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# Strictly Coordinated Food-Systems: Exploring the Limits of the Coasian Firm

## INTRODUCTION

Firms are not islands but are linked together in patterns of co-operation and affiliation. Richardson, 1972

In the recent literature on supply chain management, vertical production systems are treated as independent entities operating under a given standard of coordination. If different production systems are not denominated firms, they are being treated as if they could be coordinated by some kind of agent holding sufficient hierarchical power. Moreover, different supply chains are presented as if they could compete with each other in the marketplace, inviting us to extend the concept of the typical firm. However, according to the Coase (1988) definition, “A firm consists of the system of relationships that comes into existence when the direction of resources is dependent on an entrepreneur.” When we deal with supply chains, the entrepreneur may or may not exist.

Can supply chains be studied as independent entities? If so, can we interfere in their organization? What parameters must be considered to bind our actions toward the design of efficient systems? Provided that theories are abstract constructions designed to explain empirical regularities, we are looking for a scientific explanation for the empirical architecture and dynamics of coordination of supply systems.

In this paper, we are particularly interested in supply-chain *management*, which implies conscious interference. Therefore, it becomes necessary to develop a

theory that is useful both for decision-making and figuring out the conditions necessary to allow for discretionary interference.

The recent literature in this field has been advancing toward the development of a theory, and tools to help manage supply-systems are in demand, by both the private and public sectors.

Part of the literature has evolved from the pure Industrial Organization approach, toward the New Institutional Economics, especially incorporating Transaction Costs and Institutional Environment as important elements in the architecture of vertical systems.<sup>1</sup>This includes agribusiness systems, where several contributions have recently been reported (Frank, and Henderson, 1992; Zylbersztajn, 1996; Mahoney, Crank, and Lajili, 1994). Recent developments are trying to merge both theories, Industrial Organization and Transaction Cost Economics, as discussed by Joskow (1995), bringing new insights and enhancing the understanding of the dynamics of supply systems.

At the origins of the concept, the French school of “filières” contributed to this evolution, based on the utilization of tools focused on monopolistic behavior of specific players throughout the chain, stressing power as the key element. More recently, the Dutch school has been producing considerable literature that is shaping the concept of agri-chain management, as can be seen in Trienekens, Beers, and Beulens (1998), and Trienekens and Zuurbier (1996). This last approach considers the vertical chain a manageable system, thus treating the agribusiness system as an economic entity, which is supposedly manageable. Some authors from the Dutch school are applying the theoretical support from the modern theory of organizations while others are basing their work on an *ad-hoc* approach.

The motivation for this study can be expressed by a single question. How far have we moved toward building a useful tool to architect supply systems or chains? By architect, we mean shaping organizations and institutions that will support efficient supply systems and enforcing coordination to help implement the necessary contractual adaptations of specific systems when facing external shocks.

Testing hypotheses, designing new supply systems, and promoting adaptations, implies that we are assuming an applicable theory of supply-system management, expected to be general enough to be applied to any case of production system coordination.

This paper stems from the concept that it is not necessary to develop a new theory or a so-called chain science; it is sufficient to apply the modern theory of organizations. Therefore it is feasible to deal with supply chains as a particular case within vertical production systems management.

To address this issue, this conceptual study is structured in five parts. The second part places the concept of supply system into a Coasian framework. Part three deals with the concept of coordination and its limits. In part four, the

problem of coordination failure is examined and a supply system management theory is discussed based on existing tools offered by the theory of organizations. Finally, part five presents concluding comments and concepts that deserve further attention.

This paper deals with the definition of “strictly coordinated supply systems” (SCSS), based on the theory of vertical integration proposed by Williamson (1975). The concept of SCSS is introduced and contrasted with Porter’s definition of strategic groups.

