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Assessing the Impact of Sustainability Improvement Options on the Agri-food Supply Chain Governance Structures: Development of an Evaluation Tool*

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ABSTRACT

The competitiveness of a supply chain is driven by the ability of supply chain governance structures to adapt to the chains' continuously changing technical and organizational characteristics. The present study addresses the adoption of sustainability improvement options in the area of organization and management in the agri-food sector; within this framework the study proposes a tool for assessing the impact of sustainability oriented processes on the supply chain governance structures, in turn influencing the competitiveness of the supply chain. Two different approaches, proposed by (Gereffi et al., 2005) and (Hobbs and Young, 2000) have been linked to provide a theoretical framework for the tool development. The proposed new conceptual framework links the dimensions defining five different governance structures *complexity of transaction*, *ability to codify* and *capabilities in the supply-base* (Gereffi *et al.*,) to the *product characteristics*, *regulatory* and *technology* aspects defined by Hobbs and Young as drivers influencing the vertical coordination of supply chains. The method suggested for measuring the relations between improvement options and the chain governance structure is the adoption of experts' evaluations. This method improves the tool capacity to provide a context-related supply chain governance structure assessment and management.

***Keywords**: supply chain governance, agri-food, assessment tool, sustainability.*

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1 Introduction

The present paper derives from the EU Commission co-funded international research project SALSA, which aims at tackling the environmental challenges in Latin America by supporting the implementation of sustainable beef and soy chains. In order to allow farmers to assess and benchmark their sustainability performances, as well as the involved stakeholders to obtain a deeper understanding of what sustainability is, SALSA project provides analytical tools for defining and monitoring the different sustainability dimensions of these food chains.

A quantitative and qualitative analysis of the core indicators of *environmental* (global warming, land use change, energy use, water consumption, biodiversity) *economic* (operating profit, volatility) *social* (employability, working conditions animal welfare, food safety and food quality) and *governance* (degree of chain collaboration) dimensions was performed. When considering the management of the soy and beef chains sustainability, several sustainability improvement options were defined in relation to three focus areas: i) technical, ii) logistic and iii) food quality. The present paper focuses on the governance dimension, proposing a tool for the evaluation of the changes in the supply chain governance structure resulting from the adoption of sustainability improvement options.

1.1 Supply Chain Governance

There is a growing interest in the governance dimension of sustainability (FAO, 2013; COSA, 2013). Understanding how a governance structure fits into different types of food chains contributes, in fact, to the food chain competitiveness and its economic, social and environmental sustainability (Rota et al., 2013; Vurro et al., 2010; Adger et al., 2003).

According to the Transaction Cost Economics (TCE) approach, a governance structure refers to the manner in which transactions are organized within the chain. Supply chain governance attempts to mitigate conflict and promote cooperation between trading partners (Williamson, 1999; Lumineau and Henderson, 2012). TCE provides an important analytical framework explaining the firms' organization and their relationships along the supply chains (Barringer and Harrison, 2000). This approach considers a firm as a governance body whose goal is to grant reliable and efficient contractual relationships. According to Williamson (1975) the necessity to compensate the costs that arise from bounded rationality and from uncertainties due to partners' opportunism, leads to a firm orientation towards different level of coordination ranging from vertical integration to the least coordinated market relation (spot markets). Several studies have confirmed the hypothesis that transaction costs were a primary motivation for vertical coordination (Hobbs, 1996; Frank and Henderson, 1992). TCE has been widely applied in industrial marketing and management, such as buyer-seller relationships (Jap and Ganesan, 2000), the choice of organizational structure (Houston and Johnson, 2000), as well as marketing channel integrations (Klein et al., 1990). Recently TCE has been applied to agri-food markets, particularly in the context of supply chain management (Wever et al., 2010).

Effective governance structures based on long-term and highly collaborative work relationships are needed between the supply chain agents in order to reach a sustainable competitive advantage (Oliver, 1997) and reduce opportunistic behaviours (Cox, Chicksand, & Palmer, 2007; Geffen & Rothenberg, 2000). Collaborative governance structures play a key role in shaping the supply chain agents relationships since the performance of a supply chain depends largely on efficient coordination of the activities of the chain members (Hien Duc et al., 2010). Moreover, collaborative governance structures have a direct and positive impact on the supply chain economic (Cao and Zhang, 2010; Li et al., 2006; Kim, 2009), environmental (Yang et al., 2010) and social performances (Awaysheh and Klassen, 2010). Therefore, supply chain governance structures should be designed to ensure long-term collaboration between multiple organizations (Monks and Minow, 2011) and to accommodate potential conflicting goals (Ghosh and Fedorowicz, 2008; Vurro et al., 2010).

