Traceability as part of Competitive Strategy in the Fruit Supply Chain

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Abstract

The paper discusses traceability as part of information management in fruit supply chains of Emilia-Romagna, Italy. A review of the rules in use for traceability distinguishes between a proper traceability and a traceability plus (T+), embedded of many value attributes. Elements of competitive strategy, considered in the analysis of fruit supply chains of Emilia-Romagna, try to demonstrate that not only strategic but also operative choices determine the way a single firm or *filière* manages traceability and information issues. Applications of such elements to buyers and sellers selection as well as to competing retailers of the fruit supply chain, verify the hypothesis.

Key words: Traceability, Information management, Fruit supply chain.

JEL classification: L1, Q13

1. Introduction

The adoption of traceability systems in firms of the fruit supply chain, may be referred to the statutory and voluntary law in force or to a more comprehensive idea of traceability, going beyond the law requirements. We call it '*traceability plus*', referring to a non-standardized concept embedded with many other product/brand attributes, included in the processes of selective collection and release of information.

The focus is then shifted to the overall information flow across the supply chain.

The field study interested the fruit supply chain in Emilia-Romagna and was aimed at identifying different supply chain management practices, including information collection and release.

Issues related either to organizational performances or to competitive advantage strategies came into play and were discussed with key informants.

The paper is organized as follows: first, a problem statement related to the legal pluralism conditions on traceability and the general assumption that traceability is able to create value if it goes beyond statutory norms are exposed; then, objectives, methodology and theoretical framework applied are described, and the interpretation of traceability as an information management tool is discussed. Finally, the results of the case-studies analysis and some final comments are presented.

2. Legal pluralism for traceability: a problem statement

A plurality of legal systems refers to traceability issues: statutory law, voluntary standards and contractual agreements, firm strategies. The basic interpretation of traceability derives from the statutory definition, while a number of enhanced versions of traceability, adopted on a voluntary basis and that we may call here *traceability 'plus'* (T+), are put in place and communicated to consumers. Each firm has to put in place the traceability defined by statutory law, at European, national, and regional level (e.g. EC Reg. 178/2002). In addition, there are many T+ implementation models, differently defined through voluntary norms (e.g. ISO 9001:2000, ISO 22000:2005, UNI 10939:2001, UNI 11020:2002, BRC, IFS), and voluntary company standards. Moreover, a firm can enrich traceability with elements beyond contractual agreements or voluntary certification. In Figure 1, a diagram shows the reciprocal integration of such ruling levels.

As minimum requirement of safety control systems required by law, traceability should not be communicated as a firm added value. On the other hand, a traceability system is able to create added value as far as it goes beyond statutory norms.

3. Objectives

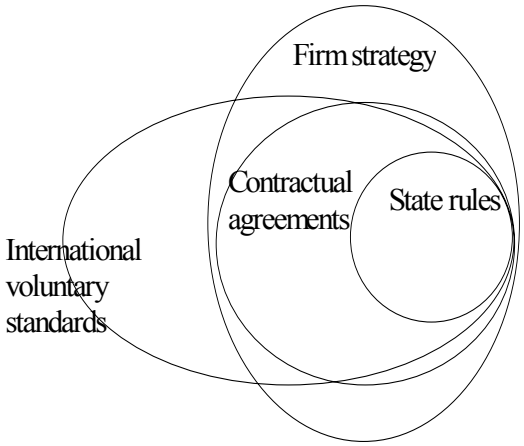
With respect to fruit supply chains in the Emilia-Romagna Region, we hypothesize that the adoption and management of T+ system is part either of the operational or strategic information management, thus being included in the organizational performance or in the competitive strategy of a firm or *filière.*

Moreover, we hypothesize that part of the costs associated to T+, or to supply chain information flows are transaction costs. They are source of many inefficiencies and a better co-ordination between firms could reduce them.

4. Methodology

Semi-structured in-depth interviews have been carried out with 17 key informants. Among them, executives from 4 producers, 6 traders (3 co-operatives, 3 wholesalers), 3 major retailers, 3 small retailers and a catering company, the responsible for traceability standards of a certification agency

Figure 1 Legal pluralism for traceability



Source: adapted from Meinzen-Dick and Pradhan, 2002.

and the manager of a system technology firm were represented. All the interviewees operate at a decision making level. Being the theme: 'supply chain management practices', interview questions were standardized around 6 sub- themes (Dibb et al., 1997). The sub themes were:

1. Information about the firm;
2. Product Management (processing and logistic);
3. Information Management;
4. Purchasing needs versus company capabilities;
5. Co-ordination issues;
6. Compliance with other management systems and voluntary certifications.

