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# Coordination strategies in the Italian agro-food supply chain: cooperatives vs. Producer organizations?

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## **Abstract**

The study of institutions in the agro-food systems is gaining momentum since it represents an intricate and undoubtedly relevant case study as concerns intermediate-product markets. Moreover, traditionally there is a problem of organization among farmers mainly due to the scarce attitude to pool decisional and property rights on input and/or output. According to the Transaction Costs Economics framework, the paper aims to investigate which are the main drivers of the collective forms of organization in the Italian agro-food system, paying particular attention to transaction costs' attributes and to the increasing role played by the institutional environment as well. The choice to join to cooperative or producer organization is conceptualized as a governance structure choice, also paying attention to the complementarity between the two alternatives. Based on the Italian version of the Farm Accountancy Data Network, bivariate probit and multinomial are estimated in order to account for three organizational alternatives (participation in cooperative, in OP and joint participation in all the three alternatives) and to test the complementarity between the two organizational forms entailed.

**Keywords:** TCE, cooperation, POs, complementarity, agri-food, Italy, FADN.

## **1. Introduction**

The modern agro-food system is characterized by the presence of a large amount of actors that are involved in delivering the food from the field to the fork. It has a funnel-shape (or oligopoly/oligopsony) structure caused by the high number of farmers that harvest crops and/or breed livestock, providing raw materials to a small numbers of processing companies and manufacturers that, in turn, sell their finished products to a few big retailers (Sexton et al., 2007). In such a context market power emerges due to imbalances in the bargaining power of the firms, relationship-specific investments, asymmetric information and incomplete contracts as well as asymmetric costs of contract enforcement (Gow et al., 2000; Renda et al., 2014).

It is indeed widely recognized that agricultural production is still highly dispersed, since there are a lot of small and economically disadvantaged (i.e. with limited capital and market access) farms with a much weaker negotiation position than their various contractors (McCorrison, 2002). Moreover, traditionally there is a problem of organization among farmers mainly due to the scarce attitude to pool decisional and property rights on input and/or output. Such a fact negatively affects the coordination the different stages along the supply chains, usually causing a miscoordination between producers (farmers) and buyers (intermediaries, processing industries or retail sector) that in turn causes price instability and market imbalances.

In this regard, it must be noted that the European authorities have historically fostered (both horizontal and vertical) integration and cooperation in the agro-food sector (Budiguel, 2016; Falkowski and Ciaian, 2016). Hopes for a more balanced distribution of rents within the food supply chain are also placed on POs. In a broad sense POs are, like cooperatives, user-owned, user-controlled and user-benefit organizations (Bijman et al., 2012). Negotiating with contractors is a basic function of any POs, since they are moreover exempted from the application of competition rules (Van Herck, 2014). Empirical evidences show that the presence of POs has a positive impact on market performance, which supports the “yardstick effect” due to the presence of such types of hybrid forms of governance (Hanisch et al., 2013; Wills, 1985). POs are legally recognized and enforced by the European law in order to foster

and improve the coordination along the supply chain. Under the Common Agricultural Policy (CAP), farmers' cooperation through recognised POs is legally supported since 2001 in the fruit and vegetable sector, and since 2011 in the milk sector. The 2013 CAP reform extended this form of farm cooperation to all the agricultural sectors. This fact can be seen as the direct consequence of the progressive liberalization of the European agricultural market that increasingly exposed farmers to price volatility and greater market risks, in a general framework of declining public resources for the European agriculture. All in all, it follows that the awareness of both policymakers and stakeholders on the problems related to the functioning of the agro-food supply chains is gaining momentum.

However, the following central question is still almost unexplored, at least empirically: which factors stimulate POs establishment?

The rationale for analyzing the determinants of participation in cooperation and POs' is based on the assumption that the diffusion of contracts, the nature of the ex-post negotiations between farmers and their contractors and, consequently, the division of ex-post surplus between them is sensitive to organizational structure of agents involved in a given transaction (Coase, 1937; Williamson, 1975; 1985; Grossman and Hart, 1986; Bijman and Hendrikse, 2003; Hendrikse and Bijman, 2002).

The transaction costs economics (TCE) perspective is therefore adopted in order to investigate the determinants of cooperation attitudes of farmers, with a particular attention to those forms of collaboration that are institutionalized in the current policy framework. TCE predicts that specific governance structures depend, above all, on asset specificity and uncertainty related to the transaction. These attributes influence the costs of transactions and, in turn, affect the adoption of the optimal forms of governance that minimize such costs. Furthermore, scholars have increasingly paid attention to the interaction between organizational forms and the institutional environment that surrounds them and establishes the rule of the game. In this regard, the agro-food system represents an interesting case study since there is traditionally a high influence of public authorities in this sector, both in terms of financial incentives and in terms of specific regulation (e.g. food quality). In this regard, the agro-food system represents an interesting case study since there is traditionally a high influence of public authorities in this sector, both in terms of financial incentives and in terms of specific regulation (Ménard, 2017).

Against this framework, the paper aims to investigate which are the main drivers of the collective forms of organization in the Italian agro-food system, paying particular attention to transaction costs' attributes and to the increasing role played by the institutional environment as well. The choice to join to cooperative or producer organization is conceptualized as a governance structure choice, also paying attention to the complementarity between the two alternatives (Cassiman and Veugelers, 2006). It seems crucial to improve the knowledge about the nature of farmers' collective action. This obviously poses the research question of how and why cooperative behaviour takes place, that is about factors motivating setting up of cooperatives and POs and/or barriers discouraging it. To the best of the authors' knowledge most of the works on such a topic are case study in nature with a limited external validity, but there is lack of quantitative evidences. To this aim, the present paper quantitatively analyzes the determinants of cooperation in Italy based on an extensive dataset. This country indeed represents an interesting case study in the European framework since, despite a high number of family-managed farms (more than 1 million in 2010) with a very small average farm size (less than 10 hectares), cooperation assumes a fundamental role and such type of collective arrangements is widely established, as showed by Pascucci et al., 2012.

The paper is organized as follows. Section 2 describes the theoretical framework dealing with the determinants of various forms of governance in the agro-food system according to the TCE. Section 3 defines the dataset and the specification used for the quantitative analysis and discusses the econometric models adopted in order to test the research hypotheses. Section 4 reports findings and discusses their both theoretical and practical implications in the lights of TCE assumptions. Lastly, conclusions are drawn in section 5.