While former studies have examined the prevalence of governance structures in the agri-food sector, and the factors influencing the stakeholders' choice for a specific governance structure (Reynolds, 2010), the present study addresses a still unexplored area of investigation: the impact of sustainability improvement options on the governance structure.

Within this aim, the present paper proposes a tool able to: i) assess the existing governance structure; ii) evaluate the changes resulting from the adoption of sustainability improvement options.

1.2 Sustainability improvement options

The concept of supply chain improvement option is strictly related to the concept of supply chain scenario. According to some authors (Vorst and Beulens, 2002; Vlajic et al., 2012), a supply chain scenario is defined as *"an internally consistent view of a possible instance of the following elements: i) chain*

configuration, ii) chain control structure, iii) chain information systems, iv) chain organisation structures". An improvement option is a change in a specific element of the SC scenario (configuration of a network, control rules, etc.) related to a specific business process that results in a potential improvement of performance. According to SALSA project outcomes, improvement options can take place on many management aspects of the chain: *logistics* (Soysal et al., 2014), *technical (LCA related)*, and *quality* (Table 1).

Table 1.
Sustainability improvement options

Logistics	• New fleet (fuel efficient) • Infrastructure improvement • Use software for planning • Multi-modal network • Other transportation alternatives • Increasing fuel efficiency • Funds to mitigate emissions • Better route planning, vehicle sharing and backhauling • Network re-design • Port efficiency improvement • Less overweight trucks • Joint planning of different transportation modes • Driver training on eco-driving • Supply adjustments • Fleet management systems • Use of information technologies and decision support tools
Technical (LCA related) Farm Level	**Soybean** • Decreasing phosphorus consumption • Mechanization of farm to use less labour • Increasing education level of labours and managers to use more efficient chemicals • Decreasing amount of fuel used in farm land **Beef** • Using mixed crop cattle farm or using efficient feeds to decrease life span of cattle • Increasing education level of labours and managers to decrease mortality rates • Using high tech mechanics to mixture the feeds rather than manual fixing
Quality	• Standards and legislations to be considered • Documented safety information • Accurate specifications according to the customer requirements (raw material specification, product specification, process description) • Allergen controlling system • Adequate quality interpretation (food defense, recall, internal auditing, assessment by external organization, documented procedures, change organization structure) • Social requirements has to be considered (code of ethics, standards) • Elimination of GMO • Definition of the quality objectives • Definition of the boundaries of the quality system (clear description of the scope consumer, vulnerable) • Adequate use of resources, supplier 'quality' assurance • Use of HACCP system • System monitoring and data recording system

2 Methodology

The goal of the paper is to create a tool for assessing the impact of sustainability improvement options on the agri-food supply chain governance structures. To this end the following methodological steps are needed:

1. Identify a theoretical framework categorizing the dimensions related to the governance structure typologies;

2. Identify a instrument to *assess* the existing governance structures measuring the indicators weight within each dimension;
3. Identify the key drivers to assess the impact of the improvement options on the existing governance structure.

According to the identified theoretical frameworks, the proposed tool will assess, by interviewing a panel of experts, the impact of the improvement options on the supply chain governance structure through the selected key drivers.

2.1 Identifying a categorization of the supply chains governance structures

A theoretical framework supporting the categorization of the governance structures was proposed by Gereffi et al. (2005), which suggests that supply chains fall into one of five different governance structures, depending on the relative levels of three dimensions:

a. *Transaction complexity:* captures the extent of "non-price information flowing across the inter-firm boundary" and refers to information like detailed product specifications, special requirements, etc.;
b. *The ability to codify:* identifies how efficient is the information and knowledge transfer between supply chain agents without transaction-specific investments. A broadly adopted technology standard for communication provides a codified language for its use in knowledge transfer activities;
c. *Supply base capabilities:* indicate the competence of suppliers in assessing the extent to which they are able to meet buyer requirements with little interference or direction from the focal firm.

The authors suggest that the combination of relative levels of these three dimensions (low or high) define 5 supply chains governance structures: *market*, *modular*, *relational*, *captive*, *hierarchy*. (Table 2) which can be described as follows:

Table 2.
Governance types proposed by Gereffi et al., 2005

Governance type	Complexity of transactions	Ability to codify transactions	Capabilities in the supply-base	Degree of coordination
Market	Low	High	High	Low
Modular	High	High	High	↕
Relational	High	Low	High	
Captive	High	High	Low	
Hierarchy	High	Low	Low	High

- *Market*: this type of governance relates to short-term contractual relationships. The complexity of product requirements is low and easily communicated, requiring less co-ordination from lead-firms and less overall risk to the buyer;
- *Modular:* in modular governance small firms, which produce independently taking full responsibility for production and outsourcing the production, characterize the transactions between buyers and suppliers. This typology occurs when the product characteristics are complex but sufficiently modular in design, that the related technical standards and information can be specified and communicated to a third-party;
- *Relational*: relational governance types involve complex interactions between the lead-firm and supplier. Tacit information is often exchanged and the buyer and supplier develop intertwined relationships over extended periods of time;
- *Captive*: this type of governance arises when the capabilities of suppliers are low and therefore requires detailed instructions and standards in order to deliver the level of quality required by the lead-firm. Captive governance is characterized by a high degree of monitoring and control by the lead-firm;
- *Hierarchy*: hierarchical governance occurs when the supply base capabilities are too low to satisfy the required level of quality and the complexity of products is high with little standardization, then vertically integrated organizations is the appropriate form of relationship.

