Merging netchain and social network: Introducing the ‘social netchain’ concept as an analytical framework in the agribusiness sector

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Along fifty years of study in the agribusiness field a wide range of analytical frameworks have been used: chains, supply chains, networks, and recently, netchains. All of those frameworks are centered in a product, a firm or an organization as main subjects of analysis. In a parallel way, in the sociological field especially, the Social Network Theory emerged and was substantially developed, taking into account the individuals and their interpersonal relationships as its main subjects of analysis. At the same time, in economics and organizational sciences, the discussions about transaction costs, structures and mechanisms of governance were intense. In part, these discussions revolved around the possibility of using trust as a mechanism of governance. This paper proposes that to better understand the trust as a mechanism of governance, individuals and their interpersonal relationships should be the central subject of analysis. Based on this assumption, the paper aims to introduce the concept of ‘Social Netchain’ as an agribusiness analytical framework and argues about its implications on trust as a mechanism of governance. ‘Social Netchain’ is defined in the paper as a set of interpersonal relationships networks comprised of horizontal ties between individuals of the firms or organizations within a particular agribusiness sector. These horizontal ties are sequentially arranged based on the vertical ties between individuals of the firms or organizations in different layers of that agribusiness sector. An application essay is presented and its managerial and political implications are discussed. We conclude that Social Netchain can be applied to better understand the trust-based relationship as a mechanism of governance into the agribusiness structures.

Key words: Social netchain, transaction costs, mechanisms of governance, governance structures, trust, individuals, contracts.

INTRODUCTION

In the last fifty years - since the term ‘agribusiness’ was first used and the Commodity System Approach was first developed - different frameworks to analyze the agribusiness sector have been developed. Chains, Supply Chains, Networks and Netchains have been established as widely used concepts. The development of these concepts has (in part) been related to advances in technological, communication and market structure. However, all these concepts and frameworks are similar in their central feature, the definitions of relationships throughout the actors are defined by a specific product and the actors are represented by firms individually or by a group of them. At the same time and in a parallel way, in the field of sociological science, a new theory has appeared and has consistently been developed: the Social Network Theory. Over the years, this sociological theory has received fundamental support of mathematical and computational sciences. This has led to the construction of a solid and structured framework to analyze social networks and relationships. What sets the Social Network Theory apart from the earlier mentioned frameworks, which

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are used to analyze relationships within the agribusiness sector, is that the theory has the linkages between individuals as a central feature.

There are at least three reasons to believe that the individuals should be a relevant subject of analysis in the agribusiness sector. First, the individual - as a subject of analysis - is a central feature in quite a few theories about firm and organizations, as in the earliest concept of firm as it was defined by Alfred Marshall (1925), or in the entrepreneur role in introducing new ideas whose results are new economic cycles as in the Schumpeterian ideas (Schumpeter, 1939), or the individuals importance as a manager to promote the firm’s growth as stated in Penrose (1959). Second, the individuals are the decision-makers in any firm (Cyert and March, 1955), what leads us to assume that he/she is responsible for decisions about the product flow throughout any structure of marketing in agribusiness. Third, and most important, the evolution of the theory of Transaction Cost Economics from Williamson (1975; 1985) has led to new insights in the role of individuals in trust based mechanisms of governance (Hansen, 1992; Lorenz, 1999; Wilson, 2000). Taking into account, at first, the relevance of individuals in carrying out managerial and trust based relational aspects throughout the agribusiness structures, and the fact the available analytical frameworks are based on products or firms, it comes out the main research question to be answered in this paper: can Social Network Theory contribute to the development of an agribusiness analytical framework based on individuals relationships which could be used to better understand the trust as a mechanism of governance? The main objective of this paper is to introduce the concept of ‘Social Netchain’ as an agribusiness analytical framework and discuss its implications in trust as a mechanism of governance.

To achieve this objective, the paper discusses, several concepts of analytical frameworks currently used to analyze the agribusiness sector, namely: chains, supply chains, networks and netchains. The paper highlights the main aspects of Social Network Theory. Special attention is given to interpersonal relationships, in particular, and interpersonal relationships are linked to Transaction Cost Theory, governance structures and trust. In that context, trust is seen as a mechanism of governance. The concept of ‘Social Netchain’ is presented and an example based on how the ‘Social Netchain’ concept can be applied is given, followed by its managerial and political implications on trust as a mechanism of governance is presented. Finally some conclusions, limitations and suggestions for future studies are pointed out.

ANALYZING THE AGRIBUSINESS SECTOR: CHAINS, SUPPLY CHAINS, NETWORKS AND NETCHAINs

In the last decades, different analytical frameworks were developed as a way to study and improve the understanding of the Agribusiness sector. In this section, the main concepts of these frameworks are shortly discussed. In particular, the relevant role and attention given to agricultural products (or commodities) and to the firms (or organizations) in these frameworks are discussed. The initial findings within agribusiness studies can be attributed to Davis and Goldberg in their work in 1957. Besides introducing the term ‘agribusiness’, they also built an analytical framework applied to analyze some of the main North-American agricultural commodities. Through the Commodity System Approach - CSA, it was possible to identify, not only the flow of a specific agricultural commodity throughout all the actors (starting from the earlier suppliers to the final consumers) but also the relative share of each actor in the generated added value amount. According to Goldberg (1968), ‘an agribusiness commodity system encompasses all the participants involved in the production, processing, and marketing of a single farm product’. It is important to consider that although the author mentions ‘all the participants’ in his work, the individuals are not identified, either as economic sectors, or as enterprises. Another relevant aspect is the term ‘farm production’ as mainstream of the process. The flowchart is defined by a specific agricultural product.