As coming from a small sample, all the evidence resulting from the interviews and observations were presented (Yin, 1994) and discussed with reference to literature. Moreover, it has been looked at how different strategies of 3 competing large retailers influence operative decisions about information and traceability management according to the Porter's framework for competitive analysis.

5. Theoretical background

The theoretical background founds on: supply chain management (SCM) practices (Tan et al.,

2002), competitive analysis (Stern and Reve, 1980; Porter, 1980) as well as transaction costs theory (Williamson, 1975; Barzel, 1982).

SCM has been defined to explicitly recognize the strategic nature of coordination between trading partners; in particular, we looked at what were the level of information sharing and the quality of information shared. The level of information sharing refers to the extent to which critical and proprietary information is communicated to one's supply chain partner (Monczka et al., 1998); the significance of information sharing impact on SCM depends on the quality of information shared: what, when, how and with whom it is shared (Holmberg, 2000).

Various theories offer insights on specific aspects or perspectives of SCM, such as industrial organization and associated transaction cost analysis. Here we refer either to industrial relations, through the Porter's framework for buyers and sellers analysis, considering the purchasing needs versus company capabilities, or to transaction cost analysis, in particular to the so called *ex-post* transaction costs including coordination and control issues (Cheung, 1987).

Shared information can vary from strategic to tactical in nature and from information about logistics activities to general market and customer information (Mentzer et al. 2000). Selective release of information about itself is a crucial point the firm has to consider either to communicate commitment, to promote new products or to disclose plans or intentions (Porter, 1980, p. 107). Such information selection including the T+ management is not only part of tactical decisions but is included in the competitive strategy of a firm.

As sharing data with other parties within the supply chain can be a source of competitive advantage (Tompkins and Ang, 1999), so inaccurate or delayed information cause dysfunctions, as information moves along the supply chain (Mason-Jones, 1997). Divergent interests and opportunistic behavior and informational asymmetries across supply chain affect the quality of information (Feldmann and Müller, 2003). Information disclosure is perceived as a loss of power, thus organizations are reluctant to give more than minimal information (Berry et al., 1994). Ensuring the quality of the shared information becomes a critical aspect of effective SCM

(Feldmann and Müller, 2003).

6. Discussion of findings: 3 sub *filière* identification

The results of interviews and observation were elaborated according to the sub-themes matrix. As result of the matrix as a whole, three fruit supply chains have been differentiated looking at the operators involved, the actors driving transactions, the management of information, the firm underlying strategy. The supply chain we called **"producer driven"** sees at its end small retailers selecting their suppliers on the basis of the price set at the wholesale fruit market. The supply chain we called **"large retailer driven"** entails large retailers setting the supply chain standards. The **"ho.re.ca driven"** supply chain includes, as driving actors, hotel, restaurants and catering companies.

The research findings pointed out a possible categorization of information produced and shared across the supply chain.

6.1 Traceability as information management

The interviews findings showed that the choices regarding which information to include in the traceability system, and which resources and tools to invest for such a system management, are based on several elements. Internal factors (related to the firm mission, to structural, technological and balance constraints), the type of operators involved and their linkages to each other, as well as macro-environmental characteristics (legislation, competitive environment), influence the selection and processing of information. The resulting information flows obey to specific requirements and objectives (Figure 2).

Economic constraints. The investments are essential to manage highly diversified requirements and non standardized techniques for information transfer.

Technological limits are strictly dependent on economic constraints; technology as well as collecting information about available and suitable technologies, is costly to the firm.

Most of the information managed has to comply with **legislation constraints**.

Asking and transferring information are strictly connected to the **firm strategies** and mission.

Traceability will consequently bear different connotations, functional to the kind of message a firm desires to communicate to its target.

Staff motivation and training is considered as strategic since traceability is often regarded as a further burden of costs and work to producers.

