DETERMINING THE USE OF CONTRACT IN CATTLE FEEDLOT IN BRAZIL

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Abstract
The cattle beef activity appears in almost 75% Brazilian farms, becoming one of the main activities in rural areas, according to IBGE (2012). The production runs, on average, for 3 years (finishing cow-calf), and for this reason, it is essential to agricultural enterprises the standpoint of property. It is also an essential component of the cash flow properties, generating the necessary liquidity to enable all the activities within them. Feedlot arises as a great alternative to intensify production. Investments in feedlot depend on the economic sustainability because it requires intensive capital and involves greater risks of production and marketing. By the side of the industry with the expansion of the consumer market is need to provide quality meat, standardized and continuously, making this sector seek partnerships and contracts with cattle`s suppliers. Because of these risks and the uncertainty of the trade, the use of contracts between producers and beef industry has been growing in the last years. Regarding the uncertainty of the agents, according to the New Institutional Economics, is not possible to predict all the events surrounding the transactions; this way, the contracts are incomplete (imperfect). This article aims to analyze the determinants of contract between producers and slaughterhouses in Brazil. The data used to make this analysis were 669 questionnaires with Feedlots in the states of Goiás, Mato Grosso and Sao Paulo in Brazil. It was used the Tobit model to determine the main factors determining the use of contracts. The choice of the model mentioned occurs because the dependent variable (contract) take many values equal to zero. And this type of data leads to a corner solution very common in economics. Therefore the choice of the above model (Wooldridge, 2009). The results show that the variables cattle, meals (cost), machines, distance and prizes were statistically significant at 1%, and that the hypotheses H_0, H_1, H_2 and H_3 can't be rejected. That is when the greatest level of technology adopted, as well as the increased risk of production and cattle size, there is a quest for realization of contract between Feedlot cattle and beef industry. Already the hypotheses H_5 were rejected. The market price doesn't interfere in the use of contracts.

Key words: Contract, *Cattle, Feedlot*

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1. Introduction

Historically, Brazil has been a major producer of cattle beef. In the last 5 years it has become the largest exporter of the meat. According to FAO (2012), 1 in 4 kg of cattle beef sold in the world is Brazilian. The exported volume exceeds 2.4 million t, generating resources in excess of $ 4 billion. This number accounts for roughly 20% of national production. The total volume of resources handled by the sale of cattle beef in Brazil exceeds the 10 billion dollars per year.

The Brazilian beef chain presents some problems related to the heterogeneity of production and processing (capitalized farmers and small producers; slaughterhouses with high technological standard and illegal slaughter, etc), lack of coordination between the links (conflicts in relationships) and influences of the institutional environment as a mediator of the problems in this chain (Benitez, 2000; Caleman & Zylberstajn, 2010).

The cattle beef activity appears in almost 75% Brazilian farms, becoming one of the main activities in rural areas, according to IBGE (2012). The production runs, on average, for 3 years (finishing cow-calf), and for this reason, it is essential to agricultural enterprises the standpoint of property. It is also an essential component of the cash flow properties, generating the necessary liquidity to enable all the activities within them.

The weak point of this success that has been highlighted is how to sustain this growth since the restrictions on land and climate appear not only in Brazil, but in the entire planet. The growth of international consumption and the need to preserve the Amazon have shown that land need to increase productivity. The Brazilian beef cattle production occupies the largest slice of Brazil's arable land and is losing space for other agricultural activities. Furthermore in Brazil, in certain periods of the year, the climate impacts in lower pasture production and consequently lower production of meat.

In this way, beef cattle need to increase land productivity and periods between harvests. Feedlot arises as a great alternative to intensify production. Investments in feedlot depend on the economic sustainability because it requires intensive capital and involves greater risks of production and marketing. By the side of the industry with the expansion of the consumer market is need to provide quality meat, standardized and continuously, making this sector seek partnerships and contracts with cattle`s suppliers.

