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Productive Systems of Animal Protein in Brazil: Characteristics of the Transactions between Producers and Processing Industries in the State of Mato Grosso Do Sul

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ABSTRACT

Background: In the area of agribusiness, mainly in studies stemmed from the "Commodity System Approach (CSA)" School, the use of Transaction Cost Economics as a theoretical model becomes increasingly constant. This constancy is due to the similar characteristics of the two bases of study: focus on a product/transaction and the systemic view/influencing factors of the transaction. Yet, using this framework is constantly related to individual analysis of only one Agro-industrial System (AIS), whereas in this research three systems with similar characteristics are studied. The research is exploratory, descriptive with qualitative approach, and also has the content of quantitative research by means of the ordinal logistic regression model. Analyses of the first approach were grounded in 98 observations with semi-structured questionnaires, whereas in the second approach 86 observations of structured questions were used. **Objective:** Thus, the present work has as its main objective to present and compare the organization of the productive systems of poultry; swine and cattle in the state of Mato Grosso do Sul (MS), Brazil. **Results:** The main result is that the factors that have influence on the transaction pattern of agribusiness systems of poultry, swine and cattle in Mato Grosso do Sul are: time in producing agent activity; the tradition of the producing family; and participation in associations and/or cooperatives. Other emerging points of the results found are the similarities among the three AIS, such as: the transaction pattern with recurring frequency, with medium uncertainty and high specificity. Moreover, as results, differences are highlighted mainly perceived in the forms of governance and the profile of each producer. **Conclusion:** Therewith, the contribution of the research to the field of Transaction Economics is the perception of the influence of other factors, besides traditional ones (frequency, uncertainty and asset specificity), on the transaction pattern in the Agribusiness Systems of poultry, swine and cattle in MS.

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INTRODUCTION

The primary production sector (specifically those within the agribusiness systems of animal protein; cattle, swine and poultry) proves to be increasingly important to the rise in competitiveness and development of Brazilian agribusiness. As evidence of this, there was an increase of 13.77% in income from the activity of beef cattle, 15.81% in pig farming, 18.52% in poultry farming (Cepea, 2013). Moreover, these activities added to the gross value of Brazilian agricultural production R$ 112 billion in 2013 (Seapa, 2014).

The importance of cattle breeding is proven by *Food and Agriculture Organization* (Fao, 2013), which states that raising animals for slaughter, on a global level, is the main demand in agricultural lands. This is because such activities are increasingly demanded by a change in diet and food consumption patterns to products of animal origin, mainly represented by the increase of consumption in Asian countries.

At the state level, Mato Grosso do Sul (MS) is emerging as an important agent in the construction of competitive differentials in the Brazilian cattle breeding system. The state ended the year 2013 as the second largest cattle slaughterer in the country, producing approximately 139.3 thousand tons of fresh meat exported, and 4.1 million slaughtered cattle. With swine, it was the eighth largest slaughterer, with about 1.2 million

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slaughtered pigs and an exported 12.7 thousand tons of fresh pork. It was also ranked as the eighth largest slaughterer of chickens, with 153 million head and 138.9 thousand exported tons of fresh chicken (Ibge, 2013).

Given the global, national or state relevance, the productive chains of animal protein of Mato Grosso do Sul, in particular, cattle, swine and poultry, presents the following research problem: What factors have the greatest influence on the transaction pattern of agribusiness systems of poultry, swine and cattle in that state?

This study aims to describe and analyze the organization of the three main animal protein production systems in MS state. Specifically, there have been issues as: i) how is the profile of each type producer characterized? ii) what is the transaction pattern between processing industry and producers? iii) how is the coordination between agents made? iv) how is the institutional environment characterized? v) what factors influence the pattern of the transaction?

This analysis is crucial to the decision making process of managers in these productive systems, the premise upon which lies the importance of this study.

This paper is structured into five sections besides this introduction. The first section presents the theoretical framework, that is, the assumptions of New Institutional Economics (NIE), more specifically, the Transaction Cost Economics (TCE) and the Theory of Measurement Cost (TMC). The second part describes the Agro-industrial System (AIS) from three different types of activities: cattle, poultry and swine farming. After that, it describes the characterization of the institutional environment, which permeates the transaction in each chain. In the subsequent section, methodological procedures are externalized, and the results are presented in sequence. Finally, in the sixth and final section, some closing remarks are posed, and recommendations arise from the resulting conclusions of this research.

MATERIALS AND METHODS

Theoretical Approach:

The Transaction Cost Economics and the Theory of Measurement Cost will develop the theoretical framework from the presentation of the analysis variables proposed. Subsequently, a discussion is carried out on the analytical framework of the transaction within the scope of an agro-industrial system.