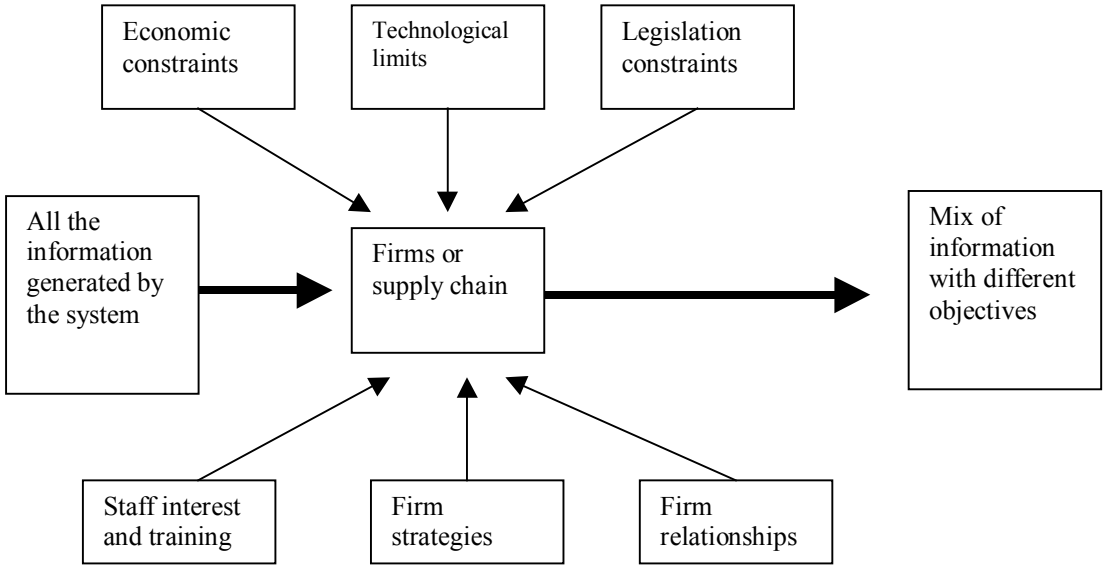
Co-ordination forms, their complexity and the **firm** willingness to create long run **relationships** with other actors of the chain, heavily affect the opportunities to collect and manage information.

Due to the above-mentioned constraints and factors, every firm or supply chain has to define which strategies drive its activity and which kind of good or service it is going to provide to the market. Any supply is identifiable as a group of attributes/values, satisfying certain customers' needs (Maslow, 1943; Gutman, 1982; Lambin, 2004 p.82). Information and the capability to manage or communicate it, is part of a firm supply. Traceability assumes different "values" depending on the information it transfers. A possible classification of information is following.

"Strategic" information is a mix of information created to highlight, implement and communicate the firm mission. Strategic information can include:

- product quality information**,** the most complex and heterogeneous information mix that includes

Figure 2 Constraints and factors affecting the information to be traced



Source: authors' elaboration

the specific quality concept chosen by the firm or supply chain but relates also to nutritional value, modes of production, uniqueness of the product;

- "accessory" information, increasing the service level provided by the firm and generating value to the client. This information may not be essential but it differentiates a firm from another, a supply chain from another;
- ethical (social or environmental) information, considered when a firm prefers to emphasize its driving "strategy" more than a product or service characteristics. Often, this group of information is communicated as compliance with voluntary norms (e.g. SA 8000, EMAS, ISO 14001).

"Operational" information. The firm may choose to manage only the information useful to allow its existence or to create a more effective and clear relationship between operators in the supply chain. It would include:

- compulsory information, required by law. This group of information should not create any added value to clients. However, enriching the compulsory information with additional elements, the consumer who may not know law prescriptions, may perceive such elements as value adding;
- hygienic-sanitary safety information is required either to comply with statutory law or to communicate a particular attention to sanitary aspects. Compulsory standards can be taken 'as is' or set stricter.