### THE COASIAN SUPPLY-SYSTEM

The key development proposed by Coase in his seminal paper “The Nature of the Firm” was a challenge to the traditional concept of the firm as a production function. Replacing the traditional neoclassical approach, Coase introduced the view of the firm as a “nexus of contracts.” One implication of this approach is an expansion of the scope of the theory of the firm to incorporate new forms of productive arrangements increasingly important in modern economies, such as strategic alliances, franchises, sub-contracting, and other non-standard contractual arrangements. The evolution of the modern theory of the firm challenges both the concept of a firm as a production function and the traditional treatment to define the boundaries of the firm.

The new theory of the firm evolved around the discussion of hierarchical power. On the one hand, Alchian and Demsetz (1972) maintain that the firm is not distinguished from the market by fiat power, since one can always fire the supplier. The authors agree with Coase in that the costs of using markets is the basic explanation for the existence of the firm, but add that one could stress that lowering costs of management would increase the advantage of the firm. Hart (1989) stresses the definition of property rights as the key element in defining the firm, contrasting the model with the neoclassical, transaction cost, and principal-agent models.

On the other hand, Richardson (1972) introduces the supply chain perspective when proposing that sub-contracting is becoming more widespread and: “...a dense network of arrangements links the industries of different countries.”. The author exemplifies this with a large retailer —Marks & Spencer —, proposing that more than just a retail chain, this company has the capacity to architect complex patterns of coordinated activities, stressing that this capacity to coordinate emerges without any shareholding in its suppliers’ firms. This is the core concept revisited in the present paper. As stated by Picot, Ripperger and Wolff (1996), firms’ boundaries are fading, even more acutely than Coase had anticipated, since hierarchical mechanisms can be found between firms and market mechanisms, and high-powered incentives can be found within the firms as well.<sup>2</sup>

Along these lines, this paper proposes to place the concept of supply-system coordination within the new approach of the theory of the firm. If the traditional hierarchical power is no longer the key element distinguishing the firm from the market, there still must be some form of coordinating power present to explain the maintenance of the complex system of contracts that characterizes the supply chain.

### **The Limits of Hierarchy**

Either approached as a production function or as a nexus of contracts, the firm demands capacity of coordination. The concept of hierarchy treated by Williamson (1975) hits the heart of this issue. The firm, once seen under the lens of the New Institutional Economics, is approached, not only as a set of contracts, but also as contracts that are defining a specific mode of governance. Governance modes range from markets to hierarchies. The first applies when the characteristics of the transactions involved are governed predominantly by the price mechanism. This situation is a particular case in which the price signals are sufficient to promote adaptations in the set of contracts.

However, in a real world setting, the price mechanism is one specific case among governance modes aligned with and defined by the characteristics of transactions. Nevertheless, contracts of a firm, both external and internal, are designed to promote efficient coordination. It follows that a broad scope of contractual arrangements is observed, ranging from simple spot markets to strictly hierarchical modes of governance, since they are simultaneously determined by the characteristics of transactions and the institutional environment (Williamson, 1985).

Looking deep into the contractual firm, the concept of hierarchy can be considered fragile as utilized in the traditional sense. Not only are internal contracts susceptible to breaches, but also all characteristics that govern transaction between firms, can also be reproduced within firms (i.e., hierarchical governance), as a result of agency problems derived from asymmetric information, opportunism, and emergence of quasi-rents in transactions classified as hierarchical. This reinforces the proposition that contracts have a cost to be fulfilled, both on an ex-ante and on an ex-post basis, and within or between firms.

Even in contracts conducted strictly inside the firm, discrepancies can emerge that cause misalignment between principals and agents. Therefore, hierarchies have limits and cannot be seen as monolithic structures in which orders are obeyed on an inflexible basis. On the contrary, modern theory of organizations focuses on the contracts through their dimensions of motivation and control, in order to achieve a pre-determined objective where disputes for residual decision rights are very frequent.

If contractual management is important within a single firm, its significance is magnified when dealing with systems of firms, as in the coordinated supply systems.