Transaction Cost Economics:

The creation of the concept of a firm started through changes in neoclassical thought and brought about important grounds for the New Institutional Economics (NIE). In the neoclassical concept, the firm was seen only as a productive system. When this traditional approach was modified in the NIE, the firm came to be understood as a set of various contracts, being the basis of studies since the mechanism via price was no longer adequate for understanding the market (Coase, 1937). Although not yet explicit, it was already possible to observe in this article the relevance of transaction cost, originated as the cost of organizing a production system, proposed as internal to the firm or between firms.

For the understanding of Transaction Cost Economics it is necessary to address an analytical micro view of the economic system (Williamson, 1993a). Evidence is the emphasis on the basic unit of analysis, the transaction, also detailing the governance structures and the behavior of agents within the environment in which they live. The institutional environment is characterized as the "rules of the game" - from formal to informal characteristics, individuals as the "players" - agents who are conducting negotiations within this environment, and the governance structure explained as the "ways to play".

The importance of understanding the institutional environment is due to the fact that through the institutions it is possible to reduce transaction costs, that is, to make the market more attractive and beneficial (North, 1990). The inclusion of this understanding, according to Joskow (1993), rose with the work "Markets and Hierarchies", by Williamson (1975), in which he argues for the need of using institutional arrangements to manage the transaction more efficiently, in other words, to optimize the effectiveness of its governance, and thus, decrease their *ex-ante* (preparation) and *ex-post* (monitoring) costs of the transaction.

Within this environment arise institutions, known as the "rules of the game", which directly influence the transaction pattern, creating benefits for those involved and, at the same time, shaping constraints that define and limit the agents' decisions (North, 1990). For this same author, the institutional environment involves two types of institutions: formal, with delineation of laws and any type of regulation by the State; and informal, with guidelines grounded in social and ethical behavior defined in a non-written way, either by a culture or even by the tradition of a class.

According to Williamson (1979, 1983) the transaction must be analyzed based on its attributes: i) frequency; ii) uncertainty and iii) asset specificity. Moreover, the author relates the nature and the change in institutional settings as replacing providers of governance forms according to the combination of these three dimensions.

Farina (1999) conceptualizes the attribute frequency as the recurrence of the transaction between the same agents, and the more frequent this relation, the smaller will be the relative costs of *ex-ante* and *ex-post*

transaction, due to the decrease in the cost of preparing and monitoring, besides the development of reputation. Still according to this author, the uncertainty is seen as gaps and unpredictable events of a negotiation, characteristics strongly associated with behavioral assumptions of individuals, opportunism and bounded rationality.

These two assumptions can be understood as the pursuit of self-interest in order to gain more value in the transaction (the tendency to breach of contract) and the limit of the cognitive ability to understand the information and formulation of complete contracts, respectively (Williamson, 1993b).

The asset specificity, according to Williamson (1983, 1991), can be: i) location: characteristics that underlie the concept of distance, so that there are transactions of 'cheek-by-jowl' and usually immobile assets (high cost and/or loss of value in transportation); ii) physical: the need for machinery and/or structural materials used in production; iii) human: investments in staff, either expertise for production or behavioral for the transaction management; iv) dedicated: increases in production capacity to meet a specific demand for a buyer, and with the extinction of this negotiation, there will be a sizable loss in investment and increase in stock; v) brand: capital embodied in an asset due to a nominal attachment, without referring to the physical or human capital; vi) time: transactional values closely linked to the time of negotiation in a transaction, changing both positively - wines, and negatively - perishables.

Williamson (1996) proposes three mechanisms of transaction governance: market, hybrid forms (contracts) and hierarchy (vertical integration). To this end, the transaction characteristics (frequency, uncertainty and asset specificity), the assumed behavior of agents (opportunism, bounded rationality) and the institutional environment are considered. For this author, the key variable for choosing the most appropriate governance mechanism to coordinate a transaction is asset specificity (Figure 1). In this figure it is observed that by the K_1 point the best alternative in terms of transaction costs is the market governance. In the gap between the K_1 and K_2 the least expensive governance mode is the hybrid (contracts). And as the last means of hiring, it comes via vertical integration at a lower cost from the point K_2. Therefore, in the relationship between costs and specificity, the market can be understood as the one with the lowest cost if there is little specificity; the hybrid form is found in a balance with the specificity term; and high specificity if the vertical integration is at the opposite limit to the market.