Because of these risks and the uncertainty of the trade, the use of contracts between producers and beef industry has been growing in the last years. This little used tool in the recent past and this sector has been gaining ground among producers, especially among the feedlots, that see in the expansion of the market a chance to qualify their flock and ensure the return of your investment.

2. Literature

2.1 Beef Cattle

The growth of national beef production is reaching higher rates compared to the past due to an increase in productivity. In Table 1, it can be observed the Brazilian beef production evolution, which exceeded 9 million tons on carcass equivalent in 2009. In the last 13 years

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(1996 to 2009), the production increased 53.7%, according to the Brazilian National Beef Cattle Council (CNPC, 2012).

Analyzing the herd for the past 13 years, it is noticeable that the cattle number increased up to 37 million head, measured by the Brazilian Institute of Geography and Statistics (IBGE) and published by the Association of Brazilian Beef Exporters (ABIEC), showing an increase of 27.3% per year.

The average productivity in kg/cow/year increased by 27.51% (Table 1). The rate of increase in this period was 2.2% per year, 2007 being the most outstanding as the national productivity registered a 5.83% raise when compared to the previous year.

Table 1. Total meat production in Brazil, total beef cattle herd and productivity, geometric growth rates and coefficient of determination, 1997 to 2009.

Year	Beef cattle Herd (million head)	Total Production (thousand tons eq. carcass)	Productivity (kg/herd/year)
1997	156.1	5,820	37.28
1998	157.8	6,040	38.28
1999	159.2	6,270	39.38
2000	164.3	6,650	40.47
2001	170.6	7,151	41.92
2002	179.2	7,540	42.08
2003	189.1	7,792	41.21
2004	197.8	8,488	42.91
2005	200.3	8,776	43.81
2006	199.1	9,053	45.47
2007	193.2	9,297	48.12
2008	191.2	9,000	47.07
2009	193.1	9,180	47.54
GGR	2.02	4,28	2.21
R^2	0.8392	0.9626	0.9145

Source: CNPC, 2012

On the other hand, in border regions, the expansion and consolidation of the beef cattle sector can be explained, mainly throughout the last years, by the diffusion of advanced technologies in genetics, nutrition, management and health. As a result, there was a raise in the sector productivity, transforming the national cattle farming into a competitive activity. Beef production is spread throughout the national territory, but more intensely in the central and southern regions of the country. The states of Minas Gerais, Mato Grosso do Sul, Goiás and Mato Grosso have the highest number of herds, representing 37% of the national total. On the other hand, the states with a higher relevance in slaughter activity are located in the central and western regions, where there are small consumer centers and big meat producers. The excess from those states are sent especially to São Paulo and Rio de Janeiro, which are the main consumer centers.

The price per arroba increased in the last 12 years. However, there were some periods with a significant amount of benchmark fluctuations, either because of the consumer market,

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or the production sector, which slaughtered many reproductive animals and reduced supplies. It is well known that the price variable is highly determining in the investment analysis and risk management.