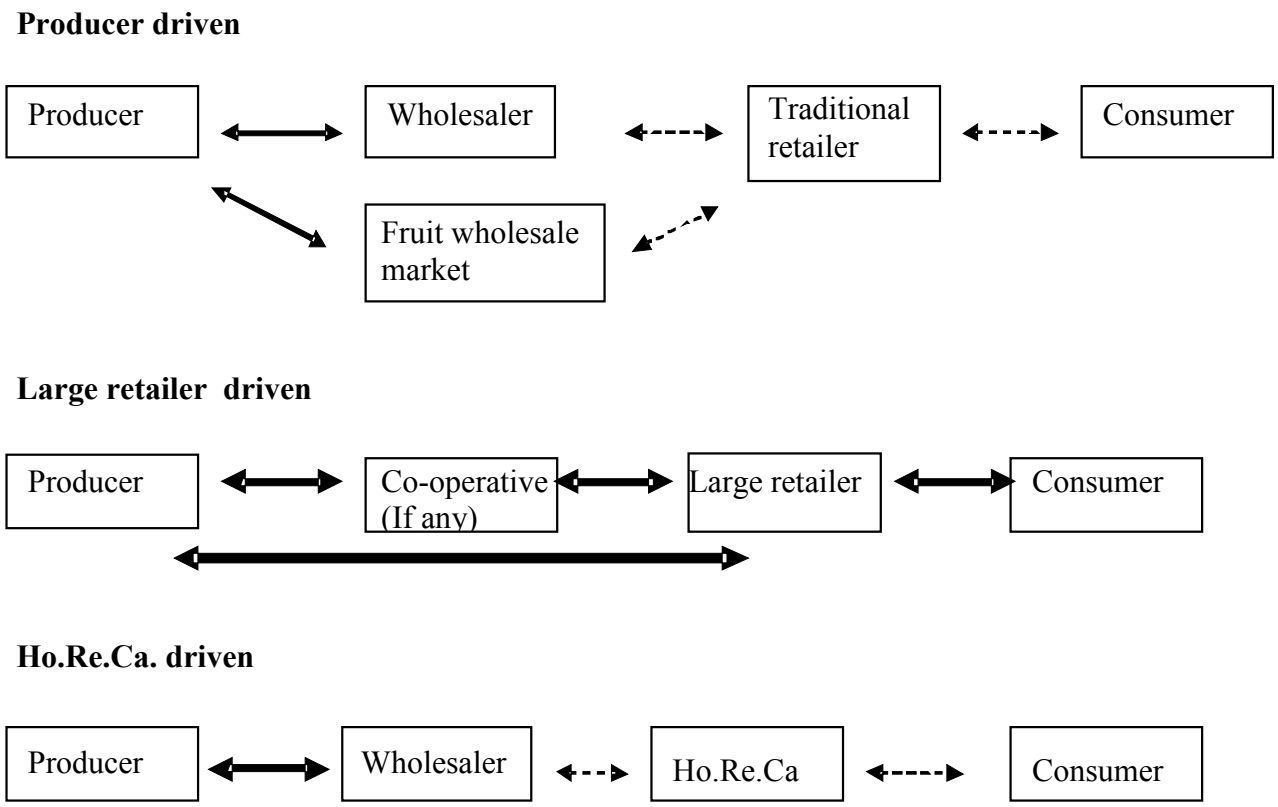
6.2 Information management in the three sub filière

Influences and linkages in the information management trough the three sub *filière* have been described in figure 3. Bold arrows indicate a strong influence and linkage in the information management, while hatching arrows indicate weaker influence and linkage.

Producer driven: the sub *filière* directed to traditional retailers is characterized by no further collection nor transfer of information than that required by law. At date, farmers have to record chemical treatments and fuel consumption on a 'farm notebook', however such a detailed information is not required along the supply chain.

Large retailer driven: suppliers of large retailers comply with contractual arrangements that

Figure 3 Supply chain and information transfer



Source: authors' elaboration

include strict quality standards, time of delivery, field and laboratory analysis, etc. Retailers keep and manage all information provided by suppliers exploiting products differentiation, and communicating commercial images not always related to characteristics of the physical product or the production process. They filter information and lead consumers to trust the retailer itself and its private label.

Ho.Re.Ca. driven: information about traceability is selected by producers and wholesalers; it remains to the supplier who ensures the fulfillment of the company purchasing needs. Essential information is available, rarely beyond the law compliance.

6.3 Purchasing needs versus *company capabilities (uncertainties in choosing the right supplier or client)*

The matching of buyers' purchasing needs with the company capability to fulfill them, is essential to the transaction: the more a firm reach a product specificity, according to its buyer's needs, the

more it will be favored among competitors (Porter, 1980). Such a specialisation implies also specific investments, then sunk costs as well as barriers to entry and exit.

Producer driven: the matching of buyers' purchasing needs happens through the market and the choice of the product is made from time to time.

Ho.Re.Ca. driven: these actors at the retailing stage ask for good looking products at a reasonable price. Product customization or modification happens at the Ho.Re.Ca. level, and the importance of the produce to the buyer's final product relates to the product availability more than to its characteristics. In case of scarcity, the cost for getting the product at the right time can be high.