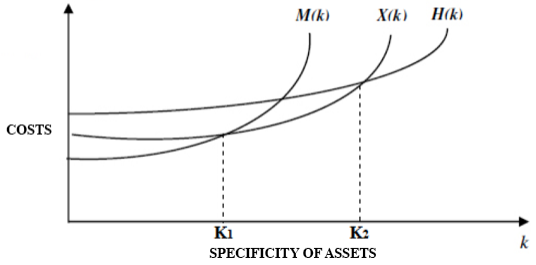

Fig. 1: Analysis of transaction costs based on the relationship governance structure versus asset specificity.
Source: Williamson (1996).

Yet according to this author, choosing the most efficient coordination mechanism, that is, through the choice of the most effective governance mechanism can reduce transaction costs. Considering asset specificity, it is possible to conclude that the more specific the characteristics of the transaction are, the more efficient the hierarchical governance will be, while the smaller the specificity is, the more advantageous will be the coordination via market. It is worth recalling that there are hybrid forms between the extremes of this classification.

However, Brickley, Smith and Zimmerman *apud* Zylbersztajn (2000), analyze the most efficient way of governance based on the relationship between the "asset specificity" and "uncertainty" attributes (Table 1).

It is observed that besides the transaction costs, especially in the attributes of uncertainty and asset specificities, an important element for understanding the governance form is the measurement cost, which is the topic of our next subsection.

Table 1: Governance Mechanisms (Uncertainty x Asset specificity).

ASSET SPECIFICITY	UNCERTAINTY		
	Low	Medium	High
Low	Market (governance via price)	Market (governance via price)	Market (governance via price)
Medium	Hybrid forms (contract)	Vertical Integration or hybrid forms (contract)	Vertical Integration or hybrid forms (contract)
High	Hybrid forms (contract)	Vertical Integration or hybrid forms (contract)	Vertical Integration

Source: Brickley, Smith and Zimmerman (1997) *apud* Zylberstajn (2000).

Measurement Cost Theory:

The desire to fill some gaps in the descriptive analysis of the transaction from the Transaction Cost Economics, and closely linked to the measurement of the attributes on trade, the Measurement Cost Theory (MCT) arises. Developed by Yoram Barzel, this theoretical approach emerges as another extension of NIE.

This construct has as its main objective to measure the product characteristics under negotiation and identify the best form of transaction governance among agents. For this, it starts from the analysis of the allocation of economic rights and the rights of property ownership. This classification is outlined in difficulties and in facilities to measure transacted attributes, that is, the higher or lower costs in measuring the attributes.

The classic case of analysis proposed by Barzel (1982) is a report on the acquisition of an orange and the measurement costs of involved attributes. Verifying the produce weigh and color incurs in little or even no loss of value in the negotiation, since weighing can be performed using great amounts of produce, while the fruit color quality can simply be visually inspected. However, as for juice measurements and taste there might be higher costs since the fruit needs to be squeezed to quantify the juice volume or the fruit even needs to be tasted. Naturally, in this last scenario there is always the possibility of an opportunistic behavior, given the fact that those who produce and sell will have more accurate and precise data compared to those who consume and purchase – this phenomenon is known as information asymmetry.

The same author states that for elements that present more difficulty for measurement, estimation models commonly anchored by statistical analysis are proposed, although always followed by a margin of error. According to the author, in order to mitigate errors and opportunistic behavior, four arrangements are suggested: product guarantees, shared contracts, trademarks, and the suppression of information. Thus, the provision of guarantee, even with an ineffective measurement solution (costly and with errors), assures the seller not to sell a product at a price below its value, also protecting the buyer in order to make him aware of the relationship price/value, and assisting in filling the gaps in quality control by industry.

The shared contracts, in turn, are effective arrangements for when there is involvement of three parts: the producer, the seller and the buyer. The remuneration of the producer depends on the value gains obtained by the seller, and these according to the quantity sold to the final consumer. It can be observed that the seller actually becomes an intermediary between the producer and the final consumer, thus causing a division of risk without a fixed payment to the producer and a creation of an uncertain future value to the seller. It has been observed that branding products enhances the seller reputation and the trust placed on them by the buyer. This positive image of the product reduces the measurement costs for the buyer during negotiations. In this situation, the industry costs are also reduced since it stops estimating the production process. However, with the decrease in making these estimates, it is possible to observe that an undetected error can tarnish the image quality of products that are not defective, thus bringing harm to the seller (Barzel, 1982).

When listing the availability of information, this same author describes that negotiations are really finished only when individuals perceive a high value on the traded product, where usually the seller seeks to achieve a high price for a few qualities and the buyer looks for a product with high quality and low price. It is noted that the search for self-interest on both agents, that is, opportunistic behavior emerges. At the same time, it is possible to relate the asymmetric information, recurrent variable for the analysis of the Transaction Costs Theory, when the products are difficult to measure (because the parties have greater contact with the asset in transaction, and therefore, have more accurate information). To coordinate the relationship of exchange and the risk levels of the transaction, different forms of governance emerge, such as: i) spot market; ii) *caveat emptor* and auctions iii) long-term relations, contractual relations guaranteed by the State and iv) relationships internally governed by organizations. The factors that have a higher level of influence for the choice of these governance mechanisms are: i) cost/difficulty of measuring the attributes of the transaction; ii) the cost to form long-term relationships; iii) the quality of the contract guaranteed by the State; iv) the number of individuals involved in relaying information (Barzel, 2002).