From the French School emerged the concept of filière or chain. That concept is attributed to Louis Malassis and was associated to the product flow across different production sectors. Malassis divided the production chain into four sub-sectors: inputs suppliers, agriculture, industries of transformation and consumers (Labonne, 1985). According to Montigaud (1991), a filière or chain is defined by those production activities strictly linked to each other in a vertical way, having, thereby, as a common point, the same product. Once more, the analytical framework is defined from a product and the relations are among firms. Rainelli (1991) presents four roles of filière or chains, all of them related to a product, firm or industrial sector. With the globalization process and the advances in communication technologies, a new concept has emerged: Supply Chain. In the Supply Chain Council concept a supply chain encompasses every effort involved in producing and delivering a final product from the supplier’s supplier to the customer’s customer. As it is defined by Stevens (1989), ‘a supply chain is a system whose constituent parts include material suppliers, production facilities, distribution services and customers, linked together via the feed-forward flow of materials and the feedback flow of information and financial capital’. According to Christopher (1992), ‘a supply chain is a network of organizations that are involved through upstream and downstream linkages in different processes and activities that produce value in the form of products and services in the hands of the ultimate consumer’. Lambert et al. (1998) designed a widely used typical supply chain framework, showing that the central point in a supply chain is marked by a ‘focal company’ and from that the linkages backwardsly with suppliers, and
forward, with consumers. In all concepts or frameworks, the product, firms or organizations are the central subject. The concept of networks started to be studied in the sociological field. In that science a proper definition of a network was given by Wasserman and Faust (1994): ‘a finite set or sets of actors and the relation or relations defined on them’. Later, the scholars in economics and strategy started to use the concept of network to analyze industrial sectors trying to explain organizations and their performance. Using the network analysis, it is possible to access different tools to map the structure of inter-organizational relationships. At the same time that network structure constrains the firms’ actions, it is also defined by it (Granovetter, 1973; Powell, 1990; Nohria, 1992). According to Powell (1990), the focus of network analysis is not the vertical ties, but, for sure, the horizontal relationships among firms in a particular industry or group of firms. The network concept that emerged in the field of sociology science analyzes interpersonal relationships. It has been mainly used in the economic and organizational sciences to study firms and organization. The analytical frameworks previously presented were designed to analyze vertical (CSA, Chain, Supply Chain) or horizontal linkages (Network) among firms or organizations. Lazzerini et al. (2001) used the concepts of Supply Chain and network to develop the Netchain concept in which they integrate both vertical and horizontal linkages in a single analytical framework.

According to the authors’ definition, ‘a netchain is a set of networks comprised of horizontal ties between firms within a particular industry or group, which are sequentially arranged based on vertical ties between firms in different layers’. Despite the relevant contributions of this hybrid concept, its main unit of analysis is still the relationship between firms, and not individuals. Based on the concepts presented that have linkages between products, firms and organizations as central elements in their analysis, we can ask: what is the individuals’ role in those analytical frameworks? In our perception, the Social Network Theory can contribute in developing an analytical framework based on individuals and interpersonal relationships, which can contribute in designing and managing agribusiness structures and better understanding trust as a mechanism of governance.

SOCIAL NETWORK THEORY

The roots of modern social networks analysis lies on the anthropologist Radcliffe-Brown’s work developed in 1930s (Scott, 2000). In the 1970s, the volume of studies and publications increased, not only in the anthropologic field, but also in other sciences, such as: Sociology, Human Geography, Economics, Biology, Social Psychology, Communications and Political Sciences (Freeman et al., 1978). In the 1990s, with the improvement improvement in the quantitative models and methods to analyze social networks, a new boom of publications took place (Wasserman et al., 2005).

As it was defined by Nooy et al. (2005), ‘Social Networks analysis focuses on ties among, for example, people, groups of people, organizations, and countries’. According to some authors, the individual is not the basic social unit, but social atoms consisting of an individual and his or her social, economic, or cultural ties. The ties can represent friendship, buyer-seller relations, contracts, certifications, cooperation, and so on (Wasserman and Faust, 1994; Nooy et al., 2005). The versatility of Social Network Theory makes it possible to analyze the relationships with different lens, from a macro-level (countries, organizations, firms) to a micro-level (people, individuals). That characteristic is particularly interesting in our study as it proposes, as its main objective, an agribusiness analytical framework based on the analysis of the interpersonal relationship. Although, Social Network is widely studied, and it is a well structured theory, we will focus just on the fundamental aspects of the theory, in particular, those related to the social network structure. Those aspects are relevant because our proposal uses the social network and netchain as a hybrid concept of analytical framework in the agribusiness sector. Wasserman and Faust (1994) highlighted the four most important points to be observed in a structural analysis of a social network:

1. The actors (people, groups, firms, organizations, countries) and their actions are seen as an interdependent instead of independent or autonomous units;
2. The linkages are channels through which the transference or resources flow (materials, tangible or intangible goods) occurs;
3. That models of networks focused on individuals perceive the network structure as a source of opportunities and/or restrictions for individual actions;
4. That network models conceptualize the structure (social, economical, political, and so on) as patterns of relationship among actors.