The period between January 1997 and December 2011 registered a price increase of 21.8% within the state of São Paulo, as observed in Figure 1. On the one hand, a big fluctuation was recorded, as the one in 1999, when the arroba reached one of its peaks due to the depreciation of the Brazilian Real to the US dollar, which allowed more sales and consequently price increase. On the other hand, in 2006 prices were the lowest with regard to the previous 50 years. Finally, the highest price since 1994 was in 2010, when the domestic market, with growing income, demanded large quantities of meat, increasing the product value (Carvalho and DE ZEN, 2010).
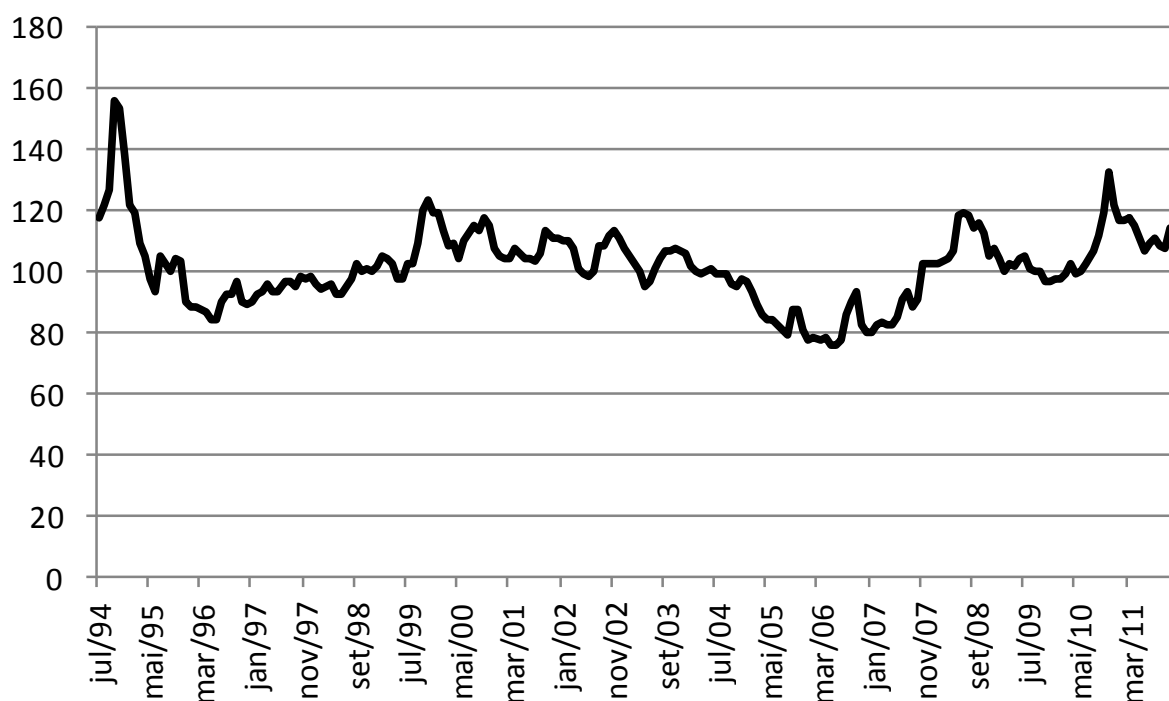

Figure 1. Finished cattle cash prices in R$/arroba within the state of São Paulo from Jul/94 to Dec/11, deflated by the Consumer Price Index (CPI) (Basis = Dec/2011).
Source: Cepea/Esalq-USP, 2012

Regarding the consumer market for beef in Brazil, distinguished two niches. The first is formed by low-income consumers, whose main decision variable in choosing the product is the price. The second niche market corresponds to the group of consumers with high purchasing power, focused primarily on product quality (Carvalho & De Zen, 2010).

Thereby the Brazilian beef chain is characterized by its complexity and diversity. The demand for quality products with traceability is related to healthy, social and environment concerns. For that an efficient coordination between industry and production should be accomplished. This new context imposes challenges to this sector. The processing industries, mainly those oriented to the international market, develop Quality Programs that, in last instance, represent a private initiative for carcasses classification and standardization. These programs aim to incentive the production of standardized animals in order to attend industrial

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processes optimization and consumer demand for quality. Compensations are given to cattle growers as a form of incentives in order to have animal carcasses with some attributes related to beef quality (Caleman & Zylberstajn, 2010).

2.2 Feedlot

The Brazilian cattle production has always been characterized by extensive system (pasture). Currently, with the incorporation of new technologies to increase productivity, there is intensive production systems in some regions, most known as feedlot (use feeds, main grains). In this system the animal remains for about 90 days in the fattening ration being treated with high protein and energy feed reaching a mean weight gain of 1.5 kg/day.