Within the spot market the role of the "invisible hand" of Adam Smith, can be observed. In such scenario agents perform their negotiations based on short term relationships mainly rooted in the point of price (Caleman *et al*., 2006).

In auctions and in the *caveat emptor* relationship the measurement performed by the buyers is noticed at purchase point and also through samples – and they are prone to present mistakes as well as being exposed to the participation of third parties not directly involved in controlling such transaction. Thus, a reduction in the measurement cost can be noticed. Antagonistic characteristics of auctions and the *caveat emptor* relationship are observed in long-term relationships. Primarily on account of arrangements - brand (Cost Measurement Theory) and reputation (Transaction Cost Economics) - verbal promises and guarantees are made in order to prompt the buyer to verify attributes acquired by a lower cost in a consumption moment. However, for this type of governance to exist, the resources expenses must be proportional to a seller's gain if there is a breach of contract. Thus, the higher the gain obtained in the breach, the greater the investment to achieve this long-term relationship (Barzel, 2002). Among long-term relationships and contractual relationships guaranteed by the State, insomuch as it operates only on a contractual breach without direct participation in trading, different

characteristics are perceived. The same author states that when there are transactions whose attributes are easily measurable there is an advantage in choosing the contracts, but when there is the involvement of more subjective aspects more prone to errors, long-term relationships prevails along with factors such as brand and reputation.

In relationships internally governed by organizations, better known for vertical integration, the search for information is done in a hierarchical way. Thus, as the measurement costs decay, the greater the number of activities conducted by the market and, hence, the fewer the amount of activities that will be developed within the firm. Thus, it is evaluated that the Measurement Costs Theory allows great flexibility in the choice of governance mechanism according to the facility of measurement and standardization of products, bringing with it a fair share of both economic and property rights (Caleman *et al*. 2006).

Method:

This is an exploratory and descriptive study with qualitative and quantitative approach. The study objects are the poultry, swine and cattle Agribusiness Systems in the state of Mato Grosso do Sul. According to Vergara (2007), exploratory research is that which takes place within a study area where there are still some gaps, while, according to the author, descriptive research refers to the exposure of characteristics and behaviors of a specific phenomenon.

The unit of analysis is the transaction between creators (cattle, poultry and pig farmers) and the manufacturing industry. We sought to identify the transaction pattern in such transactions and, therefore, the acquisition of animals was analyzed under the "commodity" standard. For the purpose of this research "standard commodity" is understood as a product that does not have brand, seal or certification audited by third parties.

The primary data used for analysis were raised through the application of semi-structured questionnaires to farmers (cattle, pig and poultry farmers). The sample number consists of 98 observations, 40 cattle farmers, 25 pig farmers and 33 poultry farmers. Depending on the availability of respondents, the survey questionnaire was applied either personally (60% swine, 100% poultry and 30% cattle) or by telephone (40% swine, 0% poultry and 70% cattle). To identify the respondents, considering the cattle farmers, we used the registration of producers provided by the State Agency for Animal and Plant Health Defense (IAGRO/MS) together with contacts provided by Early Calf Producers Association of Mato Grosso do Sul (ASPNP). As for poultry and pig farmers, producers' contacts were transferred by producers' associations, Association of Integrated Poultry Farming of Mato Grosso do Sul (AVIMASUL); Association of Pig Farmers in Itaporã (ASSUITA) and Cooperative of São Gabriel do Oeste (COOASGO).

Besides the qualitative analysis, a quantitative view was approached, in which structured questions were included in the data collection instrument. They served as the basis of this analysis, using the statistical model of ordinal logistic regression consisting 86 observations.

RESULTS AND DISCUSSION

To perform the qualitative analysis of the results descriptive statistics (mode and frequency) were used. These resources focus on specific objectives proposed for the system: i) how is the profile of each type of producer characterized?; ii) what is the transaction pattern between the processing industry and producers?; iii) how is the coordination between agents made?; iv) how is the institutional environment characterized?; v) what factors influence the transaction pattern?