### **The Expansion of the Concept: Supply Chain as a Nexus of Contracts**

Of the managerial theories under construction that focus on supply chain management, each contains elements of hierarchical coordination. In order to improve these theoretical bodies, one needs to consider two aspects. First, what are the existing explanations for governance determinants that can be applied to supply chains, and second, what are the specific aspects of supply chains (if they exist) that indicate the need for development of a specific theory.

Different managerial theories of firms have been developed, ranging from financial to human resources and technological management. In other words, they were developed with a focus on the managerial functions faced by the decision-makers and therefore show a strong applied orientation.

The organizational theories of the firm (Millgrom and Roberts) arise from the contractual perspective and apply the theory to different managerial problems, such as agency, labor motivation and controls, ownership structure, separation of property and control, and corporate finance. Incorporating the Coasian approach within the supply chain concept raises at least three challenges to both academics and managers:

First, what tools exist that allow for *discretionary interference* in supply chains? In dealing with the coordination of contracts whose locus is spread throughout the chain, how are hierarchical and control abilities defined? If different governance modes can be observed within a single supply chain, it is expected that managerial discretion will be employed with considerable efforts toward motivation and control mechanisms, all associated with transaction costs relevant to supply chain management.

Second, supply management is affected by the enforcement ability related to the specific system. The complexity and importance of this problem are particularly present when supply chains surpass country borders, as is often the case, being affected by institutional conditions defined within each distinct country environment. This imposes extra constraints on the implementation of managerial discretion because the decision-maker not only has to interact with agents dispersed throughout the chain, but also has to induce adaptations as a reaction to different signals provided by the distinct institutional structures.

The third consideration has to do with the dynamics of supply chain reorganization. Chains are rarely linear and monolithic; different sub-systems dealing with the same product can be found, but obeying different mechanisms of coordination. Therefore, different sub-systems are simultaneously coordinated, all related to a single product, and competing with each other for the final consumer.

This concept poses the problem of defining limits on supply chains that considers both, bound by the final product, and based on the discretionary capacity to manage or coordinate power. The managerial ability results from the capacity to devise and implement vertically-coordinated transactions with well-

defined motivation and control tools attuned to the needs of vertical coordination. Different systems demand different coordination tools, depending on the competitive strategy adopted and the frequency and effect of external impacts that demand coordinated adaptations.

### **Proposition 1**

The central proposition of this paper is that supply systems may be approached as a magnified set of contracts which architecture results from the alignment of the transaction characteristics, and the institutional environment. Alignment means designing efficient contract arrangements, minimizing production and transaction costs, and considering the institutional framework that binds the set of transactions.

Managing firms is a very demanding task that has been studied for many years. The management of complex supply systems is still a far more complex concept, both in theoretical and practical terms. In fact, practice seems to be demanding rapid theoretical improvements given that an efficient architecture of production systems augments its competitive capacity. In order to understand the conditions of implementing managerial discretion, the characteristics of supply system coordination will be discussed.

If different supply systems are competing in the marketplace, the question is whether we can admit the possibility of a central hierarchical coordination or if, on the contrary, the systems with different designs will emerge spontaneously in the marketplace. Problems of definition of property rights over residuals (distributive aspect) turns out to be of magnified importance in the design of incentive mechanisms to maintain the structure of the supply chain.

## **SUPPLY CHAIN COORDINATION**

The objective of the present section is to explore the concept of coordination developed by Williamson (1985) and to discuss its application to supply systems. The concept of strictly coordinated sub-systems and strategic systems will be explored.

### **Adaptability of Contracts**

External impacts are continuously affecting the contracts within any specific supply system. However, changes of both an internal and external nature are relevant. For example, technological changes can affect the specificity of assets or the uncertainty related to the transaction. Also, shifts in the institutional environment might have an impact on the conditions in which the transaction is carried out, affecting the costs of governance.