## 2. Conceptual framework and research hypotheses

The study of institutions in the agro-food systems is gaining momentum since it represents an intricate and undoubtedly relevant case study as concerns intermediate-product markets (Hubbard, 1997). Because of their perishable nature, the impact of quality on consumers, their fragmented supply, their vulnerability to climatic variations and to epidemics of various nature, agricultural products have always raised problems of coordination and control across the different stages of the supply chain, with high transaction costs as a consequence (Royer et al., 2015). In this regard, TCE makes the assumptions that exchanges are not costless, since transaction costs are the ones resulting from property rights transfer between agents (Royer, 2011). In more details, transaction costs are defined as “costs for negotiating, enforcing and monitoring a contract” (Hubbard, 1997; Matthews, 1986; Royer, 2011). TCE assumes that the transaction is the basic unit of analysis (Commons 1924; 1934; Williamson, 1991), but it is assumed that governance of transaction does not operate in isolation. Indeed, the comparative efficacy of alternative modes of governance varies with the attributes of economic actors on the one hand and the institutional environment on the other hand (Williamson, 1993).

### 2.1 *The transaction costs attributes and their dimensions*

TCE is based on the discriminating (i.e. transaction-cost economizing) alignment hypothesis (Williamson, 1979; David and Han, 2004). It implies that the comparative economic organization never examines organization forms separately but always in relation to alternatives (Williamson, 1991). The heuristic model captures the impact of transaction costs on organizational arrangements. It states that depending on the dimensions of transactions (asset specificity, uncertainty and frequency) and behavioural assumptions (bounded rationality and opportunism), economical agents will choose institutions and organizational forms that minimize the cost of exchange (Williamson, 1985). The following equation summarize the relations between transaction costs (TC) and these variables, with F for frequency, U for uncertainty and AS for asset specificity, where the signs indicates their effects on transaction costs:

$$TC = (F^-, U^+, AS^+)$$

These attributes (or dimensions) of the transaction are henceforth better described based on the TCE literature. The frequency dimension refers strictly to buyer activity in the market. Although discrete transactions are intriguing, few transactions have this very isolated character. For those that do not, the difference between one-time and occasional transaction is not apparent. Accordingly, only occasional and recurrent frequency distinction is maintained (Williamson, 1979). However, such dimension lost importance in the TCE narration, since however it matters only in presence of asset specificity, pushing transactions away from spot market and toward hierarchical arrangement (David and Han, 2004).

As for the second attribute, it must be noted that transactions conducted under certainty are relatively uninteresting. Uncertainty is widely conceived to be a critical attribute (Williamson,

1979), even though such a dimension is approached as conditional. It implies that when asset specificity is low, market governance should be preferred whatever the degree of uncertainty and, only in presence of such a specificity, uncertainty increase the relative attractiveness of hierarchies and hybrids (David and Han, 2004; Williamson, 1985). Surely, uncertainty aggravates the costs of market exchange, as well as those of internal organization, so that it is likely to favour integration (Masten et al., 1991). Recently, uncertainty is gaining importance as the leading force pushing toward organizational solutions alternative to market and/or hierarchy, so-called hybrids forms of governance. In this regard, parties have a strong incentive to change the arrangement that minimizes their cost of governance conditional to the degree of uncertainty that determines these costs. Moreover, Royer et al. (2015) submits that the density of rights shared depends on the intensity of uncertainty that parties to the arrangement face. It follows that when uncertainty threatening producers increases, parties have an incentive to share more rights in order to reduce contractual hazards and increase coordination and control over strategic rights at stake. But what are main source of uncertainty in agriculture? Moschini and Henessy (2001) single out different sources: i) production uncertainty caused by weather conditions or pests, ii) price uncertainty due to inelastic demand for food as well as market shocks, iii) policy uncertainty since agriculture is typically characterised by an intricate system of government interventions, changes in which may create risk for agricultural investment and profitability as well. Other scholars addressed the consequences of the large institutional uncertainty closely linked to rapid and unpredictable change in the firms regulatory framework that makes agreeing on price, quality and volume more complex (Hoffman, 2007; Mayer and Teece, 2008; Ménard, 2017; Jolink and Nesten, 2012). Such an aspect gained particular importance in the agri-food sector over the last decades, due to the drastic changes in the economic and institutional environment triggered by the affirmation of a market-oriented paradigm translated into the inclusion of the agricultural sector in the GATT negotiations and subsequently promoted and fostered by the WTO (Royer et al., 2015). OECD (2009) also recognizes financial uncertainty related to changes in income and/or in interest value that somehow hamper the access to credit; it follows that such dimension is indirectly connected to the above-mentioned price uncertainty. Other types of uncertainty are those related to counterpart behaviour and information asymmetry as recognized by Royer (2011) or those concerning the quality and quantity of deliverables (Royer et al., 2015): such types of uncertainty are clearly related to production so that they can be included in that dimension. Furthermore,

With regard to asset specificity, it has always represented the main determinants of transaction cost and, as a consequence, a huge literature has analysed its main facets. Basically, it arises when the specific identity of the parties has important cost-bearing consequences (Williamson, 1979). Transactions of this kind are referred as idiosyncratic. What happens is that the supplier is effectively “locked into” the transaction to a significant degree: such a situation is well known in the economic literature as ‘the hold-up problem’ (Ménard and Klein, 2004). It follows that as asset specificity increases the transaction costs associated with market governance increase accordingly and more vertically integrated solutions are necessary (Pascucci et al., 2012). According to the aim of the present study, the Williamson’s definitions (1979; 1991) and descriptions of asset specificity is adopted. In that vision such a concept refers to the degree to which an asset can be redeployed to alternative uses and by alternative users without sacrifice of productive values. Furthermore, it must be noted that asset specificity entails several dimensions (Ménard, 2004). The specialization process entails physical asset specificity due to the fact that dies or purchases of a specialized component are required for production. In more details, special purpose equipment or dedicated assets are often needed to produce a specific component, implying discrete investments made at the behest of a particular customer/client. Moreover, investments related

to production of high quality final goods with high reputation generate brand-name capital specificity. Lastly, as for human and relational capital, idiosyncratic investments generates transaction-specific human asset and networks.

Table 1 resumes the main attributes of transaction costs and their dimensions according to TCE. It summarizes the conceptual framework that inspires the empirical analysis carried out in this paper.