Profile Characterization:

A characterization of the producers is observed (Table 1) through the diversity of the sample, especially given the fact that there are large and small producers, with very little experience and high and low productivity. Moreover, it is observed that 75% of poultry farmers are represented by the municipalities of Dourados, Sidrolândia and Fátima do Sul; 68% of swine farmers are from São Gabriel do Oeste and Itaporã. On the issue of tradition in the activity, the poultry farmers stand out as the youngest farmers in the data set, with 70% being the 1st generation of the family to work with such activity; at the other extreme, there are the cattle farmers with 45% being the 3rd generation.

Table 1: Producers' Characterization.

	Poultry Farmers	Cattle Farmers	Pig Farmers
Average time of activity (years)	14	24	9
Average slaughtering volume year (*)	103.000	8.000	2,8 lots

Source: Research Data. Observation: (*) in the last 03 selling periods

Considering the organizational environment and the participation of producers in class organizations, it was observed that 84% of pig farmers participate in a cooperative, 65% of cattle farmers and 78% of poultry farmers participate in an association. In relation to technological aspects, it was observed that 80% of cattle farmers and

81% of poultry farmers inform the use of advanced technologies for breeding animals, while only 36% of pig farmers make use of this technological update with great frequency.

Besides the important analysis focused on the profile of the producers made in this subtopic, it is necessary to carry out an analysis of the transaction pattern that these creators have with their respective industries, and this very issue is addressed in the next subsection.

Transaction Pattern:

In characterizing the transaction pattern between the processing industry and the producer, several differences between each activity arise (Table 2). In line with Farina (1999), the validation of the analyzes are based on the perspective of negotiation, that is, the delivery of the final product, and this interpretation is related in poultry, pig and cattle farming during the period of animal fattening and subsequent sale. Therefore, poultry farming is the one that presents the most recurring frequency in the transaction (approximately 45 days); following is the pig farming with approximately 120 days. In cattle farming it is more difficult to assess the frequency of a transaction given the large difference in markets of this activity in MS. It is noted, however, a lower frequency in the transaction, such as the market of Early Cattle which performs the shortest fattening/slaughtering/sale time and yet their negotiations occur with a range of about 24 to 30 months.

Table 2: Transaction Pattern.

	Poultry Farming	Pig Farming	Cattle Farming
Frequency	Recurrent (45 days)	Recurrent (120 days)	More periodicity
Uncertainty	Medium	Medium	Medium
Asset specificity	High physical specificity, dedicated assets, location. Medium human specificity.	High physical specificity, dedicated assets, location. Medium human specificity.	High physical and human specificity.

Source: Research Data.

Within the evaluation of uncertainty a result was found as the average for the three systems under analysis. In the negotiations among those who raise poultry, swine and cattle and the industry, there were reports of unpredictable events, mostly related to the loss of value for the farmer, such as: livestock transportation accidents, change of agents in the industry – changes in management personnel in the industry. However, at the same time, it was noted that there is some level of trust among the agents and all three agro-industrial systems.
In relation to specificity, it is understood that poultry and pig farming present: a) a high physical specificity, because both activities t on this investment; b) dedicated assets (investment losses with the change in activity); c) location specificity (the need for proximity to the industry, as there are sizable losses in values due to animal transportation in carequire a large investment in machinery and structure as the value of the transaction is proportionally dependense of long distances, the longer the distance for the delivery of larger animals, the greater the losses in the value of the transaction, and as a result, lower revenue because of dead or injured animals and; d) average human specificity, since it is necessary to use skilled labor in the handling and control of animals. However, the support of handling performance is grounded in empirical and past knowledge through the exchange of generations of rural families. When it comes to sanitation, specialized products provide strong performance; human labor is just a complement to vaccines and other drugs. Raising cattle is seen as a high physical specificity, due to large investments required for its required structure for confinement and/or semi-confinement. Not using such structures means a loss of value in the transactions and high human specificity because of the great need for labor force in animal handling.

For the evaluation of the difficulty in measurement, relevant attributes for the negotiation were taken into consideration, such as weight, health, conversion rate, age, mortality rate, and quality and fat coverage rate. In poultry farming the difficulty was due to attributes such as food conversion rate, age and mortality rate, as the information to control these attributes belong only to the industry; in cattle farming the cause of uncertainty relates to the measurement of the thickness of the subcutaneous fat of animals - this characteristic is evaluated only in some niches, such as the sale of early calves; in pig farming there is relative difficulty in transactional aspects like food conversion and quality rate - the first is identical to that of poultry farming (information not available by that industry) and the latter due to the subjectivity of the concept "quality", that is, producers failed to accurately state what would characterize high quality swine livestock.

Transaction Coordination:

Within the poultry industry it was evidenced exclusivity by transaction coordination through formal contracts with industries, that is, 100% of all negotiations are intermediated through contracts, these being called partnership or integration contracts. Therefore, a high level of formality in the relationship among agents was observed (Figure 2). There is a close relationship between producers and industry. The latter provides much of the production inputs, such as: chicks, feed, medicine, vaccines, veterinary care, etc. The producer is responsible for the physical structure (poultry and its technologies) and the labor force for the production.