If changes of different natures are in motion, the relevant question becomes how to deal with the adaptability of existing contracts throughout the supply

chain. The concept of adaptability in agri-systems was discussed by Zylbersztajn (1996) based on the framework proposed by Williamson (1985).

Ex-post contractual adaptability is required in all governance modes, from markets to hierarchies. The determinants of contractual flexibility are associated with the characteristics of transactions. However, in the case of adaptation of a magnified set of contracts within a supply system, one must be concerned with the adaptation of a sequence of transactions potentially governed by distinct modes.

Key elements proposed by Zylbersztajn (1995) include the existence of vertical sub-systems defined by strictly coordinated transactions with specific tools to promote the identification (and even the anticipation) of external shocks, the existence of information systems that allow for rapid diffusion of relevant information, the managerial capacity of each agent to react in face of external shocks and the capacity to coordinate the adaptation. In the presence of such specialized mechanisms, the supply chain will approach a traditional Coasian firm.

Key questions are a) how rapidly can relevant information flow through the system, b) how do the agents react in terms of cooperative adjustments, and c) which organizations have been built to deal with non-cooperative adjustments?

When discussing adaptation, Williamson (1991) suggests three types of disturbances based on the way they interfere with the contractual arrangement. Inconsequential, consequential, and highly consequential disturbances must be contrasted with the adaptation tools available to deal with any given disturbance. The author suggests that distinct types of adaptation are necessary to correct eventual misalignment. Autonomous adaptation requires no effort, being entirely dependent on the price mechanism. Coordinated adjustments are needed when prices do not carry the necessary information to promote the adjustment in a timely fashion.

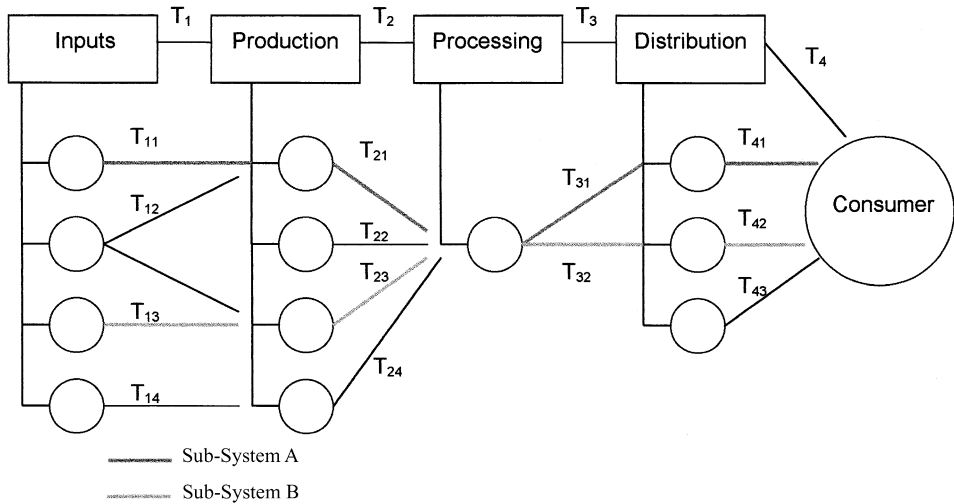
The first level is strictly autonomous, adaptation. The other levels are classified as: mainly autonomous, mainly coordinated, and strictly coordinated. The different degrees of intervention are associated with increasing degrees of asset specificity.

### **Adaptability and Strategic Systems**

Supply systems operate in environments characterized by changing levels of asset specificity associated to different competitive strategies which may affect transactions throughout the system, such as vertical differentiation, market segmentation, innovation, time specifications associated with minimum stocks, among others.