According to Gereffi, the three remaining high/low combinations are discarded as unlikely structures

2.2 Assessing the existing supply chain governance structure

A measurement instrument to assess the different governance structures proposed by Gereffi (2005) is developed by Ashenbaum et al. (2009), which suggest 6 items (two items for each dimension) based on a 5-point Likert scales (Table 3). The six items proposed by Ashenbaum provide a first specification of what can be the content of these different dimensions.

Table 3.
Supply Chain Governance Structures measurement scale

To what extent do you agree with the following statements? (1 = disagree, 5 = agree)
Transaction complexity
- We exchange considerable information with our key suppliers (e.g. product design info or inventory and item movement info)
- We require more than a simple "price quote" to award business to a supplier
Ability to codify
- Technology is by and large the same across potential suppliers
- Our industry is characterized by well-known and accepted technical standards
Supply base capabilities
- Our key suppliers are "full service" outfits who can deliver a complete design with little input from us
- We do not have to spend a lot of time monitoring our suppliers for quality or to make sure they are fulfilling their commitments

The authors consider these 6 items (indicators) as measures of a *formative* model. According to Jarvis et al., (2004) in a *formative* model the following conditions should prevail:

- the indicators are viewed as defining characteristics of the construct;
- indicators need not be interchangeable;
- changes in the indicators are expected to cause change in the construct;
- the indicators do not share a common theme;
- eliminating an indicator may alter the conceptual domain of the construct;
- not necessary for indicators to covary with each other.

The statistical tests related to the *formative mode*l validation are different from those related to another type of model called *reflective.* In a reflective model the conditions of a *formative model* do not apply. In particular:

- the indicators are manifestations of the construct;
- indicators are interchangeable;
- changes in the indicators should not cause changes in the construct;
- indicators share a common theme;
- dropping an indicator should not alter the conceptual domain of the construct;
- indicators are expected to covary with each other.

Since the study refers to an agri-supply chain context, where conditions typical of a *reflective* model apply, it is suggested to consider the measurement instrument proposed by Ashenbaum (2009) as *reflective model*. In particular, to measure the supply chain governance structure it is expected to increase the number of the items, as well as a set of interchangeable indicators with similar content and high covariance among them.

Consequently, the following methodological steps are needed to develop, validate and assess the proposed reflective measurement model.

2.2.1 Conceptualization

According to Nunnally and Bernstein (1994) "*to the extent that a variable is abstract and latent rather than concrete and observable (such as the rating itself), it is called a construct. Such a variable is literally*

something that scientists construct (put together from their own imaginations) and which does not exist as an observable dimension of behavior". As above indicated, according to the theoretical framework proposed by Gereffi et al. (2005) the measurement instrument to assess the governance structures is proposed by Ashenbaum et al. (2009), which conceptualized a set of items grouped into 3 constructs: transaction complexity, ability to codify and supply base capabilities.

2.2.2 Scale development

The scale development phase consists of two main steps: items generation and the content (or face) validity assessment.

a. *Items generation*

The purpose of item generation is to ensure that questionnaire items *"capture the specific domain of interest yet contains no extraneous content"* (Hinkin, 1995).

The main questionnaire has to be adapted in order to capture, with the same measurement instrument, the farmers and processors' point of view for both chains. Therefore, four questionnaires will be obtained; the beef and soy farmers/processors will answer on a 5-point Likert scale.

b. Content validity

Content validity refers to the extent to which the items fit into different aspects/dimensions of a construct (Vaus, 2002).

In order to provide clear linkages between the items with the theoretical literature and to assure the consistency of the responses, the finalized version of the questionnaire will be pre-tested with some experts to exclude problems regarding the clarity of the questions and to ensure that each question is relevant (Bagozzi and Yi, 1988). Based on the feedback received, some redundant and ambiguous items will be modified or eliminated.

2.2.3 Scale evaluation

After the data gathering, the refinement and the validation of the measurement scales have to be performed. Factor analysis and reliability measures are recommended as part of these processes (Hinkin, 1995).

a. Factor analysis

First an exploratory factor analysis has to be performed to assess the construct validity and (if any) to reduce the amount of items. Construct validity is *"a measure of the degree to which the scale measures the abstract or theoretical construct it is intended to measure"* (Hensley, 1999). Exploratory factor analysis is the most often used method to assess whether a set of questions forms a single scale.