In pig farming, the same evidence of coordinated negotiations through contracts was found. However, the presence of some transactions through informal agreements was observed, and these were negotiated within different attributes of transactions and contracts, such as: weight, quality, sanitation; and also the presence of transactions via market. Nevertheless, it has been pointed out that the main characteristic of transactions via market is that large farmers choose to adopt them. Therefore, in this AIS, a shift towards informality and governance via market was visualized, as shown in Figure 2.

In cattle farming, the presence of several forms of transaction coordination was observed: contracts, via market and association/cooperative intermediaries. The contracts are exercised in very specific niches, as occurs in the case of organic beef; via market are the most regular transactions without specific characteristics; through association/cooperative there is the presence of specific niches like the sale of early calves. For intermediaries use there was a large-scale production as the main characteristic, that is, the use of specific offices for the sale completion. Thus, it was possible to observe, in accordance with Figure 2, the use of different governance forms and the presence of different degrees of formality in the Agro-Industrial System of cattle.

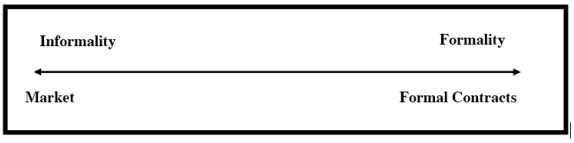

Fig. 2: Scale of Formality in Governance Forms **Source:** Developed by the authors.

In this coordination of transactions it is essential to observe all factors that can influence the formation of these costs. One of them, the institutional environment, is influential and subject of our next subtopic.

Institutional Environment:

The institutional environment that permeates the relationship between industry and the producers of these three production systems of animal protein in Mato Grosso do Sul (MS) have specific regulations comparable to all, and also some divergent institutional specificities due to the peculiarities of each system. Among their equalities are: a) provisions on integration contracts, establishing conditions, obligations and responsibilities in contract relationships between integrators and integrated producers (Brasil, 2013); b) alteration of disease lists under the application of animal health protection measures, provided in art. 61 of the regulation of animal health protection service (Mapa, 2013b); c) the technical regulation of handling pre-slaughter and humane slaughter (Mapa, 2013a); d) the institution of animal health protection in Mato Grosso do Sul (Ms, 2009); e) the establishment of general procedures of recommendations of better practice in welfare for animal production and economic interest – REBEM, covering systems of production and transportation (Mapa, 2008b); f) the technical regulation of health-hygiene and technological inspections of animal waste processing and the model document of animal waste transport (Mapa, 2008a); g) the provision of animal health protection in the state of Mato Grosso do Sul (Ms, 1999); h) the definition of criteria for the classification of carcasses for the national territory (Brasil, 1969); i) approval of the new regulation of industrial and sanitary inspection of animal origin products (Brasil, 1952); j) change in the regulation of industrial and sanitary inspection of animal origin products (Brasil, 1962); k) change in the regulation of industrial and sanitary inspection of animal origin products (Brasil, 1973).

In relation to their particularities there are: a) the rules for the trade of live birds in the state of Mato Grosso do Sul [Poultry] (Ms, 2014); b) the zoo-sanitary requirements for each state for the importation of swine for breeding [Pigs] (Mapa, 2013c); c) the steps of foot and mouth disease (FMD) vaccination [cattle] (Ms, 2012); d) the prohibition of importation, production, marketing and use of substances with hormonal anabolic activities for the purpose of growth and weight gain in slaughter cattle [cattle] (Mapa, 2011); e) the implementation of the national program for the eradication and prevention of FMD (PNEFA) [cattle] (Mapa, 2008c); f) rules and applicable procedures to all stages of production, processing, distribution and agricultural services, to ensure traceability, the origin and identity of animals, products, byproducts and agricultural inputs in the production chain of cattle and buffalo [cattle] (Mapa, 2006); e) prohibition throughout the national territory of the production, use and marketing of products for feeding ruminants which contain proteins and animal origin fats in its composition [cattle] (Mapa, 2004b); f) the technical regulation of the national program for control and eradication of animal brucellosis and tuberculosis [cattle] (Mapa, 2004a); g) settlement of measures for intrastate transit of live pig in the state of Mato Grosso do Sul [pigs] (Ms, 2003b); h) the implementation of the early calf program through the creation of PROAPE - program of livestock advances of Mato Grosso do Sul [cattle] (Ms, 2003a); i) standards for certification of pig breeding farms [pigs] (Mapa, 2002).