Table 1. Main attributes of transaction costs and their dimensions according to TCE

Attributes of transaction	Dimensions/source
Asset specificity	Human capital
	Network/relational capital
	Specialization asset
	Dimension/size
Uncertainty	Market
	Production
	Institutional/context
	Policy

Based on this conceptual scheme the present paper contributes to the ongoing debate on hybrids collective arrangements in the agro-food supply chain by investigating the determinants of co-operation in the Italian agriculture. The following hypothesis is therefore tested:

*H1: asset specificity and uncertainty significantly affects the participation in hybrid collective arrangement.*

## 2.2 The role of institutional environment in shaping hybrids

Having in mind the TCE rules of thumb that states that a transaction-specific governance structure is more fully developed where transactions are recurrent, entail idiosyncratic investment, and are executed under greater uncertainty, a new awareness is emerging in the TCE field: the institutional embeddedness of the various forms of governance (Ménard, 2014b; Williamson, 2000). Such a topic deserves particular attention where governance forms are highly affected by the institutional environment as the case of the agro-food sectors.

According to Davis and North (1971), institutions set the fundamental political, social and legal rules that establishes the basis for production, exchange and distribution. Deeply rooted in the Coasian tradition, the Williamsonian approach is aware that organizational arrangements are embedded in their institutional environment. Williamson (1993) certainly recognized that since there are strategic feedback mechanism at stake, the institutional environment matters in influencing the governance of contractual relations. Consequently, the set of rules, laws, policies, customs and norms that determine the rules of the game has to be taken into consideration since organizational arrangement are embedded and enforced in this institutional environment (Ménard and Valceschini, 2005). Moreover, it must be considered that for an arrangement to be implemented and to remain sustainable there is the need to gain institutional legitimacy, on which also depends the capacity to enforce the rules of the game (Royer et al., 2015). In this sense, very often an organization is the way to implement and operationalize the “rules of the game” as they are defined by the institutional environment and somehow this process gives birth to ‘hybrid forms’ (Ménard, 1995). The last decades have

seen an increasing interest in the development of these nonstandard modes of organization in agro-food networks, particularly in Europe where not by chance agricultural production is embedded in various and changing institutional environments, yet producers compete in increasingly global market (Ménard and Klein, 2004).

Hybrids are a class of arrangement included by Williamson between market and hierarchies. Such a mode is characterized by semistrong incentives and an intermediate degree of administrative apparatus (Williamson, 1991). Indeed, modes of collective organization of the hybrid type have spread everywhere in the food industry. Despite the apparent heterogeneity of hybrids, three main characteristics allow to identify such governance forms: i) parties pool part of their resources while keeping property rights and associated decision rights distinct, ii) the main mechanism implemented for coordinating is contractual and iii) competition persists among partners making the issue of rent-sharing particularly acute (Ménard and Valceschini, 2005). More in details, the research agenda includes a focal research topic that concern relevant understanding of the ‘jungle’ of types of organization (or ‘strange animals’ as stated by Ménard, 2012) that coexist in the agricultural sector, such as cooperatives, networks, chain systems and so on. Some of those collective arrangements (such as POs) share also a distinctive property, since they are ‘institutional hybrids’ combining self-regulation mechanism operated by private partner along the supply chain with a legal framework that determines the conditions and modalities under which these mechanism operates (Royer et al., 2015). What is under investigation is therefore if hybrids forms of governance are mainly the results of government policies rather than an efficient means of reducing transaction costs. Previous evidences demonstrate that rules and regulation in the institutional environment influence the formation of hybrids (Jolink and Nielsen, 2012). Such a process mostly concern European efforts to improve the functioning of agro-food supply chain and address the increasing environmental uncertainties that makes the agreeing on price, quality and volume more complex. On the other hand, the establishment of such hybrids highly depends on the capacity to find support as well as on the ability to gain institutional legitimacy in the institutional environment, on which depends the capacity to enforce the rules of the game (Royer et al., 2015). However, more effort is needed in order to shed lights on the bidirectional relationship between the institutional environment and hybrids arrangements in the agro-food supply chain as well as to better understand, under the TCE perspective, the importance and the role of the embedment of such forms of organization arrangements faced with a scenario of increasing and widespread environmental uncertainty (Ménard, 2004; 2014a).

In this regards, to the best of authors’ knowledge the paper realizes a first attempt in order to investigate what drives the participation in institutional hybrids, such as the POs. The main purpose is to explore the presence of similarities and difference between the membership in (spontaneously established) cooperatives and institutional hybrids (such as the POs). Such differences/analogies may be explained in the lights of the TCE, since again transaction attributes (asset specificities and uncertainty) may play a key role in fostering the allocation of decisional rights by means of specific collective arrangements promoted and enforced by the institutional environment. As a consequence, a second research hypothesis is elaborated:

*H2: asset specificity and uncertainty significantly affects the participation in hybrid collective arrangement. the participation in institutional hybrid (POs).*

Lastly, based on Cassiman and Veugelers (2006), since we are interested in investigating the drivers that affect the joint participation to both cooperatives and institutional hybrids, a third hypothesis is tested:



*H3: transaction attributes play significantly different roles in order to stimulate a strategy of complementarity characterized by a joint adhesion in cooperatives and POs.*

### **3. Methodology**

Having in mind the purposes of the paper and based on the availability and nature of data provided by the Italian version of the Farm Accountancy Data Network, reliable and robust empirical models were built in order to research hypotheses stemmed from the conceptual framework.

Henceforth the dataset and the empirical models are properly described.

#### *3.1 Dataset and specification of variables*

The FADN is a European system of sample surveys conducted every year to collect accountancy data from farms. Derived from national surveys, the FADN is the only source of microeconomic data based on harmonised bookkeeping principles. The survey does not cover all the agricultural holdings but only those which due to their size could be considered commercial. Moreover, it is an important informative source for understanding the impact of the measures taken under the CAP on different types of agricultural holdings.

The Italian version of the FADN (named RICA, acronym of ‘*Rete di informazione contabile agraria*’) is a dataset that provides several information related to both economic and organizational aspects with the aim of monitoring business activities of EU agricultural holdings. Therefore, based on the TCE conceptual framework a list of variables related to the transaction costs attributes has been identified in the RICA dataset for 2015 (n=8536 after processing data for outliers). Above all, it must be noted that the RICA by means of categorical variables allows to establish when farms are members of cooperatives (COOP) and when they are members of producers organizations (PO). What emerges is that respectively 17.7% and 11.4% of farms in the sample joined a cooperative or a PO in 2015. Furthermore a small percentage of farms in the sample (2.16%) opted for the joint participation to COOP and PO. This implies that, restricting the analysis to farms joining COOP and PO in more than one case) out of ten complementarity is at stake. Moreover, the dataset contains several variables that can be adopted as proxies for the main attributes of the transaction costs attributes and their dimensions (reported in table 1). Two main groups of covariates are identified that refer to asset specificity and uncertainty.

