
POWER AND ASSET SPECIFICITY IN THE ECONOMIC ORGANIZATION

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Abstract

The emergence and evolution of the organization of transactions have received little attention in New Institutional Economics literature. The research problem is: why specific institutional arrangements arouse in Brazilian orange juice sector? The paper aims to analyze arrangemental innovations in orange juice sector, in order to highlight the determinants of organizational change and, therefore, unveil the reasons that motivated those changes. Davis and North's theory of arrangemental innovation complements transaction costs arguments in the analysis. Broadly, four institutional arrangements as well as three institutional innovations are described under these lenses. Specifically, econometric evidence from vertical integration path (institutional arrangement) after 1995 supports hypothesis from theory of arrangemental innovation. Transaction costs drivers for economic organization appear to be not relevant to explain vertical integration path after 1995. Prudency is necessary for draw conclusions from results, since these are preliminary results and refined econometric treatment is necessary.

Keywords: *Transaction Costs; Arrangemental Innovation; Action Group; Orange Juice*

POWER AND ASSET SPECIFICITY IN THE ECONOMIC ORGANIZATION

1. Introduction

The emergence and evolution of the organization of transactions have received little attention in New Institutional Economics literature. The governance of such transactions is a discrete choice among structures taking into account relationship-specific investments involved, according Transaction Costs Economics (TCE) (Williamson, 1991). The relationship between asset specificity and organizational choice find incontrovertible empirical evidence. Nevertheless, transaction costs arguments are not sufficient to indicate the reasons by which those arrangements arise. According to Joskow (2002: 105),

essentially no effort has been made to harmonize the large body of theoretical and empirical work in the TCE tradition that is relevant to understanding why specific governance arrangements emerge, and for performing any trade-offs may arise between increases in market power and reduction in the costs of transacting à la Williamson (Joskow, 2002: 105).

The research problem is: why specific institutional arrangements arouse in Brazilian orange juice sector? The paper aims to analyze arrangemental innovations in orange juice chain, in order to highlight the determinants of organizational change and, therefore, unveil the reasons that motivated those changes. Citrus sector in Brazil initiated the production of high quality orange juice in 1963 and thenceforth presented four distinguishable institutional arrangements. The paper advances in three topics. First, Davis and North's (1970, 1971) theory of arrangemental innovation complements transaction costs arguments. Second, we analyze longitudinal data from just one transaction, which deviates from TCE tradition of cross-sectional data of several transactions. Third, we explicitly include shifter parameters in the econometric model, making one step forward in empirics of TCE.

The paper is organized in five sections. Second section presents the theory of institutional innovation (Davis and North, 1970, 1971) and TCE arguments of governance choice. Third section analyzes the history of orange juice sector in São Paulo state, located in Brazil, emphasizing why specific institutional arrangements emerged. Fourth, the institutional arrangement characterized by partial backward vertical integration of juice processors into orange production adopted from 1995 is analyzed in detail by an econometric model. Fifth, concluding remarks follow.

2. Institutional Arrangement: Innovation and Governance

The economic phenomenon occurs within a wide social context, where firm's economic activity is not only a technological decision about scale and/or scope, and trades through pure competitive markets are not so pervasive (Coase, 1937, Williamson, 1971, Williamson, 1985, Barzel, 2002). This phenomenon occurs within an institutional structure of production (Coase, 1992), i.e. the organization of the economic activity is an institutional arrangement that enables the relationship among agents. According to Davis and North (1971: 7):

An *institutional arrangement* is an arrangement between economic units that govern the ways in which these units can cooperate and/or compete. [...] It must, however, be designed to accomplish *at least one* of the following goals: to provide a structure within which its members can cooperate to obtain some added income that is not available outside that structure; or to provide a mechanism that can effect a change in laws or property rights designed to alter the permissible ways that individuals (or groups) can legally compete.

Simplifying, an institutional arrangement is the way by which transactions are organized in the economy. Institutional arrangement changes got attention of Davis and North (1970, 1971), who proposed a theory of institutional innovation. Expected income realized by changes in the institutional structure is the initial factor of these kinds of innovations. Groups of individuals or firms that will receive those expected incomes alter the institutional arrangement. Arrangemental changes can increase the total surplus or can increase only the surplus of specific groups through redistribution. In one way or another, the group who is responsible for change will be benefitted. Key concepts can be defined as follow:

The Institutional Environment as a set of fundamental political, social, and legal ground that govern economic and political activity (rules governing elections, property rights, and the rights to contract are examples of these ground rules)
[...]

An Action Group as a decision making unit whose decisions govern the process of arrangemental innovation. The unit may be a single individual or a group of individuals, but it is the action group that recognizes there exists some income that they could accrue, if only they could alter the arrangemental structure. At least one member of any primary action group is an innovating entrepreneur in the Schumpeterian sense, and within the context of this model the group initiates the process of arrangemental innovation.
[...]

A Secondary Action Group as a decision-making unit that has been established (or whose activities have been modified) by some change in the institutional arrangement to help effect the capture of income for the action group. This group makes the tactical decisions that bring about the capture, but it does not accrue all of that income (it may, in fact, accrue none).
[...]