In a second step a confirmatory factor analysis has to be performed to assess convergent and discriminant validity. Convergent validity exists when the items of a measure are high correlated; discriminant validity addresses the question of whether two different constructs in the model are really distinct from one another (Vaus, 2002).

b. Reliability

Reliability is used to describe the overall consistency of a measure. A measure is said to have a high reliability if it produces similar results under different conditions. Inter-correlations among test items are maximized when all items measure the same construct; to this end Cronbach's alpha is widely adopted to indirectly indicate the degree to which a set of items measures a single one-dimensional latent construct.

2.2.4 Assessment of the existing supply chain governance structure

Interviewing a panel of experts, the supply chain governance structure will be assessed by comparing the values of the three following indicators: *complexity of transaction*, *ability to codify* and *capabilities in the supply chains*; each indicator is calculated as the average of its defining items' score. The different scores will be grouped into a two-category variable defined by *high* and *low* levels.

Ashenbaum et al. (2009) do not provide any indication on the threshold variable. In this study adopting a threshold level of 3 is suggested; consequently indicators ranging from 0 to 3 will be considered "low" while values from 4 to 5 will be considered "high". The underlying assumption is that the respondents tend to consider as "high" a value which is greater than 3.

2.3 Key drivers influencing the existing supply chain governance structure

The conceptual model related to the drivers behind vertical co-ordination in agri-food supply chains refers to the Hobbs and Young's work (2000). The authors, according to Williamson (1975), recognise that certain transaction characteristics affect the choice of the governance structure through their influence on transaction costs. In addition to the widely discussed *frequency*, *uncertainty* and *asset specificity* (Williamson, 1975), Hobbs and Young (2000) argue that these specific transactions characteristics are influenced by the following drivers: *product characteristics*, *regulatory, technological an socio economic drivers* (Table 4).

Table 4.
Generic model proposed by Hobbs and Young, 2000.

	Transaction characteristics						
	Uncertainty for buyer: quality	Uncertainty for buyer: reliable supply (timeliness and quantity)	Uncertainty for buyer and seller: price	Uncertainty for seller: finding a buyer	Frequency of transaction	Relationship-specific investment	Complexity of transaction (variety of outcomes)
Product characteristics							
Perishability	✓	✓		✓	✓		✓
Product differentiation	✓	✓	✓	✓		✓	✓
Quality variable and visible		✓	✓	✓			✓
Quality variable and invisible	✓	✓	✓				✓
New characteristics of importance to consumers	✓	sometimes	✓	✓		✓	✓
Regulatory drivers							
Liability	✓			✓		sometimes	✓
Traceability				✓		✓	✓
Technology drivers							
Company-specific technology						✓	sometimes

For the purpose of the present study, these key drivers were selected as theoretical reference to guide the expert's judgment through the governance structure categorization process.

3 Results: The Improvement Options' Impact Assessment Tool

3.1 Assessing the impact of the improvement options on the existing governance structure through the selected key drivers: the merging of theoretical frameworks

Gereffi et al. (2005), in order to develop a theory of global value chain governance, consider "cumulatively" different theories of industrial organization (TCE, Network theories and Resource Based View of the firm) to include the transactions characteristic reported by Hobbs and Young (2000) (uncertainty, frequency, asset specificity, complexity) under the proposed dimensions of *complexity of information*, *ability to codify*, *capabilities in the supply base* (Figure 1).