Large Retailer driven: the survey showed that large retailers select suppliers on the basis of their capabilities to satisfy requirements. At date, capable fruit suppliers are few. In the surveyed fruit supply chain, it has been observed that large producers and co-operatives consider large retailers as good buyers due to the large amount of produce purchased with respect to seller total sales, the steadiness of order flow for purposes of planning and logistics, and reliable (even if late) payments. Retailers behave opportunistically: no extra remuneration is agreed to producers for their high standard.

6.4 Product management

Producer driven: at the picking stage, the production unit is identified with pallets or bins connected to the producer's name or ID-code. Wholesalers either independently or through the wholesale market, collect the product and provide it to small retailers.

Ho.Re.Ca. driven: Ho.Re.Ca. is served through wholesalers and a certain steadiness of order flow is guaranteed.

Large Retailer driven: at the level of wholesalers or co-operatives (refrigeration, processing, storage), pre-calibration and selection stages cause the splitting and the mixing up of original lots and the creation of new ones. Finally, any package and pallet is identified by its ID-code, date and time of processing. The survey revealed that retailers may decide to send back produce to suppliers notifying it as 'non conform' and putting the burden of shipping and re-customization costs on

suppliers. Similarly, the producer may resend the refused product to the same client at the following delivery. These are cases of inefficiencies.

6.5 Transaction costs/Cost of servicing

Transaction costs include: order size, direct selling versus selling through distributors, required lead time, steadiness of order flow for purposes of planning and logistics, shipping costs, selling cost, need for customization or modification.

Producer driven: the level of shopping, transaction or negotiating costs is normally the same at every order and would increase in case of switching from a supplier to another. There is no steadiness of order flow, thus planning and logistics are very difficult. The need for product customization is negligible.

Ho.Re.Ca. driven: the Ho.Re.Ca. companies propensity to exert bargaining power is not much in demanding low prices as in the threat they pose to backward integration. Indeed, the Ho.Re.Ca. companies are trying to reduce their transaction costs by increasing the number of own distribution centers, thus substituting the wholesalers.

Large retailer driven: while the volume of product purchased is generally high, it may not be reached through few orders but through many operations, which generate contractual and shipping costs. Complying with the parameter requested by retailers brings further costs to suppliers (managing more information than required by statutory law; using lab-instruments, training production operators, monitoring their activity).

6.6 Co-ordination issues

Through the different stages of the fruit supply chain, control costs are born by different operators to solve uncertainties. The co-operative or warehouse technical staff control the produce quality, either in the field or at the warehouse. Retailers receive goods and carry out several controls to verify the correspondence to the contractual agreements. Different retailers controlling the same produce category in different ways, create a relevant source of inefficiencies in the system as a whole. Costs include physical samples, laboratories of analysis, transportation, the return of unsold

produce, labor cost, instruments. Such costs, are due to two main factors:

1) distrust of information transferred and of controlling operations;
2) lack of co-ordination between retailers.

Vertical co-ordination offers several incentives, many of which related to transaction cost reduction. In the fruit supply chain, co-ordination forms are subject to limits imposed by the asset characteristics. Particularly, *uncertainties about the availability of the good and its quality*, is too risky for vertical co-ordination but stimulate horizontal integration. However, the physical concentration of bulk quantities of non-homogeneous product does not imply their standardization.

Ward (1997) emphasises that co-ordinating with lower stages of the supply chain ensures access to market information and allows to better plan the supply; whilst co-ordinating with higher stages of the supply chain allows to influence the supply side to own specific needs. Barzel (1982) highlights how convenient is monitoring during production the quality and sanitary attributes of produce, thus reducing measurement and valuation costs at the time of purchasing it.

Farmers and co-operative managers interviewed agree that co-ordination brings to suppliers greater opportunities to sell their products (Hayenga, 1996), allows a better risk and investment management thanks to the attribution of single-step responsibilities.

As seen in the fruit supply chain, problematic to vertical integration is the combination of different stages from the production to the distribution, which include a wide range of operations among which there could be inefficiently operating ones (Buzzel, 1983). Obviously, external co-ordination, cannot reduce internal inefficiencies of a single firm.

7. Competitive leverages of three "Retailer driven" supply chains

The differences noted between large retailers during the interviews justify a stronger interest towards their internal strategy. The specificity of information collection and release by three different retailers have been looked at under the light of competitive strategy.