An Institutional Instrument as a document or device employed by an action or a secondary action group to effect the capture of the external income when applied within the new arrangemental structure (DAVIS E NORTH, 1970, p. 133-134).

In the theory of institutional innovation (Davis and North, 1970, 1971) arrangemental changes are initiated by exogenous events. These events create potential opportunities to obtain additional economic incomes for certain groups in society and, consequently, induce actions to alter institutional structure. There are several potential events that initiates that process, such as: (1) *technology*, technological development enables increasing productivity in terms of scale and scope economies, as well as new products and services and new uses for products and services (urbanization, transport, communication, etc.); (2) *market size*, which affects information or exclusion costs; (3) *expected profits*, market context influences decisions such as economic crises; (4) *prices*, changes in relative prices affect economic organization; and (5) *rules of game*, when legal or political changes alter the environment.

Distinguishing from these events, economic incomes from arrangemental innovations arise from several sources: (1) *scale and scope economies*, caused by technological changes

and/or changes in market size; (2) *externalities*, because changes enable the internalization of externalities; (3) *risk*, because risk mitigation can stimulate decisions that were not made without change in the institutional arrangement, (4) *market failures*, such as information asymmetries and market power; (5) *transaction costs*, in the selection of governance structures; and (6) *political pressure*, acting in legal norms formulation.

Summarizing, the theory of institutional innovation claim that an action group perceives that an event creates a situation in which economic income can be obtained through changes in the institutional structure of production. This action group uses an institutional instrument to put the innovation in motion and economic income is added through increment of total surplus and/or redistribution. Davis and North (1970, 1971) present a preliminary and formalized model, but its description is not necessary for the analysis of citrus sector in Brazil. It is possible to analyze arrangemental innovation through two lenses: efficiency or power. In later work, North (1990: 7) suggested that power is probably the main case: “I abandoned the efficiency view of institutions. Rulers devised property rights in their own interests and transaction costs resulted in typically inefficient property rights prevailing”. Figure 1 represents the model.

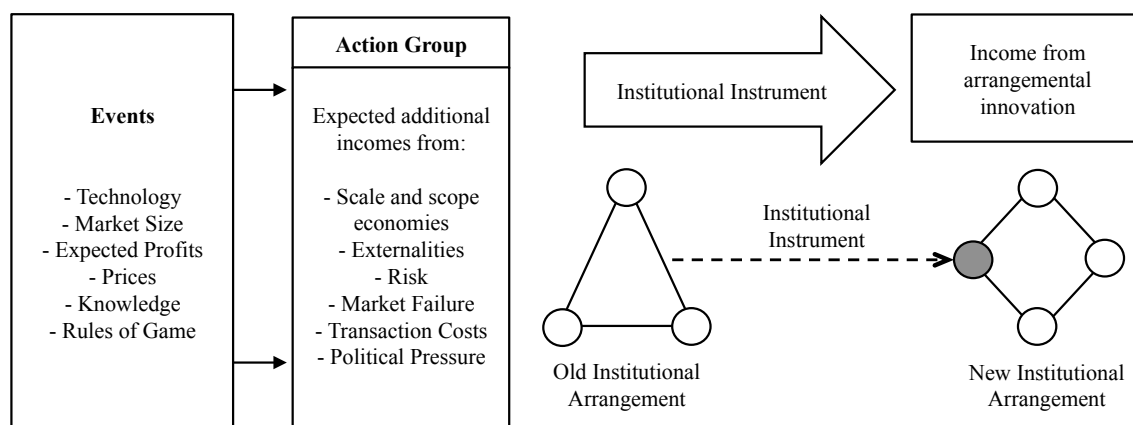


Figure 1 – Arrangemental Innovation Model
Source: adapted from Davis e North (1971: 62).

Arrangemental innovation is the key phenomenon of Davis and North’s (1970, 1971) theory and transaction costs are just one source of additional incomes for an action group. In Transaction Costs Economics (TCE) lens (Williamson, 1985, 1991), transaction costs are central in the governance of institutional arrangements. Governance of institutional arrangements is an adaptation problem, in which relational features in transactions require a specific governance structure. Given bounded rationality and the presence of opportunism (Williamson, 1975, 1985), contracts are incomplete and as relationship-specific investments deepen, risks of renegotiation and quasi-rent appropriation becomes higher (Klein, Crawford, and Alchian, 1978). Relationship-specific investments, or asset specificity, are those investments that lose value in alternative uses. In the presence of asset specificity, long length contracts and vertical integration are more likely to be adopted (Williamson, 1991).