This system has been gaining importance in Brazil in the last decade. Figure 2 shows the number of animals confined evolution in the country in twelve years. The growth is observed with fluctuations in some years due to low prices paid to the animal and feed costs high. In 2012 the total number of confined animals was 3.9 million, which represents only 2% of the total herd Brazil.
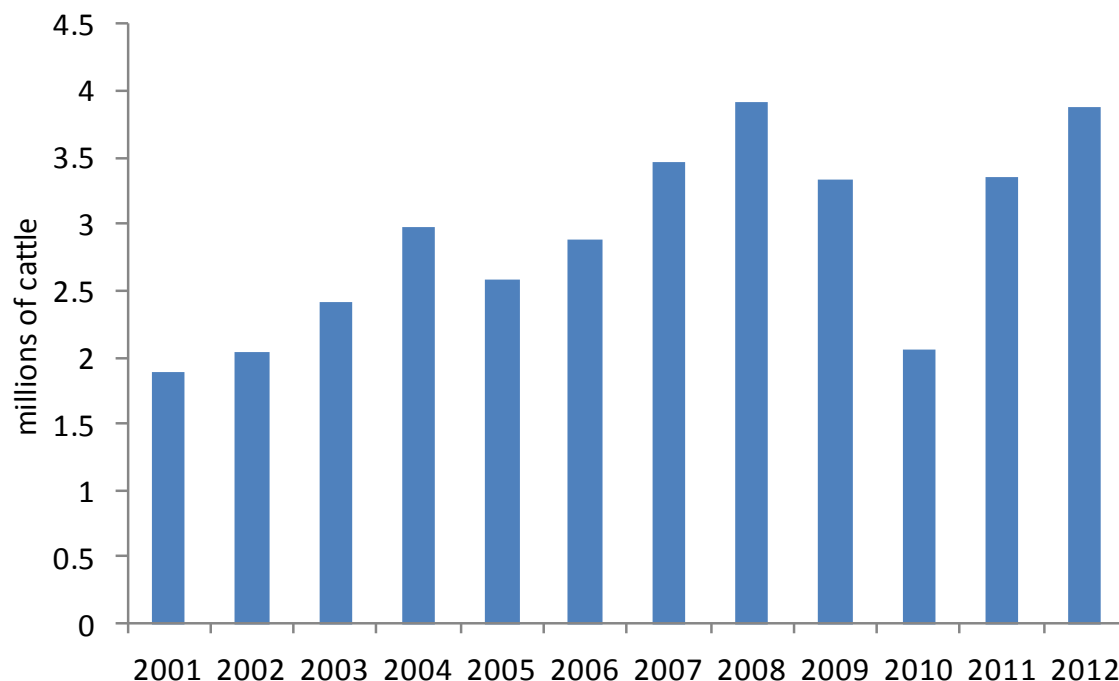

Figure 2. Number of cattle in feedlots - Brazil.
Source: Assocon & Beefpoint (2013)

An important point of feedlot production in Brazil is the largest supply of animals in the second half of the year when traditionally there is a lower supply of pastures due to climate and consequently the number of animals. Thus becomes an important regulatory mechanism in price between industry and producer. The importance of confinement is observed in figure 3 which shows the total number of animals slaughtered and the participation of animals from confinement. The share of this production system in total slaughter reaches 25% in the months from August to November.
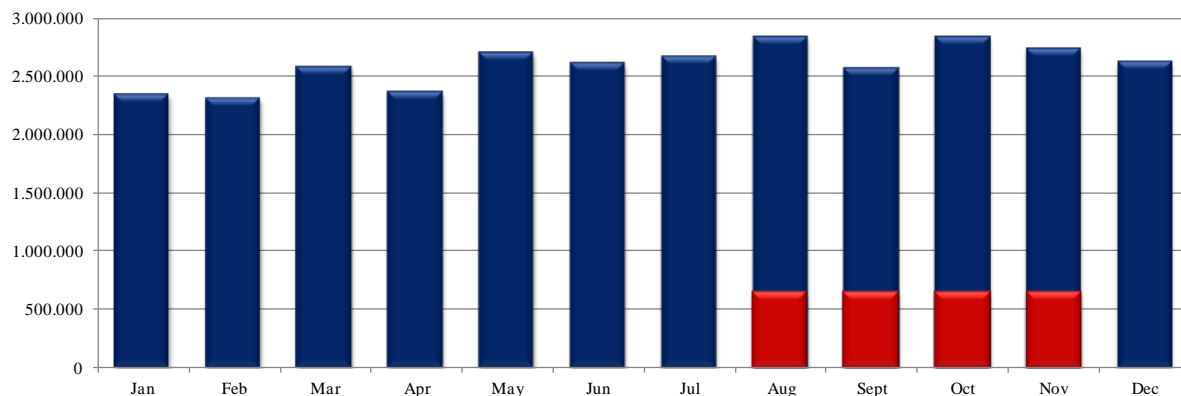
Figure 3. Number of feedlot's animal slaughtered in the total of Brazilian slaughter – millions of herds.
Source: Assocon (2013)