Furthermore, in a network, the unit of analysis is not just the actors, but also the linkages among groups of actors. The network can be analyzed in different levels: from a single dyadic tie to a network as whole. To support network-analysis, Wasserman and Faust (1994) proposed some fundamental definition about the main terms and components of a network:

**Linkage:** there are different kinds of linkages, varying according to the study purpose;

**Relation:** whole linkages of a specific kind among members of a same group. Those linkages are present only among specific pairs of actors;

**Subgroups:** any set of actors and its linkages with agents are a subgroup. The methods and techniques to
locate these subgroups in social networks have received a special attention in the social network field;

**Groups:** a group is a set of all the actors whose linkages will be measured. It is a finite set of actors that due to conceptual, theoretical or empirical reasons are studied as a finite set of individuals and in which the network measures will be applied. To define the finite set of actors is an analytical requisite, once it is almost impossible to analyze a set of infinite actors;

**Social network:** a finite set of actors and its linkages characterizes a social network.

Once the theory is mainly based on the sociological field, Social Network Theory didn’t have quantitative tools that could better explain the relationships the position and individuals’ role in a network. Freeman (1979) was one of the first authors to express social network relationship in a mathematical way, introducing the concept of centrality and the mathematical expression to obtain its value. The importance of measuring social networks in a quantitative way has increased and several alternative measures have appeared. A specific field of study called ‘sociometry’ emerged and, nowadays there are different indicators which may be used to better understand and explain the social network structure as well as identify the role of each individual in the network.

The most usual set of indexes to measure the social network structure is that related to the identification of the visibility of a specific actor or group of actors in the network, which are well known in the literature as ‘importance’ or ‘prominence’. As it was defined by Wasserman and Faust (1994), an actor will be prominent if his/her ties make he/she particularly visible to other actors in the network. The prominence of a specific actor or a group can be measured by two classes: centrality and prestige. The centrality of an actor ‘a’ will be high if he/she is widely involved in many ties. In a non-directional relation, it is not relevant if the actor ‘a’ is a sender or a receiver, but only his/her involvement in the network. The prestige takes into account the distinction between ties sent and ties received. Then, an actor ‘a’ will be a prestigious actor if he/she is the recipient of extensive ties. The main indexes to measure centrality and prestige are:

**Degree:** The degree of a specific actor explains the intensity of interaction with other network’ actors, reflecting, in some way, the capacity of those actors’ communication. An actor with a higher value for the centrality degree can be seen as the network coordinator.

**Closeness:** The closeness index is based on the distance among actors. If an actor is close to other actors and is in a central position, he or she can interact fast.

**Betweenness:** An actor with a high betweenness value can be a key actor in the network, especially for those actors not directly linked and who need a broker to intermediate the relationship. An actor with a high betweenness is important in the information transference among actors of that network;

**Power:** the power value is based on a centrality measure for every vertex, and gives an overall network centralization index for this centrality measure.

**Influence:** the influence measure is based on the possible steps of a given length among all pairs of nodes or actors. It is assumed that long steps contribute less in terms of influence.

**Information:** Measures the information centrality for each vertex, and gives an overall network information centralization index (Freeman, 1979; Wasserman and Faust, 1994; Borgatti et al., 2002).

Besides these indexes to measure the centrality, Borgatti et al. (2002) present a wider range of indexes to analyze social networks properties and ego networks, which is the particular network of a specific actor. The study will only present some of them.

**Density:** The density of a binary network is the total number of ties divided by the total number of possible ties. For a valued network, it is the total of all values divided by the number of possible ties. In this case, the density gives the average value.

**Transitivity:** It is related to the density of transitive triples in a network. Three vertices ‘u’, ‘v’, ‘w’ taken from a directed graph are transitive if, whenever vertex ‘u’ is connected to vertex ‘v’ and vertex ‘v’ is connected to vertex ‘w’ then vertex ‘u’ is connected to vertex ‘w’. The density of transitive triples is the number of triples which are transitive divided by the number of paths of length 2.

**Density of ego networks:** Constructs the ego network for every actor within the network and computes a collection of ego network measures.

**Structural holes:** Computes several measures of structural holes. The measures are computed for all nodes in the network, treating each one, in turn, as ego.

**Brokerage:** brokerage occurs when, in a triad of nodes A, B and C, A has a tie to B, and B has a tie to C, but A has no tie to C, that is, A needs B to reach C, and B is therefore, a broker. When A, B, and C belong to different groups, 5 kinds of brokerage are possible: coordinator, consultant, gatekeeper, representative or liaison.