The alignment hypothesis states that as asset specificity deepens, contracts and vertical integration are more likely to be observed. This statement found incontrovertible empirical support (Masten 1993, Shelanski e Klein, 1995, Masten, 1996, Masten e Saussier, 2000). Empirical tests of TCE used cross-section data of several transactions quantifying asset

specificity and correlate to governance structure. Shifter parameters in TCE's empirical inquiries were disregarded. Shifter parameters are factors that affect governance costs, such as property rights, contract law, uncertainty, and reputation (Williamson, 1991). Property rights are related to value expropriation by the lack of capacity of firms to guarantee protection against Govern, rival, suppliers, or buyers. Changes in contract law can affect governance costs, because it alters contract enforcement. Uncertainty is disturbances in factors that affect the transaction. Finally, reputation represents a behavioral standard that guarantee or not contracts.

TCE focuses on the reasons by which current transactions are organized under certain governance structures, whereas Davis and North (1970, 1971) are concerned about changes in arrangements. Thus, historic analysis offered by Davis and North (1970, 1971) is complementary to TCE's approach, inasmuch as reasons for the emergence of institutional structures are jointly analyzed along with economizing in transaction costs. The main proposition is that theory of institutional innovation complements TCE's approach. The organization of economic activity, especially regarding the organization of transactions, is still the key issue in analysis, but other elements are included. In this case, exogenous events, source of incomes, action groups, and institutional instruments are put together with asset specificity and shifter parameters. The case of orange juice sector in Brazil illustrates these issues.

3. Orange Juice Sector: Asset Specificity, Action Group and Institutional Arrangementⁱ

Citrus sector in São Paulo state is dedicated to production and exportation of high quality orange juice. It is possible to point four different institutional arrangements throughout sector's history. The first was an embryonic stage in 1960s. Second, during 1970s and 1980s, a deep specialization of the state in orange juice production took place. Third, events in international markets induce change of contracts in the second half of 1980s. Finally, in fourth place, antitrust intervention initiated a new institutional arrangement after 1995.

3.1. Embryonic Stage (1963-1970)

After an intense freeze in Florida in crop season of 1962/1963, the first orange juice processor plant was installed in São Paulo state in 1963, named as Suconasaⁱⁱ. Two other juice processor plants was created in 1964, Citrosuco Paulista (henceforth Citrosuco) and Citrobrasil. Sucocítrico Cutrale (henceforth Cutrale) acquired Suconasa in 1967. Thus, juice processors in 1960s were constituted by three of the largest Brazilian orange exporters, Cutrale, Citrosuco (Fischer Group) and Citrobrasil, who had excess of fruit production. The genesis of orange juice sector in Brazil is related to weather conditions in Florida and excess of orange controlled by large groups of fruit exporters. Brazil was apt to provide high quality orange juice in the moment of lack of juice supply in international markets.

After production break down in Florida, juice prices became attractive and expected profits lead to forward vertical integration of Brazilian orange producers into juice production. Cutrale, Citrobrasil and Citrosuco constituted an action group, who made investments to obtain income from externalities of oversupply of fruits and risk mitigation from international market conditions. The new institutional arrangement is represented by these forward vertical integrations. Action group was able to exploit a large unmet demand for juice and transactions between juice processors and other citrus growers were fragmented

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and without any kind of coordination. These circumstances changed in the beginning of 1970s.

3.2. Growth and Specialization (1970-1986)

Initially complementary, juice production in Brazil presented rapid growth during 1970s and 1980s. Exportation of orange juice increases from 531 tons in 1963 to more than 33 thousands tons in 1970 and, then, to more than 401 thousands tons in 1980. The sector becomes more specialized, as 2% of total orange production in São Paulo was used to produce juice in 1970, while this figure changed up to 81% in 1980. Market size in Brazil, therefore, increased dramatically and it was an exogenous event that induced arrangement innovation. Conflicts between juice processors and citrus growers and between different juice processors became evident.

Under TCE's lens, when specific investments deepen, denoted by specialization in juice production, transactions governed by markets face increasing transaction costs. The adoption of hybrid forms organization can economize those transaction costs, which led to the creation of Committees Citrus in Federal and State level Governments, in the beginning of 1970s. Another important factor is the technological features of production processes, since juice production requires large operation and economies of scale, while citrus growers could easily face diseconomies of scale. Thus, industrial structure in juice processing is naturally more concentrated than citrus growers. It is worthwhile to note the important participation of Cutrale and Citrusuco, who are the leaders of juice processors. These two firms were marked by intense rivalry between them. In the presence of specific investments and power asymmetries derived from industrial structures, citrus growers created their association, called Associação Paulista de Citricultores (Associtrus). Juice processors followed grower's initiatives, creating their association, named Associação Brasileira das Indústrias de Sucos Cítricos (Abrassucos).

Conflicts were signaling problems from industrial structure and specific investments, but both representative associations, Associtrus and Abrassucos, could mitigate those problems through Government participation. During 1970s and 1980s, the presence of Government in economic activity was frequent in agro-industrial relations; for instance, sugarcane, coffee and milk were regulated sectors in Brazilian economy. Collective negotiations between juice processors and citrus growers were intermediated by Abrassucos and Associtrus, and Citrus Committees, especially in Federal Government, adjudicated conflicts. This is a hybrid form of organization.