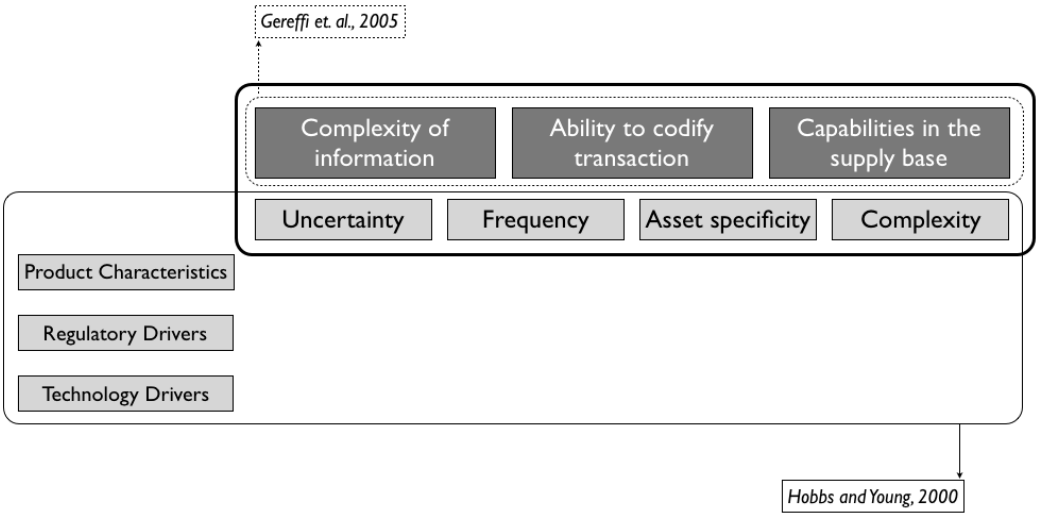

Figure 1. Merging the theoretical frameworks proposed by Gereffi et al. (2005), Hobbs and Young (2000)

The merging of the theoretical framework proposed by Gereffi et al. with the framework proposed by Hobbs and Young can be adopted to assess the impact of the improvement options on the existing supply chain governance structure.

To this end, the Hobbs and Young key drivers have been included as they provide a classification scheme for the improvement options; this because the product characteristics, the regulatory and technology drivers influence the scores of the dimensions defining the governance structure (Figure 2).

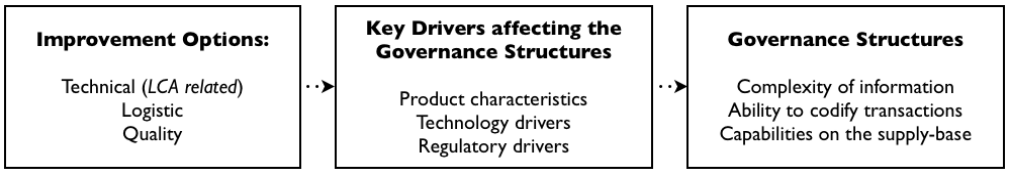

Figure 2. Conceptual scheme

3.2 Defining the impact assessment tool

Following this conceptual scheme the assessment of the impact of improvement options on the governance structure is calculated linking the improvement options and governance structures by using coefficients based upon a 5 point Likert scale.

Considering the highly complex topic and the specific knowledge required to assess the impact of the improvement options, a panel of experts of different disciplines should be involved in the coefficients definition. In particular, for each *improvement option* proposed within the *technical, logistics* and *food quality* improvement areas, the panel of experts will indicate (using a 5-point Likert scale) how much the related changes in the supply chain drivers proposed by Hobbs and Young (*product characteristics*, *regulatory* and *technology* drivers) will affect the dimensions categorizing the governance structures according to Gereffi et al. (*complexity of transaction*, *ability to codify, capabilities in the supply-base*).

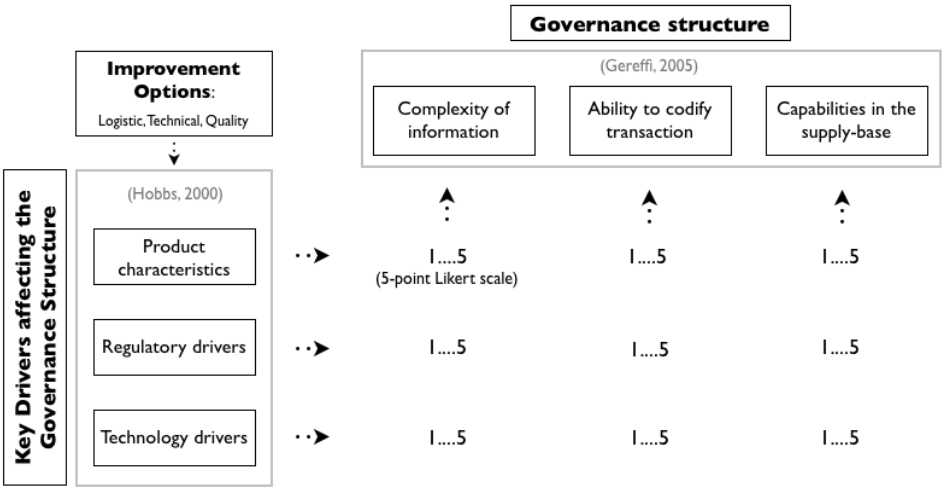

Figure 3. Conceptual model to assess the impact of the improvement options on the governance structure

As depicted in figure 3 the impact assessment tool derives from the conceptual scheme obtained by merging these two approaches. Tables 5a, 5b and 5c propose (as an example) the adoption of a *sustainability certification scheme* as an improvement option, showing the three questions adopted to collect the expert's judgements.

For each of the 3 dimensions categorizing the governance structure, a total amount of 8 scores (5 scores for *product characteristics*, 2 scores for *regulatory* drivers, 1 score for *technology* drivers) will be collected using a 5-point Likert scale. The mean value of each dimension will be translated into *high* and *low* levels using a threshold level of 3.