Influence Factors in Transaction Pattern:

In the preparation and analysis of the model proposed here, the thoughts of Zylbersztajn (1995) were used in which the time in the activity and the tradition of the agent's own family are closely intertwined with the

reliability of the industry. According to the author, this trust is strongly related to transaction costs, and hence, the pattern of transaction and its form of governance.

Test of Hypotheses:

In order to test the hypotheses proposed in Table 3 a *ceteris paribus* analysis was performed through ordinal logistic regression. The dependent variable is the formality of the test in the forms of governance, and as independent variables: i) the time in the activity of producers; ii) the tradition in the family activity; iii) participation in cooperative and/or association and iv) the difficulty in measuring the transacted attributes. Therefore, the model to be tested will be a score (S) of a linear function of dependent variables and a disturbance with logistics distribution (*u*), as shown below (Hamilton, 2006):

$$S = \beta_1 * X_1 + \beta_2 * X_2 + \beta_3 * X_3 + \beta_4 * X_4 \quad \text{(Equation 1)}$$

Where:
S = Score of the latent variable "Formality in the forms of governance"
X_1 = Time of experience in years
X_2 = Tradition in the activity, in generations
X_3 = Participation or not in associations and/or cooperatives
X_4 = Difficulties in measuring the attributes

Therefore, the probabilities of occurrences analyzed in this article are estimated as follows:
P (Formality in the forms of governance = "Market") = P ($S + u \leq$ cut 1)
P (Formality in the forms of governance = "Without contract/others" = P (cut 1 $\leq S + u \leq$ cut 2)
P (Formality in the forms of governance = "Informal Agreements" = P (cut 2 $\leq S + u \leq$ cut 3)
P (Formality in the forms of governance = "Formal Contract") = P (cut 3 $\leq S + u$)

The estimated coefficients of this proposed model to test these mentioned hypotheses can be observed in Table 4. It is observed that the estimated model had a good estimation with a pseudo R^2 of 26.30% and a good power of prediction of the estimated probabilities, very close to the actual percentage found.

Regarding the first hypothesis (H_1) it is observed that it was not rejected because it is noted that in Table 4 in column 1 there is a negative influence of time in the activity of the producer in the governance form of the transaction as expected, and that this estimated coefficient in the model was significant at the level of 1%. As for Table 4 column 2 it is possible to see that the marginal effect of time on experience, that is, in increasing one year of experience in the activity, has resulted in a reduction of 2.80% in the probability of having this respondent individual have their relationship governed by formal contracts.

Table 3: Summary of Tested Hypotheses and the Results.

Hypotheses	Description
H_1	There is a negative relationship between the time in the activity and the formality in governance forms due to the fact that the more time in activity the greater the industry reliability in producers, and therefore, the less formality in governance forms.
H_2	There is a negative relationship between the tradition in the activity and the formality in governance forms, so the greater the tradition the greater the industry reliability in producers, and consequently, the less formality in governance forms.
H_3	In measuring of the industry reliability towards the producer the time in the activity is perceived with greater influence on governance forms, due to the creation of reputation among agents.
H_4	In the case of participation in associations and/or cooperatives less formality is expected in governance forms, because there will be greater reliability in transactions among cooperating agents.
H_5	The greater the difficulty in measuring the attributes transacted the higher the formality in governance forms, since the more difficult the measuring is the greater the use of formal contracts in the transactions.

Source: Developed by the authors.

Hypothesis 2 (H_2) was not rejected either, since on Table 4 column 1 we can see a negative influence of the tradition related to the producers' family in the activity and formality in governance forms due to its estimated coefficient being significant at the level of 10%. Moreover, according to Table 4 in column 2, the increase in generation, that is, the transition from one generation to another, such as from parent to son, decreases in 12.20% the likelihood of this supply relationship being regulated by formal contracts.

Hypothesis 3 (H_3) was not rejected due to the fact that the influence of tradition has a 12.20% reduction in the likelihood of this supply relationship being governed by formal contracts, while each additional year of time in the activity presents 2.80% of probability. Thus, when the fact that the transition from one generation may vary yearly is highlighted, it is observed that after 4 years, 4 months and 10 days this hypothesis is valid, since the influence of time in the activity will be more significant than the tradition.

Hypothesis 4 (H_4) was rejected because there was a positive variation in the participation in associations and/or cooperatives and formality in the governance form, that is, the tendency to formal contract, observed by

the positive estimated coefficient in the model with a significance of 1% (Table 4 column 1). The participation of those interviewed in associations/cooperatives represents an increase of 75.00% in the probability of this supply relationship start being governed by formal contracts (Table 4 column 2).