However as previously described this system is still in the growth stage in Brazil representing a small share of beef production and with the use of contracts between producers and industry still small. A example for the country both in this production system so with the coordination of the chain is the U.S.

Since the late eighties, the size of the North American feedlots increased while the quantity is reduced, gaining economies of scale in cattle feed - about 2% of feedlots fatten 85% of all livestock in the country finishing stage (International Livestock Congress, 2002 apud Brocklenbank et al., 2008). Gains are checked in purchases of inputs for livestock feed (Barkema et al., 2001 apud Brocklebank et al., 2008) and ownership of technologies that reduce the variable costs of production, including feed efficiency programs, new protocols for health management and treatment system, electronic identification of animals - also improved the efficiency of the management system (Brester, 2002 apud Brocklebank *et al*., 2008).

The coordination of the beef market in the United States was characterized by a movement out of the spot market to expand into different market structures, with contracts, strategic alliances (with other links in semen production and calves) and vertical integration. Coordination in the spot market is low, transactions are conducted by numerous buyers and sellers from a single determinant - the price (Hobbs; 1996 apud Brocklebank *et al*; 2008).

The contracts have been typically used by processors / packers and the feedlot. Its growth has motivated the search for the reasons for this growth by Lawrence et al. (2001), The processing companies are motivated to perform contracts with the feedlot as a tool to ensure the quality of meat that can then establish contracts based on specific attributes with dealers. Economies of scale are also observed due to the flow of slaughter can be maintained near full capacity (Brocklebank *et al*., 2008).

The first incentives for the establishment of contracts by the feedloters are to ensure premium quality and get better prices by carcass of the animal sold. Differential pricing by type of carcass allows feedlots identify the problem areas and make adjustments to achieve the desired levels of price premium. The establishment of contracts allows feedlots have guaranteed capacity and stable prices, allowing management efforts are conducted with animal production (Hayenga *et al*.; 2000 apud Brocklenbank *et al*.; 2008).

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2.3 Theory

Regarding the uncertainty of the agents, according to the New Institutional Economics, is not possible to predict all the events surrounding the transactions; this way, the contracts are incomplete (imperfect). The uncertainty changes the knowledge on future transactions. This aggravates the problem of incompleteness of contracts. Thus, changes the choice of more efficient governance structure adopted by the firm.

According to Williamson (1971), uncertainty is one of the characteristics of the transaction. This author defines the governance structure as a mechanism of adaptation in the task of transacting; being that the organizational structure varies according to certain characteristics of these transactions, such as: i) asset specificity, ii) frequency and iii) uncertainty. The specification of the asset (investment) can define the degree of stiffness of the contractual relationship; greater asset specificity means that it has a unique function that cannot be modified without costs, ie when the specific asset is being incurred higher begin to develop new forms of rigid contract. The frequency of transactions can be classified as occasional or recurrent. Uncertainty is the third dimension of an economic transaction; conditions of uncertainty comes from possible opportunistic behavior after the drafting of the contract. May result in unexpected behavior even during the execution of this contract.