Using the same ratio proposed in par. 2.2.4, values ranging from 0 to 3 will be considered "low" while values ranging from 4 to 5 will be considered "high". The underlying assumption is that the respondents tend to consider as "high" a value which is greater than 3.

Consequently, as stated for the theoretical framework proposed by Gereffi (2005), the combination of the levels corresponding to these three dimensions (low or high) will define a governance structure's typology: *market*, *modular*, *relational*, *captive*, *hierarchy.*

Table 5a-c

Considering the "*adoption of the certification scheme*" and the related changes (if any) in the product characteristics, regulatory and technology drivers, to which extent the information will be **codified** and transmitted without transaction-specific investment between farmer-processors?					
	CODIFICATION of information				
	1. Not a codification	**2**	**3**	**4**	**5. High codification**
Product characteristics					
Perishability					
Product differentiation					
Quality variable and visible					
Quality variable and invisible					
New characteristics of importance to consumer					
Regulatory drivers					
Liability					
Traceability					
Technology drivers					
Company-specific technology					

Considering the "*adoption of the certification scheme*", how much the related changes (if any) in the product characteristics, regulatory and technology drivers will influence the **complexity of information exchange** between farmer-processors?

	COMPLEXITY of information				
	1. No influence	**2**	**3**	**4**	**5. Major influence**
Product characteristics					
Perishability					
Product differentiation					
Quality variable and visible					
Quality variable and invisible					
New characteristics of importance to consumer					
Regulatory drivers					
Liability					
Traceability					
Technology drivers					
Company-specific technology					

Considering the "*adoption of the certification scheme*" and the related changes (if any) in the product characteristics, regulatory and technology drivers, to which extent the **capabilities** of the actual suppliers are appropriate in relation to the requirements needed?

	CAPABILITIES of suppliers				
	1. Inappropriate	**2**	**3**	**4**	**5. Appropriate**
Product characteristics					
Perishability					
Product differentiation					
Quality variable and visible					
Quality variable and invisible					
New characteristics of importance to consumer					
Regulatory drivers					
Liability					
Traceability					
Technology drivers					
Company-specific technology					

This impact assessment tool indicates the change necessary in the chain governance structure consequent to adapt to the introduction of an improvement option (e.g. from *Modular* to *Captive* as a consequence of the impact of adopting a complex certification scheme (figure 4).

It is also a management (planning) tool since, after the first assessment step, it indicates which changes in the sustainability improvement options implementation, can be adopted to obtain a desired governance structure type. This can be obtained influencing the governance structure dimension: for example if in a Modular chain (desired type[*]) the Capabilities in the supply base (farmers) when adopting a sustainability certification scheme result low, the chain governance structure can shift from a Modular to a Captive type (undesired); actions directed to increase the farmers capabilities can be taken to avoid the chain from shifting from a Captive to a Modular governance type. These actions can results either in improving the farmer capacities or to make the improvement options easier to be adopted.

[*] A modular governance type is desirable since it increases the institutional, social and economic sustainability by granting a more equal power distribution along the chain and a more collaborative attitude between the chain agents (Vermeulen and Seuring, 2009; Ashenbaum et al., 2009).