Despite the complexity of relationships, and the quantity
of actors presented in a social network, the contributions of computational science have made the analysis of networks easier and interesting. Nowadays, different computational softwares to design the social network structure and calculate its indicators are available. As a result, it is possible to identify the position of each individual in a social network, not only in a form of figure, but also in quantitative indicators. Nooy et al. (2005) explain in details the importance of software packages and the use of specific software to study social networks. Comparing Social Network Theory with the previous and widely used analytical frameworks to study the agribusiness sector, a substantial difference is clear: whereas chains, supply chains, networks and netchains focus on products, firms and organizations, the social network (although, it is also applicable to analyze firms, organizations, countries, and so on) makes it possible to take the individuals as a central subject of analysis. This is an interesting finding which can contribute to the study and understanding of transaction costs, governance, individuals, and trust in the agribusiness sector.

TRANSACTION COSTS, GOVERNANCE STRUCTURES, TRUST, AND INDIVIDUALS

Transaction Costs Theory has been discussed in economics for a long time in such way that its concepts are already consolidated. As it is well known, the transaction costs contribute to explain the choice of governance structure. Even though, more traditional mechanisms of governance (which can vary from market to hierarchical organization of the firms or to a hybrid form) are not free of transaction costs. Recently, theories on mechanisms of governance based on trust have emerged as a way to improve quality and reduce costs in transaction among firms and organizations. In this section, we will discuss these concepts shortly, with special focus on the individuals’ role in the improvement of trust-based relationships.

In the classical Economics theory, the actors in the market were responsible for maximizing the use of limited resources through an efficient allocation via price mechanism. When Coase (1937) tried to answer ‘why does a firm emerge?’ he discovered that a firm exists because, in certain cases, it is a more efficient means of resource allocation than the price mechanism in terms of marketing costs. For instance, marketing costs include the costs related to discovering the relative prices, selecting and using information, and doing contractual arrangements. The transaction cost concept was asleep until 1970s, when Williamson (1973, 1975) retook it from his Markets and Hierarchies studies. In his work, Williamson (1973, 1975, 1985) argues why market is not the only and the better governance structure. In his opinion, human and transactional factors are very different in real world when compared to the dominant perspectives in the Classical economics theory. The two main human factors are: first, the ‘bounded rationality’, that is, individuals does not have the capacity to process all the information needed for rational decision-making; second, the opportunistic behaviour of the agents. ‘Opportunism’ would need different coordination mechanisms than just prices. On the other hand, the transactional factors include: ‘uncertainty’ about the market and mainly about the agents behavior; ‘small number’ or low frequency of transactions between a specific pair of agents; and, the ‘assets specificity’ would require other governance mechanisms to safeguard the firm’s investment.

Based on these factors and statements, Williamson (1975, 1985) argues that there are three governance structures and for each of them a specific mechanism of governance. At first, the classical economics view, where the ‘market’ is the structure and ‘price’ is the main mechanism of governance. Second, ‘Hierarchies’, which occur when a firm decides to incorporate activities in a forward and/or backward position, known as vertical integration, and then uses ‘authority’ as a mechanism of governance; and, third, ‘hybrid forms’ such as alliances, networks, joint ventures, franchising, and so on, which use ‘contracts’ as the main mechanism of governance. Therefore, contracts are the very first step of any successful stable cooperative agreement, since they can ‘infuse order, (…) mitigate conflict and realize mutual gains’ (Williamson, 2003:921). According to Chiles and McMacking (1996), in the face of opportunism, contracts have to be laden with safeguards that are designed to protect each party from the opportunistic behavior of the other. Such safeguards are costly and include costs associated with negotiating, drafting and monitoring contracts. In the paper context, especially interesting it is the concept of relational contracts established between two or more individuals, which are the structures where ‘trust is the principle mode of social control’ (Ring and Van de Ven, 1992:491). In spite of Williamson’s typologies, the central problem was not solved: although, the transaction costs can be reduced by those structures and mechanisms of governance, the transaction costs persist, and, probably, it will always exist. But the question is: are there other efficient structures and/or mechanisms of governance in terms of reducing transaction costs? When we look at the structures side, the ‘organizational networks’ forms are being deeply studied and understood, like Thorelli’s (1986) and Powell’s (1990) works. Recently, the new concept of ‘bazaar governance’ was proposed by Demil and Lecocq (2005) based on a study about open licenses in the software industry. On the other hand, when we look for new mechanisms of governance, ‘trust’ is being highlighted as an important way to improve performance and reduce transaction costs. For contractual relations infused with trust, the risk of opportunism is attenuated, thus, reducing the elaborateness and costs associated with contractual safeguards. Trust decreases negotiating
costs by fostering a game-type approach negotiations in which actors are cooperative and quick to come to a resolution rather than a tactical-type approach in which actors are cautious and slow to come to a resolution (March, 1988). Following Chiles and McMackin (1996), trust decreases drafting costs by allowing contracts to be specified more loosely with the expectation that any ex-ante gaps in the contract will be dealt with ex-post in a fair manner. Trust decreases monitoring costs as a result of each party's confidence in other's performance even though short-term incentives may favor opportunism. Trust also decreases the costs associated with more complex safeguards such as bonding, and, as noted previously, a party's reputation for trustworthiness decreases the costs of finding an exchange partner. For the fact that the costs associated with contractual safeguards and searches are, in fact, transaction costs, trust economizes transaction costs.