As for asset specificity, five sub-groups of variables are created. They concern:

- i) Human specific capital, that considers farmer’s age (*Manager\_age*), farm’s management (*Manager\_empl*, *Parents*),
- ii) Networks (relational capital), with reference to the membership to associations (*OPPAA*) or other networks (*oth\_NETW*),
- iii) Specialization assets, that regroup variables that identify dominant activity in farm (*TF\_COP*, *TF\_orch&wine*, *TF\_hort*, *TF\_mixed*, *TF\_cattle&milk*, *TF\_graniv*), variables mainly referred to specific high-value production (such as *Organic*, *PDO* and *GPI*) and covariates that reveals the presence of diversification activities (*GO\_processat\_share*) or high quality production (*GO\_qualact\_share*),
- i) Dimensional effect, by reference to a group of control variables referred directly or indirectly to farm size, such as farm size (*UAA*), rented (*Rented\_UAA*) and

irrigated land (*Irrigated\_UAA*), intensity of family labour (*FWU\_UAA*), mechanical force (*Machpow\_UAA*) and capital intensity (*Fizasset\_UAA*).

With regard to uncertainty, two sub-groups are established. They regard:

- ii) market prices uncertainty, with specific attention to gross output and farm income volatility (*GO\_sd* and *FI\_sd*, expressed as standard deviation) and the production uncertainty, that is expressed as the intensity of perceived risk (*Insurance\_UAA*, namely the amount of the insurance premium per hectare),
- iii) institutional/policy uncertainty that is represented by a set of variables referred to the concentration of the cooperatives (*Index\_agr\_coop*) the number of processing companies at regional level (*Proc\_comp*), the rate of agricultural employment at municipal level (*Employment*) and the variation of the CAP aids (*CAPaid\_ssd*, expressed as standard variation of the support), and indexes[1] of correspondence between regional coop specialization and farm orientation in producing arable crops (*Ind\_corr\_COP*), horticultural products (*Ind\_corr\_hort*) and permanent crops (*Ind\_corr\_cattle&milk*).

Table 2 shows the whole list of variables used in the quantitative analysis; descriptive statistics are reported as well.

Table 2. Conceptual approach and descriptive statistic of variables

Class of variable	Variable	Label	Obs	Mean	Sd
Dependent variables	1 if a farm is member of a cooperative	COOP	8208	0.177	0.382
	1 if a farm is member of a Producer Organizations	PO	8208	0.114	0.318
Human capital	Farmer's age	Manager_age	8535	58.030	13.559
	1 if manager is also employee in the farm	Manager_empl	8509	0.377	0.485
	1 if a predecessor is present	Parents	8535	0.094	0.292
Network	1 if is a member of a farmer association	OPPAA	8208	0.746	0.435
	1 if is a member of other networks, association and so on	oth_NETW	8208	0.206	0.404
Production and market uncertainty	Turnover volatility (expressed as standard deviation of the gross output)	GO_sd	7080	22518.360	76144.560
	Income volatility (expressed as standard deviation of the farm income)	FI_sd	7080	22267.280	79990.750
	Intensity of perceived risk (amount of the insurance premium per hectare)	Insurance_UAA	8536	103.790	374.966
Institutional/policy uncertainty	CAP aids variation (expressed as standard deviation of the CAP support)	CAP aids_sd	7080	2251.999	8188.251
	Index of concentration of cooperatives at regional level	Index_agr_coop	8536	0.029	0.016
	Number of processing companies at regional level	Proc_comp	8536	3290.167	2055.733
	Index of agricultural employment at municipal level	Employment	8532	0.117	0.087
	Index of correspondence between regional coop specialization and farm orientation in producing arable crops	Ind_corr_COP	9120	0.001	0.002
	Index of corr. between reg. coop specializ. and farm orient. in prod. horticultural products	Ind_corr_hort	9120	0.014	0.027
Specialization asset	Index of corr. between reg. coop specializ. and farm orient. in prod. permanent crops	Ind_corr_cattle&milk	9120	0.025	0.061
	1 if organic production is present	Organic	8536	0.054	0.225
	1 if PDO production is present	PDO	8536	0.053	0.225
	1 if PGI production is present	PGI	8536	0.030	0.169
	Share of gross output from processing activities	GO_processact_share	8531	0.108	0.230
	Share of gross output from high quality products	GO_qualact_share	8531	0.021	0.128
	1 if a farm is specialized in arable crops (benchmark)	TF_COP	8536	0.265	0.441
	1 if a farm is specialized in permanent crops	TF_orch&wine	8536	0.316	0.465
	1 if a farm is specialized in horticulture	TF_hort	8536	0.022	0.147
	1 if a farm is specialized in mixed production	TF_mixed	8536	0.129	0.335
Dimensional specificity	1 if a farm is specialized in animal breeding	TF_cattle&milk	8536	0.223	0.416
	1 if a farm is specialized in breeding of granivores	TF_graniv	8536	0.045	0.207
	Farm size (expressed in hectares)	UAA	8536	34.860	59.322
	Rented land (expressed as % of the total UAA)	Rented_UAA	8536	0.374	0.412
	Irrigated land (expressed as % of the total UAA)	Irrigated_UAA	8536	0.294	0.398
Dimensional specificity	Intensity of mechanical force (expressed as machine power – in kW per hectare)	Machpow_UAA	8536	12.704	22.059
	Intensity of family labour (expressed as Family Work Unit per hectare UAA)	FWU_UAA	9120	0.129	0.249
	Intensity of capital (expressed as fixed asset per UAA)	Fixasset_UAA	9120	26242.600	49520.160

### 3.2 Empirical approach

As both dependent variables are dichotomous in nature, probit and logit model seems appropriate. However, since the error terms of the two models are likely to be correlated, an extension of the probit model, known as the bivariate probit model, is usually more appropriate (Greene, 2012; Pascucci et al., 2012). In more details, taking into account that the participation in a cooperative (and/or to an institutional hybrids) depends on several dimensions of the transaction costs attributes, the bivariate probit model has the following specification:

$$\begin{aligned} Z_{i1} &= \beta'_1 X_{i1} + \epsilon_{i1}; & y_{i1} &= 1 \text{ if } z_{i1} > 0, & y_{i1} &= 0 \text{ if } z_{i1} \leq 0, \\ Z_{i2} &= \beta'_2 X_{i2} + \epsilon_{i2}; & y_{i2} &= 1 \text{ if } z_{i2} > 0, & y_{i2} &= 0 \text{ if } z_{i2} \leq 0, \end{aligned}$$

Where  $\beta'_1$  and  $\beta'_2$  are the coefficients of the covariates related to asset specificity (AS) and uncertainty (U), respectively when COOP and OP are the dependent variables of the two equations.