The increase in market size brought economic gains by arrangement innovation. Juice processors could exert market power and exploit market failures supported by industry structure. Citrus growers, in turn, could economize transaction costs, creating Associtrus and negotiating collectively through Committees Citrus, as well as exercise political pressure to create laws (Hasse, 1987). Associtrus and Abrassucos, therefore, are the action group of the arrangement innovation, using Committee Citrus as an institutional instrument.

3.3. Creation of the Standard Contract (1986-1995)

In 1980s another freeze in Florida increased juice prices and Brazilian juice processors could appropriate higher profits. Citrus growers, however, were not able to take any advantage from international markets conditions. Committee Citrus failed in provide

accordance about this new market condition and, in crop season 1986/87, a standard contract was created as a private solution, excluding Government participation. Creation of the standard contract was intermediated by Abrassucos and Associtrus. The new contract design linked juice prices in New York Board of Trade (NYBOT) to orange prices in domestic markets and its adoption was voluntary. Citrus growers massively adopted this contract and their initial results were beneficial. Change in prices was once again the triggering event of arrangemental innovation. Abrassucos and Associtrus continued as action group.

Beyond change in prices, Brazilian institutional environment was in transformation due to the end of Military Governments in 1980s and economic openness and stabilization in 1990s. Government regulation in economic activity decreased in 1990 and private solutions to transactions coordination emerged as Government moved away. These events occurred in several agricultural sectors and standard contracts were the solution adopted by citrus sector at time. Change in the rules of the game was an exogenous event that contributes to arrangemental innovation as well.

Positive effects from standard contract adoption were only transitory for citrus growers. Juice prices in NYBOT were an important determinant of orange prices in Brazil and these prices became highly volatile. When citrus growers accepted standard contract, they were both accepting benefits from increases in juice prices and accepting risk sharing from decreases in those prices. Then, in the beginning of 1990s, citrus growers faced deficits because orange prices were below production costs. Citrus growers were also dissatisfied with some terms of standard contract, which were not modified in private negotiation between Associtrus and Abrassucos. First, citrus growers claimed that juice processors were deliberately delaying orange harvest, causing dehydration of the fruit implying in lower weight and lower prices. Second, citrus growers requested the change of payment method from weight to solid content, since the amount of juice inside the orange are correlated to its solid content rather than its weight. There was no agreement about these topics.

Standard contracts, therefore, was initially beneficial to citrus growers, but prices volatility led to deficit in the beginning of 1990s. These unfavorable market conditions and disagreements about contract terms motivated Associtrus and other representative associations initiate a litigation process in CADE, Brazilian antitrust office. Citrus growers accused juice processors of concerted action using contract terms in order to deliberately raise profits. CADE accepted the accusations and initiates the legal process, but citrus growers and juice processors decided to sign an agreement, called commitment term to conduct cessation. This agreement does not imply that juice processors recognize their anticompetitive conduct, but it solves the contentious. In this agreement, CADE suspended the use of standard contract and collective negotiations were forbidden. In practice, CADE extinguished the standard contract and the sector starts to pursuit new forms of organization.

3.4. Post-CADE and Backward Vertical Integration (1995-2012)

The end of standard contract had immediate positive effects for citrus growers, recovering better orange prices level. Nevertheless, CADE intervention had transitory effects (Marino and Azevedo, 2003), partly because power asymmetries between citrus growers and juice processor were reestablished by the prohibition of collective negotiations. Associtrus and other representative associations of citrus growers were not successful in CADE litigation and lose space in further negotiations. Change in rules of game imposed by CADE was one event contributing to arrangemental innovation. Another event occurred in 1980s with

impacts on economic organization of 1990s. Cargill, juice processor created in 1970s, introduced a new technology for the logistics of juice industry, substituting steel drums for a “bulk system”. Investments on trucks, port terminals in Brazil and Europe, and specialized ships were made to implement this new distribution system, reducing costs. All relevant players in juice production quickly adopted forward vertical integration of distribution created by Cargill. Given the over capacity in port terminals in Brazil, forward vertical integration of juice distribution is an important barrier to entry in this sector.

In response to those events, in the beginning of 1990s, juice processors started a partial backward vertical integration into orange production and it was observed a continuous increasing path in this effort. Two different and not mutually exclusive explanations are presented. First, in this new context, juice processor industry sector was characterized by a concentrated structure, which depend upon economies of scale due to production technology and distribution investments. Using TCE’s lens, backward vertical integration could be the solution to coordinate orange transactions in order to economize in transaction costs. Thus, technical and transaction costs efficiencies could explain the new form of organization. Vertical integration is partial because orange production technology.

The second explanation is consistent with North’s (1990) view that rulers take advantage of their positions to receive economic income, even if inefficient property rights prevail. In this context, juice processor association, which changed its name to CitrusBR, is the action group. Citrus growers have no role in action group. Thus, backward partial vertical integration increased bargaining power over citrus growers (Azevedo, 1996) – market failures. The argument of bargaining power is reinforced by the fact that Frutesp, juice processor controlled by citrus growers co-operative, shut down in 1993 and there is very low capability of forward vertical integration of citrus growers into juice production. Barriers to entry are high and bargaining advantages from industrial structure and economic organization of transactions are beneficial to juice processors. Specific investments of citrus growers have no safeguards from opportunistic renegotiation from juice processors.