Bradach and Eccles (1989) confirm that trust is a mechanism of governance, especially used in the relations between firms. Lots of studies that support Bradach and Eccles' view are available, like, for instance, Chiles and McMackin (1996), Nooteboom and Berger (1997), and Dyer and Chu (2003). Adler (2001) presents three structures and mechanism of governance, the first two, market/price and hierarchy/authority, are the same as outlined in Williamson's work, but the third is new: community/trust, corroborating that trust can be used as a mechanism of governance. Although, the trust relations construction process among organizations are costly, delayed and complex, its results, for producing strong incentives and developing trustworthiness indicate that the trust present in the relations between firms operates as a mechanism of governance that attenuates opportunism in the transactions, as it is proved by the Bradach and Eccles (1989) and Heide (1994) studies. In accordance with authors, as Lewicki and Bunker (1996) and Sitkin and Stickel (1996), the trust is perceived as crucial for the functioning of the new forms of organization based less on hierarchy and more on lateral relationship. In this context, two main questions need to be answered: first, what is trust? And, second: is trust based on inter-firm/organization relationships or on interpersonal relationships? Answering the first question, the only agreement within the literature is that trust is a complex and multidimensional concept. Trust has definitions and concepts in different knowledge fields. Then, the conceptualization of trust depends on the purpose for which the term is being used. Different alternatives for the classification of trust are presented in literature. Das and Teng (2004) identify many classifications established in types, components and dimensions.

The classification frequently mentioned is that proposed by Barney and Hansen (1994). These authors, inside of the perspective of the Resource Based View, consider that trust can be a resource propitiating competitive advantage. Thus, they classify trust as weak, semi-strong and strong. Another classification frequently used and especially interesting for the paper subject, is that indicated by Lane (1998) and Child and Faulkner (1998). The authors point out three perspectives about trust bases:

**The calculus-based trust**

It is based, not only on the fear of punishment for violating trust, but also on the rewards for preserving it. Trust is based on a calculation comparing the costs and benefits of creating and sustaining a relationship versus the costs and benefits of severing it;

**The knowledge-based trust**

It occurs when an individual has enough information and understanding about another person to predict that person's behaviour. Accurate prediction depends on understanding, which develops from repeated interactions, communication, and construction of a relationship.

**The Identification-based trust**

It happens when parties understand and endorse one another, and can act for each other in interpersonal transactions. It requires parties to have full internalization and harmony with each others' desires and intentions.

Beyond that, there is the Mollister's (1995) classification, in Das and Teng (2004) and Child and Faulkner (1998), who classifies trust as cognition-based trust and affect-based trust. Therefore, in terms of trust conceptualization and classification, there are different items: determinant factors, components, dimensions, categories, and types of trust.

For the purposes of the study herein, a clear concept of trust is the definition proposed by Rotter (1967): 'interpersonal trust is defined as expectancy held by an individual or a group that word, promise, verbal or written statement of another individual or group can be relied upon'. In economics and organizational studies, trust has been studied in the relations between firms and organizations. These two levels of trust, interpersonal and interorganizational, can be seen in Zaheer et al. (1998) study. But, in our opinion, individuals have an important role in explaining trust and its dimensions, more than firms or organizations. For us, the fundamental supporting idea is found in Granovetter's (1985) study about embeddedness and how it works in a social network. According to the author, 'social relations, rather than institutional arrangements or generalized morality, are mainly responsible for the production of trust in economic life'.
Barney and Hansen (1994) suggest that trust between organizations depend on the trust between individuals linking organizational sectors. Aulakh et al. (1996) support that, although, the trust is property of the expectancy of bilateral behaviour, existing between individuals, it also can be extended for exchange between organizations, since the relationships between firms are managed by individuals in each organization. According to these authors, the trust relations between organizations include a set of expectations between partners related to the individuals’ behaviour and their satisfaction. Using these concepts and arguments about trust and individuals, it is not possible to state that trust is related just to interpersonal relationships, but it is clear that individuals are important in trust construction process. Four main aspects need to be taken into account: first, the typological diversity of trust and possibilities to measure it; second, the role of individuals in trust construction process; third, the importance of relationships between individuals to construct the trust process; and, fourth, the widely interaction that there is in an agribusiness’ structure, like a chain or netchain. We believe that the Social Network Theory and its modern computational tools can contribute substantially in studying, understanding and learning about trust in a deeper way. In the next section, the concept of Social Netchain and its managerial and political implications derived from an application essay are presented.