In order to test both first and second hypotheses, such a model is able to provide (consistent) estimates of the coefficient vectors  $\beta_1$  and  $\beta_2$  for the two equations, of the correlation between the error terms  $\epsilon_{ij}$  of the equations ( $\rho$ ), and of the standard errors for these parameters. Moreover, this approach makes it possible to test whether the correlation between the equations is statistically significant. In this way, we can determine whether the bivariate probit model provides the best fit. If this correlation is not significantly different from zero, however, the separate (univariate) probit estimation of the equations is preferable, as the bivariate specification is less efficient (Greene, 2012). The Probit model is indeed used to refer specifically to the problem in which the dependent variable is binary - that is, the number of available categories is two. Probit regression measures the relationship between the categorical dependent variable and one or more independent variables, which could not necessarily be continuous, by estimating probabilities. In more details, the Probit models adopted have the following specification:

$$Z_{i1} = \Phi (\beta_0 + \beta'_1 X_i + \beta'_2 X_i + \beta'_n X_i)$$

Lastly, with regard to third hypotheses, dependent variable in question is categorical with more than two categories. In more details, four possible combination of the dependent variables COOP and OP are at stake, as follows: 1) no collective arrangements, 2) cooperation only, 3) POs only, 4) joint adoption of cooperation and participation to POs (presence of complementarity). Due to this fact a multinomial logistic regression is introduced Cassiman and Veugelers (2006). More particularly, the aim is to investigate drivers that affect the joint participation to collective arrangements, in order to analyse variables that show up significantly in the multinomial logit for COOP and PO but are not significant for single and exclusive innovation strategy choice (that are COOP or PO).

The multinomial logit model is described in Greene (2012, 763–766). Suppose that there are  $k$  categorical outcomes and – without loss of generality – let the base outcome be 1. The probability that the response for the  $j$ <sup>th</sup> observation is equal to the  $i$ <sup>th</sup> outcome is:

$$p_{ij} = \Pr(y_j = i) = \begin{cases} \frac{1}{[1 + \sum_{m=2}^k \exp(x_j \beta_m)]}, & \text{if } i = 1 \\ \frac{\exp(x_j \beta_i)}{[1 + \sum_{m=2}^k \exp(x_j \beta_m)]}, & \text{if } i > 1 \end{cases}$$

where  $x_j$  is the row vector of observed values of the independent variables for the  $j$ <sup>th</sup> observation and  $\beta_m$  is the coefficient vector for outcome  $m$ . The log pseudolikelihood is

$$\ln L = \sum_j w_j \sum_{i=1}^k I_i(y_j) \ln p_{ik}$$

where  $w_j$  is an optional weight and

$$I_i(y_j) = \begin{cases} 1, & \text{if } y_j = 1 \\ 0, & \text{otherwise} \end{cases}$$

Both multinomial logit and probit models are estimated with Stata 12, using the maximum likelihood procedure with the robust estimator for variance.

#### 4. Findings and discussion

This section reports the empirical findings of the bivariate probit model. First of all, since the correlation coefficient ( $\rho$ ) do not turn out to be significantly different from zero, it follows that the error structures of the two equations are not correlated and, therefore, two separated probit models allow to obtain a more appropriate solution. As a consequence, these models yield more efficient parameters than a single bivariate probit estimation. Furthermore, before showing and discussing the results of the bivariate model, some relevant specification issues are properly discussed. Above all, due to the fact that the models contain more than thirty covariates, a test for multicollinearity is needed. Variance inflation factors (VIFs) calculation reveals an average value of 1.45 as well as the absence of variables with a VIF larger than 2.6. It follows that the models do not have multicollinearity problems. Moreover, the Wald tests also indicate high joint significance of the variables for both models. Therefore, the null hypothesis of all slope parameters in the models equals to zero is rejected.

Henceforth, the empirical results reported in table 3 are discussed, according to the conceptual framework presented in section 2.

Table 3. Results of probit models: marginal effects

		COOP		PO	
		Coeff.(SE)	P>z	Coeff.(SE)	P>z
Human Capital	Manager_age	2.96*10 <sup>-4</sup> (3.49*10 <sup>-4</sup> )		4.82*10 <sup>-4</sup> (2.99*10 <sup>-4</sup> )	
	Manager_empl	-0.004 (0.009)		0.025 (0.008)	**
	Parents	0.065 (0.017)	***	0.012 (0.013)	
Network	OPPAA	-0.103 (0.013)	***	-0.244 (0.015)	***
	oth_NETW	-0.104 (0.009)	***	-0.121 (0.006)	***
Production and market uncertainty	GO_sd	-2.91*10 <sup>-7</sup> (1.14*10 <sup>-7</sup> )		1.51*10 <sup>-7</sup> (8.31*10 <sup>-8</sup> )	*
	FI_sd	-1.10*10 <sup>-7</sup> (1.09*10 <sup>-7</sup> )		-2.80*10 <sup>-8</sup> (6.01*10 <sup>-8</sup> )	
	Insurance_UAA	8.40*10 <sup>-5</sup> (1.48*10 <sup>-5</sup> )	***	2.00*10 <sup>-5</sup> (1.29*10 <sup>-5</sup> )	
Institutional/policy uncertainty	CAP_aids_sd	8.35*10 <sup>-7</sup> (6.60*10 <sup>-7</sup> )		1.22*10 <sup>-6</sup> (4.98*10 <sup>-7</sup> )	**
	Index_agr_coop	2.583 (0.290)	***	-0.878 (0.271)	**
	Proc_comp	-2.94*10 <sup>-5</sup> 2.33*10 <sup>-6</sup>	***	-1.08*10 <sup>-5</sup> (2.05*10 <sup>-6</sup> )	***
	Employment	0.211 (0.052)	***	-0.220 (0.048)	***
Specialization asset	Organic	0.003 (0.020)		-0.008 (0.016)	
	PDO	0.090 (0.022)	***	0.016 (0.018)	
	PGI	0.099 (0.028)	***	0.018 (0.023)	
	GO_processact_share	-0.187 (0.023)	***	0.037 (0.017)	**