The definition of competitive strategy is twofold. First, it is the set of investments in productive resources made by the firm in order to attend the requirements of the prevailing competitive pattern (the set of competitive variables used by rivals in a specific market, such as price, quality, brand name, etc.). Also, competitive strategy includes the ability to change the competitive





**Figure 1.** Strictly Coordinated Vertical Sub-systems

pattern . (Best, 1990; Oster, 1994). Both may alter the attributes of vertical transactions by demanding the adoption of a new governance mode.

Moreover, transaction attributes may also be affected by new standards of quality required by public policy, or associated with supply management. In the case of food systems, specific attributes of food consumption required by changes in consumer preferences, strict legislation protecting consumers rights, and environmental awareness are all examples of increasing levels of specificity, which make it more difficult to rely on autonomous adaptations in supply systems.

Therefore, both coordinated and strictly coordinated adaptation modes will be demanded in most of the modern supply systems, and because of this, contracts may replace price-induced adjustments. In a competitive environment, a first mover advantage can be gained by implementing adaptation before other systems. For that reason, the existence of vertically organized sub-systems is proposed, assuming they are based on the coordination abilities of their agents, who compete with other sub-systems. Both cooperative and hierarchical adaptations may take place.

The concept of strategy at the firm level is augmented to incorporate strategic positions of specific vertical sub-systems in which adaptations are predominantly of the strictly coordinated mode. In fact, this type of supply system can be represented as a set of contracts, all strictly ordered and very similar to the typical contractual arrangement inside the firm, albeit lacking strict hierarchical power.

Figure 1 shows the representation of a supply system that includes different strictly coordinated sub-systems. The motivation for individual firms to establish contracts of a strictly coordinated mode is determined by the characteristics of transactions prevailing throughout the system and also by the competitive



pressures imposed by other coordinated sets of contracts. Costs of coordinating the entire system are too high, assuming the possibility of opportunistic hold-up problems, resulting in the definition of a sub-set of closely related agents functioning as a close-knit group compiled for specific purposes. In these cases there are advantages to develop collective actions.

Distinct contractual arrangements are proposed and enforced by the group, through close monitoring. The architecture of coordinated contracts may well show superior efficiency by defining new standards for the other agents of the supply system, outside the group, thus motivating the diffusion of the new contractual standard.

The motivation for organizing sub-systems originates from lower transaction costs and close monitoring possibilities. Therefore, the identification of external shocks or strategic opportunities (step 1), renegotiations of contractual arrangements (step 2), implementation (step 3), and ex-post monitoring (step 4) become a sequence of feasible steps to be adjusted rapidly, aligned with the competitive environment or strategic needs.

One might argue that the Porter (1979) concept of strategic groups is enough to explain why groups of firms adopt similar strategies. The author states that: "An industry can be viewed as composed of clusters of groups of firms, where each group consists of firms following similar strategies in terms of key decision variables... I define such groups as strategic groups". Among these strategic groups there may be important mobility barriers even if the entry barriers are low for the whole industry, which can explain different levels of return among strategic groups.

As mentioned before, if strategies alter the attributes of transactions by increasing asset specificity, uncertainty, or frequency, contracts may be commended, replacing pure market mechanisms, which will result in strictly coordinated sub-systems.

Porter's definition of strategic groups merely assumes the existence of a group of firms adopting similar strategies, without any cooperative or hierarchical motivation, while the concept of a strictly coordinated supply system is dependent on cooperation and/or hierarchical power.

In that sense the coordination presents in the concept of strategic groups is of strictly autonomous adaptation while in the concept of strictly coordinated supply systems the coordinated and strictly coordinated modes are relevant.

Another distinction between both concepts might be related to the timing of adjustment. While the strategic group is the result of long term continuous adjustments, the strictly coordinated system allows for rapid adjustments in face of external shocks. It is possible that both concepts will become more similar provided there is enough time for firms to adjust and adopt cooperative strategies as a result of repetitive transactions.

### **Proposition 2**

Firms do compete in the marketplace, and this is a cornerstone of the economics literature. If a Coasian approach to the firm is adopted, it is expected that alternative contractual arrangements will affect the standards of competition between firms, incorporating transaction costs into the traditional production costs.