It is worth emphasizing that the four attributes in the three active AIS for the analysis of hypothesis 5 (H_5) are: i) weight; ii) age; iii) quality; iv) compliance. This hypothesis was rejected due to its estimated coefficient in the model not being significant at the level of 10%, this matter will need to be revisited since it goes beyond the limitations of this study.

Table 4: Results in the ordinal logistic regression of the proposed model

	(1)	(2)
VARIABLES	Coefficients	Marginal Effect Formal C. Prob.
Time of Experience	-0,112***	0,972***
	(0,0261)	(0,00633)
Tradition	-0,488*	0,878*
	(0,291)	(0,1670)
Assoc./Cooperative	3,005***	1,750***
	(0,665)	(0,1670)
Dif. Measuring	-0,0246	0,994
	(0,315)	(0,0782)
Cut 1	-2,429**	
	(1,116)	
Cut 2	-2,124*	
	(1,119)	
Cut 3	-0,632	
	(1,099)	
Observations	86	86

Observation 1: Standard errors in parentheses
Observation 2: *** p<0,01, ** p<0,05, * p<0,1
Source: Research Data

Table 5 shows the elaborate hypotheses and results found.

Table 5: Summary of tested hypotheses and results.

Hypotheses	Description	Results
H_1	There is a negative relationship between the time in the activity and the formality in governance forms due to the fact that the more time in activity the greater the industry reliability in producers, and therefore, the less formality in governance forms.	Not rejected***
H_2	There is a negative relationship between the tradition in the activity and the formality in governance forms, so the greater the tradition the greater the industry reliability in producers, and consequently, the less formality in governance forms.	Not rejected *
H_3	In measuring the industry reliability towards the producer the time in the activity is perceived with greater influence on governance forms, due to the creation of a reputation among agents.	Not rejected *
H_4	In the case of participation in associations and/or cooperatives it less formality is expected in governance forms, because there will be greater reliability in transactions among cooperating agents.	Rejected***
H_5	The greater the difficulty in measuring the attributes transacted the higher the formality in governance forms, since the more difficult the measuring is the greater the use of formal contracts in the transactions.	Rejected ns

Source: Developed by the authors

Observation: *** = Coefficient estimated with significance level of 1%; ** = Coefficient estimated with significance level of 5%, * = Coefficient estimated with significance level of 10% and ns = Coefficient estimated not significant at the level of 10%.

Conclusion:

From the Transaction Cost Economics it was found that three agro-industrial systems of animal protein of Mato Grosso do Sul (MS) have many similarities, especially between poultry and swine, with small differences concerning cattle. On the issue of geographic location it was made explicit the large spread in cattle farming, and the high concentration of poultry and swine in key cities that held the representative industries of AIS.

In relation to family sequence and years of experience within the activity, greater representation was devoted to cattle farmers, because they have great continuity in the activity within the family, thus passing from father to son, and consequently, longer experience with this continuity. However, they have equated the poultry farmers in relation to the investments in technology. Besides that the three AIS are close to their organizational environment, with regard to associations and cooperatives.

In the analysis of the transaction standard almost equity between the transactions in poultry and swine of AIS was observed. The only difference is the time of frequency of each transaction, a fact that is due to the characteristics of each animal. In the cattle AIS a greater frequency was noted, and with high asset specificity. In the same analysis it became evident that the transactions coordination was made through contracts, and it was observed that contracts were the absolutely norm for poultry farming as in pig farming a great amount of contracts were present and very few in cattle farming. As for the use of governance via market in the swine AIS not a significant activity was observed, in contrast, a large use of governance via market was seen in cattle AIS which also utilizes intermediaries, organizational environment and its associations as coordination methods. .

Turning to the quantitative analysis and the problematic research, evidence was obtained that the time in activity, the tradition of producing family, participation in cooperatives and/or association are influencing factors on the transaction pattern, being the first two with power of negative influence over the formality of governance form. It was seen that the third power has a positive influence on the formality of the governance form. The interposition of informal mechanisms derived from the organizational environment in the swine AIS, the cooperative, and cattle AIS, the association was observed, since this represents a gap in negotiations between the cattle and pig farmers and the industry of each production system.

However, in the qualitative interim, this study has some limitations, mainly related to the fact that the analysis developed is more focused on aspects of the producers. That said, it is suggested as a research agenda the development of studies from the standpoint of processing industries in MS and also a comparative analysis with other research systems applied in different agro-industries in Brazil. In the quantitative analysis, in turn, the major limitations were the large participation in associations and/or sample cooperatives, which can lead to a questioning of the rejection of hypothesis four (H_4), besides the low diversity of attributes negotiated in the three AIS jointly, which also leads to doubts in relation to the rejection of hypothesis five (H_5) proposed in this research.

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