As in the instance of the contract between the Feedlot cattle and the meat industry, the uncertainty of the market (supply and demand) is what leads the agents to seek this kind of relationship. Despite many differences that occurs between production systems in a country with continental proportions as Brazil, the most widely used commerce system is still traditional price contract over the counter on the day of last judgment of sale. The last sense of Assocon (National Feedlot Association) showed that only 28% and 17% of confinements in Mato Grosso and Sao Paulo, respectively, used contracts to negotiate cattle with the industry. The use of the sense is used as a parameter for judging the proportion of farmers involved in marketing. This is due to the fact that producers are used as a tool of containment finishing animals, have a more technical manpower, a more professional system as a whole.

When analyzing the issue of specific assets, Lafontaine (2007) shows that some empirical tests are not designed to identify the precise nature of specificity. Instead they test for its presence in more general terms. To illustrate, one study (Weiss 1992) assesses residual correlation of share–price returns, under the hypothesis that, when specificity is important, shocks to one firm will affect the other in the same direction. In the case of Brazilian feedlots, this can occur when the producer ranges a level of standardization that the slaughterhouse wants. In this case, the producer can receive a prize for the herd quality.

3. Goal

This article aims to analyze the determinants of contract between producers and slaughterhouses in Brazil.

4. Methodology

The data used to make this analysis were 669 questionnaires with Feedlots in the states of Goiás, Mato Grosso and Sao Paulo in Brazil (Cepea / Assocon). It was used the Probit, Logit and Tobit models to test and determine the main factors determining the use of contracts. The choice of the model mentioned occurs because the dependent variable

October 07-08th,, 2013
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(contract) take many values equal to zero. And this type of data leads to a corner solution very common in economics. To test the hypothesis we used a Logit econometric model, considered appropriate for cases with discrete binary dependent variable. The dependent variable is the contractual arrangement observed in each transaction, and the transaction carried out by contractual arrangement 0 if the contract between producer and industry and 1 case otherwise

Therefore the choice of the above model (Wooldridge, 2009). The program to run the model described above was Stata.

$$Contract = \beta_0 + \beta_{1i}cattle + \beta_{2i}distance + \beta_{3i}machines + \beta_{5i}prize + u_i$$

Where:
Contract: 0 if no contract between producer and industry and 1 case otherwise
Cattle: The amount of livestock in confinement
Distance: distance between the farm and industry
Machines: number of machines used in the feedlot
Prize: Prize paid by industry for the quality of cattle

The hypotheses to be tested are:
H_0: the larger of the herd, the more risk and greater use of contracts;
H_1: The greater the technology employed (machinery), greater use of contract;
H_2: the greater the distance between the farm and industry, the greater is the use of contract;
H_3: if there receiving prize for quality, there is use of contract.

5. Results

The survey along the feedlot in the São Paulo, Mato Grosso and Goiás states, reached a total of 669 producers and together have 1,256,171 animals in 2009, representing 40% of the total animals in Brazilian feedlots. The analysis of the survey data showed that only about 30% of interviewed (farmers) used the contract to negotiate the animal with industry, and that these producers have 79% of the animals, ie, 990.851 animals are negotiated via contract with industry.

Below there are tables 2, 3 and 4 with the results of Probit, Logit and Tobit models, respectively, which were run to related the variables cattle, prize, distance and machines with the use of the contract. The best results found were for the Tobit model, which can be observed in Table 4.