If productive systems are treated as presumed to be magnified sets of contractual arrangements, they will also differ not only in terms of costs of producing goods and services, but in terms of transaction costs. The key question becomes: Who is in charge here? Who is the coordinating agent central to the traditional economic theory?

We suggest that there will be a leading firm in most cases, which will assume the coordination role. This leading position arises from the strategic leadership, not necessarily connected to business size, technological domain, or the position in the vertical chain. Many examples are available showing that small companies may play this role and build a strictly coordinated sub-system to explore a market niche.

Illycafe, a well-known Italian espresso coffee company, is a good example of SCSS in the coffee agribusiness system. The company's main competitive strategy is focused on vertical differentiation based on high quality espresso coffee. To build and preserve its reputation, Illycafe has had to strictly coordinate the coffee sub-system, which includes idiosyncratic contracts, joint ventures, and informal contracts both upstream (coffee producers) and downstream (coffee machine supplier, coffee shops, franchising systems, and so on). In spite of being a small player, Illy is the strategic leader in this sub-system, though there are larger and more powerful players downstream.

Another example is provided by new seed companies, such as Monsanto or Novartis, originated from the chemical sector. They are building SCSS in soybean, corn, and other agricultural genetically modified products (GMOs) in order to guarantee the return of their investment in R&D. Non-standard contracts with farmers, edible oils industry, research institutions, and farmers are emerging as a way to capture returns for their R&D investments.

The two examples show that it does not matter if the leader is downstream or upstream in the vertical system or if it is large or small.

If the strategy is successful and higher returns result, other companies may follow the leaders, adopting the same strategy of expanding the strictly coordination sub-system, moving towards a strategic system. As the success of the strategy depends on adequate governance structures, the mobility barriers may increase, keeping profits from being eroded by potential competition.

The adaptation of contracts in production systems is entirely based on negotiation among different agents. They will form chains based on dependent

strategies, mostly represented and reflected in specific contractual architectures. Some contractual arrangements may provide superior (efficient) coordination and therefore will tend to expand to other agents. The rate of diffusion will depend on several aspects, some of which are:

- Responsiveness of consumers to the specific attributes associated with the strictly coordinated sub-system, which might impose new standards, changing the competitive pattern;
- Monitoring costs associated with the set of transactions;
- Institutional environment, providing standards and controls;
- Self-enforcement structures designed by the participating players; and
- Internal mechanisms to resolve disputes, dealing with distributive effects or contractual adaptation.

To conclude, this chapter is proposing the existence of vertical arrangements that reproduce the contractual architecture defined at the firm level. It is not spontaneous and the agents are not anonymous. The motivation to organize a sub-system comes from market strategies and efficiency to lower transaction costs, and therefore is a result of the search for efficiency and higher returns. However, these arrangements are relatively stable, making it possible to encourage the definition of new standards or to perish in light of other systems organized in different ways and competing for the same consumer.

The dynamics of sub-system competition have yet to be well understood, but are associated to the concept of supply system management, and particularly related to Williamson's approach to vertical coordination.

## **LIMITS OF SUPPLY SYSTEM MANAGEMENT**

In order to develop a theory to address supply system management, some building blocks must be put together. This topic will address three aspects: first, the basic theoretical foundations provided by the New Institutional Economics; second, the Williamson (1996) concept of a remediableness standard, applied to organizations and supply system management; and finally, two limiting and related aspects associated to coordination failure: the hold-up problem and the aspects of contractual continuity.

### **Towards a Theory of Supply System Coordination**

The basic proposal for using Transaction Cost Economics to study supply system coordination has been in the literature for some time. Based on Williamson, there are three points to recognize:

- Firms should not be viewed merely as extensions of the markets, but rather as complex contractual arrangements shaped by the characteristics of transactions;
- Discrete contractual law can be aligned with each governance mode, providing the theoretical basis for matching transaction characteristics with prevailing contractual modes; and
- First order economizing is considered primarily as an explanation for observed governance modes.