Table 1 summarizes the main features of arrangemental innovations throughout time.

4. Recent Partial Backward Vertical Integration of Juice Processors: Econometric Evidence

Assuming institutional arrangement as the way by which transactions are organized, the most important feature of institutional arrangement post-1995 is the partial backward vertical integration of juice processors into orange production. The five largest juice processors, represented by CitrusBR, conducted this change. Henceforth, firms will not be identified explicitly and their names substituted by letters from *A* to *E*. There are two possible and not mutually exclusive explanations for this trend of vertical integration: efficiency purposes or power exertion even when inefficient property rights prevail (North, 1990, Williamson, 1991). It would be fruitful to separate these effects and evaluate which impact is higher, but this effort is outside the scope of this article. The investigation focuses on identify both determinants to economic organization, and no evaluation about magnitudes or welfare considerations will be made.

Table 1 – Descriptions of Institutional Innovations in Orange Juice Sector

Period	Arrangemental Innovation	Exogenous Event	Income Source	Action Group	Institutional Instrument	Accrued Income
Embryonic (1963-1970)	Large citrus growers forward vertical integration into juice production	Expected profits and change in relative prices derived from climate conditions in Florida	Risk mitigation from market conditions; and externalities due to losses of Florida's orange crop	Large orange growers with oversupply of fruits: Citrusuco, Citrale e Citrobrasil	Not identified	Unmet demand derived from crop breach in Florida
Growth and Specialization (1970-1986)	Collective negotiations through Committee Citrus	Increase in market size	Industrial structures generate market failures; specialization raised transaction costs; and political pressure created new laws.	Representative associations of citrus growers and juice processors (Associtrus and Abrassucos)	Committee Citrus	Juice processor bargaining power due to industrial organization; and transaction costs economizing by hybrid form selection
Collective and Private Negotiations (1986-1995)	Elaboration a standard contract to be voluntarily adopted	Price volatility changed market conditions and modifications in institutional environment changed the rules of game	Increasing risks from instable market conditions; market failures in contract term selection	Representative associations of citrus growers and juice processors (Associtrus and Abrassucos)	Standard Contract	Rents from variation of juice prices in international markets and juice processor influence over contract terms selection
Post-CADE and individual negotiations (1995-2012)	Partial backward vertical integration of juice processors into orange production	Antitrust office changed the rules of game, prohibiting standard contract; and technology innovation of juice distribution	Market failures due to industrial organization and CADE intervention; increased transaction costs; and economies of scale enabled by technology innovations	Representative association of juice processors (CitrusBR)	Not identified	Market power originated by industrial structure and barriers to entry; bargaining power from partial vertical integration; economizing in transaction costs from partial vertical integration; and economies of scale

According to theory of institutional innovation (Davis and North, 1970, 1971), action group alters institutional structures in order to obtain economic gains. Partial backward vertical integration is a modification in institutional structure drove by action group. The influence of action group depends upon of their participation in market. The first hypothesis states that as market share of firms in action groups increases, modification in structures becomes more likely to be observed, i.e. vertical integration increase. It is important to note that it is not assumed concerted operation of firms within action group. It is assumed that action group is capable to alter institutional arrangement by strategic interaction or either by tacit or explicit coalition.

Hypothesis 1 (H₁): increases in market share of firms in action group is positively related to vertical integration

Action group participation must also be distinguished from traditional market power exertion from industrial structure. Organization of industry in orange juice production was concentrated from the beginning. However, the growth of market share of firms in action group is a recent event that is not totally correlated to industrial structure. Relationship between industrial structure represented by concentration ratio of 4 largest firms in market (CR4) and market share of firms in action group is not strongly correlated (0.51). Data suggest that participation of action group is not the same thing as industrial structure and traditional market power exertion. Furthermore, data shows that vertical integration trend is strongly correlated to participation of action group (0.94).

Economies of scale are an important technological characteristic of orange juice sector, especially in juice production. Thus, the second hypothesis argues that increases in size of juice processors are related to expansion of orange production, due to economies of scale.

Hypothesis 2 (H₂): increases in juice processor size is positively related to vertical integration

Beside technical efficiency, vertical integration is also related to efficiencies in transaction costs. Relationship-specific investments, or asset specificity, are those made to support the relationship and lose value in alternative uses (Klein, Crawford and Alchian, Williamson, 1985). In orange production, there are several specific investments: first, it is a perennial crop and new trees remains unproductive for long periods; second, it is an immobile investment in terms of geographic location; and third, types of oranges destined to juice production are not appreciated by fresh fruit consumer. In juice processing, investments in plants are also specific, since plants cannot be used for anything else without additional costs and plants are geographic immobile as well.