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Tabela 2. Results of Probit Regression

					Number of obs = 669	
					Pseudo R2 = 0.3343	
contract	Coef	Std. Err.	z	P>[z]	[95% Conf. Interval]	
cattle	0.000593***	0.0000588	10.09	0.000	0.0004777	0.000708
prize	0.258***	0.0704751	3.66	0.000	0.1196515	0.3959089
distance	0.000620*	0.0003597	1.72	0.085	-0.0000851	0.001325
machines	0.0180	0.0115037	1.57	0.117	-0.0045055	0.0405882
_cons	-1.602***	0.1321048	-12.12	0.000	-1.860.449	-1.342.608

*** p<0.01, ** p<0.05, * p<0.1

Source: Results of model

Tabela 3. Results of Logit Regression

					Number of obs = 669	
					Pseudo R2 = 0.3372	
contract	Coef	Std. Err.	z	P>[z]	[95% Conf. Interval]	
cattle	0.00109***	0.000119	9.17	0.000	0.0008578	0.0013243
prize	0.457***	0.1367981	3.34	0.001	0.1889379	0.7251766
distance	0.00113*	0.0006297	1.79	0.073	-0.0001041	0.0023644
machines	0.0273	0.0194041	1.41	0.160	-0.0107669	0.0652956
_cons	-2.748***	0.24257	-11.33	0.000	-3.223.678	-2.272.821

*** p<0.01, ** p<0.05, * p<0.1

Source: Results of model

Tabela 4. Results of Tobit Regression

					Number of obs = 669	
					Pseudo R2 = 0.1019	
contract	Coef	Std. Err.	z	P>[z]	[95% Conf. Interval]	
cattle	0.000057***	8.80E-06	6.48	0.000	0.0000397	0.0000743
prize	0.171***	0.0390256	4.39	0.000	0.0945339	0.2477904
distance	0.000168	0.0003124	0.54	0.073	-0.0004454	0.0007816
machines	0.0416***	0.0089519	4.64	0.000	0.0240008	0.0591557
_cons	-1.033***	0.1313531	-7.87	0.000	-1.291	-0.7754302
/sigma	1.089***	0.0665049			0.9584454	1.219

*** p<0.01, ** p<0.05, * p<0.1

Source: Results of model

The results show that the variables cattle, machinery and prizes were statistically significant at 1%. So, the hypotheses H_0, H_1 and H_3 can't be rejected. That is when the greatest level of cattle quality, as well as the increased risk of production and cattle size, there

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is a quest for realization of contract between feedlot cattle and beef industry. As the machinery, the greatest level of technology adopted interfere in the use of contracts. However the hypotheses H_2 is rejected. The greatest of the distanced adopted doesn't interfere in the use of contracts.

The results found show that the increase of one unit of the prize, there is a increase of 0.17 units in the use of contract. The results are similar with that happens in the activity in the United States, where the use of the contract between producers and industry happens for additional pay for quality and standardized meat.

6. Conclusions.

The focus of the article was to identify the determinants of the choice of arrangements contatuais transaction between the processor - beef producer confined in the three producing states in Brazil. To understand the dynamics of the transaction, as regards existing contractual arrangements were analyzed as the size of the transaction (specific assets: cattle, prize, distance, machines) that generally influence the formation of a contractual arrangement, based on the economics of Transaction Costs.

Identified the variables that determine the choice of contractual arrangements, through statistical analysis (Logit, Probit and Tobit).The analysis of the survey data showed that only about 30% of interviewed (farmers) used the contract to negotiate the animal with industry, and that these producers have 79% of the animals, ie, 990.851 animals are negotiated via contract with industry.

The results show that the variables cattle, machinery and prizes were statistically significant at 1%. In general, this study indicates that investments in specific assets (cattle, prize, distance, machines), The dynamics of transaction feedlot beef depend on the variables in stratified hypothesis (H0: H1: H2: H3), is important to emphasize that in this work only the H2 was rejected (the greater the distance between the farm and industry, the greater is the use of contract). The results found show that the increase of one unit of the prize, there is a increase of 0.17 units in the use of contract.

Finally, we conclude a transaction more likely to align with the contractual arrangement according to specificities of the assets involved in the production (cattle, prize, machines). Longer distance between the producer and the processor (greater locational, specificity) did not influence the formation of the contract, ie, the distance is not relevant to the formation of a contractual arrangement.

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