, P. (2005). Adaptation in vertical relationships: Beyond incentive conflict. *Strategic Management Journal,* **26**: 415-440.

MacNeil, I. R. (1978). Contracts: Adjustment of long-term economic relations under classical, neoclassical and relational contract law. *Northwestern University Law Review,* **72**: 854-905.

Martino, G., Pampanini, R. **(**2006). - Natura economica delle organizzazioni dei produttori agricoli: un'interpretazione alla luce della teoria neoistituzionale, *Economia e Diritto Agroalimentare*, n. 1-2

Martino, G., Pampanini, R. (2009). Integration Policy in Agri-Food Chains: Theory and Empirical Evidences, Paper presented at the *4th International Conference on Economics and Management of Networks*, September 3-5, 2009, School of Economics and Business, University of Sarajevo, Sarajevo

Martino, G. (2010). Trust, Contracting and Adaptation in Agri-Food Hybrid Structures, *International Journal on Food System Dynamics*, 3

Fritz, M., Martino, G.,and Surci, G. (2008). Trust conditional on governance structure: theory and evidence from case studies**,** *Journal on Chain and Network Science*, vol. **8**, n.1

White, S. (20059. Cooperation costs, governance choice and alliance evolution. *Journal of Management Studies*, **42**: 1383-1412.

Williamson, O. E. (1985). *The economic institutions of capitalism.* London, U.K.: The Free Press.

Williamson, O. E. (1991). Comparative economic organization: The analysis of discrete structural alternatives. *Administrative Science Quarterly,* **36:** 259-296.

Williamson, O. E. (1995). Transaction-cost economics: The governance of contractual relations. In O. E. Williamson, & S. E. Masten (Eds.), *Transaction cost economics -Theory and concepts-* (Vol. **1**): 96-124. Aldershot, U.K.: Edward Elgar Publishing.

Williamson, O. E. (1996). *The mechanisms of governance.* New York, N.Y.: Oxford University Press.

Williamson, O. E. (2005). The economics of governance. *American Economic Review,* **95**: 1-18.

Wu, S. Y. (2006). Contract Theory and Agricultural Policy Analysis: A discussion and survey of recent developments. *The Australian Journal of Agricultural and Resource Economics*, **50**: 490-509