Analyzing the relationship between citrus growers and juice processors, the distance between farms and processor plants are called site specificity. First, according to Williamson (1985), “cheek-by-jowl” relationships are more specific, due to redeployment and set up costs. Second, there is temporal specificity, because orange is perishable and it must be processed quickly after harvest. According to Masten, Meehan and Snyder (1991), temporal specificity occurs when threats of delays are conditions to extract prices concessions. The observance of proper harvest period for oranges is important because it affects fruits weight and, consequently, its prices. Observation of harvest period also affects the quality of juice

produced. Distances between farms and plants reduce transportation and coordination costs and also reduce transportation time. Thus, as distances between plants and farms decreases, more specific are the investments and more vertical integration is expected.

Hypothesis 3 (H₃): increases in site specificity are positively related to vertical integration

Relationship between citrus growers and juice processors also presents physical specificity. Physical specificity is related to investments in equipment, machines, and other physical assets with characteristics that are designed to a specific transaction. In citrus growers activity, trees are physically specific because orange type destined to juice production lose value in alternative use. The investment in trees require time – around 4 years – to be fully productive and its redeployment is quite restricted. Thus, as physical asset specificity increases, greater will be transaction costs associated and more vertical integration will be expected.

Hypothesis 4 (H₄): increases in physical specificity are positively related to vertical integration

Finally, juice processors are large firms that possess more than one activity. For instance, Cutrale sells grains, Dreyfus is a big commodity trading and Citrosuco produces apple. In effect, the importance of citrus activity within each firm is different and specific investments in juice processing are not the same across firms. When high specific investments in juice production are involved in firm business, vertical integration are more likely to be adopted and the percentage of total revenues of these firms from citrus activity could indicate the importance of those investments. Joskow (1987) applied a similar measure to assess specific investments in coal markets. Nevertheless, there is no available data to assess the importance of orange juice production within each firm. Furthermore, investments in juice distribution such as port terminals, trucks and ships are highly specific, and no available data were found about it. These are potential specification problems in the model.

4.1. The Model

The following functional form represents the basic model: $VI = f(K, SHIFTPAR, ACT_GP, SIZE, LAND, SUGCANE)$

where,

VI_{it} = Degree of vertical integration, given by quantity of orange boxes produced by i th firm in the t th period divided by total boxes produced in São Paulo state in the t th period (source: Associtrus).

K = Asset Specificity:

K_PHY_t = physical specificityⁱⁱⁱ, sum of the quantity of orange boxes processed by each firm in the t th period divided by total boxes produced in São Paulo state in the t th period. This measure is not firm specific (source: CitrusBR e IEA).

K_SITE_{it} = site specificity^{iv}, given by modified Herfindhal-Hirschmann index (HHI), measuring the concentration of orange production around processing plants for i th firm in the t th period. The index is the sum of

- squares of orange production share in j th city weighted by the squared distance between j th city and plant's city (source: formulated from IEA data)
- $SHIFTPAR =$ Shifter parameters:
 $UNCERT_t$: uncertainty, standard deviation of orange boxes annual prices in the last five years for t th period (source: FNP e CEPEA).
 $PROP_R_t$: overall score of index of economic freedom for t th period, which measures elements such as property rights, business freedom, labor freedom, among others. (source: Heritage Foundation).
- $ACT_GP_{it} =$ Action group, given by market share of i th firm in the t th period (source: IEA, FNP, and Sabes, 2010^v).
- $SIZE_{it} =$ Firm size, given by number of processing plants of i th firm in the t th period (source: according to references in endnote 1).
- $LAND_{it} =$ Land value, average price of land in the region of the i th firm in the t th period. (source: IEA).
- $SUGC =$ Influence of sugarcane sector in orange juice sector:
 $SUGC_P_{it} =$ average value of tenancy for sugarcane production in the region of i th firm in the t th period (source: IEA)
 $SUGC_A_{it} =$ production area of sugarcane in the region of i th firm in the t th period. (source: IEA)

Interest variables are action group (H_1), firm size (H_2) and site and physical asset specificity (H_3 and H_4). In addition, consistent with transaction costs propositions, parameter shifters can influence the choice for governance structures. Whereas TCE's theoretical propositions do not specify expected effects for shifter parameters, it is expected that uncertainty is positively associated to vertical integration because more hierarchical coordination is better to deal with uncertainty. Regarding property rights, it is expected that increases in the quality of property rights index are negatively associated to vertical integration, because it is less costly to avoid value expropriation through markets or contracts. Parameter shifters are not firm specific.

Control variables include: land value and sugarcane influence over orange sector. It is expected that land value is negatively associated to vertical integration, since increases in land prices can inhibit expansion of vertical integration. Sugarcane crop is located in the same region of orange crop and these two products compete for land. Thus, price of land tenancy to sugarcane production can attract citrus growers to change their crop from orange to sugarcane. It is expected that increases in prices of land tenancy to sugarcane is positively associated to vertical integration, because juice processors will seek to guarantee their supply of fruits. Furthermore, increases in the production area of sugarcane can threat orange supply and it is expected that these increases are positively associated to backward vertical integration.