	GO_qualact_share	0.195 (0.033)	***	0.048 (0.027)	*
	TF_cattle&milk	0.083 (0.015)	***	0.052 (0.013)	***
	TF_graniv	-0.038 (0.022)	*	0.043 (0.023)	*
	TF_hort	0.182 (0.042)	***	-0.025 (0.025)	
	TF_orch&wine	0.142 (0.016)	***	0.044 (0.013)	**
	TF_mixed	0.072 (0.017)	***	0.052 (0.016)	**
Dimensional specificity	UAA	-1.71*10 <sup>-4</sup> (1.03*10 <sup>-4</sup> )	*	1.20*10 <sup>-4</sup> (7.30*10 <sup>-5</sup> )	
	Rented_UAA	-0.012 (0.012)		0.007 (0.010)	
	Irrigated_UAA	0.039 (0.012)	**	0.023 (0.010)	**
	Machpow_UAA	-4.23*10 <sup>-4</sup> (3.11*10 <sup>-4</sup> )		6.90*10 <sup>-4</sup> (2.42*10 <sup>-4</sup> )	**
	FWU_UAA	-0.054 (0.032)	*	-0.082 (0.028)	**
	Fixasset_UAA	9.51*10 <sup>-7</sup> (1.29*10 <sup>-7</sup> )	***	-1.24*10 <sup>-7</sup> (1.07*10 <sup>-7</sup> )	
N	6779		6779		
LR $\chi^2(28)$	1415.87	***	623.31	***	
Log likelihood	-2667.872		-2100.056		
Pseudo R <sup>2</sup>	0.209		0.129		

\*<0.100, \*\*<0.050, \*\*\*<0.001

Source: Author's calculation based on RICA 2015

As regards asset specificity, results show that the vast majority of the dimensions analysed somehow significantly influence the participation in cooperatives and/or POs in the Italian agricultural sector.

With regard with human capital and relational network, despite the absence of any “age effect” on the adoption of collective organizational solution, empirical evidences point out that the willingness to join a hybrid forms of arrangement in agriculture is positively affected by the presence of a predecessor in the farm (+0.065) for cooperative and by the presence of manager that are also employed in farm activities for POs (+0.025). Such results however confirm the importance of the “human” or “people” factors, since members' characteristics have an important influence on behavior toward a cooperative (Bhuyan, 2007). Very interestingly, the cooperation or the participation in POs are negatively affected by the membership in farmers association (coefficients for the two collective arrangements are, respectively, -0.103 and -0.244 ) or other types of networks (-0.104 and -0.121). Counterintuitively, empirical evidences do not confirm what Pascucci et al. (2012) showed for Italy. A possible explanation could be that since participation to several organizations is time consuming, cooperatives and POs compete with other association forms, networks and so on. However, another possible interpretation could be due to the influence played especially by specific embedded meso-institutions, such as farmers organizations (Monderlaers et al., 2014). Since these interest groups were responsible of the interpretation and implementation of public policies for agriculture, as assumed by Ménard (2014a; 2017), such a circumstance historically allowed them to interfere with the cooperation process in the Italian agri-food system, sometimes using a top-down approach (not sustainable in the long run) and establishing POs or cooperative just to take advantage of the available financial support.

Results confirm that specialization triggers cooperation for all the type of farming under investigation. Assuming arable crops as benchmark, the models reveal that farm specialized in horticulture (+0.182), orchards and vineyard (+0.142), cattle and milk (+0.083) and mixed production (+0.072) are more likely to join cooperatives than those specialized; the opposite applies for granivores (-0.038). As for POs, findings show similar but weaker effects. In more details, farms specialized in cattle and milk and mixed production (both +0.052), orchards and

wine (+0.044) and granivores (+0.043) are more willing to participate to POs than farm cultivating arable crops. Findings are consistent with existing studies showing that POs development is a sector-specific phenomenon, with cooperation being more often present in sectors characterized by higher heterogeneity in terms of quality (such as wine, fruits and vegetables, milk) and of number of products offered (such as mixed production) (Pascucci et al., 2012).

Findings highlight that brand-name capital plays a key role in triggering cooperation as well. This is clearly indicated by the fact that high quality and high value production with great reputation and high brand values, such as PGI (+0.099) and PDO (+0.099), positively affect the cooperation in the Italian agriculture. These evidences are confirmed by the fact that farms that produce high quality food are greatly motivated to participate in cooperatives (+0.195) and, to a lesser extent, to POs (+0.048). According to Raynaud et al. (2005), this finding show that quality labelling and governance of the vertical chains are related. In this regard, Ménard and Valceschini (2005) recognizes that the promotion of food quality and the enforcement of quality certification as well require highly specific investments and tight coordination among transactors. Therefore hybrid forms of governance can enable farmers to coordinate on quality control, to comply with stringent food standards as recognized by Narrod et al. (2009). No significant effects are observed for POs, a reason could be that such type of institutional collective arrangements have not the specific aim of enhancing and promoting specific (high quality) productions. Lastly, apart from a slight but positive effect for participation to POs (+0.037), farms carrying out processing activities are not likely to join cooperatives (-0.187). A typical explanation of such a result is the ‘make or buy’ decision (Klein, 2015; Walker and Weber, 1984), Indeed, when a farm decides to make (i.e., process) a product (i.e., a food), it clearly tends to compete with processing cooperatives. Therefore when farms cannot have significant advantages from collaboration, reasons for participation in collective arrangements disappear.

Concerning specificity affected by dimensional characteristics of farms, some control variables were tested. Findings highlights that size very slightly affect the participation to cooperatives ( $-1.71 \cdot 10^{-4}$ ). More relevant is the impact due to the presence of family workers (expressed by means of FWU/UAA). It indeed represents an obstacle for cooperation (-0.054) and, to a greater extent, POs (-0.082). What emerges is therefore that until farms remain a family-owned business it is difficult to design and enforce effective collective arrangements (Ménard and Klein, 2004). Turning to the intensity of assets related to farm size, as expected results reveals that it (very weakly) stimulates joining cooperative ( $+9.51 \cdot 10^{-7}$ ) as well as the presence of specific investments for irrigation positively – indicator of specific investment realized in order to carry out the production processes- influences the participation to both COOP (+0.039) and POs (+0.023), Accordingly, the more the intensity of mechanization increases the more farms are likely to join POs.

The second transaction attribute analysed in the model is the uncertainty. Empirical evidences show that such a dimension somehow influences the decision to participate in both cooperatives and POs. More in details, concerning production uncertainty, despite the slight effect ( $+8.40 \cdot 10^{-5}$ ), findings reveal that the higher is the use of agriculture insurances the more it is likely for a farm to participate in collective arrangement, such as a cooperative. This result has interesting implications, since it highlights that farms that use risk management tools are more likely to recognize the important role of cooperatives as an institutional means in order to collectively address and somehow manage uncertainty. As concerns the uncertainty that strives from market and directly affects the level of revenues, findings reveal a very weak and positive effect in stimulating participation to POs. Such an institutional

hybrids arrangement could be seen as a means for reducing the impacts of price volatility on revenues.