The three major Italian retailers have been interviewed. They differ for the managerial structure: a Consumers' Co-operative, a Small retailers consortium and a sole corporation. Elements to analyze

these three competitors include: their current strategy, their capabilities due to their structure, their assumptions about themselves, focusing on the control stages, and future goals.

The most strongly influential issues over traceability have been discussed, and are presented

Table 1. Comparison of current strategies among the large retail-driven case studies

Consumers Co-Operative	*Small Retailers Consortium*	*Retail Sole Corporation*
Particular attention to associates and their participation to choices. Private label strategy. Diversification strategy on the basis of price and quality control. Social accountability.	Small retailers associated to provide a better service. Price and number of references strategy. Presence of private label.	High quality of product and service, accountability to client. Strong emphasis on the private label for fresh fruit (100% of product).

Source: authors' elaboration

Table 2. Comparison of capabilities among the large retail-driven case studies

Consumers Co-Operative	*Small Retailers Consortium*	*Retail Sole Corporation*
a Capabilities: Number and Type of Fruit Suppliers		
High number of suppliers (farmers and co-ops). Centralized contract. Direct orders by hypermarkets. Many single orders.	High number of suppliers (farmers, co-ops, wholesalers, traders) selected on the basis of standardized supply. Centralized contract. Many single orders.	Low number of suppliers (Large producers or wholesalers). Only centralized purchase. A good timing and logistic management is required.
b Capabilities: Product Management		
Common platforms. First in – first out.	Common platforms. First in – first out.	Total product management through the firm warehouse (full-empty). The private label product is packaged at the point of sale.
c Capabilities: Information Management And The Scope For Traceability		
For the private label product: high quality standards and high number of controls. For other brands: few controls. Lot management up to the Distribution Center. The supplier has to keep information beyond the law level. The co-op feels responsible to consumers. Papery and computer support.	Broad contractual agreements signed up between suppliers and the consortium. Not very strict parameters due to the diversified internal structure of the consortium associates. For the private label product, information about the supply chain is required. Papery and computer support.	Information required to suppliers coded depending on the product characteristics (e.g. organic vs conventional). Just compliance with law required to suppliers. Traceability is possible up to the corporation storehouse, where the lots are mixed up. Information managed through IT system.

Source: authors' elaboration

synoptically in Tables 1-3.

As general result, it was pointed out that the introduction of legislation on traceability changed very little: structural and logistic characteristics of the corporation determine the supplier selection, the product management and the information management. Strategic goals influence again the information management, the level of control tests as well as the communication to clients.

8. Conclusions

Although the adoption of a traceability system is compulsory, many sort of 'T+' have been identified as dependent upon the information flow across the supply chain.

The field study interested the fruit supply chain in Emilia-Romagna and was aimed at identifying different strategic approaches within it. As result of the field research, three sub-*filière* were distinguished, characterized by: different operators; information management; purchasing needs versus company capability (staying for level of servicing and compliance to contractual agreements); transaction cost, and opportunities for co-ordination. According to the interviewees opinion, and information is an asset, information flow is shaped by the conditions constraining its

Table 3. Comparison of assumptions among the large retail-driven case studies

Consumers Co-Operative	***Small Retailers Consortium***	***Retail Sole Corporation***
a Assumptions (Held about itself and the Industry):Voluntary Certification – Control Tests		
Suppliers voluntary certifications is required or, at least, valued. Relations regulated through contractual agreements. Safety as a pre-requisite. Product analysis and control in several phases (harvesting, storage, processing, retailing).	Difficulties for product and information standardization.	Lack of interest towards external audit. The corporation considers itself as sufficient to satisfy all the clients' needs. The product is analyzed and customized at the retailing stage.
b Assumptions (Held about itself and the Industry): Communication (Able to create Added Value)		
To increase trust in the firm strategy, complete and clear information about controls and suppliers is communicated.	Little information to consumer. Higher required trust in the brand and the *filière* is required.	Little information to consumer, emphasis on quality and the production technique. Trust in the brand from which the total value derives is required.

Source: authors' elaboration

collection and its capability to create value according to firm organizational and strategic focuses. It was pointed out that scarce co-ordination generates transaction costs and resource wastage, in particular at the control stages.

Although through a small sample, and the adoption of a qualitative approach, both the hypotheses of the research seem to be supported by the analysis: traceability is part of information management which is included either in logistic or strategic issues; transaction costs arise and there is scope for co-ordination across the supply chains.

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