AN AGRIBUSINESS ‘SOCIAL NETCHAIN’: CONCEPT AND AN APPLICATION ESSAY

Revising the trajectory of analytical frameworks developed to analyze the agribusiness sector, it is clear that there is an increasing complexity and width of relations between actors. In a parallel way, structures and mechanisms of governance present the same characteristics, where the frontier seems to be the linkage between individuals/community and trust. In the third section, the study have discussed some aspects of the Social Network Theory and, in our point of view, the strong relations between these three knowledge fields are evident. Then, merging the most advanced analytical framework concept of ‘Netchain’ as proposed by Lazzarini et al. (2001) with the Social Network Theory, this study is proposing the ‘Social Netchain’ concept to analyze the agribusiness sector. As a definition, it can be said that a ‘Social Netchain’ is a set of interpersonal relationships networks comprised of horizontal ties between individuals of the firms or organizations within a particular agribusiness sector, which are sequentially arranged based on vertical ties between individuals of the firms or organizations in different layers of that agribusiness sector.

The main difference of ‘Social Netchain’ concept, compared to previous analytical frameworks, is that subjects of analysis are individuals and their relationships, instead of firms and/or organizations. Firms and organizations should be understood as a specific and intra set of interpersonal relationships of those individuals that legally belong to it. In the absence of an empirical application, the study carried out an exercise to design an agribusiness ‘Social Netchain’. Thus, the names and interactions of the individuals, as showed in the Figure 1, are merely result of the study imagination and are not associated with any specific real case. To design that ‘Social Netchain’ (Figure 1), the study used the Ucinet Software Package, which is properly developed to social networks analysis purpose. There are many aspects represented in the Figure 1 that need to be highlighted. First of all, the central elements of analysis are individuals - persons identified by their personal names. While chains, supply chains, networks and netchains are mainly focused on firms and organizations, the ‘Social Netchain’ has individuals as its central element. Consequently, the relations between individuals and not between firms or organizations are analyzed. Using this concept, it is possible to identify the interpersonal relationships intra- and inter-firm or organizations and the position of each individual in ‘Social Netchain’ as a whole. Then, it is possible to identify the point of interest and investigate the relationships in a deeper way.

By associating the software to analyze social networks, it is possible to measure some important aspects throughout the ‘Social Netchain’, like: closeness, betweenness, power, influence, information, density, transitivity, structural holes, and brokerage, among others. The characteristics associated to the concepts of those indexes can be (or not) closely related to variables traditionally used to identify the presence of trust in relationships between individuals. Then, the analysis can be carried out using quantitative methods to better understand the role of individuals in information processes as well as decision making processes (concerning the flow of materials, tangible and intangible goods, like: products, money and information). The individuals importance and/or prestige in a ‘Social Netchain’ as a whole or in the relations between two or more groups (wholesaler group and retailer one, for example) or in a specific subgroup of individuals (Industry, for example), can assume different values. Table 1 shows the values for three indexes of centrality for selected actors of the ‘Social Netchain’, taking into account the group or subgroup relationship. Analyzing some specific individuals and their centrality indexes values, some reflections can be done.

Illustrating our insight, take the case of ‘Carolina’ and ‘Valeria’ (circles in bold line in the Figure 1) and their Degree (CD) index of centrality. The two individuals belong to the same subgroup in the ‘Social Netchain’: the retailer one. When analyzing their importance in a ‘Social Netchain’ level, we can conclude that Carolina has a larger number of interactions than Valeria, but Valeria is more important in the relations between retailer and wholesaler subgroups and, even more, in the relations
Figure 1. An agribusiness 'Social Netchain'. Source: Designed by authors.
between individuals of a retailer subgroup. Another example is the values of Betweenness (CB) index obtained by ‘Xavier’ and ‘Michelle’ who belong to the Industry subgroup. Among those selected, neither Xavier nor Michelle is the most important individuals in intermediate the relationships throughout the ‘Social Netchain’ (‘Cole’ has the highest value). However, Xavier is the most important individual in intermediate relations between Industry and Wholesaler subgroups, while Michelle is the most important individual in intermediate relations between individuals who composes the Industry subgroup.

Besides the centrality indexes, as those shown in Table 1, indexes can be used to analyze some ‘Social Netchain’ properties. One of them is the Density index, which is used to measure the cohesion of a network. In Table 2, it is shown the Density value for different groups and subgroup of the ‘Social Netchain’.

Analyzing the Density index value obtained by selected groups and subgroups, it can be seen that Retailer subgroups are a denser subgroup, which means that it uses almost all possible ties. The lowest value for density was obtained by the ‘Social Netchain’. When taken into account the relationships between two subgroups, the values show Wholesaler-Retailer relations are denser than the Industry-Wholesaler ones. How could those and others indexes, extracted from the social matrix of a ‘Social Netchain’, be used in managing the agribusiness sector and understanding the improvement of trust in the relations between individuals, subgroups or groups? The main assumption is that those indexes can be relevant indicators to analyze trust when correlated to traditional ways of measuring trust in the agribusiness structures. Besides, empirical studies should be accomplished to investigated and test the assumption. Some questions need to be answered. For instance, what are the values of the centrality indexes for groups, subgroups, and ‘Social Netchain’ related to the different types of trust? How an individual with high index of betweenness can contribute to improve trust bases in a group, in the relations between groups or in a ‘Social Netchain’ as a whole? How can individuals with a high prestige improve trust bases in a set of relations? With a better understanding of those aspects, the coordination and trust in an agribusiness sector can be improved by more efficient policies and managerial actions addressed to more relevant individuals.