However, some very interesting findings are related to the institutional environment. Indeed, what emerges is that the larger is the relevance of cooperation the more farmers are stimulated in joining them (+2.583). Conversely, there is a sort of competition with POs at stake, since a high diffusion of cooperation somehow decrease the participation to institutional hybrids (-0.878). By taking into account the concept of mesoinstitution according to Ménard (2014, 2017) a possible interpretation could be that these devices play a key role, since they are in charge of actually implementing the general rules of the game through their translation into rules specific to sectors and/or geographic areas, thus framing and delineating the domain of activities of actors. In more details, when mesoinstitution are able to implement and enforce rules and property and decision rights, guaranteeing a reliable institutional environment, some types of collective arrangements (such as cooperation) can spread and, as a consequences companies, are triggered to participate. Such a phenomenon causes a sort of competition with other types of arrangements. In this regard, according to Pascucci et al. (2012) such a competition obviously grows when the number of collective arrangements, such as POs, increases.

Furthermore, results highlight that the higher is the number of processing companies in the agri-food system the more competition there will be among processors and, as a consequence, the lesser the need for farmer to join a cooperative ( $-2.94 \cdot 10^{-5}$ ) or a POs ( $-1.08 \cdot 10^{-5}$ ). Also the employment rate, that identifies more agricultural oriented areas, plays a role in fostering participation in cooperatives (+0.211) and at the same time a negative effects on participation to POs (-0.220). A possible interpretation is based on economic differences at stake among geographical areas in Italy. In more details, this implies that in areas where the primary sector plays a key role on general economy (e.g., the Southern Italy) cooperation is more likely to spread rather than institutional arrangements, such as POs. Conversely, such form of hybrid forms of governance are established in more developed areas, that is where agricultural employment accounts less (e.g, Northern Italy).

Lastly, a slight but very interesting effect is due to influence of policy uncertainties (related to the evolution of CAP aids over time) on the participation in “institutional” collective arrangement. Findings shows that POs membership is somehow slightly influenced ( $+1.22 \cdot 10^{-7}$ ) by the uncertainty related to the high variation of such a public support in the period 2013-2015, due to several reforms of the CAP that have affected many several strategic agricultural sectors in Italy. Many authors have indeed recognized the increasing role of uncertainty in shaping both institutional arrangements and modifying the collaborative attitudes of farmers, faced with the increasing liberalization of agricultural market, the decreasing dependency on public aids and the increasing regulatory support to collective arrangement (Ciliberti and Frascarelli, 2018; Ménard and Valceschini, 2005; Royer et al., 2015).

To sum up, these findings allow to confirm that both H1 (*asset specificity and uncertainty significantly affects the participation in hybrid collective arrangement*) and H2 (*asset specificity and uncertainty significantly affects the participation in hybrid collective arrangement. the participation in institutional hybrid (POs)*). Indeed, according to TCE literature findings confirms that, despite some differences, both asset specificity and uncertainty play an important role in stimulating/hindering participation in cooperatives or institutional hybrids, such as POs in the Italian agri-food sector. Moreover, what emerges is also the significant influence of the mesoinstitutional context on fostering or hampering the



participation in cooperatives or POs, since it is largely responsible of governing the increasing uncertainty that surrounds transactions in an instable and volatile agri-food supply chain.

Table 4 illustrates the results of multinomial regression. The focus is on covariates which show up statistically significant in the model for joint choice of Cooperatives and Producers organizations and are not significant in the other models (Cassiman and Veugelers, 2006). *TF\_cattle&milk* , *Employment*, *Manager\_age*, *GO\_processact\_share* and *PGI* show up significant effects for the choice of joining both to a Producers organization and to a cooperative, while it is not statistically significant for the producer organization or the cooperative alternative. Then, apart from *Insurance\_UAA*, there is not a clear evidence confirming that some variables may really influence the joint choice of both *PO* and *COOP*. As regard H3 (transaction attributes play significantly different roles in order to stimulate a strategy of complementarity characterized by a joint adhesion in cooperatives and POs) findings suggest that to take part in both a producer organization and a cooperative cannot be connected to the idea of a complementary between the two organizational forms. Our interpretation is that in the sample the choice of the forms of collective arrangements may be motivated by sectorial reason being the farm active in different sector (e.g., vegetables and cereals) and engaged in the management of different transactions.

Table 4: Multinomial logistic regression

		COOP		PO		COOP&PO	
		Coeff.(SE)	P>z	Coeff.(SE)	P>z	Coeff. (SE)	P>z
Human Capital	Manager_age	0.005 (3.09)	**	0.002 (1.58)		0.010 (3.08)	**
	Manager_empl	0.287 (5.97)	***	-0.0826 (-1.97)	*	0.255 (2.60)	**
	Parents	0.285 (3.36)	***	0.692 (11.47)	***	0.601 (4.25)	***
Network	OPPAA	-2.507 (-40.30)	***	-1.082 (-16.89)	***	-2.034 (-17.64)	***
	oth_NETW	-2.456 (-26.23)	***	-1.107 (-16.14)	***	-2.079 (-12.62)	***
Production and market uncertainty	Insurance_UAA	1.62*10 <sup>-4</sup> (1.79)		1.72*10 <sup>-4</sup> (1.86)		2.50*10 <sup>-4</sup> (2.46)	*
Institutional/ policy uncertainty	Index_agr_coop	-18.34 (- 7.62)	***	12.25 (8.35)***		-4.583 (- 0.95)	
	Proc_comp	-2.23*10 <sup>-4</sup> (-18.63)	***	-3.89*10 <sup>-4</sup> (-33.50)	***	-0.000207 (-10.64)	***
	Employment	-0.227 (-0.79)		1.595 (7.98)	***	-1.768 (-3.02)	**
	Ind_corr_COP	-31.57	*	-134.2 (-6.64)	***	-99.67 (-2.05)	*
	Ind_corr_hort	-4.985 (-3.31)	***	-7.812 (-6.63)	***	-0.250 (-0.10)	
	Ind_corr_cattle&milk	3.650 (3.86)	***	5.436 (8.34)	***	13.950 (10.10)	***
Specialization asset	PGI	0.161 (1.05)		0.694 (6.08)	***	0.603 (2.73)	**
	GO_processact_share	-0.005 (-0.97)		-2.312 (-18.24)	***	-1.195 (-5.34)	***
	GO_qualact_share	0.743 (3.30)	***	1.282 (4.90)	***	1.266 (3.95)	***
	TF_cattle&milk	-0.042 (-0.29)		0.391 (2.72)	**	-1.289 (-4.15)	***
	TF_COP	-0.240		1.041	***	-0.208	