4.2 Data and Methods

This is an exploratory study, as theory of arrangemental innovation was not empirically tested along with transaction costs propositions. Beside, empirical tests of TCE use cross-sectional data of several transactions, correlating asset specificity to organizational choice. This study advances in empirical inquiry under TCE lens using longitudinal data of just one transactions, including effects of parameter shifters. Advancing even further, the

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model tested technical efficiency along with TCE's traditional measures of asset specificity, which is important to analyze possible tradeoffs between production and governance costs increments to define the boundaries of firm. In effect, this model put together two elements presented in Williamson's (1985: 93) heuristic model rather than to focus only on governance costs. At last, action group is included to investigate the influence of specific group of firms in the institutional arrangement, complementing transaction and production costs analysis.

Sample contemplated 15 years period, from 1993 to 2007, for five juice processors within action group. This is an unbalanced panel data, since there were juice processors that closed operations during this period and there is no available information about market share in 1994 for one of juice processors. Hence, a total of 70 observations are available for major part of variables. Property rights index, land prices and tenancy prices for sugarcane are available between 1995 and 2007, which means that models with these variables were estimated using 61 observations. Table 2 shows descriptive statistics and correlation matrix.

Table 2 – Descriptive Statistics and Correlation Matrix

Variable	Mean	Std. Dev.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. <i>VI</i>	0.0316	0.028	1									
2. <i>K_PHY</i>	0.7749	0.0833	0.32*	1								
3. <i>K_SITE</i>	0.0004	0.0002	0.11	-0.05	1							
4. <i>UNCERT</i>	1.0374	0.2617	0.05	-0.09	0.16	1						
5. <i>PROP_R</i>	57.89	5.11	0.38*	0.16	0.28*	0.65*	1					
6. <i>ACT_GP</i>	2.9142	1.1098	0.84*	0.25*	0.08	0.10	0.38*	1				
7. <i>SIZE</i>	0.1734	0.0863	0.71*	0.16	0.36*	-0.02	0.13	0.70*	1			
8. <i>LAND</i>	10427.2	3603.5	0.31*	0.17	0.05	-0.23	-0.19	0.23	0.39*	1		
9. <i>SUGC_P</i>	603.3	100.1	-0.03	-0.05	-0.11	-0.31*	-0.14	-0.02	0.15	-0.03	1	
10. <i>SUGC_A</i>	1.3x10 ⁵	2.4x10 ⁴	-0.23	0.17	0.27*	0.06	0.27*	0.19	0.17	-0.23	-0.06	1

*at 0.05

Econometric model is specified as follow:

$$\begin{aligned}
 VI_{it} = & \beta_0 + \beta_1 K_DED_t + \beta_2 \ln K_SITE_{it} + \beta_3 UNCERT_t + \beta_4 PROP_R_t + \beta_5 SIZE_{it} \\
 & (+) \quad (+) \quad (+) \quad (-) \quad (+) \\
 + & \beta_6 ACT_GP_{it} + \beta_7 \ln LAND_{it} + \beta_7 \ln SUGC_P_{it} + \beta_8 \ln SUGC_A_{it} \\
 & (+) \quad (-) \quad (+) \quad (+)
 \end{aligned}$$

where, variables were defined in section 3. Expected effects are in parentheses right below each variable. This is a long panel, since it has relatively many time periods and few firms. It is also an unbalance panel. Given these characteristics, models were estimated by panel-data models using generalized least squares (xtGLS) and linear regression with panel-corrected standard errors (xtPCSE).

4.3. Preliminary Results

Table 3 presents the results. In general, economies of scale and participation of action group hypotheses are supported by empirical evidence (H_1 and H_2 , respectively). Economizing in transaction costs not only is not significant regarding physical specificity, but also negatively associated to vertical integration regarding site specificity. The negative

relationship between site specificity contradicts transaction costs arguments, but only two models present significant and negative association. Thus, hypotheses 3 and 4 are not supported by empirical evidence. Also related to TCE's arguments, uncertainty presents significant and positive effects in three models, as expected, and property rights are not significant in orange juice sector.