Meanwhile, it can be argued that the main...
advantage in using the ‘Social Netchain’ as an analytical framework is the possibility to better perceive, learn and understand the trust between individuals. In our opinion, the main contribution of the ‘Social Netchain’ concept is: linking ‘Social Netchain’ – as an analytical framework based on individuals and their relationships – to structures of governance, making it easier understand trust as a mechanism of governance. As presented in the previous section, many authors have been studying trust and classifying it as the newest mechanism of governance. We believe that the ‘Social Netchain’ framework advances in some ways when compared to the netchain concept, it makes easier visualize the process of trust as a mechanism of governance, which is important, particularly for the agribusiness sector, which has, as one of its characteristics, a wide range of interactions throughout the production flow. Figure 2 presents the evolution of analytical frameworks applied in analyzing the agribusiness sector, from an elementary linear chain framework, chains, networks, netchains, to the concept of ‘Social Netchain’. Furthermore, the figure shows the extent to which these frameworks are useful in examining trust based mechanisms of governance. Figure 2 suggests that, in general, relations based on trust can be better studied and identified using the ‘Social Netchain’ analytical framework than in other ones. On the other hand, it does not imply that a ‘Social Netchain’ structure is necessarily more intensively based on trust as mechanism of governance, once it could have another structure strong based on trust, while a ‘Social Netchain’ strongly based on price or contracts, depending on the specific characteristics of each arrangement. Therefore, the main reason is to reinforce the idea of studying trust in the agribusiness sector, using ‘Social Netchain’ as the analytical framework.

**POLICY AND MANAGEMENT IMPLICATIONS**

Major managerial implications can come upon of using the ‘Social Netchain’ concept. In this sense, the implications impact can be related to the management level in which it is being accomplished, taking a subgroup of individuals composing a specific organization inside of a ‘Social Netchain, an industrial company and its employees, for instance. Internally, the managerial implications can be related to the improvements in the human resources management, identifying the individual characteristics and allocating the resources efficiently in agreement with the characteristics that a certain position requires. Let's take as an example the case of ‘Michelle’ (Figure 1). ‘Michelle’ carries out an essential function for the information flow among the individuals of her organization. Qualification actions seeking to increase the individual abilities are necessary to accomplish the specific functions she works out in the organization and they can be better driven when the characteristics of ‘Social Netchain’ are well known. The administration of hidden leaders, turnover, absenteeism, productivity, among other aspects accomplished to the human resources management can also be made easier by using the concept of ‘Social Netchain’.

The managerial implications in an intermediate level, that is, between individuals of two or more organizations (sub-groups of a ‘Social Netchain’) can assume other dimensions. Let’s take two organizations formed by their individuals and their respective relationships: wholesaler and retailer, for instance. Specific individuals are responsible for the straight relationships between organizations, besides the internal relationships to each sub-group. Then, it is possible to identify each individual's position in these relationships. Each position inside of a ‘Social Netchain’ demands specific abilities to perform the activities inherent to it. For instance, the largest number of interactions between a sub-group of individuals and another can be given through a person who has low centrality index inside the group, but has high betweenness index between the sub-groups. In that context, a manager can be effectively less important in the relationships of his/her organization with another than a salesperson or buyer, for instance. Knowing the positions that each individual has in a ‘Social Netchain’, it is possible to qualiy the specific and inherent aptitudes to that function, trying to improve the performance of the ‘Social Netchain’ as a whole.

The implications at this managerial level are related to the development of relationships more and more based on trust. Knowing who are the individuals, their

**Table 2.** The density index of cohesion in the ‘Social Netchain’ and its selected groups and subgroups.

<table>
<thead>
<tr>
<th>Group or Subgroup</th>
<th>Density index</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry</td>
<td>0.4167</td>
<td>0.4930</td>
</tr>
<tr>
<td>Wholesaler</td>
<td>0.6333</td>
<td>0.4819</td>
</tr>
<tr>
<td>Retailer</td>
<td>0.7500</td>
<td>0.4330</td>
</tr>
<tr>
<td>Industry-Wholesaler</td>
<td>0.2667</td>
<td>0.4422</td>
</tr>
<tr>
<td>Wholesaler-Retailer</td>
<td>0.3727</td>
<td>0.4835</td>
</tr>
<tr>
<td>‘Social Netchain’</td>
<td>0.0481</td>
<td>0.2140</td>
</tr>
</tbody>
</table>

Source: designed by authors with values extracted from Social Matrix data of the ‘Social Netchain’ illustrated in the Figure 1 by UCINET.
characteristics and their positions, inside each sub-
groups, it is possible to manage the transactions towards
migrating gradually from relationships based in initial
levels of trust (calculus-based trust) to more advanced
ones (knowledge-based, and identification-based trust).
These advances allow reduce the contract dependency,
and consequently, it can reduce the transaction costs and
improve the coordination and management inside and
between organizations. Thus, the study suggest the
utilization of the concept of ‘Social Netchain’ as an
analytical framework of the reality, which presents
characteristics of a better knowledge of the individuals’
role in an agribusiness structure. This can lead, directly,
to a better understanding of the relationships based on
trust as a mechanism of governance and, as a
consequence, actions which will be able to be addressed
as a way of reducing the transaction costs (but not only)
through a gradual replacement of relationships based
more in contracts to relationships based in larger trust
levels. Such implications can also be reflected in the
strategic decisions of the organizations (individuals’
groups). Deep knowledge of ‘Social Netchain’ allows the
identification of possibilities of new interactions or
intensification of existent relationships, implying new or
denser partnership relationships, joint-ventures,
cooperation, buyer-seller relationships, certifications,
alliances, and so on.