		(-1.74)		(6.77)		(-0.61)	
	TF_hort	-0.702		0.891		-0.709	
		(-3.86)	***	(6.36)	***	(-1.37)	
	TF_orch&wine	0.363		2.052		0.935	***
		(2.85)	**	(15.38)	***	(3.31)	
	TF_mixed	0.094		0.947		0.415	
		(0.81)		(7.47)	***	(1.62)	
	UAA	0.002		-0.002		-0.001	
		(4.95)	***	(-3.40)	***	(-1.16)	
	Rented_UAA	0.216		-0.128		-0.320	**
		(3.48)	***	(-2.37)	*	(-2.65)	
Dimensional specificity	Irrigated_UAA	0.455		0.431		0.536	***
		(7.79)	***	(8.63)	***	(4.40)	
	Machpow_UAA	0.004		-0.005		0.005	***
		(3.36)	***	(-4.26)	***	(4.23)	
	FWU_UAA	-0.802		-0.177		-1.928	***
		(-6.77)	***	(-3.07)	**	(-5.41)	
	Fixasset_UAA	3.23*10 <sup>-6</sup>		4.13*10 <sup>-6</sup>			(1.33)
		(5.70)	***	(8.19)	***	1.31*10 <sup>-6</sup>	
N		26292					
Waldchi2(78)		5686.58	***				
Log pseudolikelihood		-17345.08					
Pseudo R2		0.194					

\*<0.100, \*\*<0.050, \*\*\*<0.001

Source: Author's calculation based on RICA 2015

## Conclusions

The ongoing liberalization of the European agri-food supply system adds complexity and uncertainty to transactions between farmers and the counterparts, due to the intrinsic characteristics of products (e.g. credence attributes, quality related to location and methods) as well to external factors (e.g. role of institutions, price volatility).

What emerged in the last decade is a growing interests in collective forms of organization in the agro-food sector. They are approached as a means to share uncertainty and split over the whole group costs of a hold up stemming from opportunistic behaviours of counterparts. Moreover, such hybrid solutions, where farms “co-opete” (that is, collaborate and compete at the same time) pooling decisional rights on output, allows a stronger negotiating position towards potential contractors. The European institutions, on their part, played a relevant role in fostering a constructive environment so as to promote the spread of collective arrangements along the food supply chain.

The present paper focused the attention on the determinants of hybrid forms of governance in the Italian agri-food sector, such as cooperatives and POs, under the TCE perspective. It offers an innovative and original contribution in this regard, since this is one of the first attempts to quantitatively investigate the factors that foster/hinder the establishment and the participation in collective arrangements. Moreover, in addition to asset specificity, the empirical model takes properly into account the uncertainty surrounding transactions, with a specific attention to the influence of the institutional environment.

The empirical evidences shed light on the circumstances in which successful POs and cooperatives can be established and what policy signals may be used to support this process. It is confirmed that whether farmers are better off being members of a cooperative or act on their own depends on the particular characteristics of the product and market structure. In

general, collective arrangements seems to be more beneficial in high-value supply chains (e.g. wine and cheese) as well as in presence of cash crops, such as fruit and milk. What emerges is a relevant role of cooperatives in presence of high quality local production (PDO and PGI), since they may help farmers to comply with stringent food standards. At the same time, participation in hybrids form of governance in the agri-food system is somehow highly site-specific, since it is more widespread in areas whereas agriculture plays a key-role in terms of employment, whereas participation to insitutional hybrids (e.g., POs) is diffused in more developed areas, where primary sector absorbs a lesser share of workers.,

The role of asset specificity is particularly evident for POs, since participation increases the higher is the level of specialization and sppecific fixed investments investments (in machinery and technology) made by farmers. Evidences tend to suggest that human capital also matters, even though the presence of family workforce somehow obstacles the adhesion to collective arrangements. It follows that the family farming model could somehow not perceive the importance of collective actions, since these latter do not automatically improve market access for small scale and family-owned farmers. Moreover, Very interestingly, a contrast between participation in cooperatives and in farmers organization or other networks is at stake. Apart from the reasonable competition among these organizations, such an evidence could confirm the scarce reputation of farmers organizations in leading and fostering the process of participation to collective arrangements in Italy. Indeed often the main actors in the process of POs formation are not farmers but farmer organizations for the sole purpose of benefitting from public incentives offered by the CAP. This, in turn, poses the question to what extent these organizations can be effective in promoting farmers' interests, since POs which are set up using top-down approach lack an economic justification which is an important condition for progression through the cooperative life cycle.

The other transaction attributes according to the TCE, the uncertainty, plays also a significant role in fostering the access to cooperatives and POs. Farmers are responsive to the risks linked to market and weather instability, by means of insurances or diversification strategies, but also collective arrangements are seen with increasing interesting in order to address both market and institutional uncertainty. This latter mainly stems from to the progressive liberalization of the European market consequent to the CAP reforms and the cut of the EU budget for agriculture that have reduced the dependence of farm incomes on public aids.

As for complementarity, empirical evidences revealed that the participation to both forms of collective arrangements under investigation (cooperatives and producer organizations) cannot be connected to such a concept. What really matter in order to orient the choice to join different types collective arrangements are rather sectorial characteristics that directly affect the management of specific transactions.

However, the present work presents some limitations that must be carefully taken into account but may represent the starting point for further investigation on this topic. First, attention is exclusively focused on Italy, so that any generalization for other European countries is not possible. Moreover, the time dimensions is excluded, which constitutes another barrier to properly assess whether motivations for joining cooperatives/POs change over time.

In conclusion, thanks to the TCE approach, the paper showed that farmers' relations with agricultural cooperatives depend to a large extent on specialization, human capital, network as well as on the institutional context in which farmers operate and face uncertainty. At the state of the art this heterogeneity confirms that the development of cooperative and POs is likely to be highly dependent on social, institutional and cultural context that together contribute in shaping the mesoinstitutions and their functioning. Starting from the Italian case, the paper

aimed to shed more lights on the motivations that encouraged farmers to organize as POs or cooperatives, paving the road for future works in this field aiming to fill the ‘knowledge vacuum’ of managers, stakeholders and policymakers that often do not have a common understanding of organizational problems along the agro-food supply chain.

## Endnotes

[1] 1 According to Pascucci et al. (2012), these variables are calculated multiplying the share of specific food-coops in the total number of coops by specialization dummies for farms, since processing coops in a sector are only relevant for that sector. The resulting variables are therefore zero if a share is not relevant for a particular farm specialization and else they equal the share.

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