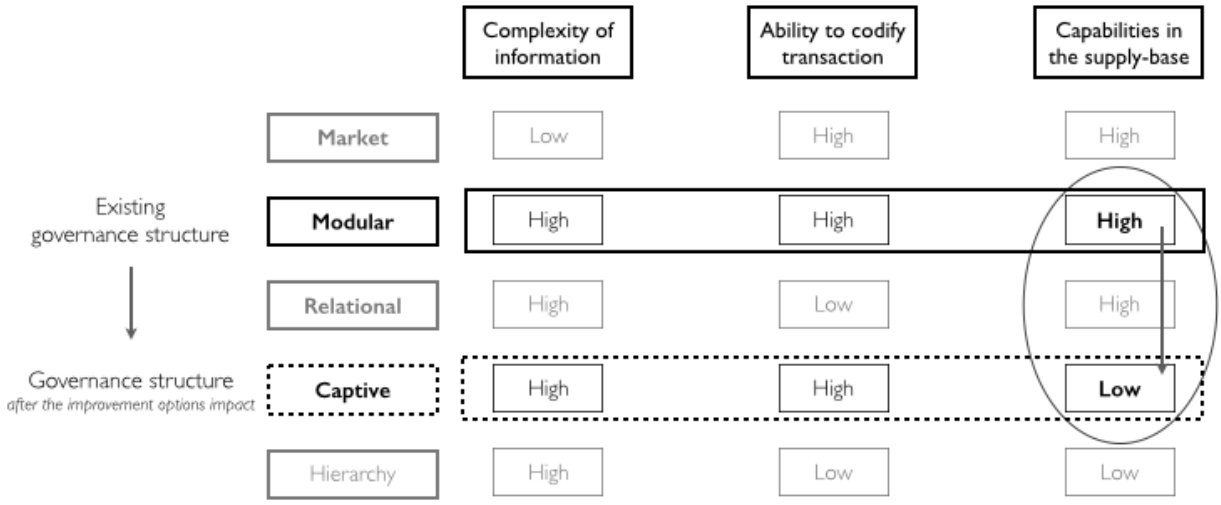

Figure 4. Impact assessment on governance structure

4 Discussion and Conclusions

The present contribution proposes a theoretical and methodological framework for the definition of a tool for assessing the impact of sustainability improvement options on the agri-food supply chain governance structures.

This represents an innovative approach which links the chain governance structure to the technical, logistics and food quality related improvements, thus increasing the capacity to support the different food chain stakeholders' sustainability strategies definition. This can be particularly relevant if a desired outcome of a sustainability strategy is the enhancement of the small farmers or SME's role in global food supply chains.

Being at a first development stage this study shows different limitations related to the following aspects:

- the relative complexity of the concepts involved in the key drivers and chain governance structure definition makes it difficult to interpret the results for an average user from SMEs or farmers organizations;
- involving expert panels can result in a demanding task considering the level of expertise required and the context dependent answers, difficult to generalize for the different improvement option categories and/or supply chains involved;
- limited number of items related to the supply chain governance structure defining the meaning of the different governance structure dimensions.
- necessity to integrate the impact assessment of sustainability improvement options on the governance structure with the economic, social and environmental dimensions of sustainability.

Further research efforts should then be oriented towards the improvement of the theoretical and methodological approach and of the tool definition in order to make it more users friendly and useful.

A pre-test on the usability and usefulness of the tool could provide a relevant contribution to its adjustment to the users' needs.

Last but not least the theoretical approach of the TCE should be integrated with the contribution of recent studies on the supply chain collaboration. They integrate the collaboration dimension with the TCE and the Resource Based View approaches. A set of supply chain agents' relational norms, including intangible factors like trust commitment and satisfaction, is defined. Last but not least, the definition of an integrated sustainability score involving also the governance dimension should be considered in further studies.

References

Adger, W. N., Brown, K., Fairbrass, J., Jordan, A., Paavola, J., Rosendo, S., and Seyfang, G. (2003). "Governance for Sustainability: Towards a 'Thick' Analysis of Environmental Decisionmaking." *Environment and Planning A*, **35**: 1095–1110.

Ashenbaum, B., Maltz, A., Ellram, L., and Barratt, M. A. (2009). "Organizational Alignment and Supply Chain Governance Structure: Introduction and Construct Validation." *The International Journal of Logistics Management*, **20**: 169–186.

Awaysheh, A., Klassen, R. D. (2010). "The Impact of Supply Chain Structure on the Use of Supplier Socially Responsible Practices." *International Journal of Operations & Production Management*, **30**: 1246–1268.

Bagozzi, R. P.,Yi, Y. (1988). "On the Evaluation of Structural Equation Models." *Journal of the Academy of Marketing Science*, **16**: 74–94.

Barringer, B. R., Harrison, J. S. (2000). "Walking a Tightrope: Creating Value Through Interorganizational Relationships." *Journal of Management*, **26**: 367–403.

Cao, M., Zhang, Q. (2010). "Supply Chain Collaboration: Impact on Collaborative Advantage and Firm Performance." *Journal of Operations Management*, **29**: 163–180.

COSA (2013). "The COSA Measuring Sustainability Report."

Cox, A., Chicksand, D., and Palmer, M. (2007). "Stairways to Heaven or Treadmills to Oblivion?: Creating Sustainable Strategies in Red Meat Supply Chains." *British Food Journal*, **109**: 689–720.

FAO (2013). *SAFA Indicators - Sustainability Assessment of Food and Agriculture System*.

Frank, S. D., Henderson, D. R. (1992). "Transaction Costs as Determinants of Vertical Coordination in the U.S. Food Industries." *American Journal of Agricultural Economics*, **74**: 941–950.

Geffen, C. A. and Rothenberg, S. (2000). "Suppliers and Environmental Innovation: The Automotive Paint Process." *International Journal of Operations & Production Management*, **20**: 166–186.

Gereffi, G., Humphrey, J., and Sturgeon, T. (2005). "The Governance of Global Value Chains." *Review of International Political Economy*, **12**:78–104.

Ghosh, A.,Fedorowicz, J. (2008). "The Role of Trust in Supply Chain Governance." *Business Process Management Journal*, **14**: 453–470.