Analyzing ‘Social Netchain’ as a whole, the managerial
implications in an even wider level, can also be pointed
out, taking as an example a ‘Social Netchain’ based on a
Supply Chain structure, having a focal company as main
characteristic. The knowledge of its ‘Social Netchain’ can
facilitate the managerial actions when strengthening fragile relationships, intensifying qualification trainings, building new channels for the information flow; replacing individuals which, among other actions, seek the better performance of 'Social Netchain' to reach its expected goals. Look at the Cole's position in Figure 1, and see how important he is in establishing the interactions between two wider groups: (i) consumer, retailer and wholesaler, and (ii) industry, producer and suppliers. How important could it be to better understand this position role in the information flow along the 'Social Netchain'? Managerial actions could take place to improve the information flow by establishing new ties between the two groups, for instance. Policy implications of the utilization of 'Social Netchain' concept can also be presented. Illustrating such implications with an example of an agribusiness structure (a meat chain, for instance) that needs to implement a policy to improve the traceability of its products. Who are the main individuals for a successful implementation of this policy along the 'Social Netchain'? To know that traceability is a process based on the change of information among the agents, it would be fundamental to identify those key individuals in the information between a sub-group and another. In other words, those individuals with high betweenness index seem to be fundamental for the success of that policy. Similar situation can be verified in the implementation of Efficient Consumer Response policies, in which the information flow in a consumer-producer direction is essential. Some theoretical implications can also be pointed out. First, it is the proposition of a new application area for the Social Network Theory: the agribusiness sector. Second, the concept of 'Social Netchain', merging the Social Network Theory with the Netchain analytical framework, seems quite appropriate to analyze trust as a mechanism of governance and its implications with the transaction costs, the administration and coordination of the organizations, once trust relationships happen among individuals composing organizations. And, third, compared to the previous analytical frameworks, the main advantage of using the 'Social Netchain' concept is the possibility of a deeper analysis of the agribusiness structures, allowing each individual's analysis in a separately way or in a sub-group (company, organization), or group (sector) or in a 'Social Netchain' as a whole (productive chain).

**Conclusions**

After the discussions presented in the paper, the answer for the central question is: yes, Social Network Theory can contribute to the development of an agribusiness analytical framework which, focusing on the individuals' relationship as a central subject of analysis can be used to better understand trust bases of relations between individuals. Achieving the proposed objective, we introduced the concept of 'Social Netchain' as an agribusiness analytical framework and argued about some of its implications on trust as a mechanism of governance.

Although, previous analytical frameworks suggest the uses of ties between firms and organizations to analyze product, material, information, financial resources, and so on, throughout the agribusiness structures, we are proposing a concept based on ties between individuals. The 'Social Netchain' is a useful concept to be applied in agribusiness structures analysis once several vertical and horizontal individual relationships can be present. Even more, the 'Social Netchain' concept has implications on different aspects, like: design, management, policies, theory and method, as well as future studies. Using the individuals and their relationships as main elements of analysis, the concept of 'Social Netchain' makes possible the analysis of the productive structures design in agribusiness sector starting with different characteristics from those used by other analytical frameworks. In this new design, it is not only possible to identify and to nominate each individual in a wider productive structure ('Social Netchain' as a whole) or in sub-structures (groups and/or subgroups), but also to verify their positions inside those structures, so that certain characteristics of each individual can be identified - as the importance and the prestige, for instance - starting from quantitative indicators - degree, closeness, betweenness, for instance - obtained from calculus based on the direction, position and intensity of their relationships with the other individuals belonging to certain productive structure. Besides, certain characteristics related to a group or sub-group, as the Density of the net relationships, can also be identified and quantified. Using appropriate computational resources, other individual or collective indexes can be obtained, such as: power, influence, information, transitivity, ego networks, and brokerage, among others.

Such group of indexes makes possible an advanced design regarding the individual characteristics and relationships composing certain productive structure of the agribusiness sector.

As any analytical framework, the 'Social Netchain' also presents some limitations. In our point of view, the presence of a widely range of individuals, in wide and long agribusiness chains can make it difficult to apply this concept of analysis. The sampling process utilization can be a possible solution. This limitation can possibly reduce the application of 'Social Netchain' to short agribusiness structures only. The absence of an empirical application of 'Social Netchain' concept can be seen as the main limitation of our study. On the other hand, 'Social Netchain' seems to be a promising field for future studies and empirical applications.

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