To extend this causal relation from firms to supply systems, one must amplify the scope of analysis, maintaining the same assumptions. Therefore, the governance mode is a function of transaction characteristics and institutional environment.

The system might be structured as a set of closely coordinated sub-systems, allowing for adaptive responses to changes in economic environment and strategies of competing supply systems. It is therefore necessary to consider some kind of hierarchical power associated with contractual motivation to promote the four steps described in the previous chapter.

Considered as an organic entity, supply systems are subject to reorientation, constantly passing through the redesign of specific contractual architecture. Managing supply systems is synonymous to constructing contracts that are potentially able to deal with the four steps in a superior manner. This approach leads us to treat the competitiveness of supply-systems as their ability to promote continuous and self-sustained contractual arrangements in the expanded market arena where not only firms are competing directly, but also the systems in which they are embedded.

Supply systems will continuously be created and will also continuously disappear, as new arrangements with sufficient coordination power are constructed to replace inefficient systems. In many cases, product differentiation associated with changing asset specificity will shape a completely new supply related to the same product.

### **Remediableness Standard**

The concept has been developed to deal primarily with institutional designs that are supposedly superior but in practice are not suitable for implementation Williamson (1996). In his paper, Williamson gives as an example the sugar program in the U.S., which, besides being economically inefficient, still persists despite the costs of its implementation. Still at the macro level, Shirley (1997) discusses how international agencies propose political reforms that are fine in textbooks but not feasible in reality.

What does the concept have to teach us, from the point of view of supply system management?

First, the architecture of supply systems is devised by human efforts. Being so, by its own nature and as a result of the difficulties with the application of the

concept of manageability, many superior proposals may prove not to be feasible, either due to the high costs of monitoring transactions or institutional barriers that are not removable in the short run.

Second, governance modes are rarely transferable from one country to another, given the importance of institutional settings. Simple remedies are difficult to prescribe without a better knowledge of the patient.

Third, inefficient supply chains might persist even in the long run, when there are distributive impacts resulting from the new proposed architecture. In this sense, some supply systems are managed in such a way as to be inefficient. Rent-seeking considerations apply here, and high competition pressures on agents are expected.

The implication is that governmental interference in SCSS may show no results in many cases, since it is very difficult to understand and to interfere in the complex contractual set.

Remediableness standard refers to a concept that applies to many cases where superior coordination modes are devised but their implementation shows obstacles not entirely anticipated.

Many studies of supply system coordination propose solutions, which are dependent on costless cooperation among agents throughout the system. The contractual approach to supply systems allows us to identify transaction costs associated to opportunistic behavior in the presence of quasi-rents related to highly specific assets.

Supply systems are sets of contracts that present situations of asymmetric and imperfect information leading to tensions which might inhibit the achievement of efficient coordination. Therefore, benign coordination, which many times is considered an implicit assumption, must be reconsidered under the lens of the economy of organizations. Coordination has costs associated to its implementation, so there are benefits to harvest. Unfortunately, there are variables out of the manager's control, which could, in many cases, serve as an excuse for failure.

There are two relevant aspects related to coordination failure: contractual hold-up and contractual continuity.

### ***Conditions of Contractual Hold-up and Continuity***

Once considered a nexus of contracts, the supply system is subject to the very same problems discussed in the literature related to contractual hold-up. In order to construct manageable contractual arrangements, it becomes necessary to focus on the question of contractual stability.

In a recent paper, Zylbersztajn (1997) reviewed the theory of contractual hold-up. Basing himself on Klein (1992), he considers that contracts can be seen as instruments designed to allow the engagement of the parties in an effort of joint production, reducing the risks of contractual hold-up. The study focused on

agri-systems as joint production efforts, albeit still subject to contractual management problems.