Hensley, R. L. (1999). "A Review of Operations Management Studies Using Scale Development Techniques." *Journal of Operations Management*, **17**: 343–358.

Hien Duc, T. T., Luong, H. T., and Kim, Y.-D. (2010). "Minimizing Bullwhip Effect in Supply Chains." In *2010 IEEE International Conference on Industrial Engineering and Engineering Management*, IEEE: 225–229.

Hinkin, T. R. (1995). "A Review of Scale Development Practices in the Study of Organizations." *Journal of Management*, **21**: 967–988.

Hobbs, J. E. (1996). "A Transaction Cost Approach to Supply Chain Management." *Supply Chain Management: An International Journal*, **1**:15–27.

Hobbs, J. E., Young, L. M. (2000). "Closer Vertical Co-Ordination in Agri-Food Supply Chains: A Conceptual Framework and Some Preliminary Evidence." *Supply Chain Management: An International Journal*, **5**: 131–143.

Houston, M. B., Johnson, S. A. (2000). "Buyer-Supplier Contracts Versus Joint Ventures: Determinants and Consequences of Transaction Structure." *Journal of Marketing Research*, **37**: 1–15.

Jap, S. D., Ganesan, S. (2000). "Control Mechanisms and the Relationship Life Cycle: Implications for Safeguarding Specific Investments and Developing Commitment." *Journal of Marketing Research*, **37**: 227–245.

Jarvis, C. B., Mackenzie, S. B., and Podsakoff, P. M. (2004). "A Critical Review of Construct Indicators and Measurement Model Misspecification in Marketing and Consumer Research." , **30**.

Kim, S. W. (2009). "An Investigation on the Direct and Indirect Effect of Supply Chain Integration on Firm Performance." *International Journal of Production Economics*, **33**: 328–346.

Klein, S., Frazier, G. L., and Roth, V. J. (1990). "A Transaction Cost Analysis Model of Channel Integration in International Markets." *Journal of Marketing Research*, **27**:196–208.

Li, S., Ragu-Nathan, B., Ragu-Nathan, T. S., and Subba Rao, S. (2006). "The Impact of Supply Chain Management Practices on Competitive Advantage and Organizational Performance." *Omega*, **34**: 107–124.

Lumineau, F., Henderson, J. E. (2012). "The Influence of Relational Experience and Contractual Governance on the Negotiation Strategy in Buyer–supplier Disputes." *Journal of Operations Management*, **30**: 382–395.

Monks, R. A. G., Minow, N. (2011). *Corporate Governance*, John Wiley & Sons.

Nunnally, J. C., Bernstein, I. H. (1994). *Psychometric Theory, Edizione 972*.

Oliver, C. (1997). "Sustainable Competitive Advantage: Combining Institutional and Resource-Based Views." *Strategic Management Journal*, **18**: 697–713.

Reynolds, N. (2010). *Factors Influencing Business Relationships in Agri-Food Chains: An Analysis of Selected German Chains in European Comparison*.

Rota, C., Reynolds, N., and Zanasi, C. (2013). "Sustainable Food Supply Chains: The Role of Collaboration and Sustainable Relationships." *International Journal of Business and Social Science*, **4**: 45–53.

Vaus, D. de (2002). *Surveys in Social Research*.

Vermeulen, W. J. V., Seuring, S. (2009). "Sustainability through the Market - The Impacts of Sustainable Supply Chain Management: Introduction." *Sustainable Development*, **17**: 269–273.

Vlajic, J. V., van der Vorst, J. G. A. J., and Haijema, R. (2012). "A Framework for Designing Robust Food Supply Chains." *International Journal of Production Economics*, **137**: 176–189.

Vorst, J. G. A. J. van der, Beulens, A. J. M. (2002). "Identifying Sources of Uncertainty to Generate Supply Chain Redesign Strategies." *International Journal of Physical Distribution & Logistics Management*, **32**: 409–430.

Vurro, C., Russo, A., and Perrini, F. (2010). "Shaping Sustainable Value Chains: Network Determinants of Supply Chain Governance Models." *Journal of Business Ethics*, **90**: 607–621.

Wever, M., Wognum, N., Trienekens, J., and Omta, O. (2010). "Alignment between Chain Quality Management and Chain Governance in EU Pork Supply Chains: A Transaction-Cost-Economics Perspective.." *Meat science*, **84**: 228–37.

Williamson, O. E. (1975). *Markets and Hierarchies*, Free Press.

Williamson, O. E. (1999). *The Mechanisms of Governance*, Oxford University Press, USA.

Yang, C.-L., Lin, S.-P., Chan, Y., and Sheu, C. (2010). "Mediated Effect of Environmental Management on Manufacturing Competitiveness: An Empirical Study." *International Journal of Production Economics*, **123**: 210–220.