Table 3 – Results

	1	2	3	4	5	6	7
	1993-2007 xtGLS ⁽¹⁾	1993-2007 xtGLS ⁽²⁾	1995-2007 xtGLS ⁽²⁾	1993-2007 xtPCSE ⁽³⁾	1993-2007 xtPCSE ⁽⁴⁾	1995-2007 xtPCSE ⁽⁴⁾	1995-2007 xtPCSE ⁽⁵⁾
<i>K_PHY</i>	0.0006 (0.06)	0.00007 (0.01)	0.0011 (0.11)	0.0059 (0.43)	-0.0028 (-0.23)	-0.0015 (-0.15)	0.0071 (0.49)
<i>K_SITE</i>	-0.0035 (-1.54)	-0.0053 (-2.81)***	-0.0026 (-0.99)	-0.0018 (-0.67)	-0.0046 (-1.93)*	-0.0030 (-1.08)	-0.0035 (-1.48)
<i>UNCERT</i>	0.0027 (0.66)	0.0044 (1.60)	0.0129 (2.23)**	0.0013 (0.25)	0.0030 (0.70)	0.0149 (2.64)***	0.0176 (2.62)***
<i>PROP_R</i>			0.0001 (0.40)			0.0002 (0.96)	0.0004 (1.33)
<i>ACT_GP</i>	0.1220 (5.21)***	0.1011 (5.67)***	0.1432 (5.44)***	0.1571 (6.15)***	0.1164 (5.20)***	0.1606 (5.46)***	0.2325 (9.36)***
<i>SIZE</i>	0.0087 (4.30)***	0.0087 (5.46)***	0.0096 (4.51)***	0.0090 (4.68)***	0.0093 (5.46)***	0.0102 (4.94)***	0.0059 (3.53)***
<i>LAND</i>			-0.0016 (-0.44)			0.0007 (0.21)	0.0082 (2.21)**
<i>SUGC_P</i>			0.0131 (2.38)**			0.0136 (2.84)***	0.0204 (3.01)***
<i>SUGC_A</i>	0.0025 (0.37)	0.0101 (1.83)*	-0.0041 (-0.58)	0.0041 (0.56)	0.0106 (1.60)	-0.0030 (-0.46)	-0.0142 (-2.30)**
	<i>N</i> = 70	<i>N</i> = 70	<i>N</i> = 61	<i>R</i> ² = 0.6141 <i>N</i> = 70	<i>R</i> ² = 0.3344 <i>N</i> = 70	<i>R</i> ² = 0.6766 <i>N</i> = 61	<i>R</i> ² = 0.8617 <i>N</i> = 61

***at 0.01; **at 0.05; *at 0.10.

⁽¹⁾ Specifying heteroskedastic error structure with no cross-sectional correlation and first-order autocorrelation structure; ⁽²⁾ Specifying heteroskedastic error structure with no cross-sectional correlation and panel specific first-order autocorrelation structure; ⁽³⁾ Specifying that, within panels, there is first-order autocorrelation and that the coefficient of the autocorrelation process is common to all the panels; ⁽⁴⁾ Specifying that, within panels, there is first-order autocorrelation and that the coefficient of the autocorrelation process is specific to each panel; ⁽⁵⁾ Specifying that there is no autocorrelation.

Land prices are significant and positively associated to vertical integration in model 7, contradicting the expected effect. Sugarcane sector, in turn, presents impacts on orange juice activity. The effects of tenancy prices for sugarcane are significant and positive, as expected. Orange juice processors can vertically integrate orange production to guarantee the supply of fruits. The area occupied by sugarcane presents negative and significant effect in just one model, contradicting the expected direction. Nevertheless, the directions of the effects of this variable changed from one model to another. The same problem occurs with physical specificity and land prices. Changing signs among models suggest problems in econometric

analysis and more detailed adjustments are necessary. Thus, this is a preliminary result and cautious is recommended to draw conclusions from those results.

5. Concluding Remarks

The aim of the paper is to explore how theory of institutional innovation can complement transaction cost analysis. Broadly, arrangemental innovations in orange juice sector are analyzed using both theory of institutional innovation and TCE. Specifically, the determinants for vertical integration in orange juice sector included variables from transaction costs and theory of institutional innovations lenses. Results are preliminary, because econometric adjustments are necessary. Nevertheless, empirical evidence suggests that action group is relevant to explain vertical integration path in orange juice sector after 1995.

Furthermore, the analysis has some limitations. First, there is a specification problem in the model, as specific investments in citrus sector in each firm – since firms are diversified – is not included in the model. Second, previous institutional arrangements, such as markets, hybrid forms constituted by Committee Citrus and standard contracts, and even antitrust intervention, have failed to solve problems of coordination in orange juice chain. In these circumstances, hierarchical solutions are expected to deal with transaction costs. In effect, failure of standard contracts and inability of antitrust office and other private mechanism to promote another efficient governance mechanism is a shifter parameter not included in the model. Third, sample size limit the use of econometric techniques and more refined estimations must be performed.

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ⁱ The historical description was extracted from Hasse (1987), Moreira e Moreira (1991), Amaro (1991), Azevedo (1996, cap. 4), Maia (1996), Vegro, Veiga Filho e Amaro (2003), Marino e Azevedo (2003) e Neves e Lopes (2005, cap. 2). Furthermore, we consult publications about the sector, reports, articles from newspapers, and

ⁱⁱ In fact, before 1963 there was an incipient production of orange juice with two leading firms, Seiva and Companhia Mineira de Conservas. One can say that the orange juice was not the main activity of these firms. Suconasa was the first company whose main activity was the production of orange juice.

ⁱⁱⁱ This variable also captures temporal specificity effects.

^{iv} Concentration ratio indicates the extent in which orange production is geographically concentrated around cities where processing plants are installed in each firm and each year.

^v Paper presented in conference (Encontro Nacional de Engenharia de Produção). Author: SABES, J. J. S. Title: Medidas de Concentração no Processamento de Laranja no Estado de São Paulo, no Período de 2000/01 a 2007/08.