According to the Transaction Cost Economics literature, incomplete contracts are a consequence of bounded rationality, being defined by situations where information exists, but is inaccessible or the costs to obtain and process further information are too high to fill the contractual gaps. As it is impossible to design complete contracts, the parties normally live with the existence of gaps that, in case of litigation arising from the dispute over rents related to the existence of specific assets, might require third parties to deal with the contracts. Here, the unrealistic assumption of benign cooperation in supply chains (relations based on trust) comes into play, being just one possibility among a more complex set of situations.

The solution to the problem involves the design of incentives aligned with the interests of contractual parties, added to monitoring mechanisms that permit all parties to access relevant information when needed, and finally, the design of enforcement mechanisms to cope with opportunistic behavior. Contractual enforcement is discussed by North (1990) and Klein (1992) and involves at least two dimensions—the first of private and the second of public enforcement mechanisms.

Private enforcement might function in sub-systems where agents interact intensively with one another and are not anonymous agents. The particular case of strictly coordinated sub-systems appears to be aligned with the following comment proposed by North (1990):

The most likely and empirically observable state in which the parties to exchange have a great deal of knowledge about each other and are involved in repeated dealings. In such a world, the measurement costs of transacting are very low because of a dense social network of interaction. Cheating, shirking and opportunism are limited or absent because they do not pay.

Legal enforcement is important in cases where private mechanisms do not function adequately or when unexpected disturbances in institutional or competitive environment occur.

When the costs of breaking the contract are higher than the benefits derived from the breach, then the contract is expected to last. In the presence of bilateral dependence, one might anticipate low monitoring costs, since both parties are engaged in continuing the contractual relation.

Joskow (1987) on the US coal industry conclude that long term contracts are associated with high levels of asset specificity characterizing the transaction. For agri-chains, ex-post contractual hold-up is also shown to be related to the level of asset specificity of transactions as discussed by Zylbersztajn and Lazzarinni (1997). This indicates the importance of transaction-specific investments made to support the relation. The last study shows that ex-post contractual duration is also affected by the degree of specific investments.

## CONCLUSIONS

To attain an adequate level of coordination in the strictly coordinated supply chain, not only must one consider good intentions, but a deep understanding of the nature of transactions throughout the system is also necessary. In many cases, the level of asset specificity is very high, demanding specific contractual controls only feasible within small, close-knit groups. On the other hand, manageable sub-systems can be structured in an efficient manner.

The institutional and organizational structure that binds a specific supply system will also affect the degree of manageability. Strictly enforced rules, either by public or private modes, will affect the coordination capabilities developed within a defined system.

Returning to the original questions that motivated this study, a strictly coordinated supply system can indeed be considered an individual entity, if a sufficient degree of control can be enforced. This will be more likely to happen with individual sub-systems than with a highly aggregated system. Controls and enforcement are the roots of managerial discretion. Therefore, sub-systems can be constructed and different mechanisms of motivation and controls can be implemented, providing support to the concept of supply system management.

Finally, the key elements to frame the study of supply systems are already in the literature of the economics of contracts and organizations. It is just a matter of practicing and adapting. Several questions remain open and require further study. How do we gather indications of potential sub-systems to be developed? How do we enhance control capabilities within systems? How do we follow the dynamics of diffusion of SCSS? When should we consider a red light for supply systems without conditions to last in the long run? These are all relevant questions, the importance of which supply system managers should be aware.

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## NOTES

1. From now on, the term supply-chain will be replaced by supply-systems in order to emphasize the definition of supply system as a contractual nexus and not only as a technical transformation production chain.
2. The most striking example of faded boundaries is the "Lopez model" for the car industry- an industrial condominium where different companies share the line of production . Bilateral



specific investments are made, creating a hostage model of contracting such as that suggested by Williamson (1985, Chapter 5).

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